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| **In-Service Questions Notes: Cosmetic chemical peel/skin** |

Botulinum Toxin A:

* blephrospasm
* hemifacial dyskinesia
* cervical dystonia
* post-stroke upper limb spasticity

Bruxism:

* treatment is splint therapy and pharmacotherpay
* botox: decreases the amplitude of the contractions but not the rhythm or frequency

Tardive dyskinesia:

* is NOT treated with botox

Paroxysmal dyskinesia:

* not treated with botox
* treated with abx, corticosteroids and immune therapy: rituximab

Bening masseteric hypertrophy:

* Masseter extends from the body of maxilla to the inferior border of the mandible
* The inferior limit of the masseter is the inferior border of the mandible
* botox injected below a line that extends from the earlobe to the corner of the mouth
  + that is where most of the masseter is located

Peel neutralization:

* occurs with basic solution
* with 1% sodium bicarbonate
* required only for **Glycolic acid**

TCA :

* penetrates deep to the **dermal-epidermal junction**
* **neutralized/counteracted by dilution with saline**
* cannot be done at the end of the treatment because it has penetrated too deeply

Procereus:

* from nasal bone to dermis of glabella
* causes HORIZONTAL rhytides

Corrugator supercilli:

* promote vertical rhytides

Orbicularis oculi:

* can also contribute to vertical glabellar rhytides

Frontalis:

* horizontal rhytides above the eyebrows

Eyelid ptosis after botox: WHEN INJECTING THE **GLABELLAR REGION**

* occurs due to injection **within or below the orbital rim**
* due to inadvertent effect of botox on **levator palpebrae superioris**
* Can be encountered with **alpha-adrenergic agents such as Apraclonidine (iopidine) or phenylephrine**
  + 1-2 drops/day x3 daily
  + elevates 1-3 mm
* This stimulates Müller muscle which is located below the levator, between the levator and conjunctiva
* Müller is another eyelid elevator

WHEN INJECTING THE FOREHEAD AND LATERAL EYEBROWS:

* ptosis occur due to paralysis of the frontalis

Hyaluronic acid (HA):

* naturally occurring polysaccharide
* from bacterial fermentation
* does not induce allergic reaction
* Can be dissolved with hyaluronidase
* Appears **gray if injected near the skin** (**Tyndall effect**)
* Not approved for injection in subperiosteal plane
* can be mixed with lidocaine
* can have minor complications such as hypersensitivity, infection , malposition of filler and inflammatory nodules or granulomas

Other types of fillers:

* Finely grounded MMA
* Calcium hydroxyapatite
* Poly-L-Lactic acid

Intravascular injection:

* tissue necrosis
* central retinal artery occlusion

**High cross linking** of HA:

* increase **stability, density, cohesivity and longevity** of the filler
* Cross-linking results in larger more stable molecules, biocompatibility and viscoelastic properties similar to fat
* Ideally should be placed **PREPERIOSTEALLY:**
  + no minimize intravascular injection and visibility

For the glabellar region botox:

* 20 units
* 1 procereus and 2 corrugators
* each botox vial contains albumin, sodium chloride and botulinum toxin

Tetracaine:

* local anesthetic

Tobradex:

* tobramycin and dexamethasone
* for infection/ anti-inflammatory in the periorbital region

Filler injection for dorsal nasal augmentation:

* intravascular injection into the dorsal nasal artery which comes off the ophthalmic artery from internal carotid
* under the pressure of injection, the fillers goes retrograde into the ophthalmic artery, when pressure is released then it will flow distally to central retinal artery
* Blindness can also happen when injecting the angular artery but in this case it causes more skin mottling and necrosis of the nasal tip

Injection in the geniomandibular and lateral lip commisure:

* associated with vascular compromise of the lips and chin

Intravascular injection of fillers:

* blindess
* scarring
* stroke
* skin necrosis
* Presentation:
  + skin blanching
  + mottling
  + slow capillary refill
* For HA: tx hyaluronidase
  + after injection of hylaluronidase:
    - massage the area to distribute Hyaluronidase
    - warm compress
    - nitropaste
    - aspirin
  + Secondary treatment:
    - hyperbaric oxygen
    - papaverin
    - PGE1
    - heparin
    - lidocaine

Recommendation to reduce the risk:

* large bore (27 g or larger)
* do not inject more than 0.1 mL per injection site
* avoid high pressure syringes
* use local anesthetic with epi
* caution around radix, lateral nasal wall and periorbital area

The most common histologic effect of skin treatment with Tretinoin:

* increase collagen production

In sun damaged skin, the major histologic findings:

* reduced collagen quantity
* dermal collagen disorder

Retinoid:

* is the mainstay in photodamaged skin

Histological effects on retinoids:

* increase collage I, III and VII
* improved organization of collagen within the dermis
* improved organization of elastic tissue
* epidermal hyperplasia
* increased mucin deposition (epidermal and dermal)
* decreased melanin
  + All these lead to improvement in rhytides, smoother skin and correction of dyschromia

Treatment with 35% TCA with Jessner solution: the clinical endpoint during the application of chemical peel:

* the appearance of uniform deep white frost
* indicates that the peel penetrated to the **upper reticular dermis**
* there is no pink hue due to capillary vasospasm in the papillary dermis layer
* depth is good for moderate and deep rhytides
* transient phenomenon
* capillary refill returns within 20-40 mins

TCA < 30%

* transparent frost with pink background
* this frost due to coagulation of protein in dermis and epidermis
* pink hue due to blood vessels in the papillary dermis

Botox works by binding receptors in presynaptic nerves that prevent the release of Ach into the synapse of neuromuscular junction

In a patient with diffuse fine rhytides with history of skin exposure and smoking:

* long term increase in dermal collagen content seen with tretinoin
* Retin-A is found to have longterm effects in collagen production
* Retinoids are vitamin A derivatives
* Increase collagen production in the dermis and decrease its degradation over 6-12 month of treatment
* Treatment is 0.05%- 0.01% topical cream applied nightly
* redness and peeling are expected but tolerance increase with time
* Early treatment reactions can be treated:
  + decrease dose
  + increase interval
  + topical hydrocortisone

TCA:

* epidermis
* superficial dermis
* has **minor collagen stimulation** effects through natural wound healing
* amount of collagen stimulation is far less than tretinoin

Laser resurfacing:

* increases **dermal injury and resultant collagen production**
* **hypopigmentation** and prolonged recovered are the disadvantages

Calcium hydroxyapatite:

* semipemanent
* **last 1-2 years**
* must prevent overcorrection, clumping due to bolus injection
* inject in **subdermal layer** and then post-injection massage
* nodules can form in areas of thin skin:
  + eyelid
  + lip
  + nasolabial
* Tx of nodules:
  + direct excision
  + observation until absorbed
  + Needle disruption and unroofing
  + intralesional steroid does **not work**

Lumps caused by Poly-L- lactic acid (sculptra) and PMMA respond well to **intralesions steroids**

Patient who presents **after facial peel** with nausea, disorientation and ringing in the ears: signs of **salicylism/ Salicylic acid toxicity:**

* rapid breathing
* tinnitus
* hearing loss
* dizziness
* abdominal cramps
* central nervous system reactions
* Occurs more when there is **large surface** area that is involved
* when **20% salicyclic acid** applied with **50% of the body surface**
  + lesser area with stronger concentration
* safe less than 20% TBSA
* Can be used in darker skin

Salicylism has been reported when large surface area of peel using Jessner’s solution have been used.

Levator palpebrae muscle:

* 40 mm in length
* last 14-20 mm is tendinous
* transition **from muscle to tendon at the region of Whitnall’s ligament** (condensation of superior sheath of the levator muscle)
* arises from the **greater wing of sphenoid**
* innervated by **oculomotor nerve**

Müller muscle:

* innervated by **parasympathetic**
* deep to levator
* gives about **2 mm excursion**

**Resurfacing** causes ablation of:

* **epidermis**
* **superficial papillary dermis**
* wound healing occurs from dermal appendages (hair follicle and sebaceous glands)
* completed within 7-10 days
* damaged dermal layer causes **stimulation of fibroblasts**
* the coagulated layer is replaced with new collagen bundles
* process than continues for up to 6 months
* during the healing and re-epithelialization there is **extensive edema and exudation of proteinaceous** material
* Erythema is more intense during the first month
* Can persist for 6 months
* **First post-operative** week: patient have **edema, pain and pruritis**
* When infection happens:
  + Staph aureus most common bacterial
  + Candida most common fungal
  + Herpes Simplex **Reactivation** occurs in **2-7%**
    - should be treated one day before and for 5 days after

Chemical peels are classified according to the depth:

* superficial: epidermis
* medium: epidermis to upper reticular dermis
* deep: mid reticular dermis

**Salicylic acid 20-30%: lightest**

* injury to **strateum corneum** and possibly **the granulosum**
* <100 ūM
* **Superficial- very light**

**Glycolic acid** 50-70% and Jessner Soliution:

* 100 ūM
* **superficia**l- light
* necrosis of the **entire epidermis to the basal layer**
* generate new epithelium
* for superficial wrinkles, acne scars and uneven pigmentation

Trichloroacetic acid **35-50**%:

* **medium** depth peel
* extends 200 ūm
* penetrates the **epidermis, papillary dermis and upper reticular dermis**
* increase collagen production- minor compared to tretinoin

TCA **20%**:

* medium depth peel
* to **papillary** dermal layer

Deep peel:

* > 400 ūm
* necrosis to **part or all mid reticular dermis**

For **melasma**: you need something that gets to **upper reticular layer:**

* deep peel
* **TCA 35-50%**

Sculptra: Poly-L-Lactic acid:

* used for HIV associated retroviral drug-related lipoatrophy
* has been use for mid face rejuvination and temporal hollowing
* l**east likely to respond to it is: hemifacial atrophy**
* FDA approved
* Patients may require injections **every 4-6 weeks for several months but results may last for up to 2 yrs**

**Lipoatrophy** due to **discoid lupus**:

* fat grafting

Onabo (botox) and Abobo (dysport):

* FDA approved for glabellar lines
* Abobo, rimabo and onabo
  + all 3 approved for cervical dystonia

Phenol-croton oil:

* used as chemical peel that penetrate **deep to reticular dermis**
* The deeper the chemical peel the **higher risk for scarring and hyperpigmentation**
* hence deep peel is better **reserved** for patients with **Fitzpatrick type 1**

Superficial peels to epidermis:

* **alpha hydroxyl** (**glycolic** and **lactic** acid)
* **beta hydroxyl** (**salicylic** acid)
* **Jessner** solution is also superficial peel ????

**Jessner** solution combined with **TCA**: achieve **deeper** peel

Injection of botox in the cervicomental area:

* can cause dysphagia and voice change
* injection to strap muscles: dysphagia
* injection to crycothyroid: voice change
* Safe to inject in pars fascialis just below the mandible

Injection along the medial aspect of SCM: does not treat platysmal banding

**Dysport** (obabotulinum toxin): **contraindicated in patients with cow milk protein allergy**

Large bolus of filler injection: can cause venous congestion

For a fundraiser:

* it is legal to inject to the glabella region as this is FDA approved

Tretinoin:

* topical treatment
* photoaged skin
* decrease pigmentation, fine and coarse wrinkles
* activation of retinoic acid receptors
* epidermal hyperproliferation which results in **epidermal thickening**
* stimulate **fibroblast deposition of collagen and glycosaminoglycan** which increases skin turgor and elasticity
* the breakdown of collagen is reduced via the **reduction of collagenase and promotion of collagenase inhibitors**
* Epidermal melanin **is reduced because of the stable rate of melanin transfer** from melanocytes to keratinocytes
* the transit rate of keratinocytes through the epidermis is increased

To increase the fullness of nasolabial folds and lips:

* Juvederm
* Restalyne
* Perlane

Injection of botox is not a procedure per ASPS:

* as it does not include making of incision

The following medications can **potentiate** the effect of Botox:

* Quinine
* Aminoglycosides
* Penicillamine
* Calcium channel blockers

**Myobloc** (botulinum toxin type B)

* greater pain with injection
* **FDA** approved for **cervical dystonia** and **hemifacial spasm**
* Can be used when there is **resistance to botox**
  + (which can be related to **chronic and prolonged use of Botox leading to formation of antibodies**)
* It is in **more acidic medium**: which accounts for higher degree of pain
* consituted in liquid form
* Prolonged shelf life without diminished potency
* However:
  + **shorter** duration of action
  + **faster onset** of action
  + **wider radius of diffusion**

Injectable allergic reactions are uncommon and mostly related to technique of injection and the amount

* Zyplast: allergic reaction to bovine collage
* 3% of patients have hypersensitivity to bovine collagen
* need to do skin test prior to injection

CosmoPlast:

* from single human fibroblast culture

Evolence:

* porcine-collagen

**Radiesse:**

* **Calcium hydoxyapatite**

Jessner solution: used for **light peel alone**

* or used in preparation to TCA

Jessner solution is made of:

* Resorcinol
* salicylic acid
* lactic acid
  + all in ethanol
* Should be kept in ai**r tight bottle**

**Kojic acid:**

* used for **skin lightening**
* inhibits the **action of tyrosinase**
* used for treatment of melasma
* can cause some sun sensitivity and slight skin irritation

Reimportation:

* the act of importing drugs that are manufactured or approved to use in the US
* Allowed only by manufactures to import their own product
* If a patient imports the drug, it is illegal to inject even if it is FDA approved: because of the way it was obtained

Fat grafting:

* biggest concern: high resorption rate- up to 70%
* placement of small amount of fat with each pass is the key step to maximize take
* Also diffuse infiltration and attempt to separate fat parcels are considered important
* Need to avoid contact of fat with each other
* hyperbaric oxygen after following fat grafting did not enhance fat take
* rinsing with LR does not increase take
* use of suction assisted lipectomy decreases fat take
* Fat grafting can lead to prolonged downtime

In a patient with Fitzpatrick III, sun damaged skin with fine rhytides over the cheek and perioral region and history of perioral herpetic lesions:

* Phenol causes more hypopigmentation than TCA
* This is more evident in patients with darker skin and sun exposure after phenol tx
* **Phenol gets to the upper reticular dermis**
* TCA one half the degree of penetration of phenol
  + because of lack of degree of penetration: less effective against rhytides
* Phenol associated with significant **bleaching and hypopigmentation**

First line of treatment for **rhytides:**

* **tretinoin**
  + **hydroquinone and glycolic acids**
  + refractory cases: **TCA** for medium depth peel

Cardiac monitoring is required when using 30% phenol with 0.8% croton oil:

* phenol has rapid dermal absorption
* high concentration: disrupt the dermal barrier and the local anesthetic effect produces painless coagulum
* Phenol is mostly excreted unchanged in urine
* eliminated and excreted by the kidneys
* half-life 3.5 hrs
* cardiac arrhythmia
* and also need respiratory monitoring

HA injection for tear trough:

* should be injected at the level of periosteum
* this location decreases the palpability
* improves the longevity especially in areas where the face does not move so it negates the effect of animation to break down the product

TCA is neutralized in the dermis by the superficial dermal plexus by the protein Keratin

Patients who have a history of herpetic viral infections should receive acyclovir or valacyclovir following chemical peel or laser resurfacing

Reactivation of HSV-1 without antiretroviral therapy after laser resurfacing or chemical peel: up to 50%

outbreaks occur in patients without known history in 6.6.%

Zygomaticus major:

* draws the angle of the mouth superiorly, laterally and posteriorly
  + during laughing, chewing and smiling

Zygomaticus minor:

* one of the lip levators and with zygomaticus major:
* contributes to nasolabial fold

TCA:

* for treatment of rhytides in the infraorbital skin and full face
* comes in several concentrations:
  + 10-25% for light peel
  + 30-35% for intermediate peel
  + 50-60% for deep peel
  + more effective for neck, chest and hands because the concentration can be lowered  to avoid hypertrophic scars
  + results in less bleaching than phenols

Phenol:

* better for coarse wrinkles
* severe sun burn
* significant pigment problems
* Response is all or none
* Provides double penetration and double the amount of neocollagen formation when compared with deep TCA peel
* Phenol less used for darker people due to its bleaching effect, prolong recovery time and potential cardiac toxicity

Dermabrasion:

* good for scars
* removes the entire skin: epidermis, upper and mid dermis and upper part of the skin adnexa
* better than peel for perioral rhytides and acne scars
* re-epithelialization and repigmentation occurs from skin appendages
* less bleaching effect than phenol

Restylane:

* from streptococcal bacterial fermentation
* highest concentration of hyaluronic acid

Hylaform gel:

* from rooster combs of domestic fowl
* less immunogenic and longer lasting than bovine collagen
* less risk of clumping

Cosmoderm and cosmoplast:

* natural human collagen grown under controlled laboratories
* need pretreatment test

Glycolic acid:

* good peel for short recovery period
* fine wrinkles
* depth of injury is limited to stateum corneum
* promotes superficial desquemation and formation of collagen

Hydroquinone:

* melanin inhibitor
* used in hyperpigmentation

Jessner’s used with TCA for medium-deep peel

Jessner’s increase exofoliation compared to glycolic acid

TCA peel should be administered by a physician

The most appropriate technique for processing the lipoaspirate to yield the highest volume of viable fat cells:

* balanced centrifugation
* gravity sedimentation is the optimal process but lengthy
* Filtration, rinsing and straining disrupt the fat cells
* one or two hours ex vivo increases the risk of drying and lipolysis

Deoxycolic acid (DCA):

* Disrupts adipocytes cell membrane
* induces inflammatory response to clear cellular debris and liberated fat from injection sute
* up to 6 treatments for submental fat

Ice-pick scarring:

* full thickness scars that do not respond to anything but direct excision and closure

Micrografting of hair:

* uses hair follicle with dermal elements

The most appropriate method for decreasing the depth of phenol chemical peel:

* use of liquid soap
* which increase surface tension and decrease the depth of penetration and absorption

Depth of phenol peel is increased by: (based on croton oil)

* applying abx ointment
* taping the skin

Dermabrasion:

* mechanical abrasion of the epidermis and variable portions of the dermis
* wound healing from dermal appendages
* epidermis is removed initially
* the dermal-epidermal junction is smooth and does not bleed
* as you get deeper in the dermis into the papillary dermis and the background becomes coarse
* at the level of superficial reticular dermis is characterized by brisk, confluent bleeding on coarse tissue background
* re-epithelialization occurs within 7-10 days
* erythema persists for 6 weeks

Tretinoin:

* accelerates the reversal of skin damage repair
* inhibits the binding of AP1 transcription factor to DNA by 70%
  + thereby decreasing the activation of collagenase, gelatinase and stromelysin
* Histologically:
  + thinning of stratum corneum
  + reversal of cellular atypia
  + thickening of the epidermis
  + In the dermis: collagen synthesis is increased and malenin is more dispersed evenly

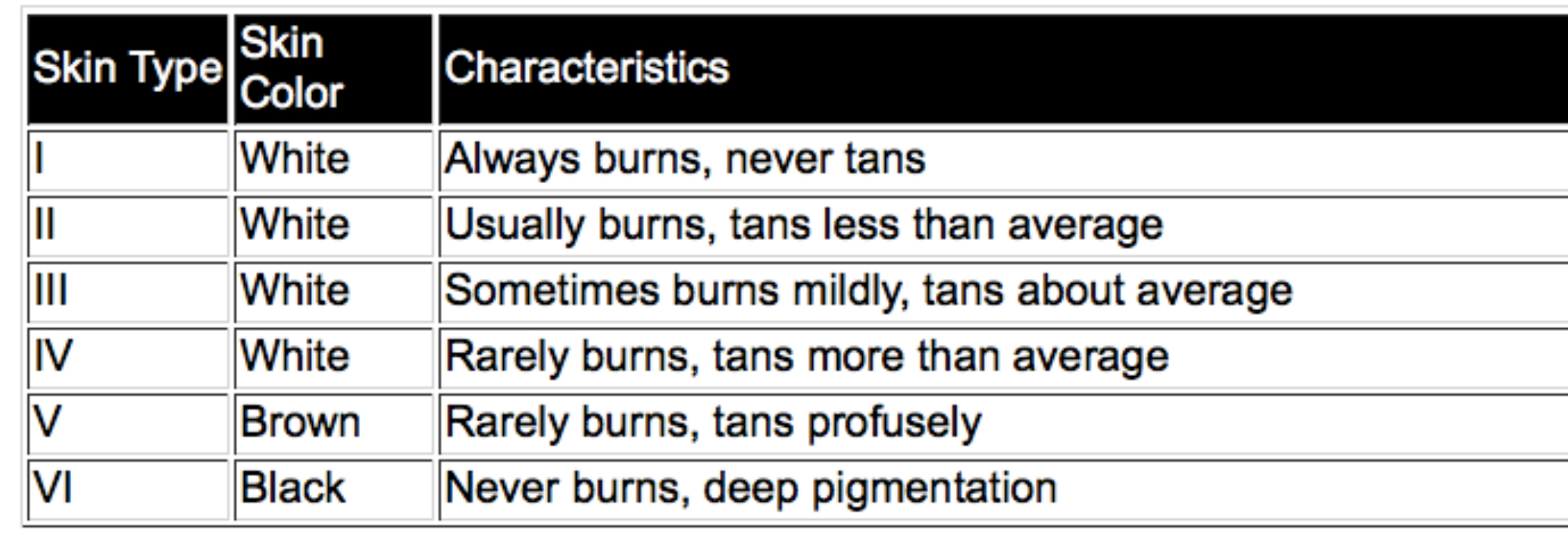
When injecting zyplast or zyderm: bovine products

* 3% allergic reaction
* test injection dose should be administered 4 weeks prior to injection
* patient need to be evaluated at 48 hrs and 4 weeks

Jessner’s solution:

contains: ethanol, lactic acid, resorcinol and salicylic acid

In a patient with history of breast cancer and axillary lymphadenectomy:

* presenting with cellulitis
* need to start IV abx with antistreptococcal
* 

TCA 30%: side effect: **hyperpigmentation**

* transient to due potential injury to melanocytes
* complications are rare
* include infection, scarring and skin pigmentation
* pigmentary changes are the most common
* TCA is superficial and will not result in scarring nor loss of sweat glands

Cardiac arrhythmias:

* due to phenol. need monitoring

Herpectic reactivation:

* laser treatment

Phenol: (carbolic acid):

* detoxified in liver (careful with in patients with liver disease)
* Only small area should be treated
* if more than half of the face within 30 mins, you can get arrhythmias and severe cardiac complications
* happened in as many as 50% of patients
* Other less common complications:
  + **hypopigmentation**
  + splotchy **hyperpigmentation**
  + prominent skin pores
  + talengiectasia
  + erythema
  + milia
* Delayed wound healing and hypertrophic scarring are rare

A woman with fine facial rhytides:

* best treatment is TCA (trichloroacetic acid)
* It provides moderate exofoliation for concentration between 15-35%

In patients who are about to undergo dermabrasion or laser treatment

* Isotretinoin (13-cis retinoic acid) is contraindicated
  + should be deferred for at least one year
* inhibits keratinization and suppress sebaceous glands
  + decreasing the oiliness of the skin and causes dryness
* This will cause delayed wound healing and hypertrophic scarring

For skin preparation for patients undergoing laser treatment or dermabrasion:

* Tretinoin is used for treatment

Bovine collagen hypersensitivity rate: 3%

* patients should be tested first
* then observed for 4 weeks prior to injection
* then after injection evaluated again at 48 hrs and 4 weeks
* (1-4% of patients have nonreactive skin tests then later develop hypersensitivity reactions)

Botox:

* once reconstituted: should be used within 48 hrs
* Onset of action 3-7 days
* lasting 4-6 months

Mechanism of action of retinoids:

* Decrease activation of metaloproteases via inhibition of AP1 transcription though binding of DNA receptor
* Retinoic acid:
  + reverse the effect of photoaging
  + thinning of stratum corneum
  + increase collagen production in dermis
  + thickening of the epidermis
  + reversal of atyping
  + angiogenesis
  + more even dispersion of melanin granules

5-alpha hydroxy:

* reduce fine rhytids through increased desquamation from diminished corneocyte cohesion immediately above the granular layer in the epithelium

Hydroquinone:

* bleaching agent
* inhibits the conversion of dopamine to melanin
* through inhibition of tyrosinase enzyme

Dermabrasion:

* can be used for removal of traumatic tattoo
* should not be deeper than the upper third of the dermis
* complications include hypertrophic scarring, hypopigmentation and enhanced porous look

Options for sun-induced actinic damage to the skin:

* laser surfacing
* TCA
* 5-FU

Fitzpatrick skin classification:

* stratifies patients accoriding to the potential for pigmentary changes following chemical peeling

Treatment of tretinoin:

* results in increased formation of collage type III
  + caused by activation of fibroblasts
* Improvements is not immediate and occurs over 6-12 months
* Dermis becomes thickening and increased elasticity of the skin (due to increase collagen by 80%)

The most appropriate therapy for acne scars:

* dermabrasion
* Appropriate depth: **the presence of punctate bleeding**
* deeper: will result in hypertrophic scars
* Patients with ice-pick scars: may need multiple treatments
* Also can use carbon dioxide

Topical agent that provides effective protection against long-wave ultraviolet A, short-wave A and ultraviolet B radiation:

* Zinc oxide

Ultraviolet B:

* the cause for most sunburns
* SPF screening measures its effectiveness against

Check question #84

Topic tretinoin: Retin-A

* decrease the effect of photoaging
* compactness of stratum corneum
* smoothing of the skin
* increase HA acid
* increase in epidermal thickness
* increase dermal mucin
* decrease melanin production

Adverse effects:

* erythema and crusting of the skin

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| **In-Service Questions Notes: Hand Nerves** |

Ulnar nerve:

* branch of the **medial cord**
* enters forearm between two heads of FCU
* Innervates FCU and ulnar side of FDP to small and ring fingers (**proximal to volar wrist= high up**)
* Dorsal cutaneous nerve of the ulnar arises 5-7 cm proximal to ulnar styloid
* Ulnar nerve enters Guyon’s canal and split to deep motor and superficial sensory
  + Deep nerve gives innervation to
    - hypothenar muscles:
      * abductor digiti minimi
      * flexor digiti minimi
      * opponens digiti minimi
    - flexor pollicis brevis (deep head)
    - adductor pollicis
  + Sensory branch:
    - small finger and the ulnar aspect of the ring finger

TMR:

* a set of nerve transfers to allow for **intuitive prosthetic control**
* nerves that **no longer have their distal muscle** are transferred to intact **proximal muscles**
* generate novel **electrical signal**
* this electrical signal can be picked by **myoelectric prosthesis**
  + example: median nerve transferred to short head of biceps to signal prosthesis for hand closure
  + opening hand: radial nerve to motor nerve of the triceps lateral head

Intrinsic muscles of the hand:

* fine motor function of the hand
* contracture and loss of function:
  + leads to loss of balance btw extrinsic and intrinsic muscles
  + leading to intrinsic plus hand
* The intrinsic muscles attach to **extensor tendon via lateral band**
* Intrinsic muscles: flexion of MCPJ and extension of PIPJ
* Bunnell test:
  + to test for intrinsic tightness
  + assess passive PIPJ flexion when MCPJ is extended
  + (extrinsic tightness PIPJ passive flexion with mcpj flexed

Radial nerve transection:

* the last muscle to reinnervate: EIP
* Thumb extension is the last to recover. look at the last 3 muscles of this list, they are all of the thumb
* order of innervation:
  + brachioradialis
  + ECRL
  + Supinator
  + ECRB
  + EDC  ECU
  + EDQ
  + APL
  + **EPL**
  + **EPB**
  + **EIP**

Lateral epicondylitis: attachement to lateral epicondyle

* ECRB
* EDC

Peripheral nerve injuries: Sunderland classification

* neuropraxia
* axonotemesis
* neurotemesis

Neuropraxia: Sunderland type 1

* injury to myelin sheath due to stretching  and compression
* segmental demyelination (conduction block)
* full recovery within days to weeks

Axonotemesis: Sunderland 2,3,4

* damage to axons and there will be Wallerian degeneration
* 2: there will be full recovery without intervention
* 3 and 4: injury to endoneurium and perineurium and fail conservative treatment

Neurotemesis: Sunderland 5

* complete disruption of peripheral nerve

Superficial radial nerve compression syndrome: Wartenberg syndrome

* fascial release between between brachioradialis and ECRL
* 8-9 cm proximal to radial styloid
* **pain, numbness and tingling** along the dorsoradial aspect of the hand to thumb and index finger
* at the posterior border of brachioradialis where nerve transition from deeper (subfascial) to superficial
* can sometimes be confused with DeQuervain’s
* Initial treatment is conservative

Guyon’s canal:

* from the proximal border of the transverse carpal ligament to hypothenar aponeurotic arch
* 4 cm in length
* medial wall: pisiform and pisohamate ligament
* lateral wall: hook of hamate
* floor: flexor retinaculum and hypothenar muscles
* roof: volar carpal ligament

Clawing of the hand:

* due to weak ulnar innervated intrinsic muscles
* Hyperextension of MCPJ: unopposed long extensors
* Flexion of PIPJ: long flexors
* paralysis of intrinsic muscles 3rd and 4th lumbricals, and interossei

Body powered prosthesis:

* Have advantage of durability training time frequency of adjustment maintenance and feedback

Myoelectric prostheses:

* Can perform more complex movement including multiple joints at the same time

Axillary nerve: from C-5 C6/**posterior cord**

* Supplies deltoid in Teres minor
* It is in close proximity to the shoulder joint as a courses along the anterior inferior border of subscapularis to enter the **quadrangle space**
* It is seen in anterior glenohumeral joint dislocation and proximal humerus fracture, direct blow to the anterior shoulder
* shoulder arthroscopy and ORIF of proximal humerus
* usually resolves in 6-12 months
* but can be permanent and require surgical intervention such as nerve graft and transfer from radial nerve

Lateral cord:

* median nerve
* musculocutaneous nerve

Medial cord:

* median and ulnar nerves

Complex regional pain syndrome:

* Diagnosis involves history physical examination and diagnostic testing
* There is alteration in blood flow temperature proprioception sensory motor and pigmentation
* no test is pathognomonic however **triple phase bone scan** can be helpful: it shows **periarticular uptake in multiple joints** of the affected extremity
* Type one n**o identified nerves** also referred to as reflex sympathetic dystrophy
* Type two there is an **identified nerve/causalgia**
* Treatment therapy modalities such as range of motion, stress loading, desensitization to pharmacological interventions with anti-convulsant or anti-depressants
* **Stellate ganglion blocks or autonomic nerve blocks may be helpful in sympathetically** mediated pain and nerve stimulation either trancutaneous or of the spinal cord level
* Peripheral nerve decompression can be helpful in **type 2**
* prophylactic treatment to prevent CRPS **after distal radius fracture is Vitamin C for 50 days** per Zollinger et al.
* they also have **increased resting sweat output**

Jones nerve transfer:

* Transfer of FCU to EDC 3 to 5
* FCU is an important wrist flexor and sacrificing it leads to difficulty in wrist flexion and ulnar deviation
* Short excursion of FCU is inadequate for finger extension

**Standard Boyes transfers:**

* PT to ECRL or ECRB
* FCR to EPL or a APL
* FDS-3 to EDC via interosseous membrane
* FDS-4 to EPL or EIP via interosseous membrane

After nerve transection:

* Patient develops Wallerian degeneration with fibrillation, and sharp waves with progressive decrease in compound motor action potential
* Sunderland type V

Nerve gap more than 3 cm:

* Peripheral nerve autograft
* Sural nerve
* medial antebrachial nerve
* lateral antebrachial nerve
* dorsal cutaneous branch of ulnar nerve
* superficial peroneal nerve
* posterior and lateral cutaneous femoral nerves

Nerve conduits, silicone tube and synthetic biodegradable tubes:

* limited to less than 3 cm

Acellular autografts can be used for short gaps less than 3 cm

Pronator teres:

* innervated by median nerve before takeoff of AIN
* not affected by AIN syndrome

AIN:

* terminal branch of median nerve
* innervates FDS, FDP to index and middle finger, FPL and pronator quadratus
* AIN arises 4-6 cm distal to medial epicondyle
* It travels btw FDS and FDP
* It lies on the volar surface of interosseous membrane
* travels with anterior interosseous artery
* terminating in wrist joint capsule, intercarpal, radiocarpal and radioulnar joints
* when pinching:
  + thumb IP is hyperextended
  + Index PIP is flexed, DIP is extended

**C-sensory fibers:**

type of axon fibers (neurons) associated with autonomic changes of **CPRS type 1**

release **substance P** and **calcitonin-gene related peptide CGRP**

For elbow flexion:

* **Oberlin:** transfer of **FCU fascicle of ulnar nerve to biceps**
* McKinnon: same as above + **FCR fascicle of median nerve to brachialis to maximize elbow flexion**

Carpal tunnel syndrome:

* NCS: nerve conduction study and EMG
* NCS: motor and sensory
* EMG: measure motor unit potential
  + in carpal tunnel: particularly: **abductor pollicis brevis,uniquely innervated by median nerve**

Carpal tunnel:

* NCS: increased or prolonged sensory distal latency
* can also see prolonged motor latencies but less frequesntly than sensory

Axillary nerve:

* posterior cord
* C5-6

C7:

* LD
* Triceps
* extension of fingers

C8-T1:

* intrinsic muscle innervation

Gracilis muscle:

* most commonly described muscle for free muscle transfer to upper extremity following brachial plexus injury

Peripheral nerve repair:

* **Younger better** outcome
* **proximal worse** outcome
* **minimal tension** and **increase number of strands** is associated with better outcome

For ulnar nerve repair:

* high up near the elbow
* can transpose the nerve
* **transposition** is done **after t**hey indicate in the stem of the question that they **did free the nerve proximally and distally**

Pronator syndrome:

* differentiated from carpal tunnel syndrome **by numbness in the palm** and **weakness of FPL and often weakness in FDP of index**
* palmar cutaneous branch which comes off the median nerve proper proximal to carpal tunnel
* also can haver pain in the forearm near pronator muscle
* Pain with resisted pronation of the forearm while the wrist is flexed
* if there is pain with resisted flexion of the superficialis to the long finger: superficialis arch need to be release
* release begins **5 cm proximal to elbow**

AIN syndrome:

* motor only
* weakness of FPL and radial aspect of FDP of the index
* occasional FDP of the long finger and pronator quadratus
* compression in proximal forearm
* **no sensory findings**

PIN syndrome:

* only extensors

**Lateral antebrachial nerve neuroma**:

* occurs when there is cannulation of the **radial artery at the wrist**
* positive tinel’s over the radial volar aspect of the forearm, just ulnar to radial artery and **overlying the flexor carpi radialis**
* it is a continuation of **musculocutaneous nerve**

After high ulnar nerve transection:

* AIN transfer to motor branch of ulnar nerve will result in the earliest recovery of the intrinsic muscle of the hand
* high ulnar nerve is considered anything **above the innervation of FCU, FDP or at the level of the elbow**
* anastomosis is about 8-10 cm proximal to wrist crease and this will result in decreasing the amount of distance to be travelled
* repair can be done end-end or end-side
  + **end to side** is done when the injured nerve is either repaired primarily or partial injury where there is expected contribution from the nerve

Musculocutaneous nerve:

* brachialis
* biceps brachii
* coracobrachialis
* also continues as lateral brachial and anterbrachial nerve that give sensation to the radial aspect of the forearm
* cannot flex elbow when hand is pronated
  + brachioradialis can provide some flexion when pronated
* biceps brachii: provide some supination but when the musculocutaneous nerve is injured, it cannot supinate

Sensation to posterior arm:

* **posterior brachial cutaneous nerve**, branch of the **radial nerve**

Criteria of EMG axonal loss:

* nerve conduction velocity decrease
* conduction velocity slowed
* distal latency is prolonged
* fibrillation potentials
* polyphasic waveforms

Median nerve when affected by compartment syndrome:

* most likely to be irreversibly affected

Carpal tunnel diagnostic study question:

* pay attention if motor or sensory symptoms or even both.
* SAP (sensory action potential) also referred to as NCS and EMG
* EMG findings:
  + latency for muscle abnormality > 4 ms
  + normal muscle show fasiculation but high fibrillation seen 5 weeks after denervation
  + normal motor show no sharp waves  and no fasciulations
  + Mild motor latency> 4 ms (more than 6 is considered severe)

Carpal tunnel release: open vs endoscopic

* both are equivalent in l**ong term relief and recovery**
* CTS (thenar atrophy and weak opposition)
* release of transverse carpal ligament
* Endoscopic has the advantage of less pain and less alteration in early grip strength
* however: both are the same regarding strength, return to work, symptom relief and reoperation
* all studies showed similar longterm relief

CTS:

* conservative treatment: initially good improvement then worsening of symptoms within 6-12 months
* 70% will go on requiring open surgery in one year

AIN Palsy:

* can **transfer brachialis branch of musculocutaneous to AIN**
* Also **ECRB branch of PIN can be transferred to AIN**

**Erb’s palsy:**

* upper trunk
* C5-6
* weak or absent:  elbow flexion, shoulder abduction and external rotation
* Preserved elbow extension and fingers and wrist flexion
* Waiter’s tip posture, sparing lower roots **C8-T1**

Posterior cord injuries:

* affect the radial nerve

Lateral cord:

* biceps and pectoral function

**Common origin:**

* ECRL
* ECRB
* ECU
* Brachioradialis

Lateral epicondylitis:

* ECRB
* sometimes and to lesser extent extensor digiti minimi

Stellate nerve block:

* anesthetize **stellate ganglion**
* **cluster of sympathetic nerves** in the neck
* decrease the overactivity of **sympathetic nerves seen in CRPS**

Complication of DeQervain’s:

* injury to **superficial branch of radial nerve**
* if repair is not possible, then transposition of the nerve to brachioradialis
  + or to a bone or vein, stripping the nerve and coverage with vascularized tissue
* Medical tx is used for the first 6 months before surgery is implicated

Ulnar nerve entrapment:

* The most common: **Ligament of Osborne**
* then **anconeus epitrochlearis**: congenital accessory muscle from the **medial epicondyle to olecranon**
* Also Struther’s arcade: U.S.A
* medial intermuscular septum
* origin of FCU

Median nerve compression:

* lacertus fibrosis
* Ligament of Struther: from supracondylar process
* pronator teres

Radial nerve compression:

* Arcade of Frohse: from lateral epicondyle

**Suprascapular nerve:**

* first branch of the upper trunk C5-C6
* prone to injury by trauma, ganglion cyst in supraspinous fossa or direct compression on the nerve as it passes under the **transverse scapular ligament**
* symptoms: **pain in the posterior shoulder**, **weakness of external shoulder rotation**, **atrophy of supraspinatus and infraspinatus** muscles

Axillary nerve:

* posterior cord
* innervates **deltoid and teres minor**

Long Thoracic:

* C5-7
* anterior serratus muscle
* injury: winging of scapula

Thoracodorsal C6-8:

* branch of the posterior cord
* Latissimus dorsi muscle
* weakness: inability to shoulder extension, shoulder adduction and internal rotation

Spinal accessory nerve:

* SCM and trapezius

Thoracic outlet compression syndrome:

* 3 surgical modalities:
  + transaxillary resection of the first rib
  + anterior and middle scalenectomies
    - it is included in most treatments because 70% have soft tissue component
  + combined approach
* First step in the approach:
  + **noninvasive vascular and electrodiagnostic studies**
* Conservative treatment includes:
  + scalene stretching
  + first rib intercostal muscle relaxation
  + nerve gliding
  + muscle relaxant
  + pain patches to painful myofascial trigger points
* TCOS:
  + neurogenic group 90%: upper extremity pain, numbness and tingling
  + True vascular group: 10%
  + 50% of patients complain of coldness of the upper extermity
  + 40-50% have peripheral nerve compression symptoms
* There are two tissue groups that cause TCOS:
  + soft tissue group:
    - anterior and middle scalene with their sheath, ligaments and bands
    - 70% of all
  + Osseous group:
    - 30%
    - cervical rib, changes in first rib and clavicle due to injury

Cubital tunnel syndrome:

* numbness and tingling in the ulnar nerve distribution
* can lead to intrinsic muscle weakness
* EMG shows decrease conduction velocity from above the elbow to wrist (as the area of compression being traversed)
  + when compared from below the elbow to the wrist
    - from below elbow to the wrist should not be affected
* To **distinguish cubital tunnel syndrome from compression at Guyon’s** canal:
  + **numbness of the dorsum of the hand:** supplied by dorsal sensory branch proximal to the wrist

Ulnar neuroma in continuity with intact motor function and no sensory regeneration:

* **microdissection of neuroma** with electrical stimulation technique to identify the motor fibers

Radial nerve exposure:

* in the arm: **between brachialis and triceps**
* forearm: **ECRB and EDC**

Median nerve exposure:

* between **pronator and FCR**

To restore elbow flexion **after musculocutaneous nerve** injury:

* **FCU fascicle** of the ulnar to **biceps**
* **FCR of median** to **brachialis**

To restore shoulder abduction after stab wound to the neck:

* **radial branch to triceps** goes to axillary nerve

In order to restore shoulder stability:

* **suprascapular nerve** can be the recipient from **spinal accessory nerve**

Median  nerve course:

* in the arm, above the medial epicondyle
  + from medial to lateral: **MAT: median nerve, brachial artery, biceps tendon**
* in the cubital fossa:
  + nerve dives **deep to lacertus fibrosis, medial to the brachial artery, anterior to brachialis**
* enters the forearm between the superficial head (humeral) and deep head (ulnar) of the **pronator teres**
  + **crosses the ulnar artery** from medial to lateral separated by the deep head of pronator teres
* The passes deep to an arch created by the two heads of the **flexor digitorum superficialis**
* then it continues between the FDS and FDP
* It becomes superficial about 5 cm proximal to the wirst

Thumb opposition:

* palmar abduction
* flexion
* pronation
* Tendon transfers that can do restore the **thumb opposition:**
  + **palmaris longus**
  + **abductor digiti minimi**
  + **FDS**

The earliest one might expect to find EMG changes after suspected median nerve damage during CT release:

* 3 weeks
* decreased amplitude, decreased velocity, increased latency
* Sensory latency >3.5
* Motor latency >4.5 are considered abnormal
* Muscle changes: altered later:
  + fibrillations
  + decreased Motor unit potential recruitment

Patients who complain of ulnar nerve compression neuropathy:

* usually report numbness in all fingers
* however, further exam: will nail it down to ulnar nerve

Radial nerve neuropraxia after humerus fracture:

* early evidence of muscle reinnervation:
  + improved function of ECRL then ECRB then finger and thumb extensors
  + if no regain of function within 3-6 months then surgical exploration
  + To restore function of thumb, wrist and fingers:
    - palmaris longus to EPL
    - FCU to EDC
    - pronator teres to ECRB

When there is neuroma:

* excise!!! and may need to do nerve graft

Suprascapular nerve:

* external rotation of the shoulder
* supraspinatous and infraspinatous
* nerve transfer is spinal accessory nerve

Desensitization of amputation thumb:

* vibration

Medial cord gives:

* medial perctoral nerve
* medial brachial
* medial antebrachilal
* median
* ulnar nerves

Lateral cord gives:

* lateral pectoral nerve
* musculocutaneous nerve
* also median nerve

Nerve gap grafting:

* sural nerve from medial cutaneous sural nerve from tibial nerve
* synthetic nerve graft not recommended beyond 2 cm

Volkmann’s contracture:

* due to supracondylar humerus fracture and sequela of compartment syndrome
* pronated forearm, flexed wrist, claw hand: MCPJ hyperextension, PIPJ and DIPJ flexion
* hand is insensate
* for moderate contracture:
  + release of median and ulnar nerve and tendon lengthening (muscle slide)

Median nerve block:

* btw FCR and palmaris longus
* 5-7 cm proximal to wrist crease: palmar cutaneous branch to the thenar eminence

Ulnar nerve block:

* lies radial to FCU
* ulnar to ulnar artery
* dorsal cutaneous branch is proximal to wrist crease
* injection is radial to FCU and pisiform

Low ulnar nerve injury:

* clawing of the small and ring finger
* unable to extend PIPJ and DIPJ when MCPJ is flexed
* ulnar clawing, especially the little finger
* Wartenberg’s sign: **extensor digit minim**i takes over
* hyperflexion of IP joint of thumb???

**EIP is good for tendon transfer to repair lateral pinch:**

* EIP to adductor: for thumb pinch
* EIP to first dorsal interosseous: for index pinch

Bouvier test:

* ability to extend IP joint while MCPJ is blocked
* can achieve correction of claw hand with passive or active transfers

Nerve repair:

* single strand vs multi-strand nerve graft: similar outcome. Both are inferior to primary repair
* primary epineural repair

Cubital tunnel vs Guyon’s compression:

* numbness on the dorsal aspect of the hand: dorsal cutaneous branch
* Guyon’s comrpession: **release pisohamate and volar carpal ligament**
* Guyon’s canal: ulnar tunnel
  + 4.5 cm in length
  + from proximal volar carpal ligament to fibrous edge of hypothenar muscles
  + Zone 1: region in tunnel proximal to bifurcation of the nerve
  + Zone 2: around deep motor branch, end at pisohamate ligament
  + Zone 3: around the superficial nerve

Arcade of Struthers: USA ulnar

* 8-10 cm proximal to medial epicondyle
* from **medial intermuscular septum to medial head of triceps**

Brachial plexus injury can occur at the following levels:

* root
* anterior branch of spinal nerve
* trunk
* cord
* peripheral nerve

Root: localized according to dorsal root ganglion

* infraganglionic (postganglionic): distal to dorsal root ganglion
* supraganglionic (preganglionic): proximal
* both types lose muscle function
* supraganglionic: continue to have sensory

Radiation-induced brachial plexopathy:

* 1.8-4-9%
* patiens who had radiation to breast or lung
* most prominent in c5-c6 distribution
* may show prominent lymphadema

Abductor pollicis brevis:

* the only instrinsic muscle that is purely innervated by median nerve: recurrent motor branch

Flexor pollicis brevis:

* deep head: ulnar nerve
* superficial head: median nerve

Thenar muscles:

* FPB: distal to the other two
* OP
* Abd pollicis brevis
* Due to dual innervation of FPB: patient can still do finger opposition of thumb to small finger

In the median nerve:

* the motor fibers are volar and radial to the sensory fibers

In the presence of nerve compression like median nerve:

* motor and sensory latency on NCS are increased
* There will be fibrillations

Compartment syndrome of the upper extremity:

* irreversible neuromuscular damage: at 12 hours
* reversible muscle and nerve injury: 6 hours
* capillary endothelial injury: 3 hours

Infant with birth caused palsy: look for biceps function

* wait for 6 months before operating
* if at 3 months, no biceps function: poor prognosis

Nerve injuries:

* early should be explored and repaired such as clean lacerations
* crush injuries with significant soft tissue injury should be repaired later
* GSW are teated like crush injuries
  + observed for 6 weeks
  + if no return then do EMG at 6 months and repeat again at 12 weeks
* if not return of innervation, surgical exploration at 3 months

Compression of carpal ligament on the median nerve:

* causes decrease/prevention of membrane depolarization
* with chronic compression, the myelin sheath disintegrates and the saltatory nerve conduction between nodes of Ranvier ceases

For digital nerves:

* gaps greater than 8 mm are better treated with polyglycolic acid conduit

MABC neuroma can happen after cubital tunnel release:

* MABC from medial cord , C8-T1
* with basilic vein

Tourniquet intolerance after axillary block:

* due to incomplete musculocutaneous block
* unlikely to be axillary because the sensory distribution is above the tourniquet

Flexor tendon laceration:

* repair when involves more than 60%
* otherwsie, it will trigger and catch on pulley
* sometimes may need to trim the tendon or excise pulley or flexor tendon sheath
* if you repair tendon that is less than 60% lacerated, then you risk the chance of weakening it
* In that case: only protected mobilization to promote tendon gliding and strengthening

When placing a tourniquet:

* breather periods in which the tourniquet is deflated allows tissue acidosis to reequilibrate
* decrease the likelihood of nerve palsy

Ulnar nerve course:

* initially medial to the axillary artery
* travels distally in the arm
* pierces the intermuscular septum
* follows the track of the medial head of triceps
* between the olecranon and the medial epicondyle
* no branches in the arm
* then passes through the cubital tunnel
* then gives branches to FCU and FDP
* passes between the two heads of FCU
* then continues between FDP and FCU
* In the distal forearm:
  + joined by the ulnar artery
* Proximal to the wrist:
  + it will give off the dorso ulnar sensory nerve
* The continues to Guyon’s canal:
  + gives the superficial and deep (motor branch)
* The superficial branch gives:
  + palmaris brevis
  + skin over hypothenar
  + digital nerves to small and ring fingers
* Motor nerve:
  + courses between ADM and FDM with deep branch of ulnar artery
  + then pierces the ODM
  + Finally Adductor pollicis and deep head of FPB

Order of return of ulnar innervation:

* FCU
* Abduction of small finger ADM
* Flexion of FDM at MCP
* Interosseus muscles
* Last: Adduction of the thumb

Digital nerve repair gap more than 3 cm require nerve graft.

-The posterior interosseous nerve is a good caliber and provides only sensory of the area near the wrist

Intersection syndrome

* seen in roars and weightlifters
* from repetitive movement
* About 4 cm proximal to the wrist crease in the distal forearm
* There will be swelling and crepitus in the muscle bellies
* pain and swelling of the muscle in the distal forearm
* Initial management consist of NSAID, splinting the wrist an extension of 15° and sometimes injection of steroid in the second dorsal compartment

Third dorsal compartment tenosynovitis:

* Affects EPL
* Requires urgent diagnoses in operative treatment to prevent tendon rupture

DeQuervain's tenosynovitis:

* first dorsal compartment
* About 1-2 cm proximal to the radial styloid

Ulnar nerve in Guyon’s canal: compression due to lipoma, ganglion cyst, fracture of the hamate, hyppthenar hammer syndrome

* Around zone two the deep ulnar nerve courses around the hook of hamate
* between the pisomate ligament and flexor arch of the flexor digiti minimi
* it innervates:
  + abductor digiti minimi
  + flexor digit minimi
  + opponens digiti minimi
  + palmar and dorsal interossei
  + adductor pollicis
  + flexor pollicis brevis
  + terminal branch to first dorsal interosseous

Patients with RA:

* PIN palsy is the most common
* from inflammation and synovitis around the elbow

Extensor tendon subluxation:

* occurs when there is rupture of sagittal bands

For hand compartment syndrome:

* **passive abduction and adduction of fingers**
* For thumb:
  + adductor: palmar abduction
  + thenar: radial abduction
* hypothenar: adduction of the small finger
* Do not use flexion and extension as this is seen in other conditions such as infection and tendon injuries

Before transferring EIP:

* must test the integrity by making pt extend the index finger while all other fingers are flexed
* EIP is ulnar to EDC
* brachioradialis transfer to EPL is an option but weak extension due to less excursion of 1-2 cm vs. EIP of 3-5 cm, making it less desirable

Posterior interosseous **artery flap**:

* PIA comes off the common interosseous artery
* which is a branch from the ulnar artery
* between the 5th and 6th compartment
  + i.e: **ECU and EDM**
* reverse PIA can support a flap of 8-18 cm

Freen innervated muscle flap:

* considered for flexors after compartment syndrome of the flexor compartment

Posterior interosseous nerve PIN:

* found in the floor of 4th extensor compartment (EDC and EIP)
* tracing it proximally, you will find it under EPL

In patients with tetraplegia:

* most helpful is to restore elbow extension as it helps with moving wheelchair, transfer and turning to prevent pressure sore
* the most common transfers: deltoid-to-triceps, bicepts-to-triceps

Cubital tunnel syndrome:

* compression anywhere 8 cm proximal to distal the medial epicondyle
* sites of compression:
  + arcade of struthers
  + osborne’s ligament (fibro-osseous
  + medial head of triceps
  + medial intermuscular septum
  + anconeus epitrochlearis

The medial antebrachial nerve is found:

* 2 cm anterior and 3 cm distal to medial epicondyle
* found with basilic vein

The lateral antebrachial nerve:

* continuation of the musculocutaneous nerve
* found near cephalic vein
* lateral to biceps tendon

For compartment syndrome of the hand:

* minimum of 4 incisions are required
* thenar
* hypothenar
* 2 interosseous: dorsal to index and ring fingers

Ulnar nerve laceration at the elbow with 2 cm gap:

* do nerve transposition
* can provide 4 cm
* in arm yields 3 cm
* forearm 2 cm
* distal forearm near wrist 1-2 cm

The median nerve compression sites:

* btw the two heads of pronator teres
* lacertus fibrosis
* proximal arch of flexor digitorum superficialis
* carpal tunnel

When doing vascularized muscle transfer for Volkmann’s contracture:

* must release the median nerve

In a neonate with C5-6 injury:

* there will be complete recovery if there is some action of the deltoid and biceps by
  + 2 months

In compartment syndrome of the hand:

* must release (10 compartments)
  + 4 dorsal interossei
  + 3 volar interossei
  + adductor pollicis
  + thenar eminence
  + hypothenar eminence
* Need four incisions to release them: on the first and 5th metacarpals
* dorsum of the second and 4th metacarpal
* To release the adductor pollicis and associated interossei:
  + need second dorsal metacarpal incision

Clenched fist:

* in patient with brain injury and spasticity
* try conservative treatment first before any surgery
* injection of botox
* if that fails then release FDS and FDP

Lumbricals:

* originate from the **radial side of FDP tendon**
* except **3rd lumbrical:**
  + **ulnar side of long finger**
  + **radial side of ring finger**
* insert in the radial sagittal band and assist in IP extension
* They rest within the carpal canal during grip
* and because of repetitive motion they become edematous and aggravate carpal tunnel

When you have comminuted fracture of the humerus:

* you can shorten it to gain more length to allow for radial and ulnar nerves to be repaired
* shoulder abduction
* elbow flexion
* the above two are maneuvers to shorten the nerves

In ulnar nerve:

* motor fascicular group is identified ulnar and dorsal to sensory group

in C5-6 palsy, upper extremity is supinated:

* need to redirect the biceps through the interosseous membrane
* Biceps is the strongest supinator in the arm

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2. [In-Service Questions Notes: GU reconstruction](evernote:///view/84585664/s492/804e7724-9017-4ba3-a638-68ec6406fed1/804e7724-9017-4ba3-a638-68ec6406fed1/) 13 done (review Kate note)
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10. [In-Service Questions Notes: Skin, fat and cartilage graft](evernote:///view/84585664/s492/4899456e-88d9-4f38-a61f-0f1811d81937/4899456e-88d9-4f38-a61f-0f1811d81937/) 87 done
11. [In-Service Questions Notes: Soft Tissue Infection](evernote:///view/84585664/s492/fd3bbbb4-464c-4a04-a2de-dd56fcb19040/fd3bbbb4-464c-4a04-a2de-dd56fcb19040/) 89 done
12. [In-Service Questions Notes: Lower Extremity](evernote:///view/84585664/s492/766d85f3-08b8-47cd-b419-e976143767ef/766d85f3-08b8-47cd-b419-e976143767ef/) 153 done
13. [In-Service Questions Notes: Breast Reconstruction](evernote:///view/84585664/s492/2d820ada-60c4-46bb-bb13-973272be2091/2d820ada-60c4-46bb-bb13-973272be2091/) 136 done
14. [In-Service Questions Notes: Wrist](evernote:///view/84585664/s492/70f5eab0-2488-485b-87e0-7570bc3a9105/70f5eab0-2488-485b-87e0-7570bc3a9105/) 40 done
15. [In-Service Questions Notes: Flaps](evernote:///view/84585664/s492/721b970e-7039-4eca-b1d8-fd17e6b2f099/721b970e-7039-4eca-b1d8-fd17e6b2f099/) 114 done
16. [In-Service Questions Notes: Mandible](evernote:///view/84585664/s492/5963d9e7-fd47-4b3a-87ac-a2d1a0b4b583/5963d9e7-fd47-4b3a-87ac-a2d1a0b4b583/) 80 done
17. [In-Service Questions Notes: Burns and Burn Reconstruction](evernote:///view/84585664/s492/44e0681f-1ae6-4093-8eb6-f46ae136dab0/44e0681f-1ae6-4093-8eb6-f46ae136dab0/) 108 done
18. [In-Service Questions Notes: Head and neck tumors/ Parotid](evernote:///view/84585664/s492/468ff92a-fdae-440a-a2ee-0ef6ae844ec8/468ff92a-fdae-440a-a2ee-0ef6ae844ec8/) 80 done
19. [In-Service Questions Notes: Congenital Hand](evernote:///view/84585664/s492/788de692-b84a-4cdc-ae10-ab49aa8ae357/788de692-b84a-4cdc-ae10-ab49aa8ae357/) 79 done
20. [In-Service Questions Notes: Breast Reduction](evernote:///view/84585664/s492/f1dae8f5-24c2-427e-8211-4776ae62526b/f1dae8f5-24c2-427e-8211-4776ae62526b/) 65 done
21. [In-Service Questions Notes: Pressure Sore](evernote:///view/84585664/s492/7aa580b1-05a4-4f0b-9568-7bf1c1078b95/7aa580b1-05a4-4f0b-9568-7bf1c1078b95/) 40 done
22. [In-Service Questions Notes: Facial palsy](evernote:///view/84585664/s492/e4f29f75-eedf-49b9-b2b1-5c4e46db4486/e4f29f75-eedf-49b9-b2b1-5c4e46db4486/) 47 done
23. [In-Service Questions Notes: Cosmetic Facelift](evernote:///view/84585664/s492/77001172-0709-4d93-ad6b-b555a7d920ee/77001172-0709-4d93-ad6b-b555a7d920ee/) 78 done
24. [In-Service Questions Notes: Cosmetic chemical peel/skin](evernote:///view/84585664/s492/9b30d61a-8bdf-43ce-95b4-ea397cd61ae3/9b30d61a-8bdf-43ce-95b4-ea397cd61ae3/) 85 done
25. [In-Service Questions Notes: Blephroplasty](evernote:///view/84585664/s492/590e1c7b-a050-4ded-9545-88d9a7f57452/590e1c7b-a050-4ded-9545-88d9a7f57452/) 49 done
26. [In-Service Questions Notes: Hand Nerves](evernote:///view/84585664/s492/bec269f6-5849-450b-bfb9-0cdd0ef9f9e2/bec269f6-5849-450b-bfb9-0cdd0ef9f9e2/) 141 done
27. [In-Service Questions Notes: Hand Tendons and Tendon Transfer](evernote:///view/84585664/s492/248728df-389f-40ed-b2b1-5a18e934fb32/248728df-389f-40ed-b2b1-5a18e934fb32/) 105 done
28. [In-Service Questions Notes: Hand fingertip amputations, Dupuytren’s](evernote:///view/84585664/s492/1f244edf-cf8a-47b2-98b5-8e31797f04c3/1f244edf-cf8a-47b2-98b5-8e31797f04c3/) 190 (review Dupuytren’s cords and shit)
29. [In-Service Questions Notes: Eyelid Reconstruction:](evernote:///view/84585664/s492/a54c543e-cd01-47b5-9784-d66588a571de/a54c543e-cd01-47b5-9784-d66588a571de/) 10 done
30. [In-Service Questions Notes: Nasal Reconstruction](evernote:///view/84585664/s492/202b5d8b-6a15-4f81-9eac-4a6aaf5df2f0/202b5d8b-6a15-4f81-9eac-4a6aaf5df2f0/) 39 done
31. [In-Service Questions Notes: Head and Neck Anatomy](evernote:///view/84585664/s492/6f2734b2-43d7-4586-85f3-837c7ab80163/6f2734b2-43d7-4586-85f3-837c7ab80163/)  done 45 (may need review)
32. [In-Service Questions Notes: Hemangiomas](evernote:///view/84585664/s492/fa4d1625-20a5-4aa8-a40d-9b0f53205f98/fa4d1625-20a5-4aa8-a40d-9b0f53205f98/) 77 done (may need review)
33. [In-Service Questions Notes: Ear Reconstruction](evernote:///view/84585664/s492/1390b30a-bd9c-4286-83cd-21d70682555f/1390b30a-bd9c-4286-83cd-21d70682555f/) 93 done
34. [In-Service Questions Notes: Rheumatoid hand](evernote:///view/84585664/s492/763ac79e-037f-4ad9-820d-121d1d4b45c2/763ac79e-037f-4ad9-820d-121d1d4b45c2/) 40 done
35. [In-Service Questions Notes: Head and Neck Congenital](evernote:///view/84585664/s492/448d0f17-0d6a-4b6b-b829-a25e379bbcba/448d0f17-0d6a-4b6b-b829-a25e379bbcba/) 92 done (may need to review meatus)
36. [In-Service Questions Notes: Orthognathic, TMJ, Chin](evernote:///view/84585664/s492/51c18b5e-9999-4745-a483-aa5f59b08fb7/51c18b5e-9999-4745-a483-aa5f59b08fb7/) 119 done
37. [In-Service Questions Notes: Maxillofacial trauma:](evernote:///view/84585664/s492/88830c48-838b-49fb-9631-8b79972e6c40/88830c48-838b-49fb-9631-8b79972e6c40/) 133 done
38. [In-Service Questions Notes: Chest wall/abdominal wall/Gynecomastia](evernote:///view/84585664/s492/12197ab7-a8b6-4ee8-b61a-cbbca699d0eb/12197ab7-a8b6-4ee8-b61a-cbbca699d0eb/) 114 done
39. [In-Service Questions Notes: Breast Augmentation and Mastopexy:](evernote:///view/84585664/s492/58701c2e-196a-4d63-b8ef-674403073405/58701c2e-196a-4d63-b8ef-674403073405/) 152 done
40. [In-Service Questions Notes: Cosmetic Rhinoplasty](evernote:///view/84585664/s492/7cd5a288-6119-410f-8cab-bfd6d905f333/7cd5a288-6119-410f-8cab-bfd6d905f333/) 96 done
41. [In-Service Questions Notes: Abdominoplasty/Liposuction](evernote:///view/84585664/s492/c12378c7-b79b-4f73-9939-aa3b11c76f56/c12378c7-b79b-4f73-9939-aa3b11c76f56/) 161 done
42. [In-Service Questions Notes: Craniofacial](evernote:///view/84585664/s492/6a8cacaa-5b25-426c-8d9e-77fcc3c01618/6a8cacaa-5b25-426c-8d9e-77fcc3c01618/) 170 done (may need review)

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| **In-Service Questions Notes: Hand Tumors** |

Soft tissue sarcoma:

* rare, representing 1% of all malignancies
* 25% in the upper extremity
* Workup includes:
  + biopsy
  + MRI
  + CT chest
* Treatment:
  + wide excision
  + primary reconstruction
  + Radiation (adjuvant or neoadjuvant)
  + **Tumor must be resected with 1 cm margin**
  + violation into the tumor decreases survival from 87% to 47%
  + More than 90% of upper extremity tumors can be managed with limb-sparing resection
  + Chemortherapy is not used
  + Amputation: **if involving neurovascular bundle or there is sacrifice of major nerve**
    - or if there is severe comorbidities limiting reconstruction

Glomus tumor:

* 1-5% of tumors of the upper extermity
* majority are **subungal**
* Presentation: blue or red nodule that can discolor or deform the nail
* **Love’s pin test**: performed by applying pressure using pinhead  to the area and this is causing extreme exquisite pain
* Dx with **plain film and MRI**
* Treatment: complete surgical excision only

Ganglion cyst:

* 60-70% **dorsal: mostly scapholunate joint**
* 20%: **volar: mostly from radioscaphoid**
* Lunotriquetral joint is **never** involved
* Can also arise from flexor tendon sheath (**retinacular cyst**), arising from A1 pulley

A patient presenting with mass with cortical erosion and biopsy showing **tan, multilobulated** mass surrounded by digital nerve and **invading the cortex:**

**Giant cell tumor of the tendon sheath**

* the second most common hand masses
* slowly growing and painless
* affect the **volar surface of the index, middle and ring fingers**
* Appear tan and yellow, multilobulated and well-circumscribed
* Bony **erosion secondary to longstanding pressure**
* Tx: excision with recurrence between 0-44%
  + **radiation following excision**: reduces recurrence rate to 4%
* High recurrence rate associated with:
  + satellite lesions
  + poor encapsulation
  + intraoseous involvement
  + Current degenerative joint disease
  + involvement of adjacent tendons

Schwannoma:

* **Benign** peripheral nerve tumors
* Originate from **Schwann cells**
* Can affect nerves of the hand
* **Well encapsulated and slowly growing**
* Typically arise over the **flexor s**urface
* Soft, non-tender mass
* mobile and maybe associated with paraesthesia
* **MRI helpful**
* These tumors can be **shelled out because they involve the nerve sheath** rather than the fascicles
* there is little risk of neurological deficit with excision
* Malignant transformation is rare
* positive Tinel’s sign
* Nerve function is not disturbed usually
* **Schawannoma are non-infiltrative**  (vs neurofibromas)
* Recurrence rate 4%

Epidermal inclusion cyst:

* painless
* firm
* keratin-filled
* traumatic **implantation of epithelium into the subcutaneous tissue**
* typical location: **volar palm and digits**
* No risk of malignant transformation
* but can have cortical destruction
* Differentiated from giant cell tumors that they are cysts, filled with keratin and not multilobulated

Chondrosarcoma:

* **most common primary malignant bone tumor**
* Frequently affects **proximal phalanx**
* arising **de novo** or **malignant transformation of endochondromas**
* with imaging: **hard to distinguish** chondrosarcoma from endochondroma
* Phalangeal chondrosarcoma are **locally aggressive but rarely metastasize**
* **Irregular cortical thickening, cortical breakthrough and soft tissue component** are all suggestive of enchondroma
* Recent literature: intralesional excision with close follow up for low grade lesions
* No role for irradiation or chemotherapy

Enchondroma:

* a mass with cortical thinning

A patient presenting with **well-circumscribed mass** on the dorsum of the hand:

**Extensor digitorum brevis manus:**

* **does not transilluminte**
* **softens when index and long finger is flexed**
* Found in **2-3%**
* tenden and found distal to th**e radiocarpal join**t about the **distal edge of extensor retinaculum**
* Present as pain and swelling following physical or manual labor
* If bilateral: the dominant hand is more prominent
* P/E: **hardening of the mass with resisted extension of the index and middle fingers**
* relaxed with flexion
* Treatement:
  + rest and immobilization
  + surgical release of the **4th compartment alone**
  + fourth compartment release with complete muscle excision
* Dx on US or MRI

Painless mass with clear thick drainage from nail fold with damage to nail plate

* **mucous cyst**
* **arises from DIPJ**
* Associated with **dorsal osteophytes secondary to OA**
* **Osteophyte is usually proximal to the cyst**
* Pressure on the germinal matrix results in grooving of the nail
* Osteophyte should be removed and is thought to be the inciting event

Malignant nerve sheath tumors: Sarcomas

* **mets to lungs in 39%**
* Soft mass arising from large peripheral nerve such as sciatic nerve and brachial plexus
* Motor and sensory
* Demographics for solitary neurofibroma:
  + 30-55 yrs
  + Neurofibromatosis 20-40 yrs
* Treatment: **wide surgical excision and radiation (integral part of treatment)**

Expansile osteolytic lesion of the proximal phalanx with biopsy showing giant cell tumor of the bone:

Giant cell tumor:

* considered benign but locally aggressive
* 2-5% arise from bones of the hand
* 1-5% incidence of lung mets
* Most common site: **DISTAL RADIUS**
* **Hand and distal radius:higher rates of recurrence and mets**
* Lung is the most common site for mets
* Need CT scan
* Grade 1 and 2: **Tx curettage and bone grafting with adjuvant tx including phenol and liquid nitrogen** but has not been proven
* Later stage tumors:
  + amputation

Schwannoma/Schwann cell tumor/Neuolimmoma:

* arises from glial cells
* benign, encapsulated tumors from nerve sheath
* arises from the side of the nerve or within the origin

**Firm, non-pulsatile mass** on the volar base of the finger that is **non-pulsatile** and **does not transilluminate** and does not move with finger flexion or extension:

* **Giant cell tumor** of the tendon sheath

When a mass in midline over the flexor tendon sheath:

DDx:

* Ganglion cyst: transilluminate
* **Giant cell tumor of the tendon sheath: does not** transilluminate

Fibrosarcoma is extremely rare:

* almost never present as a midline mass on the palmar aspect

Neurilemmoma:

* presents on the lateral aspect

Digital lipoma:

* on the midline but extremely rare

Endochondroma:

* after curettage and grafting with demineralized bone matrix
  + uneventful healing without recurrence is expected
* It is a benign tumor of chondroblasts origin
* **Most common bone tumor** that is found in the hand 90%
* Found incidentally on x-ray
* Pain: m**ore likely due to choncrosarcoma or cortical thinning**
* Typical radiograph:
  + **well-circumscribed with radiolucent** lesiont that maybe **expansile or purely lytic with popcorn stippled calcification**
* Small lesions observed
* Large lesions: **treated with curettage with or without bone grafting**
* There is no benefit of adding bone graft or substitute
* When involving pathologic fractures:
  + should be treated with **immobilization** and **allowed to heal** prior to treatment of enchondroma: **if fracture is stable**
  + If fracture is **unstable** then **curettage and fixation** in the same surgery
* Complete resection is curative
* **Recurrence** may indicate that this lesion is **low grade sarcoma**
* The risk of transformation of enchondroma: **1%**
* Malignant transformation is increased in: multiple endochromatosis such as **Ollier disease and Mafucci syndrome**
* Risk for malignant transformation is up to **30%** (chondrosarcoma/Osteosarcoma)

Ollier disease:

* nonhereditary form of multiple endochromatosis associated with skeletal dysplasia

Mafucci syndome:

* multiple endochromatosis and cutaneous hemangioma

A red nodule with milky white fluid with white solid granules:

* gouty tophus
* Tx: anti-inflammatory meds with colchicine
* Gout: **imbalance of purine metabolism** resulting in uric acid crystal deposition in the joints
* The great toe is most commonly affected: classically known as Podagra
* Gout is more common in men

Osteosarcoma:

* most common site o**f mets is the lung**
* most commonly found in the proximal humerus
* most common malignant bone tumor
* most commonly found in children
* rare in the hand
* Symptoms: pain and swelling for 3-12 months
* Radiology: **sunburst appearance with periosteal elevation at Codman’s triangle**
* Tx: **wide excision/amputation and neoadjuvant chemo**

Use of **transverse incision** for biopsy of sarcoma is considered an indication for reconstruction with flap

it is **suboptimal** for limb salvage

* Sarcoma of the hand: involves the dorsum and mid palm
* Tumors are epithelioid, malignant fibrous histiocytoma and synovial sarcoma

Glomus tumor:

* glomus apparatus: thermoregulatory control mechanism
* found in the hand
* most commonly in the digit/fingertip
* Severe pain when exposed to cold
* Evoked by **placing the digit in ice water**
* Visualized on **T-1 an T-2 MRI**
* **US can also identify**
* 25% are multiple

Malignant melanoma on the nail:

* pigmented streak under the fingernail
* painless and can go unnoticed
* should be biopsied **if does not resolve in 4 week**s (pigmented lesion of the nail)

Giant cell tumor:

* adults less than 50 yrs
* slowly growing, firm, l**obulated and painless**
* Second most common tumors of the hand
* **Does not transilluminate**
* **occur on the volar aspect of the hand**

Neurofibromatosis type 1:

* associated with malignant peripheral nerve sheath tumors (PNST)
* Majority are: Schwannoma and neurofibroma
* malignant are very rare
* 1-2% of hand tumors
* very low incidence in general population
* 2-5% in patients with NF-1
* **NF-1 plexiform subtype** increase the risk of malignant degeneration

When performing incisional biopsy on the upper extremity:

* **do not use esmarch** but can use tourniquet
* **do not use transverse incision**

Pediatric ganglion cyst:

* no concensus
* most prefer splinting for asymptomatic ganglion cyst
* In pediatrics: majority rupture  and resolve without intervention

**Ganglion cyst tumor**: also called localized nodular synovitis, **fibrous xanthoma** and **pigmented villonodular tenosynovitis**

* there is increased risk of local recurrence or extension
* **Hemosiderin deposit**: give the tumor the **tan color**
* This tumor can recur locally especially if not excised completely
* Do not metastasize
* Giant cell tumor of the tendon does not invade the bone
  + although there is giant cell tumors of the bone
* They do not invade or compromise digital vessels and would not compromise blood flow

Patient presents with soft, non-tender, mobile mass that does not transilluminate:

* lipoma
* Most frequently located on the **thenar eminence**
* followed by the volar and dorsal aspect of the digits
* Female to male 2:1
* 3rd to 6th decade

Ganglion cysts:

* 50-70%
* 3:1 female to male
* 2nd to 4th decade

Giant cell tumors:

* no sex predilection

Glomus body tumor:

* **2:1 female to male ration**
* btw 30-50
* **subungal in 50%**

Osteochondroma: treatment is only wide excision with reconstruction

BAD QUESTION #28

* cartilage covered bony overgrowth or exostosis
* most common bone tumor in pediatric
* arise spontaneously or from previous trauma
* malignant transformation in 1-25%

Enchondromas:

* most common benign primary tumor of the hand
* **90% in the hand**
* **Proximal phalanx the most common site**
  + then metacarpal
  + then middle phalanx
* Initial treatment is to stabilize the fracture
* Then do operative curettage of the lesion with bone grafting and fixation

For sarcoma:

* Wide local excision followed by radiation
* curettage is not adequate
* If resected and you still have positive margin: then high dose radiation followed by close follow up
* Local control and survival has been shown to be comparable in patients with either primary amp or limb salvage

Verrucous-type squamous cell carcinoma of the fingernails:

* affect the index, long and ring fingers
* suggest the possibility of genital-hand spread
* more likely to recur after surgical treatment more so than cutaneous SCC
* Moh surgery improve tumor-free margins
* rate of mets is low
* When there is no evidence of bony involvement: no need for amputation
* Amputation if margins remain positive despite Moh surgery

Glomus body tumor:

* provocative test: immersion in ice water or spraying it with ethyl alcohol

Pyogenic granuloma:

* benign vascular tumors of unknown origin
* can bleed easily with little or no trauma
* Can be confused with malignancy
* most of the time no history of trauma
* Treatment: shave removal and cauterization
  + if recurrent: then surgical excision

Merkel cell carcinoma:

* rare
* aggressive
* flesh-colored or bluish red nodule on the face, head and neck
* mostly in elderly patients
* neuroendocrine in origin

Neurilemoma (Schwannoma)

* most common benign tumor of the **upper extremity**
* proliferation of Schwann cells
* present on the **flexor surface of the hand and forearm**
* generally painless
* sometimes with paraesthesia
* mobile in **transverse but not longitudinal direction**
* Isointense with muscle on T-1
* **hyperintense with fat on T-2**
* Easy to shell out
* small risk of neurological deficit
* small risk of malignant transfortion
* Must be distinguished from neurofibromas that arise from the nerve fasicles
  + may occur in the setting of neurofibromatosis

MRI plays a role in identifying glomus body tumor

Small pediatric patient 18 months old with rapidly enlarging masses of the fingers and biopsy showing **fibroblastas with intracytoplastic eosinophilic inclusion bodies:**

* Diagnosis: infantile digital fibromatosis
* Age of presentation 5 months to 6 yrs
* lesions rapidly growing
* broad-based on the dorsal or lateral aspect of the fingers
* Intracytoplastic inclusion bodies in cellular tumors
* Tx: wide local excision with coverage with full-thickness skin graft or local flap

Sarcoma on the volar forearm measuring about 6 cm:

* preoperative radiation for epithelioid sarcoma
* it helps decreasing tumor size and local recurrence
* For epithlioid sarcoma: chemotherapy is appropriate for high grade tumors, greater than 10 cm, involve the lymph node
* High grade so excisional biopsy is not indicated

Recurrence rate of curettage after enchodroma: about 2-15%

* need radiographic monitoring at 6 months, 1 year and 2 yrs

Glomus body tumor:

* excision through transungal or lateral periosteal incision
* nail deformity with transungal removal
* Recurrence rate 6%- 33%
* Incidence of nail deformity 3-10%

When you have tumor:

* elevate arm
* occlude brachial artery
* inflate tournique to 250 mmHg

Patient presents with mass on the hand that is rapidly enlarging with history of kidney transplant:

* plan to perform excisional biopsy and primary closure
* the diagnosis is Keratoacanthoma:
  + appears as red papule on sun-damaged skin and expands rapidly over weeks
  + Regress without treatment but can also be aggressive and metastasize

The buccal nerve is most commonly injuried in facelift

Corticosteroids during facelift:

* decreases edema
* decrease ecchymosis

A primary advantage of endoscopic browlift over coronal:

* prevention of sensibility changes in the scalp

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| **In-Service Questions Notes: Head and neck tumors/ Parotid** |

Glossectomy reconstruction workhorse flap:

* RFFF
  + in patients with manual labor:
    - may have sensory issues
    - weak grip
    - delayed healing
* Sural artery perforator flap:
  + very thin and pliable
  + from medial sural artery

Deltopectoral falp:

* from **first intercostal perforator**
* rarely transferred as free flap

SCC of the tongue in a non-smoker patient: (check AJCC 8th edition Prognostic stage groups for HPV-associated **(p16+)**

* could be related to **HPV**
  + **less virulent**
  + 5-yr survival for HPV positive SCC: 70% vs. non-HPV which is < 50%
  + **more sensitive to radiation and chemoradiation**
  + overall better survival

**H&N cancer:**

* **HPV 16 and 18**: **oropharynx** and NOT nasopharynx
* **EBP**: **Nasopharyngeal cancer and Burkitt’s lymphoma**

Facial nerve repair: **primary or cable nerve grafting**

* **regain of function after radiation and repair** even if there is weakness preop

Parotid tumors:

* **80% benign**
* Most common location for **salivary gland malignancy**
* Pain, paraesthesia and facial paralysis: signs of neural invasion and associated with malignant tumors
* Signs of malignancy:
  + rapid growth
  + bony fixation
  + ulceration
  + palpable lymph nodes

Facial nerve: divides the parotid gland into superficial and deep gland

Superficial parotidectomy: removal of the gland above the level of facial nerve: appropriate for bening and malignant

Partial parotidectomy: less complete but with negative margins

Total parotidectomy: removal of the superficial and deep lobes

Enucleation:

* removal of the tumor only
* not indicated for malignant and also not recommended in general
* when performed: it should be the superficial lobe for a tumor than is less than 4 cm for benign tumor

Radical parotidectomy: complete parotidectomy with sacrifice of the facial nerve

Patients who undergo elective neck dissection for **T1 and T2 tumors:**

* **have higher rate of survival at 5 years**
* have an increased number of postoperative complications

Osteoradionecrosis:

* between 1.8-37% after radiation
* usually more than 50Gy but can alson occur as low as 30 Gy

In a patient with **hard, warm and non-mobile mass** in the floor of the mouth in a patient with cancer in the floor of the mouth:

* Submandibular gland duct known as **Wharton’s duct gets blocked**
* backup of salivary content
* has no prognostic value

**Ludwig angina:**

* due to **dental caries**
* can cause **airway compromise**
* present with **swollen bilateral mandibular masses**
* infection and abscess extends **below the myelohyoid**

Patient who had total laryngectomy and partial pharyngectomy:

* they had part of the thyroid gland removed and sometimes the parathyroid glands are removed accidentally or due to transient interruption of blood supply
* results in perioral numbness and tingling due to **HYPOCa+**

Dentigerous cyst or Follicular cyst:

* not tumors but cyst
* due to separation of the dental crown from the root of unerupted tooth
* in the context of unerupted tooth
* **Odontogenic** in origin
* arise during development
* lined by specialized epithelium
* **more common around mandibular third molar** (wisdom tooth)
* Adolescents and young patients
* **unilocular radiolucency**, well-circumscribed often with sclerotic rim
* second most common
* **2/3 in the mandible**

Solid tumors:  associated with **tuberous sclerosis**

* giant cell tumors
* desmoid tumors
* osseous tumors

**Cherubism:**

* rare
* **AD**
* affects **children**
* **replacement of mandibular and maxillary bone with fibrous tissue and cysts**

In a patient who had face transplant on immunosuppression presenting with **whitish papules** on the mucosa:

* Post-transplant infection:
  + early 0-2 months
  + intermediate 2-9 months
  + delayed after 9 months

Candida:

* most common and ubiquitos
* treatment is **Nystatin and clotrimazole**
* Biopsy is warranted if there is no improvement

Gustatory sweating (Frey syndrome):

* abberant innervation of cutaneous sweat glands
* resulting in sweating and flushing during eating

Stapedius:

* is a muscle that restricts the movement of stapes in response to loud noise
* Hyperacusis: due to interruption of the **facial nerve INTRACRANIALLY** before it leaves the stylmastoid foramen and becomes extracranial

Crocodile tear syndrome/ Bogorad syndrome:

* after recovery from Bell’s syndrome, the efferent fibers from superior salivary nucleus
* become improperly connected to **lacrimal glands axons**
* results in tearing when smelling and eating

EBV:

* Burkitt’s lymphoma
* Nasopharyngeal cancer
* post-transplant lymphoma
* gastric carcinoma

HPV: **oropharyngeal cancer**

Hepatitis C:

* **verrucous and squamous cell carcinoma**
* **Oral lichen planus**

HHV-8:

* Kaposi sarcoma

Parotid duct path:

* from tragus to mid upper lip
* A: gland
* B: superficial to masseter
* C: from masseter to opposite of 2nd maxillary molar

Buccal nerve:

* superficial to the masseter muscle

Submantal (IA) and submandibular (IB) lymph nodes: Level 1: separated by anterior digastric muscle

* lips
* gums
* teeth
* tongue
* anterior hard palate

Group II:

* naso/oro/hypopharynx and parotid gland: upper jugular group

Group III: (middle jugular group):

* naso/oro/hypopharynx and larynx

Group IV: lower jugular group

* larynx
* cervical esophagus
* hypopharynx

Group V:

* posterior triangle group
* drains naso/oropharynx

Group VI:

* anterior central group below the hyoid and above sternal notch
* drains thyroid, parathyroid and cervical esophagus and larynx
* more posteriorly: hard palate, soft palate
  + retropharyngeal space and deep cervical nodes

Submental flap:

* facial artery
* submental branches
* myofacial or myocutaneous: since you can incorporate the plastysma muscle

For **N0 and N1 cancers** of the oral cancer:

* **selective removal of nodes in level I-III**

Modified neck dissection:

* for palpable metastatic disease

Radical neck dissection:

* nerve, vein and muscle involvement

Vascularized bone graft is indicated:

* when there is radiation
* anterior location
* defect more than 6 cm

Free fibula:

* long pedicle 6-10 cm
* low donor site morbidity
* reliable skin paddle
* ability to accept dental implants
* large amount of usable bone
* **iliac bone flap: has higher vertical bone height**

Hyperlacrimation, crocodile tears, Bogorad syndrome:

* treatment:
  + subtotal lacrimal gland resection
  + botox

Periapical cyst:

* most common cyst
* forms from necrotic pulp after tooth infection
* present as radiolucency at the apex of the tooth

For facial nerve reconstruction after resection:

* primary repair
* cable nerve graft
* Conduit nerve repair when the gap is l**ess than 3 cm**
* When nerve is resected very proximally up to the incracranial portion
  + then do cross-facial nerve grafting
* innervated free muscle flap transfer when cross face nerve graft is not feasible
  + can use gracilis muscle
  + pectoralis minor
  + serratus anterior
  + LD
  + Epineural nerve repair can be done to either cross face nerve graft or to donor nerve to masseteric

Question #22 (cannot see the answer)

Adenoid cystic adenoma of minor salivary gland:

* much less than major salivary glands
* most likely malignant
* pediatric salivary cancers represent about 5% of all salivary glands
* **palate is most common** location for minor salivary gland tumors
  + malignant and already advanced stage at time of discovery
* When you have paraesthesia:
  + it means you have **perineural invasion**
  + need to get MRI
* Adenoid cystic adenoma of minor salivary glands:
  + Surgery with **1-2 cm margin**
  + possible adjuvant radiation
    - perineural invasion
    - lymphadenopathy
    - high stage
  + **no chemotherapy**
* Need to get CT and MRI as an initial approach

The most common finding in patient who undergoes superficial parotidectomy for sialoadenitis:

* salivary fistula
* Frey syndrome: due to aberrant reinervation of auriculotemporal nerve to sweat glands
  + late presentation: about 11 months later
  + most patients have some post-op dysfunction of the facial nerve occurring at 60% but resolves spontaneously in the majority of cases 90% without abnormalities

In a patient with SCC extending to parotid capsule and positive post-auricular lymph nodes:

* If Moh is done and involves the the parotid capsule
* then patient will need superficial parotidectomy, radiation therapy and local rotational cheek flap

In a patient who is a smoker with slowly-growing painless mass in the parotid gland:

* path shows **papillary cyst and mucoid fluid**
* diagnosis: **Warthin tumor (papillary cystadenoma lymphomatosum)**
  + second most common 14-21%
  + benign
  + In men btw 50-70 yrs old
  + more in smokers
  + most common BILATERAL salivary gland tumors
  + also often is bilateral
  + Histology: papillary cysts, mucoid fluid, nodules of lymphoid tissue

Salivary gland tumors of the head and neck:

* rare 3-4% of all tumors
* 80% in parotid
* 80% of parotid are benign

Pleomorphic adenoma:

* Benign mixed tumor
* most common parotid tumor
* Histologically:
  + epithelial and connective tissue elements
  + stellate and spindle cells
  + interspersed within myxoid elements

Adenoid cystic adenoma:

* Second most common malignancy after (mucoepidermoid carcinoma)
* exhibits perineural invasion
* 3 types:
* Cribriform: **classic swiss cheese pattern**, arranged in nests separated by round or oval spaces
* tubular: glandular architecture
* solid (basaloid): sheets of cells with little or no luminal spaces
* slightly more common in females
* between 30-70 yrs
* peak 40-59

Hemangioma:

* most common salivary gland tumors in children
* involve the parotid gland
* Histo: capillaries lined by proliferative endothelial cells
* rapid growth phase: 1-6 months
* gradual involution 1-12 years

SCC:

* rarely involves the parotid gland
* Histo: epithelial cells that form sheets opr compact masses
* invade adjacent connective tissue
* Keratinous pearls: hallmark of well-differentiated SCC
  + round nodules of keratinized squamous cells

Bisphosphonate:

* can cause osteonecrosis
* can occur after minor trauma inability to repair due to decreased ability to heal bone
* Tx: antimicrobial rinse, systemic abx, topical and systemic antifungal and D/c bisphosphonate

Raloxifen:

* estrogen agonist/antagonist
* not hormone nor estrogen
* Selective estrogen receptor modulator

Fibula bone for mandible reconstruction:

* has thicker cortical bone
* better initial stability
* reducing micromotion during osteointegration
* provide 18-20 cm of bone
* endosteal and periosteal blood supply enabling shaping of the bone with osteotomies

Question #30: all the different levels

For partial and hemiglossectomies reconstruction:

The ideal flap:

* Preserves the mobility of the tongue
* ability to manipulate food
* articular words
* sweep the oral cavity

A patient with 2-cm mass in the anterior floor of the mouth without any palpable neck masses:

* surgical resection
* selective neck dissection: Supraomohyoid dissection
  + removes lymph nodes in zone I, II, III
* (modified neck dissection covers I-IV)

The primary treatment of Keratocytic odontogenic tumor:

* enucleation and chemoablation

The most common benign tumor of the jaw:

* Ameloblastoma (37%)
* Keratocytic odontogenic tumor (14%)

Ameloblastoma:

* slow growing
* from odontogenic epithelium
* 4th and 5th decade
* also locally destructive

Keratocytic odontogenic:

* young age
* locally aggressive
* also from odontogenic epithelium

Patient presenting with bilateral expansile lesions of the jaw: Neurofibroma

* these lesions are expansile in the inferior alveolar canal
* Not locally destructive

Central giant granuloma:

* multilocular
* cortical destruction
* root atrophy

Osteosarcoma:

* always cortical destruction

When osteoradionecrosis occurs on one side only:

* you can try to get away with debridement only
* However, when bilateral mandible is affected: free fibula flap

-A patient with SCC of the central lip measuring 2.5 cm: treatment is surgical excision only

-Surgery and radiation for SCC T4 stage or those with nodal metastasis

-5-FU: used for actinic keratosis and superficial BCC

Patient with negative vector undergoing lower blephroplasty:

* risk for lower lid malposition and ectropion
* negative projection: the relationship of the maximal point of projection of the globe to the maximal projection point of the lateral orbital rim
* Negative vector:
  + deficient globe and lid support
  + usually these patients have no scleral show or lateral lid lag
  + these patients will need primary lid suspension
* Causes of lower lid malposition:
  + weakness of orbicularis muscle
  + deficient lower eyelid/globe
  + anterior lamella shortage

Lagophthalmous:

* inability to lower the upper eyelid fully
* due to excessive tissue resection or fibrosis

Patient presenting with 2-yr history of enlarging right sided face mass ~4cm in the right parotid region and firm lymph node in zone III without mets

path: mucoepidermoid carcinoma (high grade)

* Tx: Total parotidectomy with **ipsilateral cervical lymph node dissection and post-operative adjuvant therapy (because lymph nodes are positive)**
  + total parotidectomy **(because high grade tumor)**
  + **Radiation is important:** high grade and positive lymph nodes

For palatal reconstruction:

* bone graft indicated in benign cases
* defects less than 5 cm

Circumflex scapular artery: Scapular flap

* branch of subscapular artery
* supplied the medial and lateral borders of the scapular bone
* can be harvested as chimeric to include tissue supplied by subscapular artery
* cutaneous branches supply the scapular and parascapular skin

Tip of the scapula:

* receives blood supply from the angular artery of thoracodorsal

Trapezius:

* transverse cervical artery and dorsal scapular artery

Amloblastoma:

* benign tumor of odontogenic epithlium origin
* treatment is surgical
* perform segmental mandibulectomy, reconstruction and dental rehabilitation
* no need for adjuvant or neoadjuvant treatment

Segmental mandibulectomy:

* removal of segment of the mandible: full-thickness to disease-free margin with osteotomies
* done when the tumor is invading the cortex

Marginal mandibulectomy:

* performed when tumor abuting the mandible or invading the periosteum
* removal of the alveolar margin and part of the inner lingual  or inner table

Selective neck dissection:

* performed for low grade tumors for occult nodal metastasis

Risk factors for osteoradionecrosis: (ORN)

* 10% of patients undergoing radiation
* increased risk when radiation dose > 6500 Gy
* dental caries and extraction sites are precipitating factors
* Periodontal disease can lead to ORN
* **Radiation causes xerostomia and candidiasis: not RF for ORN**
* edentulous mandible with implants: also not RD for ORN

Gastric pull-up is not a good option:

* high morbidity
* low perfusion to the proximal most part
* ALT is perfect option for single stage tubularized structure

Mucoepidermoid Carcinoma:

* most common salivary gland malignancy of the parotid gland
* Second most common of the submandibular and sublingual
* Contain:
  + mucous secreting elements (low grade: more mucous elements, well-differentiated)
  + epithelial cells (high grade, few or no mucous elements, poorly differentiated
* Based on nerve invasion: need radical parotidectomy which sacrifices the facial nerve
* neck dissection should be performed for high grade lesion (almost in every question)
* post-op radiation (same as neck dissection)

Patient presenting with 1-yr history of ear and throat pain

* has 1 cm exophytic tumor of the anterior tonisillar pillar within the oropharynx
* Bx showing SCC
* The **first involved cervical lymphatic level is: level II**

The **anterior tonsillar pillar (palatoglossal arch) and tonsil**:

* **most common** site for **primary neoplasty** of the **oropharynx**
* 71% of cervical lymph node mets
* oropharyngeal tumor from base of the tongue have similar
* the most direct path is to the jugulodigastric lymph nodes: **Level II then to III, IV, V**
* **midline tumors drain to both sides**

In a patient who presents with 4x4 cm defect of the maxilla involving all teeth behind the canine but sparing the orbital floor:

* patient wants restoration of mastication, speech and swallowing with the simplest method:
  + do prosthetic obturator (palatal obturator)
  + good for replacing missing maxillary dentition
  + prevent leakage of air, liquid and food
  + removable allowing monitoring of the maxilla for recurrence
  + need to have sufficient teeth for the prosthesis to stay

Deep circumflex iliac artery:

* major blood supply to vascularized iliac bone flap
* gives ascending branch to internal oblique muscle

Nasopharyngeal cancer:

* common in africa and east asia
* caused by EBV: most associated with non-keratinized undifferentiated
* treated mostly **with chemotherapy and radiation**
* Surgery is reserved for recurrent or unusual cancer

Smoking increases laryngeal cancer by 5-25 folds

HPV most commonly with **oropharyngeal cancer**

Maxillary sinus cancer: **smokling and wood dust exposure**

Ameloblastoma:

* bening
* locally invasive
* 1% of jaw tumors
* 10% of odontogenic tumors
* 80% mandible, 20% maxilla
* Peak 3rd & 4th decade but can be seen in adolescents and young patients
* Radiographically: **unilocular or multilocular (soap bubble or honeycomb)**
* Tx: enucleation and curettage or more radical dissection
* rare mets or ameloblastic carcinoma

Nasopharyngeal angiofibroma:

* benign
* common in the second decade of life
* rarely after 25 yrs of age
* symptoms include unilateral or bilateral nasal obstruction, epistaxis and blood tinged nasal discharge
* **also conductive hearing loss due to obstruction of eustachian tube**
* locally invasive vascular tumors
* exclusively in adolescent males
* nasal obstruction, orbital displacement and asymmetry of the face
* start from sphenopalatine foramen into the nasopharynx and choana
* radiographically:
  + non-capsulated lobular soft tissue nmasses
  + intense uptake of IV dye
* bony destruction is not a feature but bone maybe remodeled
* Tx: surgical with radiation reserved for extensive cases
* preop embolization and estrogen may decrease blood loss

Best reconstructive option for circumferential pharyngeal reconstruction:

* ALT
* Descending branch of lateral circumflex
* runs between vastus lateralis and rectus femoris

RFFF:

* pedicle between FCR and BR

Circumflex scapular artery: pedicle to scapular and parascapular flaps

* in the triangular space of the back
* Teres major, minor and long head of triceps

**Quadrangular space:**

* transmits the axillary artery and **posterior humeral circumflex artery**

Patient with mucoepidermoid carcinoma of the parotid with nerve invasion that was resected without gross residual disease but microscopic deep margin, no nodal or distant mets:

* do radiation is the best next step

For salivary gland tumors:

* chemotherapy is done with radiation only in patients with SCC

Question #59: lots of cysts that have no questions about them

Oropharyngeal tumors: should always be biopsied

* MRI should always be performed to assess for disease
* Sclerotherapy does not work well for microcytic lymphatic malformation

In total face transplant: the most antigenic is the **skin**

When performing maxillectomy:

* need to reconstruct the palate, orbital floor and obliterate the maxillary sinue

Pleomorphic Adenoma of the parotid gland:

* most common salivary gland tumor 45-75%
* affect patients in their 20-50’s
* propensity for local recurrence
* Simple enucleation is discourage
* need to perform superficial parotidectomy
  + preserving the facial nerve
  + tumor does not infiltrate the nerve
* parotid gland is the most frequently major salivary gland affected
* palatal salivary tissue is the most minor salivary gland affected

Primary goal of reconstruction following hemiglossectomy:

* watertight wound closure to avoid fistula between oral secretions and neck
* restoration of speech and swallowing

VPI due to post-soft palate resection:

* **prosthetic obturator**

After circumferential defect due to laryngectomy:

* TEP: tracheoesophageal prosthesis for speech
* TEP is better with fasciocutaneous flaps than jejunal free flap (due to distensibility and mucous production)

Wide local excision of lower lip SCC extending to chin crease:

* repair with Karapandzic flap
  + perform circumoral incision
  + mobilize orbicularis muscle with nerve and blood supply (superior and inferior labial arteries)

Estlander:

* up to two third on the side

Abbé flap:

* from central lip

Scapular flap can also be based on angular branch of the thoracodorsal

Ameloblastoma:

* rare cystic tumor
* involving the mandible
* characteristic finding: multilocular radiolucent radiolucent with soap bubble appearance
  + associated with impacted molar
  + x-ray show unilocular or multilocular cystic masses with thinning of the surrounding bone
  + exam shows palisading odontogenic cells
* Tx: segmental mandibulectomy including margin of normal bone and immediate reconstruction
* Curettage is inadequate: 50-100% recurrence

Main contributors to salivary flow:

* parotid and submandibular glands
* minor salivary gland: < 10%
* **Parotid: serous secreting**
* submandibular: **serous mostly** and **10% mucous**
  + **unstimulated state**: **submandibular gland** produces most of the saliva
  + **stimulated state: parotid gland**
  + total salivary flow ~ 1.5L

Xerostomia:

* reduced to 50-70% of baseline after 10-16 Gy
* undetectable after 40-42
* 60-90% of survivors of head and neck cancer treated with radiation therapy
* cytoprotective agents: amifostine, pilocarpine
* or new radiation techniques

Failure to reconstruct the anterior mandibular bone:

* Andy Gump defect
  + impaired speech, swallowing and mastication

Supraclavicular island flap:

* based on supraclavicular artery off the transverse cervical artery

Osseointergrated dental prosthesis: 3-year survival on non-irradiated free fibula flap

* 95%

Young patient presenting with bulging of the upper eyelid with ptosis with normal skin color and normal vision without any bony involvement on CT scan:

* NF-1
  + orbitofacial tumor
* AD
* dysplasia of the greater wing of sphenoid (5-7%) with macrocephaly
* 3 types of neurofibromas:
  + plexiform, localized and diffuse
* plexiform NF: about 30% outside CNS
  + majority present at birth
  + half in the head and neck
  + tend to grow in pubescent age as a result of hormonal stimuli
  + 13% malignant transformation

(NF-2) all confined to central nervous system

Cobb syndrome:

* **capillary malformation** in the **midline** of the scalp region overlying encephalocele
* or in the skin overlying dysraphism in the cervical and lumbosacral spine

**Merkel cell tumors:**

* rare neuroendocrine tumors
* highly aggressive
* despite wide excision: 1/3 recur
* 5-year survival is 33%
* Best treated with wide local excision and SLNBx
* Adjuvant RTX is also used
* Arises from sun damaged skin of the head and neck and no intra-oral involvement

Fibrous dysplasia:

* usually treated with shaving and recontouring of the bone

Young patient presenting with skin BCC and asymmetry of the jaw. his dad died of extensive skin cancer at the age of 40

* Dx: Nevoid basal cell carcinoma syndrome
* AD
* need two major criteria or one major and one minor
  + More than 2 BCC or one BCC younger than 20 years old
  + Odontogenic Keratocysts of the jaw
  + 3 or more palmar or plantar pits
  + bilamellar calcification of falx cerebri
  + bifid fused markedly splayed ribs
  + First degree relative with NBCC
    - (ameloblastoma is very rare)
  + Genetic testing
* Odontogenic keratocyst:
  + benign
  + develop in the first decade
  + peak incidence in the second and third decade
  + seen in 74-80%
  + more common in mandible than maxilla
  + usually asymptomatic
  + may cause pathologic fractures swelling, loose teeth and displacement of developing teeth

|  |
| --- |
| **In-Service Questions Notes: Head and Neck Congenital** |

Torticollis:

* congenital neck deformity
* shortening of SCM
* head tilt
* limited ROM
* firm mass on body of SCM
* Sometimes part of the muscle become fibrotic and needs surgical release
* P/E:
  + Flexion of the head and neck towards the ipsilateral shoulder
  + Rotation towards the contralateral shoulder
  + limited flexion toward the contralateral shoulder

Buccinator:

* only muscle that compress the cheeks
* air-based instruments
* forming a bolus during mastication

Parotid duct:

* leaves the gland from the anterior border
* courses superficial to masseter
* pierces the substance of buccinator
* reaches the mucosa of the oral cavity opposite to the second maxillary molar

Tongue sensation:

* general sensation anterior 2/3 from the lingual nerve
  + branch of the mandibular division of the trigeminal
* Taste: anterior 2/3 from chorda tympani
  + from facial nerve
* The chorda tympani joins the lingual nerve and runs anteriorly in its sheath
* Glossopharyngeal: mucosa of the posterior 1/3
* Hypoglossal nerve: motor nerve to the tongue

Bell’s palsy:

* entire nerve is inflammaed
* conduction block at the meatal or labyrinthine segments
* proximal to chorda tympani and stapedial nerve
* hence metallic taste and unable to accommodate to loud noise

Tensor tympani: attaches to malleus

* innervated by trigeminal nerve

tensor veli palatini: active dilation of the Eustachian tube

* trigeminal nerve

Levator veli palatini:

* vagus nerve

Auricular branch of the vagus nerve (Arnold nerve):

* brings sensory innervation from concha and oropharynx
* Chronic external ear pain should point to oral pathology

Auriculotemporal nerve:

* carries sensory information from the anterior and superior external auditory canal

Greater auricular:

* lower half of the ear

Lesser occipital nerve:

* superior cranial portion of the ear

Facial nerve:

* exits the skull base from stylomastoid foramen

Foramen lacerum:

* internal carotid artery

Foramen ovale:

* mandibular nerve V3

Foramen rotundum:

* maxillary nerve V2

Jugular foramen:

* Glossopharyngeal IX
* Vagus X
* Spinal accessory XI

Thyroglossal duct cyst:

* form anywhere along the thyroglossal duct
* extend from base of the tongue to where the thyroid is
* most common location below the hyoid bone
* midline structure
* usually atrophies
* asymptomatic until infected

Reactive lymph nodes:

* common in children
* submandibular or jugulodigastric area

Branchial cleft remnants:

* lateral
* along the anterior border of the SCM
* just inferior to the border of mandible

Lingual thyroid:

* ectopic thyroid tissue in tongue
* failure of thyroid descend
* they represent the only thyroid tissue in patient

Mucoepidermoid carcinomas:

* salivary gland malignancies
* found in children
* common in parotid gland

Branchial cleft sinus or fistula:

* formed between the 2nd and 3rd branchial arches
* 30% bilateral
* Internal opening on the anterior surface of posterior pillar
  + behind the tonsil
* fistula will follow the carotid sheath
* before crossing the **hypoglossal nerve (XII): at risk during surgical tx**
* passing between the internal and external carotid arteries

Spinal accessory nerve:

* in the posterior triangle of the neck

Inferior alveolar nerve:

* enters the mandible on the medial side of the ramus
* 10 mm below the sigmoid notch
* courses closer to the buccal cortex
* lowest and closest to inferior cortex
* exits at the level of first molar, **second premolar**
* supplies lower lip and chin

Maxillary canine:

* can be used as a landmark for infraorbital injection

retromolar fossa:

* behind the third molar
* landmark for buccal nerve

Sigmoid notch:

* landmark for inferior alveolar nerve

Temporal or frontal branch of the facial nerve:

* found in superficial temporal fascia

Layers from superficial to deep:

* skin
* subcutaneous tissue
* Superficial temporal fascia
* superficial layer of deep temporal fascia
* temporal fat pad
* deep layer of deep temporal fascia
* temporalis muscle

Bones of the orbit:

* frontal
* maxillary
* zygomatic
* ethmoid
* lacrimal
* Greater and lesser wing of sphenoid
* palatine

Lesser wing of sphenoid:

* posterior aspect of the roof of the orbit
* transmit the optic nerve and ophthalmic artery

Greater wing of sphenoid:

contains superior orbital fissure and transmits:

* lacrimal nerve
* frontal nerve
* trochlear nerve
* superior and inferior branches of oculomotor
* abducens nerve
* nasociliary nerve
* ophthalmic branch of trigeminal nerve

Levator veli palatini:

* Fourth pharyngeal arch
* innervated by vagus nerve
* arises from ET tube and sphenoid
* inserts into the other levator veli palatini
* the function is to elevate and posteriorly reposition the soft palate against the posterior nasopharynx

Vagus nerve innervates:

* levator veli palatini
* palatoglossus
* palatopharyngeus
* pharyngeal constrictor muscles
* musculus uvulae

Palatoglossus:

* anterior tonsillar pillar
* lift the base of the tongue

Trigeminal nerve:

* ophthalmic: sensory only
* maxillary: sensory
* mandibular: mixed
  + motor innervation:
    - masseter
    - temporal
    - pterygoids
    - mylohyoid
    - tensor tympani
    - tensor veli palatini: arises from ET tube and medial pterygoids, wrap around hamulus then insert in midline
    - anterior belly of digastric

Lateral pterygoid:

* origin: attached to TMJ and fovea of the neck of mandible
* anteriorly (proximally):
  + superior head: greater wing of sphenoid bone
  + inferior head: lateral surface of pterygoid plate
  + Therefore subcondylar fracture: draw the proximal fragment anteriorly

Digastric muscle:

* from mastoid process of the temporal bone to hydoid bone and anterior mandible
* depresses the mandible or elevates the hyoid

Elevate the mandible:

* masseter
* temporalis
* medial pterygoid

Medial pterygoid:

* from lateral pterygoid and tuberosity of the maxilla
* attaches to the medial surface of the mandibular angle

Masseter:

* from the zygomatic arch
* to lateral border of the mandibular ramus

Temporalis:

* from the temporal fossa
* coronoid process and anterior border of the ramus

The nasolacrimal duct:

* drains into the **inferior meatus**
* just below the inferior concha

**ET tube** opens:

* **posterior to inferior concha**

**Sphenoid sinus:**

* **sphenoid recess**
* **superior and posterior to superior concha**

**Ethmoid air cells:**

* **superior meatus**

Myelohyoid muscle:

* forms the floor of the muscle
* from the oblique line of the mandible
* from mandibular symphysis to last molar tooth
* inserts in the hyoid bone
* innervation: inferior alveolar nerve from mandibular nerve from trigeminal (the other major nerve is lingual from mandibular)

Hypoglossal nerve (XII)

* provides motor innervation to all intrinsic and extrinsic muscles of the tongue
* except **palatoglossus: innervated by vagus**

Accessory nerve (IX):

* SCM
* trapezius

Glossopharyngeal (IX):

* innervates parotid gland
* sensation from carotid body and sinus
* general sensation of the posterior third of the tongue

Congenital midline cervical clefts:

* results from failure of fusion of the second branchial arches
* red, thin skin in midline with cleft
* some degree of lip and mandible cleft
* cord that might limit the neck mobility
* some degree of retrognathia

Nasal palatine n.:

* blocks external nose

Sphenopalatine n.:

* blocks the internal nose and palate

Muscles of mastication:

* derived from first branchial arch

Muscles of facial expression:

* second branchial arch

Ranula:

* mucocele/mucous extravasation phenomenon
* in the floor of the mouth
* arising from the ducts of the sublingual or submandibular
* often as a sequela of obstruction
* presents as a swelling in the floor of the mouth
* tinted blue or glossy white mass
* treatment is marsupialization or surgical excision of the subligual gland
* may herniate through the floor of the mouth

Torus:

* exostosis
* slowly-growing mass from the palate or mandibule
* bone covered with mucosa
* exicison
* benign osteoblastic tumor
* well circumscribed, encapsulated, covered with mucosa
* grow slowly and do not invade adjacent structures

Inferior alveolar nerve:

* closest to lingual cortex at the level of first and second molars
* Transection 3.5% during sagittal split osteotomy at the level of 3rd molar
* IAN: enters the medial side of the ramus, 10 mm inferior to sigmoid notch (closer to buccal cortex)
* then moves away from the buccal cortex as it passes the region of the first and second molars
* Closest to the inferior cortex near its exit at the level of first molar and second premolar

First visceral arch forms:

* malleus
* incus
* structures of the mandible

The second arch forms:

* stapes
* styloid
* muscles of facial expression

Third arch forms:

* stylopharyngeus

4th, 5th and 6th:

* pharyngeal, laryngeal muscles and thyroid cartilage

During endoscopic surgery for drainage of the maxillary sinus due to sinusitis:

* scope is directed to the **middle meatus**

Failure of closure of **anterior fontanelle** results in:

* dermoid cyst of the nasal dorsum
* anterior encephalocele
* nasal glioma

Superior orbital fissure: located in orbital apex, superior orbital fissure syndrome

* oculomotor
* trochlear
* abducens
* also: lacrimal, frontal, nasociliary nerves
* sympathetic nerves
* anterior and inferior branches of the ophthalmic vein
* orbital branch of middle meningeal artery
* recurrent branch of the lacrimal artery
* ophthalmic branch of trigeminal nerve

Apex of the orbit contains:

* optic canal:
  + optic nerve
  + ophthalmic artery
* Inferior orbital fissure:
  + infraorbital nerve
  + zygomatic nerve
  + infraorbital vessels

Foramen rotundum:

* between the middle cranial fossa and pterygopalatine fossa
* maxillary branch of trigeminal nerve and that’s the only structure

Foramen ovale:

* middle cranial fossa to infratemporal fossa
* contains:
  + mandibular branch of the trigeminal
  + lesser petrosal branch of the glosspharyngeal (IX)
  + accessory meningeal branch of the maxillary artery
  + emissary vein

Foramen spinosum:

* also between the middle cranial fossa and infratemporal fossa
  + middle meningeal artery and vein
  + meningeal branch of the mandibular division of the trigeminal nerve

External ear innervation:

* auriculotemporal: superior and anterior aspect of helix
* greater auricular: inferior two third
* lesser occipital: posterior aspect
* Arnold branch of vagus: ear canal

Greater occiptal nerve:

* sensation to skin and posterior aspect of the scalp

Fibrous dysplasia:

* bening tumor of bone origin
* can be part of McCune-Albright syndome (polyostotic fibrous dysplasia)
* localized to craniofacial but rare and unlikely in the palate

Gliomas:

* encephalocele that lost their connection with intracranial connection
* just lateral to nasal root
* red, non-compressible, firm and lobular
* do not transilluminate
* non-pulsatile

Posterior ethmoidal nerve:

* branch of the nasociliary nerve (from ophthalmic of the trigeminal)
* provides sensation to the posterior ethmoidal sinuses

Anterior ethmoidal nerve:

* terminal branch of the nasociliary nerve
* sensation to nasal septum and lateral nasal wall

Nasal tip:

* dorsal nasal nerve

Branchial arches:

* start to develop during the 4th week of gestation
* neural crest cells migrate to the head and neck

To gain more exposure for recipient vessel in the neck when the bifurcation is high:

* can cut the **anterior belly of digastric**
* can cut **stylohyoid**

Muscles of facial expression are innervated along their posterior surface except:

* levator anguli oris (innervated along the anterior surface)
* buccinator
* mentalis

Modiolus:

* levator anguli oris (deep to all of them) hence innervation on the anterior surface
* risorius
* buccinator
* depressor anguli oris
* orbicularis oris
* zygomaticus major

Formation of the primary palate:

* fifth week of gestation
* completed by end of 6th week
* anatomically: anterior to incisive foramen
* contains central and lateral incisors

Superficial fascia:

* SCM
* trapezius
* suprahyoid muscles

Pretracheal:

* trachea
* thyroid

prevertebral fascia:

* scalene
* paravertebral muscles

Mandibular branch of the facial nerve:

* mentalis
* depressor anguli oris
* rarely risorius
* paralysis of these muscles: elevation of the angle of the mouth
* risk of injury during: rhytidectomy, neck dissection, parotidectomy

Buccinator branch of the facial nerve:

* buccinator
* orbicularis oris
* risorius
* levator anguli oris

Pterygomaxillary fissure:

* on lateral cephalogram: reverse tear drop
* posterior border: pterygoid plates
* anterior boder: maxilla
* superior border: pterygopalatine fossa, sphenoid bone, orbital process of palatine bone
* inferior orbital fissue and pterygopalatine fissure are oriented at right angle to each other
* pterygopalatine fissure:
  + connects pterygopalatine fossa to infratemporal fossa
  + transmits the terminal branch of the maxillary artery and vein

Branches of external carotid artery from proximal to distal:

* superior thyroid
* ascending pharyngeal
* lingual
* occiptal
* facial
* posterior auricular
* maxillary arteries

Numbness in the distribution of the infraorbital nerve:

* means that the maxillary division of trigeminal is involved
* meaning the tumor could be in the foramen rotundum

Muscles that elevate the mandible:

* temporalis
* masseter
* medial pterygoid

Muscles that depress the mandible:

* digastric
* geniohyoid
* genioglossus
* mylohyoid

Lateral pterygoid:

* inserts in the capsule of TMJ
* pull condyle head medial there there is high fracture

Palatoglossus:

* 2 paired muscles
* attaches to the side of the tongue to palatine aponeurosis
* elevate the tongue and pull it against the soft palate
* the only tongue muscle innervated by vagus (all others innervated by hypoglossal)

Palatopharyngeus:

* separates the oropharynx from nasopharynx
* pulls the soft palate: anteriorly, medially, superiorly
* attaches the lateral wall of the pharynx, hard palate and palatine aponeurosis

Superior laryngeal nerve:

* sensation to supraglottis

Recurrent laryngeal nerve:

* motor innervation to laryngeal musculature

The spinal accessory nerve (XI):

* exists through jugular foramen
* passes between the jugular artery and vein
* courses around the jugular vein
* gives a motor branch to SCM
* then courses deep or through SCM
* Emerges on the posterior border of SCM (always upper half)
* then goes into the posterior triangle floor over the levator scapulae
* Deep to the investing fascia
* above the prevertebral fascia
* gives motor to trapezius

The papilla of the parotid duct:

* adjacent to maxillary second molar
* empties secretion via Stensen’s duct

Buccinator muscle:

* sandwiches btw the oral mucosa and facial artery
* must be included in FAMM flap
* originates from pterygomandibular raphe
* inserts into orbicularis oris and mucosa of the lateral lip

**T**rigeminal nerve:

* **t**ensor veli palatini
* **t**ensor tympanic

Vagus nerve:

* Levator veli palatini
* palatoglossus
* palatopharyngeus
* musculus uvuli

Submental flap:

* elevated below the level of the platysma
* supplied by submental artery and vein
* branches of the facial artery
* submental artery gives off one or two cutaneous branches to the submental flap
* submental artery runs in close relation to the anterior digastric muscle

Stenson’s duct:

* at the level of second molar
* 4-7 cm length
* from the anterior border of the superficial lobe of the parotid gland
* runs over the masseter muscle: above half way between the corner of the mouth and the zygomatic arch
* pierces the buccinator muscle
* the buccal and zygomatic nerves cross over the parotid

Parotid abscess:

* should be drained via horizontal incision to avoid injury to the duct and the branches of the facial nerve
* compartmentalized with septae
* pitting edema is indicative

Passavant’s ridge:

* formed by **superior constrictor muscle**
* **levator veli palatini**
* bulge in the posterior pharynx
* **above the atlas**
* patients with VPI this can be activated as a compensatory mechanism
* serves at a reference point during surgery

Soft palate muscles:

* levator veli palatini
* tensor veli palatini
* palatoglossus
* palatopharyngeus
* uvula

Levator veli palatini:

* elevates and retracts the soft palate
* bring it in touch with posterior pharynx
* open ET tube

Musculus uvulae:

* brings the uvula up and superiorly

Palatoglossus and palatopharyngeus:

* lower the soft palate
* narrow faucial isthmus

tensor veli palatini:

* tenses and lowers the soft palate
* opens ET tube

Foramen rotundum:

* located within the **sphenoid bone** of the middle cranial fossa
* transmits the maxillary branch of the trigeminal nerve
* from middle cranial fossa to pterygopalatine fossa

Anterior cranial fossa foramen:

* cecum
* cribriform plate foramen
* anterior and posterior ethmoidal canals

Cribriform plate:

* horizontal component of the ethmoid bone
* in contact with anterior cranial fossa on one side
* nasal cavity on the other
* contains multiple foramen for olfactory nerves

Lesster petrosal sinus:

* located in the anterior wall of the petrous part of the temporal bone in the middle cranial fossa
* transmits the lesser petrosal nerve

Innervated along the anterior surface:

* buccinator
* levator anguli oris
* mentalis

Glioma:

* encephalocele that failed to maintain intracranial communication
* nasal glioma: lateral to the nasal root
* reddish, firm, non-pulsatile, does not transilluminate
* lobular with overlying talengiectasia

Dermoid cyst:

* derived from **mesoderm and ectoderm**
* lined with squamous epithelium
* **contain specialized adnexal structure**s  such as hair follicles, pilosebaceous glands and smooth muscle

Infraorbital and mental nerve blockade:

* does not cover the commisures
* Commisures innervation from buccal nerve, which is a branch of the mandibular division of the trigeminal nerve

Bilateral infraorbital nerves:

* will block all components of upper lip except commisures

Bilateral mental nerve block:

* covers all lower lip

Buccal branch of the mandibular division of the trigeminal nerve:

* sensation to buccal mucosa

Injury to auriculotemporal nerve:

* numbness of the tragus
* external auditory meatus
* tympanum
* temporal skin
  + the nerve is vulnerable to injury during parotidectomy

Auricular branch of the vagus:

* concha
* antihelix

Greater auricular nerve:

* helix
* lobule

Auricularis anterior, superior and posterior:

* temporal
* posterior auricular
* both from trigeminal (motor innervation)

Temporalis muscle:

* anterior and posterior deep temporal arteries
* middle temporal artery
* Innervation: deep temporal nerves (buccal, masseteric a
  + from mandibular division of trigeminal

Ear embryology:

* 6 hillocks during 6th week of gestation
* First branchial arch(mandibular) : 1-3 hillocks
* Second branchial arch (hyoid): 4-6 hillocks
* External auditory meatus: second branchial groove

Maxillary division of the trigeminal nerve:

* cheek
* upper lip
* upper teeth via superior alveolar nerve

Abducens nerve:

* motor to the lateral rectus

Infraorbital nerve:

* supplies the sidewall of the nose
* ala
* upper lip
* lower eyelid
* medial cheek

Buccal nerve of V3:

* central cheek
* blocked by injection between the sigmoid notch of the mandible and the lateral pterygoid plate

Dorsal nasal nerve:

* branch of the anterior ethmoid
* which comes off the nasociliary nerve
* which is off the ophthalmic division of trigeminal nerve
* supplies skin to the dorsum of the nose to the nasal tip

Infratrochlear nerve:

* branch of the nasociliary off V1 as well
* medial upper eyelid sensation

Zygomaticfacial nerve:

* branch of the zygomatic nerve
* off V2 (maxillary division of trigeminal)
* emerges just lateral to the infraorbital rim
* supplies the area to the zygoma and lateral cheek

Muscle that elevates the mandible:

* MEDIAL pterygoid

Medial pterygoid:

* arises from inferiorly, laterally and posteriorly of the medial surface of the lateral pterydoid
* inserts into the mandibular ramus and angle
* A patient who sustains a fracture medial to the mandibular angle:
  + the mandibular ramus will be displaced medially and cephalas by the effect of the medial pterygoid muscle

Anterior belly of digastric:

* from mandibular symphysis
* to the hyoid bone

Posterior belly of digastric:

* from the hyoid bone
* to mastoid notch of the temporal bone
* in mandibular fracture: pulls the mandible in posterior inferior direction

Buccinator:

* arises from the pterygomandibular raphe
* inserts into the orbicularis muscle and the mucosa and skin of the lip
* innervated by the buccal branch of the facial nerve
* acts to flatten cheek against teeth

Lateral pterygoid:

* origin from greater wing of sphenoid
* and from the lateral surface of the lateral pterygoid plate
* inserts into the neck of the condyle and the anterior margin of the articular disk of TMJ
* Acts to protrude the mandible forward
* Subcondylar fracture: pulls condylar head in anteromedial direction
* in unilateral fracture: movement of the contralateral pterygoid results in deviation of the mandible towards the side of the fracture

Stylopharyngeus muscle:

* the only muscle that arises from the 3rd branchial arch
* innervated by glossopharyngeal nerve (IX)
* one of the intrinsic muscles of the larynx

Muscles of mastication:

* anterior belly of digastric
* myelohyoid
* tensor veli palatini
* tensor tympani
* all derived from first branchial arch
* innervated by the trigeminal nerve

Muscles of facial expression:

* posterior belly of digastric
* stylohyoid
* stapedius
* Second branchial arch
* innervated by facial nerve

The fourth branchial arch:

* constrictors of the pharynx
* levator veli palatini
* cricothyroid
* palatoglossus
* palatopharyngeus
* Innervated by the superior laryngeal nerve of the VAGUS

Fifth branchial arch is rudimentary

Sixth branchial arch:

* intrinsic muscles of the larynx except
  + stylopharyngeus  (3rd)
  + cricothyroid (4th)
* Striated muscles of the esophagus
* from recurrent laryngeal nerve

**Hamulus:**

* the inferior extension of the medial pterygoid plate

**tensor veli palatini:**

* originates from the medial pterygoid plate
* becomes a tendon that changes its course as it wraps around the hamulus
* extends medially to form an aponeurosis in the anterior soft palate
* inserts on the hard palate

**Levator veli palatin:**

* from inferior surface of the petrous portion of the temporal bone
* passes downward and obliquely to join the contralateral muscle
* forming the palatine velum
* acts to move the palate

**Palatoglossus:**

* arises from the soft palate
* courses downward within the anterior tonsillar pillar
* inserts into the tongue

**Palatopharyngeus:**

* arises from soft palate
* coursing down to posterior tonsillar arch
* joins stylopharyngeus which inserts into the thyroid cartilage
* used for sphincter pharyngoplasty

The superior pharyngeal constrictor muscle:

* arises from the medial pterygoid, hamulus, pterygomandibular raphe and alveolar process of the mandible
* wraps around the pharynx
* inserts on the median raphe to form Passavant’s ridge (contributes to VP closure)

The internal carotid artery supplies supraorbital artery of the scalp

Scalp blood supply:

* supraorbital and supratrochlear arteries: arise from the ophthalmic artery of the internal carotid artery

Frontalis and parietalis:

* branches of the STA which comes off the external carotid artery

Occipitalis and posterior auricular:

* comes off the external carotid artery

**Ocular muscles origins:**

* levator palpabrae superioris: arises from the lesser wing of sphenoid
* inferior oblique: from maxilla
* All the others:
  + from fibrous sling around the optic nerve called:
  + annulus tendineus communis

Second branchial arch structures:

* Stapes
* Stylohyoid
* lesser cornu of the hyoid bone
* upper part of hyoid bone

First branchial arch:

* malleus (Meckel’s cartilage)
* incus ( Quadrate Cartilage)
* Greater wing of sphenoid (from Quadrate cartilage)
* Mandibular condyles (Meckel’s cartilage)
* From Meckel’s and quadrate ( endochondral ossification)

Maxillary and mandibular prominences (intermembranous ossification)

Maxillary prominence:

* gives rise to maxilla, zygoma and squamous portion of temporal bone

Mandibular prominence:

* body and ramus of mandible

**Sinus drainage anatomy:**

* nasolacrimal duct: inferior meatus
* anterior ethmoid air cells and maxillary sinus: middle meatus
* Nasofrontal duct: middle meatus
* Sphenoid sinus: sphenoethmoid recess (above and behind the superior concha): SUPREME meatus
* posterior ethmoid air cells: superior meatus

**Auriculotemporal nerve is a branch of V3:**

* need to block trigeminal nerve for superior helix laceration

**Great auricular nerve:**

* originates from the cervical plexus, composed of branches of spinal nerves C2 and C3

**Ear development:**

* sixth week of fetal gestation
* From first and second pharyngeal arches
* First (mandibular arch): drain into parotid lymph nodes
  + tragus
  + helical root
  + superior helix
* Second mandibular arch (hyoid): drain into cervical lymph nodes
  + antitragus
  + antihelix
  + inferior helix
  + lobule

**During dissection to the level of the digastric tendon during microsurgery of H&N:**

* the hypoglossal nerve is found lateral to both internal and external carotid arteries
* The hypoglossal nerve is also found between the internal carotid artery and internal jugular vein
* Also passes under occipital artery
* also passes deep to stylohyoid and digastric

**Frontonasal encephalocele:**

* most likely to herniate through foramen cecum

**Foramen rotundum:**

* maxillary branch of trigeminal nerve

**Foramen ovale:**

* mandibular branch of trigeminal nerve

**Superior orbital fissure:**

* Oculomotor
* abducens
* trochlear
* ophthalmic division of trigeminal

**When you perform LeFort 1:**

* blood supply to maxilla become through: both are branches of the external carotid artery
  + Palatine branch of ascending pharyngeal artery
  + ascending palatine branch of facial artery

**Before LeFort 1: internal maxillary artery**

* descending palatine
* posterior superior alveolar artery
* infraorbital arteries

**Greater palatine artery:**

* from greater palatine foramen
* supplies the palate and soft tissue of the roof of the mouth

**Lesser palatine artery:**

* from lesser palatine foramen
* supplies vascularity of the soft palate and palatine tonsils

During rhytidectomy:

* the great auricular nerve is at risk of injury
* highest risk of injury where it emerges behind the SCM 9 cm caudal to the external auditory canal
* 6 cm inferior to the tragus
* The nerve lies posterior and superficial to SMAS
* Can cause numbness and dysesthesia of the lower two third of the ear and adjacent neck and cheek

**The external acoustic meatus:**

* first branchial GROOVE

**The first tooth to erupt:**

* first molar

The lateral orbital wall:

* formed by the greater wing of sphenoid
* zygomatic bone

**Superior oblique muscle:**

* Primary function: depression
* secondary function: intorsion and abduction
* Originate from outside and superomedial to the annulus of Zinn
* Courses around trochlear nerve to insert onto the globe
* Sensory innervation by trochlear nerve

**Sternocleidomastoid:**

* from mastoid process to clavicle and sternum
* Blood supply is segmental
* from three equally dominant sources
* superior third: from branch of the occipital artery
* middle third: branch of the superior thyroid artery
* inferior third: branch of the thyrocervical trunk

**Whitnall’s tubercle:** (the lateral orbital tubercle):

* found about 10 mm below the lateral orbital rim
* attached to it:
  + lateral check ligament
  + facial extension of the lateral rectus muscle
  + lateral horn of levator aponeurosis
  + lateral palpebral ligament
* The **lateral limb of Lockwood’s ligament** is not attached to it

**Supraorbital nerve:**

* can be injured during endoscopic browlift
* Branch of V1
* Arises from notch/foramen of the superior orbital rim
* Divide to deep and superficial branches
* Deep division:
  + courses laterally toward the superior temporal line
  + continues to coronal suture
  + supply the central frontoparietal scalp
* The superficial branch:
  + courses cephald into the frontalis and supply sensation to the central forehead and hairline

**Radix of nose sensation:**

* supratrochlear and infratrochlear nerves

**Temporal forehead:**

* V2 and V3

**Temporal scalp:**

* occipital nerve

**Palatine bone:**

* contributes to the orbit
* found behind the maxilla and pterygoid plate
* consists of horizontal and pyramida processes
* Horizontal process:
  + posterior aspect of the hard palate and forms the floor of choana
* Pyramidal process:
  + extends vertically and forms the orbital floor

**Anterior nasal spine:**

* prominence in the maxilla

**Hamulus:**

* inferior extension of the medial pterygoid plate

**External nose:**

* 2 pyramidal bones
* frontal processes of the maxilla

**Branchial cleft cyst:**

* cyst that develops as a remnant from the second branchial cleft
* found at the anterior border of SCM

**Paralysis of the trigeminal nerve:**

* results in paralysis of the tensor veli palatini (first branchial arch)

**Levator veli palatini/Palatophayngeus**

* off 4th branchial arch
* Superior laryngeal nerve
* (vagus nerve)

**Stylohoid:**

* Second branchial arch
* innervated by facial nerve

**Stylopharyngeus:**

* third branchial arch
* Glossopharyngeal n.

Question#87:

some details about great auricular nerve

**Auricular branch of vagus nerve (Arnold’s nerve):**

* contribution from glossopharyngeal nerve
* supplies the external auditory canal

**Posterior auricular nerve: from facial nerve VIIo**

* supplies motor innervation to the posterior auricular and occipitalis muscle

**Lingual nerve:**

* branch of the mandibular
* supplies sensation to the anterior 2/3 of the tongue

**Branches of V3: mandibular branch of trigeminal**

* lingual nerve
* inferior alveolar nerve
* long buccal nerve
* mental nerve
* auriculotemporal nerve: from posterior aspect immediately after exiting foramen ovale
  + passes around the middle meningeal artery
  + then course between external auditory canal and TMJ

**Mental nerve foramen:**

* between the first and second premolars

**Stensen’s duct:**

* found in the buccal space
* opposite to the second maxillary molar

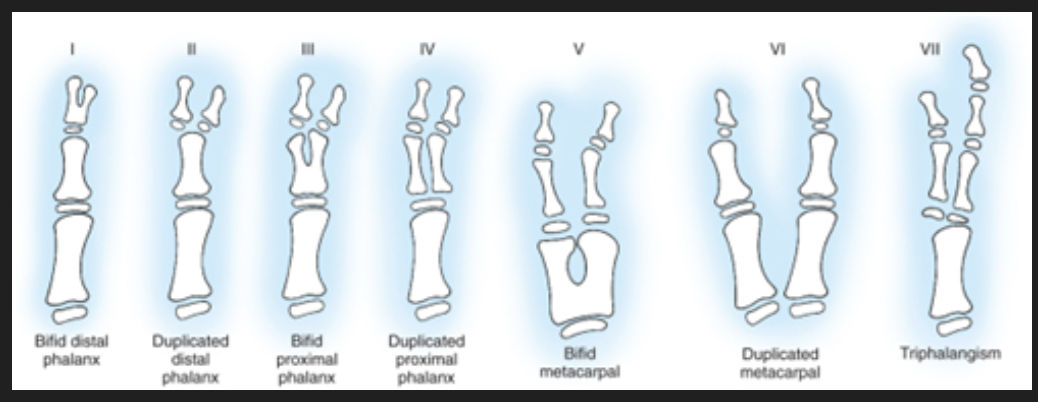
**Muscles of mastication: innervated by the mandibular branch of the trigeminal nerve**

* medial pterygoid
* lateral pterygoid
* masseter
* temporalis

|  |
| --- |
| **In-Service Questions Notes: Congenital Hand** |

Wassel Classification for preaxial polydactyly of duplicate thumb:

* **type IV** most common
* **second** most common **type II**



Amniotic band syndrome:

* 1/1200-1/15000
* can be associated with cleft palate, imperforate anus, body wall defects and equinovarus
* intrinsic theory: **mesenchymal hypoplasia** and **scarring**
* extrinsic theory: **amniotic tissue causing constriction**
* can range from **dimpling to amputation**
* neurovasc: like **peripheral nerve palsy, lymphedema or arterial insufficiency**
* syndactyly is common but **acrosyndactyly** is more common:
* **Patterson** classification:
  + first is simple constriction
  + second: constriction ring
  + third: constriction rings with **acrosyndacytyly**
  + fourth: amputation

Campodactyly: affects **1% of population**

* progressive painless **non-traumatic contracture of PIPJ**
* due to malformation of **superficial flexor tendon, oblique and transverse retinacular ligaments, lumbrical muscle and alternation in the configuration of the PIPJ**
* most commonly in the **little/small finger**

Congenital trigger finger:

* **different** from congenital trigger thumb
* rare
* affects the **ulnar digits**
* sporadic locking
* **release of A1 pulley alone is not enough**
  + **must release partially A2 and tenoplasty of the chiasm**

Macrodacyly:

* congenital overgrowth
* 0.9%
* involves all tissue type

Syndactyly:

* results from f**ailure of programmed cell death**
* **BMP** plays a role

**Removal of apical ectodermal ridge (AER)**

* results in **limb truncation**

**ZPA**: zone of polarizing activity:

* present along the **posterior aspect** of the developing limb
* helps direct the **anteriorposterior axis (radio-ulnar axis)**
* Sonic hedgehog **(SHH)** critical signal factor
* **ZPA transplantation or excess (SHH)** results in **mirror hand deformity**

WNT7A:

* expressed on **dorsal ectoderm**: **dorsal palmar** structures
* Activating LIM homeodomain:
  + resulting in expression of LMX1B transcription factor from dorsal mesenchyme

en-1:

* **ventral ectoderm**
* **ventral palmar** structures

**Radial longitudinal deficiency (RLD)**

* need to rule out other syndromes:
  + **Fanconi anemia**
  + **Thrombocytopenia -absent radius (TAR) syndrome**
  + **Holt-Oram syndrome**
  + **VACTREL syndrome**

TAR:

* AR
* **absent radius with normal thumb**
* **Thrombocytopenia** occurs at earlier age than Fanconi
* resolves spontaneously with age

Holt-Oram:

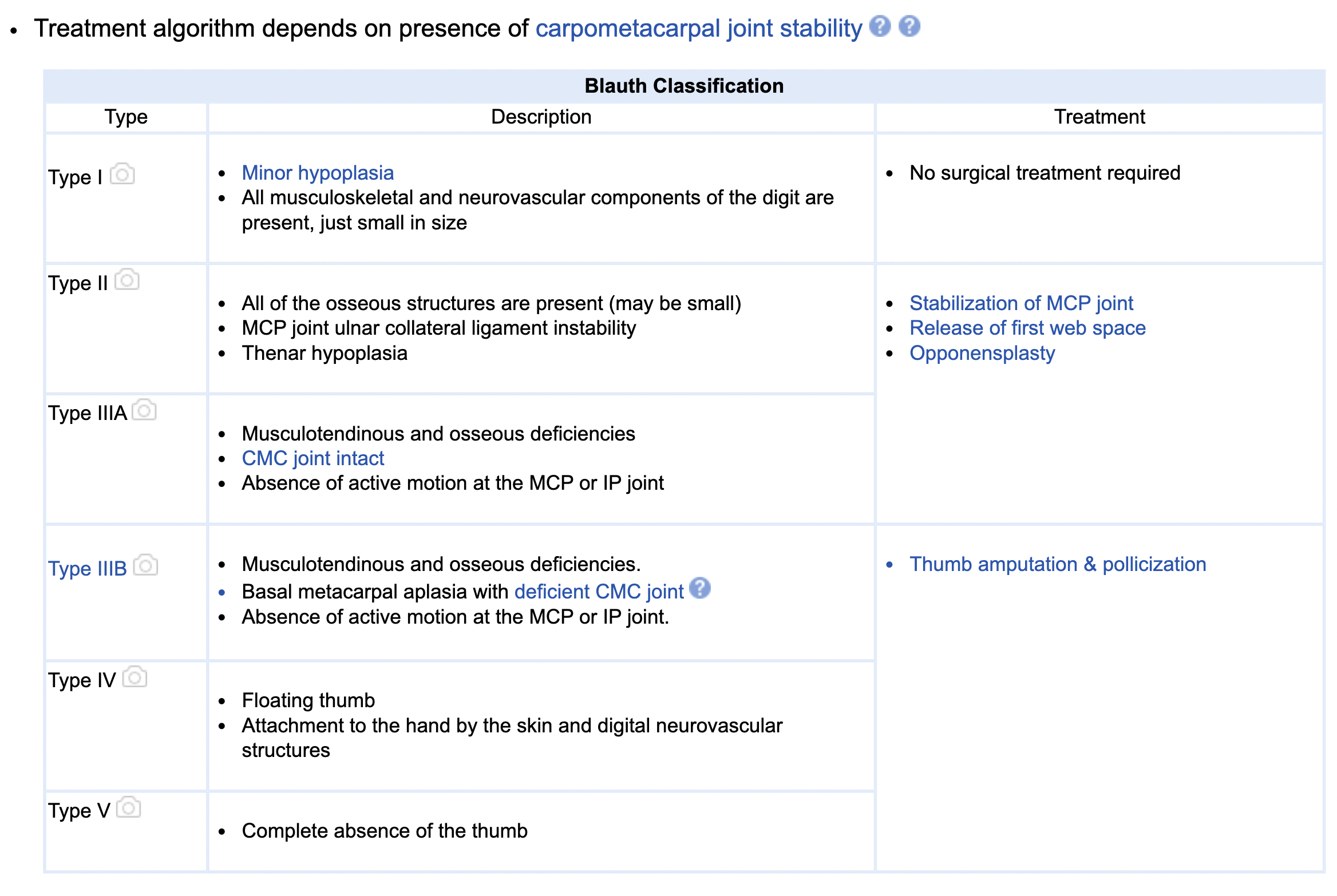
* **Autosomal dominant**
* **Atrial and ventricular septal** defect with **conduction abnormalities**
* Ranges from subtle **pre-axial carpal abnormalities to absent thumb or radial club hand**

Fanconi anemia:

* AR
* pancytopenia
* RLD
* Also café au lait spots, short stature, genital anomalies and microcephaly
* need spinal x-rays, echocardiography, renal ultrasound, CBC
* Cannot be diagnosed in children younger than 3 yrs based on blood sample
* **need chromosomal breakage test**
* Tx: bone transplantation
* life expectancy 20-30 yrs
* can also perform mitomycin testing

Thumb hypoplasia:

* Blauth classification
* **pollicization is done for type IIIB** and higher
* requires **shortening of the index finger metacarpal**
  + then repositioning of the **metacarpal head in extension position against preserved metacarpal base**
  + the **index metacarpal phalangeal joint becomes the new thumb CMC joint**
  + and the index distal IP joint becomes the new thumb’s IP joint



Grade IIIa and below on Blauth classification: treatment of the

* deepening of first web space
* MCP stabilization
* opponensplasty

Complex syndactyly of the hands and feet:

* Apert syndrome
* AD
* FGFR-2 mutation

Signaling pathways of the upper extremity: located in

* Anterior-Posterior
* Proximal-distal
* dorsal-ventral

Proximal to distal limb growth:

AER: **thickening of the ectoderm** over the limb bud

* Fibroblast growth factor secreted within AER signal the underlying mesoderm to differentiate
* **disruption causes truncation**

Anterior-posterior growth (radioulnar):

* determined by zone of polarizing activity (ZPA)
  + located on the **posterior aspect of limb bud**
* Sonic Hedgehog protein **(SHH)** signal the development of the limb into the radial and ulnar aspect
* **disruption leads to mirror hand**

Dorsal-Ventral limb development:

* **Wnt signaling pathway**
* produces transcription factor **LMX1B**: induces the development of dorsal structures
  + deficiency leads to **nail-patella syndrome**
* Ventral portion by **Engrailed-1 gene**
  + blocks Wnt **leading to ventralization**

**Shoulder dystocia**:

* greatest risk factor predicting **brachial plexus injury** 100-113
* followed by **macrosomia** 14 folds
* **foreceps** delivery 9 folds

Congenital constriction band syndrome:

* 12-14 % of all upper extremity congenital defects
* 4th most common after polydactyly, syndactyly and trigger thumb
* incidence 1/5000 to 1/15000
* might be associated with **ruptured amnion** at early stage of pregnancy due to **oligohydramnios**
  + **low amniotic fluid level plays** a role in the **development of constriction rings**
  + can present in kids with cleft L/P, heart defect and renal anomalies, club foot, craniofacial defects, hemangioma, meningocele

Predictors for mortality in patient with VACTERL

* congenital heart disease (those who undergo surgery worse)
* birth weight less than 2 kg
* black race

In a patient with **incomplete syndactyly:**

* can be treated with **full-thickness skin graft**

Cleft hand: Ectrodactyly

* **failure of formation**
* Swanson type 1
* caused by **longitudinal growth deficiency**
* **Autosomal dominant** with 70% penetrance
* Most important is to maintain gripping and grasping **between the thumb and index finger:**
  + surgical management of the **web space**
* Cleft hand is classified according to Manske:
  + question number 14

Congenital constriction band syndrome:

* 1/1200- 1/15000
* Goal: improvement of function and consmetic appearance
* Treatment in the past was **Z-plasty.**
* Also **excision followed by direct closure**
  + this results in significant improvement of edema within weeks
* if **circumferential**:
  + **first half excised first**
  + **then second half after 3-6 months**

Reconstruction of pollicization:

* for Blauth IV (pouce flottant)
* The **first palmar interosseous** muscle will become the **adductor pollicis**
* In pollicization:
  + the index finger is transferred on its neurovascular bundle
  + i**ndex finger MCP joint becomes becomes the new thumb CMC joint**
  + EDC becomes APL
  + **Dorsal interosseous** becomes **APB**
  + **Palmar interosseous becomes Adductor pollicis**
  + EIP becomes EPL

**Mirror hand**: **abnormal expression of SHH**

* abnormality in anterior-posterior axis (radio-ulnar)
* **SHH** is expressed in zone of polarizing activity **(ZPA)** on the **posterior aspect** of the developing limb
* **Direct expression of SHH**:
  + development of ulnar
  + ulnar column of carpus
  + small, ring and ulnar aspect of the middle finger
* Diffusion of SHH:
  + long range signaling
  + development of radial half of long finger and index finger
* Absence of SHH:
  + development of radius, radial column of carpus and thumb
* **Ectopic expression of SHH:**
  + **duplication with ZPA at the anterior margin** of limb bud
    - results in **duplication of the ulnar sided structures in a mirror hand**

Compartment release:

* diastolic pressure in neonates less than 40 mmHg
* small increase is not well tolerated

When performing the first stage of syndactyly release:

* the anatomical structure that **limits the release proximally is the artery**
* For central digit when 3 or more digits are involved
  + **proximal dissection should stop at the bifurcation**
  + otherwise will need revascularization with vein graft
* nerve can be separated with **intrafascicular dissection to a level proximal to the neo-web**
* Flexor and extensor tendons are not involved in syndactyly

Limb bud outgrowth is controlled by:

* **Fibroblast growth factor**
* FGF 10 from mesenchyme induces the formation of AER which produces FGF8
* this signaling induces the mitosis of the underlying cells leading to limb elongation

Apoptosis of interdigital tissue induced by:

* **BMP** under influence of **SHH from ZPA**

Polydactyly and mirror hand:

* caused by genetic anomaly in **SHH**

Complete syndactyly:

* reconstruction of the web space with coverage with a dorsal rectangular flap

Syndactyly:

* digital separation starts from **distal to proximal**
  + mediated by **BMP** signaling TGF-beta
  + occurs between **44-54 days**
* **Overexpression of BMP inhibitors** and **persistence of FGF**
  + leads to syndactyly
* Familial in 10-40%
* girls x2
* must undergo release **before 18 months**

Limb bud appears by day: 26

hand paddle by day: 33

Phalangeal tips ossified by day 56

**Phacomelia:**

* transverse deficiency of the upper limb
* abnormal development of the limb with an interruption in longitudinal growth

Limb bud forms at 26 days

rapidly enlarges to completion at 47 days

around 52-54 the fingers separate

Syndactyly of the toes:

* between t**he 2nd and 3rd toes:** most common
* Surgical correction: **dorsal rectangular flap with full-thickness skin graft**

**Pollicization** for Pouce Flottant (Blauth type IV):

* should be done **between 3 months and 3 years**
* Most surgeons prefer between **6-12 months** where there is more integration and adaptation to using the pollicized thumb
* Child is aware of thumb at age of **3 months**
* also before 3 months the cardiopulmonary system is not mature enough yet
* Fine coordination is achieved at **3 years of ag**e and it becomes **more challanging to re-adapt**

Contriction band syndrome classification:

* type 1: shallow indentation without lymphedema (mild)
* type 2: distal lymphedema, acrosyndactyly (moderate)
  + discontinuous musculotendinous and neurovascular but without vascular compromise
* type 3: progressive lymphaticovenous or arterial compromise (severe)
* type 4: intrauterine amputation

Early release of contriction amniotic band does not release in longterm neurologic improvement

ischemia and necrosis can be reversed

sometimes might need to excise a nerve segment and even nerve grafting

Huber transfer:

* transfer of hypoethenar muscle for thenar action abductor digiti minimi
* type IIIa can be constructed with it

Limb buds: **5 weeks**

Digital separation: **8 weeks completed**

**Syndactyly** in a patient with **Poland syndrome:**

* is considered **Failure of Differentiation**

Congenital hand deformities classification:

* Type 1: failure of formation:
  + longitudinal arrest or transverse arrest such as clubhand radial or ulnar
* Type 2: Failure of differentiation
  + syndactyly
  + campodactyly
  + clinodactyly
  + symphalangia
  + radioulnar synostosis
* Type 3: Duplication
  + triphalangeal thumb
  + radial and ulnar polydactyly
  + mirror hand
* Type 4: overgrowth
  + macrodactyly or hemiatrophy
* Type 5: undergrowth:
  + brachydactyly
  + Brachysyndactyly
  + Pouce flottant (type 4 Blauth classification)
* Type 6: constriction ring syndrome
* type 7: generalized skeletal defromity:
  + Apert
  + Holt-Oram
  + Thrombocytopenia-absent radius TAR syndrome

Camptodactyly:

* 5% of all congenital hand syndromes
* can occur sporadic or part of syndrome
* occurs in the first year of life but can also occur around **age of 10 years**
* considered as **type II of congenital hand deformities: Failure of differentiation**
* Affects **PIP joint**
* **never repair.** never a functional deficit. even if parents persist, don’t repair it
* however: minimal functional deficit for extension can be corrected by transferring the lumbrical to central slip
* If **extension deficit is 30 degrees** or more: then you can **release the lumbrical and superficialis tendon**
  + and possibly the release of **accessory collateral ligament to the volar plate**

**Delta phalanx:**

* associated with **clinodactyly**
* abnormally shaped, short tubular bone
* radial or ulnar deviation of the digit
* **little finger** more common
* inherited as **dominant trait**
* associated with **delta middle finger**
* severe deformity requires surgical correction

Kirner deformity:

* palmar and radial deviation of the distal phalanx of the small finger
* idiopathic, non-traumatic disruption of the epiphysis of the distal phalanx
* Maybe caused by cold exposure and frost bite to multiple fingers

Symphalangism: **type II failure of differentiation**

* congenital stiffness of PIP joints
* **absent of flexion crease**
* fingers longitudinally foreshortened
* multiple digits

Question #33:

* they might try to confuse you by saying CMC joint is stable but when there is dorsoradial movement that appears like subluxation
  + this means **CMC joint is not stable**
  + then it becomes **Blauth type IIIB**
  + Also on X-ray: you will see **narrowed and underdeveloped metacarpal base: which is hallmark of CMC instability**

Type II and IIIa:

* stabilization of MCP joint: u**lnar collateral ligament**
* **opponensplasty**
* **deepening of the web space**

Syndactyly of the toes:

* incomplete can be repaired without skin grafts
* complete will require full-thickness skin graft: get it from the lateral groin (medial groin may cause hair growth with puberty)

Thumb reconstruction:

* recommended to perform prior to the child performing side-to-side pinch between the fingers

Wassel type II and IV polydactyly thumb reconstruction:

* after excising the radial thumb, do it with care to **preserve periosteal flap for reconstruction**
* **detach the radial collateral ligament with periosteal sleeve** of tissue
* must place **in thumb spica for 4-6 weeks**
* Excision of **central bone and soft tissue can be used for type II and IV** but in case a surgeon choses to excise the radial thumb, then you have to do the ligament reconstruction with periosteal flap

Syndactyly release is contraindicated in:

* when there is **super digit**
* **complexy syndactyly** in conjoined fingers functionally moving as one unit

Amniotic Band syndrome risk factors:

* Low birth weight < 2.5 kg
* **multigravida**
* low maternal age
* prematurity
* **NOT FAMILIAL**

Constriction band syndrome:

* acrosyndactyly: fingers have separated but then fused back again due to amniotic band syndrome (ABS)
* 1:15000
* equal in males and females
* No mode of inheritance (not familial)
* No infectious cause
* Associated with oligohydramnios
  + can be seen with clubfoot

Vasculocutaneous catastrophe:

* seen in newborn
* altered fibrinolytic system
* **high level of plasminogen**
* **antiplasmin inhibitors**

Syndactyly:

* failure of normal separation of the fingers during 5-8 weeks of gestation
* 1/2000
* spontaneously or part of a syndrome
* Border digits should be released first between **4-6 month: one stage at a time to avoid injury to the blood supply**
* In complete syndactyly: **first and 4th web spaces** are released **first**
  + then 2nd and 3rd webspace are released later in two separate surgeries
* If there is no border digit tethering:
  + then you can release the first and 3rd space
  + followed by 2nd and 4th web space
* When 1 and 4th web spaces are involved: (tethering) should undergo release at younger age to avoid risk of differential growth

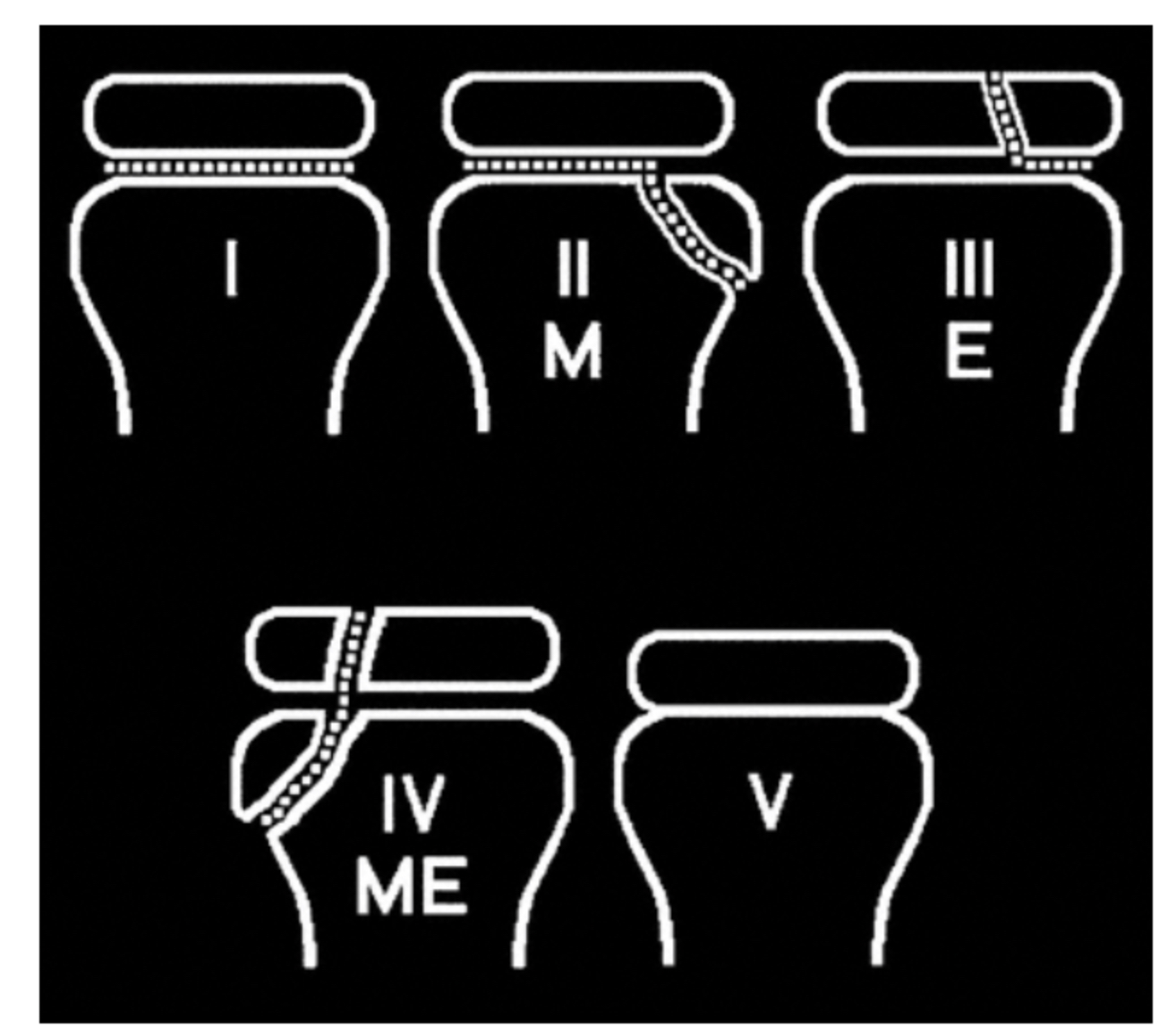
Question #44:

* Shortened fingers or brachydactyly:
* The most functional improvement is to lengthen the ring and small finger
* Performed during 8-12 months of age
  + non-vascularized phalanx toe transfer
  + distraction lengthening

Macrodactyly:

* **lipomatous hamartoma** growth along the digital nerves
* if finger is sensate then debulking of the fingers with epiphysiodesis  (should be performed when fingers are at adult length)

**Salter-Harris fracture:**



When the pediatric patient is able to perform functions with hand:

* there is no need for surgical indication

**Trigger finger:**

* 1/2000 to 3/1000
* not sure if it is acquired or congenital
* in the first 12 months: observation as kids have the tendency to flex fingers
* can present at birth or up to 3 yrs
* conservative non-operative management is reported to be between 0-30%
* thumb trigger finger: there is nodule in the tendon
* camtodactyly: affects small finger mostly and not sure of etiology

In a patient with **radial aplasia or hypoplasia:**

* need hematologic evaluation
* can occur with Holt-Oram syndrome, TAR syndrome, Fanconi anemia, VACTERL
* TAR and Fanconi are contraindication for early intervention due to need of hematologic abnormalities

In type 4 Wassel thumb duplication correction:

* important to **preserve the ulnar collateral ligament** to stabilize the pinch
* the **abductor pollicis brevis is included in the reconstruction of RCL**
* FPL is intact and does not require reconstruction
* transfer of the abductor pollicis brevis from the radial base of the resected duplicated to the base of the retained ulnar duplicate
  + if the abductor pollicis brevis is not transferred then the thumb will form a Z-deformity
    - with ulnar deviation of the proximal phalanx
    - radial deviation of the distal phalanx
* The **adductor pollicis**:
  + firmly inserted into the ulnar base of the proximal phalanx of the retained ulnar duplicate

Question #58:

* Blauth classification
* also conditions associated with thumb hypoplasia

Finger nails identified by **17 weeks gestation**

For babies after syndactyly release:

* **need to do long arm cast**

Ectrodactyly: cleft hand, partial or total absence of the fingers: central hand deficiency

* Central hand deficiency can be classified as typical and atypical
* Those with typical: have absence of the third ray
  + finding is bilateral
  + can be associated with: cleft lip and palate, CHD, deformity of upper and lower extremity
  + familial inheritance
* Atypical:
  + several deficient rays
  + unilateral
  + commonly knows as symbrachydactyly and the opposite hand is true cleft
  + inheritance non-familial
  + not common with syndactyly and foot involvement

Cleft hand deformity:

* Autosomal dominant but may occur as spontaneous mutation
* should be evaluated for cardiac, pulmonary, MSK, ocular and renal defects
* can also have clefting of the feet
  + split hand foot gene SHFM1 to chr 7q21

Causes of thumb-in-palm in CP patients:

* hypomobility of MCP joint of thumb
* skin contracture of first web space
* spasticity of adductor tendon of thumb
* spasticity of flexor tendon of thumb
* NO ROLE FOR FLACCIDITY OF THE EXTENSOR AND ABDUCTOR TENDONS OF THE THUMB

For kids with absence of functional fingers:

* perform toe-to-hand autotransplantation
* premature physeal closure occurs in 10%, otherwise it is 90%

Angular deformity of the ring finger:

* bracketed longitudinal growth plate with a reverse C-shaped configuration
* Longitudinal growth stopped on the radial side and continues normally on the ulnar

Third web space is most commonly affected in syndactyly

Clinodactly:

* delta phalanx (and triphalangeal thumb)
* angulated short tubular base
* growth plate: reverse C-shape or bracket rather than transverse
* bilateral
* transmitted as AD
* radial deviation of the DIP of small finger
* in patients with delta phalanges:
  + resection of bracket
  + fat grafting
  + osteotomies: closing, opening or reverse

phalangeal toe transfer:

* done only when there is aplasia or hypoplasia of the fingers

In patients with constriction bad syndrome:

* second toe-to-finger transfer

bent finger: camptodactyly

* the little finger is the most commonly affected
* nearly two third have bilateral involvement
* deformity of the volar plate and due to abnormal insertion of the superficialis and lumbrical

In case of total absence of radius: check question #78 (too tired at this point)

* wrist is stabilized by **centralization of the ulna**
* followed by **pollicization of index finger**
* total absence of the radius is most common
* 1/55,000
* boys=girls
* bilateral
* preaxial hypoplasia or aplasia is common
* radial artery is absent
* thumb hypoplastic or maybe absent in half of the patients
* common radial muscle is noted
* the wrist is angulated radially from 30-90 degrees
* the carpus articulates with the radial border of the ulna
* scaphoid and trapezium are absent

Phacomelia:

* due to **thalidomide** during pregnancy
* forearm directly connected to trunk
* or hand directly to arm

|  |
| --- |
| **In-Service Questions Notes: Hand Tendons and Tendon Transfer** |

The central slip is the terminal end of extrinsic extensor tendon:

* It is the **primary extensor of PIPJ**
* The terminal end of inter-osseous muscle terminates on the dorsal base of the middle phalanx
* In patients with his injury to the central slip but the terminal end of interosseous muscle tendon is intact patient will still be able to extend PIPJ

The oblique retinacular ligament

* connects the flexor tendon sheath to the extensor tendon.
* Laceration to the middle phalanx may prevent extensor lag and Mallet deformity

The lateral conjoint tendon:

* Formed by the lateral bands of the interosseous muscle and the lateral lips of the extrinsic extensor tendon
* Provides extension to the DIPJ

The sagittal bands

* keep the extrinsic extensor tendon centralized over the MCPJ by connecting to the volar plate
* Destruction of the sagittal band lead to instability of the extensor tendon over the MCPJ and extend MCPJ

The extensor indiciss proprius has the most distal muscle belly in zone seven over the dorsal wrist and that's how you identify it

Extensor tendon injury at the level of the forearm:

* Passive flexion of the wrist demonstrates the fact of tenodesis
* This will bring the extensor tendons under a stretch and extend MCPJ if the extensor tendon are intact

Putting the hand in cold water:

* Is a good test for sensory nerve injury as there will be loss of wrinkling

When you have a patient with DeQuervain’s tenosynovitis the fails to improve corticosteroid:

* consider the presence of septum btw APL and EPB in first extensor compartment
* Needs to be surgically treated
* There is no association between Dequervain's and the number of slips of APL

Wrist extension tendon transfer:

* The most appropriate tendon transfer for wrist extension is pronator teres- median innervated
* Transfer to ECRB
* The ideal tendon to be transferred should have strong muscle, good range of motion and synergistic affect for tenodesis

Thumb extension:

* Low radial nerve palsy, brachioradialis can be used for some extension
* It can also be used to restore wrist and finger extension, thumb flexion
* Cannot be used with high radial nerve injury
* Palmaris longus can also be used for thumb extension

Finger extension:

* Flexor carpi ulnaris can be used

Flexor tendon repair in zone two

* Increasing suture caliber increases the force of static testing and fatigue strength in dynamic testing
* The placement of the suture dorsal he has shown to improve the strength of the repair by 2 to 4 times because it decreases the interference with the synovial fluid
* Locking loops improves force and gap resistance compared with grasping loops flexor tendon repair

Stenosis tenosynovitis/trigger finger:

* results in pain over MCPJ
* crepitus, clicking and locking

A2 pulley rupture:

* Injury in rock climbers
* Forceful flexion of FDP and FDS with PIPJ at 90° and the DIPJ extended places loading exceeding the tolerance of A2 pulley.
* The crimp position.
* Treatment: rest ice and anti-inflammatory medication and splint

Jersey finger:

* Results from rupture of FDP and inability to flex DIPJ
* pain will be above the avulsion site and ruptured tendon

Volar plate avulsion:

* Pain along the Palmar aspect was more pain to stress and hyperextension
* May see a bony fragment

Extensor pollicis longus EPL:

* 0.3% to 5% rate of rupture after non-displaced or minimally displaced distal radius fracture at Lister’s tubercle
* Can also occur with rheumatoid arthritis
* tendon transfer of extensor indicis proprius is the standard of care
* Anytime between two weeks and 11 months, average 7 weeks
* Patient can extend their thumb when it's aducted due to connection of the intrinsics with the dorsal apparatus

Treatment of mallet finger:

* Medical treatment with splinting: closed reduction and splinting
* surgery is Indicated when the injury is chronic **more than three month**
* Pinning in extension is appropriate for a small subgroup of patients who cannot wear a splint all the time

Flexor tendon repair:

* the larger the caliber and more strands the stronger the repair
* Two strand repair cannot withstand early range of motion
* at Least four strands including a cruciate repair
* **Early active protocol higher incidence of rupture** but lower incidence of decreased range of motion

EIP is the preferred tendon for repair of chronic EPL injury

* Has the appropriate excursion and direction
* Shen the injury is chronic you cannot do interposition tendon graft because of sufficient my static contracture

DeQuervain's tenosynovitis:

* Pain along the dorsoradial aspect of the hand with pain to extension of the thumb
* Positive Finkelstein test along with the reproduction of the pain and resistance to extensor pollicis brevis
* over the radial styloi

Digital flexor Tenosynovitis or trigger finger:

* Pain can be elicited with resisted flexion

Intersection syndrome:

* Tendinopathy at the intersection of the first and second extensor compartment
* Pain occurs more proximal in the forearm
* Pain to resisted extension of the wrist
* On the radial side of the forearm
* Where abductor pollicis longus and extensor pollicis brevis muscles intersect

Ulnar collateral ligament injury/skiers thumb:

* Can be treated with four weeks of splinting if:
  + either no instability
  + Less than 30 to 35° of laxity under load
  + Less than 10 to 15° difference to the contralateral UCL
* Incomplete injury or mild injury can be treated with occupational therapy
* Abductor pollicis is a stabilizer of MCPJ and is a target for treatment of mild injury
* Adductor strengthening for mild injury
* patients present with weak pinch and grip along with strain
* ligament reconstruction with palmaris or plantaris

Saddle deformity seen in osteoarthritis of the basil joint:

* The interphalangeal joint flexion of the thumb is caused by zigzag longitudinal collapse with hyperextension of the metacarpal phalangeal joint

Radial collateral ligament injury:

* angulation more than 20 degrees: poor prognosis
* widening of the joint space indicates interposition of ligament fibers

The most appropriate positioning for splinting acute Boutonnière:

* extension of PIPJ
* Free DIPJ: this allows flexion of DIPJ and lateral bands migrate back dorsally and DIP hyperextension is resolved
* this permits healing of central slip back to the middle phalanx

For extension tendon repair: in a patient that wants to go back to being active:

* relative motion extension splint: allows immediate controlled motion
* placing the injured tendon 15-20 degrees less motion than adjacent tendons
* Full IP range of motion is permitted

Extension of IP joint and MCP joints to neutral position:

* is possible despite extensor tendon laceration due to the function of lumbricals and dorsal interossei.
* The extrinsic extensor tendon are capable of extending MCPJ beyond neutral

Juncturae Tendinum:

* allow the extension of the ulnar three fingers when injury is at the level of the wrist or dorsal hand with isolated single tendon injury
* It will not allow extension of all fingers

Single stage tendon grafting conditions:

* Intact passive range of motion
* Wound healing with minimal scarring
* Intact digital arteries and nerves
  + The classification is called the Boyes classification

The Brand Transfer:

* Uses external carpi radialis longus or brevis to correct claw deformity
* Need a tendon graft to bridge the gap between the native distillate of extensor carpi radialis longus or brevis to the transfer insertion on lateral band on the proximal phalanx of the fingers
* This tendon graft is taken from extensor digitorum longus
* The transfer must pass through the interosseous membrane of the forearm then through the carpal tunnel or intermetacarpal spaces in the hand
* Transfer most passive Oralee deep to the transverse metacarpal ligament to have the correct vector of pull

Flexor tendon reconstruction in zone two when done in two stages:

* Excise the native tendon
* Secure the silicone rod to the stump of flexor digitorum profundus or the distal phalanx
* Place it adjacent to the motor tendon muscle but do not secure it
* This point construction takes place with tendon graft to allow the formation of pseudosheath around the silicone rod
* Aggressive therapy for passive range of motion
* Tendon reconstruction has a second stage within three months
* For patients who cannot tolerate a second stage you can do implantation of active silicone rod, I love her they must meet the criteria of single stage tendon reconstruction

Criteria for single stage tendon reconstruction:

* Passive range of motion of all joints
* Minimal scarring
* Intact pulley system
* Neurovascularly intact
* Compliant patient

Dorsal dislocation of thumb MCPJ

* Due to hyper extension of the thumb
* Results from volar plate and collateral ligament rupture
* Irreducible due to interposition a volar plate
* Can also be a irreducible due to interposition of dorsal extensor expansion, sesamoid bone, bone fragment, collateral ligament and **FPL**

The main rationale of early range of motion after flexor tendon repair is:

* Decrease adhesion formation

Jersey finger:

* Occurs when DIPJ is flexed and suddenly hyperextended which leads to FDP rupture
* Classified according to Leddy’s classification
* Type one:
  + Retraction into the palm
  + Rupture of vinicula longus and viniculum brevis
  + Must be repaired within seven days otherwise necrosis of the tendon and takes place
* Type two:
  + Retraction of FDP to proximal phalanx. Remains attached to the viniculus longus.
  + Sometimes associated with fracture fragment  and is stuck at the level of A2
  + hard to tell the level of retraction
  + must be fixed within 7 days (in another question they said 6-12 weeks)
* type III:
  + intraarticular
  + large fragment
  + stops at A4 level
  + repair within 2-3 months
* Type VI:
  + rare
  + type III
    - avulsion with bone fragment
    - also avulsion from the bone fragment
    - urgent repair

For spastic flexion contracture:

* Transfer FDP to FDS

Oberlin-McKinnon transfer:

* median nerve to brachialis
* ulnar nerve to biceps

Flexor pronator slide:

* detach the muscles from the medial epicondyle of the humerus
* advance distally
* treat Volkmann’s contracture

The triangular ligament is bound by:

* lateral bands
* central slip
* terminal tendon: is the convergence of lateral bands at the dorsum of the middle phalanx inserting into the distal phalanx

The lateral bands:

* migrate volarly to become flexors of the PIPJ
* Extensors of DIPJ

After flexor tendon repair:

* wait 3-6 months prior to tenolysis

Triangular ligament:

* stabilizes the lateral bands from volar subluxation (Boutonnière)

Transverse retinacular ligament:

* prevent dorsal migration of the lateral bands at PIPJ (Swan neck)

Elson’s test:

* central slip disruption
* When PIPJ is maximally passively flexed, this results in slack of the terminal tendon
* injury to central slip, eliminates this slack, therefore the DIPJ can be actively extended when PIPJ is maximally flexed

Swan neck deformity:

* disruption of terminal tendon
* inability to extend DIPJ
* irrespective of PIPJ position

Sagittal band disruption:

* inability to extend MCPJ actively
* able to maintain extension if placed passively

Kids have better ability to regain range of motion after prolonged immobilization for tendon repair

* hence the adults protocols should not be applied to kids
* Kids cannot comply with ROM restrictions

Flexor tendon repair protocols:

* low force moderate excursion is the best
* In vivo, early active mobilization may limit tendon end softening and loss of repair strength that generally occurs after 7 days
* Kleinert: increases flexion contracture due to holding the finger in flexed position

Intersection syndrome:

* tenosynovitis of the second extensor compartment
* Where APL and EPB cross ECRL and ECRB
* Repetitive forceful extension
* 4-6 cm proximal to Lister’s tubercle

Wartenberg syndrome:

* compression of radial sensory nerve as it exists the supinator muscle
* paraesthesia in radial nerve distribution with positive Tinel’s sign

Closed brachial plexus injury:

* **CT and MR myelogram at 3-4 weeks** to see pseudomeningocele and denervation changes
* EMG and conduction study is done at **14-16 weeks**
* **Nerve grafting for lower brachial plexus trunk injuries is not successful** due to long distance for regenerating axons to reach target muscle

After 12-18 motor of nerve injury:

* **intraneural fibrosis**
* **loss of Schwann cells**
* **Muscle atrophy**
* **Motor end-plate degeneration**

Transfers for fingers and wrist extension:

* palmaris longus to EPL
* pronator teres to ECRB
* FCU to EDC
* in complete brachial plexus injury: free muscle transfer is the best option

The most likely option to result in poor function after late tendon repair:

* **stiffness of the joints**
* need aggressive hand therapy **before attempting**

Junctura Tendinum:

* tendon like bands that connect long, ring and small fingers
* if laceration proximal to junctura, patient will still be able to extend

Interosseous muscle and lumbricals:

* flexion at MCPJ
* interosseous extension at PIPJ

When performing muscle transfer:

* Muscle should be placed under the **same tension**
* too much tension, there is **overlap btw actin and myosin and cannot generate more contraction**
* too little tension, cannot generate contraction

Tendon rupture after repair can occur up to **6-7 weeks post-op**

* most common **7-10 days**
* reoperation yielded similar results
* **repair should happen before 2 weeks due to tendon shortening**

ECRB and ECRL can be used to restore intrinsic muscle function

* when ulnar nerve is injured and there is clawing of the hand

To restore thumb abduction/opposition:

* transfer of AIN to recurrent branch of median nerve
* transfer EIP to Abductor pollicis brevis

Swan neck deformity:

* post-traumatic
* RA
* Origin can be PIP, DIP and MCP
* Laxity of the volar plate to allow hyperextension of PIPJ
* **Oblique retinacular ligament can be used to repair it**
* **Palmar subluxation of MCP joint can lead to Swan neck deformity**

Flexion deformity of **Mallet finger:**

* can lead to **swan neck deformity**
* the terminal tendon slides proximally
* the conjoined lateral band will slide proximally and work as extensor of proximal tendon

Boutonniere deformity:

* hyperflexion of PIPJ
* central slip disruption
* lateral bands displaced volarly: act like extensors of DIPJ

Clinodactyly:

* the fifth finger has a curvature towards the 4th finger

Campodactyly:

* genetic deformity
* flexion of PIPJ of small finger

Mallet finger: causing Boutonnier:

* even after two months, you can splint to get the central slip to heal if closed injury
* splint PIPJ in hyperextension and leave DIPJ free
* when DIPJ flexes, the lateral bands will move from volar to dorsal and hyperextension is repaired

The transferred tendon should have:

* adequate strength
* range of motion
* synergestic action
* allow for tenodesis to facilitate re-education

Radial nerve palsy tendon transfer:

* to restore finger extension: **flexor carpi ulnaris**
* also can use **flexor carpi radialis** and **flexor digitorum superficialis**

For Zone II repair:

* repair is recommended **within 10 days**
* **Beyond that need two stages:**
  + flexor tendon **sheath collapsed**
  + tendon is retracted and cannot be retrieved: need pulley reconstruction over rod
  + in the second stage:
    - suture tendon graft to rod, pull from proximal to distal
    - **secure the distal end first to the bone** then adjust the tension and suture t0.7 o the motor muscle
      * **FDS to prevent quadriga and lumbrical plus posture**

Zone 1, 3, 4 and 5:

* late repair can be done in single stage tendon graft

Indication for 2-stage flexor tendon repair:

* **late zone II**
* **need for pulley reconstruction (A2 and A4)**
* **If volar soft tissue reconstruction is needed**

The purchase of core suture from cut end using 2- and 4- core sutures:

* **0.7- 1 cm**
* to resist gapping and ultimate strength to breaking

In patients with palmaris longus laceration:

* common to **find laceration of the median nerve** at the same time
* Median nerve is **dorsal to palmaris longus**
* palmaris longus is absent in **20% of patients**

FDS tendons:

* index and small finger: dorsal to middle and ring

Ulnar nerve and artery are dorsal to FCU

EPL rupture after distal radius:

* synovitis
* bony spur
* ischemia in that area
* **Ultrasound can confirm** the diagnosis

**Chronic Mallet**:

* do **FOWLER CENTRAL SLIP tenotomy**
* (distal to triangular ligament)
* rebalances the extensor mechanism
* the **DIP can be extended again**
* will **not restore extension in patients with pre-existing extension lag of more than 36 degrees**

The quadriga effect is characterized by an**active flexion lag** in **fingers adjacent to a digit with a previously injured or repaired flexor digitorum profundus tendon**.

Jersey finger:

* forced DIPJ extension while it is in flexion
* FDP avulsion in 75% of the ring finger

Scaphoid fracture malunion or arthritis:

* results in rupture of flexor pollicis longus

If A2 pulley is not repaired: bowstringing of the tendon

* length of moment arm will increase
* Motion of PIPJ will decrease

Best way to diagnose **FDP** rupture after repair:

* MRI

Sensory branch of radial nerve:

* arises between **brachioradialis and ECRL** 8 cm proximal to
* pierces the fascia 5 cm/ 3 fingerbreadth proximal to radial styloid

Previous injuries to flexor tendon lead to scar formation and inability to extend.

* also **volar plate contracture (including checkrein ligaments)**
* **collateral ligament contracture**
* **scarring and insufficiency of skin volar to the joint**

Dorsal collateral ligament contracture:

* can limit passive and active flexion of PIPJ

In a patient with suspected ulnar collateral injury:

* you need to decide if it is partial or complete tear
* partial tear with 5 degrees laxity is considered partial tear and can be managed with thumb spica

EPL:

* weak active extension of IP joint of the thumb
* inability to lift the thumb off the table

**Fusion of the PIPJ of the long/middle finger**:

* **Decreases the excursion of all profundus function and reducing grip strength**
* causes quadriga

Usually it is well tolerated in the index finger because:

* the **index finger** has a relatively **independent profundus**: hence fusion does not affect these fingers

A **significant grip strength is decreased** when **PIPJ of the small and index fingers** are fused **less** than **45 degrees**

and when the **middle and ring** are fused **less that 60 degrees**

Any time there is decrease in profundus excursion:

* limitation in grip strength

Extrinsic tightness:

* unable to flex PIPJ when MCPJ is flexed

Intrinsic tightness:

* unable to flex PIPJ when MCPJ is extended

A patient with amputation at DIPJ presenting with weak grip and the PIPJ extends when MCPJ is flexed (paradoxical extension)

* this is called lumbrical plus position
* occurs when the tendon of FDP migrates proximally
  + resulting in contracture of the lumbrical muscle
* The most appropriate management is the **release of the lumbrical**

When performing **ulnar collateral ligament repain:**

* after skin and subcutaneous layer
* **sagittal bands**
* **Adductor aponeurosis**
* **Collateral ligamen**t

Release tourniquet:

* 5 minutes for every half an hour
* for 2 hours tourniquet: 30 mins

Chronic mallet finger:

* **Fowler tenotomy and open repair**

In compliant patient: you can do up to **12 weeks of non-operative treatment**

In a patient with **PIPJ flexion contracture** due to **volar plate dislocation**

* after the **release of the checkrein ligaments**: patient has **mild flexion deformity but some hyperextension of DIPJ**
* This is caused by tighness of the **ligament of Landsmeer**
  + the oblique retinacular ligament of Landsmeer
  + it passes volar to the axis of rotation of the PIPJ and when it is involved in fibrotic process, i**t causes DIPJ hyperextension**
  + Resulting in **Boutonniere deformity**

Congenital trigger thumb:

* the most appropriate step is: **A1 pulley release**
* kids have thickening of the **tendon called Notta’s node**
* Trigger thumb **younger than 3 yrs old will resolve spontaneously in 30%** of the cases

Jersey finger:

* No flexion at distal IP joint

Three types of Jersey finger:

* Type 1: FDP retracts to the palm
* type 2: retracts to PIPJ
* Type 3: entrapped to A1 pulley

Steiner lesion:

* When the **adductor aponeurosis gets interposed between the ulnar collateral ligament and the base of the proximal phalanx**

In a patient with CP, poor mental function and sensibility:

* primary goal is **hand hygiene**
* The tendon transfer to relieve clenched fist:
  + transfer of **FDS to FDP to lengthen the tendon** and decrease clenching of the fist
  + **downside is weak fist formation**

A volar dislocation of PIPJ is **far less commo**n than dorsal dislocation

* closed reduction can be difficult due to interposition of **extensor tendon within the joint**
* The extensor tendon is **torn by the distal condyle** of the proximal phalanx
* If the condyle pushed against the extensor tendon, then t**he extensor tendon will act like a sling to prevent the red**uction

In dorsal dislocation:

* **flexor tendon** and **volar plate** can be interposed in the joint

The best prognosis of flexor tendon repair in **Zone 5**

* this zone lies **proximal to carpal tunnel**
* there is **plenty of space for gliding of the tendon**

A patient with burn contracture that was released, then was able to flex PIPJ like 30 degrees when the MCPJ is extended,

* hence there is instrinsic tightness
* because able to flex, so the tightness is from the extensor system
* the scar is on the **dorsal hand and dorsal to lateral bands**
  + so it is central slip release is what you need to do

Lumbrical plus deformity:

* when after amputation at DIPJ level there will be extension of PIPJ to MCPJ flexion
* the FDP tendon and lumbrical migrate proximally
* with flexion, the tension is exerted by the **lumbrical via the radial lateral band**
* Need to divide the lumbrical tendon

The lumbrical tendon originate from **FDP tendon and insert into the radial lateral band**

* these tendons pass palmar to the deep transverse intermetacarpal ligament

Patient presenting with pain, swelling and crepitus **4 cm proximal to wrist along t**he **distal radial forearm:**

* intersection syndrome involves the second compartment ECRL and ECRB cross the common wrist extensors
* **erythema and crepitus** associated
* symptoms exacerbated by **prolonged wrist function**
* Tx: **conservative with splinting in extension and steroid injection**
* or surgery: release of the second compartment with synovectomy

DeQuervain’s:

* 1-2 cm proximal to the radial styloid

**Wartenberg syndrome:**

* the superficial radial sensory branch is entrapped between the **brachioradialis and ECRL**

In patient with flexor tendon repair:

* if it ruptures **after repair, need to re-explore**
* usually occurs **within 4-6 week**s after repair due to devascularization of the tendon or excessive grip force

**Congenital clasp thumb:**

* **absence of EPB and or EPL**
* severe flexion of MCPJ of the thumb and adduction of the thumb into the palm

Rehab programs:

* **immediate graded early active flexion**  has been shown to result in greater total active motion than early passive flexion and/or late motion programs

Quadriga:

* results from excess distal pull on one of the profundus tendons
* because all profundus tendons are connected together:
  + excess pull on one tendon results in decrease in force and amplitude on the other tendons
* Can occur:
  + **distal amputation  in which FDP is attached to extensor tendon**
  + following **grafting of excessively short tendon**
  + **Advancement of FDP tendon in patients with zone 1 injuries**

**Lumbrical plus deformity:**

* affects **most frequently the index finger**

Total range of motion:

* the sum of provided range of motion of MCPJ, PIPJ and DIPJ minus any extensor lag

A person with normal range of motion= **270 degrees**

90 for MCPJ

110 for PIPJ

70 for DIPJ

In a patient presenting with fresh Boutonnière deformity after injuring his finger while playing sports:

* the most appropriate INITIAL managment:
  + extension splinting of PIPJ for **6-8 months**
    - this can be done as late as **6 weeks after injury**
    - DIPJ should stay free to allow the dorsal migration of lateral bands
    - Depends on the stage of Boutonnière:
      * stage 1 able to passively extend
      * stage 2 cannot extend
      * stage 3 degeneration of the joint
  + this occurs due to disruption of central slip with volar migration of lateral bands
    - volar migration is not seen for 10-21 days after injury

Dark purple Cobblestone lesion covering the face:

* capillary malformation that is untreated
* due to progressive ectasia of the vessels within the capillary malformation

In a patient who had tendon injury and was repaired, then he presented several months with pain at the site away from the initial injury site:

* get MRI to make sure there is **no osteo that was spread hematogenously or local infection**
* treatment is IV abx, cultures, decortication

In a patient with severe carpal tunnel syndrome:

* unable to abduct the thumb: do the **CAMITZ abductoplasty by transferring the palmaris longus**

**Opponensplasy:**

* restores the thumb-finger opposition:
  + Bunnell transfers the **flexor tendon superficialis of the ring finger**
  + Huber: transfer of **abductor digiti minimi**
  + Phalen-Miller: transfer of **ECU**
  + Burkhhalter: transfer of **EIP**

In a patient with high median and ulnar nerve palsy:

* for opponensplasty: the only option is something innervated by the radial nerve
  + in that case it will be **EIP**

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| **In-Service Questions Notes: Hair Restoration** |

Trichotillomania:

* impulse controlled disorder

Body dysmorphic disorder:

* Obsessive compulsive disorder
* preoccupation with perceived physical flaw for at least an hour a day
* repetitive behaviors related to preoccupation
* clinically significant distress
* exclusion of eating disorder

Androgenetic alopecia:

* progressive **shortening of anagen** phase
* **elongation of telogen phase**

**Follicular unit transplantation**:

* gold standard
* preserves the natural architecture of the hair units
* Follicular unit is a **physiologic entity** rather than anatomical

Micrografts: 1-2 hairs

Minigrafts 3-4 hairs

Not as effective as follicular unit

Hair shaft loss is expected in the first month following surgery:

* hair enter telogen phase which lasts 3-4 months
* the attachement of the hair at the follicle becomes weaker until it breaks from follicle and sheds
* Then anagen phase starts and the hair is quiet thin initially
* Final results are not evident until 6-8 months in men and 10-12 months in women

Unlike men, Androgenic alopecia in women:

* spares the frontal hairline
* affects frontoparietal scalp
* Causes miniaturization of scalp follicles through the expose of dihydrotestosterone in patients with scalp androgen receptors
* Minoxidil: increases scalp blood supply and slow hair loss in both males and females

Plug look:

* larger number of follicular units

Micrografts and minigrafts:

* smaller size, hence lower metabolic demand
* they tend to grow in areas of fibrosis and burn scars and over skin grafts and flaps
* Rate of survival is 85% vs normal healthy scalp 95%

Anagen effluvium:

* insult to the hair follicle that affects the mitotic and metabolic activity
* commonly associated with chemotherapy
* results in tapered fracture of the hair shaft

Female pattern hair loss:

* reduction in hair density over the crown and the frontal area
* with sparing of the frontal hairline
* 10-40% of women are hyperandrogenic
* Menstrual irregularities, acne and hirsutism: PCOS

Patients who had hair transplant:

* Growth for one month, then fall, then new normal hair growth after 3 months

Alopecia areata:

* recurrent non-scarring alopecia that affect the entire scalp hair bearing area
* benign but can cause tremendous emotional and psychological distress
* Pathophys is unknown: cell-mediated autoimmune conditions
* Corticosteroids have been used to treat this condition
  + intralesional corticosteroids injection: treatment of choice
* Regrowth is seen by 3-4 weeks of injection

Each hair is produced by the matrix of cells found at the base of hair follicles

* the progeny of these cells become displaced from below and become mature and produce keratin

The outermost layer of the hair is called the hair cuticle and composed of hard keratin

* responsible for anchoring the hairs in its follicle system

The infundibulum:

* the upper portion of the hair follicle
* above the sebaceous duct
* lined by surface epithelium

Balding occurs when the anagen phase is shortened and the telogen is prolonged

Hair cycles:

* Anagen (active)
  + 1000 days in men
  + 2-5 yrs longer in women
  + at one time 85-90% of hairs are in anagen phase
* Catagen (degradation)
  + lasts several weeks
  + during this phase: follicular bulb atrophies and degrades
* Telogen (resting)
  + 2-4 months
  + 10% of the hair at any given time is in telogen phase
  + On average 50-100 hairs fall per day and are replaced with new growing hairs

In micrografting:

* transplanted unit is hair follicles with dermal elements

Male-pattern alopecia:

* genetic pattern is X-linked dominant
* Increased activity of 5-alpha reductase in susceptible follicles
* plasma testosterone levels are normal in these patients

The least amenable condition to follicular transplantation:

* chronic telogen effluvium
  + persistent increase telogen hair shedding

Patients with global diffuse hair thinning:

* may benefit from hair transplantation but the quality is poor

The most common cause of male pattern hair loss:

* inheritance
* X-linked AD

Hair follicles in the occipital area:

* have longer lifespan after they have been transplanted

Hair follicles in balding areas are miniaturized and DHT levels are increased

For lateral eyebrow hair transplantation:

* composite graft from scalp containing hair follicles is the most appropriate

Hair follicles:

* found within the subcutaneous layer of the scalp
* hair follicles are indentations of the epidermis in the subcutaneous layer of the scalp

Sagittal scalp reduction:

* gets rid of the bald areas and conserve the donor sites

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| **In-Service Questions Notes: Laser** |

Laser hair removal:

* works in patients with melanin in hair follicle
* therefore it does not work in patients with fair skin and hair
* Electrolysis is the best way for hair removal in these patients

In a patient with **green ink** that stays in tattoo:

* most appropriate treatment is: **Q-Switched Alexandrite** 755 nm
  + 75% clearance of green pigment in just one or two treatments
* Alternatively: **Ruby laser** with 694 nm wavelength
  + 1064 nm is very effective for black and other dark colors

**Long-pulse Nd:Yag**

* for **hair removal**
* **varicose veins**

IPL or long laser pulse  results in incomplete tattoo clearance, thermal damage and scarring

TCA 70%

* do it yourself
* associated with hypertrophic scarring requiring excision and skin grafting
* not effective for tattoo treatment

Carbon dioxide not used for treatment of tattoos

Laser smoke:

* significant occupational hazard
* some substance are **carcinogenic, mutagenic** when released during pyrolysis of the tissues
* Viable skin bacteria like **coagulase negative staph, corynebacterium and Neisseria** have been recovered
* **HPV DNA** have been recovered also from carbon dioxide plumes
* Surgical masks filter particles of **5 microns and larger**
* 77% of particles are smaller than 1%
* High efficiency smoke evacuator should be used and should be placed about **1-2 cm away** from the the smoke

The best way to decrease risk of fire when using CO2:

* use **conscious sedation**, **nerve blocks and no supplemental oxygen**
* no foot pedals as these can get activated

Chromophore for **Pulsed-dye laser:**

* at a wavelength of 585: **oxyhemoglobin**

Rhytides, acne scars and dyschromia:

* **CO2:** absorbed by **water**

**Er:YAG:**

* wavelength of 2940 and is absorbed by **water**
* **less collateral thermal necrosis**

**Acne scarring** is managed with infrared lasers at wavelength of:

* 1064-1540 nm
* include **Nd:YAG**
* **Diode**
* **Erbium lasers**

Tattoos are managed by:

* **Q-switched ruby laser** at wavelength of 694 nm which is absorbed by melanin and CO2

**Side effects of laser treatment:**

**Hyperpigmentation:**

* most common side effect of **laser resurfacing**
* 36%  of patients
* Most common in dark pigmented patients
* Treatment is **hydroquinone and tretinoin**
* Can be decreased with pretreatment using bleaching agents and retinoic acid

Acne can also occur after laser treatment:

* especially in a patient with history
* should be treated in the same way

Infection can also occur and can be minimized with prophylactic antibiotics and topical care

Viral herpes simplex outbreaks can occur: antiretroviral therapy can be used now

Scarring can occur with excessive thermal injury

* should be treated with steroids, silicone sheets and pulsed-dye

erythema can last 1-4 months

Persistent erythema after 2 months from CO2 laser surfacing:

* treated with Ascorbic acid

Posttreatment erythema:

* worse with CO2 than fractionated CO2 and Er:YAG
* Post-op treatment should be treated with topical ascorbic acid

Hyperpigmentation after laser therapy occurs in about 40% of patients especially dark skinned ones

* occurs between 6 weeks to 6 months and 100% in dark skinned patients
* Hyperpigmentation is most often transient and last 9 months to 1 year

For Dark pigmented tattoo used by amateurs:

* done at different depth length compared to the professional ones
* this will make it difficult to remove tattoo in one session or any at all
* The chromophore for CO2 is water: therefore it destroys the normal skin  too in addition to the tattooed skin

Q-switched lasers:

* include **Ruby,Nd:YAG** and **alexandrite** types
  + these are all suited for removal of **black** tattoo

**Pulsed-dye laser**:

* the treatment for **capillary malformation** in pediatric patients
* **Oxyhemoglobin** is the target chromophore 585 nm and 595 nm are used

**Nd:YAG:**

* effective in the treatment of **superficial venous malformation**

**Q-switched alexandrite**:

* removal of **black, blue and green** ink tattoos

Q-switched **ruby**:

* minimal scarring
* **black**
* **black-blue**
* **green**

CO2: targets water in the skin

* epidermis is 90% water
* vaporized at temperature of 100c

The most common infection associated with with laser resurfacing is is HSV

* reactivation of latent **HSV**
* experienced in about 2-7% of laser treated patients
* All patients planning to undergo laser resurfacing should be started on **anti-retroviral**
* Symptoms include tingling, burning or discharge
* can lead to scarring

**Facial capillaries:**

* KTP 532-595 nm is appropropriate
* has the highest affinity to vessels

**Carbon dioxide and Erbium lasers**:

* high affinity to water

**1064 nm**:

* used for hair reduction or collagen stimulation but works on deeper layers
* more specific for darker pigmentation of vessels such as **blue**

**HSV prophylaxis:**

* starts **2 days prio**r to treatment and continues for **7-10 days after treatment**

The **success of carbon dioxide**:

* neocollagenesis and neopelastosis
* main draw back is high rate of **hypopigmentation**
* **erythema and hyperpigmentation are short term** not long term
* hypertrophic scarring is a possibility but not reported as long term side effect

When **red pigmen**t remains after the tattoo removal:

* then use **Q-switched Nd: YAG (532 nm)**

Quality switched laser:

* ruptures cells containing pigment
* triggering phagocytosis and packaging of the tattoo fragments for lymphatic drainage

Nd:YAG 1064:

* deepest penetration and least risk of hypopigmentation
* l**east effective in removal of colored tattoos**

**Nd:YAG 532 nm:**

* effective for **orange, red and yellow**
* also absorbed by hemoglobin
  + leading to purpura that can last 7-10 days

**Q-switched Alexandrite and ruby lasers:**

* effective against **black, blue and green**
* absorbed by melanin leading to transient hypopigmentation but sometimes permanent depigmentation

**Er:YAG:**

* **targets water** but less thermal diffusion to surrounding tissue

**Nd:YAG**

* **vessels, RBC, Hb**
* **collagen and melanin**

Resurfacing with carbon dioxide is contraindicated if patient was previously treated with **isotretinoin**

* should not be used for up to one year prior to surfacing
* causes healing complications if used before laser treatment

When a patient presents with outbreak of herpes simplex:

* must also send Tzank smear
* Increase the dosage

Yellow ink tattoo:

* **Nd:YAG**
* **orange and yellow** tattoo

**Nd:YAG (**1064 nm) optimal fo**r black pigment**

Laser surfacing is contraindicated in patients who were on **isotretinoin within 18 months** prior to treatment

Hydroquinone:

* tyrosinase inhibitor
* lightening (bleaching) of the skin

**Topical aminolevulinic acid:**

* activated by **pulsed-dye laser**
* used in treatment of acne vulgaris
* results in several days of swelling, erythema and exofoliation
* Skin is photosensitive for 48 hrs

**Nd:YAG**

* can be used for removal of black and red pigment
* **532 removes red**
* **1064 removes black**

Port-wine stain:

* **585 nm wavelength**

Superficial vascular talengiectasia

* **532 nm**

**Noncoherent light source:**

* **Instense pulsed dye**
* used for tx of hyperpigmentation, talengiectasia, rosacea and excessive unwanted hair, rhytids and vascular malformation

When there is certain types of material embedded in the skin such as: **Road asphalt, carbonaceous material or amateur tattoo:**

* **most appropriate method is Nd:YAG**

**Transudate wound:**

* more common in patients with **erbium:YAG rather than CO2**
* **less hypopigmentation**

The highest affinity to water:

* **Er:YAG** 2940 nm
* **10 times greater than CO2**

Er:YAG:

* greater affinity to water
* short duration of exposure
* minimal tissue necrosis
* limited coagulative necrosis
* effect is photomechanical rather than photothermal
* amount of collagen contraction is much less
* d**oes not stimulate** collagen remodeling

Q**-switched Nd:YAG and Alexandrite**

* best used for removal of **blue-green** tattoo pigments

**Q-switch Ruby:**

* **violet and purple**

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| **In-Service Questions Notes: Soft Tissue Infection** |

Herpetic Whitlow:

* herpes simplex virus
* more common in dental and medical personnel
* Tzank smear and antibodies can confirm but not necessary
* Treatment: observation as it heals spontaneously within 1-3 weeks
* Acyclovir or Valacyclovir: not necessary but can shorten the duration if started within 2-3 days

Human oral flora/fight bite:

* Eikenella corrodens: anaerobic organism
* Group A streptococcus

Fight bite:

* treatment is aggressive antibiotic therapy and surgical exploration

Clostridium perfringens:

* gram negative rods
* gas gangrene

Pasteurella multocida:

* gram negative anaerobic

Rhicocerebral mucormycosis:

* rare opportunistic infection of the nasal cavity and sinuses
* can rapidly spread to orbits and brain by erosion of bone and invation of blood vessels
* caused by Saprophytic fungi
* affects DM and immunocompromised patients
* mainstay: reversal of immunocompromised state, systemic antifungal and surgical debridement
* time is crucial
* intraoperative biopsy with frozen sections

Epiglotittis:

* H influenza B
* rare since introduction of vaccine

Mastoiditis:

* due to infection of untreated otitis media

Head and neck necrotizing fasciitis:

* spreads through subcutaneous fat and fascia with overlying necrosis of the skin
* spread from infection of the teeth or pharynx

Sweat produced by Apocrine gland causes malodorous smell

Two types of sweat glands:

* eccrine: producing water and salt and are found throughout the body
* apocrine: found in hair bearing area such as the groin and the axilla
  + water fluid and high protein
* Mammary glands are part of apocrine glands
* Sebaceous glands are holocine (the hole cell gets destroyed)
  + also meibomian glands
* Hyperhidrosis:
  + excessive sweating through eccrine glands
* Osmidrosis or bromhidrosis:
  + excess secretion through the apocrine glands combined with bacterial proliferation with corynebacterium
    - this enzymatic breakdown by bacteria results in malodor

Stevens-Johnson syndrome and Toxic epidermal necrosis:

* spectrum of the same disease
* T-cell delayed hypersensitivity reaction
* within 8 weeks of the offending agent
* Fever, mucositis and vesiculobullous rash
* Fullthickness necrosis of the skin
* Positive Nikolsky sign: skin separation with application of shear force
* skin separation less than 10%: stevens-johnson, mortality 1-5%
* > 30%: TEN, mortality 25-40%
* Between 10-30%: overlap
* treatment is supportive: better be in a burn center
* IV steroids are given though controversial
* Can leave skin scarring and mucosa strictures and ocular complications

Toxic shock syndrome:

* toxins produced by staph aureus and strept pyogenes
* toxin acts like a super Antigen and widespread immune response
* Staph TSS: due to surgical or traumatic break in the skin or colonization or foreign body
* occurs within 48 hours of surgery
* starts with generalized symptoms leading to shock
* skin desquamation 2-3 weeks

Check question number 6:

* Dress syndrome and Acute generalized exanthematous pustulosis

Flavobactrerium:

* from freshwater fish bites

Vibrio:

* shark bites and other marine injuries

Mycobacterium:

* can be seen in bear and ferrets bites

Necrotizing fasciitis:

* Polymicrobial
* Streptococcal species more than 60%
* mortality rate about 20%
* delayed surgical debridement increase the mortality rate and is directly proportional to delay time (Strongest risk factor for mortality)
* Second strongest risk factor is immunosuppression and hematologic malignancies
* Extremes of age are also associated with mortality (1 year and 60 yrs)

Space of Parona:

* potential space on the volar aspect of the wrist, behind the flexor tendons and above pronator quadratus
* where the proximal extent of the tendon sheath of both small and thumb fingers are in close proximity

According to CDC: Surgical site infection

* occurs within 30 days from surgery and within 1 year if there is a prosthetic implant
* infection requires:
  + purulent drainage
  + isolated organism
  + spontaneous dehiscence of deep incision or deliberate opening of the incision in patient with fever, pain, localized swelling or redness unless site is culture negative

Vibrio vulnificus:

* gram negative bacilli
* causes necrotizing fasciitis
* found in warm saltwater (Florida)
* present with hemorrhagic bullae

Mycobacterium marinum:

* associated with watery environment
* affects aquarium owners with indolent granulomatous process

C. Diff first line of treatment:

* metronidazole
* oral vancomycin is the second line of treatment for severe cases
  + IV vancomycin not excreted in colon
* oral fidaxomicin: as effective as oral vancomycin
  + increase cure rate and decrease recurrence

Rice Bodies:

* pathognomonic for TB
* M. tuberculosis: cultured in **Lowenstein-Jensen culture**
* Acid-fast bacilli
* All mycobacterium and norcardia are acid facid
* If mycobacterium is suspected: Mantoux test injected in the skin
* M. TB should be considered in all imnnunocompromised patients

Pasteurella multocida:

* gram negative coccobacillus
* Tx started with penicillin with local wound care and surgical I&D

Dog bite:

* pasteurella
* anaerobes
* Staph and strep
* Ideal treatment is Augmentin but if someone is allergic to it: cannot give

Tetracycline: (doxycyline)

* contraindicated in children younger than 8 yrs due to its effect on growing bones and teeth

Fluoroquinolone:

* contraindicated younger than 18 yrs due to effects on cartilage and joints
* except for kids with CF, multi-drug resistant UTI and inhalation anthrax

For dog bite in a kid younger than 8 yrs old with penicillin allergy:

* give bactrim/clindamycin

FTS: risks for poor outcome:

* diabetes
* age more than 43
* subcutaneous purulence
* digital ischemia
* polymicrobial infection

Decolonization protocol:

* mupirocin ointment BID
* chlorhexidine body wash for 5 days

Health-care workers MRSA carrier rate: 5%

HS:

* apocrine glands disease
* initial tx: wound care, weight loss, antibiotics and hygiene
* if not improvement with abx
  + only excision of disease apocrine glands is curative

Atypical mycobacterium:

* rarely systemic symptoms
* manifest as non-healing wound
* Ml. Marinatum: injury from boat
  + results in localized granuloma

Toxic shock syndrome:

* temp > 102
* multisystem organ failure
* rash
* multiple constitutional symptoms
* Exotoxin-1 and exofoliative toxin-producing staph aureus
* Enterotoxin A, B, C producing-strept

The most appropriate abx for Gustillo IIIB open fracture:

* 3rd generation cephalosporin: Ceftriaxone
* should be given as soon as possible and not longer than 72 hrs for prophylaxis
* broad spectrum should be avoided as they increase the rate of nosocomial infection

Hidradenitis Suppurative (HS): Acne inversa

* chronic inflammation of the skin and subcutaneous tissue
* chronic subcutaneous nodules
* can advance to abscess and results in draining sinus tracts
* Caused by follicular occlusion of aporcrine sweat glands
* hair follicles become occluded due to over production of ductal keratinocytes, followed by rupture then re-epithelialization
  + this process leads to housing of bacteria

Antibiotics against Aeromonas:

* bactrim
* ciprofloxacin
* 3rd generation cephalosporin such as cefotaxime

Tigecycline:

* effective against staph and gram negative rod infection
* not effective against Pseudomonas

Nec fasc:

* dishwasher water: pathognomonic
* metabolic acidos, oliguria, acidosis and increased tropnin
* mortality rate decreases from 70% to 4.2% after debridement

Vibrio Vulnificus:

* crab bite
* gram negative curve shaped rod
* treatment: Levofloxacin
* immunocompromised: need surgical debridement otherwise death
* effective abx:
  + cephalosporin: 3rd generation is best
  + quinolones
  + aminoglycosides
  + aminopenicillin

Rhinocerebral mucormycosis:

* must obtain biopsy specimen and frozen tissue samples
* right angle non-septate branching hyphae
* Amphotericin  B

Most common organism in hand infection:

* staph aureus
* MRSA most common: 60%

Aeromonas hydrophilia:

* found in leech
* prophylaxis using fluoroquinolone, tetracycline and bactrim

Horse bite:

* Actinobacillus lignieresii

Risk factors for necrotizing fasciitis:

* DM
* immunosuppression
* age over 50
* malnutrition
* PVD

two forms of nec fasciitis:

* one caused by strep pyogenes
* another one caused by mixed flora

Progressive necrosis:

* involves the superficial fascia and subcutaneous fat

Pain with passive adduction of the fingers, without pain to passive extension:

* think of collar-button abscess
* pus resides dorsal and volar to natatory ligament of the palmar fascia
* with small connection between the two spaces passing through the natatory fibers
* drains through the proximal dorsal and volar incisions in the web space
* Do not incise through the apex of the web space, as it causes web space contracture

Cleland ligament:

* within the finger
* dorsal to the neurovascular bundle

Grape-like clusters of gram-positive bacteria: Staph

Chain-like collections of gram-positive bacteria: strep infection

Human bite:

* most common pathogens
  + s.aureus
  + E.Corrodens
  + H.Influenza
  + Beta-lactamase-producing anaerobic bacteria
* Treatment: Augmentin
* Eikenella: resistant to clindamycin
* Doxycyline and bactrim: not effective against anaerobes

Subcutaneous infiltration of doxorubicin where there is port:

* IV injection of Dexrazoxane
* for topical application: Dimethyl Sulfoxide (DMSO) with cortisone

For patients with water and seafood occupation:

* Vibrio Vulnificus: causes hemorragic bullae with painful cellulitis and marked swelling
* M.Marinatum: there is absence of pain and non-purulent fluid in the tendon sheath

Cervical necrotizing fasciitis:

* extends to the mediastinum
* pharyngeal and tonsillar as well as dental abscesses are the most common
* DM and immunocompromised are most susceptible
* skin necrosis is a late finding
* CT scan may or may not show gas within soft tissue
* Need broad-spectrum abx and aggressive surgical debridement
* The origin is from the pharynx

When there is joint swelling and the history of confusing between trauma and arthritis:

* first step is joint aspiration

When rabies is suspected:

* irrigate wound with povidone-iodine
* this decreases the rate of infection by 90%
* If a cat bite has worsening pain: then need I&D
* Symptoms of pasteurella: cellulitis and seropurulent drainage

Other infections with cats:

* tularemia
* cat-scratch disease: Bartonella henselae

Cat bite abx:

* Bactrim
* TMP-SMX
* Flagyl
* clindamycin
* fluoroquinolone

In a patient with allergy to penicilin:

* Give Ciprofloxacin and clindamycin

The most sensitive test for septic joint arthritis:

* WBC in synovial fluid
* gram stain and culture: not always positie
  + might be 50% negative

Orbital cellulitis vs. preseptal cellulitis:

* orbital cellulitis with proptosis
* must rule out abscess

Open fracture of the lower extremity with contamination:

* the factor that correlates the most with post-op infection is the type of contamination

Check question number 45 about the antibiotic treatment for cat bite

Extravasation of Doxirubicin for lung cancer treatment:

* apply dimethyl sulfoxide to the skin

In a patient with history of frost bite with subsequent surrounding cellulitis:

* rapid rewarming with circulating water 40-42 for 15-30 mins
* pain control
* elevation
* antitetanus ppx
* debridement of clear blisters
* leaving hemorrhagic blisters intact
* application of Aloe vera
* penicillin for cellulitis

Copperhead snake bite:

* after checking vitals and labs (including anticoagulation)
* give tetanus toxoid if patient does not recall his immunization status
* Observe the area of bite closely and monitor for neurological, coagulopathy and hemodynamic instability
* Rattlesnakes: most potent venom and responsible for majority of fatalities
* Acute first aid:
  + avoid excessive activity, immobilization and neutral position
  + Do not give antivenin for dry bites: can cause serum sickness and anaphylaxis
    - indication for antivenin therapy: Progressive venom injury
* Debridement and suction therapy has not been shown to be effective

Necrotizing fasciitis:

* commonly polymicrobial: group A hemolytic strep and staph are the most common
* the infection travels along fascial planes
* induces hypoxia and tissue necrosis

Cat bite:

* Augmentin
* alternative treatment for adults: clindamycin and fluoroquinolone
* for children: clindamycin and bactrim

Patients with contraindications for toxoid vaccine should be managed with tetanus immunoglobulin

The most likely pathogen for upper extremity nec fasc:

* strep pyogenes (Group A hemolytic)

Purpura fulminans:

* toddler presenting with fever, lethary, petechial rash that coalesce to hemorrhagic bullae:
  + Dx: Purpura fulminans
  + Usually caused by N. meningitidis
* Mx:
  + initiate broad-spectrum abx
  + aggressive fluid resuscitation with inotropic support
  + DIC develops and patient may benefit from Protein C administration
  + Wait on the debridement until after resuscitation

Sometimes they may try to trick you with organism that is not covered:

* example staph that is not covered with vancomycin, clindamycin or bactrim

Type II monobacterial Nec Fasc:

* Group A hemolytic strep
* treated with penicillin and clindamycin
  + penicillin is added because of increasing resistance to clindamycin

Parona space:

* between the pronator quadratus fascia and the flexor digitorum profundus tendon sheath
* the flexor tendon sheath of the small finger is connected to the ulnar bursa which is connected to the transverse carpal ligament
* infection of the small finger and the thumb communicate

Thenar space: does not include thenar musculature

* bordered dorsally by the fascia of the adductor pollicis
* radially by the thenar muscle fascia

Joints are poorly vascularized:

* favoring colonization
* the difference between pyogenic and gonoccocal infection of the joints:
  + gonococcal does not cause joint destruction
  + therefore I&D and debridement are not necessary
  + occurs in sexually active adults

The most common causative organism of infectious folliculitis:

* staph aureus

A kid with snakebite with fang marks on the left thumb: Question #64

* Next best step is administration of antivenin after skin testing with dilute serum in patient with evidence of envenomation

Tuberculous tenosynovitis:

* most common mycobacterium marinatum
* presence of rice bodies during exploration on synovial surface

In a patient with fightbite:

* even after 4 days, still do surgical drainage of the finger

The index finger infection:

* drain into the thenar space

Middle, ring and small:

* drain into midpalmar space

The radial and ulnar bursae:

* communicate to parona’s space which lies deep to pronator muscle

The two most common organisms isolated from HS:

* Staph aureus and step viridans

Study question #70: for the palmar spaces

Septic arthritis:

* most common organism is the staph aureus
* In young sexually active patient: think of gonorrhea

Treatment of nail deformity caused by fungal infection (onychomycosis):

* fungal culture
* 50% of deformed nails
* Tx: itraconazole or terbinafine for 6 weeks
* Terbinafine causes:
  + SJS
  + neutropenia
  + hepatotox
  + hepatic failure
  + TEN
  + anaphylaxis

The difference between Streptococcal toxic shock syndrome and Clostridium necrotizing fasciitis:

* Clostridium has ephysema and air in the tissues on radiographs
* Streptococcal toxic shock syndrome:
  + liver and renal abnormalities
  + coagulation abnormalities

Collar button abscess:

* courses through the palmar fascia
* which communicates from the volar web space to the dorsal aspect of the hand via palmar fascia or lumbrical canal
* finger abduction is a characteristic finding
* appropriate management is drainage via dorsal and volar approach

In a patient who has been bitten by a rabid animal:

* in addition to washout and debridement of the wound
* administration of rabies vaccine into the deltoid
* administration of rabies immunoglobulins into the wound margin

Felon, paronychia and FTS are caused by staph aureus

Spontaneous cellulitis in patient with history of axillary node dissection:

* even with normal leukocyte count
  + must admit for IV abx

Chronic paronychia:

* recurrent abscess beneath the eponychial edge of the fingernail
* associated with repeated exposure to moist environment
* Candida albicans is the most commonly cultured microorganism
* can occur if acute abscess was not adequately drained or patient was not given the right abx
* Should respond to minimizing the moist environment and giving topical itraconazole or ketoconazole
* If infection does not respond:
  + get radiographs to see if the bone is exposed
* If not responding:
  + then excision of dorsal nail roof (marsupialization) in a crescent shape peice with a width of 3-5 mm

Dapsone: is given for brown recluse spider bite

* adverse effect: hemolysis

The most appropriate management of scorpion bite:

* application of cold compress
* scorpion stings in adults are self-limited
* causes intense localized pain and paraesthesia with severe pain to tapping over the area
* For children: hospital admission
  + monitor for arrhythmia and neurotoxic effect

Leech therapy:

* Aeromonas hydrophilia
* Bactrim
* Fluoroquinolone

Black widow spider bite:

* neurotoxin
* hallmark is muscle pain and cramping within 15 mins
* Tx: administration of calcium gluconate, methocarbamol and diazepam

Brown recluse spider:

* hemotoxin

Cobra is hemotoxin

Persistent paronychia:

* think of candida albicans

|  |
| --- |
| **In-Service Questions Notes: Skin Lesions** |

The strongest indication for using Moh surgery for BCC:

* Morpheaform subtype
* Other indications of Moh surgey:
  + recurrent SCC/BCC
  + tumors involving critical areas such as eyelids and lips
  + Location prone to recurrence: H-type
    - periorbital
    - periauricular
    - upper lip
    - nose and nasolabial fold
    - chin
  + Functionally important areas:
    - genitals
    - hands/feet
    - perianal location
  + Tumor arising from previous irradiation area
  + Large tumors more than 2 cm
  + lesions with ill-defined borders
  + Histologic subtypes:
    - morpheaform
    - basosquamous
    - perineural
    - invasive/poorly differentiated SCC
  + Tumors arising in immunosuppressed patients such as transplant recipients with genetic predisposition (basal cell nevus syndrome, xeroderma pigmentosum)

Nevus sebaceous:

* present as yellow-organge flat plaque
* mostly on scalp in 60% and face in 30%
* present at birth and may appear in the first few years of life
* they are hamartomas arising from pilosebaceous unit of the skin
* Maternal transmission of HPV to the fetus has been implicated
* there is mutation RAS pathway
* Excision: for cosmetic reason and to avoid secondary tumor
* most commonly trichoblastoma (benign tumor)
* Malignant risk transformation 10% but recent studies 1%
* Extremely rare in children (malignant transformation)
* Definitive treatment is excision

In a patient with multiple melanocytic nevi:

* treatment is excisional biopsy if there is high suspicion for melanoma
* Criteria for excision:
  + asymmetry
  + irregular border
  + variable color (dark lesion is not a suspicion for melanoma)
  + size more than 6 mm
  + evolution

Lesions with waxy surface:

* seborrheic keratosis
* found in elderly in sun exposed areas

HS:

* apocrine gland bearing regions
* lowest recurrence rate with wide excision

Merkel cell carcinoma:

* rare and aggressive neuroendocrine cutaneous malignancy
* propensity for lymph node and distant mets
* high mortality
* present as asymptomatic erythematous papule or nodule in the head and neck
* Surgical treatment:
  + wide local excision with 1-2 cm margins
  + SLNBx is standard of care: cervical lymphadenectomy if LN positive
  + adjuvant radiation to improve local-regional control and increase survival

Dermatofibrosacroma Protuberands (DFSP):

* rare neoplasm
* intermediate malignancy
* Most commonly in the trunk
* least likely head and neck
* high recurrence due to microscopic projections
* Margin of excision should be about 5 cm
* In locations where this is not reliable:
  + the can rely on intraoperative frozen sections
* Excision should always include the deep fascia
* In the head: should include the outer table of the cranium
* Should include muscles in trunk and extremities
* Should include peritoneal in thin patients

Cutaneous SCC arises from:

* **stratum basale from keratinocytes**

Glaborous skin has an additional layer between stratum granulosum and coneurm called:

* stratum lucideum

Melanocytes and merkels cells: found in stratum basale

Langerhands cells: in **stratum spinosum, startum granulosum and dermis**

Moh surgery:

* highest cure rate
* 5-yr cure rate is 90%

HPV:

* type 2 and 4 are associated with warts on the hands
* patients whose hands are exposed to wet environment are at risk
* no cancerous risk
* can be transmitted by clothing and and public showers
  + enter through a break in the skin
  + alter the squamous epithelium to produce cauliflower-like  growth
* Spontaneous resolution occurs in 50% of kids in one year and 90% in 5 yrs

Low risk BCC:

* margin is 2 mm

In patients with recurrent, inoperable or metastatic:

* treatment is chemotherapy
* Imatinib: which is a tyrosine kinase inhibitor
* DFSP: platelet derived growth factor receptor tyrosine kinase is inhibited by imatinib
* Radiation can be used to improve local control and reduce the risk of recurrence postoperatively

The ideal time to start radiation after excision of keloid:

* Should be within 1-3 days
* Given over a period of 2-3 days
* radiation is sensitive to endothelial vascular buds and decreases proliferation of new fibroblasts
* risk is 2.5%
* Adjuvant therapies:
  + radiation therapy
  + intralesional steroids
  + 5-FU
  + topical silicone
  + Pressure

In a smoker patient:

* it is best to do primary closure on the face after cancer excision whenever is possible

In a patient with BCC nodular, recurrent about 1 cm in diameter

* 5 year-recurrence is 3%
* superficial radiation therapy is an alternative to Moh surgery
* Electrodessication: high recurrence rate
* 5-FU NOT for BCC
* Pembrolizumab: stage IV melanoma

Rhinophyma:

* far end of acne rosacea
* involving the sebaceous glandular growth
* most common on the nose but can occur anywhere on the face
* Early rhinophyma:
  + abx and isotretinoin
* Advanced: resection with ablation such as dermabrasion  and carbon diaoxide laser excision, scalpel excision

Von Recklinghausen:

* associated with neurofibroma

**Factors associated with recurrence of SCC:**

* histologic subtypes: adenoid, adenosquamous and desmoplastic

High risk areas:

* Anatomic lesions such as mask areas: eyelids, eyebrows, periorbital, nose, lips, chin, temple and ear
  + as well as genitalia, hands and feet
* Lesions greater than 6 mm: indicate high recurrence rate

Mid-risk areas:

* cheeks, forehead, scalp and neck
* with lesions greater than 10 mm indicating high risk

Low risk areas:

* extremities and trunk
* lesions greater than 20 mm indicate high recurrence

Depth greater than 2 cm indicates high risk

Other factors:

* poorly defined borders
* immunosuppression
* prior radiation
* site of inflammatory process
* perineural/vascular invasion

Glomus body tumor:

* MRI is the most accurate

Scalp nevus sebaceous measuring 4 cm in a child:

* Tx: serial monitoring and selective excision
* malignant risk 1%

Moh surgery is indicated in BCC arising from traumatic scar

Cylindromas:

* benign adnexal tumors showing eccrine and apocrine differentiation
* Found in face and scalp
* most commonly in women
* Sporadic in nature
* multiple cylindromas can be seen with Brooke-Spiegler syndrome as AD trait
* Cylindromas can undergo malignant transformation, hence need surgical excision and post-op monitoring
* Radiotherapy has been used for malignant cylindrocarcinoma

For HS:

* wide local excision of all hair-bearing skin with 1-2 cm margin
* recurrence is high when resection is not compelete

DFSP:

* minimum margin 2 cm
* Moh is better especially on the cranium with recurrence rate less than 10%

Gorlin syndrome: Basal cell nevus syndrome

* AD
* males = females
* mutation in PTCH1 gene
* Clinical characteristics:
  + multiple basal cell carcinomas
  + odontogenic cysts of the mandible
  + facial dysmorphism
  + Skeletal abnormalities of the vertebrae, skull and ribs
  + 5-10% develop medulloblastoma

Check question number 26 for indications of Moh surgery

The most appropriate initial medication for HS:

* clindamycin: topical
* HS is also known as acne inversa

Pilomatricoma/ Pilomatrixoma/ calcifying epithelioma of Malherbe:

presentation: firm to the touch, mildly tender and slightly bluish

* bening calcifying tumor of the hair appendages
* most commonly occur before 20 yr old of age
* excision is treartment of choice
* occurs in head and neck as well as the extremities
* malignancy is very rare
* Intraoperative findings: calcific and friable mass that is adherent to the undersurface of the skin
* No discrete capsule or punctum
* recurrence 1-2%

Sebaceous nevus:

* waxy textured skin patch
* present at birth
* scalp is a common site
* slowly growing and bening
* 1% malignant transformation
* BCC more than SCC

Spitz nevus:

* melanocytic lesion that occur in children and adults
* benign spindle cell lesions
* malignant transformation not common
* appear dark brown or black macules

Aspirin:

* irreversibly binding to the cell’s cyclooxygenase
* blocking the production of thromboxane
* Risk of stopping it in someone who is chronically on it
* results in rebound thromboxane production, decreased fibrinolysis and prothrombotic state
* There is not increase bleeding risk in patient who is on 81 mg

Potential malignancy of pigmented lesions:

* ABCD
* asymmetry
* border irregularity
* color variation
* diameter > 6 mm

Pyogenic granuloma:

* present after local trauma
* friable papules and bleeds easily

Merkel cell carcinoma:

* aggressive and rare neuroendocrine tumor
* older in immunocompromised women in sun-exposed areas
* 80% due to polyomavirus
* wide local excision
* for tumor less than 2 cm:
  + 1 cm margin
* SNLbx due to occult nodal metastasis
* Radiosensitive and postoperative radiation is indicated
* Chemotherapy only for palliation

Actinic Keratosis (AK):

* common in sun exposed areas and in response to ultraviolet radiation
* Malignant transformation 10% to SCC
* Tx: for isolated lesions: cryoptherapy with liquid nitrogen
* For diffuse: cryotherapy, photodynamic therapy, imiquimod, glycolic peel and 5-FU

DFSP:

* 15-20 mm high rate of recurrence-free survival and primary closure

Indications for Moh surgery:

* indistinct border
* recurrent cancer
* high risk zones of the face
* morpheaform basal cell cancer
* evidence of neurovascular involvement
* large BCC> 2 cm

Extramammary Paget disease:

* Intraepithelial cells with a large nucleus and abundant pale cytoplasm
* 7-40% risk of malignancy
* treatment is wide excision
* Paget disease of the breast: eczematous skin changes and associate with breast cancer

SCC:

* low risk vs. high risk depending on:
  + size
  + location
  + depth of invasion
  + recurrence
  + patient’s factors such as immunosuppression
* Low risk lesions: need 4 mm margin
  + well-differentiated tumors
  + < 2m
  + do not involve the scalp, ears, eyelids, lips, nose or subcutaneous fat
  + recurrence after excision 5-8%
* High risk lesions: 6 mm margins:
  + larger than 2 cm
  + invasive to fat
  + high risk locations: central face, ears, scalp, genitalia, hands and feet
  + depth should always include a portion of the subcutaneous tissue

Pilar cysts or trichelimmal cyst:

* outer root sheath of the hair shaft
* present as firm, slowly growing subcutaneous nodules that is difficult to differentiate from epidermoid cyst
* found on the scalp where they are the most common cutaneous cyst
* They are lined with stratified squamous epithelium which undergoes keratinization
* Sometimes they exhibit aggressive behavior and they have to be excised

Scleroderma or systemic sclerosis:

* thickened sclerotic lesion
* Localized scleroderma: involves the skin only
* systemic sclerosis:
  + limited: restricted to the hands, distal forearms, face and neck
  + diffuse: CREST
    - more than half of the patients have GI symptoms
    - GERD
    - they also have mucocutaneous talengiectasia

Seborrheic keratosis/Verruca senilis/pigmented papilloma:

* benign
* during the 5th decade
* from basal layer of epidermis
* composed of basal cells well-differentiated
* Horn cysts: inclusions of keratinous material
* Lesions exhibit: hyperkeratosis, acanthosis, papillomatosis
* waxy stuck on appearance
* size 1 mm to 5 cm
* malignancy is extremely rare

Nevus sebaceous: Jadassohn nevus

* hairless and can appear on scalp, face or neck
* can become verrucous and nodular during puberty when it is found at birth
* BCC, keratoacanthoma and SCC can also develop

For Merkel cell tumor:

* Moh or wide local excision are accepted

Nevus of Ota:

* also known as nevus fuscoceruleus opthalmomaxillis or oculodermal melanocytosis
* a dermal melanocytic hamartoma that demonstrates bluish hyperpigmentation along the opthalmic and maxillary divisions of the trigeminal nerve
* failure of complete embryonic migration of melanocytes from neural crest to the epidermis
* affects darker pigmented people
* more prevelant in female
* bimodal age incidence of distribution: 1 yr  and around puberty
* increasingly prominent with age, puberty and postmenopausal state
* opthalmologic exam because 10% have ipsialteral
* Malignant degeneration to melanoma occur in 4%
  + more frequent in light colored patients
* Dx: clinical
* More effective tx is laser
* **Q-switched ruby, alexandrite and Nd:YAG (1064 nm)**

Old patient with multiple erythematous papules that are scaly and rough:

* Fair skin with history of sun exposure
* Actinic keratosis
* Potential risk for malignant transformation
* For multiple lesions: Imiquimod: producing local immune response as well as apoptotic pathway
* other tx:
* photodynamic therapy
  + cryotherapy
  + 5-FU
  + Diclofinac gel

SCC more than 2 cm in diameter:

* more likely to recur
* more likely to metastasize

Epidermal inclusion cyst or sebaceous cyst:

* occurs anywhere in the body
* benign
* proliferation of epidermal cells within the dermis
* well-circumscribed cyst wall made of stratified squamous epithelium
* communicate to the surface with opening and might have white or black ketinous plug
* slowly growing and can occasionally get inflammed and infected
* Manual expression: white material, often foul-smelling
* Tx is excision to leave no epithelial remnants

Cutaneous angiosarcoma:

* Tx: wide local exicison
* present as a mass that enlarges gradually, non-tender, soft and flat and purple
* Highly aggressive
* most commonly found on the face of white caucasian males
* 50% in the head and neck
* also seen in patients with hx of radiation and lymphedema
* Appears as purple plaque
* Multifocal, local recurrence is common
* wide local excision

Trichoepithelioma:

* Neoplasms of follicular differentiation
* multiple, yellowish-pink translucent
* distributed symmetrically on the cheeks, eyelids and nasolabial area
* more seen in women
* benign but can be confused with BCC
* but desmoplastic trichoepithelioma need Moh surgery for complete excision

Eccrine poroma:

* can become malignant and need to be excised

Verrucous nevus:

* need to be excised

Cylindromas:

* also need to be excised

DFSP: most common type of cutaneous sarcoma

* malignant mesenchymal tumor that arise from the dermis
* characterized by latency in its initial detection, slow infiltrative growth and local recurrence  if not adequately treated
* Distant mets are rare
* Most commonly on the trunk followed by extremities
* irregular shape with frequent finger extention
* infiltrating growth pattern extending beyond the incisions
* Moh can be used for aesthetically sensitive areas
* reconstruction after confirmation of negative margins
* Most recurrence occur within 3 years
* SLNBx not indicated

Pyoderma gangrenosum: patient with ulcerative colitis, Crohn or RA

* commonly occurs in lower extremities after minor trauma
* May become rapidly painful and appear as necrotizing ulcer
* Tx: systemic steroids and immunosuppression
* Surgery is the last resort

Marjolin ulcer: SCC arising from burn wound or

* takes about 5-30 yrs
* chronic wound or burn

Pyogenic granuloma:

* appears in childhood as a rapidly growing lesion, red that bleeds easily
* definitive treatment is excision

Kaposiform hemangioendothelioma:

* present at birth
* patients commonly have Kassabach-Merritt syndrome
* thrombocytopenia, bruising and bleeding
* First-line is Vincrisine

Morpheaform BCC:

* fingerlike extensions BCC
* Higher recurrence rate when simply excised

5-FU:

* antineoplastic agent that can be used topically for BCC when surgical excision is not an option

A pediatric patient that presents to ED with history of lethargy, fever and reddish purple rash on the arms and legs with fever and petechial rash then begins to hemorrahge and blister with digit ischemia:

* Dx: purpura fulminans
* Rapidly evolving autoimmune syndrome with septic shock and hemorrhagic bullae with massive desquamation
* Cause: infection: **N. meningitidis**
* Patient will go into DIC
* Give abx, supportive tx
* Give activated protein C

In aesthetically sensitive: such as eyelid

* you can use 3 mm for BCC with 95% cure rate

Desmoid tumor:

* relatively rare
* benign fibrous tumor
* arises from musculoaponeuritic abdominal wall
* local invasion and high rate of recurrence
* wide local excision with 1 cm

Keratoacanthoma:

* low grade malignancy that resembles SCC clinically and pathologically
* natural presentation:
  + rapid growth followed by spontaneous regression
* it can progress to SCC with mets

Amelanotic melanoma:

* uncommon melanoma less than 5%
* characterized by nonpigmented melanoma lesion
* appear pink or tan
* similar to bcc or scc
* does not ulcerate or regress

Seborrheic keratosis:

* cutaneous horn is a conical projection of hyperkeratosis overlying a hyperproliferative skin lesion

Stewart- Treves syndrome:

* aggressive rare upper extremity lymphangiosarcoma
* survival rate < 1%

Actinic keratosis:

* old fair patient with history of sun exposure  presenting with multiple light red scaly lesions of the scalp and forehead
* can progress to SCC or precancerous SCC in situ: Bowen’s disease
* Tx:
  + imiquimod (Aldara)
  + cryotherapy with liquid nitrogen
  + photodynamic therapy with 5-aminolevulinic acid

BCC appearance:

* small **dome**-shaped bump
* **pearly white** color
* **talengiectasia** on the surface
* can appear like pimple-like growth that heals
* Common signs: sore that heals then bleed again and recur again
* oozing and crusting spots within the sore are normal

Dermatofibroma:

* benign lesion of mesodermal and dermal cells
* can be found anywhere but mostly on the anterior surface of the lower legs
* Asymptomatic, firm, raised papules, plaques or nodules
* can vary in size from 3-10 mm
* lateral compression causes dimpling or retraction
* SLE might have multiple dermatofibromas > 15
* Tx for cosmetic reason: excisional biopsy

Aldara (Imiquimod):

* stimulation of proinflammatory cytokine production
  + induce apoptosis of tumor cells
  + used for actinic keratosis
  + viral warts and nonmelanoma skin malignancy

5-FU:

* topical chemotherapy that inhibis DNA synthesis

Retinoids:

* prevent new skin cancer development by regulating cells differentiation

Diclofenac:

* inhibits cyclooxygenase pathway
* useful in actinic keratosis

Interferon:

* control cell differentiation by modification of gene transcription

Pathologic calcification of skin lesions in CREST:

* treated with debridement

Xeroderma pigmentosum:

* AR
* defective DNA repair
* deficient ability to repair DNA damaged by ultraviolet
* Increased risk of malignancy
* Dx at 1-2 yrs of age
* Sunburn after the first exposure
* unusual severe sunburn that last several weeks after short duration of sun exposure
* Other symptoms:
  + freckles at young age
  + everything that can possible happen to the skin due to sun exposure happens here
* Detected at 8 yrs of age

Patient with Cutis Laxa:

* highest risk of developing ventral hernia
* rare condition of hypoelastic skin
* defect in elasin fibers
* Skin does not spring back in place
* These conditions are congenital: AD, AR, X-linked
* Scar formation and healing appear normal but produces redundancy
* Homocystenuria:
  + increased risk of thrombosis

Chondrodermatitis nodularis helicis:

* presents in old patient with painful lesion on the ear that is tender on palpation
* Chronic inflammatory painful nodular lesion that presents on the helix or antihelix
* exquisit tenderness that interferes with sleep
* histologically: underlying cartilage demonstrates focal degenerative changes and surrounding perichondritis
* Surgical excision of the affected cartilage is recommended if conservative therapy with steroid injection is unsuccessful
* in patients over 50 yrs
* can be confused with sun exposure cancers
* rarely exceed 1 cm
* usually btw 4-6 mm

keratoacanthoma:

* smooth, round, nodule
* pink nodule encircling a large keratinous plug
* rapidly enlarges during weeks then disappears
* histologically difficult to distinguish from SCC
* Tx of choice: Excision

Seborrheic keratosis:

* excised to prevent potential confusion with malignant melanoma
* seen in middle aged and older patients
* sharply circumscribed, waxy, with stuck on appearance
* pigmentation from tan to deep black
* Tx: shave excision, electrodesiccation, freezing with liquid nitrogen, simple exicison
* do not undergo malignant transformation

Moh surgery provides the lowest recurrence rate of BCC 3-8%

Electrodessication and curettage is the highest recurrence rate 40%

Congenital melanocytic nevi:

* composed mostly of melanocytes
* represent an anamaly of embryogenesis
* Common in light fair skinned patients and uncommon in dark skinned individuals
* excisional biopsy is treatment of choice

Nevus of Ito is similar to nevus of Oto but follows the distribution of lateral brachial cutaneous and supraclavicular nerves

For multiple actinic keratosis:

* 5-FU provides the best aesthetic outcome

Lymphangioma circumscriptum:

* a patient who presents with lesions  that appear like clusters of white, vesicular lesions about 2-5 mm, obliterated by gentle pressure and refill when the pressure is removed
* communicate with underlying cistersn of lymphatic malformation
* may present on apparently normal skin
* adequate treatment: removal of the skin and the underlying deeper lymphatic component

Neurofibroma of Von Recklenhausen

Dermatosis papulosa nigra:

* a variant of seborrheic keratosis that is primarily in african american and some asians
* begin in adolescents and commonly affect the cheek area
* Tx: shave excision, curettage and cryotherapy are acceptable treatments

Melasma: hyperpigmentation of the face and neck

* commonly associated with pregnancy and estrogen use

Actinic keratosis can become malignant and give rise to SCC in 25%

Rhinophyma:

* high incidence of skin cancer

For melasma:

* you can use 1% tretinoin or 70% glycolic acid

Erbium laser can cause hypopigmentation

phenol oil and croton oil are not used in dark skinned patients because they produce hypopigmentation

Sebaceous carcinoma of the eyelid arises from Meibomian glands

Spitz nevus:

* occurs in adults and children
* difficult to distinguish clinically and histologically from malignant melanoa
* typically occuring in fair skin patients
* men=female

The most effective management of herpetic whitlow:

* application of dry dressing

Etidronate:

* most effective for prevention and treatment of heterotopic ossificatoon

When you hear non-caseating epithelioid granulomata: and some treatment with steroids:

* think of sarcoidosis

Calciphylaxis:

* inceased serum PTH
* rare complication of ESRD
* painful ischemic violaceous skin lesions on the extremities and trunk
* leads to full thickness necrosis then infection then sepsis and death
* mortality is about 60%

Becker nevus:

* considered hamartoma

Lentigines:

* arises from sun exposure

Acrochordon:

* simple skin tag

Cutis aplasia:

* initial treatment
* Silver sulfadiazine

Cutaneous hornes:

* associated with premalignant lesions in 20% and SCC in 15%

Spitz nevus:

* most commonly in the head and neck
* appear between age 5-10 yrs
* usually small
* less than 6 cm in diameter
* nodular and multiple

Halo nevus can be confused for melanoma

Administration of retinoids:

* reverses the potential for development of premalignant lesions
* reverse the formation and growth of actinic keratosis

Amateur tattoos are characterized by irregular penetration of ink within the superficial dermis

* small particles
* black or blue

Nevus of Ota:

* associated with trigeminal distribution

Blue nevus:

* well defined intradermal nevus that rarely displaces malignant potential

Sebaceous carcinoma: ocular type

* affects the eyelid
* more aggressive
* causes mets

Erythroplasia of Queyrat:

* irregular erythematous pathc of full-blown SCC or carcinoma in-situ that affects penis
* it is a feature of a condition knows as Bowen’s disease
* these lesions composed of squamous cells that completely replace normal dermis at the affected site
* 15% of Bowen’s disease progress to become invasive squamous cell carcinoma, surgical excision of erythroplasia of Queyrat is recommended

Most aggressive BCC types:

* infiltrative
* ulcerative
* sclerosing
* and morpheaform

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| **In-Service Questions Notes: Wound healing/ Keloids** |

Keloid:

* recurrence after resection
* extension beyond the original borders of the wound
* late recurrence after several years
* continued growth without regression or involvement
* Can be pruritic
* Similar to normal skin:
  + more type I collagen than type III
* Impacted by cell signaling between keratinocytes and fibroblasts
* randomly oriented collagen fibrils and not organized into bundles

Hypertrophic scars:

* less likely to recur
* contained within the original boundaries
* regress somewhat within a year
* recur earlier in the postoperative phase
* can be pruritic
* Unlike skin:
  + more type III than type I
  + pro-fibrotic-collagen cross linking
* require an abundance of myofibroblasts expressing smooth muscle actin
* Have parallel collagen fibrils and bundles

The most rapid nonsurgical treatment of keloid with the fewest adverse effects:

* intralesional 5-FU
* similar efficacy to intralesional corticosteroids
  + lower risk of hypopigmentation

Silicone sheeting is effective for hypertrophic scars but slower visible effect

In a kid: late walking, easy bruising and hypermobile joints: Think EHLER-DANLOS

* skin hyperextensibility
* tissue fragility
* widened atrophic scars “cigarette paper"
* classic EDS:
  + AD mutation COL5A1 and COL5A2
  + involve in collage type V synthesis
* Vascular EDS:
  + aortic dissection, rupture or aneurysm

When performing dermabrasion:

* the endpoint of treatment is: pinpoint punctate bleeding on a white background
  + which is removal of soft tissue into papillary dermis
  + Post-treatment changes: thickened epidermis and
* Yellowish white coloration: reticular dermis
  + stop before deeper injury occurs
* Preservation of adnexal structures is important for reepithelialization
* Full thickness removal to subcutaneous layer: significant deformity occurs

Randomized controlled trial:

* no difference in terms in infection when telling patient to wash wound after closure with tap water vs. keeping it dry for 48 hours
* wet and moist wounds: better healing, less scar formation and inflammation compared to dry wounds

Adipose-derived stem cells:

* can directly differentiate into keratinocytes, endothelial cells and dermal fibroblasts
* Modulators of wound healing environment but not involved in immediate chemotaxis during inflammatory period

Lysyl oxidase:

* extracellular enzyme responsible for final alignment of collagen fibrils

Presence of skin adnexa such as hair follicles and sweat glands:

* hallmark of scareless fetal healing

Hair follicle formation occur during embryonic development and involves interaction of ectodermal and mesenchymal cells influenced by signaling pathways including Wnt/b-catenin and BMP1

Skin glue/ Cyanoacrylate:

* cosmesis similar or better than external suturing when used correctly
* In vitro studies showing decreased gram positive cocci and decreased infection
* Should not be used as the only closure method: otherwise: dehiscence
* if adhesive leaks between the skin edges, it can hold there and prevent healing with increased scarring or poor cosmesis
* Should be applied to well-opposed skin edges only
* Contraindicated on mucosa and contaminated wounds

Post-bariatric surgery patients: need to consume more protein

* 60-70 g/day for 2-4 weeks prior to surgery
* 60-70 g/day for 1-2 months after surgery

Calcium Alginate vs. wet to dry dressing:

* less daily dressing change
* keeps wound moist
* absorbs exudate
* higher cost
* no evidence of faster healing time though
* Calcium Alginate:
  + made of brown seaweed fibers and can hold up to 10 times of their weight in fluid
  + some say they deactivate metalloproteinases and stimulate wound healing but in vitro data is lacking

The main mechanism of action for wound VAC:

* removal of interstitial fluid to increase blood flow
  + interstitial fluid accumulation decreases below the capillary filling pressure and thus allowing re-opening of the these wound capillaries
  + hence increases blood flow therefore increase the wound granulation tissue
  + Microstrain forces created by the vacuum on the cells within the wound
  + including activation of VEGF pathway and enhance angiogenesis
* Fluid-based mechanism and mechanical stress mechanism

The rate of recurrence of keloids after excision and injection of steroids:

* 15%
* Earlobe keloid after piercing: affects 2.5% of the population
* Recurrence rate after excision and radiation 14%: higher cost and significant complications
* recurrence rate after excision and intralesional steroids 15%: can be performed anytime pre-intra-post
  + pain on injection
* Recurrence rate after excision only 55%

E-cigarette:

* gives the harmful effect of nicotine, through delivery of vaporized nicotine
* Causes peripheral microvascular vasocontriction
* Nicotine inhibits the synthesis of prostacyclin
* nicotine also diminishes inflammatory response by inhibiting chemotaxis, reduced migration and impaired bacterial killing by the inflammatory cells and subnormal release of proteolytic enzymes and inhibitors

Hyperbaric oxygen therapy:

* can be used for anaerobic nec fascii
* increase leukocyte function and bacterial clearance and blood flow

Check question number 13 for indications of hyperbaric oxygen

The effect of nicotine on wound healing:

* increase platelet aggregation due to enhances adhesiveness of the platelets to themselves
* leads to thombosis and decrease oxygen delivery to tissue

Vitamin C:

* required co-substate for hydroxylase enzymes which are involved in collagen synthesis
* deficiency leads to scruvy
* in patient who are not deficient: int will not increase wound healing

Wound VAC:

* increased split-thickness skin graft incorporation
* decrease the rate of infection
* reduces inflammatory response and edema
* Failed to show any benefit of wound VAC over standard dressing: if anything: increase rate of enteric fistula

Regenerated skin:

* different histologically from scar but similar to normal physiologic skin
* it shows mechanical competence, heat and cold sensitivities and vascularization
* the dermal-epidermal junction shows rete ridges and capillary loops
* displays elastic fibers and increased collagen fiber density in the reticular dermis and often exhibit nerve regeneration
* Regenerated skin even when from split-thickness skin graft: does not have dermal appendages
  + such as hair follicle and sweat glands

Vitamin A:

* offsets the detrimental effect of corticosteroids

Elevated serum homocysteine:

* impaired wound healing and increase risk of coronary and cerebrovascular disease due to enhancement of clotting pathways
* folate is used for treatment of homocysteinuria

Radiation damage:

* hypoxic, hypovascular and hypocellular environment that can delayed healing and even ulcer formation
* need aggressive surgical debridement  and removal of entire zone of injury and repair with well-vascularized tissue
* for axilla wound after radiation: can use thoracodorsal artery perforator flap

Collagen deposition is the highest during proliferative phase:

* Proliferative phase: 2 phases
* fibroblasts appear on day 3 of wound healing
* proliferative phase end between week 2-4 of wound healing and this is when collagen synthesis reaches its max  and marking the beginning of wound remodelling

Inflammatory phase of wound healing is marked by inflammatory phose:

* there is influx of PMN, macrophages and lymphocytes
* PMN not essential for wound healing: sterile incision heals without PMN
* Macrophages are essential

In the remodeling phase:

* type III is converted to type 1
* increase collagen cross-linking and increased tensile strength

Silicone gel:

* level one evidence for improving hypertrophic scars

Negative pressure wound:

* Contraindications:
  + exposed vessels is an absolute contraindication
  + should not be used in the setting of active uncontrolled infection
  + over malignant wounds
  + nonenteric fistula or unexplored wound
  + poorly debrided wounds

Smoker patients with mandible ORIF:

* increased risk of wound infection
* x6
* Complication in general is lower in children
* but increased with patient age and gender
* intraoral incisions associated with higher risk of infection vs. extraoral

Wound edge eversion:

* has the greatest favorable impact on the final appearance of the wound

Systemic antibiotic prophylaxis:

* recommended for breast surgery (clear, with or without implant)
* routine ppx abx for clean surgeries is not indicated

Chromic gut:

* loses 50% in 2 weeks and nearly all strength in 3 weeks

Vicryl:

* stength decreases by 50%  in 2-3 weeks and nearly complete loss of strength in one months

Monocryl:

* loses 50% of strength in 7-10 days and near complete loss of strength in 3 weeks

PDS:

* 50% strength at 4 weeks
* complete loss of strength in 6 weeks

Glue closure vs. normal suturing technique:

* higher rate of wound dehiscence
* not appropriate for long complex wounds
* however when used as an adjunct to normal subdermal closure, the rate of dehiscence is similar

The amount of collagen in the wound reaches its peak within 3 weeks

Normal skin collagen ration type I:type III

* 4:1
* but this ratio decreases due to increase collagen type III

Major contraindication for wound VAC:

* untreated osteomyelitis
* malignant wounds
* wounds with exposed major vessels
* wounds with unexplored and or nonenteric fistula

Radiation dermatitis:

* erythema
* edema
* Desquamation
* Tx: hydrocortisone
* Severe changes: may require the radiation therapy to be discontinued

if you have a patient presenting with acute dirty infected wound:

* first step even before washout and debridement: administration of tetanus shot
* Tetanus causes lockjaw caused by Clostridium tetani: gram negative anaerobes
* The administration of antibiotics have not shown to increase wound infection

In an elderly patient with comorbidities and not a good surgical candidate with exposed calvarium due to moh surgery:

* do local flap reconstruction

Read question number 33 for the different types of hypersensitivity reactions

Acute rejection: occurs between 0-3 months

ABO incompatibility and antibody incompatibility: hyperacute

* mediated by humoral immune system
* occurs within minutes of transplantation

Chronic rejection: after years

Calcium gluconate extravasation:

* injection of hyaluronidase
* when injected, increases the rate of absorption of injected substance
* therefore facilitating diffusion of the substance over a large area
* When injected locally within 1 hour, it breaks down hyaluronic acid  and decrease the viscosity of the extracellular matrix

Extravasation of vasocontrictive agents such as norepinephrine and dopamine:

* reverse by local infiltration of phentolamine

Doxurubicin infiltration:

* DMSO
* free radical scavenger
* preventing the ulcers formed by Doxorubicin

Smoking:

* increase peripheral microvascular vasocontriction: primary mechanism of impaired wound healing
* increase thromboxane A2 and stimulation of catecholamine release
* random skin flaps are very sensitive to sympathomemitic:
  + rely on subdermal plexus
* Increases carboxyhemoglobin:
  + which shift the oxygen dissociation curve to the left
  + decreasing oxygen carrying capacity by direct competitive inhibition from carbon monoxide
* Decrease prostacyclin
* increase platelet aggregation
* increase fibrinogen
* decrease RBC deformability
* decrease leukocyte function

Rhytidectomy:

* 12.5 x more likely to cause skin necrosis in patients who smoke vs those who don’t smoke

For cosmetic surgery:

* should stop smoking 4 weeks before and after surgery

Keloid scar

* occur later after surgery then proliferate indefinitely
* has increased fibroblast density
* The activity of fibroblast is much more increased than hypertrophic scar
* Keloid has decreased ration of type III collagen to type I
* thicker, larger and more randomly oriented collagen fibers

Tensile strength of incision:

* 1 week: 5%
* 2 weeks: 10%
* 3 weeks: 20%
* 4 weeks: 40%
* 6 weeks: 80%
* Full-strength at 12 months

Radiation damage to blood vessels:

* obliterative endarteritis
* which decreases the oxygen

In a patient with history of cancer and receiving paclitaxel with extravasation from the port:

* recommended treatment is line removal and observation

Calcium gluconate:

* indicated after generally washing the area exposed to hydrofluric acid

Topical collagenase:

* for wounds that have some necrosis. Good for debridement

L-arginine:

* can be used to augment wound healing and collagen production

Pressure garments:

* reduces blood flow to scar areas
* leading to decreased production of the collage
* leading to balance between collagen synthesis and lysis
* producing flatter, soft and less vascularized scar
* Must be worn almost 24 hrs
* Should be started as soon as burns heal
* initially low pressure 15-17 mmHg and increased to 24-28 mmHg

33% of patients can have hypersensitivity reaction to Vitamin E

Treatment of ear keloid with excision followed by radiation:

* the most likely longterm complication is:
  + altered pigmentation (hypo or hyperpigmentation)
  + followed by talengiectasia and skin desquamation

Cutis aplasia:

* the most appropriate initial therapy is local wound care with application of antibiotic ointment
* can range from small area healed in utero to full-thickness defect area
* most small/intermediate areas heal quickly
* bone healing if small can be complete or may require some reconstruction later
* large areas are associated with exposure of dura and associated with mortality 20-55%
  + as a result of
* Reconstruction: skin graft, ADM, immediate or delayed flap
* tissue expansion is not recommended

The first types of cells to appear in the wound are:

* platelets
* then neutrophils
* then macrophages
* lymphocytes
* last is fibroblasts: predominant types of cells on day 3-5
* Wound reepithelialization: occurs when keratinocytes migrate from wound margins

Antilymphocytes therapy (basiliximab, thymoglobin and lymphocyte immune globin):

* not associated with impaired wound healing

keloid extension beyond the scar:

* distinguished keloid from hypertrophic scar
* density is the same in both but the proliferation in keloid is more
* hypertrophic scar more common on flexor surfaces

Skin is considered the most antigenic and immunoreactive tissue in composite tissue allotransplantation

* cellular rejection is largely attributed from the skin
* skin can be used for monitoring

Placement of subgaleal tissue expander:

* Vascular endothelial growth factor is upregulated VEGF
* necessary for angiogenesis

Split calvarial bone graft:

* heals by **osteoconduction/creeping substitution**
* like cortical bone

Osteogenesis:

* vascularized bone graft and cancellous bone???

Osteoinduction:

* causes by bone morphogenetic protein

Free liquid silicone injection:

* causes granuloma

For patient with exposed tendon/bone and not a good surgical candidate:

* use integra

Biobrane:

* used in burn patients to prevent evaporative loss and wound dessication

Dermagraft:

* dermal graft from neonatal foreskin fibroblasts

Apligraf:

* used for treatment of venous ulcers and diabetic foot ulcers

Silver ion dressing:

* kills broad spectrum bacteria

Hydrogel:

* waterproof and would prevent bacterial contamination

Epithelial cell migration:

* initiated by **loss of contact inhibition**
* occurs from periphery of the wound and adnexal structures
* **Myofibroblasts** causes contraction of the wound but has **no role in epithelialization**
* Collagen deposition is seen in the remodeling phase
* Release of cytokines from platelets plays an important role in the initiation of hemostatic initial phase

Scurvy: Vitamin C deficiency:

* deficiency in collagen cross-linking via the hydroxylation of proline and lysin to hyroxyproline and hydroxylysine
* impaired collagen synthesis and decreased in collagen tensile strength
* The hallmark of scruvy is:
  + hemorrhaging from any organ with petechia and swollen gums
  + loss of dentition
  + lack of osteoid formation

Pyridoxine (B6) and Folate:

* play an integral role in DNA synthesis and cellular proliferation

Vitamin A:

* epithelialization and fibroblast proliferation

Vitamin E:

* strong antioxidant and immunomodulator

Zinc:

* most important micronutrient
* acts as a factor for numerous metalloenzymes and proteins

Fibroblast: appear in wound after 3-5 days

* type 3 collagen is the predominant first in early wound healing
* then replaced by type 1 collagen

Wound contraction begins during the fibroblastic (proliferative) phase and continues well into the remodelling phase

Doxorubicin: (adramycin)

* causes dermal necrosis
* associated with severe soft tissue necrosis

Papain-urea ointment:

* Disadvantage: does not allow adequate wound debridement
* Papain: digestant of nonviable protein material but does not affect healthy tissue
* urea increases the digestive potency of pain
* Should not be used with silver as it deactivates it
* burning is a drawback
* good for small area but not for large area

Complications of body lift procedures:

* wound dehiscence: most common
* early and late
* Early: caused by patient movement
* Late: most often due to seroma
  + more common than infection and skin necrosis

Chronic anemia:

* is not associated with impaired wound healing

Aging is associated with reduced production of collagen and angiogenesis

* decreased response to environmental stresses

When the wound is sutured:

* the earliest time the wound is epithelialized is 24 hours

In acute wound: PLATELETS

* initiate coagulation, hemostasis and inflammatory cascasde

Neutrophils:

* found in wound within 24-48 hours

Macrophages:

* the dominant cell types within 48-72 hours

Eosinophils do not play any role in wound healing

After debridement of full-thickness wound such as pressure sore in a patient who is malnurished:

* place wound VAC

The peak tensile strength of the skin:

* at 6 weeks
* 80% of original wound strength

Hyperbaric oxygen therapy:

* can be used in osteomyelitis, nec fasci and ischemia perfusion injury

Most widely accepted hypothesis for silicone sheeting:

* increased hydration due to occlusion
* Should be worn for more than 12 hours a day for 3 months

Hypertrophic scars develop within 6-8 weeks after injury

Worsen up to 6 months then subside with time

Hypertrophic scars have predilection to flexor surface joints

Associated with contractures

In Keloids: compared to hypertrophic scars

* there is increased fibroblast proliferation rates and decreased apoptosis
* Decreased density of blood vessels
* Myofibroblasts are absent in keloids
* TGB-1 and 2 are found in both

Chronic wounds:

* Metalloproteinases are found in higher level in chronic wound
* Inflammatory phase is disrupted by prolonging inflammatory phase
* Proinflammatory cytokines are increased
  + which increase protease activity
  + and decrease protease inhibitor and growth factors levels
* this results in decrease matrix deposition and prevents epithelialization and healing
* Tissue oxygen tension is abnormally low

The mechanism of pressure garments:

* induce local tissue hypoxia
* reduce fibroblast proliferation
* reduce collagen synthesis

Corticosteroids:

* increase tissue proteinases

Normal skin ration of collagen:

type I: type III

4:1

During scar maturation, type III collagen is replaced with type I collagen

Neutrophils are the first leukocytes to enter the wound, peaking at 24 hours

first cells to enter the wound during the inflammatory phase are platelets

To form collagen:

* the carboxy and amino terminal ends must get cleaved from procollagen

Keloid have excess production of collagen

The maximal tensile strength of the wound is provided by Molecular cross-linking

* occurs during the remodeling phase of the wound
* Peak tensile strength at 6 weeks and is 80%
* Collagen synthesis peaks at 3 weeks and accumulates to its maximum level at 6 weeks

Collagen:

* type I: most abundant and found in skin. most abundant in healed scar
* type II: cartilage and vitreous
* type III: second most common type of collagen in the healed scar
* Type IV: basement membrane
* type V: widespread

Intermediate phase of wound healing:

* between day 3 and day 21
* mediated by collagen synthesis
* fibroblasts are the primary cells

Least improvement of hypertrophic scar is:

* use of vitamin E

Silicone sheets:

* increase static electronegative field

In immature scars/Hypertrophic scars

* the ration of collagen type 1:type 3
  + 2:1

Deep mechanical message: results in accumulation of collagen bands

The primary disadvantage of autologous cartilage: warping

TGF-BETA:

* stimulates fibroblasts to produce collagen

Corticosteroids: inhibit wound macrophages and disrupts the mechanism of fibrogenesis, endogenesis and wound contraction

Vitamin A: restores the monocytic inflammation process that is inhibited by corticosteroids

keloid and red hypertrophic scars:

* higher levels of adenosine triphosphate
* when compared to mature pink and white scars

Vitamin A deficiency:

* decreased in fibronectin and monocyte inflammation

Vitamin K definiciency:

* inhibits prothrombin production

Scurvy:

* prevents collagen cross-linking and the maturation phase

After intralesional injection of corticosteroids to keloid:

* decrease itching and burning

The process of epithelialization is enhanced with:

* basic fibroblast growth factor
* epidermal growth factor
* tretinoin
* keratinocyte growth factor

The process of epithelialization is impaired by:

* isotretinoin

The site most susceptible to keloid formation after injury:

* upper arm

IgG is the immunologic response to bovine collagen in patients exhibiting allergic sensitivity

In normal wound healing: collagen synthesis and collagen breakdown reach equilibrium at:

* 21 days

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| **In-Service Questions Notes: Anesthetics** |

The primary goal of optimal pain therapy:

* provide dynamic pain relief that allows early ambulation while reducing opioid consumption

Liposomal bupivacaine (Exparel):

* 96 hours of pain relief with single administration
* combined with NSAID, tylenol and COX inhibitors as part of ERAS

Risk factors for PONV:

* female sex
* history of PONV
* non-smolking
* young age
* general vs regional anesthesia
* postop opiods
* type of surgery

Transplant patient on tacrolimus: presenting with increased GFR and Creatinine

* reduce calcineurin inhibitors trough levels

Vichow’s triad:

* stasis in blood vessels
* endothelial (intimal) damage
* intrinsic hypercoagulability

Personal history of prior thrombotic event:

* single most important risk factor
* free flap success rate can be up to 80% in patients with identifiable hypercoagulable state

Sickle cell trait is not a risk factor for increase thrombotic complications

Malignant hyperthermia:

* autosomal dominant
* 50% chance of passing it to offsprings
* hypermetabolic reaction to volatile gases such as halothane, enflurane, isoflurane, sevoflurane and desflurane
* Also susceptible to the depolarizing effect of succinylcholine
* Preoperative workup:
  + Caffeine-Halothane Contracture test
  + piece of muscle is taken and exposed to ryanodine receptor agonist halothane and/or caffeine

Rivaroxiban: (xarelto):

* direct anticoagulant
* acts within the clotting cascade by blocking Factor Xa (which along factor Va helps convert prothrombin to thrombin)
  + this is the step where the intrinsic and extrinsic pathway converge to common pathway
  + leads to fibrinogen cleavage to fibrin and stabilized by factor XIIIa as cross-linked clot
* No need for monitoring and equivalent in efficacy
* Excreted in kidney so must be altered in patients with renal failure
* Reversal agent: recombinant coagulation factor Xa (Andexxa)
* prior to this reversal agent: FFP was the antidote of choice

Coumadin:

* affects vitamin K dependent factors II, VII, IX, X

Heparin:

* prevents clots propagation by blocking thrombin-mediated activation of fibrinogen to fibrin

There is no adverse effect is resuming Asa 81 mg

In a patient with closed head injury and evidence of increased intracranial pressure:

* fluid of choice: Hypertonic saline 3%
  + decreases intracranial pressure to greater efficiency than mannitol
* Other modalities:l hyperventilation, mannitol, diuretics and surgical decompression

Pregnant woman who presents to trauma bay after blunt abdominal injury with seat-belt sign:

* If patient is stable: the next step is: determine maternal Rh status
* Traumatic placental injury can cause materal-fetal hemorrahge
* many times it goes unnoticed
* as little as 0.001 mL from fetal blood can alloimmunize maternal blood if she is Rh negative
* therefore it is mandatory for all pregnant females to get maternal Rh status
* If maternal Rh is negative, then administer Anti-D antibody (IgG)
* within 72 hours
* single dose can be protective unless there is a hemorrhage more then 30 mL then will need more
* Also should provide all women with 4-hr of electronic fetal monitoring prior to discharge if they are more than 23 weeks GA

Effect of Epinephrine in case of cardiac arrest:

* Vasocontriction (alpha-1)
* Increase cardiac output (beta-1)
* Should be administered during CPR with PEA or asystole
* dose is 1 mg every 3-5 mins followed by 20 mL of normal saline

Brain death criteria:

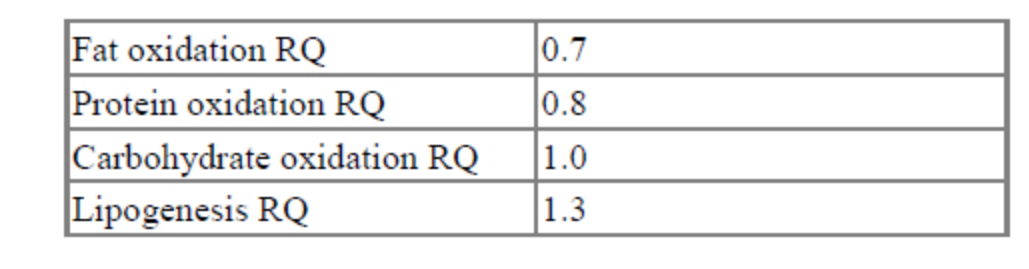
* absence of all brain stem reflexes needs to be present for brain death to occur
* Absence of corneal reflexes demonstrates an absence of brain stem reflexes
* Deep tendon reflexes is not part of assessing brain death

Tranexemic acid (TXA)

* inhibits the conversion of plasminogen to plasmin when administered intravenously
* it inhibits the proteolytic action of plasmin
  + thus inhibiting fibrinolysis

Respiratory quotient:

* measures the amount of oxygen consumed/ amount of CO2 produced
* Optimal RQ is 0.9: balance between oxygen consumption and CO2 production
* RQ>1: overfeeding
* RQ< 0.8: underfeeding



Resting energy expenditure:

* Weir equation
* REE= 3.94xVO2 + 1.1xVCO2

Pregabalin (Lyrica):

* shown to decrease narcotic consumption
* GABA analogue
* Decreases GABA in the brain
* more potent than gabapentin as an analgesic

The primary mechanism for increasing bleeding time associated with the use of Ketolorac:

* inhibition of Thromboxane A2
* Ketolorac: NSAID
* inhibits COX-1 and COX-2
* impaired platelet aggregation by thromboxane A2

Tension pneumothorax:

* needle decompression at the second intercostal space

After being stuck with needle from seropositive patient with HCV:

* retesting for HCV antibodies is done at 6 weeks, then 3 months, then 6 months

Delirium:

* hypoactive
* hyperactive
* Avoid benzodiazepine and antihistamine

In a diabetic patient with AKI post-op

* control blood sugar
* not higher than 180
* other recs:
  + isotonic crystalloids to expand intravascular volume
  + avoid restriction of protein

Test to confirm sepsis:

* lactate

Minors cannot receive or donate organs without the consent of their parents

Creutzfeldt-Jacob disease and cancer are contrainindication for organ donation

HIV is not a contraindication for organ donation as long as the donor and recipient are HIV positive

New guidelines for CPR:

* after shock delivery, you should continue with chest compression for 2 minutes
* Do not waste time checking for pulse
* Check pulse after finishing two minutes of CPR

Malignant hyperthermia:

* the inhaled anesthetic causes release of calcium into the skeletal muscle
* abnormal build up of calcium into muscle cells
* causing the muscle to remain contracted
  + producing high levels of lactic acid, CO2, phosphate and heat
* Physiologic changes:
  + metabolic acidosis
  + hypercapnia
  + hyperphophatemia
  + fever
  + hyperkalemia
* Treatment is:
  + discontinuation of volatile agents
  + succinylcholine
  + dantrolene
  + Tx of hyperkalemia and metabolic acidosis

Administration of prophylactic abx is appropriate for:

* Mastopexy
* breast surgeries are the only clean cases in which prophylactic abx is recommended
* Cefazolin: single dose is most appropriate

Minute ventilation = RR x Vt

Increasing minute ventilation can decrease respiratory acidosis

Residual volume:

* The volume of air still remaining in the lungs after forcible expiration

Inspiratory capacity:

* volume of air that enters the lungs after forcible inspiration

Inspiratory reserve= inspiratory capacity - tidal volume

(the difference between the deepest breath and the quit breath)

Expiratory reserve volume:

* the volume of air that stays in the lungs after expiration

Vital capacity:

* the amount of air that can be forcefully expired from lungs after the most forcible inspiration possible

Total lung capacity:

* the combination of vital capacity and residual volume

Patient in PACU with disorientation, lightheadedness and muscle twitching: Lidocaine toxicity: antidote: **Fat emulsion**

* symptoms occur within few minutes after injection
* can last for up to 60 mins
* Symptoms can range from
  + central nervous system excitement: circumoral numbness and tingling, metallic taste, lightheadedness, dizziness, visual and auditory disturbances, disorientation and drowsiness
  + Higher dose: muscle twitching, convulsions, unconsciousness, coma, respiratory depression and arrest, cardiovascular depression and collapse
* Cardiovascular manifestations:
  + chest pain, palpitations, hypotension and syncope

Flumazenil: benzo

Dantrolene: malignant hyperthermia

CDC categorizes “superficial surgical site infection”:

* no more than 30 days
* involves the skin and subcutaneous tissue
* involves at least one of the following:
  + purulent drainage from site
  + positive cultures
  + incision that is deliberately opened
* Diagnosis by surgeon

The most important factor to prevent infection in trauma patient with lower extremity wound:

* administration of Abx within 3 hours
* cephalosporin, gram negative coverage +/- anaerobes for grossely contaminated
* no clear advantage of debridement within 6 hours vs 24 hours as long as abx is initiated in a timely manner

For anaphylaxis:

* intramuscular anterolateral thigh injection of epinephrine 0.01 mg/Kg (not exceeding 0.5 mg) every 5-15 mins
* meantime to arrest after anaphylaxis in the hospital is 5 mins
  + only 14% received epi prior to arrest
* The do the ABC, get IV access and supplemental oxygen

Hypothermia is not a criteria for brain death:

* needs to be reserved for 4 hours at least and up to 24 hrs

Must establish a cause for brain death prior to starting brain death examination

Patient who develops allergy to vancomycin as red man syndrome:

* the most appropriate step after stopping vancomycin is the administration of antihistamine
* then vancomycin can be resumed back at a slower rate once the rash and symptoms improve
* Red man syndrome:
  + most common manifestation of allergic reaction to vancomycin
  + patients have generalized rash with erythema, burning sensation and discomfort
  + this allergic reaction is not antibody mediated and can occur even with first administration

Tension pneumothorax:

* pressure builds up leading to decrease venous return
* tracheal deviation to opposite side
* hyperresonance on the same side

Types of rejection in transplantation:

* hyperacute
* accelerated
* acute
* chronic

Hyperacute rejection:

* humoral response
* mediated by antibodies already in the host
* begins in the operating room

Accelerated rejection:

* cellular and humoral
* begins on day 3-5 after transpantation

Acute rejection:

* regulated by the activation of T-cells
* begins on day 5 post-op and last for 4-6 months
* graft biopsy is taken for dx

Chronic rejection:

* antibody and cell-mediated immune response
* several months to years after transplantation

Graft-vs-Host:

* stem cells or bone marrow transplantion
* activation of immune cells of the graft by the recipient’s tissue

Free water deficit: the amount of water required to bring sodium level to normal

* = normal body water x (1-serum sodium/140)

Superior alveolar nerve:

* branch from infraorbital nerve
* which is a branch from the maxillary division of trigeminal nerve
* provides paraesthesia to central and lateral incisors, canine and first and second bicupids

Avoid neck extension in positioning to prevent injury to vertebral artery

Gravid uterus:

* compress the vena cava
* 30% decrease in CO

The most common cause of fetal death:

* maternal hypotension and maternal death
* scond most common cause: placental abruption

TAP block:

* transverse abdominis plane block
* between internal oblique and transverse abdominis
* Site of injection: horizontal line from umbilicus to vertical line at the anterior axillary line
* 20 mL injected

Petit (lumbar) triangle: long acting local anesthetic is injected into the lumbar triangle

* external oblique anteriorly
* LD posteriorly
* iliac crest inferiorly

As a result of crush injury:

* leading to Rhabdomyolysis
* leading to hypocalcemia
* hyperkalemia
* myoglobin: renal failure
* urate
* hyperphosphatemia
* metabolic acidosis

Closed head injury:

* Diabetes insipidus
* decrease ADH/Vasopressin
  + released by posterior pituitary
  + produced by hypothalamus

In a patient undergoing conscious surgery and develops low blood pressure:

* first thing to do is increased rate of IV fluid

Rapid response team (RRT): called when patient has:

* rapid heart rate
* hypotension
* respiratory distress
* altered level of consciousness

PR interval is long: first degree heart block

Progressive prolongation of PR interval followed by dropped QRS: Second degree heart block (Wenckebach)

Multifocal atrial tachycardia:

* 3 distinct morphologically P waves with heart rate of 110-140

Atrial fibrillation:

* dilation of left atrium
* normal QRS tachycardia without P wave

Atrial flutter:

* increased atrial rates 25-350
* not all atrial beats enter the ventricle
* ratio 2:1
* sawtooth flutter

Patient with anaphylaxis:

* acute onset of generalized hives and swelling with either respiratory compormise or hypotension

Avoid bolus administration of epinephrine due to risk of overdose and dosing error

IV infusion of epinephrine when refractory to intramuscular epinephrine but not the first choice

1% lidocaine with epinephrine: should be administered about 25 minutes prior to initiation of procedure for hemostasis

When you have a cardiac arrhythmia question always check if electrolytes are normal

Treatment of hyperkalemia:

* administration of calcium gluconate
* Administration of regular insult
* B-2 agonists such as albuterol
* lasix (K+ wasting diuretic)
* Cation exchange resins (kayaxelate)
* Dialysis

In addition to giving patient 4 mg of zofran prior to surgery, to decrease the POVN:

* given arepitant 40 mg should be given orally 1-3 hours before induction
* highly selective brain penetrant: neurokinin-1 receptor antagonist

Ondasetron:

* serotonin 5-HT3 receptor antagonist

FeNa= (UNa x PCr) / (PNa x UCr) x100%

FeNa < 1%: prerenal failure

FeNa> 2%: ATN

When you have seizure due to lidocaine:

* first secure the airway

In a patient with recent drug eluting stent less than 6 months:

* must continue aspirin and plavix

In a patient with preoperative Von Willbrand disease:

* the dosage is determined by the level of factor 8 VIII

Pulse oximetry read is altered by:

* HYPOTENSION
* two wavelength one that reads loaded and the other that reads unloaded Hb
* need pulsatile blood

Scopalamine patch:

* can cause fixed dilated pupil due to contamination of the eye with scopalamine on the same side
* Dripping pilocarpine: into the eye will not cause contriction if the mydriasis is pharmacologic but will occur if it is paralytic

Bier block:

* good for short procedure

For inadverent injection of epi in the finger in a pediatric patient:

* the answer might be observation or elevation
* rarely the answer is injection of phentolamine

Ketamine:

* IV or intramuscular
* IV associated with:
  + less laryngospasm
  + less vomiting
  + shorter duration of onset and effect

read question 87 (too long and Im too tired)

Succinylcholine in patient with burn or history of burn can exacerbate hyperkalemia

EMLA cream takes about 30 mins to take effect

Must keep OR temperature around 70 F or 21.1

Cocaine:

* causes constriction of epicardial arteries

Hypersensitivity reaction with urticaria caused by procaine (read question #100)

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| **In-Service Questions Notes: Melanoma** |

Acral lentiginous melanoma:

* prognosis is worse than all other melanomas
* Least common subtype
* but highest percentage of melanoma is dark pigmented patients
* poor survival rate due to late prognosis
* **Tumor thickness** is the most important prognostic factor
* ALM prognosis factor 80% vs 91% for all other melanomas
* Predominantly found in nail beds, palms and soles

Clinical features of melanoma:

* asymmetry
* irregular border
* heterogenous color
* Diameter more than 6 mm
* Evolution

 \*\* After thickness, ulceration is the most important prognostic factor

* a component of T staging
* more important than mitotic rate (which is no longer a factor in determining T stage)

Subungal melanoma

* 7-3.5% of all melanomas
* diagnosed late due to location and is more advanced
* difficult to distinguish from benign melanonychia

Concerning characteristics of subungal melanoma:

* age btw 50-70
* longitudinal band greater than 3 mm
* irregular border
* change in lesion size or coloration
* Extension into periungal skin (Hutchinson sign)
* personal or family history of melanoma
* single finger involvement

The primary indication for congenital melanocytic nevus:

* Diameter: greater than 10 cm makes it a giant nevus
* Definition of giant nevus:
  + Larger than 20 cm or that will become 20 cm when the child is grown
  + more than 1% the size of the head and neck
  + more than 2% of the body
  + Surface area more than 100 cm2
  + nevus that cannot be excised in one stage
* The main indication for excision:
  + malignant potential 5%
* A patient that has more than 3 nevi, this potentially increases the risk of malignant melanoma

In a pregnant patient in the first trimester with melanoma

* excised melanoma and then performed delayed SLNBx in the second trimester or after delivery
  + to minimize the risk of preterm contraction and spontaneous abortion

Nodular melanoma:

* second most common type
* 10-20%
* Head and neck and trunk
* more in men
* Upon invasion of the dermis:
  + rapid vertical growth vs superficial nodular where there is horizontal growth
* These lesions are dark, dome shaped and has the appearance of blood blister
* Increased malignant potential
* well-circumscribed epidermal component with dermal proliferation with atypical melanocytes

Superficial spreading:

* lateral spreading of melanocytes in the epidermis
* this is the most common subtype
* develops prolong horizontal spreading prior to developing vertical component
* In sun exposed areas and on pre-existing nevi
* They appear flat and become irregular and raised with growth

Lentigo maligna:

* rare form of melanoma
* grow slowly in radial fashion before vertical phase
* more common in older women
* related to sun exposure
* found on face, head and neck, and tan convoluted lesions

Desmoplastic melanoma:

* rare subtype
* aggressive local growth
* rarely metastasize
* histologically: appear similar to spindle cell tumors
* confused with common nevi, Spitz nevi or hamengioma

Melanoma:

* three subgroups of distant mets
* skin and subcutaneous tissue (best prognosis)
* lung mets (intermediate prognosis)
* Visceral prognosis (brain and liver) worst prognosis
* Elevated LDH: upgrades the first two groups to the last subtype

Melanoma depth of 1-4 mm is an indication for SLNBx

Even subungal melanoma in-situ should be treated with wide local excision

Congenital melanocytic melanoma:

* on the lumbar region with coarse hair
* patient is at increased risk of occult spina bifida
* these lesions are also associated with neurocutaneous melanosis

Lentigo maligna in-situ

* occurs in elderly with history of sun exposure
* slowly growing in radial phase

Need to review Breslow depth

Benign streaks in nailbeds are very common in african american:

* occur spontaneously with advanced age

When you have subungal pigmentation:

* not sure what the diagnosis is yet. then do SHAVE biopsy

Congenital melanocytic nevi (CMN):

* present at birth and become more apparent in the first year of life
* found in 1-2% of general population
* arise from melanocytes

Large axial CMN:

* associated with neurocutaneous melanosis
* with CNS involvement
* CNS manifestations:
  + hydrocephalus, seizure, focal deficit and partial paresis
* CNS involvement includes the  presence of large or multiple axial CMN or both
* nevi on the presence of the posterior midline
* presence of multiple satellite nevi

The external auditory meatus and the superior portions of the ear:

* drain into the mastoid region
* superficial cervical chain of lymph nodes

Patients with large melanocytic melanoma:

* a greatest risk of malignant transformation of the CNS
* large congenital melanocytic nevi:
  + increased risk of neurocutaneous melanocytosis
  + collection of melanocytes is present in leptomeninges
  + also results in CNS melanoma
  + MRI screening early in life is recommended
    - especially in those with posterior midline nevi and satellite nevi
* The incidence of rhabdomyosacroma is also increased with congenital melanocytic melanoma

For nail melanoma-in situ:

* wide local excision with skin with skin grafting

For nail melanoma with depth of 1 mm:

* amputation to interphalangeal joint

Indication for SLNBx:

* melanoma depth more than 1 mm
* SCC > 2 cm
* Marjolin ulcer (burn scar carcinoma)
* Merkel cell carcinoma

20-25% of subungal melanoma appear to be amelanotic

The presence of pigment in the paronychial fold:

* Hutchinson sign

Xeroderma pigmentosum:

* associated with invasive malignant melanoma
* Autosomal recessive
* intolerance to ultraviolet light
* absence of DNA repair mechanism
* freckling with thickening of the skin with thinning of the subcutaneous tissue
* malignant melanoma occurs in children younger than 10 yrs

Actinic keratosis:

* 10% can develop SCC
* Surgical excision
* or 5-FU

Hutchinson freckle’s:

* is another name for lentigo maligna melanoma
* or melanoma in site
* which affects the epidermis only
* fair skinned, elderly
* darkened macule or patch of darkened skin on face or sun-exposed area
* risk of invasive melanoma is 5-30%

Benign juvenile melanoma:

* include spitz nevus
  + spindle cell nevus
  + epithelioid nevus
* pink to red in color and most likely appear on the face of the child
* can be mistaken for melanoma
* conservative tx or  complete excision

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| **In-Service Questions Notes: GU reconstruction** |

Prerequisite for chest surgery: WPATH criteria:

* ONE letter from qualified health professional
* Need to be on hormone therapy
* one year of continuous living in a gender role

For FTM chest surgery:

* persistent, well-documented gender dysphoria
* capacity to make full informed decision and able to sign consent for themselve
* age of majority in a given country
* If significant mental or medical health concerns are present, they must be reasonably controlled
* Hormone therapy is not a prerequisite
* ONE referral

For male to female:

* need to have one complete year of hormone therapy but not specific criterion

For genital surgey:

* 2 letters of referral
* must be on one year of hormone therapy
* lived in the congruent gender for at least one year

VRAM is associated with lower rates of perineal wound and flap complications:

* when compared to gracilis and gluteal flaps

Primary closure of the perineum is associated with twice the risk of wound complications

Do not use pudendal flap when there is radiation

For male to female genital surgery:

* the most common complication is **neovaginal stenosis**

Female to male:

* **complication is urological and anastomosis**

Radial forearm flap:

* can make a phallus of 7.5 to 14 cm
* Radial artery is anastomosed to the external iliac artery or femoral artery
* The medial and lateral antebrachial nerves are anastomosed to ilioinguinal and clitoral of deep pudendal nerves

Goals of phalloplasty:

* aesthetically pleasing neophallus
* with tactile and erogenous sensation
* ability to micturate while standing
* ability to perform penetrative intercourse

The most common complications of phalloplasty:

* urologic in 40%
* RRF: 26% fistula, 12% stricture

The most common location of fistula and stricture:

* at the site where the **phallic urethra and the fixed urethra are anastomosed**
* half can be managed non-operatively:
  + suprapubic bladder catheter
  + endoscopic fistula dilation

Masculanizing mastectomy WPATH:

* patient is able to provide consent and has capacity to make medical decision
  + if younger than 18, must have parent consent and assent
  + 12 months history of hormone replacement therapy
  + living at least 12 months in their current gender role
  + psychiatric illness is controlled
  + documentation of gender dysphoria by at least two health care workers???

Blood supply to the penis from the internal pudendal artery which continues as:

* bulbourethral artery
* deep corporal/cavernosal artery
* dorsal penile artery

Repair of dorsal penile artery: helicine artery is the terminal branch of dorsal penile artery

* predicted the best sexualy, urinary and sensation outcome
* there are two deep dorsal arteries and one vein

Pudendal thigh flap:

* based on terminal branches of superficial perineal artery
* the superficial perineal nerve, follows the curve of the superficial perineal artery (from pudendal nerve)
  + then it becomes the posterior labial nerve

Fibular free flap:

* no need for prosthesis for erection
* also allows for sensation via the superficial peroneal nerve
* the incidence of urethral stricture is greater with fibula
* sensation though is not as good as the radial forearm

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| **In-Service Questions Notes: Facial palsy** |

Low lip recontruction:

* if more than 2/3 of the lower lip is gone, need to repair with bilateral lower lip-cheek advancement flap (Bernard-Webster)
* If the surrounding soft tissue is damaged, then do free flap
* Lip switch flap is good for 1/3-2/3 defects
* Karpandzic: is good for up to 2/3 central lip defects

Static reconstruction:

* Good when you have an elderly patient with comorbidities
* patients with poor prognosis
* Those who failed facial animation surgery

Lyme disease:

* Borrelia by ticks
* Bull’s eye rash is common finding but absence does not mean it is not there
* Doxycycline is abx of choice
* Neurological findings: several days to several weeks
* Cephalexin/Keflex: used as third line in the treatment
* Dapsone is also used in post-treatment

For viral Bell’s palsy:

* antiviral with corticosteroids at the same time

In Neonate with unilateral facial palsy without any other issues:

* think of temporal bone abnormalities
* need CT scan of head and temporal bone

In EMG:

* fibrillation is seen in muscles that are alive but awaiting reinnervation

Electroneurography:

* used for facial nerve paralysis
* one electrode placed over the stylomastoid foramen and the other in the nasolabial fold

The rate of return of **stapedius muscle reflex** can be used to predict the rate of return of facial nerve function after facial nerve paralysis

Nerves that can be used for transfer:

* massteric nerve
* Hypoglossal nerve: can cause oropharyngeal morbidity
  + causing ipsilateral tongue atrophy
  + never ever used for bilateral nerve transfer
* Glossopharyngeal nerve is **not used!!!**

To restore dynamic smile:

* 2 stage cross facial nerve graft
* single stage using the massteric nerve of trigeminal
* both utilize gracilis muscle:
  + consistence of vascular pedicle
  + long nerve (obturator)
  + expandable
* Importance to **donor nerve axonal density**
* Age: no issue in 2-stage in kids less than 10 yrs old
  + **results are inferior in adults**

Facial nerve paralysis:

* congenital: traumatic, genetic
* acquired: traumatic, neoplasm, infectious, inflammatory
* 40-75% idiopathic: Bell’s palsy most common cause
* majority in children caused by infection
  + caused by otitis media

Primary repair of the nerve should be attempted in 72 hours before the neurotrasmitter stores are depleted **for motor end plate depolarization** and it will be difficult to  stimulate the distal nerve

* injuries anterior to a line drawn from corner of the eye to the mouth:
  + recover spontaneously

Use of masseter nerve:

* patient needs to clench in order to smile
* l**ess spontaneity**

When a patient has cerebellopontine tumor resection:

* best to do CFNG with **hypoglossal babysitter** nerve/nerve to masseter

Hyperkinesis of the contralateral side:

* need mirror training with botox: that can help
* Selective facial myotomy has been used for improvement of synkinesis

In a patient with history of Bell’s palsy and has synkinesis with squinting when smiling:

* If patient does not want botox because she is pregnant:
  + then do facial neuromuscular retaining using biofeedback using mirror and electromyography

Nerve to the masseter:

* most commonly used transfer due to proximity and low morbidity
* Spontaneous smiling is achieved routinely in 59% and occasionally in 29%

After schwannoma resection and facial nerve sacrifice, the fastest way to get restoration of natural reflexive dynamic blink:

* **nerve transposition**: which is NERVE transfer
* quickest way to get reinnervation to the orbicularis oculi muscle
* (nerve regeneration 1 mm/day)

Ramsay Hunt Syndrome:

* Herpes Zoster Oticus
* Form of herpes zoster
* In in reactivation: affects **afferent and motor neurons of the facial nerve**
* Tx: **combination of corticosteroids, narcotics and acyclovir**

Facial Myokemia:

* associated with MS
* Wormlike movement of facial muscles

Mobiüs syndrome: congenital facial paralysis

Cholesteatoma:

* bening overgrowth of the middle and external ear from desquamating keratin
* locally aggressive and cause destruction and facial nerve

For lower lip reconstruction in a patient that requires symmetric, dynamic and competent lip:

* need functional gracilis muscle
* if you use split thickness skin graft from the scalp:
  + color mismatch will be superior to radial forearm flap

Gracilis muscle:

* has reliable pedicle
* can be harvested supine
* incision is hidden
* able to generate enough contraction force for animation
* direction of pull is only one: restore animation in one direction

Mobiüs syndrome:

* paralysis of 6th and 7th nerve
* kids are motivated and they do well with free gracilis flap
* Donor nerve: nerve to masseteric from Trigeminal

For Gold-weight prosthesis:

* it must bring the upper eyelid within 2-4 mm of the lower eyelid
* completely covers the cornea
* Should not aim for complete closure of the eye
* Contralateral symmetry is rarely achieved and should not be a goal
* The speed of closure of the eyelid is slower than the contralateral side and should not be a factor in the criterion

Facial nerve regeneration:

* Tinel sign can be helpful
* If patient does not recover within 6 months, should consider facial reanimation

Karapandzic flap:

* should be considered for patients with 1/3-2/3 defects of the lower lip
* entails making circumoral incision and mobilize the orbicularis oris muscle without disrupting the innervation and vascular supply
* Main advantage of this technique is a continuous sphincter of orbicularis muscle is created, helping to restore oral competence

Estlander flap:

* full-thickness
* cross lip transposition flap
* reconstruct lateral defects of the lower lip (1/3-2/3)
* Recreate the oral commisure

Melolabial flap:

* reconstruction of large full-thickness lower lip defects
* requires grafting of the deep surface of the flap
* less reliable random blood supply
* does not provide a functional muscular oral sphincter

Submental artery island flap:

* based on submental branch of the facial artery
* a paddle of skin, subcutaneous fat and fascia harvested from submental area
* Used for coverage of the lower face, preauricular area, inferior and lateral neck wounds

Facial artery myomucosal flap:

* oral mucosa, submucosa and small amount of buccinator
* facial artery and venous plexus
* good for reconstruction of inner lip mucosa: same color, texture and moisture
* Can be used for reconstruction of the dry vermillion but this will result in scabbing and drying
* Not indicated for full-thickness defects

Used of masseteric branch of trigeminal:

* single stage
* good muscle reinnervation and commisure contraction
* no reports of crossbite
* variable smile symmetry and spontaneity
* Requires cortical adjustment and behavioral education

In children:

* most common cause of acquired facial nerve palsy is Bell’s palsy
* second to trauma and infection
* followed by neoplastic and congenital

Cervicofacial flap:

* inferomedially based
* transfer of large amount of skin and subcutaneous fat from loose preauricular and neck laxity
* Incision starts along the superior aspect of the defect, along the outer canthus to zygoma then to preauricular crease
* The incision ends in retroauricular hairline or curves anteriorly in the region of the neck. preferably within the cervical rhytid
* Anchoring the flap to zygoma is recommended to avoid tension on the lower eyelid and ectropion

Hypoglossal nerve transfer:

* good facial tone
* exhibit synkinesis of the treated side and sometimes hyperkinesis
* Botox is used when there is hyperkinetic muscles
* inject about 6-12 points and up to 24: you want attenuation rather than paralysis

For large central upper lip defect:

* bilateral karapandzic flaps with Abbe flap for philtral reconstruction
* Karapandzic: transfer the muscle without deinnervation of the musculature (Gilles flap)

The inset of the gracilis muscle:

* should be attached to zygoma or temporalis fascia
* Distally to orbicularis oris muscle lateral to the commisure
* in the vector of zygomaticus major

Risorius:

* pulls the commisure in a horizontal direction

Bernard-Webster:

* bilateral advancement cheek
* good for central lip reconstruction
* not for commisure
* excision of Burrow’s triangles on both sides

Karapandzic vs Gillies:

* In Kaparandzic: you preserve the facial nerve hence preserving the function

Buccal branch of facial nerve:

* travels with Stenson’s duct
* keep stent for 2 weeks when you repair stenson’s duct

In case of Bell’s palsy:

* to achieve symmetry: inject botox on the unaffected side for symmetry

Temporalis muscle for facial reanimation:

* creating a bulge under the skin and cheek augmentation
* requires activation of trigeminal nerve

**Nasalis muscle:**

* dilation of nasal aperture: alar fibers + **levator labii superioris**
* constriction of nasal aperture: transverse fibers

**Corrugator and procereus:**

* innervated by the temporal branch of facial nerve

**A patient with synkinesis: a patient whose eye closes when they chew**

* Treatment: botox into the orbicularis muscle

**A patient with Bell’s palsy: develops ectropion:**

* because of paralysis of the orbicularis oculi muscle

**Frey syndrome:**

* during parotidectomy
* regeneration of auriculotemporal parasympathetic fibers to sympathetic nerve fibers
* Gustatory sweating when eating
* Tx: botox in the affected area, fat grafting, placement of ADM

**Great auricular nerve:**

* behind SCM
* 6.5 cm inferior to tragus

**Tympanic branch of glossopharyngeal (nerve of Jacobson):**

* innervates the tympanic cavity
* ear pain can be referred pain from head and neck malignancy

**Bell’s palsy recovery:**

* 85% within the first 3 weeks
* 15% within 3-6 months
* EMG findings not evidence until 2-3 weeks

**Success of cross face nerve grafting:**

* **depeneds on the time elapsed from paralysis to surgery**

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| **In-Service Questions Notes: Nasal Reconstruction** |

Goals of nasal reconstruction:

* establish structural support
* provide nasal lining
* provide skin coverage of similar texture and color

Complications of alar rim reconstruction:

* poor scar
* notching
* nasal obstruction
* narrowing of nostril

Composite graft from the ear:

* harvested along the helical root
* should be reserved for maximal diameter of 1 to 1.5 cm
* wound bed should be well-vascularized
* non-smoker patient
* Composite skin graft follow a predictable healing pattern:
  + white/blue
  + then pink/red as revascularization improves wound healing

Tip of the nose:

* local transposition flaps such as:
  + rhomboid
  + bilobed
  + V-Y advancement flap
* For defects more **than 2 cm:**
  + paramedian flap

alar defect:

* less than 0.25 cm
  + primary closure
  + healing by secondary intention
  + defect **not near the rim**
* can also use **nasolabial flap**
* defect more than **1.5 cm:**
  + **forehead flap with cartilage graft**

Bilobed flap:

* distal nasal defect

Glabella flap:

* ideal for proximal reconstruction

Dorsal nasal flap:

* an option for **tip** if large enough

When there is radiation to the nose:

* must bring healthy tissue, well-perfused, non-irradiated

Rhinophyma:

* progressive hypertrophy of the **sebaceous glands** of the nose
* causing enlargement and bulbous nose
* end stage of rosacea
* Tx: topica and oral abx for mild cases
* tangential excision and laser
* There is **no association** with alcohol abuse
* **No association with radiation exposure**
* **no association with psoriasis**

BCC margin:

* 3 mm for BCC less than 2 cm
* 13 mm defect on the ear is a bit large for primary closure and will result in cupping
* therefore: **chondrocutaneous advancement flap**

Nasal subunits:

* ala x2
* soft triangle x2
* tip
* sidewall x2
* dorsum

Bilobed:

* **circular defects on the tip**

Dorsal nasal flap:

* rotates tissue from dorsum to tip

Sidewalls:

* advantage of thin skin with underlying bone that resists the contracture

A patient with 1.4 cm full-thickness defect of the nasal tip:

* bilobed flap is the answer
* best color match and thickness for moderate size full-thickness defect
* heal with lots of scar but they all heal very well

Rhinophyma:

* final stage of rosacea: most severe expression
* Disease of **sebaceous glands**
* Rosacea is more common in women
* Rhinophyma is almost exclusively in men
  + occurs mostly in caucasian men
  + 5-7th decade
  + strong association with alcohol
  + rare in Japan and african american
  + tuberous enlargement of the nose
  + thick skin
  + **foul smelling sebum**
  + excessive enlargement of the sebaceous gland and surrounding connective tissue
  + lymphedema: late rosacea
  + **BCC transformation is late**
  + Tangential excision

A patient with 1.7 cm defect of the nasal tip and ala defect, exposed cartilage with no perichondrium:

* correct answer is locoregional flap
* Nasolabial flap can be harvested either superiorly or inferiorly based
  + 2 stage procedure
  + When placed for alar margin repair:
    - conchal cartilage is used to prevent notching
* Dorsal nasal flap:
  + for lower half of the nose
  + **less than 2 cm**
  + **above the level of tip defining points**

Septal pivot flap:

* provide lining and support
* dissection of the mucosa and septal cartilage
* based on septal branches from the bilateral superior labial vessels

**Bipedicled mucosal advancement flap:**

* provides lining only
* based on medially the septum l(abial artery)and lateral on vestibular blood supply

**Ear composite graft** is useful if the graft is **less than 1.5 cm**

Turn-in flap involves skin that is elevated and attached only at the edge of the defect to provide lining

The aesthetic subunits of the nose:

* nasal dorsum
* nasal tip
* columella
* 2 ala
* 2 side walls
* 2 soft triangles

If the defect includes more than 50% of the subunit: it is best to reconstruct the entire subunit: Burget et al.

Rod Rochrich argues with that statement

Defects less than 10 mm: primary closure or secondary intention healing

Defects 10-15 mm: bilobed flap

Defect greater than 15 mm: paramedian flap

Cheek advancement flap can be used to replace the lateral sidewalls

Nasolabial flap:

* less than 2 cm can be used for repair of alar defects up to 2 cm
* **also columella and nasal lining**

In a patient with entire lateral nasal wall that is resected with intact ala and tip

* a contralateral mucoperichondrial flap can be harvested
  + based on the anterior ethmoidal artery
  + provides lining and support

Patient with nose trauma and numbness of the tip:

* damage to anterior ethmoid nerve branch from V1
* external branch of the anterior ethmoid emerges between the nasal bone and the upper lateral cartilage
* provides sensation to the skin of the lower dorsum and the tip

The infratrochlear n. is a branch from V1:

* sensation to the skin of the bridge and upper lateral nasal area

Nasopalatine nerve, branch of V2:

* nasal septum and anterior hard palate

The maximum angle of transposition for bilobed flap:

* 100 degrees
* Zitelli modification for proper design of the flap otherwise bad scars from excessive rotation, deformity and strangulation of the flap
* **Should not excess 90-100 degrees (45-50) per flap**
* with the second smaller flap is placed on the dorsum of the nose or the sidewall (loose skin)
* If a defect requires 60 degrees of rotation or 30 per lobe
  + then do banner or rhomboid flap (single lobe rotation)

The primary reason for a patient to seek MOHS surgery:

* **tumor with indistinct border**: need to maximize the preservation of uninvolved skin
* Adventageous:
  + morpheaform carcinoma
  + recurrent tumors
  + indistinct margins
  + cosmetic or functional sensitive areas

Factors that are NOT primary important:

* size
* multiple subunits
* gender
* age

BCC margins:

* 4-10 mm

In a patient where the dorsal nasal bony support is gone:

* it is best replaced with cantilever cranial bone grafting
* can be from cranium, rim or iliac crest
* Cranial has several advantages:
  + longer longevity
  + painless
  + keeping the operative fields in the same place

Hinged septal flap:

* L-shaped flap of septal cartilage/bone designed off the dorsal border of already reduced septum in order to reconstitute the dorsal border of the nose in its distal two thirds including support of the nasal tip
* the shorter the limb of the L-should sit on the nasal spine
* used to provide support to the nose

Hull graft:

* cartilage graft from auricular concha
* already curved
* provides height for the dorsum
* used in saddle nose deformity

The main blood supply to the nose:

* ophthalmic branch of the internal carotid
* facial artery off the external carotid
* (from both carotids )

Dorsal nasal flap:

* dominant blood supply from the angular artery which is the terminal branch of the facial artery
* Facial artery: from external nasal artery
  + crosses the base of the mandible
  + anterior to masseter
  + gives superior labial artery to the columella and nasal tip : via nasal septal artery and lateral nasal artery
  + continues towards the medial canthus as Angular artery

The ophthalmic artery of the internal carotid artery gives:

* anterior ethmoidal artery
* the terminal branch also knows as the dorsal nasal artery
* gives small area of skin on the dorsum of the nose from the nasal bones  from the undersurface
* transected during elevation of dorsal nasal flap

Internal maxillary artery

* is one of the terminal branches of the external carotid artery
* supplies the lateral face
* terminates as the infraorbital artery which anastomose with the angular artery

Ophthalmic artery: gives off

* dorsal nasal artery
* supratrochlear artery

The ideal time for second stage surgery of paramedian  flap is:

* 3-4 weeks

Nasolabial flap:

* good for dorsal nasal wounds
* alar
* tip
* 2.5- 3 cm
* require maintenance of the dermal subdermal plexus
* problem is loss of cheek-ala concavity when reconstructing the nasal ala

Bilobed flap:

* 0.5-1.5 cm
* middle dorsum and lateral upper aspect are good donor sites
* laterally based design for tip and medially based design for ala
* wide underminning
* must preserve the perichondrium and periosteum
* The diameter of the first lobe is equal that of the defect, and the second lobe is smaller

Single-lobed area such as Banner flap:

* preferred in thin skinned area

Full-thickness skin graft:

* good for upper 2/3 of the nose
* 2.5 cm in diameter

Axial frontonasal flap:

* Reiger’s flap
* good for dorsal midline defects less than 2 cm

**Check question #29**

* for large complex defect involving the ala and composed of structural, lining and coverage
* Do staged forhead flap with septal mucoperichondrial flap (ipsilateral) and septal and conchal cartilage grafts

**Complication of alar rim reconstruction:**

* notching
* scarring
* airway obstruction and narrowing
* best reconstruction by composite full thickness graft from the ear

The area of the nose that is most likely to provide **aesthetically unpleasing** appearance is:

* nasal tip
* due to prominent position and high visibility

Healing by secondary intention:

* most aesthetically acceptable in the medial canthal area
* (also glabella, nasolabial fold and philtrum 90% showed aesthetically acceptable)

Question #36: can be tricky:

* dorsal nasal flap:
  + can be used for defects involving the tip
  + as large as 2 cm (definitely not 3 cm)
  + potential disadvantage is the violation of multiple subunits

Medial canthal area:

* can be reconstructed using local flap or skin graft

Nasolabial flap:

* best use for alar rim

Bilobed up to 1.5 cm

Cheek advancement flap is good for lateral nose above the alar crease

Columellar full-thickness defect measuring 2 cm:

* nasolabial flap can be used for full-thickness defect
* based on angular artery which is the terminal branch of the facial artery

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| **In-Service Questions Notes: Blephroplasty** |

Eyelid muscles:

* Innervated by facial nerve
* occulomotor nerve
* sympathetic fibers

Sympathetic fibers:

* Upper lid retraction:
  + superior tarsal muscle: Müller muscle
* Lower lid retraction:
  + inferior tarsal muscle

Levator palpebrae superioris: main upper eyelid retractor

* Oculomotor nerve

Facial nerve:

* orbicularis: zygomatic and temporal
* procereus
* corrugator supercelli
* frontalis

In a patient who had upper bleph with local that has epinephrine and later developed lagopthalmos after surgery:

* stimulation of Muller muscle by epinephrine

Tear film is formed of three layers:

* Outer layer: lipid formed by the Meibomian glands: found posterior to the tarsal plate with opening at the eyelid margin
  + this lipid layer prevents the tears from evaporating
* middle layer: aqueous
* inner layer: mucin
  + nourishes the cornea and allows for tear distribution

In a patient with lower scleral show (positive lower eyelid vector) after lower bleph

Complications after bleph:

* early: within one week
* intermediate: 1-6 weeks
* late: after 6 weeks

Most common intermediate complication:

* lower eyelid malposition
* Due to imbalance in tension between the anterior and posterior lamella
* Predisposing factors:
  + negative vector: the inferior orbital rim is retropositioned in relation to the vertical corneal plane
  + excessing skin resection
  + aggressive imbrication of the orbital septum
  + thyroid ophthalmopathy Graves disease with exophthalmos: more affect on lower lid malposition than euthyroid status
  + excessive and or persistent edema or hematoma

The most common predictor of lower lid malposition after lower bleph:

* horizontal tarsoligamentous sling laxity
* Manifested by snap test: able to pull the lower eyelid by 8 mm anteriorly away from the globe
* surgical correction is by tarsal strip procedure

Inferior oblique muscle:

* small narrow skeletal muscle
* near the anterior margin of the orbital floor
* innervated by the oculomotor nerve (inferior branch)
* abduction, extorsion and elevation of the eye
* found between the medial and central fat compartments

Inferior rectus:

* depressing
* adducting
* extorting the eye

Superior oblique:

* intorsion
* depressing
* abduction

Superior rectus:

* elevation
* adduction
* intorsion

Transconjunctival bleph with skin pinch technique vs. transcutaneous with skin muscle flap:

* lower rate of scleral show
* more difficulty accessing the fat compartments, especially the left
* allow more thorough skin resection
* less middle lamellar scarring as the orbicularis is not violate
* canthopexy is not changed

The accepted time frame between bleph and corneal refractory surgery is:

* 6 monts
* otherwise patient is at high risk of dry eyes and keratopathy

Involutional bleph of the upper eyelids:

* the most likely physical sign to support this:
  + Higher than normal tarsal plate

Blephroptosis:

* Acquired
  + involutional (senile)
  + Mechanical
  + Traumatic
  + Neurogenic
  + Myogenic
* Congenital
  + Neurogenic
  + Myogenic

Involutional (senile):

* caused by dehiscence or attrition of the levator aponeurosis from its attachement on the anterior superior tarsal plate
* Confirmed when the distance from the upper lid margin to pupillary light reflex is more than 2.5 mm

Physical findings that support involutional blephroptosis:

* lid drop during downward gaze
* higher than normal upper lid crease
* seeing the eye through the thinned upper eyelid
* **normal levator excursion (greater than 10 mm)**
* **Greater than 4 mm distance from the upper lid margin to pupillary reflex as a degree of ptosis is considered normal**

The release of orbitomalar ligament, repositioning of the fat

The orbicularis retaining ligament or orbitomalar ligament:

* bilaminar membrane that spans from the periosteum of the inferior orbital rim to the underside of the fascia of the orbicularis
* during aging this tendon accentuates the orbital malar depression
* restricting the orbital fat from blending with sub-orbicularis oculi fat
* Patient will present with prominent orbitomalar sulcus and tear trough depression
* Release of the medial orbital portion of the orbicularis muscle and the orbitomalar ligament allows fat transpostioning over the orbital rim
* thus softening the deformity

Capsulopalpebral fascia:

* retractor of the lower lid
* incised during transconjunctival fat excision

Minimal lagopthalmous after upper bleph is not uncommon and generally self-correcting

it may persist but is often asymptomatic

* due to compensatory blinking
* and tear production

LASIK:

* creates corneal flaps
* interrupts the long ciliary nerves of the ophthalmic division of the trigeminal nerve
* decreased corneal reflex arc

Transconjunctival bleph:

* does not violate middle lamella which contains the orbicularis oculi (middle lamella: septum and tarsal plate)
* hence, less likely to develop ectropion and lower eyelid malposition
* Difficult to access the fat compartments especially the lateral
* There is insignificant lower rate of hematoma with this approach
* Greater risk of corneal abrasions

When doing upper bleph: extending the incision too medially increases the risk of webbing of the nasal skin

When doing lower bleph:

* negative vector predispose patient to lower lid malposition
* at risk of lower scleral show
* due to lack of skeletal anatomy and globe support
* need to address this ahead of time to perform primary lid suspension

Other conditions associated with lower lid malposition/ectropion:

* orbicular weakess
* anterior lamella shortage
* inferior eyelid/orbital volume deficit
* eyelid laxity

Lagopthalmos:

* can occur due to excessive upper eyelid resection during upper bleph

The anatomic basis of tear trough deformity:

* the tear trough ligament
* which is osteocutaneous ligament that extends from the medial canthus inferolaterally towards the midpupillary line where it meets with the orbitomalar ligament
* If putting filler in this area: should be placed below the tear trough ligament
  + otherwise the deformity will be worse

Tears:

* Trilaminar
  + precorneal: made of mucin produced by goblet cells in the conjunctiva
  + Middle layer: aqueous layer made of protein and water
    - formed by the lacrimal gland
    - promote osmotic regulation and infectious agents
  + Outer layer: meibomian
    - prevent the evaporation of the tears

The intercanthal distance:

* approximates the orbital fissure length
* normal values 30–35 mm
* some described it as 40 mm
* intercanthal distance represents one fifth of the facial width

Hering Law:

* Equal innervation to both eyelids so that the signal to both levators is the same despite the need for each eyelid to work independently
* when ptosis of the affected eye is corrected, the contralateral unaffected eye may reveal ptosis
* can be also performed with a patch for 15 mins

von Graefe:

* lagopthalmos in downward gaze   seen in patients with Grave’s disease

Müller maneuver:

* is the opposite of valsalva

After blephroplasty, patient can have transient lagopthalmos

* Fluorescin stain can test positive for corneal erosion
* this can put patient at risk of corneal ulceration
* During the first week after surgery: important to protect the eye with lubricating drops and ointments
* Bell phenomenon: protective movement to protect the cornea behind the upper eyelid
  + upward and outward movement of the eye
  + absent in 10-15% of population
  + absence after blephoplasty can predispose patient to corneal ulceration and erosion

Incision for retroseptal approach:

* placed 3-5 mm below the tarsal border or 8 mm from the lid margin
* By definition:
  + deep to orbicularis and septum
  + hence to need to violate the septum
  + used for fat reduction only

Preseptal approach is used for:

* modification of lid-cheek junction
* facilitates fat pad redistribution and access to midface

It is safe to perform laser resurfacing or chemical peel with transconjunctival blephroplasty

Zygomaticofacial nerve:

* provides innervation to the lateral fat compartment of the lower eyelid

The lateral palpebral branch of the lacrimal nerve:

* branch of the infraorbital nerve
* supplies the lateral upper eyelid

Infratrochlear nerve:

* the medial aspect of the upper and lower eyelid

Lacrimal nerve:

* from ophthalmic division of trigeminal
* supplies the upper eyelid

Dysfunctional tear syndrome: or Dry eye syndrome

* combining upper and lower bleph is greater risk due to dysfunction of orbicularis
* Women on hormone therapy are at higher risk of dry eye syndrome after bleph
* Prior LASIK: should wait for 6 months

Lower eyelid malposition:

* more likely in patients with negative vector

Patients who undergo blephroplasty and ptosis:

* may have worsening ptosis post-op
* patients may have excess skin, eyelid ptosis
  + must recognize compensated brow ptosis: when the patient uses frontalis to raise eyebrows
  + ask patient to close her eyes and notices the elevation of eyebrows when opening the eyelid
  + Change in position of the brow on downward gaze and front gaze indicate compensated brow ptosis

Most common cause of proptosis and diplopia in adults:

* thyroid ophthalmopathy
* affects women 4-6 times
* puffy, swollen eyelids, injected conjuctiva, eyelid lag and proptosis are common in thyroid ophtalmopathy

Orbitomalar ligament:

* attaches the orbicularis to the orbital rim
* separates the lower eyelid from midface
* must be released to access the midface when approaching it from lower eyelid

Capsulopalpebral fascia:

* inserts in the inferior border of the tarsus
* makes up the anterior superior portion of the lower eyelid retractor distal to lockwood ligament
* it is divided during transconjunctival approach

Lockwood ligament:

* fascial thickening that supports the globe
* surrounds the inferior rectus and inferior oblique muscles
* fuses with capsulopalpebral fascia
* analogous to Whitnal’s ligament for the upper eyelid

The orbital septum:

* attaches to periosteum at the arcus marginalis inferiorly
* Superiorly to the eyelid margin

Above the level of the tarsus:

* orbital septum: anterior to the levator
* preaponeurotic fat behind the septum

Retro-orbicularis oculi fat:

* anterior to the septum and posterior to orbicularis oculi muscle

Transection of less than 50% of inferior oblique muscle does not cause diplopia

The most common complication of lower blephroplasty:

* lower eyelid malposition:
  + ranging from mild scleral show
  + to severe cicatricial ectropion
* Preoperative factors:
  + malar hypoplasia (negative vector)
  + globe proptosis
  + high myopia
  + laxity of the lower eyelid
  + thyroid ophthalmopathy
* Post-operative mild scleral show:
  + managed with massaging and topical lubrication

Chemosis:

* resolves in 6 weeks

The most appropriate approach to avoid lower lid malposition:

* Lateral canthoplasty:
  + it can treat lower lid excess skin and prevent post-bleph malposition of the eyelid
  + for severe lower eyelid laxity (greater than 6 mm of eyelid distraction)
    - lateral canthoplasty with lateral cantholysis
    - allows for increased superior mobility and precise positioning of the lower canthal tendon inside the orbital rim

Horizontal wedge excision:

* can address lower eyelid laxity
* not recommended when there is canthal tilt (negative canthal tilt when the lateral eyelid is lower than the medial) who also require lateral eyelid suspension

Mild eyelid laxity (1-2 mm)

* can be addressed with orbicularis repositioning

Supratrochlear nerve:

* courses superiorly through the corrugator muscle
* innervates the central forehead

Abducens:

* nerve to lateral rectus muscle

The zygomaticotemporal:

* sensation to the lateral orbital forehead area

Eyelid lashes rubbing against the inferior cornea: (epiblephron)

* presentation with epiphora
* Mostly likely cause:
  + **excess pretarsal skin and orbicularis muscle** at the lower eyelid margin
  + forms a fold of skin and underlying orbicularis muscle that pushes the cilia against the globe
  + the eyelid margin and tarsus are stable and maintain the proper orientation
  + affects lower eyelid
  + more common in asia
  + accentuated with downward gaze

Senile ptosis:

* dehiscence of the levator aponeurosis
* most common cause of ptosis in elderly
* Tx: levator plication and advancement

Congenital ptosis:

* absence of eyelid crease
* poor levator function
* Frontalis sling is required sometimes

Lower eyelid morbidity:

* increase in patients with exophthalmos
* also increased in patients with enophthalmos and lower eyelid laxity

The Hertel exophtalmometer:

* measures the distance from the anterior globe
* to the anterior most aspect of the lateral rim
* enopthlamo: < 14 mm
* midrange: 14-18
* exopthal >18

During eyelid closure:

* The lacrimal puncta closes
* the lacrimal sac is collapse
* the canaliculi are patent

Involutional ptosis:

* the most important factor to determine the appropriate management:
  + The amount of excess eyelid skin
* Defect in the levator aponeurosis that allows the downward positioning of the tarsal plate
* Involutional ptosis:
  + associated with good levator function
  + high supratarsal crease
  + thinning of the eyelid tissue above the tarsal plate
* The degree of levator function determines the management:
  + 0-6 mm: frontalis sling
  + 6-10 mm: levator resection (excision)
  + > 10 mm: excellent function, need aponeurotic surgery
* The amount of brow ptosis will help determine if additional corrective surgery is needed
* Amount of skin excess: the distance between the tarsal edge and the blephroplasty

The position of the supratarsal fold:

* determines the cause of ptosis

Layer of the eyelid:

* conjunctiva
* müller muscle
* levator
* orbital fat
* orbital septum
* retro-orbicularis oculi fat
* orbicularis oculi muscle
* skin

Whitnall’s ligament is superior to the levator tendon

Fasanella-Servat procedure:

* does not address excess skin of the eyelid fold

Defect of the lower eyelid:

* >75% reconstruction with cheek advancement flap with a nasal septal csartilage and lining graft for internal lining

Causes of ectropion:

* involutional: horizontal skin laxity (abnormal snap back test and distraction test)
* vertical shortening of the anterior lamella (congenital or cicatricial)
* paralysis of orbicularis muscle causing loss of eyelid muscular tone
* neoplasia within the lower eyelid

Involutional ectropion and entropion can appear to be the same in static state:

* due to lower eyelid skin laxity
* They can completely distinguishable on animation of orbicularis oculi muscle
* Inversion of the lower eyelid occurs when attempted eyelid closure in involutional entropion
  + causes: orbicularis dysfunction with preseptal portion overriding the pretarsal portion
  + upper eyelid closure kick
  + disinsertion of lower eyelid retractors
  + loss of horizontal and vertical eyelid support
  + loss of orbital fat volume

Hertel exophtalmometry:

* the objective measure of globe position in relation to the orbita

Scarring between the capsulopalpebral fascia and the orbital septum because of trauma or aggressive lower eyelid blephroplasty can cause vertical contracture of the lower eyelid resulting in corneal exposure

* in that case lower eyelid graft is the only solution: spacer graft. Autologous or alloplastic
* in conjunction of eyelid tightening procedure such as lateral canthopexy and canthoplasty

Punctal occlusion alleviates dryness caused by exposure

Repair of lower eyelid retractors in conjunction with lateral canthal resuspension is used to correct lower eyelid entropion

Ectropion:

* cicatricial
* involutional: most common
* neurogenic

Cicatricial ectropion:

* treated with full-thickness skin grafting
* prevented by early surgical intervention
* Burn reconstruction should be delayed for one year until the scar have matured sufficiently

Asian eyelid:

* 50% lack insertion of the levator aponeurosis into the dermis
  + causing lack of supratarsal fold
* the fusion of the orbital septum to the levator aponeurosis is typically more caudad and decreases the widthe of the pretarsal segment of the supratarsal lid fold
* Increased amount of ROOF and SOOF
* More likely to have epicanthal fold

The snap-back test:

* used to assess the horizontal laxity of the eyelid

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| **In-Service Questions Notes: Eyelid Reconstruction:** |

Congenital ptosis repair:

* autologous fascia lata:
  + lowest complication rate
  + lowest recurrence rate
* irradiated fascia lata:
  + recurrence rate of 50%

Unilateral ptosis:

* elevated lid crease means:
  + levator aponeurosis dehiscence or attenuation: cause of ptosis
  + Known as senile ptosis
* The challenge is to know if the other eye has ptosis or not
  + Hering’s law: when one of the eyes has ptosis, the brain signals both eyelids to raise
  + the less ptotic eye can look normal
  + problem when the only ptotic eye is repaired
  + the impulse to raise both eyelids is decreased
    - then other eyelid is not ptotic
    - Hence need a way to find if the other eyelid is ptotic and needs repair
  + Put phenylephrine in the ptotic eye:
    - stimulate Muller muscle to raise eyelid
    - the afferent signal to raise the contralateral eyelid is decreased
    - If the contralateral eyelid falls over the next 10-15 mins
      * phenylephrine test is positive and patient needs bilateral ptosis repair
    - Other techniques:
      * patching of the ptotic eye to decrease the afferent signal
      * or manually raising the ptotic eye

MRD: Marginal reflex distance-1:

* distance in mm from the light reflex on the patient’s cornea to the level of the upper eyelid margin while patient in primary gaze
* Normal value: 2.5 mm
* most ppl have MRD-1 btw 4-5 mm

Schrimer test:

* tear production

Tear breakup time:

* how quickly tear to evaporate

Congenital ptosis:

* the most appropriate method is: resection and advancement of the levator aponeurosis
  + this technique is good for patients with levator function more than  5 mm

Frontalis suspension:

* reserved for patients with poor levator function
* patients with congenital Marcus Gunn jaw-winking syndrome

Fasanella-Servat Procedure: (tarsoconjunctival mullerectomy)

* for correction of minimal ptosis
* alter the eyelid contour

Frontalis muscle flap:

* for use in patients with severe ptosis and levator muscle function less than 4 mm

Muller-conjunctival resection:

* for patients with good levator function
* does not allow intraoperative adjustment of eyelid height

Correction of mild to moderate ptosis in children:

* should be delayed until kid is cooperative with exam
* intervention only when severe ptosis interfering with visual axis

Cutler-beard flap:

* full-thickness flap
* from the lower eyelid
* when defect is more than 66%
* flap is divided 4-6 weeks after inset

Semicicular Tenzel flap:

* good for upper and lower eyelids
* excellent for anterior lamella but also will require a second flap for posterior lamella reconstruction in full-thickness defects

Hughes:

* transconjunctival flap: similar to Cutler-Beard but for lower eyelid

Medial canthus degloving injury due to laceration from forehead to medial cheek:

* patients presents with telecanthus from degloving of the medial canthal tendon, posterior limb
* ptosis from avulsion or injury of the upper eyelid
* epiphora: lacrimal/canalicular injury
* stage repair: telecanthus then canalicular/lacrimal repair
  + then in 3–6 months: second stage for ptosis repair

Eyelid reconstruction:

* <25%
* 25-50%
* >50%

must reconstruction both lamella:

* anterior: skin and orbicularis
* posterior: conjunctiva and tarsus

High eyelid crease and 3 mm ptosis with good levator excursion:

* advance and reattach the levator muscle to the tarsal plate
* this results from disinsertion of the levator aponeurosis from tarsal plate

Fasanella-Servat procedure:

* excision of portion of mucosa, Muller’s muscle and superior tarsus (shortening the posterior lamella)
* Addresses mild ptosis 1-2 mm with excellent levator function

Frontalis sling:

* use autologious or alloplastic material tunneled from thew brow to upper tarsus to accomplish eyelid elevation
* ptosis when cause is congenital

Involutional or senile ptosis:

* when evaluating for blephroplasty: must evaluate for blephroptosis
  + otherwise patient will have ptosis despite blephroplasty

Physical exam of blephroptosis:

* high skin crease more than 7 mm
* thinned upper eyelid
* lid drop on downgaze
* levator function should be assessed (lid excursion with brow and frontalis muscles at rest)

Levator function:

* normal more than 10 mm
* moderate: 5-10 mm
* poor: < 5 mm

Cutler-beard flap:

* disadvantage
  + two-stage
  + eye occlusion for several weeks
  + sacrifice of lower eyelid tissue (risk for ectropion)
  + lack of intrinsic support

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| **In-Service Questions Notes: Pressure Sore** |

**HyperK+ after succinylcholine: Due to upregulation of nicotinic acetylcholine receptors in denervated or traumatized muscle**

* in paraplegics
* upper and motor neuron injury
* burns
* crush injury
* or any condition that cause rhabdo
* treatment:
  + Calcium
  + followed by sodium bicarbonate and glucose

**The highest risk factor for recurrence of pressure sore:**

* Paraplegia
* Other factors that predispose patient to prolonged pressure sore and decreased ability to repair:
  + age >70 yrs
  + immobility   poor nutrition
  + DM
  + end-stage renal failure
  + cerebrovascular disease
  + hip fracture within 3 months
  + prior pressure ulcer surgery
* **Not associated with recurrence:**
  + vitamin C and zinc deficiency
  + incontinence

**First step in management of pressure sore:**

* Bone biopsy and culture

**Malignant hyperthermia (MH):**

* From use of succinylcholine or inhalation anesthetic
* hereditary anomaly that interferes with calcium regulation in skeletal muscle
* Once triggered: uncontrolled hypermetabolism due to build up of calcium within the skeletal muscle
* The earliest sign: unexplained increase in **end-tidal CO2 that progresses to presence of fever**
* **Tx:** removal of offending agent
  + IV dantrolene

**Autonomic Dysreflexia:** occurs in a patient with paraplegia above the level of T6

* uncontrolled sympathetic response due to stimulus
* 50-70% lesions above T6
* Common symptoms:
  + headache
  + nausea
  + Hypertension
  + Bradycardia
  + flushing
  + blotching
  + sweating above the level of the lesion

Most common precipitant:

* urologic: bladder distention
* GI: rectal distension
* MSK: fractures
* Others: skin ulcerations, infections, pregnancy

Tx:

* removal of offending agent
* Second line of tx is oral nefedipine

**Preoperative optimization prior to pressure sore surgery:**

* Albumin > 3.5 g/dL
* daily intake 1.5-3 g/kg/day
* noncaloric protein 25-35 kcal/kg/day
* eradication of infection
* tx of spasms and contractures
* smoking cessation
* urinary and tool diversion
* Post-op plan including off loading

**Failure of pressure sore flap:**

* **HbA1c >6% (on inservice this year)**
* young patient
* ischial location
* Albumin less than 3.5 g/dL

**Posterior thigh flap:**

* biceps femoris
* semitendinosis
* semimembranosis
* Reliable blood supply: first perforating branch of profunda femoris
* Generous amount of tissue
* Also: ability to re-advance in case of recurrence
* Preserves additional donor sites
* Disadvantage: upward mobility 10-12 cm
* Limited to NON-ambulatory patients as it sacrifices multiple knee flexors
* MATHES AND NAHAI TYPE 2:
  + dominant pedicle: first perforating branch of profunda femoris
  + smaller segmental distal pedicles
* Need to divide the proximal origin and insertion of these flaps to maximize mobility and minimize tension
* Can be designed as V-Y configuration

**Posterior thigh fasciocutaneous flap:**

* based on descending branch of the inferior gluteal artery

**For ambulatory patient:**

* the best option is to spare the muscle and use fasciocutaneous flap
* disadvantage: limited bulk
* When the answers are gluteal vs posterior thigh fasciocutaneous flaps for ischial pressure sore:
  + **choose gluteal fasciocutaneous**

**Gold standard for Osteo diagnosis:**

* bone biopsy
* the next one come after it is MRI

**Factors associated with dehiscence of pressure sore:**

* age younger than 45
* previous same site pressure sore
* albumin < 3.5 mg/dL
* HbA1C > 6%
* Ischial pressure sore

**Not associated with recurrence and dehiscence:**

* Size of sore
* underlying osteomyelitis

**Key strategy:**

* Always consider need for subsequent surgical procedure
* Flap should be designed in a way in which if recurrence develops, patient will continue to have surgical options
  + such as re-advancement and re-rotation of the prior flaps

**Whenever a patient is ambulatory:**

* do not choose muscle flap

**Pressure sore stages:**

* Stage I: non-blanching ulcer that resolves within one hour, involves the epidermis and superficial dermis
* Stage II: Blister, abrasion or shallow crater. Full-thickness to adipose tissue
* Stage III: full-thickness to but not involving the fascia. to underlying muscle
* Stage IV: full-thickness to everything. to bone and joint space

**For appropriate management of pressure sores in the perineal region:**

* alteration of bowel regimen or diverting colostomy
* to decrease the bacterial contamination and reducing the likelihood of reconstructive failure

**The elevation of semitendinosis, semimembrnosis and biceps femoris:**

* coverage of ischial pressure sore

**The earliest time to allow for sitting in paraplegic patient with ischial pressure sore repair with gluteal rotational flap:**

* Limited sitting at 3 weeks

**The most important factor for pressure sore development is:**

* prolonged pressure above end capillary pressure (32 mmHg)
* Pressure > 70 mmHg for more than 2 hours

**Wound characteristic that is most likely to impair wound healing with negative-pressure wound:**

* Wound fibrosis:
  + need to be debrided and all devitalized tissue excised

**In the question when they say excision of ulcer for patient presenting with draining infected pressure sore:**

* this should be the answer for the next step
* they will try to confuse you by using this as an option instead debridement in OR

**Girdlestone procedure:**

* resection of the head of femor
* used for trochanteric pressure sore

**A pressure sore that extends to the level of the fascia:**

* stage II: because it did not involve the underlying fascia (which will make it stage III).

**In a patient with spasticity:**

* to ensure stability of the repair: intrathecal administration of baclofen via implantable pump
* it causes shearing force and should be controlled

The level of **S2-S3** is the highest level you can get to with bony debridement without getting into the dural space

**Check question number 33 for staging!**

Stage I: skin is intact

Stage II: blister or break in the dermis

Stage III: subcutaneous destruction into the muscle

Stage IV: bony or joint involvement

**Integra:**

* synthetic bilaminar
* dermal matrix of bovine collagen cross linked with shark chondroitin
* becomes infiltrated by host fibroblasts, endothelial cells and inflammatory cells
* The host collagen replaces the bovine collagen
* Adequate revascularization:
  + within **2-3 weeks**
  + **Thinner autograft** can be applied
  + immediate temporary coverage using integra
  + more rapid healing
  + improved cosmesis

Performing **ischiectomy** for ischial pressure sore:

* increases the likelihood of ischial pressure sore on the other side
* 28% in patients who had ischiectomy, develops ischial pressure sore on the contralateral side
* If bilateral ischiectomy are performed:
  + 58% will develop perineal ulcers and urethrocutaneous fistulas

**Calcium Alginate dressings:**

* absorb exudate from wounds
* contain mannuronic and guluronic acids from Laminaria seaweed
* Changed every 24-48 hours
* conductive for wound healing and bio-occlusive to prevent drying
  + environment that is favorable for epithelialization
* no inherent antimicrobial propreties
* Promote inflammation and cause foreign body reaction
* procoagulant activity

Congenital nevus: classified as Giant if

* If larger than 20 cm
* larger than twice the size of the patients palm
* excision and primary closure cannot be performed in single surgery
* Risk of melanoma 5% (not 8%)

**Rectus femoris blood supply: type II**

* descending branch of lateral circumflex
* off the profunda femoris

**Gracilis muscle: type II**

* ascending branch of medial circumflex

**Vastus lateralis: type I**

* descending branch of lateral circumflex

**TFL: type I**

* ascending branch of lateral circumflex

**The most common cause of death in patients with pressure ulcers:**

* renal failure secondary to chronic amyloidosis

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| **In-Service Questions Notes: Rheumatoid hand** |

Small joint arthroplasty:

* benefit is pain relief
* similar range of motion as preop
* excision of the arthritic head of the proximal phalanx and base of the middle phalanx
* replace them with silicone stemmed implant
* allows for scar capsule to form
* There will be also improvement in the aligned of the finger but that’s not the main goal of silicone arthroplasty
* range of motion and grip strength has not been shown to improve in studies

Synovial proliferation:

* the hallmark of RA arthritis
* The progression to synovial pannus
* periarticular bone deminerlization
* subchondral osseous erosion
* cartilage destruction
* infiltration by activated T-cells: promoting chronic synovial inflammatory

Boutonniere:

* hyperflexion of the PIPJ
* hyperextension of DIPJ
* Causative event in RA:
  + synovial pannus formation within PIPJ
  + synovitis
* attenuation of central slip
* lateral bands take more volar position: accentuating flexion
* extension transferred to DIPJ

Intrinsic tightness of PIPJ:

* when unable to flex PIPJ when MCPJ is extended

EPL ruptures at the level of the wrist:

* spontaneous can occur
* also mechanical or vascular changes within the 3rd compartment around Lister’s tubercle
* in RA rupture is a combination of:
  + ischemia
  + synovial inflammatory infiltration of the tendon within the 3rd compatment

Other ruptures in RA:

* EDC and EDM: on dorsal wrist
* FPL on volar tendon (Mannerfelt lesion)

RA:

* immune complex deposition
* results in inflammation and synovial hypertrophy
* joint destruction
* ligament laxity
* The wrist is the most commonly affected joint

What happens to the wrist:

* collapse of the carpal height on the radial aspect of the wrist from attenuation of SL ligament
  + results in weakening of the ulnar collateral ligaments of the wrist
  + ulnar subluxation
  + supination of the carpus
  + radial deviation of the metacarpals
  + results in ulnar drift of the fingers seen in RA
  + in addition to MCP joints synovitis

Loss of finger extension in RA because one of three:

* attenuation of the radial sagittal band of MCP joint from inflammation and ulnarly directed forces from pinch and grip may result in ulnar subluxation of the extensor mechanism
* the extensor tendon will slide into the valley between the metacarpal heads and the extensor tendon will place a flexion force on the MCP joint
* Passive extension of the fingers will centralize the extensor and the patient will be able to maintain the fingers actively in an extended position: critical physical exam maneuver

Patients with synovitis fo the distal radioulnar joint and dorsal subluxation of the ulnar head (caput ulna):

* may present with spontaneous rupture of the extensor tendon
* starts from extensor digit quinti and progresses radially
* intact junctura may make this difficult to diagnose initially
* patient will not be able to extend small finger with other fingers flexed and patient will not be able to maintain active extension of the finger after it is passively extended

Volar subluxation or dislocation of MCP joints from synovitis:

* ulnar drift
* loss of digit extension
* can be distinguished from extensor subluxation by xray

RA:

* can have PIN palsy
* affects all extensors of the hand

Boutonnière deformity:

* hyperflexion of PIPJ
* Hyperextension of DIPJ
* central slip rupture
* lateral bands displaced volarly causes hyperextension of the DIPJ
* Synovitis in RA lead to attenuation of central slip leading to the same deformity that can be caused due to trauma and central slip rupture

Darrach procedure:

* distal ulna resection
* treatment of distal radioulnar joint arthritis and distal ulnar instability
* approach is dorsal via 5th extensor compartment
* ECU and TFCC are preserved
* resection is proximal to radial sigmoid notch

DRUJ arthritis and instability:

* due to attrition of extensor tendons due to dislocated and eroded ulna with restriction of forearm rotation
* The goal is pain relief, prevent tendon rupture and improvement of forearm rotation

FPL rupture: inability to flex IP joint of the thumb

* due to scaphoid osteophyte
* Mannerfelt lesion
* most common flexor tendon to rupture
* Tx: tendon transfer, tendon grafting, IP fusion
* Should explore carpal tunnel and remove all osteophytes to prevent further tendon rupture
* Tx: FDS tendon transfer, palmaris tendon grafting
* Not EIP tendon transfer as this is reserved for extensor tendon rupture in RA

Boutonnière deformity:

* most common deformity of the thumb
* Swan neck deformity is the second most common
* Boutonnière deformity starts with:
  + synovitis of the MCPJ that stretches the dorsal joint structures
  + EPB tendon insertion site is disrupted leading to flexion
  + further the EPL tendon subluxes volarly increasing the flexion of proximal phalanx
  + treatment: synovectomy, extensor tendon repair, MCPJ arthrodesis

Swan neck deformity:

* synovitis of CMC joint leading to joint bony erosion
* CMC joint will dorsiflex and radially subluxate causing adduction contracture of first metacarpal leading to hyperextension of the MCP joint

Gamekeeper’s thumb:

* ulnar collateral ligament weakness

Thumb in palm deformity:

* CP patients

Basal joint arthritis:

* MCPJ hyperextension
* it compensates for the adduction of the thumb to help with pinch and grasp
* Failure to address hyperextension more than 30 degrees with basal joint arthritis lead to weakness and poor hand function
* Removal of the entire trapezium is most important
* pinning is not the most important and not necessary with ligamentous reconstruction

Single joint involvement:

* does not justify the use of infliximab

In a labor patient:

* arthrodesis
* and NOT CMC arthroplasty with ligament reconstruction

In RA hand:

* reconstruct the proximal joints first
* to provide stability and motion for distal reconstruction

Synovitis of the wrist:

* synovitis of the ulnar wrist
  + attenuation and rupture of the extensor ligaments and stabilizers of DRUJ
  + dorsal dislocation of the ulna and caput ulna syndrome
* Synovitis of the volar and intercarpal ligaments:
  + volar and ulnar subluxation of the wrist with supination
* Intact radial extensor tendons:
  + radial deviation at CMC joint
  + compensatory ulnar drift at MCPJ

Isolated DRUJ:

* Sauvé-Kapandji prevents further ulnar subluxation

Implant arthroplasty:

* improve pain
* do not change pre-existing range of motion
* consistent for silicone, pyrocarbon and titanium-polyethylene
* Silicone PIP implants act as a spacer following joint resection and allowing fibrous scar capsule of scar tissue
* Complications of silicone implant:
  + failure
  + degradation
  + revision of silicone implant 11-13%
  + Longterm study showed that 50% of them are fractured at 16 yrs

Swan neck deformity:

* hyperextension of PIPJ
* hyperflexion of DIPJ
* Nalenbuff classification based on PIPJ mobility and radiographic changes
* not worth memorizing the classification and the treatment for one question

EDC:???

* most common ruptured tendon in RA

EPL:

* second most common

Trigger finger in RA:

* common
* related to intratendinous nodules
* synovial inflammation
* initial treatment is: steroid injection
* then surgery:
  + NOT A1 pulley release as it is the only structure preventing ulnar drift and should never be divided in RA
  + most appropriate: flexor tenosynovectomy and removal of intratendinous lesions

Bouvier maneuver:

* MCP hyperextension is prevented by dorsal pressure
* EDC can extend IP joints
* tendon transfer:
  + insertion into A2 pulley and proximal phalanx will result in MCP joint flexion

Pronator teres to ECRB:

* well described transfer for isolated radial nerve palsy
* harvested from the insertion on the radius with periosteum to get length
* woven into ECRB either end-to-end or end-to-side if ECRB is expected to get some function
* A portion of tendon grafting harvested from ECRL can be used to strengthen the repair

Axillary-radial nerve coaptation:

* in the upper arm
* radial nerve is donor to axillary nerve
* which supplies the deltoid

Median nerve to nerve of ECRB:

* for wrist extension

Biceps to triceps transfer:

* in patients with tetraplegia
* for elbow extension

Phrenic nerve can provide axons to posterior cord:

* which will eventually become the radial nerve

Proximal forearm injury: ulnar side (high ulnar nerve injury)

* clawing of the hand
* Ineffective grip
* tendon transfers:
  + ECRL
  + Zancolli FDS Lasso procedure
* The classic nerve transfer is AIN to pronator quadratus to ulnar motor branch

Oberlin nerve transfer: in patients with brachial plexus injury

* to restore elbow flexion
* transfer of nerve of FCU to musculocutaneous

Low median nerve palsy:

* affects the opposition of the thumb
* abductor pollicis brevis
* Transfer of:
  + EIP (better, less adhesions around a pulley)
  + FDS of the ring: requires a pulley formed by part of FCU (ulnar half) at the level of pisiform

High median nerve palsy:

* affects all FDS
* FDP to index and ring
* palmaris flexion

Arthroplasty vs. arthrodesis:

* arthroplasy if primary goal is range of motion
* arthroplasty also provides pain relief

RA hand: trigger finger

* ulnar drifted is worsened by A1 pulley release
* A1 pulley should be preserved
* tenosynovectomy of the fingers should be performed
* very mild cases may response to corticosteroids

In patients with RA and if you are wondering why the can’t extend their fingers:

* do tenodesis test
* if the fingers extend with passive flexion: then extensor tendons are intact???
  + hence it is compression of the PIN
* Inability to extend the thumb in RA patient should be a clue for PIN compression at the ARCADE OF FROHSE

Dupuytren’s:

* increased proliferation of myofibroblasts
* strong family history
* young patient
* bilateral
* no correlation with gender
* Ectopic deposits:
  + Lederhose: on the sole
  + Garrod knuckle pads on PIPJ
  + On penis: Peyronie disease

Vaughn-Jackson syndrome:

* rupture of extensor tendons
* either due to inflammation
* or attrition from underlying bony abnormality

RA extensor tendon rupture:

* frequency EDM > EDC (ring) > EDC (small) > EPL

RA criteria to establish Dx:

* RF factor: is positive in about 70% of patients with RF
* ESR elevated in more than 90%
* 1% prevelance
* female to male ration is 3:1
* age of onset 25-50
* Anemia is found in 80% of patients
* Inflammed joint: leukocytes more then 2000-5000 mm3 without crystals or bacteria
* symptoms for 6 weeks

Rheumatism:

* morning stiffness longer than one hour before improvement
* arthritis of 3 or more joints
* arthritis of the hand: PIPJ, MCPJ and wrist
* Bilateral involvement
* Positive RF
* Rheumatoid nodules
* radiographic evidence of RA

For MCPJ:

* extensor tendon rebalancing: will improve the alignment
* intrinsic muscle release: balance the forces causing the ulnar drift
* synovectomy: will retard tendon rupture or and misalignment
* MCP joint silicone arthroplasty: alleviate bone to bone pain

Indication for surgery:

* improvement of function
* improvement of appearance
* correction of deformity
* retardation of deformity

Surgery:

* will not improve function
* will not increase grip strength
* will not improve dexterity

Pyrocarbon MCP arthroplasty:

* young patients
* high demand
* less than 60 degrees of extension lag
* less than 45 degrees of ulnar deviation
* no severe dislocation or shortening

Thumb-in-palm deformity:

* results from imbalance caused by variable degree of spasticity of adductors, flexors
* contracture of the first web space
* weakness of the abductors and extensors
* laxity of MCPJ

Systemic sclerosis: Scleroderma

* patients will have PIPJ flexion contracture
* becomes thinned and stretched
* leading to local ischemia and ulceration
* surgery for severe cases when patient have severe disability or digital ulceration
* **Arthrodesis in moderate flexion with bone shortening will result in healing of the ulcer**
* If there is compensatory MCPJ hyperextension and loss of mobility
  + then do MCPJ capsulotomy first
* Do not do local flaps as skin is very sclerotic
* for ulcers on MCPJ, you can do integra

Basilar joint of the thumb:

* articulation among
  + trapezium
  + trapezoid
  + scaphoid
  + first metacarpal
* anterior oblique ligament (beak):
  + primary stabilizer of trapeziometacarpal joint
  + laxity is the first sign of basilar joint arthritis
  + this laxity is followed by damage to the palmar articular surface of the scaphoid

Scaphoid blood supply:

* recurrent branch of the radial artery

DeQuervain’s

* irritation of APL and EPB

The most likely cause of swan-neck deformity in patients with RA:

* tightness of intrinsic tendons
* Caused by intrinsic rheumatoid myositis
* increased tension within the intrinsic system of the hand
* happens to the ulnar most 3 fingers
* Recommended procedures:
  + arthroplasty of mcpj
  + comprehensive soft tissue and intrinsic releases
  + centralization of the extrinsic extensor tendons
  + spiral oblique retinacular ligament or zancollu FDS reconstruction

Centralization of the extensor tendons:

* for the management of extensor tendon subluxation at MP joints

Release of radial tunnel for:

* PIN palsy

In RA:

* FPL most common FLEXOR tendon to
* spur at the distal pole of scaphoid

In patients with Juvenile RA:

* Hand deformity: most common loss of flexion of IP joint
  + wrist flexion with loss of wrist extension
  + carpus and metacarpals are deviated ulnarly
  + loss of flexion and radial deviation of MCPJ
  + RARE: Boutonnière, Swan neck or tendon rupture

Adult RA:

* radial deviation and supination of the carpus
* MCPJ subluxed palmarly and ulnarly
* can have boutonnier, swan neck and tendon rupture

Psoriatic arthritis or Reiter’s syndrome:

* rapid explosive onset of psoriatic arthritis
* HLA-B27
* HIV should be suspected

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| **In-Service Questions Notes: Burns and Burn Reconstruction** |

Patient presenting with 10% hydrofluoric acid burns:

* Tx: copious irrigation and application of calcium gluconate: to bind fluorid ions
  + injection of calcium gluconate
* Hydrofluoric: strong acid but can cause liquefactive necrosis like the alkalis
* Patients greater than 5% TBSA or concentration with less than 50%: this causes systemic toxicity

When it comes to burn questions calculation:

* pay attention to the timing as they play a lot with it

Over resuscitation:

* causes increased risk of burn infections
* development of acute respiratory syndrome
* abdominal compartment syndrome

Under-resuscitation:

* conversion of burns to deeper

Parkland Formular:

* 4x %TBSA x weight in Kg
* given over first 24 hours
* if the question is about first 8 hours only then do half of Parkland
  + which is 2 x weight in Kg x %TBSA
* Employed in patients with TBSA > 20%

Pressure garments:

* reduce differentiation of fibroblasts to myofibroblasts
* when compression is applied to the scar perpendicular to wound tension
* Scar strength is increased with pressure garments by 34%
* Also the scar becomes formed of smaller more densely packed collagen fibgers

Corticosteroids:

* increase tissue proteinses

Best treatment of deep partial thickness burn:

* tangential excision until pinpoint bleeding using Gouliane knife

Full-thickness burn are excised to the level of fascia or fat

To increase Bone Mineral Content (BMC):

* give Oxandrolone to severely burned kids (more than 30% TBSA)
* Statistical significant improvement in height, muscle and cardiac work, bone marrow density
* Increased IGF-1 and in combination with excercise there is increase in lean body mass and muscle
* Oxandrolone:
  + testosterone derivative
  + low hepatotoxicity and low virilizing effect
  + binds androgen receptors

Glutamine:

* decreased hospital stay and cost by
  + decreasing wound infections
  + decrease mortality
  + increase wound healing

Silver Sulfadiazine: (silvadene)

* Decreased penetration into the wound bed
* Limited to the surface epithelium particularly when there is eschar
* because silver binds to surface proteins
* Does not cover pseudomonas or enteric bacteria
* Covers fungi such as candida albicans
* Antimicrobial effect lasting 24 hours
* Transient neutropenia that resolves few days after stopping the agent
* causes neutropenia and thrombocytopenia (granulocyte reduction)

Xeroform:

* has bismuth which is a heavy metal with antimicrobial properties
* dirsrupts biofilm formation by inhibiting polysaccharide capsule production by bacteria

Phosphorus fertilizers explosion:

* first step is saline irrigation
* found in firework and fertilizers
* ignite when exposed to air
* Tx:
  + immediate debridement
  + copious irrigation
  + keep area wet and covered with saline soaked gauze
  + cardiac and electrolytes monitoring
* Can cause: hypocalcemia, hyperphosphatemia and leading to sudden death

Hydrofluoric acid:

* calcium gluconate

Polyethylene glycol:

* phenol and cresol burns

Mineral oil:

* used to isolate sodium, potassium and magnesium from water

Sulfamyolon (mafenide acetate):

* penetrates burn eschar
* decrease risk of suppurative chondritis
* twice daily application
* monitor for metabolic acidosis
  + metabolized to sulfamoylbenzoic acid
    - which is carbonic anhydrase inhibitor

The most effective way to fixate autograft is:

* Negative pressure wound therapy
  + offers good fixation
  + exudate removal
  + promotion of wound perfusion
  + therefore improved graft survival

Carbon monoxide (CO) toxicity:

* normal appearing oxygen saturation due to carboxyhemoglobin is mistaken for oxyhemoglobin
* Treatment is 100% inhaled oxygen
* which lead to dissociation of CO from hemoglobin

When you are operating on the face and the ET tube is disconnected then there was a flash:

* first step: immediately remove the ET tube
* Early warning signs is hearing a pop or snap or foopm
* ordors
* unexpected movement or discoloration of the drapes
* Steps to be taken in case there is fire:
  + remove the ET tube
  + interruption of flow through all airways
  + removal of all sponges and other flammable material
  + pouring saline inthe airway
* The re-establish ventilation, avoid oxidizer, examine ET tube for possible fragments and consider bronchoscopy

Muscles in the deep flexor compartment that are first to be affected with compartment syndrome:

* FPL
* FDP
* End result is Volkmann’s contracture

Burn injury hemodynamics:

* Decreased cardiac output
* hypovolemia
* decreased peripheral blood flow due to extravasation of plasma into the burn wound
* increased systemic vascular resistance

During burn situation:

* decreased splanchnic blood flow might cause gut ischemia due to increased metabolic demand
* Clinical signs:
  + firm and obvious abdominal distention
  + more than 200 cc of gastric output per day
* Hypotension requiring vasopressor means you should decrease the rate of feeding to trophic feeds only

Ringer’s lactate:

* isotonic solution
* used for resuscitation during the first 24-48 hours
* Lower sodium 130 and higher pH 6.5
* potential added benefit of the buffering effect of metabolized lactate on metabolic acidosis

Toddlers more than 15% TBSA, less than 20 kg and less than 2 yrs of age

* must add 5% dextrose to prevent hypoglycemia as they have lower hepatic glycogen storage

In patient with compartment syndrome leading to rhabdomyolysis:

* renal and metabolic disorders: **decreased GFR**
* HyperK+: occurs when there is rhabdo
  + Peaked T-wave
  + Tx: D50W 50 mL IV plus regular insulin 5-10 units

FROSTBITE:

* formation of crystals in the intracellular and extracellular spaces: **this is the inciting event!**
* there is also vascular endothelial damage leading to intravascular thrombosis and decreased capillary flow
* Forstbite should be rapidly rewarmed with water temprature 40 C/104 F in 20-30 mins
* Tissue takes weeks to months to declare itself

Curreri Formula: calculate the caloric needs:

* 25 kCal/kg/day + 40 kCal/TBSA%/day

Escharatomies of the hand:

* thumb on the radial side
* all other digits on the ulnar side

Bilaminar skin substitute:

* silicone outer layer (epidermis)
* biologic scaffold for inner, dermal layer
* typical maturation is 21 days
* can be accelerated with negative pressure dressing

Severity of injury:

* proportional to the cross-sectional area of tissue able to carry current
* most severe injuries occur in ankle and wrist
* extremities most commonly affected with upper extremities more

Tissue resistance:

* nerve
* blood vessel
* muscle
* skin
* tendon
* fat
* bone: highest resistance therefore more heat is generated here around bones

Deep tissue retains more head so that periosseous tissue especially between two bones has more severe injury

Thrombolytic therapy is used for frostbite for endothelial injury causing thrombosis

In burn patient who just came back from OR after tangential excision:

* marked blood loss
* leading to hypovolemic shock
* Sepsis and ARDS occur later
* Sepsis:
  + fever and high cardiac output

ARDS:

* associated with large volume of transfusion and lung injury

Silver nitrate:

* Good against staph
* most gram negative including pseudomonas
* Used when sulfonamide allergy
* used for TEN
* tissue penetration is poor
* Causes hypoNatremia
* Brown staining of the equipments

Sulfamylon (mafenid acetate):

* excellent eschar penetration
* highly effective again gram negative
* causes hyperchloremic metabolic acidosis

Silver sulfadiazine:

* most commonly used
* good antimicrobial spectrum
* low incidence for development of resistant microorganisms
* transient neutropenia (leukopenia)

If you have patient that continues to have no signal after rewarming for frostbite:

* next step is **angiography with tPA infusion**
* found to decrease the rate of amputations if administered in the first 24 hours after fostbite

Massive injury and burn:

* causes massive systemic inflammatory response
* result in fluid leakage into the interstitial space
* decreasing the perfusion to vital organs
* leading to oliguria, acidosis and relative polycythemia
* Goal urine output for resuscitation is 0.5-1 mL/kg/hr
* LR is the fluid of choice
* Parkland formula
* half is given in the first 8 hours and the second half over 16 hours
* in delayed presentation the first half of the fluid resuscitation should be administered within the first 8 hours regardless of how much time is the delay

TBSA %

H&N: 9%

Each upper extremity 9%

Each lower extremity 18%

Anterior thorax: 18%

Posterior thorax 18%

Groin 1%

Criteria for referral to burn center: Question # 74

* > 10 % TBSA in patient younger than 10 yrs old and more than 50 yrs old
* second and third degree burn more than 20%
* third degree burn more than 5%
* burn to perineum
* burn to face, palm and feet, major joints in adults or young patients
* Third degree burn in any age group
* inhalation injury
* concomitant trauma
* electric or lightening burn
* Chemical burn such as hydrofluoric acid or phosphorus
* Any patient with pre-existing medical or social situation
* Children admitted to a hospital without pediatric care should be transferred

Splinting burns:

* neck in slight extesion
* elbow in extension at 180 degrees
* Shoulders abducted at 90 degrees
* wrist in neutral or slightly extended
* hands in intrinsic plus position

Clear blisters should be debrided:

* they contain large amount of inflammatory mediators

Hemorrhagic blisters:

* not debrided because this may cause exposure to deep structures and increase the risk of desiccation and subsequent necrosis

You should always wait until tissue further demarcates:

* early debridement and amputation if there is infection

Antiprostaglandins: ibuprofen and aloe cream:

* block the cascade of arachidonic acid by cyclooxygenase and inflammatory mediators
* leading to vasodialation and anti-platelet aggregation

Cultured epidermal autografts: (CEA)

* knows as cultured keratinocytes
* by 3 weeks: keratinocytes are expanded by 10,000 folds
* they must be grown in murine fibroblasts and fetal calf serum
  + both contain xenogenic proteins that may contribute to rejection of these autografts
* CEA lacks dermal component and extremely fragile: susceptible to mild shear
* CEA very expensive 13,000 per 1% TBSA

In a patient with third degree burn with large TBSA%: greater than 30% result in great systemic inflammatory response and circulating cytokines

* the immunologic response in the first week is:
  + increased T-suppressor lymphocyte function
* Both humoral and cellular-mediated immunity are suppressed
* Diminished activation of complements and depressed levels of circulating immunoglobulins
* upregulation of TNF-a, IL 1 and \*
* Decreased B-cells and NK cells
* Increased number and activity of T-suppressor lymphocytes
* These changes normalize during the next 2-3 weeks
* Question #38 for more explanation

Contractures are formed by:

* loss of normal skin
* skin healing along straight line
* differential in the growth rate between the normal skin and the burned skin especially in the younger patients
* Z-plasty:
  + lengthens the contracted scar
  + breaks the straight line
  + shift soft-tissue contour

Toxic epidermal necrolysis: TEN: Steven-johnson syndrome

* 1-3 weeks after starting Bactrim, allopurinol and phenytoin
* skin exofoliatio
* Patients present with fever, malaise and dysphagia
* Mortality is 30%
* Autoimmune response to basement membrane of epithelial tissue induced by drug exposure
* Dx: skin Bx is pathognomonic
* Do not apply silver sulfadiazine: contraindicated. exacerbates the immune response due to sulfa moeity

When there is high-voltage injury to full-thickness or partial thickness loss:

* need to perform fasciotomy
* carpal tunnel release
* deep compartment release to pronator quadratus: between two bones which have high resistance therefore more injury due to heat

Patient who is presenting with exposure keratitis and corneal ulceration due to bilateral ectropions from burn to head and neck:

* need to perform staged upper and lower ectropion releases with skin grafts
* You need to release the ectropion, resurface the orbicularis muscle with high quality skin
  + full-thickness skin graft
  + best harvested from supraclavicular fossa and shoulder: better match for color and texture
* In burn: it is not about just reconstruction
  + you have to think about release the burn
* Even when the patient had this surgery in the past by another surgeon and it failed, you should do it again

Burn injury:

* lead to systemic inflammatory response
* release of vasoactive mediators
* third spacing
* increased metabolic requirement

Skin substituents:

* Apligraf:
  + cultured foreskin-derived neonatal human keratinocytes and fibroblasts
* Alloderm:
  + human cadaveric dermis
* Biobrane:
  + type 1 porcine collagen peptides
* Integra:
  + silicone and matrix of cross-linked bovin tendon collagen and shark derived glycosaminoglycan

Bacterial wound infection:

* Most common organisms: must cover gram positive cocci and gram negative rods
  + MRSA
  + Pseudomonas
  + Klebsiella

Thromboxane A2:

* powerful inflammatory mediator during frostbite
* Ibuprofen blocks cylooxegenase cascade that results in Thromboxane A2 production
* but this also blocks the production of PGE2 and PGI1 which cause vasodilation and antiplatelet aggregation

When using Apilgraf:

* might need to use it multiple times
* so on the exam: choose the answer of reapplication

The most appropriate diagnostic tool to delineate the level of amputation in patients in patients with fostbite

* Technetium-99 m bone scanning

When you have a burn patient that needs free flap:

* must wait for 6 weeks after debridement to perform it
* otherwise: flap will be lost due to hypercoaguable state during burn

Check question number 59 for pediatric resuscitation formula

In a patient with inhalation injury:

* after starting 100% Oxygen: it takes one hour for level to fall off by half
* must perform fiberoptic bronchoscopy
* Carbon monoxide toxicity > 40%, patient will have cherry red skin
* Focal infiltrates take about 5-10 days before the finding is seen on radiograph

Most common site for contracture release:

* neck
* followed by Axilla
* lease it the hand
* Release is performed in more than one site

Neck contracture: significant tightening of the lower face and mechanical disability

* release of the scar must be complete and involving the platysma
* post-op: fitted in a splint that extend the neck

When you have contracture of the finger:

* plan is to release the contracture then do full-thickness skin graft

To evaluate the extent of muscle injury in patient with electric burn:

* use MRI
* skin may appear normal but the muscle is injured

When you have exposure of tendons and no flaps available nearby:

* used integra

The presence of erythroblasts in the peripheral blood smear is an indication of fatal disease

Groin  flap:

* based on superficial circumflex artery

Reverse radial forearm flap:

* can be used for coverage of the index, middle and ring finger
* followed by a second surgery for syndactylization

Tendon repair and nerve grafting are not indicated in the early phase

* especially in children

Capillary leak after burn is resolved after 24 hours

* addition of 5% albumin help maintain the intravascular volume

Mentosternal contracture:

* wide excision followed by

Anhydrous Ammonia: causes liquefactive necrosis

* alkaline solution
* denature and dissolve proteins and lyse cell membranes
* increasing the alkaline solution penetration into the eye

In major burns:

* the most important factor causing shock is hypovolemia
* disrupts capillary endothelium and membranes
* leading to leakage from circulation
* leading to decrease plasma voluma
* decrease cardiac output
* decrease urine output
* increase peripheral vascular resistance
* dilation of peripheral vasculature, myocardial depression, renal failure and paralytic ileus: all occur later

reDO question #82

In a patient presenting with frostbite that happened several days ago:

* the level of skin necrosis does not correlate with the level of bone necrosis
* therefore bone scan can help determine the viability of bone

Manifestation of shock following acute burn injury:

* decreased cardiac output
  + down by 40-60%

Arterial smooth muscle relaxation:

* angiotensin II
* catecholamine
* Neuropeptide Y
* Vasopressin

Silver Sulfadiazine:

* side effect: neutropenia

Toxic epidermal necrolysis (TEN)

* involves the superficial dermis
* therefore it heals without contracture
* and once patient is extubated, splinting patient is no longer needed

In a patient with large surface area burn like 60% TBSA:

* there is impairement of T-lymphocytes function
* there is redistribution of T-lymphocytes within the peripheral blood stream and tissue compartments
* IgG decreased the most among all Ig, however, all Ig decrease: due to plasma leakage and increased protein turnover
* IL-7 increased during the first week after burn injury
  + this results in decrease in proliferative capacity of B-lymphocytes

Hydrofluoric acid spills:

* calcium gluconate gel
* after copious irrigation with normal saline
* metabolic derangements can occur several hours if left untreated due to cellular death:
  + hypocalcemia, hyperkalemia and hypomagnesemia
* Any patient with hydrofluoric burn: should be hospitalized and monitored for symptoms of arrhythemia

Phenol burns:

* application of mineral oil
* irrigation is contraindicated because it dilutes phenol and causes deeper penetration and increase tissue damage

Creosol burns:

* should be treated with polyethylene glycol

Silver nitrate can be used for cauterization of pyogenic granuloma

Patients with sulfa allergy:

* cannot be treated with silver sulfadiazine (silvadene)

Can use mupirocin, bacitracin, polysporin

Acticoat: contains soluble silver that provides antibacterial activity for 5 days

* advantage: decrease rate of dressing change and decrease cost

The administration of NSAID for a patient with frostbite:

* decreased the production of thromboxane B2

Thromboxane B2 and PG F2a: induce microvascular thrombosis

* they cause platelet aggregation and vasocontriction

PGE2 and I2: antiplatelet

* resulting in vasodilation

It is thought that frostbite causes:

* increase in TxB2 and decrease in PGI2
* leading to imbalance towards microvascular thrombosis

Monoclonal antibodies have been found to reduce the depth of burn wound:

* inhibiting neutrophil adhesions to zone of stasis

There are three zones when discussing the burn injury:

* Zone of coagulation: the zone with direct contact with to the highest temperature where necrosis develops and extends downward
* Zone of stasis: the next zone out, cells sustain less injury initially, injury occurs following the development of ischemia and subsequent impairement of blood flow
  + injury here is potentially reversible
* Zone of hyperemia: cellular injury is minimal and potentially reversible

SIRS:

* occurs when more than 30% TBSA

Hypertrophic scar:

* develops if wounds remain open for more than 3 weeks

In a labored with burn to the dorsum of the hand:

* early excision followed by STSG!!!! Question #95

Inadequate fluid resuscitation:

* results in conversion of zone of stasis to zone of coagulation

In a severe whole body burn patient with suspected fungal infection:

* excision should be to the fascia
* (not only to healthy bleeding tissue: which will cause severe burn)

During the initial inflammatory response:

* there is increase in chemotaxis
* increased TNF-alpha, IL-1, IL-8
* increase chemotaxis of neutrophils into the wound
* there will be upregulation of integrins

In a kind with electrical burn on the oral commisure due to biting on cord:

* need to splint for 6 months to prevent micromastia
* then for several months at night only

Immunologic response for someone with TBSA more than 50%:

* decreased level of fibronectin
* diminished level of complement activation
* decreased production of Ig Ab
* Decrease in quantity and function of B-cells and T-cells
* increase number of suppressor T-lymphocytes

In the first 24 hours after thermal burn:

* there is increase in blood glucose level due to increase levels of catecholamines

Sulfamylon: Mafenide acetate

* decrease rate of suppurative chondritis
* broad antibacterial spectrum
* penetrates carilage

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| **In-Service Questions Notes: Breast Reduction** |

**Accessory mammary tissue:**

* young patient presenting with progressively enlarging mass of the axilla
* Path: hyperplastic glandular tissue without cytologic atypia
* occurs along the embryonic milk line
* Enlarges during period of hormonal stimulation
* Path: glandular tissue and receptor staining for estrogen and progestrone

**Fibroadenoma:**

* shows epithelial and stromal hyperplasia

**Juvenile Hypertrophy: (Virginal)**

* progressive enlargement of the breasts during puberty
* > 3% of total body weight
* or greater than 3.3 lbs (1500 g)
* Path: increased **stromal collagen** and fat

**Juvenile Papillomatosis (Swiss cheese disease)**

* papillomatosis and epithelial hyperplasia
* sclerosing adenosis and cysts
* 10% will develop malignancy
* occurs in pediatric but more common in adults

**Superomedial pedicle in breast reconstruction:**

* blood supply from the perforators of internal mammary artery
  + 1-4
  + through 1-4 interspaces
  + **Second perforating** branch is considered the principal one

**The Dominant blood supply to NAC:**

* comes from **internal thoracic artery** which anastomose with others

**Thoracoacromial artery:**

* **4 branches:**
  + **pectoral: supplies the breast**
  + acromial
  + clavicular
  + deltoid

**Viability of NAC intra-operatively:**

* can be assessed with idocyanine green angiography

**Glactorrhea:**

* rare but common complication that can occur after breast surgery
* Prolactin is elevated
* Due to breast manipulation, periareolar incision and irritation of the **4th intercostal nerve**
* **TX: Bromocriptine**

**Juvenile breast hypertrophy:**

* increase in **stromal** connective tissue
* Fatty tissue: **NOT PREDOMINANT**
* **Lobules** will be **absent** or poorly formed

**When you have a patient presenting with mass:**

* first step is to obtain imaging studies
* < 30 yrs old: ultrasound: dense breast tissue
* >30 yrs old: mammogram is the first test to be ordered
  + if mammogram is benign, then do US to differentiate solid from cystic
* Mammogram: Screening vs. Diagnostic
  + diagnostic has more additional views
* **In the question:**
  + if a patient already has a mass then needs diagnostic mammogram

In a patient with **history of mastectomy for breast cancer:**

* the risk of occult breast cancer in the contralateral breast that is found during breast reduction:
  + **5%**

The risk of occult breast cancer in patients with undergoing reduction mammoplasty **for symmetry:**

* **0.4%**

Factor most likely associated with increased risk of **postoperative fat necrosis after breast reduction:**

* tissue resection weight
* 5-10% after breast reduction surgery regardless of the technique
* Presents as soft tissue mass that is firm. Resolves spontaneously
* can be associated with redness and discomfort and confused with infectious process
* Other factors:
  + greater BMI
  + large amount of resected tissue
  + long distance from suprasternal notch to nipple
    - > 37 cm
  + Less clearly: smoking and technique

Wise-Pattern breast reduction using superomedial pedicle:

* sensation to nipple-areola complex
  + terminal branch of anterior 4th and 5th intercostal nerves
  + (lateral cutaneous branch of the 4th intercostal nerve is severed when doing superomedial pedicle)

**Nipple-areola innervation:**

* lateral cutaneous branch of the 4th intercostal nerve
* terminal branch of the 4th and 5th intercostal nerves

**Intercostobranchial nerve:**

* Lateral cutaneous branch of the second intercostal nerve
* medial and posterior upper arm sensation

**ACS recommendations for breast cancer screening:**

* baseline mammogram between the age of 40-44
* annual mammogram 45-54
* Then biennial from 55 onward

The incidence of occult breast cancer in reduction mammoplasty

* **1%**
* **Invasive ductal carcinoma is the most common type identified**

**In another question:**

* **the most common complication in reduction mammoplasty:**
  + delayed wound healing
    - correlates with preoperative breast volume
    - average resection
    - weight per breast
    - smoking
    - Inversely related to patient’s age
  + then: spitting of sutures
  + then hematoma

**Liposuction of breast vs. reduction mammoplasty:**

* Does not impair breast feeding
* Major blood supply and nerves remain intact
* Recovery is longer:
  + 6 weeks of bruising
  + up to 6 months for swelling and lumpiness to settle
* does not work well in glandular breast/teenagers

Fat necrosis on mammography:

* ranging from undetectable to spiculated density and clustered microcalcification

Atypical lobular hyperplasia:

* associated with increased risk of malignancy

When you find **atypical ductal hyperplasia** after breast reduction on path:

* follow the Gail Model of risk assessement
* There is increased risk of breast cancer: ipsilateral and contralateral
* 3-5 folds

**Radiation therapy is indicated:**

* positive margins
* > 5 cm size of tumor
* more than 4 axillary lymph nodes
* T4 disease

**Management of papilloma:**

* excisional biopsy
* any atypia needs to be excised

**Breast cancer and reduction mammoplasty:**

* rate decreased by 30% vs. prophylactic which is 90% decrease

**Most common cause of adolescent unilateral breast hypertrophy:**

* fibroadenoma
* phyllodes
* juvenile hypertrophy

**Phyllodes tumors:**

* fibroepithelial tumors and stromal derived
* increased cellularity, mitosis and stromal overgrowth
* 3%
* bening, borderline and malignant
* WLE with 1 cm margin
* the extent depends on grade
* margin negative, breast conserving is the most appropriate trestment
* behave more like sarcoma
* radiation is reserved for patients with margin positive
* no role for chemotherpy
* prognosis is considered excellent

**Reduction mammoplasty: using superior pedicle**

* has the highest risk of altered nipple sensation
* lateral cutaneous branch runs within the pectoral fascia

The amount of resection does not correlate with the amount of relief after breast reduction

**The role of estrogen in breast function:**

* facilitates ductal growth
* increases cell division (associated with fibrocystic changes)

**Progestrone:**

* glandular proliferation
* periductal stromal development

**Risk of nipple necrosis and ischemia:**

* <5%
* if noted in the OR: consider stitch release and free nipple graft
* if noted in the early post-op phase: release stitches

**The second and third perforating branches of the internal mammary artery are the dominant blood supply**

**The risk of complications in breast reduction:**

* increased with the amount of weight resected
* Intraoperative hypotension: increases the risk of hematoma
* hypertrophic scarring is decreased with larger resections

Even in young patients:

* perform reduction once enlargement has been stabilized for one year

**When breast development begins before the rest of puberty:**

* Benign premature telarch

**In mammary hypertrophy:**

* trapezius muscle is hypertrophied

Blood supply to the breast comes from:

* perforating branches of internal mammary artery
  + from second, third and forth posterior intercostal arteries
* lateral branches of posterior intercostal
  + second, third and forth perforating branches of the internal mammary artery
* branches of the axillary artery
  + pectoral branch
  + lateral thoracic artery

The larger vessels appear to be not so far from the skin

flaps need to be left at least 2 cm thick for maximum viability

Preservation of dermis when de-epithelializing flaps to protect the subdermal plexus from injury

Juvenile breast hypertrophy:

* increased end-organ responsiveness to estrogen
* They have normal levels of estrogen, progestron and prolactin
* They also have normal number of estrogen receptors

Patient presenting with hard lump after breast reduction:

* most likely fat necrosis due to hemorrhagic necrosis as a result of vascular compromise
* secondary revision can be performed in 6-12 months

Inferior pedicle breast reduction:

* allows for large amount of resection of tissue

The presence of **branching-pattern** calcification should always warrant ordering additional workup studies

* Malignant calcifications: appear as casting (linear or branching) or pleomorphic (granular)
* Benign calcification: popcorn appearance (fibroadenoma), large rod (secretory), round eggshell (oil cyst), dystrophic or coarse (fat necrosis)
* Tissue Bx is indicated if tissue is indeterminate or malignant

Main disadvantage of liposuction for breast reduction:

* inadequate correction of ptosis
* Advantages:
  + lack of scar
  + rapid technique
  + quick return to work
  + preservation of sensation
  + full ability to breastfeed
  + Complications such as hematoma, seroma and nipple necrosis are minimal
  + Not affective in young patients with dense breast tissue
  + Difficulty assessing the amount of breast tissue removed due to infiltration of tumescent solution
  + lack of pathologic examination
  + inadequate tissue removal in large breast
  + Poor skin shrinkage
  + Dissemination of cancer has not been reported
  + The nipple will rise about 2-6 cm but will still be ptotic
* Preferred candidate:
  + young with good skin elasticity
  + minimal to moderate hypertrophy
  + no ptosis

Vertical mammoplasty:

* using upper pedicle
* central breast reduction
* decreased undermining of the skin
* Key features:
  + vertical scar reduction mammplasty with skin excision in one direction
  + reduced scar burden
  + central vertical glandular excision
    - improved postop shape of the breast by narrowing the breast while maximizing the projection
  + This method is less precise than the inverted- T incision
* No significant difference in the rate of hematoma and nipple numbness
* The initial shape: flattened lower pole and small dog ears but that improves with time

The rate of occult cancer in breast reduction:

* 0.2%

Find the indication of free nipple grafting for breast reduction

The selection of vertical mammoplasty is limited by:

* limited by the length of the pedicle
* quality and amount of skin
* Lassus recommends transposition no more then 9 cm

In breast reduction: preservation of nipple sensation is dependent on:

* pedicle location
* (the anatomic location of glandular resection)
* Highest risk for nerve injury is using SUPERIOR pedicle
* (the amount of tissue removed is not statistically significant)
* (nipple to notch distance is not a factor, breast volume or type of skin incision

The sensitivity of NAC decreases as the breast size increases

NAC congestion post-op:

* torsion on the pedicle
* excessive tension on the closure
* Conversion to free nipple graft if release of the pedicle or no correctable cause is identified

Fibroadenoma:

* most common breast neoplasm in adolescent patient
* giant fibroadenoma > 5 cm
* presentation soon after puberty
* short doubling time
* solitary, firm and nontender
* presentation:
  + rapid asymmetric enlargement
  + prominent veins over the mass
  + occasional ulceration due to pressure
  + benign and excised by enucleation
  + minimal risk of recurrence

Following bilateral breast reduction:

* intercostal nerves most likely to be injured:
  + third and fourth intercostal nerves

Cutaneous branches of intercostal nerves:

* pass in the deep fascia of the chest wall at two anatomic points
  + lateral cutaneous branches at the midaxillary line
  + anterior cutaneous branches beside the sternum

Breast skin is innervated by anterior and lateral cutaneous branches of T1-T7

* the important one is T2-T6

Nipple innervation:

* by the anterior and lateral cutaneous branches of T3-T5
* Cutaneous area supplied by T4 is larger (is primary but not sole supplier)

The area of the breast that is the most sensitive:

* superior quadrants
* Nipple is the least sensitive to light pressure

Vibration is most sensitive in the areola

Breast sensitivity decreases with age

The most common mammographic findings after 6-18 months of bilateral breast reduction using inferior pedicle:

* calcifications

Most common radiographic findings are parenchymal redistribution and elevation of nipple (caused by downward shifting on tissue

The inframammary fold is used to determine where the new nipple is going to be

At the time of closure: nipple is about 7 cm from the inframammary fold

NAC innervation:

* anterolateral branches of the 3rd to 5th intercostal nerves

**The primary innervation to the nipple is from the lateral branch of T4**

**Gynecomastia is caused by:**

* Cimetidine
* Digitalis
* Minocycline
* Spironolactone
* amphetamine
* isoniazid
* haloperidol
* opiates
* progestins

**Not caused by ZOLPIDEM**

Vertical scar breast reduction:

* associated with central vertical glandular resection (narrowing the breast while increasing the projection)
* excision of skin in one direction to decrease scar burden

WISE PATTERN MASTOPEXY:

* should never be performed in gynecomastia patients

patient dissatisfaction after breast reduction is mostly due:

* prominent scarring

Breast feeding and breast reduction:

* 27-35% were able to breast feed for more than 2 months

Patients who had inferior pedicle mammoplasty:

* 29% were able to breastfeed
* 18% unsuccessful
* 53% did not attempt

There was no significance in the amount of breast tissue excised or mass between the group that breast fed and that which did not

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| **In-Service Questions Notes: Mandible** |

For edentulous patient with mandibular body fracture:

* need to perform open reduction internal fixation
* preferably using reconstruction bar

In a patient with parasymphyseal fracture:

* unfavorable fracture
* temporalis and pterygomasseteric sling close the jaw
* the mylohyoid depresses the mandible at the level of the symphysis
* because of the orientation of the fracture, they will displace
* if an intubated patient, once the effect of paralytics is gone, the fracture is more displaced

In a patient with bruxism:

* in a patient with pain: botulinum toxin A: reduces pain associated with bruxism
  + and also with masseter hypertrophy
* equal efficacy to occlusal splints
* Bruxism is a reported side effect of SSRI such as fluoxetine and escitalopram

Mandible contouring surgery:

* used for both mandible angle and body

An independent risk factor for concomitant C-spine injury:

* chest injury and ramus-condyle injury: are independent risk factors for concomitant C-spine injury
* C-spine injuries occur with mandibular fracture in about 4.4-10%
* Patients with mandibular fracture and associated face and head fractures are increased risk for CSI

When extracting mandibular molars;

* need to remove two tooth roots
* if tooth root is injured during reduction or fracture then it needs tom be removed
  + retained tooth root predispose someone to tooth abscess
* Maxillary premolars and mandibular molars have two tooth roots
* all other teeth have one tooth root

Aneurysmal bone cyst:

* biopsy shows multinucleated giant cells
* CT shows radiolucent bone lesion with expanded cortex
* Might be related to giant cell tumors
* they are most common in long bones
* but can be found in mandible in about 1.9%
* Resection and curettage is the treatment of choice
  + if not completely resected then can recurr
* path: pseudocyst with multinucleated giant cells, woven trabecular bone and sinusoids lacking endothelium
* These lesions can bleed a lot until resected

Patial mandibulectomy with free margin:

* treatment for ameloblastoma

If you have a patient with bilateral non-displaced subcondylar fracture without loss of facial height:

* can be treated with MMF for 4-6 weeks

Hypothesis of akylosis:

* formation of intracapsular hematoma
* resulting in fibrosis and bone formation
* causing hypomobility
* therefore if there is no involvement of the condylar head, then can do MMF for longer period

Do MMF for 4-6 weeks followed by guiding elastics for 2-3 weeks

In kids with displaced mandibular condyle fracture with intra-articular extension:

* Tx is MMF with arch bars
* Condylar fracture can predispose to facial growth disturbance and TMJ dysfunction
* Condylar fracture with displaced parasymphaseal fx should be repaired with MMF and arch bars
* Avoid ORIF to avoid injury to tooth buds
* Arch bars are safe in period of mixed dentition

Mental nerve:

* mental foramen exit
* inferior and slightly anterior to second premolar

Blood supply to the mandibular condylar head:

* medullary branch of the inferior alveolar artery

Blood supply from the condyle of the mandible comes from three sources:

* branch from the inferior alveolar artery (branch of the maxillary artery) from the external carotid artery: **most important**
  + **can be disrupted by the fracture to the neck or subcondylar region**
* contributor from TMJ
* large supply from branches of the lateral pterygoid

For intracapsular condylar fracture:

* ORIF is not recommended
* fragments are too small for hardware fixation
* a period of immobilization rather than observation will allow for restoration and pain relief

For mandibular angle fracture:

* placement of internal fixation using Champy technique over EXTERNAL OBLIQUE RIDGE
* By contouring the plate to this line, rigid fixation is achieved in two planes

Ligula:

* found along the lingual surface of the ramus of the mandible
* where V3 enters the mandible

Mandibular notch= glenoid notch

Once patient reaches skeletal maturity:

* can use titanium plates
* Angle plate cannot be treated with MMF
  + requires Champy plate or more rigid fixation

Right subcondylar fracture:

* anteromedial displacement of the condylar segment out of the glenoid fossa is secondary to the pull from lateral pterygoid muscle
* leads to loss of height
* premature occlusion on the fracture side
* ipsilateral crossbite
* contralateral open bite

Pterygomasseteric sling:

* formed by the medial pterygoid and masseter
* from skull base and zygoma to interior border of the mandible
* responsible for displacement of mandibular angle and body fracture

Mylohyoid and genioglossus:

* can contribute to fracture displacement of the body and parasymphysis

The use of resorbable plates:

* increased cost
* no statistical difference in overall or specific complications
* although recent studies are showing increased complications

Submandibular/Risdon approach:

* for body and ramus of the mandible
* marginal mandibular branches leave at the inferior border of the parotid gland
* Marginal mandibular nerve travels superficial or within the investing layer of deep cervical fascia
* It travels 1 cm below the mandibular border posterior to the facial vessels
* and then above the mandibular border anterior to the facial vessels

The submandibular appraoch:

* 2 cm below the mandibular border
* incise the skin
* divide the platysma and dissection deep to the investing fascia just above the submandibular gland

Severely comminuted bone fragments:

* get their blood supply from the periosteum and periosteal vessels
* that’s why you should avoid periosteal stripping in comminuted fractures
* hence the concept of closed reduction

Tubular (long bones) blood supply:

* dual blood supply
* blood vessels enter the middle third of the diaphysis then bifurcates
* anastomose with blood vessels that supply the metaphysis an epiphysis that supply the joint
* hence in kids fractures are the joints lead to growth retardation as there is less robust blood supply
* there is also the periosteal vascular blood supply from the overlying muscles

Flat bones:

* dual blood supply with nutrients
* periosteal vessels and vascular plexus

Load-bearing osteosynthesis:

* assumes all the load of the given bone instead of distributing it among the plate and the bone
* Mandibular locking plates

Load-sharing:

* lag screw fixation
* MMF
* non-locking mandibular border plate
* Monocortical miniplate (Champy Principle)

Osteonecrosis of the jaw due to bisphosphonate: BRONJ: bisphosphonate related-osteonecrosis of the jaw

* mandible is more affected than maxilla
* if there is no evidence of infection:
  + treatment is observation and use of antiseptic mouth wash
  + often resolves spontaneously once bisphosphonate is stopped

Stage 1:

* exposed bone with necrosis and no evidence of infection: treatment as above

Stage 2:

* exposed with necrosis and clinical evidence of infection and pain
  + antiseptic mouth wash, oral abx and superficial debridement

Stage 3:

* if all of the above with pathologic fracture, extraoral fistula, osteolysis extending to the inferior border
  + then surgical debridement or resection in addition to the above
  + if segmental mandibulectomy is performed:
    - usually repair with free fibula

In pediatric population:

* the fracture that most commonly causes future growth restriction is
  + bilateral non-displaced condylar fracture
* Growth centers in the mandible are found:
  + in condyle
  + posterior aspect of the ascending ramus

Apertognathia:

* anterior open bite
* Most common fracture associated with anterior open bite:
  + subcondylar/condylar fracture
  + caused by premature contact of posterior molars
* When unilateral:
  + causes open bite on the contralateral side

The spherical gliding principle:

* after placement of the first screw through the plate
* second screw should be placed on the other side of the fracture
* eccentrically
* away from the fracture line

In a patient who had chemotherapy and radiation for oropharyngeal fracture:

* then presented with pathologic fracture of the mandible after dental extraction:
  + most common cause of mandible fx after radiation
  + patient should undergo resection of that segment followed by free fibula

Load-bearing:

* locking plates and screws
* or external fixator
* indicated in:
  + comminuted fractures
  + segmental defects
  + edentulous mandible

Load sharing:

* MMF
* lag screws
* Champy plate
* compression plates

Patient with isolated mandibular fracture:

* associated C-spine fractures occur in 5%

When you have a pediatric patient presenting with displaced parasymphyseal, condylar and subcondylar fractures:

* treatment is ORIF of the parasymphaseal fracture
* Closed reduction and MMF of the rest
* Pediatric fractures are treated more conservatively than adults due to mixed dentition
  + due to for potential of remodeling and elasticity of the skeleton
* MMF should be removed at 3-4 weeks
* if titanium plates are used:
  + need to be removed within 2-3 months

Young patient with mandibular fracture at the angle:

* ORIF (rigid fixation)

Subcondylar fracture:

* displaces the condyle anteriorly and medially
* therefore unopposed action of the temporalis and masseter muscle takes over resulting in shortening of the posterior height

Facial numbness is seen with ramus and body of mandible fractures

Basal skull fracture:

* bilateral mastoid ecchymosis
* clear fluid from external auditory canal

Osteonecrosis of the mandible:

* occurs in 40% of patients with radiation to the head and neck
* exposed irradiated bone that is not healing for 3 months
* hyperbaric oxygen can used if there is involvement of the alveolus only or mandible above the level of the canal

Right mandible angel fracture:

* results in shortening of the height on the right
* pull of the masseter
* posterior open bite on the contralateral side

**Check numbering of teeth**

**Ameloblastoma:**

* excision includes segmental mandibuctomy with wide margin and free fibula
* odontogenic tumor with multilocular lucency, thinned cortex
* curettage or conservative resection: 50% recurrence
* lack of mucosal ulceration or corical bone erosions: points away from the a malignancy

Open reduction of the condyle indications:

* displacement into the middle cranial fossa
* impossibility of obtaining dental occlusion by closed reduction
* lateral extracapsular displacement of the condyle
* invasion of foreign body (bullet)

Intermaxillary fixation in pediatric patient:

* 1-2 weeks

In children:

* **condyle fractures** are the most common 34%
  + present with premature contact on that side and also pointing of the chin towards the affected side
* least is symphyseal

In adult: most common site for **mandibular** fracture is the angle

* up to 30%

Presence of symphysis or parasymphyseal fracture:

* should alert for a second fracture

Depression and protrusion of the mandible:

* lateral pterygoid
* Originates from the greater wing of sphenoid, inferotemporal crest and lateral surface of the lateral pterygoid
* insert into the neck of the mandibular condyle and TMJ
* Action:
  + depress
  + protrude
  + move the mandible from one side to another

Muscles of mastication:

* innervated by the trigeminal nerve, mandibular branch V3
* Masseter closes the jaw
* Medial pterygoid: from medial surface of the lateral pterygoid into the medial surface of the ramus
  + acts to close the jaw
* Temporalis inserts into the coronoid process and the anterior surface of the ramus
  + closes and retract the jaw

Angle classification:

* class I: mesial buccal cusp of the first maxillary molar on the buccal groove of first mandibular molar
* class II: 1: lingually inclined
  + II 2: labially inclined

In adults the normal vertical mandibular opening:

* 41-50 mm

Lateral jaw excursion:

* 10 mm

For low subcondylar mandibular fracture:

* the safest and most versatile is retromandibular approach
  + also the safest when it comes to branches of the facial nerve
  + allows access to the coronoid process and angle of the mandible
  + the addition of transfascial trocar facilitates access to higher level subcondylar fracture

Kids with bilateral condylar fracture:

* highest risk of mandibular hypoplasia
* condyles serve as the growth center of the mandible
* contributes to vertical growth
* these fractures generally remodel and do not cause growth disturbance
  + unless there is injury to the thin localized matrix
* These fractures usually heal well with short period of MMF (2 weeks)

Champy’s principle for fracture management:

* placement of miniplates along the tension lines in the mandible at the site of fracture
* compression is not necessary
* miniplates can be anchored with monocortical screws
* Champy detemined that anterior to the canine: 2 miniplates, posterior to canine one miniplate

The submandibular space:

* inferolateral to myelohyoid muscle
* superior to hyoid bone
* contains:
  + submandibular gland
  + lymph nodes
  + facial artery and vein
  + interior loop of the hypoglossal nerve
* Infection in the submandibular space involves infection of the second and third mandibular molars
  + their roots are below the myelohyoid muscle

Infection of the anterior mandibular teeth:

* drains above mylohyoid muscle
* into the sublingual space

Locking reconstruction bone plate:

* decrease postoperative malocclusion after comminuted fracture
  + do not require intimate contact because the bony segments are secured by screws that are locked to the plate
* Cortical compression
* blood supply disruption and bone resorption occur less frequently with locking plates than standard recon plates
* less difficult plate contouring
* no increase in hardware failure
  + less likely
* Rate of infection is the same
* vs conventional (non-locking) that require precise adaptation of the plate to the underlying bone
  + without intimate contact, the bone is drawn to the plate when screws are tightened
    - altering the position of the osseous segments and the occlusion relationshop

Crossbite:

* Buccal vs lingual relationship
* mandibular molars in relation to maxillary molars in transverse plane

Indication for tooth removal in patients with mandibular fracture:

* fracture through the root of the tooth
* severe loosening of the tooth in the setting of severe periodontal disease
* extensive periodontal injury with broken alveolar walls
* displacement of teeth from their alveolar socket
* Periodontal disease alone is not an indication
* multiple fractures of the mandible are not an indication for tooth removal because patient needs IMF
* Caries not an indication for removal of tooth
* loose tooth not an indication and can be addressed with proper alignment and reduction of all fractures

In distraction osteogenesis of the mandible using external distractors:

* Successful distraction is most dependent on stable fixation of the bone
  + (adequate stabilization of the bone edges)
  + unstable fixation results in excessive motion and fibrous union

Consolidation period of at least 4-6 weeks before the removal of distractors

Rate of distraction is 1mm a day is good but there have been studies were people used 2 mm

Lag perior is never necessary in craniofacial distraction

supraperiosteal dissection is important in distraction fo the extremities but has not been shown to be necessary in the mandible

For procedure on the maxilla such as plating of the maxilla with fracture that involves the central and lateral incisors

* Need to block the nasopalatine and anterior superior alveolar nerve
* Nasopalatine: block the lingual surface
* Anterior superior alveolar nerve for the teeth and alveolar mucosa (buccal surface)

Nasopalatine nerve:

* from inferior orbital nerve and pass through the incisive foramen to the anterior hard palate
* innervates the premaxilla then go posteriorly to innervate the maxillary cuspid

The anterior superior alveolar nerve:

* branches from infraorbital nerve after it exits the infraorbital foramen
* provides innervation to maxillary incisors and canines

Greater palatine nerve:

* to the posterior aspect of the hard palate

The middle and posterior superior alveolar nerves:

* from infraorbital nerve
* after it exits the pterygopalatine foss
* the middle innervates the bicuspids
* posterior innervates the first, second and third molars within the maxila

Anterior muscles that exert forces on the mandible:

* geniohyoid
* genioglossus
* myelohyoid
* digastric muscle (anterior belly)
  + the muscles from this group exert anterior distractive force on the anterior fracture segment of the parasymphyseal fracture
  + displacing the fractured segment: posteriorly, medially and inferiorly

Geniohyoid:

* from the mental spine of the inner anterior mandible
* to the hyoid bone
* depress and retract the mandible

The digastric muscle:

* originates from the medial aspect of the mastoid
* courses inferiorly and forward as a tendon
* passing through fascial sling on the hyoid bone
* continues as a anterior belly and inserts into the digastric groove of the mandible
* Posterior belly: elevates the hyoid
* anterior belly of digastric exerts forces on the mandible

Fracture of the parasymphysis:

* depressed by the anterior muscles

Simultaneous contraction of medial and lateral pterygoind:

* produces the side to side grinding and chewing movement of the mandible

medial pterygoid:

* originates from the medial surface of the lateral pterygoid and tuberosity of maxilla
* insert into the medial surface of the mandibular angle and ramus
* act to elevate the mandible

Lateral pterygoind:

* from the lateral surface of the lateral pterygoid and infratemporal surface of the greater wing of the sphenoid
* inserts into the mandibular condyle and articular disk
* protrude the mandible forward and open the mouth

When both medial and lateral pterygoid on the same side work at the same time:

* there will be vertical axis movement around the contralateral condyle
* Grinding and chewing occurs when both sides alternate rhythmic movement
* Action of all 4 pterygoids results protrusion of the mandible

When patient sustains a fracture that results in bilateral parasymphyseal fracture:

* the anterior segment of the mandible will be displaced inferiorly and posteriorly by the action of
  + anterior bellies of digastric
  + geniohyoid
  + genioglossus

Upward, medial and forward movement of the mandible:

* medial pterygoid

Patient with microgenia in AP and vertical dimensions: Microgenia: small in three dimensions and can be associated with normal occlusion or prognathism

* perform osseous genioplasty or sliding genioplasty

Retogenia:

* the chin is posteriorly placed but not small

Chin implant:

* increases anteriorposterior projection but not vertical height

Infection after mandibular ORIF:

* results in failure of fixation device and loosening of the screws
* beside I&D, IV abx, might need to remove the plate and screws and replace them with intermaxillary or external fixation for stabilization
* if the plate is still stable, then do not remove it and just do I&D and abx treatment

Lip numbness after fracture of the mandible:

* site of fracture is the body

During the late 4-5 cm of jaw opening:

* The articular disk separates the joint disk into superior and inferior spaces
* At rest and during rotation: the mandibular condyle is located in the lower joint space
* during translation: the condyle moves into the upper joint space

Initial 1-2 cm of jaw opening: rotatory or hinge movement

2-3 cm opening: rotation and translation

terminal 3-5 cm: translatory movement only

Mandibular distraction at a rate of 1 mm/day is found to be optimal

Non-displaced fracture of the coronoid:

* MMF for 1-2 weeks
* the tendons of the temporalis will act like a sling
* may need physical therapy after that

If there is displaced coronoid fracture that obstructs normal mandible motion:

* partial coronoidectomy

The most effective way in determining the maxillomandibular relationship prior to application of rigid fixation in an edentulous patient with displaced bilateral mandibular fracture of the body:

* custom-fabricated intraoral splints
* or patients own dentures

|  |
| --- |
| **In-Service Questions Notes: Hand fingertip amputations, Dupuytren's** |

Digital replantation should always be attempted in children

* unless the finger is crushed
* life-threatening condition
* functional outcome is much better than adults
* better sensory return
* can have normal growth

Single digit amputation:

* contraindicated if proximal to the insertion of FDS
* Poor range of motion

Multiple digit amputation:

* implantation is indicated due to functional deficit

Thumb:

* should always be replanted
* responsible for 40% of the function
* Even if still, should be replanted because it can still act like a post for opposition

Index finger:

* proximal phalanx or proximal to PIPJ
* by many is considered an indication for amputation
* stiff and painful index
* patient will exclude
* better global function of the hand

Digits tolerate long ischemia time:

* due to lack of muscles
* 6-12 hours warm ischemia time
* 12-24 hours of cold ischemia
* has been reported after 33 hrs of warm ischemia time and 94 hrs of cold ischemia time

Abx of choice for leeching:

* ciprofloxacin
* Hirudo medicinalis: most common leech species used
* Against Morganella, Rikenella and mostly Aeromonas
* Doxycycline and cetriaxone: alternatives
* Cirpofloxacin: first quinolone approved for use in children from 1-17 yrs

The co-morbid condition associated the most with replant failure:

* psychotic disorder: 79%
* PVD
* Electrolytes imbalace
* Alcohol abuse 16%
* Smoking 7%
* DM 3%

Thumb amputation at the level of carpo-metacarpal level:

* pollicization
* allow for sensate and functional index

Require part of the metacarpal to be available:

* toe to thumb transfer
* metacarpal lengthening
* osteoplastic reconstruction

In patient with scleroderma, digital pain with ulcer due to Reynaud’s:

* botulinum toxin:
  + improves digital ischemia
  + reduces pain
  + increases blood flow
* Pathophysiology of Reynaud’s:
  + sympathetic hyperactivity
  + increases endothelin and alpha-2 receptors
  + abnormal platelets and RBC
* Studies have shows increased blood flow, reduced pain in 5-10 mins and healed ulcers in 60 days
* Stellate ganglion block: only short term relief and no effect of healing of ulcers
* brachial plexus block: increases blood flow temporarily and advocated for patients undergoing microvascular surgery only
* Bypass does not work as the target vessel is diminutive

Fingertip amputation:

* less than 1.5 cm2
* with minimal or no bone exposed
* best to heal by secondary intention with semiocclusive dressing: semipermeable and transparent: opsite or tegaderm
* healing time on average is 20 days
* change every 5-7 days
* With moist dressing (an option in another question): it can take about 3-6 weeks to heal

First toe and second toe blood supply:

* First dorsal metatarsal artery (FDMA): 70% dominant
* First plantar metatarsal artery: 20% dominant (FPMA)
* When dissecting: start dorsally in the web space btw big toe and second toe
  + junction btw the lateral digital artery of the great toe and medial digital artery of the second toe is identified above the intermetatarsal artery
* If FPMA is used:
  + then need vein graft
  + short pedicle
  + limited to mid metatarsal
* Vascular pedicles btw two second toes are asymmetric in 20% of patients

Psoriatic arthritis:

* auto-fusion of the small joints of the hand
* fusiform, sausage shaped finger, psoriatic dactylitis
* inflammation of the periosteum, tendon and tendon insertion
* nails: pitting, leukonychia and onycholysis, nail crumbling
* nail deformities in 80% of patients with psoriatic arthritis and 50% in patients with psoriasis

Nail Lichen Planus (NLP):

* thinning
* longitudinal ridging
* distal nail plate splitting
* treated with intralesional or systemic steroids, not topical

Arsenic toxicity:

* hyperkeratosis
* Mee lines: horizontal lines in the nails of toes and fingers due to deposition of arsenic in keratin rich tissue

Subungal melanoma:

* brown or black streaks in the nail without known injury
* Huntinchon’s sign:
  + When the nail has streaks that extend from the tip of the nail down to the nail bed and into the eponychium
  + Do not improve with nail growing

Nails in HIV:

* clubbing
* splitting
* discoloration

To reverse the effect of epinephrine: (alpha adrenergic receptor activator)

* phentolamin
* alpha-receptor blocker
* inject 1-2 mg in 1-5 mL in saline into the areas where epinephrine was injected
* reversal of effect will be evident within an hour
* terbutaline: should be considered as an alternative, it reverses in some but not all

The level of amputation is more important than: distal to FDS insertion should be attempted

    proximal to PIPJ or proximal phalanx is not indicated

    thumb should always be replanted

* age: always indicated in a child
* hand dominance
* nonsmoking status: smoking is not a major variable in replantation
* the type of finger

First web space contracture:

* release adductor aponeurosis and palmar fascia
* intrinsic muscle and joint contracture should be addressed
* May need to perform trapeziectomy to restore the function of CMC joint
* Best choice of flap:
  + Posterior interosseous artery perforator flap
  + PIA runs between the extensor carpil ulnaris
  + extensor digiti quinti
  + **(ECU and EDM)**
  + Forms an anastomosis with **anterior interosseous artery**
    - 2 cm proximal to DRUJ

Flexor carpi ulnaris flap:

* good for elbow coverage as turnover flap

Reynaud’s initial management:

* oral nifedipine
* Botulinum toxin: second line when Ca channel blockers fail
* Third line for patients with pain and ulcers:
  + surgical sympathectomy

Reverse Homodigital island flap:

* distally based
* useful for repair of fingertips
* arterial flow from the contralateral digital artery
* requires sacrifice of the ipsilateral digital artery
* must preserve the nerve
* skin graft the donor site

Volkmann’s contracture:

* Affect mostly the deep volar forearm
  + FPL
  + FDP mostly
* Tx: dynamic splinting
  + Physiotherapy
  + Muscle origin sliding Or tendon lengthening

Hypothenar hammer Syndrome:

* Gold standard for dx is angiography
* Pathognomonic findings:
  + Tortuous ulnar artery with corkscrew appearance
  + Aneurysmal formation
  + Occlusion around the hook of hamate
  + Intraluminal emboli at the site of occlusion
  + Treatment:
    - Conservative with mild or intermittent symptoms:
    - Smoking cessation
    - Avoidance of trauma
    - Padded gloves
    - Occupation change
    - Cold avoidance
    - Ca channel blockers
      * Nifidipine
      * Diltiazem
    - Antiplatelets/anticoagulant
    - Local wound care to fingers
    - Decrease blood viscosity: pentoxifylline
  + Surgical treatment:
    - Ligation if arch is intact
    - Excision of segment with end-to-end anastomosis or vein/artery graft

Finger fillet flap:

* an option for coverage of hand wounds especially in an old patient, with medical comorbidities that cannot sustain a long surgery

For thumb reconstruction:

* Metacarpal distraction:
  + Can provide long sensate big thumb without nailbed and aesthetically not good
* First web space deepening:
  + Good when the thumb has some length ln it and allows for opposition
* Osteoplastic recon with flap:
  + No mobility
  + Aesthetically bad
* Index pollicization: best aside from toe to thumb transfer

Dupuytren’s disease:

* Lipofilling after needle aponeurotomy reduce the density of cell to cell myofibroblast contact
* Inhibit myofibroblast proliferation by stem cells
* Acting as interposed tissue graft
* equivalent at one year to limited fasciotomy

Signs and symptoms of compartment syndrome:

* increase pain with passive stretch
* pressure on palpation
* pallor
* paraesthesia
* paralysis
* pulselessness
* pain out of proportion to physical exam

Indications for fasciotomy:

* compartment pressure 30 mmHg
* Or the difference in the intracompartmental pressure and diastolic pressure is less than 30 mmHg
* Otherwise, Volkmann’s contracture: scarring and shortening of the muscles
  + intrinsic minus appearance of the hand (claw hand)

Wrist disarticulation vs. Transradial amputation:

* Primary benefit of wrist disarticulation is the preservation of the forearm range of motion at the distal radioulnar joint
* preservation of length aids in prosthesis fit but may lead to limb length discrepancy when adding functional units such as myoelectric
* predispose to pressure-related wounds
* more likely to abandon their prosthesis compared to transradial amputation

Acute arterial thrombosis of the hand:

* first line of treatment is heparin and aspirin administration
* Distal limb salvage is the same at 30 days, 6 months and 1 year when comparing:
  + surgical extraction vs thrombolysis
  + Bleeding and distal embolization:
    - more common in embolization

Indication for surgery in extravasation injury:

* full thickness skin necrosis
* chronic ulceration
* persistent pain

In digital replantations:

* vein grafts permit vascular anastomosis outside the zone of injury
  + they exhibit similar rates of thrombosis and replantation survival

Sequence of digital replantation:

* Structure by stucture (not digit by digit)
* Bone, tendon, artery, nerve, vein

In patients with scleroderma:

* when there is no arterial inflow problem
* spasm is the most common cause of their ischemia
* **Digital sympathectomy** can be performed
  + stripping adventitia of the radial, ulnar and digital arteries

**Mechanism of injury** for replantation:

* has great influence on the survival of the replanted digits
* the more the tissue is crushed, the more the vessel injury and less likely to survive

Ulnar artery aneurysm:

* local mass effect
* distal embolization
* vasospasm
* normal DBI 0.75-0.97
  + < 0.7 inadequate tissue perfusion: indication for arterial reconstruction (reversed vein graft, arterial graft from lateral femoral circumflex system)
  + < 0.5 tissue loss

Pollicization:

* transfer of the index finger to thumb position
* index proximal phalanx to thumb metacarpal

Sensate options for thumb pulp:

* neurovascular island flaps
* Moberg flap
* Free toe pulp flap
* FDMA: flap also knows as Kite flap
  + supplied by an artery that that courses in the fascia of the metacarpal index and supplies the skin over the proximal phalanx
  + with a branch of the radial nerve for sensation
  + (cortical reorientation): takes 2 yrs, 2-point discrimination is 10-11 mm
  + FDMA is compared to heterodigital island flap, but FDMA is easier and acceptable donor site

Effect of Botulinum toxin on Raynaud Phenomenon:

* inhibition of Rho/Rho kinase activity
* inhibition of substance P secretion
* Decreasing the activity of chronically upregulated C-fiber nocireceptor

Islandized Moberg Flap:

* provides sensation to thumb based on neurovascular pedicle
* This islandized modification by making a transverse incision at the base, dissect neurovascular bundle to gain more advancement and put skin graft over the proximal defect

Body Powered prosthesis: TMR provides better prosthesis control by input from median and ulnar nerve signals

* uses motion of remaining joints to control prosthesis
* TMR does not affect the function of prosthesis:
  + places the nerves as far from cutaneous closure as possible
* TMR: does not decrease denervation atrophy
* Resected nerves can be coapted to remaining muscles
  + transcutaneous EMG are placed over these reinnervation sites to detect nerve signals
* TMR does not affect the amount of bony length that can be preserved

Injection of botulinum toxin for Raynaud’s digital vessels:

* perivascular injection in the palm
* studies have shown 75%-100% pain reduction
* 50% healing of chronic ulcers
* 10 units around each digital neurovascular bundles in the palm
* most common side effect is temporary weakness of intrinsic muscle

High pressure latex injection:

* emergency I&D
* can lead to compartment syndrome as well as infection in small space
* Can be see on x-ray and you should get it
* optimal time for intervention is 6 hrs

The minimal stump length that is required for upper extremity prosthesis below the elbow:

* 5-10 cm
* Need:
  + adequate length
  + durable soft tissue
  + tapered shape
  + muscle preservation for myoelectric
* For ideal muscle coverage:
  + amputation at least 10 cm proximal to the wrist
  + or at the junction of middle and distal 1/3

The number of replanted dorsal digital veins correlates the survival of replantation

Split nail results from adherence of nail fold to nail plate plate.

Treatment includes excision of nail bed and repair the nail bed.

Grafting of the Nail is required when there is no enough tissue to close the nail beds

Split graft of the sterile matrix is used if the defect is distally only. However if it involves more personal than you need full thickness graft

The best reconstructive option of the thumb when there is no metacarpal bone is

* Pollicization of the index finger
* When the amputation involves the proximal phalanx or the metacarpal bone other options can be used such as bone lengthening toe to thumb transfer and osteoplastic reconstruction
* Pollicization will restore thumb length and provide

Limited fasciectomy for Dupuytren’s:

* Provides the greatest degree of correction
* Longest duration prior to recurrence
* However it has the highest cost

Always remember when you have a trauma patient, to finish the trauma workup

Replantation in children:

* Most significant contraindication is crush injury and multi-level injury
* Replantation in children does not adversely affect epiphyseal growth plate
* Although the index finger is expendable, replantation in children should always be attempted
* They have more favorable results

For upper extremity contrast extravasation:

* The use of ionic high osmolality contrast increases the complications
* Recently they have been using low osmolality, non-ionic contrast

The use of Collagenase Clostridium histolyticum:

* No cases of digital nerve rupture during cord breakage
* Pulley rupture and tendon rupture have been reported
* There is usually in neuropraxia that should be observed
* Exploration of neurapraxia can be performed after eight weeks

When it comes to finger coverage, they like to ask about sensation

* The homodigital island flap is skin and fat based on one of the neurovascular bundle's that is transferred distally to cover the pulp
* It's requires that one of the vessels need to be patent
* The digital nerve is raised with these flaps hence it retains the sensation

FDMA:

* Based on the branch of the radial artery and superficial radial nerve overlying the proximal phalanx.
* This will not reach the tip of the finger, if it is the index finger

Thenar flap and Cross-finger flap:

* They do not bring their own sensation
* Sensation grows from surrounding nerves

The nail bed:

* Germinal matrix proximally
* Sterile matrix distally

Hook nail:

* When the sterile matrix is foreshortened and it heals to the volar soft tissue

Forearm warm ischemia should not exceed six hours and can be stretched to 12 hours when cooled

When performing a vascular anastomosis on amputated tissue, allow for metabolites to be flushed by performing the arterial anastomosis first

Thumb reconstruction:

* Amputation through the proximal phalanx provides adequate length for pinch in opposition through deepening of the first web space
* Prior to microsurgery, some reconstruction took place using Osteoplastic reconstruction with reverse radial forearm flap with a segment of the radius. This was nothing like a thumb, it was insensate and minimal range of motion through CMC joint
* The Great toe wraparound flap is good for resurfacing of soft tissue in the skeletal structure is there
* The downside of great toe free transfer is that the toe can be larger, and the effect of the donor site is more aesthetically unpleasing
* Second toe transfer allow for more aesthetically pleasing donor site with good function and sensation similar to great toe

Moberg Flap:

* Great for soft tissue defect of the thumb about 1.5 cm² on the volar aspect
* It has axial blood supply
* Provides sensate coverage
* V-Y flap does not cover a defect of 1.5 cm²
* The one disadvantage is deficit an extension at the IP joints
* You can do this flap in the thumb because of robust dorsal circulation
* If you do it in any other finger it will result in dorsal skin necrosis due to volar circulation

The nail grows at a rate of 3 mm a month and it takes 3 to 4 months for the whole nail plate to grow again

In hand transplant, the skin is the most immunogenic component

* This is type two hypersensitivity reaction
* acute Rejection takes place
* IgG and I GM are formed against offending antigens destruction by the immune system
* Since the skin contains Langerhans cells, hence the skin is quite immunogenic

The most common complication of brachial artery arterial line placement:

* **injury to the median nerve**
* That's because the median nerve courses with the brachial artery i totally **separate by the bicipital aponeurosis**
* Hence it's at greatest risk of injury in the distal arm
* Therefore numbness in the radia three fingers of the median nerve distribution
* Femoral artery is associated with the highest rate of local and bloodstream infection
* There is decreased risk of thrombosis in larger caliber vessels,
* increased risk in case of large bore catheters, more than 72 hours low blood flow states peripheral vascular disease and vasospastic disorder

Lumbrical plus finger:

* Occurs after the amputation of the distal third of the middle finger
* FDP retracts
* Increasing the tension on the lumbricals
* This leads to paradoxical extension of PIPJ with flexion of the fingers
* Will be resolved by releasing the lumbricals of the FDP of the middle finger

Hypothenar hammer syndrome:

* Known as trauma induced thrombosis of the ulnar artery
* Affects more men than women with a ratio of 9:1
* age 40-60
* Occurs almost always on one side, ulnar side
* Associated with vibration or blunt trauma activities to the ulnar base of the palm
* can include pain over the hypothenar eminence, call sensitivity and paresthesia of the ring and little fingers blanching and slow capillary refill
* Possible positive Allen's test
* Sometimes they'll be an aneurysm: Guyon’s canal
  + source of emboli
* Non-operative management is activity modification
* If there is an aneurysm then it requires resection and then grafting of the affected segment

Buerger Disease: Thromboangitis obliterans

* Acquired vasculitis
* Always in smokers
* Bilateral and not localized to ulnar side
* 30-40 yrs of age
* Progressive intermittent claudication to severe ischemia and necrosis with digital alterations

Ulnar tunnel syndrome:

* compression on the ulnar nerve in the ulnar canal
* usually by ganglion cyst

Thoracic outlet syndrome:

* Neurovascular compression of the subclavian artery and brachial plexus
* Can present with cold intolerance and sensory symptoms localized to the ulnar nerve but are more diffused and not particular to the other side of the hand

The first muscles to sustain injury from upper extremity compartment syndrome are:

* FDP
* FPL

Hook nail deformity occurs when there is lack of bony support to the sterile matrix

* Sterile matrix should be 2 mm proximal to the distal phalanx Tip.
* Bone grafting is an option but has the highest failure rate due to resorption
* Other options include free vascularized nail flaps, arterialized Venus Nail flaps, or osteo-onychocutaneous nail flaps

Dupuytren’s contracture:

* Progressive contracture of Palmar facia
* Increased activity of myofibroblasts with genetic component
* more common in people of northern european descent
* Treatment of PIP contracture of the little finger is most likely to be associated with tendon rupture from collagenase injection
* Inject no deeper than 2 to 3 mm and no further than 4 mm to the palmar crease
* It's too close to the Palmer crease as much as possible

Toe to thumb free transfer:

* First dorsal metatarsal artery from dorsalis pedis is the most common pedicle in 70%
* First plantar metatarsal artery from the lateral plantar artery it's less commonly the dominant pedicle
* If the plantar artery the dominant pedicle, this can be traced to dorsalis pedis as there's connection between plantar and dorsal metatarsal arteries
* Recommend using van graft when the plantar the tarsal artery is the dominant particle

Hyperacute rejection:

* Within minutes to hours
* Pre-existing antibodies during previous transfusion, pregnancy or transplant
* Ag-Ab complex activates complement system
* no treatment

Acute humoral rejection:

* within days
* takes time for antibodies to form
* can be treated with plasmapharesis and anti-B cell reagents

Acute cellular rejection:

* within month 3-6
* T-cell mediated: activated against donor antigens in recipients lymphoid tissue
* Tx: increasing immunosuppressive medication dosage or anti-lymphocytic antibodies

Chronic rejection:

* developls several months to years
* both Ab and cell-mediated

Evaluating post traumatic some reconstruction:

* Determine the residual length
* And the function of the remaining thumb
* The function is good but need extra length, use four flap Z plasty to deepen the first web space
* Can also use single Z-plasty with dorsal rotational flap\

Moberg flap:

* Volar advancement flap
* Used for soft tissue coverage distal to IP joint
* Does not exceed 2 cm
* Based on neurovascular bundle, axial

Dupuytren’s indication for surgery:

* MCP > 30 degrees
* PIP flexion
* MCP is usually not a problem and released easily by simple fascial excision
* If PIP remains flexed: chekerin ligaments need to be released
* the next to be released is the accessory collateral ligament

Ring finger avulsion:

* failed replantation
* do Ray amputation: which resects the whole finger with part or all of the metacarpal
* eliminates segmental loss and improves function and aesthetic appearance

When using leech therapy for venous congestion

* Look at the age of the patient
* If Pediatric then use ceftriaxone instead of ciprofloxacin

For thumb replantation you will need vein graft from princeps pollicis artery

Tsuge and Holden classification of Volkmann’s contracture

Mild involves FDP only

Moderate involves the rest of the deep flexor compartments and begins to affect superficial flexor compartment

Complete deep flexor compartment and superficial compartment as well as the extensor to some varying degree

For nailbed injury that involves scarring of the germinal and sterile matrix:

* Take full thickness nail graft from the big toe

After the composite skin graft for distal tip injury is debrided and as long as there is no exposed tendon or bone:

* Continue local wound dressing
* Bilateral VY flap/Kutler, or volar advancement flap/Atasoy there will be increased risk of flexion contracture at PIPJ

Spiral cord is formed when Dupuytren's disease affect

* the pretendinous band, spiral band, lateral digital sheet, Grayson ligament
* The normal Palmar fascia structures passed around neurovascular bundle in a spiral fashion
* Record forms and contracts it becomes Straight
* Neurovascular bundle is done displaced centrally on the digit and distorted to spiral around the cord

Thumb tip defect:

* 1 to 1.5 cm can be repaired with volar rectangular advancement flap/Moberg flap
* Larger surface area can be covered with FDMA or little flap dorsoulnar aspect of the long finger
* Little flap can cause flexion contracture if harvested too volar over the finger, IP crease not preserved and full-thickness skin graft is not used on the donor side
* It's no bone is exposed and it's more than 1 cm then you can do a skin graft, if less than 1 cm then you can let it heal spontaneously

AV fistula can be acquired during hospitalization and the treatment is excision and vascular reconstruction with vein graft

When you have small finger tip injury:

* You want to preserve FDP to maintain grip strength
* You should never suture FDP to the extensor tendon because that will result in quadriga effect and decrease in grip strength

Systemic sclerosis is a connective tissue disease where there is progressive the position of calcium in the soft tissue with resultant skin tightening

Hook nail deformity or parrot beak nail deformity occurs when there is loss of volar tissue support to the nail bed

Complex regional pain syndrome CRPS:

* There are stage 1, 2 and three
* Abnormalities and blood flow to the circulation and 98% of the cases

Synechia of the nail bed at the lateral aspect of the eponychial fold:

* two fold problem: eponychial fold is contracted and adherent to underlying nail bed
* and the nail bed is scarred
* Tx:
  + scar excision
  + reconstruction with an eponychial flap
  + nail bed graft from toe

Hook nail:

* need bone grafting for support
* cross finger flap for coverage

Reverse cross flap:

* covers defects on the dorsum of the adjacent finger
* the skin on the dorsum of the finger is incised at the side closest to the recipient finger
* then the subcutaneous tissue is incised as a flap with its base closer to the recipient tissue
  + this is sutured to the recipient digit bed and used on which full-thickness skin graft is placed
* the native skin of the donor finger is returned back

Cross-finger flap:

* used to

Toe-to-thumb transfer:

* standard of care of thumb reconstruction when the level of injury at the level of MCPJ

Pollicization:

* when amputation at the level of CMC joint

CREST findings:

* calcinosis
* raynaud’s phenomenon
* esophageal dysmotility
* scleroderma
* talengiectasia

Hypothenar-hammer syndrome:

* blow or repetitive vibration
* thrombosis of the ulnar artery

Thumb contributes to 40% of hand function

Even after partial amputation of the index finger, when you have amputation of the thumb:

* you can still do pollicization of the index finger

Ring avulsion injury:

* the most appropriate treatment to improve survival of the finger
  + resection of the injured vessels and vein grafting

Moberg flap:

* good for advancement for distal wound on the thumb

FDMA:

* can be made sensate if you take a small branch of the radial sensory nerve

Replantation of single digit in zone II is relatively contraindicated

Soft tissue loss from the volar aspect of the fingertip:

* healing by secondary intention can provide durable coverage and sensation
  + sometimes this leads to insufficient padding
* toe pulp can be used: harvested from the lateral aspect of the great toe or medial aspect of the second toe

the germinal matrix:

* produces 90% of the nail and extends to linula

sterile matrix is distal to germinal matrix

* reconstruction requires removal of the scarred sterile matrix
* **split-thickness nail bed grafting** for reconstruction of sterile matrix
* 25% donor deformity

When reconstructing germinal matrix:

* need full-thickness graft
* harvested from the first or second toes

In a guillotine amputationof the hand distal aspect of the palm:

* poorest recovery in the intrinsic muscles of the hand
* First dorsal interosseous muscle will be affected

FDMA:

* can be made sensate with the use of first dorsal metacarpal nerve

Moberg flap:

* sensate advancement for up to 1 cm

Longterm outcome of dermal fasciectomy for dupuytren’s contraction of MCP and PIP joints:

* Good for MCPJ
* Bad for PIPJ

When performing toe to thumb transfer:

* transplantation of the **ipsilateral** great toe

When you have amputation of the thumb and fingers with the thumb not being recovered:

* then replant the index to thumb
* long to index
* small finger to long
* Also knows as transpositional microsurgery

Pincer-nail syndrome:

* constriction of the distal nail plate
* there is excessive transverse curvature of the nail plate that increases from proximal to distal
* resulting in severe pain
* Etiology:
  + psoriasis
  + ill-fitting shoes
  + subungal exostosis
  + epidermoid cyst
  + OA
* Tx: elevation of nail plate and dermal grafting under the matrix

Adipofascial flap:

* reverse cross-finger flap
* need to be designed about 2-4 mm wider
* base to length ration about 1:1.5-1:3

In Dupuytren’s:

* the nerve is medially displaced by the spiral cord
* nerve transection is about 1.5 %
* arterial injury  1%
* recurrence 18-24%

When the sterile matrix is damaged:

* best to repair with sterile matrix from the great toe

History of renal transplatation is associated with the highest risk of amputation in a diabetic patient with infection:

* 75-100%

Hand infections require more debridements and take longer to resolve in diabetic patients

* insulin dependence
* elevated leukocytes
* Serum BG > 450
* All above 3 are not associated with increase infection

In patients with scleroderma and due to poor circulation:

* ulcerations at the fingertips, over PIPJ and MCPJ
* Mx: conservative debridement, topic abx, resection of exposed bone
* must attempted conservative tx first before

SCC of the nail bed:

* require 1 cm margin
* best treated with amputation to distal phalanx

Thumb length is more important than motion

* motion not very altered by IP joint fusion
* considerable motion by CMC and MCP

To facilitate advancement of Moberg flap:

* flex IP joint
* Extend lateral incision proximal to MCPJ
* Islandization of the flap by releasing the skin at the base of the flap

Small finger ulnar cord:

* originates from abductor digiti minimi

General guidelines for replantation:

* more than 6 hrs proximal to carpus
* more than 12 hrs for the digit
* (warm ischemia times)

When you can’t use Moberg or FDMA flaps:

* First web space flap is the gold standard for neurosensory flap
* harvested from lateral aspect of the great toe to the medial aspect of second toe
* based on the first dorsal metatarsal artery coming from dorsalis pedis
* venous drainage from venae comitans
* Provide sensate glabrous skin

In case of multiple digits injury:

* the digit that is in best condition is replanted first
* In case of digits at different levels of amputation: then do digit by digit
* Overall for replantation: should do the following
  + bone
  + flexor tendon
  + extensor tendon
  + artery: will help determine the efflux vein
  + nerve
  + veins

Atasoy-Kleinert flap:

* homodigital
* using volar pulp V-Y advancement

Indication for Dupuytren’s surgery:

* loss of 30 degrees MCPJ extension
* loss of any IP joint extension
* neurovascular compromise (caused by spiral cord)
* Pain is not an indication
* Most commonly affected finger is the ring

The anatomic structures involved in Dupuytren’s:

* pretendinous bands
* spiral bands
* lateral digital sheet
* Grayson’s ligament
* lateral digital sheet
* natatory ligament

In general: replantation proximal to FDS insertion is relatively contraindicated due to longterm poor function

Sometimes full-thickness skin grafting is a good option when there is no tendon or bone exposed:

* they also allow for good retention of sensibility

When everything is done for finger ulceration in a patient with scleroderma:

* you can do conservative amputation
* also digital sympathectomy if it is an option

Thenar flap is good when there is loss of volar tissue

V-Y advancement flap is not a feasible option when there is injury to the volar surface

**Hx of MI is an absolute contraindication to replantation**

In a patient with flexion contracture of PIPJ that was released and later developing ischemia of the tip:

* cause: stretching of the neurovascular bundle

Collagenase injection:

* results in complete resolution of MCPJ flexion contracture but not PIPJ
* PIPJ requires radical fasciectomy

In Dupuytren’s:

* the normal fascia and the cords become the contracted cords
* Contraction of the spiral cord can displaces the neurovascular bundle proximally and superficially

The spiral cord is composed of:

* pretendinous band
* spiral band
* lateral digital sheath
* Grayson’s ligament
* Vertical band

For thumb pulp wound:

* FDMA is preferred over the Littler flap because:
  + larger vein can be included with vena comitans
  + decreased morbidity of donor site
  + prospect of cortical reorientation of sensation on the thumb is better

In a patient with stellate matrix laceration who is 13 yr old:

* do primary repair of the nail bed and replacement of the nail plate under the eponychial fold

In a patient with ring finger avulsion: question #150

* success of replantation is dependent on long finger digital artery-based revascularization

Carpal tunnel contains:

* FPL
* 4 slips of FDS
* 4 slips of FDP

When a patient undergoes ray amputation:

* after removal of the metacarpal bone:
  + the deep intermetacarpal ligaments are sutured together to obliterate the space

Thenar flap:

* effective for reconstruction of the index and middle finger tips

Dupuytren’s of PIPJ:

* caused by central and lateral cords

Ring avulsion are associated with high rate of replantation failure:

* the most appropriate next step if it fails: Ray amputation
* revision amputation makes it hard to be functional

In a patient with split-nail defomity:

* most appropriate management is full-thickness nail graft from the toe
* it causes significant donor site cosmetic defect: graft from second toe provides the least unsightly result
* If it affects sterile matrix alone: it can be excised and repaired primarily
  + the germinal matrix cannot tolerate approximation

In Dupuytren’s contracture:

* the structures that encase the neurovascular bundle:
  + Cleland’s lig
  + Grayson’s lig
  + Lateral digital sheet
  + Retrovascular band

When a patient has amputation of the distal finger and then starts to extend PIPJ when attempting to make a fist:

* Lumbrical plus deformity
* Treatment is: sectioning of the lumbrical muscle

The most appropriate management of stellate sterile matrix damage:

* primary repair

**The mechanism of injury** is the most important factor that determines the outcome of the repair

Trumpet nail deformity: Pincer nail deformity

* patient presenting with nail bed pain, worsens with pressure on the pulp with swelling and tenderness of the paronychia when the hand is immersed in water
* P/E: curled nail with deep impingement of the medial and lateral margins of the nail plate
* Tx: nail plate is removed, nail bed is elevated from the sides of the distal phalanx
* dermal grafts are placed under the medial and lateral sides of the nail plate

Topical Podophyllin:

* for management of plantar or digital warts

Dupuytren’s diasthesis:

* aggressive form of Dupuytren’s contracture
* Earlier age of onset and more rapid progression of the disease
* More likely to be bilateral and involve the radial aspect of the hand
* associated with knuckle pads and plantar fascia involvement
* Peroney’s disease or thickening of tunica albuginea
* If they undergo surgery: higher incidence of flare and recurrence or extension of the condition

When performing index transposition to middle finger:

* transposition should be performed at the level of metacarpal base
* higher chance of union

To close web space after Ray amputation:

* the deep transverse metacarpal ligament should be sutured together
* but the width of the palm decrease
  + and also the grip strength decreases

Moberg flap:

* provides sensate and durable coverage to the thumb
* It can be used to cover defects as large as 2x2 cm
* Should include two arteries and two nerves
* Lateral incision is made between the volar and dorsal skin
* Dissection from distal to proximal
* Following harvest: the thumb is splinted for 2-3 weeks
* sensibility is near normal
* can have stiffness
* the skin at the base of the flap can be divided and the base of the flap can be divided

The location of the first dorsal metacarpal artery for FDMA:

* within the fascia of the first dorsal interosseous muscle
* in rare cases within the muscle itself
* based on the terminal branch of the radial artery after it exists from anatomical snuffbox
* Skin paddle of this flap from the dorsal skin of the index finger over the proximal phalanx

Natatory ligament is not involved in PIPJ contracture in Dupuytren’s

Nail bed injuries:

* 80-95% of distal phalanx fractures are associated with nail bed injuries
* 60% of patients with subungal hematoma of more than 50% have nail bed injuries

Synechia:

* adhesion of eponychial fold to the nail bed

Neurovascular island from the ulnar aspect of the long finger:

* routinely ligate the radial digital artery to the ring finger
* need to confirm that ulnar artery to the ring and radial artery to the long fingers are intact

Any patient who sustains amputation above the level of the wrist:

* must establish blood flow within 6 hours of warm ischemia time
* keep vein open after that to prevent return of lactic acid to bloodstream

Review question #177:

PIPJ flexion contracture is most commonly caused by central cord which arises from pretendinous cord

* lateral and spiral can also cause it

DIPJ caused by contracture of the lateral cord

MCPJ: pretendinous cord

Natatory ligament: loss of small finger abduction and flexion contracture of PIPJ

Littler’s neurosensory island flap:

* based on proper digital nerve from the ulnar nerve
* Used to provide sensibility to the thumb and index fingers
* Proper digital artery from superficial palmar arch
  + need to ligate the radial digital artery to the small finger
* Flap is tunneled through the palm

Kite flap is FDMA flap

Need to review question #186, 187

* Dupuytren's
* Limited abduction of the fingers in Dupuy caused by natatory ligament issues

Non-operative Tx of Dupuytren’s:

* Application of DMSO
* injection of collagenase
* Injection of corticosteroids
* Continuous skeletal traction

|  |
| --- |
| **In-Service Questions Notes: Ear Reconstruction** |

The most common complication of ear molding device:

* skin ulceration7.6%
* Chondritis and allergic reaction to adhesive tape can happen also

Prominent ear:

* Molding ideally is started by 2 weeks of age
* but has been seen in patients up to 3 months

Ear splinting:

* Lop ear
* Stahl ear

Hyaluronidase injection:

* can be used in kids over 3 months of age
* still in trial

Otoplasty for prominent ear:

* 6 years and older

In patient with chronic ptosis, more than 2 years, traumatic:

* use muscle outside the eyelid to power elevation
* suture the eyelid: mainly tarsal plate to frontalis muscle using
  + alloplastic material
  + autogenous fascia
  + biologic product

Traumatic ear injury:

* think of putting things together as composite graft
* microsurgical reattachement
* local flap

Stahl’s ear:

* Presence of abnormal third crus of the antihelix
* Flattening of the helix
* unfurling of the helix
* hypoplasia of the superior (anterior) crus
* posteriorsuperior projection of the helix

Darwin’s Tubercle:

* pointed thickening at the junction of upper and middle third of helix

Conchal projection:

* due Mastoid projection/prominence

Prominent ear:

* enlarged conchal cartilage

Gold plate placement:

superficial to levator aponeurosis and tarsal plate

at the junction of the medial and central third of the eyelid and medial limbus

inferior border is few mm above the eyelid

Jones test:

for nasolacrimal duct obstruction

Snap-back test:

for lower eyelid laxity

Cryptotia:

pocket ear

the upper part is adherent

cartilage is buried under skin in the pocket

other deformities:

missing upper sulcus

antihelical crura

underdeveloped scapha

Caused by abnormalities of **intrinsic oblique and transverse auricular muscles**

surgical technique: release from the pocket, resurfacing of post- and retro-auricular defects

otoplasty

Ear reconstruction: Alloplastic

superficial temporal/temporoparietal fascia

workhorse flap

based on STA

Ear Reconstruction/Microtia:

Nagata vs. Brent

The main difference is how the lobule and the tragus are reconsutructed

Brent: they are done in two different stages

Nagata: one stage

Both use autologous rib cartilage but never iliac bone crest

When venous outflow cannot be established via microvascular replantation:

do micro

then leech

If no micro can be done: do Mladick technique:

dermabrasion followed by burial followed by staged elevation

Reconstruction of the middle helix:

postauricular flap: Dieffenbach:

based on posterior auricular artery

conchal cartilage graft: so no cicatricial deformity

buried and requires devision

full-thickness skin graft to the donor site

Antia-Buch chondrocutaneous advancement flap: can also be used

can be an ear smaller and cupped

Anti-helix reconstruction:

revolving door or flip flop

based on posterior auricular skin

Prominent ear/Cup ear:

wide conchal mastoid angle and absent antihelical fold

high post-partum circulating estrogen:

increase the amount of hyaluronic acid

making the ear malleable

For surgeries that cannot be corrected with molding

deferred till age of 6 yrs

Best candidate for ear molding:

one week old with conchal deformation

plasticity of ear due to maternal estrogen peaks at 3 days

returns to baseline at 6 weeks

30% correct in the first week

Stahl ear:

congenital ear deformity with 3rd crus of the antihelix

repaired with otoplasty and local cartilage

The primary predictor of local control rates to radiation therapy:

**size of tumor**

For the concha (area supplied by the auricular branch of the vagus

direct infiltration

BAHA is placed **after completion** of external ear framework reconstruction

The pathophysiologic explanation of cryptotia:

**abnormal distribution of the intrinsic transverse and oblique auricular muscles**

common in Asians

unable to wear glasses

upper part of the retroauricular sulcus is buried

Ear molding should be initiated at 3 days of age and can continue to 6 months

high circulating maternal estrogen: concentration is highest on day 3

To recreate the antihelical fold:

place Mustardé stitch between the scapha and the conchal cartilage

Conchal setback:

place sutures between the conchal cartilage and mastoid fascia

Stahl ear, constricted ear and lop: do not get better with time as the child grows

Treatment of Microtia at age of 6-7 yrs

width of the ear and its distance from scalp continues to grow

In patients with unilateral microtia:

ear canal formation should be delayed till 13-19 yrs so scarring does not interfere with external reconstruction

Persistence of lobule prominence after otoplasty could be related to inadequate reduction of cavum concha

The most common complication of otoplasty for protruding ear is:

recurrence: 3-24%

Post-auricular revolving door flap for reconstruction of conchal defect is better than skin graft:

faster

less contraction

better color match

The primary blood supply to the anterior surface of the ear is from:

posterior auricular artery

Auricle blood supply:

Posterior auricular artery

STA

occipital artery: only minor contribution

Normal helical rim to head measurements:

10-12 mm at the helical apex

16-18 mm at midpoint

20-22 mm at the lobule

Auricular chondritis/perichondritis:

serious surgical infection

requires urgent intervention

get culture swab

start broad spectrum abx

I&D, open the wound, debridement

BAHA is placed after the ear reconstruction is completed:

it is affixed in the mastoid region using osteointegrated implant

this can compromise the integrity and mobility of the skin envelope that will cover the autogenous rib catilage

Need continuous JP drain closed for the first 5 days after fist stage microtia

Do not do pressure dressing

Stahl Ear:

abnormal cartilage pleat

extends from crus of antihelix to edge of helix

deforming the regular curvature of the ear

Correction:

wedge excision of the third crus and helical advancement

Prominent ear:

increase conchal scaphal angle

deep conchal bowl

prominent lobule

Alloplastic frame work placement for anotia:

higher infection rate

higher rate of extrusion

Patient presenting with an area on the ear that is painful with chronic scabbing and ulceration, exposed cartilage can be noted:

chondrodermatitis nodularis helicis:

inflammation of the cartilage

painful

can mimic skin cancer

excisional biopsy to rule it out followed by primary closure

In a patient with ear loss due to explosion:

best step for ear reconstruction is: temporoparietal fascia with rib graft framework

When you have chondritis after microtia reconstruction: give it a try with the following prior to removal of the cartilage

IV abx

I&D

placement of irrigation drains

If fever and erythema do not improve quickly, then remove the cartilage

For traumatic ear injury:

initial treatment is debridement and local wound care

In a patient with dog bite to the middle third of the ear involving the helical rim, antihelix and concha:

the best method to repair is:

postauricular transposition skin flap

based on the edge of the hairline

base of the flap is 10 days

Wedge resection and primary closure results in cupping of the ear

Rim defect:

can be repaired with triangular kite flap

or rim advancement flap

The postauricular revolving door island flap:

ideal for conchal area

The average time for ear molding:

2 months

Prominence of ears:

the most common deformity is loss of antihelical fold

the second most common deformity is conchal hypertrophy

Classification can be accordingly.

Untreated auricular hematoma:

leads to the formation of new cartilage in the subperichondrial

cauliflower ear

Must do percutaneoous drainage followed by placement of blolster

In a patient who needs ear reconstruction after radiation to that areas: also look at comorbidities. you want the least invasive

most appropriate reconstructive technique is:

implantation of osseointegrated auricular prosthesis

Ear reconstruction:

should be delayed until the kid is at least 5-6 yrs

preferably 7-8 years

young age: kids don’t care, won’t comply and may not have enough rib cartilage

reconstruction of ear too early in life will result in ear smaller than normal

Patient with protruding ear:

need conchal reduction via anterior or posterior approach

anterior approach: reduce skin and cartilage

posterior approach: cartilage only

need to create antihelix

The antihelix and antitragus:

arise from second branchial arch

Question number 58 is embryology review if needed

Stahl’s ear:

prominence of third crus

which extends from antihelix to helix

Can be molded over the first 6 weeks of life

success rate is 80%

Surgery includes excision of third crus and it can be used for reconstruction of superior crus

in this deformity:

superior crus is absent

scaphoid fossa is broad and flat

giving a pointed ear shape

Lop ear:

downward fold of the superior helix

Telephone deformity:

seen after otoplasty: prominence of upper and lower poles

Radial forearm for ear reconstruction: provides poor color match

When skin is damaged as well as temporoparietal fascia:

the best oucome would osseointegrated screws and prosthetic device

If concerned about lacerating levator muscle during upper bleph:

this can be confirmed by visualizing Müller muscle

Stenstrom cartilage abrasion is that performed for prominent ears:

abrades the anterior surface of the antihelix

Surgical correction of promient ears includes:

Mustardé mattress sutures to create the antihelix

partial excision of the conchal bowl

placement of concha-mastoid sutures for setback of conchal bowl

Stenstrom cartilage abrasion (causes the cartilage to bend away from the abraded surface

The FURNAS procedure:

relies on placement of conchomastoid sutures

designed to repair ears with deep concha (more than 2.5 cm)

The WEBSTER technique

corrects prominent helical tail by fixation of the helical tail to the concha

Lucket technique:

excision of postauricular skin to achieve ear setback

One of the main disadvantages of banking amputated ear cartilage in the subcutaneous tissue:

**warping:** as it loses its strength

Own cartilage is preferred in cases of microtia because:

reduced risk of extrustion

Anti-buch flap:

local flap that arises the helical rim based on postauricular skin

When performing replantation of the ear:

reconstruction with vessels on the posterior aspect of the ear

because the large arteries of the ear enter on the posterior aspect

These branches include branches of the external carotid artery

anterior auricular branch of STA

branch of occipital artery

Microsurgical reconstruction of the ear:

provides the best aesthetic outcome

Microtia is not associated with inner ear abnormalities

but associated with:

C-spine abnormalities

macrostomia

mandibular hypoplasia

preauricular pits

Cryptotia:

superior auricle adheres to the temporal skin

management involves release of the adherent portion of the auricle and skin grafting

In a patient who had ear reconstruction with polyethylen implants and temporoparietal fascia who later developed exposure of implant with eschar on a small area:

recommend wound dressing

the porous nature will allow for ingrowth of tissue

surgeon must wait at least 6 months prior to insertion of any implant or cartilage graft

Mustardé technique:

mattress suture through the antihelix to create a fold

on the cranial portion of the ear to bend the antihelix posteriorly

In patient with microtia:

growth of the reconstructed ear is dependent on the presence of perichondrium

(age is a secondary thing because auricle reaches near normal size at approximately 6 years)

Cryptotia/hidden ear:

characterized by the absence of superior auriculocephalic sulcus

review question #80

Patient with Parry Romberg with only soft tissue deficiency:

reconstruction with free parascapular flap is indicated

Prominent ear is characterized by:

conchal vulgus

cranioauricular angle greater **than 40 degrees**

underfolding of the antihelix

For micro reconstruction:

between 6-7 years when the cartilage is fully developed

each achieves 85% of size by age 3 yrs

and full size by age 5-7 yrs

start with bone conduction hearing aid

Severe pain 24 hours after otoplasty:

most likely due to hematoma

if not evacuated quickly then cartilage necrosis can take place with overlying skin necrosis

Stahl’s ear:

third crus

flattening of the antihelix

malformation of scaphoid fossa

Constricted ear:

hooding of the helix and scapha

Telephone ear:

either due to excessing reduction of concha

or inadequate correction of upper and lower poles of the ear during otoplasty

Auriculotemporal nerve:

provides sensation to anterior and superior part of the external ear

Lesser occipital nerve:

sensation to the upper cranial surface of the ear and skin of the anterior and superior surfaces of the external auditory canal

Isolated unilateral microtia:

Due to maldevelopment of mesenchymal proliferation **around**

the first pharyngeal **cleft**

in the first trimester (btw 4-10 weeks)

In a patient who presents several weeks after otoplasty for prominent ears with recurrence in the upper half of the left ear:

this is due to inadequate placement of antihelical fold sutures

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| **In-Service Questions Notes: Cosmetic Facelift** |

**Aging skin:**

loss of dermal papillae

flattening of the dermo-epidermal junction: most consistent by more than a third

reduced interdigitation between the layers

this flattening begins in the 6th decade

the number of cell layers is stable: skin thins

Epidermis thins about 6.4% per decade

Enzymatically active melanocytes decrease at a rate of 8-20% per decade

leading to uneven pigmentation in elderly skin

Number of sweat glands does not change

decrease sebum production by 60%

Dermis thickness decreases with age:

decrease in both vascularity and cellularity

Decrease collagen turn over due to decrease in fibroblast and their collagen synthesis

Decrease in elastin

Radiafrequency skin tightening (RFE):

uses high energy alternating electrical current that alters biological tissue

delivers energy deep into the skin

causing collagen remodeling and neocollagenesis through controlled healing

minimize the scattering of energy by epidermal constituents

Ultrasonic energy:

disrupt tissue with sonic vibration

Cryolipolysis:

reduces subcutaneous fat without damaging other tissues

Early transient numbness of the lower ear after facelift is common

returns to normal in 6 months

Ear lobule: most consistent with injury to great auricular nerve

supplies: lobule, concha and posterior auricle

Surgical exploration:

if numbness more than 6 months with allodynia

To avoid this injury:

place platysmal and SMAS suspension and flap sutures posterior to a line drawn from McKinney’s point to a point 1.5 cm posterior to the insertion of the ear lobule

McKinney’s point:

a point where the great auricular nerve crosses the mid transverse belly of SCM at a point of 6.5 cm below the bony edge of external auditory canal

Hematoma:

most common complication of facelift

once adrenalin is resorbed: rebound hypertension

hematoma occurs about 4-6 hours postop

Risk of hematoma in non-HTN pts: 3%

Increases to 8% in HTN pts

Also higher in males

Most common cause of hematoma after facelift:

HTN

Defined as systolic >190 with or without diastolic > 100 on two consecutive reads

Patients who are antihypertensive: should take their anti-HTN meds

as adjuncts: preop or intraop clonidine can be given too

postop systolic should stay below 140 mmHg in postop phase

Classic signs of aging:

loss of volume due to deflation of fat compartments of the face

attenuation and laxity of the anatomical retaining ligaments of the face which compartmentalize the fat

Facial aging is controlled by environmental and anatomical factors

Environmental factors:

smoking

BMI

excessive alcohol consumption

sun exposure

There is also change in the structural bone (not periosteum) that affect

There is no atrophy of underlying mimetic muscles or periosteum

There is atrophy of fat compartments with attenuation of retaining ligaments

Great Auricular nerve:

most commonly injury during facelift

incidence in 6%

Purely sensory from C2 and C3 spinal roots

exits the neck along the posterior border of SCM

courses parallel and posterior to external jugular vein

bifurcates into anterior and posterior branches

Guidelines to avoid injury

raise the platysma along the anterior border of SCM

At SCM, GAN is deep to platysma

GAN does not perforate the SCM but lies on top of it

McKinney’s point:

located along the midwidth of SCM

6.5 cm inferior to external auditory meatus

represents where GAN exits under the SCM fascia where it becomes superficial

Salivary leak after facelift:

common: due to injury or inadverent suture through the gland

self-limiting: may take several weeks or months

surgical tx is not indicated

Common tx:

regular percutaneous drainage

placement of temporary drain??

compression

Antihistamine: scopolamine

Bland diet

Botox injection

One of the draw backs of short-scar rhytidectomy:

in patient with moderate to severe laxity, without the posterior auricular incision extension, patient can have a vertical skin fold on the lateral side of the neck below the ear

need to extend the incision behind the ear to elevate postauricular skin flap and excising skin excess

For Brow lift:

pretrichial incision is the only one that can address a long forehead

Endotemporal: for patients with thin hair, lateral ptosis

transcoronal: for patients with short forehead and deep rhytides

Deoxycolic acid (DCA): Kybella

Disrupts adipocytes cell membrane

induces inflammatory response to clear cellular debris and liberated fat from injection sute

up to 6 treatments for submental fat

GAN injury during facelift:

permanent complete numbness up to 5% of patients

GAN:

found most superficial location one third the distance from the external auditory canal to the clavicular origin of SCM

Also same distance from mastoid process to the clavicular origin of SCM

Also found 1 cm cranial to external jugular along the anterior aspect of SCM

Frankfurt’s line:

from the external auditory canal to the lateral edge of the inferior orbital

Retinoids:

reduction of fine rhytides and actinic keratosis

fading of pigmented macules

improvement of skin appearance

Histologic changes:

increase thickness of epidermis and dermis

elimination of dysplasia, atypia and microscopic actinic keratosis

uniform dispersion of melanin granules

increase collagen and glycosaminoglycan deposition int eh papillary dermis

diminished dermal elasosis

angiogenesis and compaction/thinning of startum corneum

Side effects: erythema, photosensitivity and desquamation

must always use sunscreen due to photosensitivity

topical tx is about 3-4 months

greatest improvement after 1 year of use

treatment starts nightly at low dose

Check question #14 for: posterior scalp pre-hairline with inferior extension into hair-bearing scalp

Numbness of the forehead after endoscopic browlift:

supraorbital and supratrochlear nerves

branch from ophthalmic division of trigeminal nerve

Zygomaticotemporal nerve:

sensation of the anterior temporal area

Pixie ear is also known as Otobasion inferius

incidence 6% in facelift population

corrective techniques:

V-Y closure

Readvancement of facelift flap

Telephone and reverse telephone ear deformities: complications of otoplasty repair

Lop ear deformity:

congenital ear deformity involving the superior portion of the helix

SMAS:

continuous with temporoparietal fascia superiorly

platysma inferiorly

Temporal branch of facial nerve: just deep to temporoparietal fascia

Facial nerve:

exits from the stylomastoid foramen

main trunk: Pes anserinus

found 1 cm inferior and posterior

midway between the tragus and posterior belly of digastric

Cutis Laxa:

genetic disorder

variable inheritance and expressive pattern

poor elastic tissue due to degeneration of the elastic fibers and non-functioning elastase

as a result: patients with loose, coarse, excess skin

in AD:

affects only the skin

In AR:

affects skin and other organs such as congenital heart disease, aneurysms, ephysema and PTX

Cutis laxa worsens with time

There is no issue with wound healing

Surgery can be performed to fix ectropion and ptosis

Ehlers-Danlos:

genetic mutation affect collagen synthesis and structure

Clinical presentation:

skin laxity

hyperextensibility

excessive thinness of the skin

joint hypermobility

aortic aneurysm

Poor wound healing and elective procedures should not be performed

Elastoderma:

disorder of unknown etiology

starts with pendulous skin laxity of the trunk and extremities

then involves the whole body

wound healing is unpredictable

elective surgery is not recommended

Werner Syndrome:

AR

pigmentated, indurated, plaque containing skin

osteoporosis

muscle atrophy

growth retardation

cardiovascular disease

Diabetes

small vessel angiopathy

poor wound healinfg

progeria: hutchinson-Gilford syndrome

AR

premature aging:

lax and excess skin

growth retardation

craniofacial abnormalities

cardiac disease

poor wound healing

premature death

Ambulatory procedures:

should not exceed more than 6 hrs

begin early in the morning

Over 4 hours there is increase in urinary retention and post-op nausea and vomiting

IV anesthesia:

decreased risk of DVT

No need to use muscle relaxant and the associated decrease is peripheral vascular resistance

Face is divided to:

Horizontal thirds

vertical firth

Horizontal thirds:

from anterior hairline to glabella and brows

middle third: glabella to subnasala

lower third: subnasale to menton

Width fifths:

starting from the lateral canthi

each fifth is equal to the width of the palpebral fissure

the line dropped from lateral canthi should approximate the width of the neck

the line from from medial canthi should approximate the alar grooves

Vascularized composite facial allotransplantation:

severe changes in volume and composition over first 3 years

resembles morphologically accelerated aging

significant volume loss in bone (~21%) and non-fat subcutaneous soft tissue (~26%)

btw 18-36 months

likely due to transient denervation

differential response to acute and chronic rejection

Allograft fat (deep and subcutaneous): does not change

no significant change in thickness of epidermis and dermis

no change in collage and fat content

Most common cause of post-operative facial nerve paralysis after rhytidectomy:

effect of local anesthetic

Auriculotemporal nerve:

innervates the temporal scalp, upper helix and external auditory canal  dra

Gustatory sweating (Frey’s syndrome):

reinnervation of cutaneous sweat glands after the laceration of auriculotemporal nerve branches after parotidectomy usually

GAN is injured in about 2.6% during rhytidectomy

Posterior auricular muscles:

innervated by temporal branch of the facial nerve

SMAS tightening:

tension on the closure on the SMAS layer rather than skin

Skin will cause hypertrophic scar

SMAS procedure: better results and longer lasting

Injury to spinal accessory nerve during facelift:

exists the skull from jugular foramen

passes deep to styloid process

Under SCM

Exits the posterior aspect of the SCM

2 cm superior to the great auricular nerve

Vulnerable to injury as it is sandwiched between the skin and the muscle fascia

runs obliquely and inferiorly to the anterior edge of the trapezius

Follows a path drawn by a line perpendicular and bissecting a line connecting the mastoid process to the angle of mandible

Spinal accessory nerve is posterior to platysma

passes through the posterior triangle of the neck

Lore fascia:

dense tissue inferior to the auricle that can be used to anchor the SMAS

In secondary rhytidectomy:

patients have more comorbidities

depression most common

HTN second most common

Less skin is excised

Skin and SMAS are thinner

Skin is better vascularized because of the delay phenomonon

When patient age, there will be deflation of facial fat compartments

more visibility of areas with high density of retaining ligaments

marionette lines:

deflation in conjunction with intact mandibular ligament

injectable fillers can minimize these lines

SMAS:

envelops the platysma and cheek

Anteriorly: becomes attenuated: but terminates as investing layer of the superficial layer of the mimietic muscles

Laterally fuses with parotid capsule

superiorly passes over zygomatic arch to join superficial temporal fascia (temporoparietal fascia and galea)

To distinguish the cervical branch from marginal mandibular:

unable to depress the lips

but able to purse the lips because the mentalis and orbicularis nerve branch is intact

In general, cervical branch weakness can resolve in 4-12 weeks

Marginal mandibular: can resolve in 6 months in about 80%

The use of fibrin sealant and PRP:

decrease ecchymosis

decrease edema

decrease seroma

prolong induration

With chronological age:

decrease in Langerhans cells

decrease fraction of type III collagen

decrease amount of glycosaminoglycan

Disorganization of collagen and elastic fibers

number of available keratinized cells decreases: contributes to decrease skin in elderly

The marginal mandibular nerve:

located deep to the platysma and SMAS

The area over the mandibular notch: thin and leave the nerve susceptible to injury

It can travel as low as 1-2 cm below the mandible

Causes weakness to orbicularis and mentalis in addition to inability to depress the ipsilateral side of the lip

Spontaneous recovery in 6 months is achieved in 80%

in case of neuropraxia: the depressor function is expected to come back in about 3-6 months

Endoscopic forehead rejuvenation:

inadequate removal of the glabellar muscle

resulting in early recurrence of glabellar lines and frowning action

this can be avoided by removal of all the muscle between the frontal bone and subcutaneous tissue and placement of fat graft

Application of fat: will improve the contour and also reduce the potential for the full gain of muscle function

and also eliminate the flatness of the glabella

In a patient with indistinct mandibular border and obtuse cervicomental angle:

there is increase in preplatysmal fat

When evaluating for neck rejuvination:

must assess preplatysmal fat

subplatysmal fat

postion of the hyoid bone

position of thyroid cartilage

Malpositioned or ptotic submandibular gland

The ideal aesthetic neck:

cervicomental angle 105-120 degrees

distinct mandibular border

subhyoid depression

visible SCM and thyroid cartilage

Obtuse cervicomental angle:

loose or excess skin

low hydoid bone:

normal position at the level of C4

if projecting below, then patient will have obturse neck

excess subplatysmal or preplastysmal fat

excess preplatysmal fat is the most common

removed by direct excision or liposction

retrodisplaced or small chin

Submandibular gland and thyroid cartilage:

do not influence the overall aesthetic contour of the neck

As patients age, the face and forehead elongate

Normally the forehead should be somewhere between 6-10 cm, from hairline to brow about 1/3 the length of the face

Must distinguinsh brow ptosis from dermatochalasis:

brow ptosis: patient activate frontalis muscle:

ask patient to close their eyes then open slowly

you will notice that patient is raising their eyebrows

Open pretrichial incision:

shortens the forehead

good on deep rhytides

Endoscopic:

good on patients with ideal forehead length

as it can be difficult to access long, convex forehead

Coronal incision:

elongates forehead

used for patients with short forehead

Transpalpebral corrugator resection:

most useful for patients with no brow ptosis

Youthful aesthetic shaped face:

inverted egg shape

with aging: the broader shape becomes lower

the orbital region is full

extends convexly down to the eyelid

ending just above the ciliary border with only a few millimeters of eyelid skin visible

Aging face:

concavity of the malar region

deep-set upper orbital sulcus

long position of the lower eyelid-malar junction

obtuse submental angle

Minimal Access Cranial Suspension (MACS) facelift:

The management of SMAS here is: Purse-string suturing to the deep temporal fascia above the zygomatic arch

avoiding facial nerve

this elevated deep tissues and skin using a vertical vector only

The skin flap is elevated through preauricular and pretemporal hairline incision only

In simple MACS lift: 2 purse string sutures are placed in SMAS to correct neck and lower face

in extended MACS lift: an additional third purse-string is placed to suspend the malar fat pad

MACS does not involve SMAS plication, excision, elevation or suspension to zygomatic arch

Numbness in the frontoparietal scalp after rhytidectomy and endoscopic brow lift:

supraorbital: has two branches:

superficial branch that supplies the central forehead and hairline

deep branch central frontoparietal scalp

Supratrochlear:

supplies radix of the nose and part of central forehead

both of these nerves can be injured during corrugator muscles dissection

Drugs that interfere with clotting mechanism and should be avoided in patients undergoing facelift: ginko, garlic and vitamin E

Hematoma is the most common complication:

should control blood pressure

also should control nausea and coughing

Removal of excess supraorbital and infraorbital fat removal:

longterm gives the Cadaveric appearance

Tear trough deformity:

the depressed and discolored groove at the junction of the cheek and lower eyelid

Patients with excess skin and negative vector are at increased risk of lower lid malposition when they undergo lower eyelid rejuvenation

Hertel ophthalmometer normal 15-17 mm

more thant 18 then patient has prominent globe

Pinch blephroplasty removes excess skin then mid-face lift will correct the descended lid-cheek junction and provide support in conjunction with lateral canthopexy of the lower eyelid

When you have a patient with permanent marginal mandibular nerve injury:

first step is to inject anesthetic motor block

it will demonstrate the potential outcome of resecting the muscle or injecting botox

The great auricular nerve:

runs with external jugular vein and can be injured during hemostatis to the external jugular vein

leading to ear numbness

they both run above the plastysma and can be injured during flap elevation

Pharyngeal muscles are innervated by vagus except stylopharyngeus (Glossopharyngeal)

SMAS is continuous with superficial temporal fascial and the platysma

From superior to inferior, the layers that are continuous with each other:

Galea

superficial temporal fascial

SMAS

Platysma

Superficial cervical fascia

Also deeper layers from superior to inferior:

pericranium

deep temporal fascia

parotidomasseteric fascia

deep cervical fascia

The deep temporal fascia splits around the temporal fat pad:

extend inferiorly towards the zygomatic arch

superficial layer anterior

deep layer posterior

in relation to zygomatic arch

Superficial layer is continuous with parotidomasseteric fascia

deeper layer with posterior masseteric fascia

Question #55: I don’t understand it and it does not make any sense

(about hair incisions)

Augmentation of the malar region: that fills the atrophy

Prosthesis placed in the submalar region

bound posteriorly by the masseter muscle

superiorly by the malar eminence

medially by the nasal labial fold

Facelift hematoma at day 5 post-op need to be suture-released and evacuated

hematoma liquefies at day 7-10

therefore aspiration is not possible

Eyelid ptosis after botox injection:

occurs when the intention is to inject corrugator supercilli

The most likely adverse affect to occur in secondary rhytidectomy vs primary:

distortion of hairline

incision placement is often difficult due to hairline shifting,

if the same pattern is used then patient will develop alopecia

therefore surgeon should create new incisions in secondary rhytidectomy

The risk for injuring the facial nerve is the same despite thinner SMAS

Transverse rhytids can be eliminated by resecting:

procerus

which originate from upper lateral cartilage and nasal bones and insert into the skin of the glabella

contraction causes transverse rhytids by pulling the forehead downward and the nose upward

In SMAS plication and inability to raise the upper lip:

injury to the buccal branch of facial nerve

innervates the levator labii oris

buccal branch is superficial to parotid fascia, crosses the masseter  and can easily be injured during dissection of SMAS

most deficit recovers due to cross branching with this area

Rhytidectomy:

improves static facial rhytids and diminishes mildly deepened nasolabial folds

malar fat is suspended by suturing it to deep temporal fascia

prominent neck bands due to separation of platysmal muscle and can be repaired with plication

Low heaviness of eyebrowns: can be fixed with open browlift

long forehead: then do hairline incision/pretrichial

resection of corrugator and procereus

In patients with resorption of malar soft tissue after undergoing advancement of the malar fat pads:

due to disruption of angular artery

it courses directly to the fat pad

the transverse facial artery course deep into it

if fat pad advancement more than 2 cm, submalar dissection results in disruption of blood supply to malar fat pad via angular artery

read question number 70

Pseudoherniation of buccal fat:

due to weakening of the buccopharyngeal membrane that encase the buccal fat pad

walnut size mass at the lower aspect of the cheek that can be reduced

causes:

surgery

corticostroids

DM

Must rule out: salivary gland tumors, hemangioma, abscesses and lymphadenopathy

Question number 76: zone of face for augmentation

Prominent anterior platysmal bands:

treatment: midline plication

In browlift:

the peak should be located between the lateral limbus to the lateral canthus

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| **In-Service Questions Notes: Hemangiomas** |

NICH:

rare

stable

present at birth

does not change

does not involute

surrounded by white-gray rim

similar to infantile hemangioma: histologically and radiographically

High flow

does not stain for **GLUT-1**

Infantile hemangioma:

around the parotid

still involute

do not do anything

surgery is reserved when refractory to medical treatment with functional impairment

observation for small and stable

Beta blockers:

decreasing the size of symptomatic or large hemangiomas

safe and effective

well tolerated

**first line of medical treatement**

Infantile Hemangioma:

most common tumor in infancy

develop between 2 weeks to 2 months of infancy

Rapid proliferation:

proliferative phase during the first 9 months

Involution phase: over 3.5 years

most commonly occur in the skin

**Liver** is the most common extracutaneous site

Skin: head and neck, then trunk then extremities

Affects both sexes:

female to male ratio 3-4:1

More frequent in premature and twins with low birth weight

Some infantile hemangioma can ulcerate during proliferative phase

Osler-Weber-Rendu or Hereditary hemorrhagic talengiectasia (HHA):

abnormal **AV shunting** in the mucosa of the naso-oropharynx, GI/hepatic and even CNS and pulmonary

They are at risk of anemia, bleeding or strokes

Genes include:

Endogline gene

ENG

ACVRL1

SMAD4

RASA1:

capillary malformation with or without AVM

Oval, macular port-wine staining

PTEN:

Bannayan-Riley-Ruvalcava syndrome

AD

Macrocephaly, genital lentiginosis (penis freckling) and GI polyps

Can also have AV anomalies

KRIT1 mutation:

AD

cavernous malformation in the brain (venous malformation, no fast flow)

Risk of cerebral hemorrhage

Cutaneous manifestations: hyperkeratotic vascular malformation (slow-flow malformation)

PIK3CA:

CLOVES syndrome:

congenital lipomatous overgrowth

vascular malformation

epidermal nevi

spinal/skeletal anomalies with scoliosis

Should have spinal MRI to screen for CNS AVM

also may have slow vascular malformation

GLUT-1:

specifica marker for infantile hemangioma

VEGF and TGF-B:

also present in hemagioma but not specific for infantile hemangioma

FGFR-3:

Muenke syndrome

epidermal nevus

achondroplasia

Congenital head and neck masses in children:

could be malignancy

branchial remnants

malformations

MRI should be done to identify whether it is venous or lymphatic malformation

and tell you about the deep tissue involved

Indication for treatment of infantile hemangioma:

bleeding/uceration

visual obstruction

impingement on the mouth prohibiting feeding

Treatment for infantile hemangioma:

steroid injection

propranolol

surgical resection

Kaposiform Hemangioendothelioma:

vascular tumor

present at birth

The lesion can cause Kassabach-Merrit phenomenon

thrombocytopenia < 25000

leading to spontaneous bruising and bleeding

Treatment: Vincristine/Rapamycin

Vascular anomalies:

Vasoproliferative or vascular neoplasm

Vascular malformation

Vasoproliferative neoplasm:

hemangioma

kaposiform hemangioendothelioma

increased endothelial cells turnover

Vascular malformation:

do not have endothelial cells turnover

They grow in proportion to the body

Port-wine stain:

venous malformation

superficial

skin shows discolored red

First line of medical treatment of infantile hemangioma:

intralesional steroid 3mg/kg triamcinolone

if too large: prednisone 3mg/kg

Propranolol

interferon is NO longer used: causes spastic diplegia

Common side effects of Propanolol:

GI effects: vomiting, diarrhea and constipation

rash

fatigue

hyperosmia

bradycardia

hypotension

chest pain

shortness of breast

bleeding

bronchospasm

glaucoma

IN PEDIATRIC: HYPOglycemia

Venous malformation:

present at birth

growth with kid

become more symptomatic with growth and dependency

Rapid swelling and pain:

from phlebothrombosis (clotting) within the anomalous venous channels

When symptomatic, treatment is sclerotherapy

Surgical excision is not curative and reserved to when there is significant functional impairment and poorly circumscribed lesions, critical tissue

Klipper Trénauny syndrome:

capillary malformation

varicosities

limb hypertrophy: **limb-length discrepancy**

absence of AV fistula

On one side of the body

sometimes it affects the thorax

does not affect the head and neck

pathognomonic feature: presence of embryonic vein of Sevrellein in the lower extremity

Increased risk of DVT

compression garments may alleviate pain

Maffuci syndrome:

in adolescents 80%

present with cutaneous hemangioma

extremity endochondroma

endochondromas: present with pathologic fractures

10-15% malignant transformation to chondrosarcoma

most likely in patient with **venous malformation**

**Intracranial tumors**

Parkes-Weber syndrome:

high cardiac output heart failure

AV fistula with vascular malformation

Microscopic AV fistula

Confined to upper or lower extremity

Kassabach-Merritt syndrome:

Kaposiform hemangioendothelioma

thrombocytopenia

Hemangioma on the scalp with small to moderate size:

can be closed with single-stage excision and linear closure

up to 7 cm: this can be done without the need for tissue expansion

AV malformation:

the rate of recurrence is related to Schobinger stage of the lesion

Schobinger 1: recurrence is 80% with embolization only and 21% with embolization and resection

Schobinger 3: ulceration, 99% recurrence with embolization only and 81% with embolization and resection

**Schobinger staging:**

Stage 1 quiescent

Stage 2 Expansion

Stage 3 Destruction

Stage 4 Decompensation

In large **venous** malformation:

the first step in therapy is: **sclerotherapy** for symptomatic venous malformation

Resection is the second line of treatment

Recurrence is common

In **arteriovenous** malformation:

**embolization**

Prior to initiating propranolol for treatment of infantile hemangioma:

get EKG

Causes hypoglycemia and lethargy

Hypoglycemia: manifests as seizure. medication must be given with food

Macrocytic lymphatic malformation:

first step in management: Sclerotherapy

most commonly affect: neck and axilla

two types: macrocystic and microcystic

Macrocystic have cysts that are large enough to be treated with sclerotherapy

**Microcystic**: do not have large enough cysts to be treated with sclerotherapy: **Resection**

Most common sclerosing agents used:

doxycycline

ethanol

Sodium Teradecyl sulfate

Resection is the second line of treatment

can also occur in the floor of the tongue

enlarge with infections

Laser:

affects superficial dermal structures

Periorbital hemangioma when it is not causing visual obstruction:

can be treated with propanolol

Periorbital hemangioma that requires surgical resection:

well localized

> 2 diopeters for asitgmatism

visual obstruction

non-responsive to medical therapy

Intralesional bleomycin for hemangioma

can be used for local control

requires multiple sessions

Kaposiform hemangioendothelioma: malignant vascular tumor

associated with Kassabach-Meritt syndrome

Thrombocytopenia: profound

Seen in infancy

Seen on trunk

Pathognomonic: deep red-purple and shiny tumor

Since it is malignant: tx is chemotherapy

Vincristine

INF 2-alpha was used in the past but associated with spastic diplegia: irreversible

often large, superficial and diffuse

Propranolol:

dramatic response in 24 hrs

significant resolution over one week

Contraindications:

bronchospasm

cardiac abnormalities

cerebrovascular abnormalities

Propranolol is most effective during the proliferative phase in the first 2 years

so if the kid is above 2 yrs of age, then it is unlikely to help.

Treatment for about 2-6 months

Parkes-Weber syndrome:

AV fistula present

Sturge-Weber syndome:

facial capillary malformation (port-wine stain)

Distribution of trigeminal nerve (first and second division)

vascular malformation can be deep to leptomeninges, causing seizure

Unilateral or bilateral

hypertrophy of the cheek, lips and maxilla

occasionally hypertrophy of the mandible

MRI can show additional leptomeningeal and choroid plexus

Osler-Weber-Rendu:

Hereditary hemorrhagic talengiectasia

AD

Face, tongue, lips, nasal and oral mucosa and conjunctiva

Intramuscular hemangioma:

vascular lesion not present at birth

pose challenge due to their depth and lack of cutaneous changes

The treatment algorithm just like hemangioma:

start with propranolol and costicosteroids

if it fails to respond then en bloc surgical excision

Cutaneous AV malformation:

can be treated with pulsed-dye laser

Kawasaki disease:

true aneurysm

presents as a pulsatile palpable mass

in children

Hemangioma:

increased cellular proliferation

present as increased growth and slow regression

hemangiomas are the most common tumors in infancy

girls to boys 5:1

more common in premature

extracutaneous locations: most common parotid gland

most common extra-cranial: liver

30-50%: premonitory mark such as talangiectasia or bruise like herald patch

Venous malformation:

present at birth

enlarge slowly

soft, painless, bluish

Congenital hemangioma:

fully grown at birth

2 types

RICH: rapidly involuting

rapidly involuting postnatally

fully regressed by age of 12 months

NICH: non-involuting:

remains the same size

does not involute

not enlarging at age of 2

rarely problematic

resected only if causing significant deformity

Pyogenic granuloma:

small rapidly growing lesion

present at birth

main problem is bleeding

< 1 cm

Tx is excision

Periocular hemangioma:

can cause ptosis and result in visual fields abnormalities  and other eye issues

Cobb syndrome:

capillary malformation over the middle of the scalp overlying an encephalocele

of the skin posterior to an area of dysraphism

Nevus flammeus neonatorum:

behaves like hemangioma and not like vascular malformation

fades by age of 1 yr

upper face or posterior trunk

AV malformation:

cutaneous involvement: faint pink discoloration

overtime, there is tendency to expand into adjacent structures and become painful

Considered high flow lesions

MRI high flow

Capillary malformation:

treatment of choice is pulsed-dye laser therapy that targets oxyhemoglobin (577, 585, 595)

lesions on the face and extremities are less responsive

lesions on the neck are the most responsive to pulsed-dye laser

Steroid treatment for hemangioma:

most common side effect: cushinoid face 71%

personality change

gastric irritation

oral and perineal fungal infections

reversible diminished gain of height weight

In a patient with lymphatic malformation patient with multiple infections:

surgical excision

The earliest sign of hemangioma is blanching of the skin

infantile hemangioma:

50% resolution by 5 yrs

70% resolution by 7 yrs

Of those involuted by age of 6 yrs,

68% will leave residual evidence with scar formation

Patient can present with purple mass, since birth, expanding with palpable thrill

AV malformation

they can increase in size with puberty

fast flow

**Klippel-Trenauny syndrome:**

port-wine stain (typically involving the extremity)

with overlying lymphatic and venous malformation

Skeletal hypertrophy: most frequently in the lower extremity

Patients with venous malformation:

pain, ulceration and ectasia

patients with lymphatic malformation:

soft-tissue swelling and hypertrophy

**Parkes-Weber:**

similar to KTS but with AV fistula and involves the upper extremity

**Osler-Weber-Rendu: hereditary hemorrhagic talangiectasia:**

AD

multiple vessel ectasia:

skin

mucous membranes

visceral organs

Present with epistaxis, hematuria, hematemesis and melena

**Von-Hippel Lindeau disease:**

Hemangioma of the retina

Hemangioblastoma of the cerebellum and visceral organs

Associated with seizure and mental retardation

**Parkes-Weber syndrome:**

skeletal hypertrophy of the upper extremity

with overlying port-wine stain

can be associated with capillary, venous and lymphatic malformations

**Maffucci’s syndrome:**

multiple endochondroma

venous malformation

foreshortened fingers

20% develop chondrosarcoma

**Proteus syndrome:**

partial gigantism of the extremities

hemifacial hypertrophy

macrocephaly

macrodactyly

localized exostoses

subcutaneous lipomas

vascular malformation

**Osler-Weber-Rendu:**

multiple red talanegiectasia of the face, fingertips and mucosa surfaces of the GI tract, bladder and bronchial lining

brain involvement can lead to onset of seizure

The best modality that delineate the extent of involvement of AV malformation to surrounding tissue:

MRI

occurs secondary to inhibited formation of the capillaries

Hormonal changes can lead to progression of the lesion

Growth is due to increased blood flow and expansion

(not due to cellular proliferation)

80% of hemangioma noted in the first month

1-3% at birth

60% occur in the head and neck

**Hemangioma:**

high cellular turnover rate

Described as hyperplasia

**Kasabach-Meritt syndrome:**

not associated with capillary malformation (the only syndrome)

patients have profound thrombocytopenia

should not be given (causes bleeding)

**Arteriovenous malformation:**

most appropriate treatment is angioembolization followed by excision

they are high-pressure arterial system

pulsatile with palpable thrill and bruit

MRI is the imaging test of choice to delineate soft tissue involvment

**Ambylopia:**

can develop if ocular occlusion occurs in kids less than one year

**Untreated port-wine stain/Capillary malformation:**

cobblestoning and thickening of the skin due to ectasia of the vessels

**Bony destruction:**

occurs in AV malformation in 34% of cases

Study question #47, 55, 57, 58, 60, 61, 62, 63, 65

Erbium for lymphatic malformation

Lymphatic malfomation:

bony enlargement of the maxilla and mandible

Skeletal deformities occur with vascular malformation

Short neck, low posterior hairline and cervical vertebrae fusion:

Klippel-Fleil syndrome

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| **In-Service Questions Notes: Flaps** |

Pediatric patient presenting with finger amputation:

most important reason for replantation is: patient is a child.

except when severely crushed or there is associated injuries

functional outcomes are superior in children

Will have better sensory return and can have normal growth

Single digit amputation:

contraindication to replantation if amputation is proximal to the level of FDS insertion

worse prognosis than distal to FDS insertion

Multi-digit amputation is an indication to replantation

The thumb should always be replanted even if it will be stiff and insensate

will act as a post for opposition

Digits tolerate ischemia longer than proximal level amputations due to lack of muscles

tolerated warm ischemia time 6-12 hours

cold ischemia time 12-24 hours

Reported replantation after 33 hours of warm ischemia time and 94 times after cold ischemia time

Lateral arm flap:

pedicle is located between the lateral head of the triceps and the brachialis

Dominant pedicle: radial collateral artery

branch of the brachial in the arm

reliable fasciocutaneous flap for small and medium sized defects

thin and excellent quality

satisfactory aesthetic outcome and ability to primary closure of the donor site

The radial nerve:

courses from posterior of the humerus to the lateral aspect of the humerus from posterior to anterior

The antebranchial cutaneous nerve that branches from the radial nerve to join the vascular pedicle

(posterior branch of the radial collateral artery)

must preserve this cutaneous nerve proximally during flap dissection

Z-plasty:

the central limb should be parallel to the line of maximal tension

subsequent limbs between 30-90 degrees

wider angles give greater scar elongation at the expense of greater transverse tension

Reverse lateral arm flap:

can be used for reconstruction of antecubital fossa defect

transfer as pedicled-flow flap based on **radial recurrent artery**

(Persistent median artery pass through the carpal tunnel and runs with the median nerve)

ALT flap:

can become chimeric allowing multiple skin paddles, use of muscle (VL) for bulk and iliac bone crest

Flap size 35 x25 cm

defect larger than 10-12 cm will require skin grafting

Pedicle length 12-16 cm

lateral circumflex, descending branch that goes to vastus lateralis and rectus femoris

Radial forearm flap:

pedicle length 18-20 cm

maximal dimension 12x30 cm

Lateral arm flap:

radial collateral artey

short pedicle 6 cm

small skin paddle 6x12 cm

Pedicle for rectus abdominis muscle:

8-10 cm

muscle is only 6 cm so not wide enough to cover large defect

Z-plasty scar lengthening:

Central limb is parallel to the long axis of the scar

30 degrees: 25%

45: 50%

60: 75% most common

75: 100

90: 120

Angles more than 60° will inhibit flap transposition due to significant tension

After performing Z-plasty:

the scar is oriented along the limb incisions

the new central incision lies within relaxed skin tension lines

Reverse Sural Artery Flap: Masquelet flap

median? sural artery

sural nerve

lesser (short) saphenous veni

Major complication of this flap:

venous congestion

requiring delay or leech therapy

The greater saphenous vein:

runs medial and proximal to the lesser saphenous vein

drains medial and anteromedial portion of lower leg

Popliteal vein:

drains the lesser saphenous vein

The anterior and posterior tibial veins:

the deep venous drainage of the lower leg

Femoral vein is the deep venous drainage

Omental flap:

supplied by gastroepiploeic vessels

based on right and left gastroepiploeic vessels

to increase the length of the pedicle: flap can be based on either vessels

usually the right gastroepiploic

The left is branch of splenic

right is a branch of gastroduodenal

Omentum has angiogenic and immunogenic properties that make it ideal for reconstruction of sternal wounds

When you perform multiple Z-plasties along the length of the incision

space them apart to be at equal distance

then do the math off the length of ear distance

MSAP: medial sural artery perforator flap:

the pedicle arises from the popliteal artery

small flap that is used for head and neck reconstruction and lower extremity defects

first perforator is found along a line from popliteal fossa to the medial melleolus at 8 cm from proximal end

Sub-fascial dissection to protect perforator and to use it as a surface for gliding for tendons

thin in obese patients

donor site less than 5 cm can be closed primarily

Posterior radial collateral artery:

from profunda brachial artery, off brachial artery

a second branch is the anterior radial collateral artery is variable and small

radial collateral artery allows for reverse lateral arm flap

The middle or medial collateral artery is a branch off the posterior radial collateral artery in 61.5% and off the profunda brachial artery in 38.5%

this can be used to elongate the flap by converting it to V-Y

Gracilis muscle:

between the pubic tubercle and medial femoral condyle

blood supply: medial circumflex artery off the profunda femoris

Mathes-Nahai type II

pedicle on the deep aspect of the flap from lateral to medial

To have sensation on the foot during flap transfer:

lateral femoral cutaneous nerve of ALT is transferred to medial plantar nerve which is the terminal branch of the tibial nerve

What is the sensation to the dorsal foot? what does superficial and deep peroneal nerve supply?

Deep circumflex iliac artery:

arises from the external iliac artery

supplies the iliac crest osteocutaneous flap

for hemimanibulectomy: it follows the natural curve of the jaw (iliac crest)

a portion of the internal oblique muscle

off the ascending branch of the deep circumflex artery is included in this flap

Descending branch of the medial geniculate:

supplies the medial femoral condyle

Ascending branch of lateral circumflex:

tensor fascia lata

Peroneal artery:

fibula

When taking radial osteocuteneous flap:

can safely harvest 10 cm

should not take more than 1/3-1/2 of the thickness to avoid iatrogenic fracture

which can happen even with prophylactic plating

can tolerate osteotomies for anterior mandible and radiation

Osteointegrated implants are not used with this flap due to thickness

this flap has thin pliable skin with long pedicle

can reach ipsilateral transverse cervical artery or contralateral neck vessels without interposition vein grafts

Despite everything: ischial pressure sore will have 70% recurrence rate

need surgical planning for the future

Need large rotation or advancement flaps that can be re-rotated or re-advanced

this cannot happen with transposition flaps

Sartorius flap:

transferred as distally based and not proximally based

distally based will have tip necrosis due to ligation of segmental branches for arc of rotation

The anterior interosseous artery supplies posterior interosseous flap via connection to posterior interosseos atery

located on the dorsum of the forearm

The superior ulnar collateral artery :

from the brachial artery

supplies the medial arm flap

dissection is very tedious

The medial plantar artery flap is location on the non-weight bearing plantar surface that is structurally similar to the plantar area of the hind foot including fibrofatty tissue and plantar fascia

The medial plantar artery:

terminal branch of the posterior tibial artery

lies between the abductor hallucis and flexor hallucis brevis

medial plantar nerve can be harvested for flap sensation

The flap can be distally based from retrograde flow through the lateral plantar artery for forfoot wounds

or as free flap

The lateral plantar artery

runs between flexor digitorum brevis and abductor digiti minimi

Dorsalis pedis:

between the extensor hallucis longus and extensor digitorum longus

Blood supply to the medial femoral condyle:

descending genicular artery 89%

superior medial genicular artery 100%

Gracilis muscle can be used for functional muscle transfer after Volkmann ischemic contracture

innervation from branch of the obtrurator nerve which is composed of 2-3 fascicular bundles

The nerve length from obturator foramen to the muscle about 7.7 cm

Fascicular bands allow the muscle to be segmented

Superficial circumflex iliac artery (SCIP) flap:

dominant pedicle for groin flap

The long axis of the flap is centered along a lone parallel and 3 cm inferior to the inguinal ligament

max reliable length 10 cm

harvested from lateral to medial

beginning caudal to the posterior iliac spine and extending across the sartorius muscle to femoral vessels

To improve reliability:

scarpa’s fascia should be incorporated with the flap laterally and dissection must continue below the sartorius fascia as deep circumflex iliac artery courses between the deep investing fascia of the sartorius and Scarpa’s fascia

Propellor flap:

most common complication:

venous congestion

partial flap loss

If flap becomes congested during elevation: must trace the perforator to the main vessel and release any potential constriction or tethering

if still kinking then need microvascular venous supercharging

venae comitants are very thin and can get kinked when insetting flap 180 degrees

Delay procedure is the last resort

to augment arterial inflow

it allows choke vessels to open

The flap will still be susceptible to venous congestion when it is rotate for inset after delay

Ideal perforator greater than 0.5 mm and pulsatile

Should be designed longitudinally with the blood flow

flap survival 90%

8-10% complications

Post-trauma free flap;

if more than 2 weeks, patient is hypercoagulable

Osteocutaneous iliac crest free flap:

blood supply: deep circumflex iliac artery (DCIA)

arises from external iliac artery

it travels towards ASIS

between transversalis fascia and transverse abdominis muscle

medial to ASIS: it gives the ascending branch to internal oblique arterya

Serratus anterior:

type III muscle flap

Type V:

pectoralis major muscle

latissimus dorsi muscle

Medial plantar artery perforator flap:

Arises from medial plantar artery from the posterior tibial artery

nerve supply:

medial plantar nerve that is the terminal branch of tibial nerve

Flap can be used for coverage of heel wounds

provides durable glaborous skin that allow skin bearing

can be raised as sensate flap and this nerve can be anastomosed at another site

Sural nerve:

provides sensation to the lateral aspect of the foot

Superficial peroneal nerve:

sensation to the lateral aspect of the leg

Rectus femoris muscle:

most superficial of the extensor quad

Bipennate

extends from ileum to patella

surrounded by vastus lateralis and medialis

provides the terminal 15-20 degrees of extension

also powerful flexor of the hip

mild deficit is observed that is not clinically significant

W-plasty:

regular pattern of interdigitating advancement flaps

Accordion-like effect of the scar line

best used for scars that cross the relaxed skin tension lines

The main disadvantage:

the need to remove significant amount of healthy tissue around the scar to be revised

leading to increase wound tension and the need for significant undermining

Arterialized venous free flap:

Main disadvantage: difficult flap monitoring

venous congestion makes flap monitoring difficult

advantage: easy to harvest without the sacrifice of major artery

can be found anywhere in the body

just with visualization

Flap viability can be monitored only by palpating the pulse or laser Doppler probe analysis

total flap loss is rare and the success rate is similar to conventional flaps

Posterior interosseous flap:

can be used to cover elbow, antecubital fossa and proximal volar forearm defects

Reversed: based off the anterior interosseous and can be used for wrist and hand reconstruction

PIA emerges on the dorsal forearm, deep to supinator

Course between ECU and EDM

Proximal to DRUJ

Anterior interosseous artery:

found between the muscle bellies of FDP and FPL

Superficial branch of the radial nerve:

found anterior to pronator teres and deep to brachioradialis

Radial artery:

in distal forearm is found deep to brachioradialis and radial to the flexor carpi radialis

Posterior cutaneous nerve:

found superficial to both anconeus and extensor digitorum muscle

Amputation stump neuroma:

desensitized using vibration

starting at the periphery and moving toward the center

additional therapy:

massage

transcutaneous nerve stimulation

Lateral arm flap:

vascular supply:

posterior radial collateral artery

which is the terminal branch of the deep brachial artery

6x12 cm can be harvested and allow for primary closure

Gracilis muscle:

ascending branch of the medial femoral circumflex artery

Adductor muscles:

descending branch of the medial femoral circumflex artery

Trapezius flap:

blood supply is the transverse cervical artery

Temporalis muscle:

deep temporal artery

Superficial temporal artery:

superficial temporal fascia

Prelaminated flap:

using axial flap and adding all the missing parts prior to elevating it

Freestyle flap:

finding a perforaton and trancing to a pedicle

Find the definition of Prefabricated flap

Parotid gland:

transverse facial artery: from STA

Posterior intercostal artery supplies:

Paraspinous muscle

reverse LD muscle

Radial forearm flap:

vascular pedicle passes between the brachioradialis and flexor carpi radialis

the paddle is supplied by septocutaneous perforators

Primary closure of the scalp:

can be achieved for defects of 3 cm or less

even with galeal scoring

When there is dogear after doing scalp rotation:

resist the urge to excise

as this will increase length:width ratio

It will resolve on its own

if not, can be excised later

Blood supply to skin paddle of free fibula flap:

comes from septocutaneous perforators from posterior intermuscular septum

from peroneal artery

This skin flap also has musculocutaneous perforators coming from soleus and gastroc muscles

but they are ligated because of their tedious dissection and they arise from posterior tibial artery

Type I:

gastroc

TFL

Rectus femoris

Type II:

check question number 59

LD flap for closure of spine wounds:

can be used as turnover flap based on secondary pedicle

Or transposed/advanced based on the primary pedicle

can sometimes vein graft for further advancement

Coverage of the elbow with lateral arm flap:

use reverse flap

based on recurrent radial artery

which is a branch from the radial artery in the cubital fossa

it anastomose with the posterior radial collateral artery

Heparin-induced thrombocytopenia: (HIT)

immune mediated complication that complication that occurs in 3-5% of patients on heparin

especially those exposed previously in the last 3 months

20% will have thrombotic event and devastating event

30% mortality

30% limb loss

Formation of heparin-PF4 complexes

IgG Ab formed against heparin: PF4 complexes

results in potent platelet activation

platelet aggregation

increased thrombin generation

Any patient with platelet drop less than 30% while on heparin and with thrombosis is HIT until proven otherwise

Tx: stop all forms of heparin administration

start danaparoid sodium

lepirudin

argatroban

Dx should be confirmed with platelet aggregation factor

and heparin:platelet factor 4 ELISA

Patients with SCA:

sludging can cause flap failure

Vasodialtion:

PGI2

PGE1

histamine

bradykinin

acidosis

hyperthermia

hypercapnia

Gracilis muscle:

medial thigh

posterior to the adductor longus and sartorius muscle

nerve enters the muscle about 6-10 cm from its origin

vascular pedicle: 8-12 cm from muscle origin

length of pedicle 4-6 cm

TUG:

the musculocutaneous and septocutaneous perforators travel in a transverse direction

Supply cutaneous territory anteriorly above the area of adductor longus and sartorius

extending 5 cm posteriorly beyond the margin of the gracilis muscle

Leech therpy:

Hirudo medicinalis

organism: Aeromonas hydrophila: gram negative anaerobe

incidence of infection 2.4-20%

ranges from cellulitis to necrosis, abscess and septicemia

Delayed infection: colonized necrotic tissue

susceptible to fluorquinolone: ciprofloxacin

prophylactin fluoroquinolone and aminoglycoside is recommended

Gluteal muscle: question #68

superior and inferior gluteal arteries are terminal branches of internal iliac artery

above and below the piriformis muscle

Fibula free flap:

harvested with a skin paddle laterally based on perforators from lateral (posterior) intermuscular septum

pedicle is located need the flexor hallucis longus in the deep posterior compartment of the leg

presence of a cuff of this muscle will help protect the pedicle

A composite free flap including the flexor hallucis longus

also a lateral portion of the soleus muscle can be included

**Need to review all lower and upper extremity compartments**

Dorsal scapular artery:

the inferior portion of the trapezius myocutaneous flap is supplied by dorsal scapular artery

dorsal scapular artery comes off the subclavian artery as a separate trunk

or forms a common trunk with superficial cervical artery

when a common trunk is present: referred to as transverse cervical artery

superficial branch: superficial branch of transverse cervical artery

deep branch: dorsal scapular artery

Superior or descending part of the trapezius:

supplied by branches of the occipital artery

Middle or transverse part:

superficial cervical artery

Trapezius muscle:

supplied by the transverse cervical artery:

80% from thyrocervical trunk

20% subclavian

Need to review the blood supply to the trapezius muscle

Soleus muscle:

posterior tibial artery

Gastroc:

sural artery off the popliteal artery

The pedicle of the gracilis muscle is located:

between the adductor longus and brevis

enters the muscle about 8-10 cm from the pubic tubercle

Triangular space:

teres major

teres minor

long head of triceps

Arterialized venous flap:

congested the first week

decongest the second week

not associated with increased arterial thrombosis, failure of replantation or hematoma

Radial free flap osteocutaneous:

harvest cortical bone on the radial side

between the **brachioradialis and pronator teres**

 Cuff of FPL to the radius is maintained to preserve the periosteal vessels

10 cm length

40% thickness

For lateral calcaneal wound coverage:

lateral calcaneal flap

reverse sural artery flap

free flap

Lateral calcaneal flap:

based on lateral calcaneal artery

terminal branch of **peroneal artery**

axial pattern flap

this flap is reliable and the artery can be identified using doppler

Dorsalis pedis fasciocutaneous flap:

is acceptable for lateral calcaneus wound but has significant donor site

reserved as the last option

Extensor digitorum brevis muscle flap:

has large arc of rotation

requires sacrifice of the dorsalis pedis artery

External oblique turnover flap:

not commonly used

but an provide coverage for large surface area

extends to the midline of T10-L4

Upper half is supplied by the intercostal

Lower half is supplied by either deep circumflex iliac artery 95% or iliolumbar artery 5%

Upper half is segmental in nerve and artery

lower half is segmental in nerve but only one artery

FAMM flap:

includes Buccinator muscle

Submental flap:

good for contour, color and texture for head and neck reconstruction

elevation below the level of plastysma

includes branches of the submental artery and vein from the facial artery and vein

gives one or two cutaneous perforators to the submental skin

submental artery runs in relation to anterior belly of digastric

The most appropriate intervention to increase the viability of an ischemic skin flap:

adequate fluid resuscitation

Trapezius muscle:

type II mathes and Nahai

External oblique muscle:

type IV

Superficial inferior epigastric artery flap (Shaw flap):

SIEA is one of 3 cutaneous arteries that supply the skin from the femoral artery

arises from the intersection of inguinal ligament and femoral artery the course superiorly and laterally toward the anterior axillary line

transferred as fasciocutaneous flap

lies in position higher on the torso than the groin flap

When harvesting reverse radial forearm flap:

if there is immediate marked congestion, need to think about anastomosis of a vein

must always try to preserve outflow vein

If mild venous congestion, then you can apply leech

but if there is marked onset of venous congestion without evidence of kinking of the vessels then consider strongly venous outflow

DIEA:

from external iliac artery at a point just proximal to where the artery crosses the inguinal ligament

Lateral thigh flap:

dominant blood supply: third perforating branch of profunda femoris

originate immediately caudad to adductor brevis  and pierces the insertion of adductor magnus

traveses between the rectus femoris and the vastus lateralis

Triangular space of circumflex scapular artery:

teres major

teres minor

long head of triceps

Quadrangular space:

lateral to triangular space

defined by surgical neck of the humerus

lateral head of triceps

teres major

teres minor

axillary artery and posterior humeral artery pass through this space

Gracilis muscle:

immediately posterior to adductor longus

Adductor magnus is posterior to gracilis muscle

pectineus is anterior to adductor longus at the floor of the femoral triangle

sartorius muscle overlies the gracilis muscle distally

Superficial circumflex iliac artery:

and the superficial inferior epigastric arteries have separate orgins in approximately 40% of patients

Superficial circumflex iliac artery:

arises from CFA or SFA

courses laterally parallel to inguinal ligament

about 2-3 cm inferior to it

minimal donor site morbidity

Delay procedure for TRAM flap:

results in increased diameter of the superior epigastric artery

should be considered in patients at risk for flap loss:

obesity

smoking

hx of radiation therapy

large volume requirements

Involves the ligation of deep and superficial inferior epigastric arteries

leading to increased diameter of superior epigastric artery

Choke vessels will achieve maximum dilation in 48-72 hours

Cell hypertrophy within the walls of choke vessels

Z-plasty:

does not prevent burn scar contracture

improves contour

lengthens the scar

realign scar with minimum tension

Vascular supply to osteocutaneous radial forearm flap:

fascioperiosteal perforators between the brachioradialis and flexor carpi radialis

Also musculoperiosteal perforators of FPL and in pronator quadratus

Transverse cervical artery:

supplies the trapezius flap

ligated during neck dissection

patients whom you cannot use this flap for coverage

Lateral arm flap:

can provide vascularized bone graft and sensate flap

radial collateral artery and **posterior branchial cutaneous nerve**

as much as one third of the humerus can be harvested

(10-15 cm in length and 1-1.5 cm in diameter)

Serratus anterior muscle flap:

must preserve 4-5 slips to prevent winging of scapula

Drainage of reverse radial forearm flap:

radial venae comitantes

The osteocutaneous free flap that allows for maximum independence in repositioning skin paddle in relation to bone segment:

scapular

greatest leeway in positioning skin flap in relation to bone segment

Vastus lateralis can be raised on its pedicle and provide coverage to:

trochanter, perineum, groin and acetabulum

but NOT THE KNEE

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| **In-Service Questions Notes: Breast Reconstruction** |

The reported evidence of venous congestion after free tissue transfer to the breast:

2-20%

Causes: venous thrombosis, inadequate perforator selection, superficial system dominance with lack of communication with deep system

Signs:

cyanotic/blue color

brisk cap refill

increased skin turgor

cooler temperature

rapid bleeding to pinprick

absence of continuous venous doppler signal

Post-Mastectomy radiation relative indications:

postive SLN with unknown status of other axillary nodes

one to three positive nodes on permanent histology

close surgical margins (less than 5 mm)

Post-mastectomy radiation is recommended as standard of care:

positive margins with inability to get clear margins

four or more positive lymph nodes

Patient presenting almost 8 years with unilateral breast pain and tightness that appears fuller on exam:

think of ALCL

late seroma around 1 year

can happen as early as 4 months

First step US with FNA of any fluid

immunohistochemistry for CD30 and ALK negative (-)

Breast implant/Expander infection: 8% but can range from 1-35%

most common gram negative bacteria: Pseudomonas

Gram positive: Staph species

In a patient with recovering sensitivity of the NAC after mastectomy:

Anterior branch of 4th intercostal nerve

Anterior and lateral branches of the second and 6th intercostal nerves:

innervates the breast skin only

Anterior and lateral branches of the 3-5 intercostal nerves:

NAC

In mastectomy, the lateral branch of the 4th intercostal nerve is transected because it goes through the glandular tissue to the posterior aspect of the nipple

Hence the return of sensation: via the **anterior** branch of the 4th intercostal nerve

it takes a superficial course in the subcutaneous tissue and reaches the nipple from the lateral side

Nipple reconstruction: The flap derives its blood supply from **SUBDERMAL plexus**

skate flap

star flap

C-V flap

opposing tab flap

There is not TNM stage for LCIS

treated as benign entity with malignant capacity in the future

Pleomorphic LCIS: has features that overlap with features of ductal carcinoma in situ

Preoperative chemotherapy:

increases patients likelihood of getting breast conserving lumpectomy vs mastectomy

It also provides prognostic information based on response to therapy

minimizing the extent of axillary surgery and allowing time for gfenetic testing andb reconstructive planning prior to surgery

After lumpectomy: whole breast radiation:

reduce 10-year risk of recurrence and 15-year risk of breast cancer death

patients with breast cancer size more than 5 cm should get radiation therapy

Patients with relative contraindications to radiation:

lupus or scleroderm

should be offered total mastectomy instead of radiation

Single pedicle nipple reconstruction:

C-V flap

star flap

Skate flap

opposing tab flaps

Early complication:

scar breakdown leading to implant exposure

Late complication:

loss of nipple projection

Carbon dioxide-based tissue expander (AeroForm):

fixed volume device with inability to deflate tissue expander

in comparison with saline implants:

no difference in wound infection

extrusion

device dislocation

wound dehiscence

Advantage:

more rapid expansion

shorter time to implant exchange

device is self-contained and patient controlled

No needles or physician visits

Patients with high BMI:

increased risk of delayed wound healing of the donor site

risk increased to 50-60% for morbidly obese patients

Must minimize undermining

Morbid obesity has no correlation with occurence of abdominal hernia or bulge

risk less than 2%

Rates of flap fat necrosis as high as 10-15%

not related to body habitus or BMI

Phyllodes tumor:

uncommon fibroepithelial breast tumors

behaves like benign adenoma

high propensity for local recurrence

Surgical resection with 1 cm margin

Patients with Lupus undergoing breast reconstruction with free tissue transfer: on chronic steroid use

Increased risk of thromboembolic events

Rate of free flap failure is similar to the general population

Steroids used: increased risk of wound healing complications but not risk of flap failure

increased rate of infection due to steroid use

Failure of breast device salvage in breast reconstruction:

Gram positive staph infection

also:

obesity

uncontrolled DM

Smoking

Hx of radiation

Postop seroma

early contamination with implant biofilm formation

(prepec does not increase failure rate)

Patients with history of C-section who are undergoing DIEP for breast reconstruction:

have the advantage of decreased venous flap congestion

superficial epigastric circulation is divided

hence more robust venous circulation with protective effect against fat necrosis

delay- phenomenon

C-section is not a contraindication for DIEP

There is evidence of increased rate of abdominal healing problems

seroma 15% vs 6%

wound healing problems

fat necrosis of the abdomen

Predictive of implant salvage failure:

pseudomonas infection

Salvage is defined as:

Systemic abx administration (oral or IV)

washout and debridement

replacement of the device

Factors associated with implant salvage failure:

increased WBC

high temp

purulent periprosthetic fluid

MRSA and pseudomonas

Implant infection:

smoking

CTX

RTX

previous mastectomy flap necrosis

Increased BMI

Use of ADM

In an obese patient with history of breast cancer, mastectomy, CTX, RTX, High BMI and well controlled DM:

do surgical delay of the flap followed by contralateral pedicled TRAM

this will decrease the risk of tissue related ischemia

delay is performed about 14 days prior to surgery

Also when there is subcostal incision: you cannot use that side for ipsilateral TRAM

Hartrampf perfusion zones:

medial row: I, II, III, IV

lateral row: I, III, II, IV

Postmenopausal hormone replacement therapy with estrogen and progestin

increased the risk of invasive ductal carcinoma

decrease the risk of DM and osteoporosis

does not impact CAD and endometrial cancer

The capsule of BIA-ALCL:

significant amount of Ralstonia picketti

Is gram negative bacteria

BIA- ALCL

CD30 positive

ALK negative

The lowest risk of nipple-sparing mastectomy:

non-obese patient

tumor far away from the nipple

without severe ptosis

The most likely chronic effect of post-mastectomy radiation:

Dyspigmentation

Acute injury by radiation includes:

erythema

edema

desquamation

hyperpigmentation

ulceration

Chronic injury from radiation:

skin atrophy

dryness

talengiectasia

dyspigmentation

dyschromia

These all lead to chronic fibrosis of the skin and subcutaneous tissue

For patients with bilateral mastectomy followed by tissue-expander placement:

give preop abx

then abx for 24 hrs and that’s it

Complications of implant-based breast reconstruction:

up to 60%

20% due to infection

according to the question #25

the infection was reduced when abx given for 24 hrs after surgery

but there was no difference when it was continued beyond 24 hrs after surgery

and it was equivalent to giving abx for 24 hrs vs until drains are removed

Nipple-sparing mastectomy and total skin sparing mastectomy are the same

Contraindications:

Tumor size > 5 cm

tumor location < 2 cm from nipple

evidence of axillary disease

tumor involvement on retroareolar biopsy

lymohovascular invation

HER-2 receptor positivity

HER-2/Neu positivity on bx

Expander-based breast reconstruction infection:

cover for staph

then pseudomonas

The mechanism of radiation injury:

formation of free radicals that cause DNA damage

leads to lymphatic obliteration

capillary thrombosis

Most cancer recurrence occurs after 5 years.

Factors that lead patients for less breast reconstruction:

being far from reconstructive surgeon geographically and lack of insurance coverage

Young patients and BRCA are more likely to have breast reconstruction

SIEA vs DIEP:

higher risk of flap failure

higher rate of anastomotic thrombosis

failure rate 7-14%

failures are arterial in nature

Less rate of bulge as you don’t incise through the anterior rectus sheath

fat necrosis rates are the same

no evidence of increased wound dehiscence or umbilical necrosis

Implant-based breast reconstruction:

higher rate of capsular contracture

Women with a history of breast cancer:

increased risk of metachronous lesion of the contralateral breast

cancers are adenocarcinoma in nature:

arising from glandular tissue such as ducts of lobules

SIEV:

venous lifeboat in case of venous congestion

If venous congestion happens: first thing investigate any mechanical cause

then investigate SIEV: if engorged then superficial dominant

other options: vena comitans

Fat grafting to the breast is safe oncologically

there will be increase in benign lesions such as cysts and calcifications

The risk of developing breast cancer in the contralateral side is 2-6%

Risk of complication is additive, hence, it is doubled for patients with prophylactic mastectomy

Contralateral prophylactic mastectomy:

does not improve cure rate for the known cancer

does not reduce risk of recurrence

does to decrease the number of anticipated surgeries

Radiating tissue expander vs. permanent implant:

increase the risk of expander explantation

(increase the risk for reconstructive failure by 46%)

however, aesthetic results are better and less capsular contracture

No difference in patients-reported outcomes

no difference in cancer recurrence

Aromatase inhibitor (anastrazole)

inhibits the conversion of androgen to estrogen

estrogen promotes normal breast tissue growth as well as growth of many breast cancers

Preservation of NAC:

improves satisfaction with reconstruction

quality of life

feeling of completeness

Contrast induced nephropathy:

treated with hydration with normal saline

Also avoidance of dehydration and use of non-ionic contrast media

In patients in whom post-op radiation is a possibility:

the best first step is placement of tissue expanders

Some people prefer autologous breast reconstruction after being done with radiation

Cutaneous innervation of the breast:

medially from anterior cutaneous branches of the first to the sixth intercostal nerves

laterally from lateral cutaneous branches of the second to 7th intercostal nerves

Nipple-areola complex:

innervated by the lateral and anterior branches of the third and fifth intercostal nerves

After mastectomy:

innervation from anterior branch of the 4th

anterior takes a more superficial course

while the lateral takes deep course and innervates NAC via breast parenchyma

Coaptation for the anterior 4th intercostal nerve with intercostal nerve from DIEP for breast reconstruction with sensation

Iliohypogastric:

sensation to the lateral gluteal region

Ilioinguinal:

upper medial thigh

Genitofemoral:

upper anterior thigh and mons pubis

Lateral femoral cutaneous:

innervation to the lateral thigh

Post-menopausal obesity:

risk factor for hormone sensitive breast cancer

Nipple-sparing mastectomy/ total skin sparing mastectomy:

highest risk for nipple necrosis: periareolar incision

Mondor disease or Superficial thrombophelebitis:

involves the superficial veins of the breast and anterior chest wall

may occur following surgery, biopsy, radiation or trauma

presentation: pain, tenderness, swelling and tethered thickened cord

usual resolves in 4-6 weeks using pain relief

Nipple papilloma:

bloody nipple disharge

benign but harbor an area of atypia or ductal carcinoma in situ

needs excisional bioopsy

Oral contraceptives:

increases atypical hyperplasia

Decrease the occurrence of all proliferative forms of bening breast disease without atypia  such as:

intraductal hyperplasia

intraductal papilloma

sclerosing adenosis

Benign breast biopsy showing atypical hyperplasia:

increased risk for developing cancer by 4.5-5 folds

Aporcrine metaplasia:

carries no risk for breast cancer

To decrease infections:

a study in NEJM, that application of mupirocin x2 daily and chlorhexidine shower for 5 days prior to surgery

this study showed 60% decrease in Staph infections

Alcohol containing preparations:

more effective against iodine

Preop Ancef should be administered 30-59 minutes prior to skin incision

Corrective surgery after breast conserving surgery (lumpectomy) such as fat grafting and contralateral mastopexy may not be covered by insurance companies

When considering breast conservation therapy:

age is not a contraindication

histologic subtype and pathology not a contraindication as long as the tumor is not diffuse and can be safely excised with negative margins

Small or large breast are not contraindications to breast conservation

skin retraction is not an absolute contraindications as long as it can be safely removed

Absolute contraindications for breast conservation therapy:

multicentric disease with two or more tumors in separate quadrants and cannot be encompassed in a single excision

diffuse malignant microcalcification on mammography

history of prior radiation of breast or chest wall

pregnancy

persistently positive margins despite re-excision

In an obese who had mastectomy and with contralateral ptotic breast who does not anything done on that side:

Autologous breast reconstruction with free tissue transfer

Free flap: improves reliability and decrease fat necrosis compared with pedicled flap

In a patient who may or may not require post-mastectomy radiation:

Placement of tissue expanders preserves the option for implant vs autologous reconstruction by preserving the skin envelope

The use of ADM for implant-based breast reconstruction:

reduces the risk of capsular contracture

Borders of the breast:

sternum

clavicle

IMF

anterior border of LD

Contralateral symmetry can be performed synchonously with unilateral autologous breast reconstruction

situation requiring reduction rather than augmentation or mastopexy

do not recommend mastectomy: that’s too aggressive

IGAP:

ellipse of inferior buttock with the inferior border within the gluteal fold

TUG flap:

anteromedial thigh with the superior border within the gluteal fold

SGAP:

ellipse of the middle buttock from posterior superior iliac spine to the apex of the greater trochanter

Lateral hip flap:

superior to the iliac crest

PAP:

ellipse of the posteromedial thigh with the superior border within the gluteal fold

the superior marking is within or just below the gluteal fold and the inferior marking is roughly 7 cm below the superior marking

Nipple-sparing mastectomy is appropriate when:

tumor size 3 cm or less

more than 2 cm from nipple

not multicentric

clinically negative nodes

Tamoxifen:

risk of thromboembolic events

must be stopped 28 days before free flap

increased risk of total flap loss

decreased rate of flap salvage

Nipple-sparing mastectomy: NSM

type of the tumor is not associated with the oncologic safety of NSM

There is an inverse association between the distance of the tumor from the nipple and the nipple involvement

Nipple involvement is more than 50% when the cancer distance from the nipple is less than 2 cm

There is a direct correlation between the tumor size and nipple involvement

> 4 cm was greater than 50% involvement

Women with BRCA1 and 2:

increased risk of breast cancer

increased risk of ovarian cancer

increased risk of colon cancer

In men:

there is increased risk of breast and prostate cancer

In men and women: alterations in BRCA2:

lymphoma, melanoma, cancer of the pancrease, gallbladder and bile ducts as well as stomach

Women with BRCA1 and 2 are:

x3- x7 times risk of breast cancer

For large chest wall defect after inflammatory breast cancer resection:

using contralateral TRAM flap

in the question they are asking #83, LD will not provide enough coverage but can be an alternative given size and also donor site

Late radiation tissue injury:

occurs in about 5-10% of patients who had radiation for treatment of their breast cancer

can occur late several months to years after radiation

Biopsy is always needed to rule out radiation induced-SCC or sarcoma

Phyllodes tumor:

occurs in perimenopausal women

rarely malignant

has more stromal cellularity than that in typical fibroadenoma

excision with 1 cm margin

Men with BRCA1:

breast cancer

pancreatic

testicular

early prostate

Men with BRCA2:

stronger for pancreatic and prostate

Criteria for nipple sparing mastectomy:

tumor size less than 3 cm

more than 2 cm away from the nipple

no gross involvement of the nipple

negative retroareolar tissue

negative nodal disease

For a patient undergoing breast reconstruction with abdominally-based free flap:

abx is appropriate for preop and intraop

A patient with Beckwith-Wiedmann left breast enlargement that is found to  have right breast masses as well:

the right answer is to perform right breast lumpectomies and left breast mastectomy with skin reduction and free nipple graft

Patients who are active smokers and undergo breast reconstruction with free flaps:

have higher rates of mastectomy skin loss

also higher rate of donor site complications such as:

abdominal flap necrosis

umbilical necrosis

hernias

No increase in microsurgical complications or flap related complications such as flap loss of fat necrosis, infections or hematoms

Current recommendations is to stop smoking for 4 weeks prior to surgery

Pedicled TRAM:

less total flap loss

shorter operation

higher incidence of fat necrosis

higher incidence of partial flap loss

Increased length of stay

Free flap:

ease of flap shaping and insetting

decreased risk fo abdominal hernia and abdominal weakness

Suitable for diabetic patients, obese and smokers

According to Sbitany et. al:

ADM allows for a greater initial fill of saline

improves cosmetic outcome

offers the benefits of fewer expansions and the potential for more predictable secondary revisions

ADM causes higher rate of seroma

Higher rate of infection

lower rate of capsule contracture

Risk of breast cancer in patients with BRCA 1 and 2:

10%

Transverse Musculocutaneous gracilis flap:

disadvantage: small flap: enough for small or medium sized breast

major advantage: constant vascular anatomy

low rates of fat necrosis

flap perfusion is always reliable

donor scar is inconspicuous

Phyllodes tumor:

non-epithelial tumors

smooth

well-dermacated

large tumor with an average size of 5 cm

85% benign

Analysis of radiated tissue will show:

increased vessel thrombosis

tissue oxygenation is inadequate

impaired healing with slowed fibroblasts

main problem in the inhibited healing of chronic radiation injury

SIEA flap:

lowest abdominal morbidity

fascia remains intact

these vessels are present in only one third of the patient

only in half can sustain a free flap

higher frequency of flap loss

higher incidence of fat necrosis

BRCA2 and male breast cancer is about 7%

mostly around age 30-40

and decreases with age

In a patient with breast expander and has a lot of pain after expansion

possible blanching of the skin

indicative of tissue ischemia and poor oxygen tension

best step is to withdraw fluid from tissue expander

When placing tissue expander under the pectoralis:

there is decrease of pectoralis torque

Kleinfelter syndrome:

very important subset for gynecomastia

Increased FSH, LH, decreased testosterone

Presence of estrogen and progestrone receptors in elevated concentrations:

malignancy risk which sometimes happens in Kleinfelter

and the absence of these receptors tells you why patients with gynecomastia don’t have cancer

In patient with DCIS s/p skin sparing mastectomy

risk of another breast cancer in 45 months is less than 2%

LD:

medial/internal rotation

extension

adduction

For large burn scar contracture of the breast:

need to release the scar contracture and then put integra

subsequently you can do thinner split-thickness skin graft

When performing breast reconstruction with free flap:

the most aesthetically appropriate placement of the skin paddle is to be placed inferiorly and laterally

Pectoralis major muscle:

lateral pectoral nerve from lateral cord

innervates the **medial and superior** portion of pectoralis major musche

Medial pectoral nerve:

innervates the **lateral and inferior**

it pierces the pectoralis minor muscle and then courses along the lateral edge of pectoralis major muscle

The second intercostobrachial nerve:

supplies the axilla and inner arm

LD flap:

most common complication is seroma

least common complication is shoulder stiffness

Gluteus free flap is requested when

Abdomen already used

LD will not provide enough tissue

Patient wants only her own tissue to be used

Smokers with free TRAM:

no increase risk of

vascular thrombosis

flap loss

fat necrosis

Smokers have increased risk of:

abdominal hernia

abdominal flap necrosis

mastectomy skin necrosis

Superior gluteal artery perforator flap:

difficult to mold because the fat is firmer

however it does provide sensation, well hidden scar, abundant tissue and no gait dysfunction

The advantage of extended LD for breast reconstruction:

eliminates the need to use breast implant

Can use parascapular, scapular and lumbar fat

Increase seroma formation and wound necrosis

Congenital absence of the breast:

rare disorder

absence of the nipple

and absence of no development of the breast

Anterior thoracic hypoplasia:

sinking of anterior chest wall

superior placement of the nipple

hypoplasia of the breast

normal pectoralis major

In patients with BRCA1 and BRCA2:

the lifetime risk of developing breast cancer is 50-85%

BRCA is autosomal dominant

Codes for proteins that facilitate DNA repair, hence protecting against tumor growth

BRCA1 on Chromosome 17

BRCA2 on Chromosome 13

BRCA2 is not associated with ovarian

When you perform breast reduction and then you find out that there is cancer:

the initial tumor margin determines the most appropriate next step

if tumor not completely excised, then must go back and perform completion mastectomy

potential of shifting of tissue

seeding

residual lymphatic spread

Occult carcinoma is found in 4.6% when performing a balancing reduction

women who have that tend to be younger

also tend to be lobular

without palpable lymph nodes

Smoking and free TRAM:

smoking does not cause fat necrosis

|  |
| --- |
| **In-Service Questions Notes: Lower Extremity** |

Reverse sural flap:

venous insufficiency: 9x increased risk of developing flap complications (highest rate)

Also: obesity, DM, HTN, PVD

3.2% flap loss

15% partial flap loss

Gastrocnemius flap:

blood supply from sural artery

arises from popliteal artery 3-4 cm above the head of the fibula

enters the muscle at the level of the head of fibula

dimensions: 5 to 9 cm and 13- 20 cm

Fasciotomy is recommended if:

compartment pressure is greater than 30 mmHg

difference between the diastolic pressure and the compartment pressure is less than 30 mmHg

Common peroneal nerve:

in case of injury: loss of dorsiflexion of the ankle

branch from the sciatic nerve

follows the medial border of biceps femoris

passes over the posterior aspect of the fibular head and winds around the neck of the fibula

It divides into superficial and deep peroneal nerves

Deep peroneal nerve:

supplies muscles of the anterior leg

dorsum of the foot ???

first web space

Superficial peroneal nerve:

peroneus longus and brevis

skin on the distal third of the leg

dorsum of the foot

Injury to common peroneal nerve:

results in paralysis of anterior and lateral compartment muscles paralysis

results in foot drop

sensory distribution:

anterolateral leg and dorsum of the foot

Sensation to the medial foot:

medial plantar nerve

saphenous nerve

Sensation to lateral foot:

terminal branches of the tibial nerve

medial and lateral plantar nervers

Tibial nerve:

innervates the muscles of the plantar flexion:

gastroc

soleus

plantaris

tibialis posterior

flexor hallucis longus

flexor digitorum longus

intrinsic muscles of the foot

Reverse sural flap blood supply:

perforator from the peroneal artery

5 cm proximal to the lateral malleolus

Heel defect with exposed calcaneus: 2x2 cm

appropriate coverage: medial plantar artery flap with medial plantar nerve which is a division from posterior tibial nerve

glabrous skin

Flap options for heel reconstruction:

local flaps:

abductor hallucis

flexor digitorum brevis

abductor digiti minimi

Reversed sural flap

free flaps

Thigh abduction:

TFL

Sartorius

Thigh adduction:

pectineus

adductor longus

adductor brevis

adductor magnus

gracilis

Knee flexion:

hamstrings: semitendinosus, semimembranousus and biceps femoris

Untreated extensive acute thrombotic occlusion:

leads to progressive cyanosis, ischemia leading to gangrene

First line of treatment in this case:

catheter-directed thrombolysis with or without percutaneous transluminal angioplasty

not increased risk for bleeding

In patient with increased risk of bleeding:

can do transluminal clot retrieval aspiration thrombectomy, open IVC with or without AV fistula creation

Contrast-induced nephropathy:

IV saline hydration

Choices for nerve graft:

medial or lateral antebrachial nerve

sural nerve

Nerve conduits such as PGA tubes and processed human allograft conduit

used for gaps less than 3 cm

Capanna Technique:

vascularized bone graft with bone allograft for limb preserving surgery for large segmental defect

Ilizarov:

for small defects 4-6 cm

Propellor fasciocutaneous flap from medial leg:

from posterior tibial artery

vessels emerge between flexor digitorum longus and soleus muscle

Three clusters of perforators between:

4-9 cm

13-18 cm

21-26 cm

Peroneal artery perforators:

through posterior peroneal septum

Anterior tibial artery perforators:

between the **extensor digitorum longus and peroneus longus**

or between the **tibialis anterior and extensor digitorum longus**

When harvesting LD muscle:

shoulder weakness and loss of motion

muscles of the rotator cuff compensate

the number of patients that changed occupation less than 10%

Function of LD:

shoulder adduction

extension

internal rotation

Claw toe or loss of active flexion of the great toe IP joint:

harvest of flexor hallucis longus for free fibula flaps

Deep posterior compartment:

Tibialis posterior

FHL

FDL

Popliteus

Superficial posterior compartment:

gastroc

soleus

plantaris

Anterior compartment

tibialis anterior

EDL

EHL

Peroneus tertius

Lateral compartment:

peroneus longus

peroneus brevis

Tibial nerve:

from sciatic nerve

courses with posterior tibial artery

gives muscles to posterior compartment

branches to medial and lateral plantar nerves

Injury results:

loss of plantarflexion

loss of sensation to the plantar surface of the foot

Injury to the femoral nerve:

weakness of the knee extension

gives the anterior thigh

Obturator nerve:

innervates the medial thigh (adductor compartment)

Muscle vs. Fasciocutaneous flap:

more donor site morbidity

Same survival rates, speed of dissection and treatment of osteomyelitis

Prophylactic cephalosporin for open wounds until definitive coverage

Vacularized bone graft:

indicated for segmental defect measuring more than 6 cm

for large bone defect: vascularized bone graft with allograft

Venous insufficiency:

CEAP staging:

clinical

etiologic

anatomical

physiologic

First step:

compression and wound care

elevation

application of serial compression dressing (unna boot)

Apligraf (can be used in cases of ulcer for wound coverage)

Reverse sural flap:

contraindicated in case of peroneal artery occlusion

DM, HTN would not prevent the success of reverse sural flap use

Peroneal artery:

posterior to tibialis posterior

anterior to flexor hallucis longus

When you want to assess perfusion and prognosis of lower extremity:

you need to get ABI to assess for peripheral vascular disease especially if patient has that and it is asymptomatic

(CT only shows you anatomy)

 Gustillo classification:

type I:

less than 1 cm

little soft tissue injury

no crush injury

no or minimal comminution

Type II:

more than 1 cm

no extensive tissue damage

slight moderate comminution

type III:

extensive soft tissue injury

high degree of contamination

type A: soft tissue coverage of the bone is adequate

type B: extensive injury to or loss of soft tissue  with periosteal stripping and exposure of bone

type C: any open fracture with vascular inury

Patient with chronic ulcer and history of SLE:

pyoderma granulosum

next step in treatment is systemic corticosteroids

associated with inflammatory bowel disease or immunologic disease

Both heads of the gastroc can be harvested and there is still 75% of the plantar flexion preserved

Loss of plantar sensation due to tibial nerve transection is no longer a contraindication for amputation:

tibial nerve should be repaired

sensation is regained within 2 yrs

The saphenous nerve: terminal branch of femoral nerve

supplies the antero-medial aspect of the leg

In diabetic patient:

use Toe-brachial index

>0.7 is considered normal

The medial plantar artery flap:

**perforator is identified between the between the heads of the flexor hallucis brevis and abductor hallucis muscles**

The maximum length at which a segmental nerve injury is expected to have recovery:

12 cm

good results are usually for less than 6 cm

around 25% ranging between 6-12 cm

Common peroneal nerve:

lies between the lateral head of gastroc and the rectus femoris muscle

innervates the peroneus longus, brevis and biceps femoris

injury to the nerve results in foot drop and sensory loss to the dorsum of the foot

Lateral sural nerve:

arising from the common peroneal

provides sensory to the posterior and lateral surface of the leg

Posterior tibial nerve:

from the sciatic nerve

gives branches to gastroc, soleus and popliteus

below the soleus supplies: posterior tibialis, FHL,FDL

Lateral plantar nerve:

from the posterior tibial nerve

supplies Quadratus plantae and abductor digiti minimi

sensory to the 5th toe and the lateral half of the 4th toe

Reverse sural flap:

delay includes ligation of the proximal lesser saphenous vein

Perforators to this flap from peroneal artery

4-7 cm proximal to the lateral malleolus

Hard signs for bleeding:

active hemorrhage

exanding hematoma

bruit and thrill

absent distal pulses

distal ischemic signs and symptoms

Common peroneal nerve injury:

if prolonged, results in foot drop

transfer of tibialis posterior tendon to tibialis anterior

After free fibula flap:

pain when walking is normal

risk is peroneal nerve injury when there is less than 6 cm left or when the fibula head is included

destabilization of the ankle when less than 6 cm is left distally

possible injury to posterior tibial nerve

Injury to common peroneal nerve:

foot drop

loss of dorsiflexion

numbness of the first web space of the toe

On EMG:

loss of recruitment of lateral and anterior compartment

Isolated superficial peroneal nerve:

spares the anterior compartment

Biceps femoris and tibialis posterior:

supplied by tibial nerve

When you have crush injury to the sciatic nerve:

get baseline nerve conduction studies in 3 weeks: it won’t show anything more than just fibrillations and it is not a reliable indicator of the recovery

the nerve conduction studies at 3 months is able to pick up signs of recovery not appreciated on physical examination

if no signs of recovery at 3 months, then do nerve repair

If the sciatic nerve is transected at the time of injury:

viability is not stable until 7-10 days

When you have a trauma patient with vascular injury, open fracture:

if reduction does not restore the perfusion, then do temporary vascular shunt

getting CT angio with hard signs of vascular occlusion will only delay the diagnosis

**Common peroneal nerve:**

**3 branches:**

**articular to the knee joint and lateral collateral ligament**

**Superficial branch: supplies the lateral compartment muscles and sensation to the lateral calf and dorsal foot**

**deep branch: that innervates anterior compartment and provides sensation to the first web space**

Posterior tibial nerve:

innervates the posterior compartment

ankle plantar flexion and toe flexion

medial and plantar nerves are terminal branches of the posterior tibial nerve

provide motor innervation of the deep plantar muscles of the foot and sensation to the plantar surface of the foot

The lateral calcaneal artery:

a terminal branch of the peroneal artery

occasionally may arise from posterior tibial artery

During harvest of plantaris tendon:

the tibial nerve is a greatest risk of injury

the tendon is harvested through a vertical incision anterior to the medial aspect of the of Achilles tendon

the dissection begins behind the medial malleolus distally and close to tibial nerve

Great toe-to thumb transfer:

first dorsal metatarsal artery

branch of dorsalis pedis artery

2/3 of the cases

In 1/3, it arises from the deep plantar artery that communicates with the plantar arch or is a branch of the plantar arch

in that case FDMA is vestigial

Bone defect greater than 6 cm requires vascularized bone graft

Other indications: infection and prior failure

Propellor flaps:

medially based on the posterior tibial artery

laterally based on the peroneal artery

In traumatic lower extremity reconstruction:

Godina emphasized the importance of coverage within 72 hours

Inadequate bone or soft-tissue debridement prior to reconstruction is a common cause of failure

Lateral aspect numbness and weak dorsiflexion:

common peroneal nerve injury

Superficial peroneal nerve: supplies peroneus longus and brevis and sensation to the lateral aspect of the leg

injury causes weakness of eversion and plantar flexion

deep peroneal:

anterior compartment of the leg:

tibialis anterior

extensor hallucis longus

externsor digitorum longus and brevis

peroneus tertius

sensory distribution to the first web space

weak dorsiflexion

Injury to the weak fermoral nerve:

weakness of extension of the knee

Sural nerve:

sensation to the lateral foot

found between the calcaneus and lateral malleolus

Tibial nerve: off the sciatic nerve

supplies gastroc, soleus, plantaris and popliteus

travels with posterior tibial nerve

in the leg: gives tibialis anterior, flexor hallucis longus, flexor digitorum longus

injury: cases weak plantar flexion and anesthesia to plantar surface of the foot

Most common cause of congenital constriction band syndrome:

early amnion rupture

Amniotic band syndrome:

1/1200-1/5000

No distinct sex determined

Prenatal risk factors:

prematurity

low birth weight

maternal illness during pregnancy

maternal drug exposure

maternal hemorrhage

attempted abortion in the first trimester

Reverse sural flap:

predominant blood supply: peroneal perforators

about 5 cm proximal to the lateral malleolus

ligation of the lesser saphenous vein does not compromise the flap

Sensory neuropathy:

leads to loss of protective sensation

Sympathetic neuropathy leads to warm and dry feet that are prone to skin breakdown

Arterial ulcers of the lower extremity are associated with ABI < 0.45

Peroneal nerve palsy:

supracondylar femur fracture

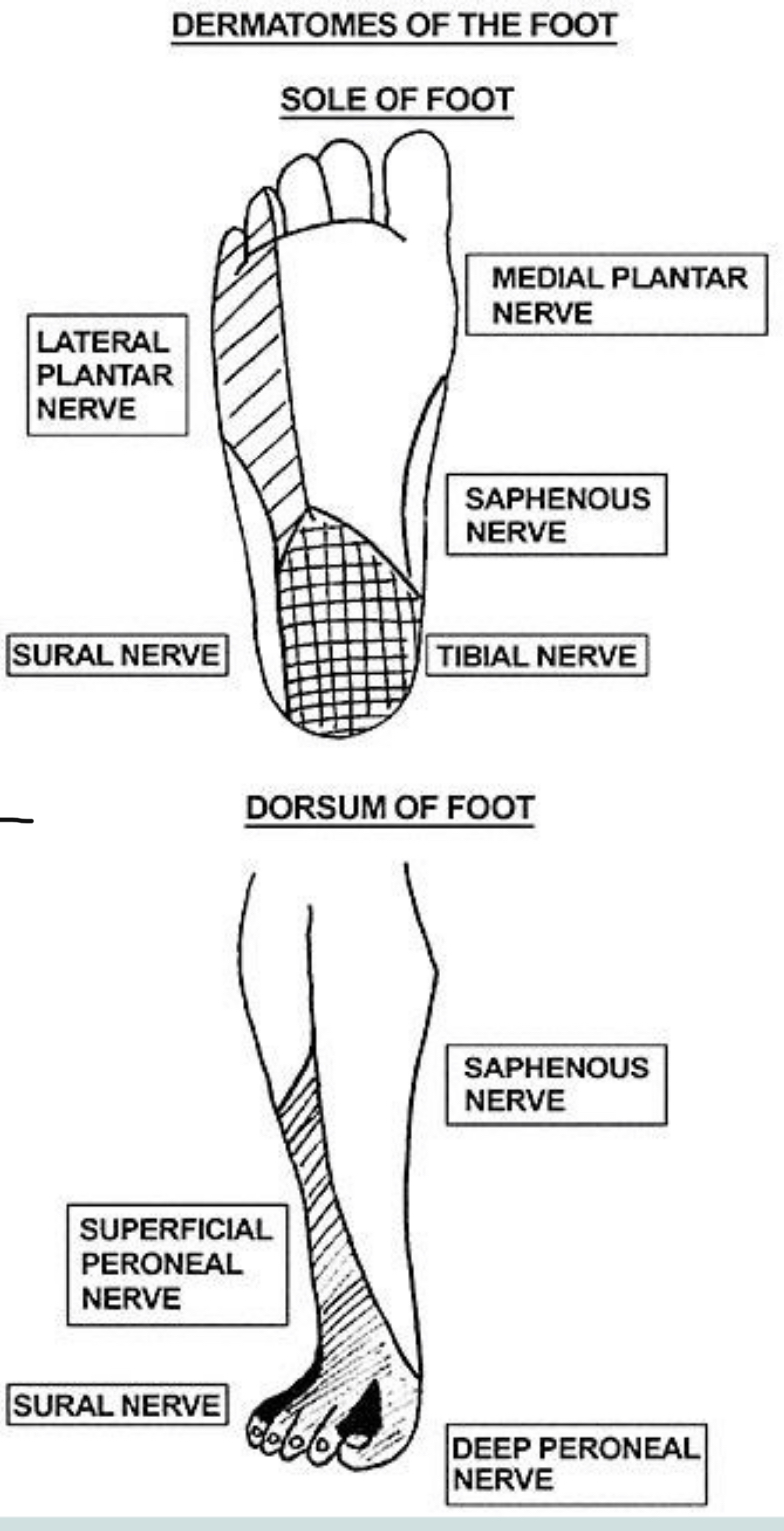
posterior knee dislocation

proximal tibial fracture

Tibial nerve injury is more morbid:

affects the plantar aspect of the foot

in addition to loss of plantar flexion



Proximally based soleus muscle flap:

blood supply from peroneal artery proximally

posterior tibial artery inferiorly

Best candidate for bilateral legs replantation:

young age

sharp cut

clear mechanism

Contraindication to bilateral legs replantation:

crush mechanism injury

ischemia time over 8 hours

multiple-level

poor baseline healthy

advanced age

When reconstructing the femur and using allogenic bone graft and intramedullary free fibular flap:

the most common reason to do this: to decrease union time

free fibular flap contains instrinsic blood supply and osteogenic cells

this will offer the ability for osteoinduction

hence it shortens union time

Shortened to as low as 3-5 months

Allograft healing time is about 14-23 months

Sartorius muscle flap:

from superficial femoral artey

8-10 pedicles

One of the most likely adverse outcome of reverse sural flap:

partial flap loss

**At the level of the ankle:**

saphenous nerve is found between the medial malleoulus and the tibialis anterior tendon just lateral to the saphenous vein

When performing ankle arthroscopy:

the **superficial peroneal** nerve is at risk of injury

results: diminished sensation over the middle part of the dorsum of the foot

**Sural nerve:**

between the lateral malleolus and achilles tendon

**Greater saphenous vein:**

medial malleolus and extensor hallucis longus

**Posterior tibibial vessels:**

medial malleoulus and achilles tendon

**Dorsalis pedis:**

Between extensor hallucis longus and tibialis anterior

ALT:

blood supply: descending branch of the LCFA is dominant in 85% of the cases

Oblique branch: occasionally the primary in 15%

it is an offshoot from descending or transverse branch

Pathophysiology of venous ulcer:

incompetence of valve

leads to increase capillary hydrostatic pressure

leading to leakage of protein and fluid to extracellular space

decrease oxygen deliver leading to tissue necrosis and ulceration

Tx:

compression of the edematous limb

reduces interstitial edema

decreasing tissue pressure

best treated with occlusive and compressive Unna boot

The sural nerve:

contribution of medial and lateral sural cutaneous nerve

found 1 cm posterior to sural nerve

leaves minimal sensory deficit

lateral foot and ankle

Treatment of talipes equinovarus:

placement of tissue expanders can minimize skin shortage and wound complications

Tarsal tunnel syndrome:

medial and lateral plantar nerves from tibial nerve are compressed

The flexor digitorum brevis:

innervated by the medial plantar nerve

Flexes both proximal and middle phalanges of the toes

Plantar flap:

from medial plantar artery and medial plantar nerve

between the head of first metatarsal and the heel

Dorsalis pedis flap:

dorsalis pedis artery and superficial peroneal artery (sensate flap)

good for ankle and distal foot

To have sensate flap using the medial gastro myocutaneous flap:

preservation of saphenous nerve

When you can’t use contrast for CT or angiography in a patient with renal failure:

you can use color-flow doppler

monophasic signal means there is obstruction

Or you can use MRA

The dominant blood supply to:

proximally based soleus: popliteal

distally based soleus: posterior tibial

Obturator nerve:

innervation to the medial thigh (adductor group)

adductor longus, brevis, magnus, gracilis and obturator externus

cutaneous branch that provides sensation to the medial thigh

For heavily contaminated comminuted fracture of the lower extremity:

the best initial step is Ex-fix

the converted to intramedullary rod within the first 10 days

In a patient who can evert foot but cannot dorsiflex:

Injury to deep peroneal artery

Common peroneal nerve:

deep branch to extensor hallucis longs and anterior tibial nerve

Supoerficial peroneal nerve: peroneus longus and brevis

In diabetic patients:

30% calcification of vessels

ABI cannot be measured accurately due to inability for the pressure cuff to compress the vessels

Biphasic or triphasic color doppler flow: means there is good flow

Digital vessels are resistant to calcification: therefore measuring absolute toe pressure is a better indicator of peripheral ischemia than ankle pressure

less than 30 mmHg is indicative to obtain formal angiogram and need to improve peripheral flow prior to attempting free flap

Compared with non-vascularized bone autograft:

free fibula has increased osteocyte viability

no creeping substitution

Non-vascularized incorportation occurs by creeping substitution

involves gradual vascular ingrowth, resorption and repalcement of necrotic bone

Knee dislocation is a common cause of common peroneal nerve compression

patient will have foot drop due to injury to deep peroneal nerve

decrease sensation over the lateral aspect of the foot

When raising reverse sural flap:

important landmarks:

lesser saphenous vein

sural nerve

the pivot point is about 5 cm superior to the lateral malleoulus

The soleus muscle can be used in a patient who is a smoker with **mid-tibial fracture and soft tissue loss** (but maybe outdated question because they consider free flap wrong in this question)

bipennate flap

medial head attached to posterior tibial

popliteal and posterior tibial

lateral head attached to fibula

peroneal

**Saphenous artery** for saphenous flap:

comes from **descending genicular artery**

genicular artery comes from superficial femoral artery

Gracilis flap secondary pedicle:

comes from superficial femoral artery

A patient who was stabbed in the leg with loss of dorsalis pedis pulse

means there is injury to the anterior tibial artery

which is in the anterior compartment

this is where the deep common peroneal nerve is

leading to numbness of the first web space

The dorsal aspect of the foot with exception to the first web space is the superfial peroneal nerve

the medial aspect of the foot: saphenous nerve

lateral aspect of the foot: sural nerve

Primary arterial blood supply to great toe flap from toe to thumb transfer:

first dorsal metatarsal artery coming from dorsalis pedis

If you have a patient with hardware that was placed two weeks ago then got exposed:

cover only free flap only

do not remove the hardware- too soon

Sartorius muscle flap:

supplied by SFA and superficial circumflex iliac artery

Contralateral vascularized free fibula flap:

provides 20 cm in length

When you have avulsion amputation fo the middle third of the leg with distal third and foot intact and you also have exposed tibia:

you can do fillet-of-foot flap or free flap

The best way to clear bacteria off bone with debridement without killing osteoblast-osteocytes:

surgical soap

otherwise everything else is bad

Factors associated with osteomyelitis after Gustillo IIIB of the lower extremity:

presence of dead space

presence of devitalized bone

presence of dead muscle

Inadequate tissue coverage

\*\*\* Internal fixation does not increase the risk of osteomyelitis

10-15% of patients do not have plantaris

33% have only one plantaris (unilaterally)

MRI with gadolinium:

good for osteo

must be with contrast

lower extremity venous arterialization???

Even if patient has DM and hx of kidney transplant and taking immunosuppression

the right treatment is free flap for distal third wound

|  |
| --- |
| **In-Service Questions Notes: Maxillofacial trauma:** |

Patients with frontal sinus fracture have 55% (45-65%) chance of intracranial trauma.

Patients with facial fractures are at risk of delayed or missed mild TBI

Nasal bone: tolerance to fracture 25-75 lbs

frontal bone: highest tolerance to fracture 800-1600 lbs

Massive transfusion protocol:

FFP and pRBC at 1:1 ratio and discontinue IV crystalloids

delivered via rapid transfuser and blood warmer

transfuse one single donor apheresis or random platelet pool for each six units of pRBC

Most common complication of using PEEK implant:

infection is the most common complication

In orbital floor fractures:

emergent surgery is required when there is hyphema: blood in the anterior chamber

can lead to permanent damage

Patient with orbital trauma with loss of globe and eyelids:

give them orbital prosthesis

In reconstructive cranioplasty:

rate of complications is increased in frontal location

Cranialization of the frontal sinus:

removal of the posterior table (not repair)

closure of dura

sinonasal tract

obliteration of sinus mucosa

Indication to repair the anterior table:

nasofrontal duct involvement: obliteration of the frontal sinus and repair of anterior table

absence of nasofrontal duct involvement but patient desires aesthetic outcome

When there is canalicular injury:

lacrimal system must be investigate

Perform Jones I and Jones II test

Check for fluorescin from the lower eyelid to the nasal fornix

If interruption identified: must place a silicone stent between the proximal and distal stumps and leave it for 3-6 months

If continues to be obstructed despite stent: salvage procedure Dacryocystorhinostomy: salvage procedure

Patients older than 60-65 years of age with craniofacial injuries:

longer hospital stay

need for assistance on discharge

other noncranial injuries

higher rate of death

Tracheostomy scar:

excise

reapproximate platysma, sternohyoid, sternothyroid

Jones test:

Jones I:

investigate lacrimal outflow under normal physiologic conditions

2% fluorescin in the conjunctival fornix and cottom-tipped applicator in the inferior nasal meatus near nasolacrimal duct at 2 and 5 minutes

this one can yield abnormal results and not always used

Jones II:

determines the presence or absence of fluorescin when it is flushed from the conjunctival sac with clear saline to determine whether there is reflux

NOE fracture repair:

lacrimal system at increased risk of injury

ephiphora is very common

50%

after 3-6 months: 50% resolve

25% need further investigation

TMJ dysfunction:

can occur after unilateral comminuted condylar fracture

Pediatric orbital floor fracture:

should not be delayed more than 7 days

associated with varying degrees of diplopia

if there is entrapment of inferior rectus muscle: pain and nausea

operate within 24 hrs

ZMC fracture:

align ZF

ZM

inferior orbital rim

if there is a gap of more than 2 cm squared in the orbital floor, then must do reconstruction

Fractured tooth crown:

sensitivity to cold and touch

yellow color exposed is the dentin (under the outer enamel)

Most common complication of temporal bone fracture:

CSF leak

resolves spontaneously within one week

Longer: risk of meningitis

Facial nerve injury is the second most common complication: dependent on severity and delay of onset

Hearing loss is the third most common complication

Orbital floor fracture:

most common bone to be fractured: maxillary

it is thin behind the orbital rim

perforated by the infraorbital nerve

most common age group in 30’s

male to female 4:1

assault is the most common etiology

Closed nasal fracture reduction:

30-40% residual nasal deformity

simultaneous nasoseptal fracture

Failure with C-shaped nasoseptal deviation

external nose deviated at least 1/2 of the nasal bridge width

Contraindication to nasotracheal intubation:

Absolute contraindications:

Basal skull fracture

Mid face instability

Epiglottitis

Impending apnea or respiratory arrest

Relative contraindications:

Nasal polyp

Nasal foreign body

History of frequent epistaxes

History of recent nasal surgery

Upper neck hematoma

Indication for nasotracheal intubation:

Oropharyngeal and oral surgery

Surgery involving the mandible

Dental surgery

Disadvantage of nasotracheal intubation:

Requires multiple attempts

Difficult in uncooperative patient

May lead to increased intracranial pressure

In a patient was repaired parotid gland and Stensen's duct:

Sialocele and cutaneous fistula are common complication after a major salivary gland repair

Prior to intervention the surgeon need to aspirate fluid and confirm that it's saliva by looking at amylase > 1000 U/L in order to rule out infection and hematoma

The first step in the management is conservative and that includes:

Pressure dressing

Repeated aspiration

PO intake limit

antisialologues to decrease salivary flow: **Atropine and glycopyrrolate**

Most studies show that this will resolve within 2 to 3 weeks

Wound exploration and repair is very difficult because of inflammation granulation tissue and scarring

Radiation is not used for treatment, it did in the past and failed

Internalization of secretion can be attempted and it's better than trying to repair the gland

Relative afferent pupillary defect:

The light is shone in the normal causes constriction in the other eye, however when the light is shone in the abnormal eye there is dilation of both eyes.

This is called Marcus Gunn pupil from optic nerve dysfunction

Most common cause of Marcus Gunn a pupil is optic nerve lesion, optic neuritis and retinal disease

The normal pathway is the light is perceived from the pupil to the brain via the optic nerve. Then the efferent pathway sent back to both pupils via oculomotor nerve and celery ganglia

The most common indication for orbital floor fracture repair is:

Herniation of orbital content with diplopia

Symptoms may include diplopia, enophthalmous and numbness in V2 distribution

Other indications include extraocular muscle entrapement: **Inferior rectus** most commonly, also in another question inferior oblique is the most common

Early signs of enophthalmos

Displacement of more than 50%(which will lead to enophthalmous)

Lateral orbital wall displacement which can impact the orbital apex

Wisconsin criteria that is predictive to facial fracture:

Periorbital swelling

GCS less than 14

Malocclusion

Tooth loss

Bony step-off

Persistent facial swelling after ZMC fracture repair at three months:

Residual soft tissue swelling

Overreduction of ZMC fracture in the sagittal plane is almost impossible

Malreduction of ZMC fracture results in:

malar flattening

vertical dystopia

enophthalmous

prominent hardware: localized prominence

In trauma patient:

Establish and control airways first

Stabilize C-spine

Control bleeding

Perform secondary survey

When you have Parasymphyseal fracture and subcondylar fracture:

First establish MMF

Second do ORIF to parasymphaseal fracture

Inpatient with unrepaired orbital floor fracture:

They will eventually develop diplopia due enophthalmous which also result in vertical dystopia

This happens because of increase volume of the orbit

so the globe will sit deeper and more inferior

so the directed line of vision is no longer the same as the opposite side

Orbital floor fracture most commonly occur with ZMC fracture

Orbital floor fracture diplopia when there is inferior rectus muscle entrapment

to upward and lateral gaze

When looking upward

with limited movement of the eye looking upward

For a patient with bilateral subcondylar fracture with no displacement of posterior vertical height:

Place in MMF for four weeks to 6 weeks

followed by a period of 2-3 weeks of guided elastics

Prolonged MMF duration causes TMJ ankylosis (stiffness)

Ankylosis of TMJ joint is most likely due to direct injury to the joint capsule or condylar head

ZMC fracture with NOE fracture:

affect the perceived reduction of ZMC when performing ORIF

The lateral orbital wall is the most reliable landmark when confirming the reduction of ZMC

it is a three-dimensional landmark

frontal, sphenoid and zygoma

Other landmakrs:

ZF suture

ZM

Zygomatic arch

Orbital rim

If the orbital rim is well reduced but the lateral orbital rim is not:

then NOE fracture is the most likely reason

Therefore must reduce NOE fracture first before reducing the orbital rim

In isolated orbital fractures:

the most commonly involved bone is the maxillary bone

it is thin behind the orbital rim

perforated by the infraorbital nerve

When a patient is bleeding from oronasal and unstable maxillary fracture:

if the patient underwent ET tube placement. Also MMF in the ED is hard to achieve

Then anterior and posterior nasal packing is performed to control the bleeding

This is accomplished by inflating foley catheter that is inserted in the posterior choana

Followed by anterior packing with ribbon or nasal tampon

When packing fails, then need to go to IR for embolization

internal maxillary artery

STA’s are the most common ones

When a patient has facial fracture with pulsation of the globe:

think of orbital roof fracture that enters the middle cranial fossa

allows the communication between the cavernous sinus and the carotid artery

Zygoma fracture: involves displacement of the fracture that:

articulates with zygoma, sphenoid and frontal bone

Reduction of Zygomaticofrontal, zygomaticomaxillary buttress and infraorbital rim

if orbital fracture more then 2 cm2, then it needs to be reduced also to prevent enophthalmous

In a patient with facial fracture who cannot smell:

injury to the ethmoid bone is the reason

It supports the olfactory bulb and olfactory nerves passageway

Cribriform plate of ethmoid bones have many foramina that transport olfactory nerves and in contact with meninges

Anosmia

CSF leak due to tearing of the meninges attached to cribriform plate

The ethmoid bones have two portions:

central portion: perpendicular plate which forms the nasal septum

lateral portions: lamina paprycea that form the medial orbital wall and ethmoid air cells

Marcus Gunn Pupil:

relative afferent pupillary reflex defect

caused by optic nerve disease: between the retina and optic chiasm

and severe retinal disease

The pupillary constriction is less when the light is swung between the unaffected eye to the affected eye

Optic nerve injury causes Marcus Gunn Pupil:

also retina

Testing involves: shining the light in the affected side, no constriction but there will be constriction in the other unaffected side

then shine in the unaffected side, both pupils constrict

then shine back/ swing to the affected and there will be constriction on the unaffected side and paradoxical dilation on the affected side

Ocular muscles that are supplied by the **Oculomotor nerve:**

superior rectus

medial rectus

inferior rectus

inferior oblique

Pupillary muscles

abducens nerve:

lateral rectus

Trochlear:

superior oblique

Hyphema: blood in the anterior chamber of the eye

Tentorial herniation due to laterally expanding intracranial hematoma:

oculomotor is susceptible to compression

pupil is fixed and dilated or sluggish

the eye is laterally deviated due to unopposed action of the lateral rectus

Normal pupillary constriction:

light perceived in the retina

afferent fibers of the optic nerve II

to pretectal nucleus and both Edinger-Westphal nuclei

parasympathetic fibers via oculomotor III to sphincter pupillae

Odontogenic cyst:

**Periapical cyst:**

most common odontogenic cyst

etiology is nonviable tooth that becomes infected leading to necrosis of the pulp

Toxins exist the apex of the tooth leading to periapical inflammation

leading to radiolucency seen on x-ray

**Dentigenous cyst:**

second most common

develops within the normal dental follicle surrounding an unerupted tooth

such as the mandibular or maxillary third molar or maxillary canine

most are asymptomatic and found incidentally on x-ray

**Odontogenic keratocytes OKC:**

third most common

can have a wide variety of presentation

the cyst is rapidly growing and aggressive

can be hard to remove

recurrence rate is high

component of basal cell nevus syndrome

**Mucous retention cyst:**

**Or mucocele**

pseudocyst that arises from the minor salivary glands in the lips

**Traumatic bone cysts:**

self-limiting radiolucent lesions of uncertain etiology

forms empty or fluid-filled cavity

most commonly within the mandible

In a patient with **repair** of panfacial fracture including basilar skull fracture who presents with:

unilateral proptosis

Visual impairment

limitation of ocular movements

Classic presentation of post-traumatic carotid cavernous fistula (CCF)

Pulsatile proptosis

ocular and orbital erythema

chemosis

diplopia

headache

visual loss

Occurs due to abnormal connection between internal carotid artery and cavernous sinus

rarely between the internal carotid or branches of the external carotid artery and venous plexus of the skull

Can lead to blindness if it progresses

Also can lead to paralysis, unconsciousness and death

**Cerebral angiogram is the study of choice**

Can be confused with superior orbital fissure syndrome or stroke

Carotid duplex will be normal

if a kid sustains linear skull fracture with underlying dural injury:

then the fracture will fail to heal

as the skull grows, the fracture will increase in size and the cranial defect increases

For Isolated medial orbital wall fractures:

transcaruncular approach is used for isolated medial orbital wall fractures

can be associated with entrapment of medial rectus muscle

Injury to the orifice of the parotid duct:

should be treated with stenting

if left untreated: sialocele or cutaneous fistula develops

Ligation of the proximal duct if there is extensive injury to the gland/duct system and neither ends of the ducts can be repaired

On the in-service question # 44

Despite the nasofrontal duct being patent, but due to deformity of the anterior frontal table, they wanted to do ORIF.

of note, they also mentioned in the question that the posterior table is non-displaced

Head injuries in infants when accompanied by dural injury/laceration:

if the dural tear is missed, then the fracture will increase in size as the skull grows

These dural tears need to be repaired acutely

Frontal sinus develops at the end of 2 years hence it cannot be obliterated before that age if there is frontal bone laceration

Tooth fracture:

can be minor involving the outer enamel only

or more significant involving the underlying dentin:

the overlying yellow substance that protects the inner tooth pulp

The exposed outer third of the tooth is called the crown:

consists of outer enamel

inner dentin

small portion of the pulp

The two third of the tooth in the alveolar bone:

outer cementum

inner dentin

pulp chamber

X-ray can determine the level of tooth fracture

Sensitivity to cold it means that the dentin is exposed

predisposes to infection that can progress to pulp and destroys the tooth

tooth should be capped soon

x-ray should be repeated to make sure the pulp did not die

If a pulp dies then the whole tooth should be removed

Or root canal: where the dying pulp is removed and the tooth is filled with filling

For transcuruncular incision for medial orbital wall fracture:

after incising the conjunctiva

dissection should proceed between the medial orbital septum and Horner muscle

to expose the periosteum that is posterior to the posterior lacrimal crest

This approach will minimize the injury to Lockwood ligament which is more inferior and the lacrimal sac which is more anterior

Preservation of the septum will minimize the spillage of fat into the surgical field

The minimum increase is orbital volume that can cause post-traumatic enophthalmous:

5%

In a patient with midface and lower face fractures + history of smoking:

will likely be on the vent for a while

Also if the patient will need MMF then cannot do oral intubation

And if they have NOE and midface instability, then they cannot do nasotracheal

tracheostomy is better for this patient

Nasotracheal intubation is contraindicated in patients with NOE fracture and midface fracture

NOE fracture is:

fracture to the medial orbital wall

nasomaxillay buttress

lateral nasal bones

The medial canthus:

attached to medial orbital wall

it is also displaced laterally with displacement of bony fracture of the NOE

Telecanthus:

increased distance between the medial canthi

In orbital fractures:

most important thing to call the opthalmologist for is: hyphema

Hyphema is blood in the anterior chamber

caused by tearing in the blood vessels of the iris

blood in the eye is dangerous because it can form a clot

interferes with fluid egress and results is glaucoma

Diplopia and ptosis do not warrant urgent consultation

retrobulbar hematoma and globe rupture warrant urgent consult

To identify the site of parotid duct laceration:

methylene blue is injected in the ductal papilla

duct should be repaired over stent using 8-0 nylon stitch

If unable to repair duct, then best of ligate the duct

Starch-iodine test:

used for Frey syndrome

to assess gustatory sweating because of inappropriate reinnervation of sympathetic sweat glands after parotid surgery

After orbital fracture surgery:

10-20% of patients require some revision surgery

When a patient presents 8 weeks after midface fracture with severe malocclusion:

the only to correct is to do osteotomy and MMF

In a patient with non-displaced anterior and posterior table fracture with CSF rhinorrea

Tx: observation until CSF leak resolves with head of bed elevation and possible lumbar drain placement

If leak fails to resolve: then maybe will need obliteration of frontal sinus

Infection after mandibular fracture ORIF is common:

0.4-32%

management of infection should be I&D

Do not remove plate until fractured segments are ossified and rigid fixation is maintained

nonrigid fixation with MMF and external hardware lead to worsening of infection

Hydroxyapatite should never be used in patients with history of irradiation:

infection rate is 100%

Also should not be used in pediatric skulls

reduction of infection: when at least one year elapsed from time of infection and the time of reconstruction

HA is approved by FDA for reconstruction of bony defect up to 25 cm2

The absolute indication for orbital floor repair is loss than greater than 50% of the floor

NOE fx repair with telecanthus and repair of the medial canthal tendon:

drill holes should be placed superior and posterior to the posterior crest of the bony lacrimal fossa

Clinical signs of enophthalmos:

narrowing of the palpebral fissure

deepening of the supratarsal crease

best assessed in submental view

Retrobulbar hematoma:

treatment is lateral canthotomy and cantholysis

Signs and symptoms:

pain

decreased visual acuity

proptosis

history of trauma

chemosis

increased intraocular pressure

ophthalmoplegia

Must be treated within 90 minutes before permanent visual loss takes place

Repair of orbital floor is usually delayed for one week

Mannitol and dexamethasone are regarded as adjuncts

Comminuted Anterior and posterior table fractures  of the frontal sinus:

indication for cranialization

which includes removing the posterior table, blocking the nasofrontal duct with bone flap or pericranial flap

to separate the frontal sinus mucosa from the intracranial space

Always make sure the nasofrontal duct is patent

Reattachment of the medial canthus:

1-2 cm superior and posterior to the posterior lacrimal crest

overcorrection is required

Medial canthal tendon:

anterior limb inserts medially on the anterior lacrimal crest

posterior limb that attaches to the posterior lacrimal crest

vertical limb that inserts on the medial orbital rim inferior to the nasal frontal suture

CSF:

has low protein and low K+

Double halo formation

Glucose content in CSF exceeds mucous or blood

In patients with non-displaced posterior table fracture but with CSF leak:

Bed rest

elevation > 30 degrees

if CSF leak persists more than 4 days, then spinal drainage

If more than 10 days, then requires craniotomy by either obliteration of the sinus or cranialization

In kids with orbital floor fracture:

bradycardia

nausea

oculocardiac reflex

must intervene urgently

Must ensure the reduction of the greater wing of sphenoid and lateral orbital wall in addition to all the components of the ZMC

Children facial fractures:

most common

mandible

nasal

LeFort

Orbital

Untreated septal hematoma:

septal perforation

fibrosis

necrosis

collapse: saddle nose deformity

Septal hematoma should be treated immediately with L-shaped incision over the hematoma

followed by loosely closing the incision and quilting sutures to prevent reaccumulation

follow up with internal nasal packing

systemic abx

close follow up

Markowitz and Manson NOE fracture classification:

type I: large central segment, which can be reduced and a plate is applied to stabilize

type II: comminution of central segment but the insertion of the medial canthal ligament is still intact

type III: severe comminution extending to the insertion of medial canthal tendon insertion: requires transcanthal wiring

Optic neuropathy with orbital ZMC fracture:

2-5%

most likely mechanism is shearing of the optic nerve at its entrance into the optic foramen

Vertical buttresses:

nasomaxillary

zygomaticomaxillary

pterygomaxillary

Posterior facial height:

condyle and posterior ramus of the mandible

Horizontal buttress:

frontal

zygomatic

maxillary

mandibular buttress: composed of mandibular arch: width during pan facial fracture

Dilochocephaly is another term for scaphocephaly

Turribrachycephaly/Oxycephaly used to described vertically tall head

the bony intercanthal distance should be between 16-23 mm

The lateral orbital wall:

zygoma and greater wing of sphenoid

The medial orbital wall:

ethmoid and palatine bones

Orbital floor trap door:

more common in children

the bone goes back to where it is after tissue herniates

causes oculocardiac reflex

most likely to entrap inferior rectus and inferior oblique muscle

Nasal innervation:

Anterior ethmoid:

nasal tip

Infratrochlear and infraorbital:

sidewalls of the nose

Lateral branch of pterygopalatine:

upper and middle turbinates

Medial branch of pterygopalatine:

septum

nasopalatine (terminal branch of pterygopalatine):

hard palate

maxillary incisor teeth

gingiva

Cranialization is indicated in patient with frontal sinus posterior table fracture

(might try to confuse you with nasofrontal duct fracture)

However, not indicated in case of non-displaced fracture

Even when there is CSF leak, some surgeons wait for 10 days before cranialization

as long as the fracture is non-displaced

nasofrontal duct is intact

If case of posterior table fracture with nasofrontal duct injury

obliteration instead of cranialization

as long as there is no brain injury

no or minimal comminution

Cranialization includes:

obliteration of the nasofrontal duct

removal of posterior table

removal of all mucosa

Fracture of the orbital roof medial to superior orbital fissure:

likely damaged the nasofrontal duct

in which case: do obliteration

Post-traumatic mucocele:

managed by sinus obliteration

cranialization is only indicated when the mucocele has expanded and destructive to the posterior table

Surgical repair of orbital fractures:

emergent

urgent

delayed

Reasonable to repair in two weeks

indication for repair:

diplopia in central gaze (although in another question it was not the answer: the answer was orbital floor defect greater than 2 cm)

acute enophthalmos

large orbital floor defect that will eventually lead to enophthalmos

vertical dystopia

In pediatric:

emergent repair needs to take place within 24 hours

such as trap door fracture:

cartilaginous nature of the fracture that allows for recoil of orbital tissue

entrapment of inferior rectus muscle

Hyphema is blood in the anterior chamber:

contraindication of early treatment due to increased risk of bleeding

Most common cause of mucocele after frontal sinus fracture:

retained sinus mucosa

typically occurs in patients with unrepaired frontal sinus fractures

however, can also occur when there is retained mucosa in the sinus after obliteration

Mucopyocele: infected mucocele

After removal of thbe mucosa:

the sinus must be obliterated with either vascularized flap such as galeal flap

or cancellous bone graft

then reconstruction of the sinus

(free fat and muscle grafts are associated with necrosis and potential resorption)

Medial canthal tendon detachement:

even if it is partial (which lateral could lead to telecanthus)

must be repaired with transnasal canthopexy

In ZMC fracture repair:

the single most important landmark of proper alignment is:

zygomaticosphenoidal suture: greater wing of sphenoid with zygoma

The sphenoid portion of the lateral orbital wall separated from the roof by the superior orbital fissure and from the floor by the inferior orbital fissure

The sphenoid with zygoma articulation is broad and provides the best assessment of the reduction

it is possible to reduce these segments without this alignment but that is not a proper reduction

In a child with displaced symphyseal fracture and condyle fracture:

ORIF of the symphyseal fracture

MMF for 10-14 days

Must be aware of tooth buds during mixed dentition

When there is no direct laceration of the lacrimal system:

injury risk is very low

best to do is observation

The central segment of NOE fracture consists of:

ascending frontal process of the maxilla

descending internal angular process of the frontal bone

it provides the bony support of the medial canthus

The initial management of ectropion after repair of facial fracture:

massaging for SIX months prior to surgical intervention

This approach if patient has normal Bell phenomenon, minimal scleral show and lagophthalmos

Beyond 6 months: the surgical options include:

Kuhn-Szymanowski procedure (horizontal shortening of the lower eyelid)

lateral canthoplasty

scar release and application of Frost traction suture

Nasal septal cartilage graft for posterior lamella support

**Question #97**

For a baby who has bilateral cleft lip and palate:

the risk for his sibling to have cleft lip with or without palate: 5.7% and 8% depending on the reference

The incidence of cleft lip with or without cleft palate for the sibling of a child with bilateral cleft lip but no cleft palate is 6.7%

For sibling of a child with unilateral cleft lip and palate 4.9%

For sibling of a child with unilateral cleft lip and no cleft palate is 4%

Two affected childern with cleft lip with or without cleft palate: third child 9%

The major cause of enophthalmos persistence after ZMC reduction:

inadequate reduction

misalignment increases the orbital volume

malalignment of ZS suture: enophthalmos with malar flattening

For Gillies approach: isolated zygomatic arch

instrument is placed between the deep temporal fascia and temporalis muscle

the strong fascia is attached to the upper border of the zygomatic arch and will guide the instrument into position immediately beneath the malar eminence

**in another question answer #129**

**beneath the deep layer of deep temporal fascia, which lies beneath the arch**

NOE physical exam:

Deep nasofrontal angle

regional edema leading to occlusion of puncta and epiphora

The medial canthi can be detached creating telecanthus

fracture of the superior half can lead to upturning of the nasal tip

The most indicative physical exam sign of nasal septum fracture when there is concern for nasal fracture:

mucosal tear is the most indicative

followed by septal deviation

followed by crepitus

Nasal bone fracture is the most common fractured bone of the face and the 3rd most common in general

Osteotomy should not be performed in acute fracture because risk of nasal collapse

Mandible fracture is associated with C-spine fracture in 5-15%

In a patient with nasal fracture, significant swelling and septal hematoma:

drain the septal hematoma first

then splint in 3 days once the swelling and edema improved

Septal fracture leads to septal hematoma which can be bilateral

If you have midface fracture with bilateral subcondylar fractures:

repair the subcondylar fractures first to establish the heigh followed by the midface fracture

6 weeks after LeFort1 with impaction and bilateral sagittal split osteotomy:

patient presents with open anterior bite

because the condyle is not properly seated within the condyle

Must release the intermaxillary fixation after osteotomy to check for the condyles to make sure they are well seated

Orbital floor fracture:

diplopia to central or primary gaze is not an indication for surgery

defect more than 2 cm of the orbital floor is an indication for surgery

Frontal sinus anterior table glue fixation with Butyl-2-cyanoacrylate:

fixation stability comparable to resorbable plates or titanium plate screw fixation

facial bone healing is not impeded: healing is believed to be augmented

In patients with ZMC fracture:

most useful is repair of lateral orbital wall #ZSsuture

During preseptal transconjunctival incision:

    the plan between the orbicularis oculi muscle and the septum is incised

capsulopalpebral fascia is incised

scar is well concealed

less likely for the eyelid to retract

Loss of pupillary light reflex: direct and consensual

injury to the parasympathetic ocular fibers that travel with oculomotor nerve and inferior oblique muscle

manipulation during reduction and also injection of epinephrine can result in this finding

Marcus-Gunn pupil:

injury to the optic nerve

loss of afferent pupillary defect

no response to direct light

but has consensual response

Loss of dilatory pupil response:

injury to ocular sympathetic nerves

Trochlear nerve:

Affects the function of superior oblique muscle

Displaced zygomatic fracture:

downward cant of the palpebral fissure

Rounding of the orbital fissure:

detachment of the lateral canthal tendon

severely comminuted fracture of the frontal process of the zygoma

Nasofrontal duct:

assess with instillation of meth blue

check in the nose

A patient who presents with periorbital ecchymosis, loss of sensation in the area of the forehead, ptosis of eyelid, right sided ophthalmoplegia, fixed and dilated pupil with intact consensual reflex:

superior orbital fissure syndrome (found between the greater and lesser wing of sphenoid):

oculomotor

trochlear

abducens

V1

Paralysis of the extraocular muscles and the levator palpebrae

V1 injury causes the anesthesia of the forehead, eyebrow and upper eyelid

Orbital apex syndrome:

same as superior orbital fissure syndrome

in addition to that: blindness due to injury of the optic nerve

Check question 119: annoying teeth age question

C-spine injury with facial fracture **10%** (that’s the answer)

Fixation material that causes the least amount of scatter on CT scan is:

Polylactic acid (lactasorb)

non-metallic

Completely resorbed in one year

In a patient who had LeFort 1 fracture followed by rigid fixation, when MMF is removed, patient was found to have posterior open bite

The next step is to remove all rigid fixation followed by disimpaction of the maxillary fracture

Orbital floor blowout fracture:

injury to the infraorbital nerve within the inferior orbital canal

numbness in V2 distribution

Ectropion after ZMC fracture repair via subciliary incision:

due to scarring and edema of the orbital septum

In a mandibular condylar fracture:

the proximal segment is medially displaced by the action of the lateral pterygoid

lateral pterygoid has two heads

the only muscle that inserts directly into the mandibular condyle

The inferior head on the anterior surface of the neck of the condyle

the superior head on the articular disk and capsule

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| **In-Service Questions Notes: Orthognathic, TMJ, Chin** |

Chin Augmentation:

porous polyethylene implants: allow for fibrous tissue to grow into the implant

this avoids the capsule formation that usually forms due to smooth surface

less likely to migrate

neither polyethylene nor silicone resorb

silicone implants: 55% of patients with bone resorption during 20-month follow up period

TM disorder:

between 20-40 years

more common in women

most consistent clinical sign: pain on palpation of the muscles of mastication

Bruxism:

masseter hypertrophy

Vertical maxillary excess: Long face syndrome

long vertical height, especially the lower third

narrow constricted alar bases

lip incompetence with excessive interlabial gap

excessive gingival and upper incisor show at rest and while smiling

May have retruded and vertically long chin and retrognathic mandible

SNA and SNB are smaller than normal

ANB angle larger than normal (> 3 degrees)

Surgical treatment: LeFort 1 with impaction

TMJ:

articular disc subluxation: increased mobility of the articular disc

result from acute trauma

chronic trauma: Bruxism

symptoms can worsen overtime and crease closed lock in where patient cannot open his mouth

Subluxation of the condylar head: restricts motion, does not produce click

Spasm of the lateral pterygoid: TMJ pain

MRI is the gold standard for evaluation of TMJ (dynamic MRI)

highest sensitivity and specificity

Blood supply to maxilla BEFORE LeFort 1: all from internal maxillary artery, which comes from external carotid artery

Descending palatine artery

infraorbital artery

posterior superior alveolar artery

LeFort 1: the descending palatine artery is at risk of injury as it runs on the posterior aspect of the maxilla

Blood supply to maxilla after LeFort 1:

ascending palatine of the facial artery after (from facial artery) from external carotid

palatine branch of the ascending pharyngeal artery, off external carotid

Face is divided into thirds:

upper third: hairline to glabella

middle third: glabella to subnasale

lower third: subnasale to menton

During genioplasty or mandibular horizontal advancement:

genioglossus is identified after down fracture and separation of mobile and non-mobile segments

genioglossus is a source of blood supply

also advanced during OSA surgery

it can contribute to posterior pull after advancement

Innervated by hypoglossal nerve

Vertical maxillary excess:

midface is protrusive

excessive eruption of the posterior dentition causes clockwise rotation of the mandible

lip incompetence

excessive gingival show

efforts to close lips: MENTALIS strain

Anterior open bite

Maxillary transverse deficiency:

in skeletally mature patient: surgically assisted rapid palatal expansion

Young patients before suture closure: orthopedic and orthodotic surgey

Centric occlusion:

maximal intercuspation

Centric relation:

condylar seating within the glenoid fossa

The above two are important for optimal occlusion after orthognatic surgery

TMJ joint is :

ginglymoarthrdial (hinge-sliding)

Split-sagittal mandibular osteotomy:

do it when SNA is normal

SNB is less: meaning mandible is retrognathic

ANB> 4 degrees confirming class II deformity

Frankfurt line:

superior edge of external auditory meatus **(porion)**

Inferior orbital meatus (orbitale)

SN: Sella to nasion

A on maxilla: anterior nasal spine

B on mandible

Pogonion: chin point

Isolated vertical maxillary hypoplasia:

leFort 1 osteotomy

Perinasal osteomy:

Lengthen the nasal framework

increase nasal length

good for short nose and nasomaxillary hypoplasia

Most common cause of TMJ ankylosis:

trauma

Patients with midface hypoplasia undergoing LeFort 3:

may have recurrence of the initial pathology due to minimal midface sagittal growth with normal mandbilar growth

Massive bleeding can occur after maxillary surgery:

greater palatine vessels

maxillary artery

pterygoid plexus

Acute anterior displacement of TMJ:

patient present that they cannot close their mouth after yawning

do closed reduction under sedation

Results from interruption of normal sequence of muscle action

The masseter and temporalis elevate the mandible before the lateral pterygoid relaxes

results in pulling ther condyle anterior to bony prominence and out of the temporal fossa

Spasm of the masseter, temporalis and pterygoid muscle keep the condyle from returning into the glenoid fossa

Symptomatic open locking of the mandible:

Treatment: reduction of the articular eminence with intracapsular disk repositioning

Rheumatoid arthritis:

TMJ affected in 33%

articular erosion

joint destruction

ankylosis

When RA develops in children or early adolescence:

juvenile idiopathic arthritis

erosion of the condyles

can lead to mandibular retrognathism and anterior open bite

Condylar hyperplasia:

painless

lead to chin point deviation

In patient with Pfeiffer syndrome with midface hypoplasia and nasopharyngeal obstruction:

LeFort 3

In patients with cleft palate repair:

the scarring and bony dissection can restrict the growth of the maxilla

must wait until skeletal maturity is achieved before performing orthognathic surgery

When skeletal maturity is complete: LeFort 1 is done

Vertical Maxillary deficiency:

inadequate incisal show

maxillary osteotomy and vertical lenghthening

Look at the values:

might need to advance maxilla

setback the mandible

then the chin which is in a good spot, will go back with mandible, hence you need to do genioplasty

Angle Class III:

SNB more obtuse

ANB: describes the relationship of mandible to maxilla and will be more acute

SNO describes the relationship of inferior orbital rim to skull base

Orthognathic surgery for OSA:

advancement of maxilla and madible

amount of advancement is 10 mm regardless of cephalometric analysis

Success rate 75-100%

Anterior subluxation of the articular disk:

clicking sensation upon opening the jaw

clicking happens when the posterior attachment of the disk become attenuated or ruptured

the disk then allows to sublux anteriorly and relocate

Conservative management: NSAID, bite block and aggressive physical therapy

The ideal amount of tooth show in repose:

2 mm of maxillary incisor

in women 4 mm is acceptable

Patient with maxillary hypoplasia: undergoes LeFort 1:

the greatest risk factor for developing VPI is: cleft lip and palate

(maxillary hypoplasia due to repair of cleft palate)

to evaluate for risk of developing VPI postop:

nasal resonance

nasal air emission

borderline VPI

combination of all of the above

In patient with class III malocclusion due to mandibular prognathism:

mandibular setback is the procedure of choice

Mandibular reconstruction with TMJ recon in pediatric patient: there will be mandibular overgrowth on the reconstructed side if:

if rib bone graft is used

cartilaginous cap is left on the rib

allows the growth of the rib as the child grows

can also result in overgrowth, asymmetry and malocclusions

During LeFort 1 for maxillary advancement: and also during plating (at risk)

Canine tooth root apex is at greatest risk of injury

length approx 30 mm

During disimpaction: if the forceps are not placed correcrtly:

central and lateral incisors are at greatest risk

Clicking of TMJ joint without deviation:

due to subluxation of articular disk

Conservative management:

splint

anti-inflammatory drugs

physical therapy

Surgery is reserved for patients who failed medical treatment

Isolated mandibular retrognathia:

normal SNA

decreased SNB

Ptosis of the lower lip after genioplasty:

due to failure of reapproximating the mentalis muscle post-op

excessive show of the lower teeth

if the depth of the labial sulcus is reduced: patient will have drooling

Overjet:

horizontal relationship

Overbite:

vertical relationship (overlap)

Open bite:

lack of vertical ovelap

Crossbite:

reverse relationship between the maxillary and mandibular teeth

Cephalogram:

S: sella, center of hypophyseal foss

N: nasion, the junction of nasal and frontal bones at the most posterior point of the curve of the nose

A: on the maxilla, innermost curvature from the maxillary anterior nasal spine to the alveolar process

B: on the mandible, innermost curvature of the chin to the alveolar process of the mandible

Pg: The most anterior chin point

When planning vertical maxillary changes:

most important thing is to look at the upper incisor show in repose

aim is 3-5 mm

males show less than females

aging: progressive decrease in upper incisor display

**Check question #40**

Marfan syndrome patient with bilateral posterior lingual crossbite:

patients with Marfan syndrome have: high arched and narrow palate

resulting in transversely constricted palate

Therefore they need LeFort 1 with palatal expansion

A patient presenting with progressive difficulty of opening her mouth for several months with popping and clicking of TMJ and pain with varying severity:

Anterior dislocation **without** reduction: maintains anterior relationship that does not allow translation to occur

Popping and clicking due to anterior relationship of the articular disk to the mandibular condyle

Reducible disk is associated with popping and clicking with normal range of motion

In a patient with a photo of vertical maxillary excess:

treatment is LeFor 1 with vertical maxillary impaction

This will result in:

cephalic rotation of the nasal tip

increased projection of the nasal tip

reduction in nasolabial angle

flattening or shortening of the upper lip

reduced exposure of vermillion

obstruction of nasal airway

increase width of alar base

The correct sequence of phases of distraction osteogenesis:

latency

the period immediately after the corticotomy and the application of distractors

1-7 days

No movement of the bones occur

then activation

the period which distraction device is turned to lengthen the gap between bones by 1 mm/day

then consolidation

twice the number of days necessary for the activation phase

The interorbital distance: the distance between anterior lacrimal crests

the shortest distance between the medial orbital walls of the orbit

This point is from Dacryon to Dacryon

Dacryon is the junction of the anterior border of the lacrimal bone with the frontal bone

Normal distance is 25 mm in women

28 mm in men

Normal incisor display:

1-4 mm

> 4: vertical maxillary excess

No show: vertical maxillary deficiency

Horizontal maxillary discrepancy:

associated with posterior crossbite

Horizontal maxillary deficiency:

most common

horizontal maxillary excess is usually due to mandibular transverse deficiency

Most TMJ issues are resolved with conservative treatment

MRI showing only mild meniscal issue

Children with cleft lip and palate:

have maxillary hypoplasia with class III malocclusion

When advancement needed is greater than 1 cm then need to do distraction osteogenesis

Frankfurt line:

Orbitale to Porion

Porion: superior aspect of the external auditory meatus

Orbitale: most inferior aspect of inferior orbital rim

Point A is the most posterior aspect of the anterior maxilla

Point B: most posterior aspect of the anterior mandible

Menton: most inferior point of the mandible

nasion: junction of frontal bone with nasal bone

Distraction osteogenesis:

Can be done using external or internal devices

External: secure with percutaneous pins

Internal: placed subperiosteally

Advantage of external devices:

three dimentional distraction

ability to mold the bony regenerate

adjust dental relationship prior to consolidation

greater length of distraction

greater ease of placement

Disadvantages of external device:

creation of more prominent facial scars

increased  from the body of the distractor to the bone

which leads to longer moment arm at the device-bone interface

increasing the possibility of pin loosening

Internal devices:

avoid significant facial scar

do not allow for alteration of the distraction

For patients with cleft lip and palate:

if they have Angle class III and negative overjet more than 1 cm

then will need LeFort 1 with distraction osteogenesis

In a patient with retrognathia and moderate vertical maxillary excess and class 1 occlusion:

best genioplasty is:

advancement with inferiorly angled osteotomy

this will cause reduction in chin height by 2-4 mm

if more than 5 mm needed then must remove a wafer of bone

Profuse bleeding during LeFort 1:

injury to descending palatine artery

descends within the perpendicular portion of the palatine bone

injury is common during LeFort 1

branch of the internal maxillary artery

The incidence of paraesthesia of the lower lip immediately after bilateral SSO:

90%

due to neuropraxia

stretch and compression of the inferior alveolar nerve

reduced to 12.5% after one year

Patients with vertical maxillary excess:

they have narrow alar base

so when you perform LeFort 1 with impaction

these patients will have widened alar base

Vertical maxillary excess: Long face syndrome:

narrow alar base

obtuse nasolabial angle

anterior open bite

mentalis strain

labial incompetence

excess gingival show

exposure of upper incisors

For palatal expansion LeFort 1:

need osteotomy of the following:

anterior antral walls

lateral antral walls

pterygoid plates

midpalatal suture

nasal septum

No need for lateral nasal walls

Myofascial pain dysfunction:

No anatomical abnormalities in TMJ

patients present with myofascial pain with preauricular pain

joint clicking

restricted jaw opening

tenderness of masticatory muscles

Causes included:

bruxism

anxiety

occlusal abnormalities

In patient with vertical maxillary excess who underwent LeFort 1 for repair:

tooth-lip relationship is the most accurate determinan for the final position

perform soft tissue and skeletal analysis and prediction tracing

normal is 2-3 mm

In a patient with exposed oral plates few weeks after surgery:

just maintain good oral hygiene and observe as mucosa will granulate over the plate

Bilateral lower lip numbness one year after bilateral SSO:

10%

Check question number 77:

most patients with madibular prognathism will require BSSO for mandibular setback and Maxillary advancement

Patient with progressive Juvenile RA:

can have progressive condylar resorption

which will cause open bite

associated with condylar shortening

decrease in posterior facial height

clockwise rotation of the mandible

Angle Class II malocclusion

Slow progressive movement of point B

After performing osteotomies, must take patient out of MMF to ensure the condyle is sitting in the glenoid

Widening of the alar base of the nose after LeFort 1 procedure: occurs after the exposure of anterior maxilla

can be minimized using alar cinch suture

placed at the base of the ala and tightening as needed

Modified Weir excision:

treat nasal flare

V-Y advancement during oral mucosal repair after LeFort 1: (usually flattens the upper lip)

advances tissue anteriorly and add fullness to the upper lip

The most unstable and prone to prolapse orthognathic movement:

**transverse maxillary widening**

patient lose 50% after the first year

(also maxillary downgrafts and mandibualr setback are relatively unstable)

Patients with vertical maxillary excess: Long face syndrome:

narrowed alar base

obtuse nasolabial angle

anterior open bite

mentalis strain increased

labial incompetence increased

excess gingival show and incisors exposure

Retrogenia

Increase length of the lower third of the face

lip-to-tooth relationship > 3mm

Chin is retruded and vertically long

Class II malocclusion

mandible retrognathic or due to mandibular autorotation

SNB is normal?

LeFort 1 with maxillary impaction: Patient will be left with widened alar base

will rotate the mandible forward and upward: resolving retrogenia

on lateral cephalogram: forward autorotation of the mandible with counterclockwise rotation

Treacher-Collins:

malar hypoplasia with clefting through the zygomatic arch

patient have hypoplasia of the mandible and maxilla with antigonial notching of the angle of the mandible

Angle class II malocclusion

Anterior open bite with clockwise rotation of the mandible

Also affects TMJ

Mandibular deficiency:

true retrognathia

Class II malocclusion and lip incompetence

Decreased SNB

Mandibular excess:

class III malocclusion

prominent lower lip below the vermillion border

excessive closure of the jaw will decrease the vertical height

Cephalometric show increase SNB

Vertical maxillary deficieny or short-face syndrome:

decreased facial height vertically

absence of maxillary incisor show with edentulous look

upper lip that appears flat and short

wide alar base

SNB normal or larger than normal

Angle class III

In patients younger than 2 years of age: with tongue-based airway obstruction

the above statement is the most common indication for distraction osteogenesis

this will pull the base of the tongue

If kids younger than 2 yrs of age with any form of mandibular hypoplasia but do not have tongue-based airway obstruction: it is contraindicated to perform distraction osteogenesis of the mandible

Advancing the mandible for tracheomalacia or laryngomalacia will not relieve airway obstruction

For patients with hemifacial microsomia:

distraction osteogenesis is performed after one year of age

Locked jaw after yawning:

occurs when the condyle slips into a position anterior to the articular eminence and cannot return to normal position

Reduce jaw in ED under sedation

if failed: then in OR with giving succinylcholine

If problem persists: get MRI to plan osseous reduction of the articular eminence

by reducing the slope the eminence, the condyle can reduce back into the fossa

In a patient with juvenile RA:

maxillary impaction: this will allow closure of the open bite caused by RA without creating condylar load

this will result in mandibular autorotation and increase SNB

then any sagittal deficiency can be corrected with advancement genioplasty

LeFort 1 midface advancement:

above the apices of the teeth

includes the maxillary alveolus, pterygoid and vault of teeth

the osteotomy extends through the base of the maxillary sinus and the floor of piriform aperature

LeFort 2:

above the level of apices of the teeth then extends through the pterygoid plates

portion of the medial orbital wall, orbital floor,  nasofrontal junction

LeFort 3:

through zygomaticofrontal suture, to nasofrontal suture passing through orbital floor

the entire midface is detached from the base of the skull

The most common complication of BSSO:

loss of lower lip sensibility

Side notes: roots of mandibular molars are closer to lingual cortex than buccal cortex

(less likely to be injured)

Bone defect for any craniofacial skeleton more than 5 mm needs bone grafting

any movement of LeFort 1 in excess of 5 mm without bone grafting will result in relapse

In patients who have undergone LeFort 1 maxillary advancement: soft tissue changes:

Increased nasolabial angle

widened alar base:

alar cinche stitch can be used

upper lip is shortened:

can be minimized by performing V-Y advancement during closure

incisal show is decreased

Alloplastic chin augmentation: ideal for

used for symmetric chin

normal facial height

shallow labiomental fold

minimal sagittal deficiency

Optimal amount of incisor show:

2-3 mm of the upper central incisor to be showed

Only 1-2 mm during full smile

Patients with vertical maxillary deficiency have NO incisor show at rest: prematurely aged appearance

Vertical maxillary excess: gymmy smile

Patient with edentulous appearance/ premature aged appearance

LeFort 1 with inferior repositioning

upper lips appear short and flat

bite is deep

chin protrudes excessively

wide alar base

Mandible plane angle is acute

The optimal way for bone formation during distraction osteogenesis

use low-speed corticotomy that divides only the bone cortex

More than 5 mm distraction will result in medullary bone disruption and impairement of the central callus: resulting in fibrous union

In another question:

the use of external devices: less number of operative procedures as they can be removed in the office

(question asking about LeFort III distractors placement)

there is no difference in operative morbidity

risk of relapse

degree of advancement

rates of distraction

The most appropriate step when considering chin augmentation:

must evaluate for dental occlusion

Jumping genioplasty is done when:

patient has narrow chin (horizontal/sagittal deficiency)

and vertical excess

Interpositional genioplasty:

done when there is vertical deficiency

Reduction genioplasty:

when there is vertical

In a patient requiring LeFort 1 for maxillary hypoplasia:

patient is at greatest risk of developing VPI if they have midface hypoplasia secondary to repaired cleft palate

The optimal latency period for mandibular distraction is about 1 week

In a patient with temporal headache with sensation of sand in the jaw, history of facial trauma

exam showing reciprocal clicking and transient locking jaw during opening and closing of the jaw

MRI showing anterior malposition of the meniscus and posteriorsuperior displacement of the condyle:

**the cause is internal derangement of TMJ**

**abnormal relationship between the articular disk and the mandibular condyle**

The most common etiology of ankylosis of TMJ:

On cephalogram:

Sella-nasion plan: used as the cranial base plane

The difference between LeFort III and Monobloc:

monobloc: nasofrontal and frontozygomatic sutures are not osteotomized

Advantage: simultaneous correction of supraorbital and midface deformities

Disadvantage: right rate of infection and CSF leak

Landes angle:

formed by frankfort horizontal line and the nasion to point A  (N-A) plane

can sometimes be used instead of SNA angle

In patient with maxillary hypoplasia and mandibular prognathism

LeFort 1 and sagittal split osteotomy

The most appropriate study for evaluation of click of jaw:

MRI

LeFort 1:

should be above the level of canine/cuspid root

which is about 27 mm

Frankfurt line:

Gonion-orbitale

In a patient who had genioplasty and presents with increased lower incisal show:

inadequate repair of mentalis muscle

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| **In-Service Questions Notes: Head and Neck Anatomy** |

Mucocele:

cyst caused by minor salivary gland mucous seepage

lower lip is the most common but can happen anywhere in the oral cavity

away from midline of the lower lip

minority resolve on their own

need excisional biopsy

Keloid:

recur after resection

extends beyond the borders of the incision

do not regress over the years

Keloid contains MORE type 1 than type 3 of collagen (similar to skin)

impacted by cell-signaling between keratinocytes and fibroblasts

thick, randomly oriented collagen fibrils

pruritic

takes longer to recur

Hypertrophic scar:

Less likely to recur

contained within the boundaries of the lesion

pruritic

recur earlier in the postoperative phase if they recur

MORE type 3 than type 1 collagen

pro-fibrotic collagen cross-linking

requires abundance of myofibroblast expressing smooth muscle actin

parallel collagen fibrils and bundles

First branchial arch:

mandible

tragus

anterior helix

First Branchial cleft:

external auditory canal

Second branchial arch:

remained of helix

antihelix

antitragus

crura

Second branchial cleft:

obliterated

but may give rise to second branchial cleft cyst

First branchial arch: trigeminal

Second branchial arch: facial

third branchial arch: glossopharyngeal

Fourth:                     superior laryngeal

Sixth:                         Recurrent laryngeal

All pharyngeal muscles are supplied by:

vagus nerve

except stylopharyngeus: glossopharyngeal IX

Thyroglossal duct cyst:

midline

can move with swallowing if closer to the base of tongue

remnant of the descent of thyroid gland

extend from foramen cecum to thyroid gland

Ultrasound

also need to do radioisotope study to make sure it is not ectopic thyroid tissue

Sistrunk procedure:

removal of the mass

tract

1 cm section of the hyoid bone

First branchial cleft cyst:

external auditory canal

Second, third and fourth:

sinus of His: which will become involuted

First branchial cleft cyst:

type one:

near external auditory canal

inferior and posterior to tragus

can involve the parotid gland

type two:

angle of mandible

may involve the submandibular gland

Second branchial cleft:

along the anterior border of the upper third of SCM

Mental nerve:

under the second premolar or first molar

First branchial arch:

muscles of mastication

tensor tympani

tensor veli palatini

myelohyoid

All innervated by trigeminal nerve

Second branchial arch:

gives rise to muscles of the facial expression

posterior belly of digastric

stapedius

facial nerve

Third pharyngeal arch:

glossopharyngeal nerve

stylopharyngeus muscle

Fourth phayngeal arch:

cricothyroid

all intrinsic muscles of the soft palate except tensor veli palatini

superior laryngeal nerve

Sixth pharyngeal nerve:

recurrent laryngeal nerve

instrinsic muscles of the larynx except

cricothyroid

Fifth:

does not give rise to anything

Hyperdontia:

most frequently in the maxilla 90%

happens during the initiation phase or proliferation

more in males, 2:1

more with permanent teeth rather than primary

(hypodontia with ectodermal dysplasia)

Superior thyroid artery:

external carotid artery

Daily saliva production:

500- 2000 ML

majority from submandibular gland: 60%

Parotid 20%

Sublingual and minor glands: 10%

Maxillary canine:

the last permanent teeth to erupt

third molars after

Maxillary first molar:

the first to errupt

Surgery for OSA:

Uvulopalatopharyngoplasty

removal of uvula and the oropharyngeal tissue

Most common site of obstruction:

retropalatal area

lateral pharyngeal wall

Other surgeries:

septoplasty

geniohyoid advancement

Frey syndrome:

Gustatory sweating

injury to the auriculotemporal parasympathetic nerve fibers

aberrant regeneration

the postganglionic parasympathetic innervation to sympathetic fibers to sweat glands

Neck:

Anterior triangle:

anterior to SCM

to midline

superiorly: lower border of the mandible

Posterior triangle:

SCM

clavicle

anterior border of trapezius

Neck Zones:

Zone 1: sternal notch to cricoid

Zone 2: cricoid to angle of mandible

Zone 3: angle of mandible to base of skull

Facial artery:

starts as part of facial-lingual trunkl

travels under the hypoglossal nerve

before it enters the submandibular gland

transection can cause dysarthria

tongue will deviate towards the damaged side

Vocal cord paralysis:

injury to vagus nerve: common carotid dissection

injury to recurrent laryngeal nerve: superior laryngeal artery dissection

Shoulder drop:

Accessory nerve

related to occipital artery

Tongue numbness:

lingual nerve

laryngeal artery

submandibular duct

Myxoma:

slow-growing benign tumor

in infants:

most common mandible and maxilla

presentation: painless, progressive facial swelling

should be surgically removed with clear margins

otherwise continued growth

not always well circumscribed

Unrepaired parotid duct injury:

the primary complication is formation of sialocele (pseudocapsule)

then followed by salivary fistua

wound infection is uncommon

Some modalities of treatment include:

anti-sialogogue

radiation therapy (although in other questions it is not really good)

parasympathetic denervation (tympanic denervation)

cauterization of the fistulous tract

reconstruction of the duct

superficial or total parotidectomy

Dermoid cyst of the lateral brow:

firm

well-circumscribed mass

slow growing

has the potential for infection or continued growth

Midline masses: increase the risk of intracranial extension and need MRI

Abnormal redness and perspiration after trauma: Frey syndrome

Seen after parotidectomy

Also encountered after mandibular condylar fracture

Due to damage to parasympathetic auriculotemporal nerve fibers

with subsequent aberrant regeneration and innervation of sympathetic fibers to sweat glands

Choanal  atresia:

presentation: newborn with cyanosis that improves with crying

can be unilateral or bilateral anatomic abnormality of posterior nasal passages and choanae

nasal airway obstruction can also be apparent when the baby is breastfeeding

On physical exam: no fogging of the mirror when held under his nares

inability to pass tube from nose to nasopharynx

CT scan are obtained routinely

narrowing of the posterior nasal airway

medial displacement of the lateral nasal wall and pterygoid plates  and enlargement of posterior vomer

Can occur isolated or with CHARGE syndrome

When you have a patient who presents with parotid gland infection:

acute suppurative sialadenitis

begin with aggressive medical therapy

fluid, electrolytes, antibiotic, sialogogue such as lemon drops, warm soaks and massage to promote secretion and drainage

Occipital artery arises from the external carotid artery

When the neck **external carotid vessels are sacrificed**, transverse cervical artery can be used. It comes off the thyrocervical trunk from the subclavian artery

**Parotid gland innervation:**

comes from parasympathetic fibers of the glossopharyngeal nerve (IX)

also taste comes from the posterior third of the tonue

**Submandibular and subligual gland:**

parasympathetic fibers via Chorda tympani

**Vestibucocochlear nerve:**

sound and equilibrium

Auricular branch of the vagus nerve (CN X)

external accoustic meatus

can stimulate coughing Arnold reflex

**The first branchial arch: Mandibular arch: Trigeminal nerve (and all its branches)**

Muscles of mastication (medial and lateral pterygoid, masseter and temporalis)

Myelohyoid

anterior digastric

tensor tympani

tensor veli palatini

Cartilaginous bar:

premaxilla

maxilla

zygomatic bone

part of the temporal bone

incus

malleus

anterior malleolar ligament

sphenomandibular ligament

internal acoustic meatus

adenoids

maxillary and external carotid arteries

**The second branchial arch: Hyoid arch: 95% of all branchial arch anomalies**

Facial nerve

muscles of facial expression

buccinator

stapedius

stylohyoid

posterior digastric

auricular and platysma muscles

Reichert’s cartilage:

stapes

styloid process

stylohyoid ligament

hyoid bone (lesser cornu and upper party of the body)

palatine tonsils and cervical sinus

stapedial and hyoid arteries

**The third branchial cleft anomalies are rare**

Glossopharyngeal nerve motor innervation to only the stylopharyngeus

hyoid (greater cornu and lower part of the body)

The pharyngeal pouch and groove give rise to the inferior parathyroid, thymus and cervical sinus

internal and common carotid arteries

**The fourth branchial arch:**

vagus nerve (superior and inferior laryngeal)

cricothyroid and all intrinsic muscles of the soft palate: including levator veli palatini

thyroid and epiglottic cartilage)

superoor parathyroid and thyroid parafollicular cells

subclavian artery and aortic arch

**The sixth branchial arch:**

vagus nerve (recurrent laryngeal nerve)

all intrinsic muscles of the larynx except cricothyroid

thyroarytenoid (make the mass of the vocal cords)

cricoid

arytenoid

corniculate

cuneiforms cartilages

Right and left pulmonary artery

ductus arteriosus

Sphenopalatine nerve:

arises from the incisive foramen

innervates the anterior hard palate

Superior dental plexus:

anterior superior alveolar nerve

middle superior alveolar nerve

posterior superior alveolar nerve

Anterior superior alveolar nerve:

arises from the maxillary branch of the trigeminal nerve

sensation to the anterior maxillay teeth

Lesser palatine nerve:

descends through the greater palatine foramen

provides sensation to the soft palate and the uvula

Thyroid gland:

originates from foramen cecum

Foramen cecum originates from between first and second branchial pouch

it represents the opening of the thyroglossa duct into the tongue

Ectopic thyroid gland can be found anywhere along the track of descent

most commonly at the base of the tongue

just posterior to foramen cecum

Thyroglossal duct cyst:

found at the level or below the hyoid bone

can be present anywhere from base of the tongue to thyroid cartilage

Ossification of the cartilages from the second and third pharyngeal arches gives rise to the hyoid bone

**The periodontal ligament**

 is responsible to keeping the tooth anchored

**Enamel:**

The outer protective layer of the tooth

**Depressor septi nasi muscles:**

located on either side of the septum

originate from medial crura footplate

insert into the incisive fossa of the maxilla or in some fibers of orbicularis muscle

**Nasalis muscle:**

compress the cartilaginous part of the nose

depress the ala towards the septum

**Procereus:**

depresses the medial angle of the eyebrow

creates horizontal rhytid over the bridge of the nose

**Zygomaticus major:**

draws the angle of the mouth superiorly and posteriorly

**During mixed dentition:**

the **first** tooth to erupt:

first mandibular molar

**Order of eruption in the maxilla:**

first molar

central incisor

lateral incisor

first premolar

second premolar

canine

second molar

third molar

**In the mandible, the order of eruption:**

first molar

central incisor

lateral incisor

canine

first premolar

second premolar

The buccal and zygomatic branches of the facial nerve:

closely related to the parotid duct

Parotid duct is superficial to the masseter muscle

Mucous draining skin sinus on the lower third of the neck:

overlying the anterior border of the SCM

puckering of the sinus with swallowing

communication with the tonisllar fossa

pharyngeal fistula

found to be superficial to the stylopharyngeus muscle

Second pharyngeal cleft and pouch anomalies:

cyst are three times more common than fistula

fistula is present at birth

the external opening of the fistula is found along the anterior border of SCM

between the hyoid bone superiorly

suprasternal notch inferiorly

Fistula has a muscular coat

continues with platysma superiorly

palatopharyngeus inferiorly

if the muscle coat is developed then swallowing will cause puckering

the fistula courses deep to the second pharyngeal arch and superficial to third pharyngeal arch

deep to stylohyoid and posterior belly of digastric muscle

superficial to internal carotid and stylopharyngeal muscle

Bening masseteric hypertrophy:

if unilateral can show some degree of hypertrophy of the masseter and temporalis on that side

medical management with anxiolytic, antiepileptic and botox

surgical: partial resection of the masseter muscle and contouring of the angle for aesthetic purposes

Condylar hyperplasia:

overgrowth of the mandibular condyle

unilateral overgrowth of the face

deviation of the midpoint of the mandible towards the unaffected side

class III on the affected side

open crossbite on contralateral side

condylar resection is the main stay

Condylar dislocation:

condylar reduction with muscle relaxants

may need eminence surgery

unilaterally occurs in patients with hypermobile or stretched TMJ or in patients with dystonia (hyperfunctioning lateral pterygoid)

During the microvascular decompression of trigeminal neuralgia:

the auriculotemporal nerve can be injured

For external ear innervation:

the great auricular nerve: innervates the first branchial arch components of the ear

the auriculotemporal nerve innervates the components of the second branchial arch

Auriculotemporal nerve block:

blocks helix and tragus

anterior and superior to tragus

Great auricular and lesser occipital:

injecting in the posterior sulcus of the ear

To restore sensation to a flap used for tongue reconstruction:

nerve coaptation to the lingual nerve stump

The supraorbital nerve:

sensation to the frontoparietal scalp at the level of forehead

also supplies the paramedian forehead skin

The supratrochlear nerve:

through the medial corrugator supercilii

Patient who had septorhinoplasty and cannot taste after surgery:

olfactory dysfunction from nasal surgery

80% of flavor comes from olfactory input

experienced in about 7-9%

Facial nerve:

stylomastoid foramen

Jugular foramen:

CN 9,10,11

Lingual thyroid:

present as a mass at the posterior aspect of the tongue

Congenital subglottic stenosis:

respiratory distress caused by subglottic airway narrowing

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| **In-Service Questions Notes: Breast Augmentation and Mastopexy:** |

Most likely cause of capsular contracture:

subclinical infection with biofilm formation has a clear correlation with a higher degree of capsular contracture

Textured implant have decreased risk of capsular contracture

submuscular placement less capsular contracture

Large areola:

require vertical limbs to diverge widely

this will create lower pole deformities: flattening or boxiness

The position of the nipple-areola at Pitanguy’s point:

transposition of the inframammary fold onto the breast

Double Capsule:

when the surface of the textured implant breaks

the implant itself becomes surrounded by a capsule in addition to the normal capsule that forms

this results in late seroma

noted more with anatomical textured implants

Late seroma causes:

trauma

infection

inflammation

malignancy

Late Seroma workup:

first: get US

aspirate fluid

Send for CD30 T-cell surface protein flow cytometry, ALK negative

send for cytology

bacteriology

More cohesive implants: improves rippling

rippling happens more with saline implants

BIA-ALCL:

Textured implants

DOES NOT CORRELATE WITH:

highly cohesive

pocket

saline implants

1:1000 to 1:30,000

Treatment: complete removal of the lymphoma, capsulectomy and removal of implant

more advanced disease: chemotherapy, radiotherapy and/or lymph node dissection

4.6% contralateral breast lymphoma

NCCN : recommend consideration of contralateral removal of the implant

more indolent and more favorable than systemic lymphoma

Amastia:

breast and nipple are absent

Anterior thoracic hypoplasia:

unilateral sunken anterior chest wall

hypoplasia of the breast

superiorly placed nipple-areola complex

normal pectoralis muscle

normal sternal position

Poland syndrome:

abnormal pectoralis major muscle

Pectus deformities:

deformities of the sternum and its costal attachements

Seat belt syndrome:

cleft on the implant

need MRI to assess integrity

intracapsular seroma can form

Mastopexy:

periareolar mastopexy is for very minimal degree of mammary ptosis

when used on moderate to severe ptosis:

flattening of the central breast mound

widening of the areolar diameter: areolar spreading is the most common

hypertrophy of the circumareolar surgical scar

recurrent ptosis or bottoming out

Baker classification of capsular contracture:

Grade I: breast soft and normal in size and shape

Grade II: little firm but appear normal

Grade III: firm and appear abnormal

Grade IV: firm, abnormal and painful

Decreased Baker III and IV capsular contracture:

augmentation through inframammary fold

subpectoral pocket placement

Textured implants

Increased capsular contracture:

periareolar/axillary incision

subglandular placement of smooth implants

MRI is the most sensitive and specific method for detection of silent rupture

linguini or teardrop sign

Galactorrhea after breast implant placement:

more in parous women

factors that stimulate suckling or change in the innervation of the chest wall and nipple-areola complex

due to increase tissue pressure and interruption of the intercostal nerves

No relationship to incision placement site

No relationship to device between device positioning: subpec, subgland or dual plane

No relationship with type of implant

Postpartum Involutional changes:

breasts appear deflate due to loss of volume and stretched skin

due to decreased number and area of differentiated lobules that were enlarged and specialized in milk production

This lobular area is then replaced with stromal matrix and eventually fat

Montelukast:

leukotriene antagonist and can inhibit the inflammatory cascade

more useful for patients with capsular contracture less than grade III

Snoopy nose deformity/Waterfall breast deformity:

when the breast hanging off the implant

not a pocket expansion

The implant stayed in its native position but the breast tissue is hanging off as it becomes ptotic with time and gravity

Corrected with mastopexy

Symptomatic galactocele:

benign breast cyst containing milk

lactation or OCP

oral bromocriptine: dopamine receptor agonist

Mastopexy/Augmentation:

One stage: harder to predict the overall aesthetic result

higher complication and revision rates

longer operative time

need for implants increases the operative cost

Advantage: increase upper pole fullness which cannot be achieved with mastopexy alone

Addressing two opposing forces: volume and ptosis

Higher rate for revision surgery

Regnault Breast Ptosis:

Grade I (mild): Nipple at the level of inframammary fold or 1 cm below IMF. Can be treated with crescent mastopexy when elevation not more than 1-2 cm

Grade II(moderate): Nipple btw the level of inframammary fold and the lowest contour of the breast. NAC is 1-3 cm below IMF

Grade III(severe): Nipple at the lowest contour of the breast

Pseudoptosis: NAC above the level of IMF

Superior nipple malposition:

resect the lower pole

nipple should be designed lower than it is on the marking during wise pattern markings

MRI:

Linguine sign means intracapsular rupture

The affected breast will not be significantly different

You do not see increased rippling with intracapsular rupture

Tuberous breast deformity:

92% of cases are single stage

96% implant placement with circumareolar mastopexy combined with inframammary crease adjustment and radial scoring of the parenchyma

No data showing superiority of total vs partial capsulectomy or capsulotomy vs capsulectomy

Nipple and areola sensation:

lateral branch of the 4th intercostal nerve

Breast ptosis:

Combination of:

atrophy of breast tissue

loss of elasticity of skin envelope

attenuation of Cooper’s ligament

Form-stable silicone implants are shaped and textured

decreased incidence of folding and rippling

Higher incidence of malposition

higher rate of seroma due to textured surface

Increasing cross-linking:

improves stability

hence shape of the implant is maintained despite external forces

increasing cohesiveness leads to increase gel fracture and delamination of the implant

Absence of nipple: Athelia

Absence of breast tissue: amazia

Absence of breast and nipple: amastia

 Poland syndrome:

absence of breast tissue

abscence of pectoralis major muscle and rib cage

High-riding nipple is the most difficult and challenging problem:

can consider:

direct reposition of the nipple-areola complex

expansion of skin between the nipple and the clavicle

repositioning of the breast parenchyma and inframammary crease

Breast:

modified sweat glands

Ingrowth of the ectoderm that form breast lactiferous ducts and alveoli

Tuberous breast:

deficiency of breast parenchyma

high IMF

Herniation of breast tissue through the areola

deficiency of inferior pole

Surgical goals of tuberous breast:

symmetry

volume

lowering the IMF

Reduction of herniation

correction of ptosis

double bubble happens when IMF is not sufficiently obliterated

Parenchyma scoring: release any consitricting band and release lower pole

Subglandular placement decreases the double bubble vs subpectoral

Breast augmentation:

most common complication is lifetime need for reoperation

Tuberous breast with bad implant:

double bubble

the IMF is at the superior transverse line

the inferior transverse line at the lower limit of the implant

Mondor disease:

benign

self-limiting

superficial thrombophelebitis of the inframammary veins

painful tender cord

superficial veins of thoracoepigastric

management is warm compresses and anti-inflammatory

Papilloma without atypia:

still remove it

11% can have DCIS

especially if it is > 1 cm and peripherally located

PIP implant:

high risk of implant rupture after 5 years

no increased of cytotoxicity or breast cancer

Implant monitoring:

3 years post-op get MRI

then every 2 yrs

After fat grafting to the breast:

fat necrosis can range from lipid cyst to microcalcifications or speculated masses

The most frequent finding after fat grafting breast augmentation:

bilateral scattered microcalcification

radiolucent oil cysts with or without microcalcifications

Microcalcification after fat grafting appear as late finding

Benign process microcalcification:

round

spherical

diffuse

punctuate

Malignant process microcalcification:

branching

speculated

clustered

Tuberous breast:

high IMF crease

herniation of breast parenchyma from nipple-areola complex

Tight IMF crease that needs to be opened up: if not opened up and released then patient will have double bubble

Overtime the lower pole will expand and the double bubble will improve with time

Superior pedicle:

blood supply from the IMA

Second interspace

1-2 cm below the skin

medial to breast meridian

Inferior pedicle:

branches from IMA

Fourth intercostal space

Also some intercostals from the inframammary fold

Medial pedicle:

IMA

third superficial branch

Lateral pedicle:

superficial branch from lateral thoracic

Augmentation/Mastopexy:

higher rate of revision compared to augmentation only

Also increasing grade of ptosis: increases the rate of reoperation

Late seroma:

textured implants

Capsule line the pocket

Another capsule lining the implant'

Double capsule: can happen in subglandular and subpectoral

Rubin et. al study:

they found the patients that had breast reduction are more likely to have masses and scarring that require biopsy vs. patient in breast augmentation and fat transfer

no difference in terms of calcifications

Silicone breast implants:

radiopaque

can obscure breast tissue (small amount)

Women who develop breast cancer are not diagnosed at more advanced stage and do not have worse prognosis

less likely to have superior pole rippling

Nipple-areola complex:

medial innervation of the nipple-areola complex comes from the anterior cutaneous branch of the third and fourth intercostal nerves

-There is no causative association between silicone breast implants and breast cancer

-The most important factor of determining the largest size of breast implant is:

the size of breast base width

Mycobacterium fortuitum:

treatment is 6 months of cipro/bactrim

clarithromycin and doxycycline can be used as well

atypical, non-tuberculous

most common non-TB soft tissue infection organism

Course is indolent and manifest over several weeks to months post-op

Swelling, erythema and clear drainage: purulent is possible

Fever may be absent

request acid fast bacilli and myobacterial cultures

replace prosthesis is possible in 6 months

Breast cancer screening after augmentation mammoplasty:

mammography with Eklund view

The breast implant is pushed against chest wall and breast tissue is pulled forward in front of the implant

It is better to obtain diagnostic mammography instead of screening mammo

After vertical mastopexy:

nipple to inframammary fold distance is most likely to increase with time

that leads to pseudoptosis or bottoming out

If prosthesis is used: then distance of suprasternal notch to nipple will increase

Saline and silicone implants rupture at similar rates:

saline is more easily detectable

saline prosthesis are firmer

For silicone ruptue: subtle loss of upper pole fullness or increased softness

Breast shape following breast augmentation undergo dynamic change:

the upper pole skin and the pectoralis major are stretched due to implant

the skin of the lower pole will also stretch to allow migration of the implant inferiorly

circumferential breast band application can help with this and prevents the implants to sit high on the chest

Zafirlukast:

leukotriene-antagonist

used for asthma

potential life threatening liver complications and neuropsychiatric events

Widening of the areola after mastopexy is due to failure of purse-string suture

FDA recommend gel implants for age 22 and above and for a question where they ask about the age, if it is less than

Lateral pectoral:

innervates pectoralis major

Long thoracic:

serratus anterior

Thoracodorsal n.:

LD

Supraclavicular n.:

skin of the upper breast

Rippling:

seen more in textured silicone vs. smooth silicone

highest in saline filled implants

the question stem might try to confuse you with capsular contracture: do not choose this answer

Rippling is minimized with subpectoral implant placement

Breast appearance after massive weight loss:

grade III ptosis

flatness of the upper pole

medialization of NAC

lateralization of the breast mound

extension to the lateral axillary fat roll

IMF is in lower position

More asymmetrical volume loss

skin laxity is apparent and the skin excess is significant

Transaxillary augmentation mammoplasty:

avoid dissection in the axillary fat pad in order to preserve sensation to the medial arm

intercostobrachial and MABC course superficial to the axillary fat pad, posterior to the lateral border of the pectoralis major

not affected by the location of prosthesis placement whether in the subglandular or subpectoral plane

Axillary breast tissue:

0.4-6%

maybe asymptomatic

can cause pain

restriction of arm movement or cosmetic problems

MRI has been used to identify axillary breast tissue

Synmastia:

unrelated to the type of implant being used

can be related to multiple procedures

lage prosthesis with large base diameter

pre-existing chest wall deformity

subpectoral positioning of the implant

To minimize gel diffusion in third-generation silicone prosthesis:

internal barrier coating

produced in 1986

Increasing the cross-linking of the silicone elastomer:

increases the strength and thickness of the wall of prosthesis

Breast infection after augmentation:

severe cicatricial contracture of the lower pole

operate after six months once inflammation resolved and scar is mature

requires submammary flap:

medial or lateral base

blood supply medially from perforators of internal mammary or superior epigastric

or laterally from intercostals

Breast innervation:

the anterior cutaneous branch of the 2-6th intercostal nerves provide medial innervation

anterior rami of lateral cutaneous branches of the third through six intercostal nerves provide lateral innervation

Polymastic breast/ Polymastia:

Ectopic: outside the milk line

scalp

ear

back

shoulder

epigastrium

posterior or dorsal thigh

Accessory: along milk line

90% in chest region

axilla, groin, vulva and medial thigh maybe affected as well

In secondary mastopexy after breast augmentation:

blood supply to NAC relies on medial, superior superomedial and superolateral pedicle

Least blood supply comes from inferior pedicle

Tuberous breast correction:

periareolar mastopexy with augmentation

allows for radial scoring and expansion of the IMF and areolar reduction

Subglandular breast implant placement:

when pinch test in the upper pole is less than 2 cm, there is increased chance of rippling and wrinkling

Inverted T-mastopexy:

widening the angle of divergence to compensate for wide areola increases the risk of lower pole deformity leading to flattening or boxiness of the lower pole

The position of NAC is set at Pitanguy point

Double capsule:

it forms when the surface of textured implant breaks off the breast parenchyma and creates a space that gets filled with blood or serous fluid.

it can happen due to trauma or daily living

For patients who need breast and want to have implant removed for capsular contracture: offer autologous reconstruction

Patients seeking reoperation for larger implants should be notified of the following side effects:

Thinning of tissue

stretching of tissue

shrinkage of breast tissue: the bigger the implant the more the shrinkage

palpable edge of implant/shell

visibile implant edges

visibile rippling

possible sensory loss

lactation is not impaired especially in subpectoral plane

Capsular contracture rate:

5-7% at one year

18% at 3 years

Implantation with prosthesis:

enhances size and contour

increases upper pole fullness

For saline implants:

if they are filled below the recommended level, this will result in rupture due to flaw-fold

Breast augmentation with silicone implants:

rupture rate at 10 years is 25%

Triple antibiotic irrigation of the pocket should include:

ancef

gentamicin

bacitracin

Transaxillary breast augmentation:

difficulty visualizing the breast pocket

blind blunt dissection: leading to malposition of the implant

the endoscopic transaxillary approach: allows direct visualization and dissection of the origin of pectoralis major muscle and allowing to lower the inframammary folds

To preserve sensation to NAC during breast augmentation:

blunt dissection lateral to the lateral border of the pectoralis major

The 4th and 5th anterolateral intercostal nerves

pierces fascia lateral to the lateral border of pectoralis major through the interdigitation of serratus anterior

Periareolar incision does not interrupt the sensory supply to nipple

Silicone granuloma:

common response of the tissue to foreign body such as silicone

not that common but can happen

The degree of preoperative ptosis is the most important determinant if the patient will need breast contouring following implant removal.

The size of implant has not been shown to affect the amount of breast tissue visualized during mammography

Need Eklund view

However 5% may not be visualized of breast parenchyma

The position of the implant and the degree of capsular contracture has been shown to affect the mammography

Poland syndrome:

absence of sternal head of pectoralis major muscle: must have finding

most patients can have absence of breast, partial absence of pectoralis major muscle or serratus muscle

brachysyndactyly is the hand finding ipsilaterally

Hematoma after breast augmentation can be seen as far as 14 days after surgery

Anterior and lateral cutaneous branches of the 3-5th intercostal nerves supply NAC: the **lateral** cutaneous branch is the most cutaneous branching pattern of the 4th intercostal nerve

Fibrinogen:

surface bound

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| **In-Service Questions Notes: Cosmetic Rhinoplasty** |

Inverted V-deformity:

Is the visibility of the caudal edge of nasal bones caused by collapse of the upper lateral cartilage

Dorsal hump reduction: destroys the support caused by the connection between the nasal bones and the upper lateral cartilage

the upper lateral cartilage will splay, distort and collapse posteriorly: narrowing the internal nasal valve

results in airway obstruction and distortion of aesthetic dorsal lines

Upper lateral cartilage spanning sutures are used to re-establish the connection between the medial edge of the upper lateral cartilages and septum

caused by the excessive removal of the transverse portion of upper lateral cartilage during dorsal septal reduction

collapse of the nasal sidewalls with retraction of the upper lateral cartilage and exposure of the shape of the nasal bones in the keystone area

spreader graft can fix this

Depressor septi nasi: causes smiling deformity

Paired muscle

from upper lip

inserts in the base of the nose on both septum and alae

puling the tip of the nose when in animation

decreasing the nasolabial angle

shortening the upper lip

Originate from medial crural footplate

released from the medial crura through transnasal approach

Procereus muscle:

lies btw the eyebrows

depress medial eyebrow

creates horizontal wrinkle

Corrugator supercilli:

pyramidal shaped on the medial part of the supraorbital ridge

moves eyebrows medially

vertical wrinkles between the eyes

Alar rim:

affected by maneuvers that affect the lower lateral cartilages

alar rim graft is placed in subcutaneous tissue under the LLC

Nasal tip appearance:

cartilage tip onlay graft

failure to place a columellar strut graft

inadequate transdomal sutures

Spreader graft:

placed between the upper lateral cartilage an the nasal septum

Placed in submucoperichondrial pocket

increase internal valve angle

can be used for inverted V-deformity

can be used for open roof deformity

can be used to correct deviated septum

Improve aesthetic dorsal lines

correct the dorsonasal roof

Septal deviation:

removal of septum in the area that is causing the narrowing

Empty Nose Syndrome:

inferior turbinate resection: over aggressive resection

characterized by recalcitrant and paradoxical symptoms of nasal obstruction and suffocation despite widely patent airway

postsurgical loss of nasal tissues

psychological burden

any procedure that involves the inferior turbinate but less with submucous resection

FYI: there is no difference btw radiofrequency and microdebrider for nasal obstruction: also similar risk of nasal obstruction

Submucosal technique most commonly employed: advantage of keeping nasal mucosa

Killian incision:

1-2 cm posterior to the caudal edge of the septum

access to the septum for septoplasty

does not provide access to the caudal septum

when nasal tip is slightly under projected

Transfixion incision:

access to the septum

incising both sides of the membranous septum at its junction with caudal septum

disrupts the septal ligaments: deprojects the nasal tip

considered when deprojection of the nasal tip is desired

Weir incision:

made at the alar base

to reduce wide or flaring nostrils

marginal incision

is made at the caudal aspect of the lower lateral cartilage

Rim incision

is made at the rim

in the vestibular skin just inside the border of the nostril

can be used as an approach to create a pocket for nonanatomical rim graft

Intercartilagenous incision

made between the upper and lower lateral cartilages

follows the caudal border of the upper lateral cartilage

Transcolumellar: can be used in open approach to get to the septum

Retrobulbar injection of hyaluronidase :

should be done quickly between 60-90 mins

bath the retinal circulation with hyaluronidase

25 g needle

enter orbit along the orbital floor

between the inferior and lateral rectus muscles

advance needle about 1 inch and injected 2-4 mL

Filler enters through the dorsal nasal artery to ophthalmic artery under pressure

once pressure is released: then the filler would flow antegrade into the central retinal artery which is the terminal branch of the ophthalmic artery

Clear discharge after septorhinoplasty:

CSF leak

unilateral

clear and salty

beta-2 transferrin

more accurate than halo test and measuring the glucose level of the fluid

increase with bending, straining and valsavla

traumatic injury to cribriform plate (perpendicular plate)

more common on right 2:1 and more in men

frontal headache

complications: meningitis and pneumocephalus

Structures for airflow in the nose:

external valve: deep inspiration and watch for collapse

internal valve: Cottle maneuver

inferior turbinates

nasal septum

Cephalic trim:

trimming of the excess lower lateral cartilage

decrease the vertical height of the lateral crura and debulk the tip

basically it is removal of excess lower lateral cartilage from cephalic portion

6 mm rim strip is accepted how much should be left behind

Excess resection: weaken lateral crus: retraction, notching and/or external valve dysfunction

Bulbous tip:

convex lower lateral cartilage

the domal width is more than 4 mm

the angle of divergence is more than 30 degrees. the angle between the right and left middle crura, running from medial genu to lateral genu

or combination of both

treatment is the placement lateral crural strut graft on the undersurface of the lower lateral cartilage.

These are strong grafts that can reshaped the thick inflexible lower lateral cartilage

lateral crural mattress spanning sutures can straighten the convexity of the cartilage if it is flexible

Another option is alar batten graft

Subdomal spreader grafts:

used to correct a pinched tip deformity

as well as asymmetry of the dome

bar shaped graft, spanning beneath both domes

controlling horizontal and vertical orientation of the domes

Pinched nasal deformity:

results from decreased interdomal distance or narrow domal arches of the lower lateral cartilages

Lateral crural strut graft:

can be used for collapsed external nasal valve

sutured to the undersurface of the lower lateral cartilage

The nasal tip has dual blood supply from:

facial artery: dominant supply. Columellar artery 68%, lateral nasal artery 100%

ophthalmic artery: anterior ethmoid, dorsal nasal and external nasal

Columella strut graft:

increased tip projection and support

Composite alar rim graft:

includes skin and cartilage

Bony hypertrophy of inferior turbinate:

the finding most suggestive for submucous resection

anterior extension plays a role in decreased air flow but not suggestive of submucous resection

Simple mucosal thickening: addressed with outfracture

Keystone area of the nose:

nasal bones overlap the upper lateral cartilage

widest part of nasal dorsum

overlapped by the nasal bone for 4-14 mm

 internal nasal valve:

narrowest part of the airway

50% of airway resistance

10-15 degrees

caudal border of the upper lateral cartilage superiorly

nasal septum medially

floor of the nasal vestibule inferiorly

anterior part of the inferior turbinate posteriorly

bony edge of the pyriform aperture laterally

Collapse of internal nasal valve:

septal deviation

turbinate hypertrophy

collapse of the upper lateral cartilage

loss of cartilage strength due to aging

Spreader graft is placed between the septum and the upper lateral cartilage

Parenthesis tip deformity:

caused by malposition of alar cartilage, cephalically oriented bulbous lateral crura

to correct: the lower lateral cartilage must be rotated inferiorly

lateral crural strut graft: 3-4 mm sutured to the undersurface of the lateral crura

buried or sutured to the soft tissue of the pyriform aperture

Caudal septal extension graft:

sutured to caudal septum

control nasal tip projection, shape and rotation

lengthen the shortened nose

Crural turnover graft:

folding the cephalic portion of the upper lateral cartilage inferiorly onto itself

Spring graft:

widens the middle vault by spanning between both upper lateral cartilages

Gentle Gull in flight:

the appearance of alar margin with columella on AP view

On lateral view: the nostril should appear oval shape and a line drawn along the long axis should be 1-2 mm away from the alar rim and columella

Hanging Columella:

long caudal septum

long medial crura

combination of both

transfixion incision in the membranous part of the caudal septum and it allows access to caudal septum and resect any redundant membranous septum

resection of the caudal septum

and resection of the caudal margin of the medial crura

Intracartilagenous incision:

made within the substance of the lateral crus of the lower lateral cartilage

can be used in a closed approach to combine the incision for the access to the nose with removal of the cartilage superior to the incision to accomplish a cephalic trim of the lower lateral cartilage

Depressor anguli oris:

originates from mandible

inserts at the angle of the mouth

associated with frowning

Nasalis:

two parts

transverse and alar

Transverse part from maxilla above and lateral to the incisive fossa. Compresses the nostrils, drawing them toward the septum

alar part: attached by one end to the greater alar cartilage and by the other to the integument at the point of the nose

alar part: dilates or flares the nostrils

Levator anguli oris:

from canine fossa under the infraorbital foramen

inserts at the mouth angle

Levator labii superioris:

broad

flat

quadrangular muscle

extending between the lateral side of the nose and the zygoma in the infraorbital area

Dilates the nares

Submucous septal resection:

for caudal septal deviation with a concave C-shaped deformity of the septum

must preserve 9-10 mm L-strut of septal cartilage to maintain structural integrity

Alar Batten Graft:

placed in a pocket extending from the piriform aperture to a paramedian position in the alar sidewall

prevent lateral nasal wall collapse and alar retraction during inspiration

can improve bulbous nose

Septoplasty:

scoring of the quadrangular cartilage to influence its shape

cartilage will bend away from the scored surface

Rhinomanometry:

objectively assessing the dynamic nasal cavity patency and nasal function

assesses nasal cavity patency and nasal function

Subjectively: the cottle test

Asian Nose:

**Length** of the upper and lower lateral cartilages in Asian noses are **similar** to caucasians

the **height** of the upper and lower lateral cartilages are **shorter**

Septal perforation:

crusting along septal defect

bleeding

whistiling: altered airflow pattern

Steroids administration at the beginning of rhinoplasty improves edema and ecchymosis in prospective trials.

preoperative administration is superior to postoperative

Fillers for nose:

should be injected in sub-SMAS plane- Supraperichondrial- just above the periosteum: less chance of visibility and palpability

should be restricted to the nasal dorsum and sidewalls.

Avoid nasal ala and tip: high risk of necrosis

For broad and bulbous nose:

transdomal suture: used to treat wide domal arches

will narrow the dome

narrow the convexity of the lateral crus

Interdomal suture: for asymmetry in domal height or to reduce interdomal width

Medial crural sutures or medial crural septal sutures: increase or decrease tip projection

Columellar septal suture: used to establish tip strength and intergrity which might have been lost with a transfixion incision

When the L-strut is fractured:

there is risk of midvault collapse

the strut will rotate posteriorly creating saddle nose deformity

spreader graft in this case will act like batten grafts and secure the L-strut in place

Dorsal onlay graft is used for dorsal augmentation

External nasal valve:

caudal edge of the lateral crus

soft tissue of the alae

membranous septum

nostril sill

can be seen as a result of overresection of the lateral crus

Body Dysmorphic Disorder:

5%

Most commonly the nose

7-15% of all plastic surgery patients

Angle of Divergence:

the angle between the right and left middle crura

running from medial to lateral genu

ideal angle 30-60 degrees

more obtuse angle produces a long intercrural distance and more boxy tip

narrower angle: more

Angle of rotation:

from middle and medial crura

tip gently bends cephalad from the columella to the tip-defining point

When harvesting septal cartilage:

leave 1 cm of L-strut

1 cm caudal strut

1 cm dorsal strut

Otherwise: saddle nose deformity

Open roof deformity:

when the dorsum is taken down to the point there is separation between the nasal septum and the sidewalls

can be closed by either nasal bone infracture

or placement of spreader greaft

Pollybeak deformity:

fullness of the supratip area that pushes down and underprojects the nasal tip

results from excess scar formation in the supratip region or inadequate resection of the lower dorsal septum

Rocker deformity:

occurs after medial osteotomy of the nasal bones that go beyond the thick bone of the radix

when you do osteotomy, you go more into the frontal bone

when trying to infracture, the superior part sticks out laterally

posterior nasal septum:

sphenopalatine artery

upper central nasal septum:

posterior ethmoid artery

KTP 532-595 nm: highest affinity to vessels

Carbon dioxide and erbium: ablative lasers with higher affinity for water

1064 nm: hair reduction or collagen stimulation: more specific for darker pigmentation of vessels such as blue

                can be used for vessel reduction in the leg

Osteotomy of the frontal process of the maxilla:

reduce or narrow a wide nasal bridge

Dorsal sidewall grafts:

used to combat localized lateral wall depression or asymmetry of the body of the nose

placed along the lateral side of the nose

Lateral nasal osteotomy using the External perforating technique:

will injure  the angular artery which comes off the facial artery

Angular artery: once on the nose, it become the lateral nasal artery: at a point 2-3 mm superior to alar groove

Blood supple to lateral nasal and the dorsum of the nose:

come from the anterior ethmoid and dorsal nasal arteries

In Caucasian nose:

the ratio of the lobular portion of the nose to the columella is 1:2

lobular portion should be one third

Columellar portion should be 2/3 of the total distance from tip of the nose to base

The long axis of each nostril points in a slight medial direction

If numbness of the alloplastic genioplasty continues beyond 2-3 weeks, then the implant should either be positioned lower to not impinge the the mental foramen or the wings should be trimmed.

More than 8 weeks will result in permanent numbness. latest should be adjusted by 4 weeks.

When performing alloplastic genioplasty: the ratio of soft tissue response to augmentation is 0.8-1.0: so for 5 mm advancement, need 6 mm implant

Porous polyethelyne facial prosthesis: allow for fibrous tissue ingrowth, explantation is more difficult but less likely to migrate

Smooth implants: result in formation of a capsule

Pollybeak deformity of the nose:

means fullness in the supratip, convexity in that area.

Most common cause is overprojection of the caudal nasal dorsum

and underprojection of tip projection

Corrected by increasing nasal tip projection with graft

Steroid injection can be used for tip deformity up to 3 months when there is soft tissue swelling/fibrous tissue formation between the tip and overresected nasal dorsum

Transdomal sutures:

sutures placed in the domes or the lateral crus

mattress sutures

to narrow the domes

Secondary goal: to narrow the convexity of the lateral crura

may increase in tip projection: as tertiary projection

Interdomal sutures:

affect more the tip projection and columella projection

Columella-septum suture:

tip rotation

Nose innervation:

nasopalatine n. comes from Pterygopalatine ganglion, travels through the incisive foramen to meet with greater palatine nerve from the palate

Anterior ethmoid nerve: sensation to the tip and lateral nasal vaults

internal nasal nerve: from the anterior ethmoid and supplies the anterior nasal lining

Infraorbital nerve: nasal sidewalls

Lesser palatine: supples the soft palate

Nose innervation part 2: all off the trigeminal

Anterior ethmoidal nerves:

external branch btw the nasal bones and the lateral nasal cartilages, supplies the tip and alae

Internal branch: septum and internal nasal walls

Nasopalatine: runs anteroinferiorly, on the nasal septum, in a groove in the vomer, sensation to septum and internal nasal walls

Lesser palatine nerve:

uvula, tonsil, soft palate

infratrochlear nerve: the skin over the radix, also supraorbital nerve per inservice question

In older age:

tip of the nose drops

manifest as droopy elongated tip of the nose

primarily due to loss of lower lateral cartilage support

Secondary causes:

laxity of the suspensory ligaments

loss of medial crural support

thickening and possible ossification of the cartilage

thickening of the skin with overlying increase vascularity

Also maxillary hypoplasia:

leading to divergence of medial crural feet

columellar shortening

In patient with small chin:

silicone prosthesis will add sagittal advancement of the pogonion

Silicone implants cannot improve symmetry

patient with short vertical chin and deep labiomental angle is best served with osseous genioplasty or medpor implant to increase the vertical length and efface the labial mental fold

When you do rasping of the nose, all the debris should be removed, otherwise patient will have periostitis of the nose. Oral abx should be the treatment. the dorsal prominence left behind can be excised after 8-12 months from the time of resolution of the infection

Nasal dorsal hump:

57% cartilage: septum and upper lateral cartilages. Separating them does not help and is a problem to the nose

43% bone

Asian nose:

columellar show is not a usual characteristic

common characteristics:

alar flare

bulbous nasal tip

thick subcutaneous tissue

wide flat nasal dorsum

Fracture of the nose:

upper vault: spreader graft

nasal bones

ethmoid

vomer

cephalic septal border

Middle Vault: spreader graft

upper lateral cartilage

maxilla

septum

Lower vault: Columellar strut, shield and umbrella grafts

alar cartilage

inferior septum

Infracturing of the nasal bones can lead to narrowing of the internal septum

Tip projection is increased:

tip graft

suturing the medial crura

strut graft between the medial crura

Airway collapse with negative Cottle:

the issue with external nasal valve

treatment: lateral crural strut graft, inserted between the vestribular lining and lateral crus

Cottle is for internal nasal valve

When evaluating for nasal obstruction and the turbinates are hypertrophied

must check the septum

The middle meatus marks the path of the primary inspiratory nasal current

Internal nasal valve is the narrowest area of the nose

Pinched nasal deformity:

can be caused due to excessive resection of the lower lateral cartilage

can be repaired with alar grafts

Traumatic nasal deviation:

must evaluate nasal septum

must evaluate the ethmoid and vomer

The osseous component of the septum is comprised of:

ethmoid makes the superior portion of the nasal bone

vomer makes the inferior portion of the nasal bones

In case of fracture:

surgery should include removal of bone and not infracturing or correcting the bony deformity

Excessive defatting and extended alar base resection can lead to injury to the lateral nasal artery

Septal hematoma can lead to saddle nose deformity

Pollybead deformity:

high caudal septum angle

combined with decreased tip projection

Columella retraction:

overresection of the caudal end of the septal cartilage and/or the nasal spine along with caudal rotation of the cartilaginous septum following overmobilization and or vertical shortening

Midnasal asymmetry:

asymmetric narrowing of the middle third

causing medialization of the lateral nasal wall

Transfixion incision: (Killian incision is hemi-transfixion)

can lead to decreased tip projection

especially if dissected down over the anterior nasal spine

Columellar strut graft can help

Midnasal vault collapse is prevented with spreader graft

Remember to limited resection above the alar groove to prevent injury to the lateral nasal artery

Lateral nasal artery is the terminal blood supply to the skin envelop after primary rhinoplasty where the columellar artery is taken down

Alar graft is good for inspiratory collapse as well as overresection of the lower lateral cartilage

Boxy nose:

square perimeter of the nasal base that is caused by the position of the lower lateral cartilage

angle of divergence of middle crura (and their length) determines the the intercrural distance

Optimal angle of divergence is 30-60 degrees

Septal deviation: C-shaped, without dorsal deviation, negative Cottle and competent external nasal valve:

Do submucous septal resection

In a patient with unilateral nasal obstruction due to trauma and depressed nasal side wall with buckled septum:

submucous septoplasty

osteotomy on the affected side only with spreader graft

No need for osteotomy on the other side if it is patent on examination

If L-strut gets fractured during rhinoplasty:

it must be repaired to prevent saddle nose deformity

it gets repaired using spreader graft

In a patient with Bell’s palsy who feels that his nose is clogged:

paralysis of levator labii superioris

When performing open rhinoplasty and Weir resection for alar flaring:

do not dissect above the alar groove as you will injury the lateral nasal artery which will be the blood supply

Primary purpose of transdomal sutures in boxy nose:

narrowing of the dome

Pain during resection of nasal spine:

sphenopalatine nerve

In old patients:

there is drooping and elongation of the tip complex

caused by loss of intrinsic support of the LLC

Saddle nose deformity caused by:

excessive resection of dorsal nasal septum

loss of dorsal support

excessive resection of septum

fracture of perpendicular plate of ethmoid

comminution of nasal bones during infracture leading to displacement in the piriform aperture

The presence of thick skin with sebaceous glands will decrease the likelihood of optimal results

|  |
| --- |
| **In-Service Questions Notes: Abdominoplasty/Liposuction** |

Barbed sutures:

decrease operative time

more expensive

cost saving due to shorter operative time

no studies to show better tensile strength of scar

aesthetically same

higher rate of extrusion and minor wound healing complications

Lidocaine toxicity:

nervous system effects: perioral numbness, metallic taste, anxiety, muscle twitching and seizures

cardiovascular effects : tachycardia, hypertension, V-tach, asystole

Tx: Bolus of 20% lipid emulsion

Dantrolene: for malignant hyperthermia

Flumazenil: antidote for benzo overdose

Naloxone: opioid antagonist

Corticosteroids: fat embolism???

Brachioplasty:

Posteromedial incision results in hidden scar

Medial antebrachial cutaneous nerve at risk of injury

The basilic vein is used as a landmark

skin of anterior and medial surface of the forearm to palmar aspect of the wrist

Also: medial and posterior sides of the elbow

C8-T1 from medial cord of brachial plexus

found in anterior arm: medial to brachial artery, medial to bicep brachii muscle

lies on the ulnar side of the biceps muscle: proximal to medial epicondyle, it branches to anterior and posterior

Anterior division is expandable for graft

Lateral antebrachial cutaneous nerve:

lateral/anterior

C5,6,7

Terminal part of musculocutaneous

innervates lateral forearm

Inferior lateral cutaneous:

C5,6

branches from radial

sensory and vasomotor to the lower lateral aspect of the arm

Posterior brachial cutaneous:

C5,6,7,8

from radial nerve

posterior aspec of the arm

Posterior antebrachial cutaneous nerve:

Lateral/Posterior

C5,6,7,8

From radial nerve

Distal to posterior brachial cutaneous

Posterior cutaneous aspect of the forearm

Palmar cutaneous of ulnar nerve: Distal/anterior

Dorsal cutaneous of ulnar: distal/posterior

Options for wetting solutions:

Dry: no wetting solution: zero. Blood loss 20-45%

Wet: 200-300 mL per anatomic area. Blood loss 4-30%

Superwet: 1:1 ratio. Blood loss 1%

Tumescent: 2:1 or 3:1. Blood loss 1%

Cryolipolysis:

cold-induced panniculitis

44 degree F

does not damage other tissue, only adipocytes

Crystallization and cold ischemia injury followed by ischemia reperfusion injury

Causing generation of reactive oxygen species, increase cytosolic Ca level and activation of apoptotic pathway

Inflammatory cell infiltrate peaking at 30 days

The damaged adipose cells will be removed in 3 months

Paradoxical adipose hyperplasia (PAH): known complication

1/500-1/5000 treatments

use of large applicator

male sex

hispanic background

abdominal location of treatment

Age is NOT

Tx: PAL once the affected area has softened at 6-9 months

Most common complication is transient hypoesthesia: decreased sensation in the treated area

resolves in 6 months

Surface contour abnormalities and chronic pain can occur

TAP (transverse abdominis plane) Block:

between the internal oblique and transverse abdominis

Abdominal wall sensation: T6-12 and ilioinguinal/iliohypogastric nerves

Caprini Score:

3 points for history of Fhx of DVT

1 point for BMI and OCP

Abdominoplasty is more than 45 mins so you give it 2 points

Fat embolism:

respiratory distress

cerebral dysfunction

petechial rash

starts 24-72 hours after liposuction procedure

Gluteal Fat Grafting:

higher mortality than any other surgery

fatal pulmonary fat embolism

Most common causative mechanism is mechanical tear of a large gluteal vein followed by intravascular injection of fat or migration of extravascular fat into an injured vein by a pressure gradient

Avoid intramuscular injection

Use single hole cannula more than 4.1 mm diameter

avoid downward angulation of the cannula

inject only when the cannula is in motion

Body Contouring Surgery Notes:

Hx of DVT is not contraindication for body contouring surgery but need hematology involved

type 2 DM not a contraindication

BMI is predictor of complications and more than 35 is associated with increased complication rates

Lower body lift and abdominoplasty: highest risk of DVT

BMI > 25 and age >40: are independent predictors

Advancement of of flaps in a lower body lift: continuous or discontinuous release of the lateral gluteal depression

Weight loss via gastric bypass has been shown to be associated with higher rates of surgical complications following body contouring

Must correct calcium, B12, folate and thiamine

Daily protein intake should be between 60-100 g to avoid wound healing complications

Seroma is caused by:

injury to rich lymphatic supply

possible excision of lymphoid tissue

extensive subcutaneous dissection

shear forces and motion

Doxycycline and bleomycin: most common sclerosant agents

Liposuction: provides long-term reduction in treated areas without fat reaccumulation in either treated or untreated areas of the body (opposite to what was thought before). Level III evidence. it does occur if patient starts eating

For patient after massive weight loss:

body contouring: must wait a year from surgery

stable weight for 3-6 months

Seroma is the most common complication after abdominoplasty:

use progressive tension sutures or drains

Patients who undergo full-length vertical component in their thighplasty are at highest risk of prolonged edema due to circumferential compression of the low pressure lymphatic system

When performing liposuction:

expected local anesthetic in the aspirate between 10-30% and mean of 9.8%

the answer on inservice was 20%

Male gender is a risk factor for increased hematoma and seroma in body contouring patients

Abdominoplasty complications rate:

alone 3.1%

with liposuction 3.8%

with breast surgery 4.3%

with breast surgery and liposuction: 4.6%

with liposuction and body contouring 10.4%

with liposuction, body surgery and breast 12%

There is increase risk of major surgical site infection when multiple cosmetic surgeries happening simultaneously

Of overal abdominoplasty complications:

31.5% hematoma

27.2% infection

20.2% VTE

Liposuction with brachioplasty:

facilitate the dissection

decrease risk of nerve injury and lymphedema

Main advantage of ultrasound assisted liposuction vs suction assisted liposuction:

less surgeon fatigue

there is no other benefit of ultrasound vs suction liposuction: NOTHING

increased incidence of seroma formation

thermal injury to tissue

neuropraxia

must inject tumescent solution and keep hand in constant motion to prevent thermal injury

Always think of the Caprini score when the question is about DVT

The area of supraumbilical abdomen:

highest risk for wound healing due to disruption of blood supply

in another question they are saying central infraumbilical

After abdominoplasty:

the area of highest risk for post-operative hypothesthesia is the infraumbilical area

Anterior abdomen sensation: anterior cutaneous branches of 6-12th intercostal nerves

the anterior cutaneous nerve perforates the anterior rectus sheath and is severed during elevation of abdominal flaps

Corset Trunkplasty:

addresses upper abdominal laxity that is not normally addressed with normal abdominoplasty

Belt lipectomy: addresses vertical excess but not horizontal

Iron deficiency:

30-50% of post-bariatric patients

RYGB is both restrictive and malabsorptive

B12 deficiency:

13.6%

comes second after iron deficiency

mostly in short limb gastric bypass

Lipoaspirate

> 5000 mL is considered large volume

Should be considered for overnight stay

Liposuction of the central supraumbilical flap:

will further impair blood supply to the area farthest from blood supply

can cause wound complications

Extensive undermining under the hips is well tolerated

Discontinuous release of tissue over the costal margins:

preserves perforators

Brachioplasty:

MABC is at risk

arises directly from medial cord

travels with the basilic vein

medial to brachial artery

Anatomic studies shows that the nerve pierces the deep fascia about 14 cm proximal to the medial epicondyle

to protect this nerve, must leave a cuff of fat, about 1 cm above the deep fascia

Most common complication is hypertrophic scar in about 40%

Seroma is also considered the most common complication if hypertrophic scar is not in the options.

Lidocaine toxicity:

Safe dose of lidocaine in tumescent solution is 35mg/kg to 55 mg/kg

plasma levels peak after 10-14 hrs after infiltration (or 8-18 hrs)

complications include neurologica and cardiac

Neurologic include:

slurred speech

metallic taste

tinnitis

perioral numbness

more severe: muscle twitching, seizures, cardiac arrest

Lateral femoral cutaneous nerve (LFCN):

can be entrapped during abdominoplasty

exits the abdomen near the anterior superior iliac spine

nerve injury can be confirmed by injection of lidocaine at the location of Tinel’s sign

Can either do massaging and PT

and for more severe pain: local exploration

Factor V Leiden:

most prevalent hypercoagulation disorder

most common inherited thrombophelia

most common genetic risk factor for DVT

Protein S and C inhibit the coagulation pathway by inactivating factor V and VIIIa

Increased resistance to activated protein C

The ideal location of umbilicus is between the two iliac crest

Caprini score:

risk of VTE: 3 points

hx of malignancy and length of surgery greater than 45 mins: 2 points

age, obesity and contraceptive use: 1 point

Approval for medical panniculectomy:

inability to walk normally

chronic pain and ulcertion under the pannus

pannus hanging below the level of the pubis

intertrigo lasting more than 3 months despite medical treatment

weight stable for 6 months

18 months post-bariatric surgery

Progressive tension sutures:

help with decreasing tension to midline

decrease rate of seroma

minimize flap movement

close dead space

Another way to decrease the tension:

is to close the native umbilical skin in a vertical position

Coolsculpting:

less expensive than liposuction

abdomen needs 2-6 hrs of tx

outer thighs: 2 hrs per side

1 hour for inner thighs

Laser-assisted liposuction:

the only difference is post-operative pain compared to suction assisted liposuction

Skin laxity is the single most important determinant for brachioplasty

pinch test more than 1.5 cm is a determination for excess fat

Okay whenever you see abdominoplasty and complications: highest and related

Post-bariatric surgery patients:

vitamin B1 (thiamine) deficiency: WK encephalopathy

B1 stores depleted within 3-6 weeks

deficiency can be related to decreased dietary intake

WK is rare but can happen in post-RYGB patients who take multivitamin around 2 years post-op

WK symptoms;

confusion

ataxia

oculomotor abnormalities

Can result in  brain damage if not recognized early

Subcutaneous fat of the abdomen:

two layers: superficial about 1-2 mm below the dermis

deeper which is loose and areolar

most common complications after superficial fat liposuction is contour abnormalities

Nerves of the abdomen travel in the plane between:

transversus abdominis muscle

internal oblique muscle

Minimal incision brachioplasty:

in the axilla

anchoring the superficial fascial system

anchor the arm and axilla dermis to the superficial fascia

Lateral femoral cutaneous nerve:

anterior and lateral thigh

Genitofemoral nerve:

supplies the proximal portion of the thigh about the femoral triangle just lateral to the skin innervated by ilioinguinal nerve

Ilioinguinal nerve:

supplies the pubic symphysis

superior and medial aspect of the femoral triangle

root of the penis and anterior scrotum

mons pubis and labia majora

can be injured in lower abdominoplasty

Iliohypopgastric:

small area superior to pubis

Saphenous nerve:

symptoms of entrapment

deep aching sensation in the thigh, knee pain and paraesthesia in cutaneous distribution of the nerve in the leg and foot

You can combine abdominoplasty with TAH via any approach, however, risk of thromboembolic event is increased.

Most common complication after brachioplasty

liposuction is contour abnormalities

can be caused by swelling

wait 6 months before any revision

early tx is lymphatic massage

later can be fat grafted

Seroma rare in the upper extremity

Hyperpigmentation after liposuction is more common in the medial thigh after ultrasound-assisted liposuction

Combining abdominoplasty with liposuction:

increases the risk of thrombotic

embolic events

skin necrosis

fat necrosis

Abdominal zones:

Zone 1: mid-abdomen but supplied by deep inferior epigastric artery

Zone 2: lower abdomen, supplied by the external iliac artery

Zone 3: lateral abdomen and flanks, supplied by intercostal, subcostal and lumbar arteries

Zone 4: NO SUCH THING

After abdominoplasty and liposuction: blood perfusion relies on Zone 3 (safe zone)

Fat embolization syndrome: FES

altered mental status

petechial rash over the trunk, axillary and

respiratory dysfunction (hypoxemia and tachypnea

Limited medial brachioplasty is good for patients with skin laxity in the proximal third of the arm, resection of a vertical ellipse, leaving a small scar in the axilla

Remember that enoxaparin should not be given in patients with renal failure even if the scenario sounds like VTE

VTE after abdominoplasty is 1:300 to 1:1000

Start VTE ppx pre-op and continue for 5-10 days post-op after abdominoplasty and some studies suggest up to one month

Pseudogynecomastia: Lipomastia

reduction mammoplasty will reposition the nipple at or above the IMF, reduction of areola size and removal of excess skin and fat.

Mastectomy is used for gynecomastia

Skin redundancy above and below the navel: requires panniculecomy

Miniabdominoplasty does not include above the umbilicus

Zones of adherence:

What are they?

And what causes the zones of adherence?

T-shaped brachioplasty: arm and axilla

do not do lipobrachioplasty when liposuction was already performed

When planning large volume liposuction:

in order to decrease the risk of lidocaine toxicity:

Decrease the concentration of lidocaine in the wetting solution

Use smaller volume of infiltrate by applying superwet technique with ratio of 1:1

When planning arm liposuction:

the medial portion at and below the bicipital groove

due to thin fat and wrinkly skin that will not retract

Risk factors for seroma formation:

BMI greater than 30

large skin resection

concomitant liposuction

shear forces

Studies have shown that garments don’t prevent seroma formation

Gluteal region post-bariatric weight loss:

excessive skin

exaggerated fat loss

Autologous gluteal augmentation with vascularized flaps using superior and inferior gluteal arteries

Gynecomastia:

to improve skin retraction and redraping: disruption of the inframammary fold, to allow the skin to drape more naturally over the abdomen

Nerves most commonly injured in abdominoplasty:

lateral femoral cutaneous nerve

iliohypogastric nerve

ilioinguinal nerve

Hyperextension or twisting of the upper body can exacerbate the problem: Carnett sign

After local injection with lidocaine, MRI is the next step.

Second block with corticosteroids may prolong the comfort

Neurotin: temporary relief

Contour irregularities is the most common complication that occur after liposuction in about 20% of patients

DVT 1%

hyperpigmentation 4

When brachioplasty is performed in conjunction with liposuction:

the most common complication is wound dehiscence

dehiscence is most common at T-point in the axillar or L-bachioplasty in the axilla

Iliohypogastric:

small region superior to pubis

rarely injured alone

burning in the inguinal and suprapubic region

Genitofemoral:

just proximal portion of the thigh

about the femoral triangle

just lateral to the skin innervated by ilioinguinal

Ilioinguinal:

superior and medial aspect of femoral triangle

pubic symphysis

root of penis and anterior scrotum

labia majora in women

Saphenous nerve: entrapment symptoms in the thigh, knee and cutaneous distribution of the leg and foot

Mesotherapy is not an affective alternative to suction lipectomy and not approved by FDA

phosphatidylcholine and isoprotrenol are currently used to inject for lipolysis

The percentage of fluid that remains in the body after infiltrating using super-wet technique is 70%

In patients undergoing simultaneous procedures, most common complications:

wound healing issues 15%

then seroma 10%

infection, hematoma and PE less than 5%

To avoid contour irregularities:

small cannula should be used in the deep fat

corss-tunneling between the two sites and they should be at a right angle from each other

Nicotine:

increases microvascular vasoconstriction leading to decreased tissue oxygenation

Smoking: increases carboxyhemoglobin, platelet aggregation, blood viscosity, decreases collagen deposition and prostacyclin formation.

Smoking one cigarette will cause vasoconstriction for 90 minutes

One pack a day are hypoxic all day

Massive weight loss patients:

suffer malnutrition: especially thiamine deficieny

tx 100 mg/day of thiamine

100 mg every 8 hours until resolution of symptoms

Garlic can cause:

intraoperative and post-operative bleeding

stimulator of fibrinolytic activity

must stop at least 7 days before surgery

1% lidocaine: contains 10 mg/mL of lidocaine

so 2% contains 20 mg/mL

using 20 mL means 20 mL x20mg/mL= 400 mg

Patients who undergo RYGB will have :

iron deficiency anemia

B12 deficiency

fat soluble deficiency

All these lead to bleeding

Thighplasty:

seroma in 4-20%

avoid injury to femoral triangle to avoid lymphedema

femoral triangle: inguinal ligament, adductor longus and sartorius

Body lift after massive weight loss:

complication 50%

wound dehiscence is the most common complication

early wound dehiscence is caused by movement

late wound dehiscence is caused by seroma

Men are more likely to have wide upper diastasis recti

women more likely to have lower diastasis recti

Men skin is thicker and less likely to have striation

Most common complication of brachioplasty:

unattractive wide scar

Should not aspirate more than 5 L during liposuction: should watch for signs of fluid overload

Medial thighplasty:

Colle’s fascia:

helps define the perineal-thigh crease

it is the deep layer of the superficial perineal fascia

lies deep to the subcutaneous fat of the perineum

anteriorly: it is continuous with the Scarpa’s fascia of the abdomen

Posteriorly: it fuses with the urogenital diaphram

High in elastin: giving it yellow hue, distinguishing it from nearby white muscular fascia

Lockwood described the fascial anchoring to subdermal layer

to decrease inferior scar migration

labial spreading

recurrent thigh ptosis

In abdominoplasty:

to maximize the body lift in the mons area, incision should be placed within 5-7 cm from the vulvar commissure within the hairline

Superficial fascia of the medial thigh:

superficial layer: thick, loose areolar with adipose in it

deep layer: Colles fascia, thin aponeurotic and with considerable strength

Must anchor the inferior skin flap to the deep layer of the superficial perineal fascia (Colles fascia)

To avoid lymphedema: must stay superficial to the fat over the femoral triangle

In brachioplasty:

relaxation of the clavipectoral and axillary fascia

re-anchoring of the soft tissue of the posteromedial aspect of the arm to the axillary fascia

For patient with massive weight loss seeking thighplasty:

medial longitudinal thighplasty is the preferred one

of note: cresentric incision distorts the vulvar structure

The most common complication in lower body lift is seroma, followed by wound dehiscence

Infiltration of lidocaine with epinephrine

For subcutaneous injection with 1% lidocaine with 1:00,000 epinephrine: use 7 mg/kg

however, when using with tumescent with 1:1000,000 of epinphrine you can use as high as 35mg/kg

Infiltration techniques:

dry suction lipectomy: 20-45% of blood in the suction aspirate

wet technique: 200-300 of wetting solution: blood loss 4-30% of aspirate

superwet technique: 1:1 ratio, blood loss 1% and is comparable to tumescent technique which is 3:1 infiltration:aspiration

In patient with RYGB followed by body countouring surgery and later developing wound dehiscence and if the stem of the question is telling you that the wound is clear and no need for debridement: think about malnutrition as the cause

During suction lipectomy:

hydration is very important

too little fluid causes hypotension

too much fluid causes pulmonary edema

The combination of infiltrate and IV fluid administration should add up to twice the aspirate removed

Belt lipectomy:

highest risk of complications: seroma

The least likely structure to be injured in brachioplasty: cephalic vein

Infiltration technique:

dry: 20-45% blood in the aspirate

wet: 4-30%

superwet and tumescent 1%

Smokers with abdominoplasty:

risk of complication about 48-52%

Should stop smoking for 8 weeks prior to surgery

Suction lipectomy can be used for breast reduction:

female breast is 50% fat

Suction lipectomy most common cause of death:

Thromboembolism 23%

Abdominal perforation 15%

8% fat embolism

The nerve least likely to be injured in abdominoplasty is the genitofemoral nerve

this nerve course deep in the abdominal wall

pierces fascia below inguinal ligament

provides sensation to the skin of the femoral triangle and pubis

Suprapubic region is at risk of necrosis after abdominoplasty

Abdominoplasty with liposuction: most common complication is seroma

|  |
| --- |
| **In-Service Questions Notes: Craniofacial** |

benign idiopathic masseter hypertrophy:

injection of botox

partial myotomy

mandibular angle reduction

contralateral augmentation

Amyloidosis: causes bilateral masseter hypertrophy

Saether-Chotzen Syndrome:

AD

TWIST 1 gene

Asymmetrical brachycephaly

Bicoronal or unicoronal synostosis

low frontal hairline

ptosis of eyelides

prominent crus of helix

Crouzon syndrome:

AD, FGFR2 gene mutation

Hydrocephalus

increase ICP

Chiari malfomation

brachycephaly

bicoronal craniosynostosis

exorbitism

anterior open bite

midface hypoplasia

**extremities normal**

Apert Syndrome:

AD

FGFR2

brachycephaly

hydrocephalus and high risk for Chiari Malformation

Turribrachycephaly

enlarged anterior fontanel

bitemporal widening

occipital flattening

anterior open bite

complex syndactyly of the hands and feet

acrocephalosyndractyl

Pfeiffer syndrome:

AD

FGFR 1 and 2

hydrocephalus

high risk Chiari

turribrachycephaly

**down slanting palpebral fissures**

anterior open bite

severe midface hypoplasia

**broad thumbs and toes**

Muenkesyndrome

FGFR3 gene mutation

coronal synostosis

elevated intracranial pressure

**sensorineural hearing loss**

**abnormal middle phalanges**

Crouzon:

OSA with increased ICP: treated with monobloc osteotomy: similar to LeFort III but without osteotomy to nasofrontal and frontozygomatic. high rate of CSF leak and infections due to communication btw the nasal and cranial cavities

LeFort 3: does not treated increased ICP, only OSA

Facial bipartition: is used for the treatment of telerobitism

Godlhenhar Syndrome:

hemifacial microsomia

ear anomalies

mandibular hypoplasia: occlusal cant and oral commisure asymmetry

Ocular findings: epibulbar dermoids, optic nerve colobomas: interruption of circular structures of the eye, can lead of visual field deficit

can affect iris only

Treacher-Collins:

also known as madibulofacial dysostosis

AD

5q31.3-q33.3

TCOF-1 gene

micrognathia

underdevelopment or clefting of the zygoma

hypoplastic mandible

lateral canthal vertical dystopia

antimongolian palpebral fissure

long anterior sideburns

anterior open bite

cleft palate

Microstomia

microtia

anothia

eyelid coloboma (notching)

1:50,000

also known as mandibulofacial dysostosis, first and second branchial arch syndrome

bilateral tessier cleft 6,7,8

absence of malar bone and zygomatic arch

Angle class II

open anterior bite

clockwise rotation of the occlusal plane

no involvement of the extremities

EFNB-1: Craniofrontonasal syndrome: hypertolerism, craniosynostosis, clefing of nasal tip

Muenke: FGFR3

Crouzon: FGRR2

Pfeiffer: FGFR 1 and 2

Parry Romberg: progressive hemifacial atrophy

self-lmited

starts in the first 20 years then is self-limited

for minimal to moderate: autologous fat grafting

more severe adipofacial

more severe cases: distraction osteogenesis and bone grafting

Could be a localized scleroderma

Use **parascapular flap** if bone is needed. on the inservice free fibula was the wrong answer

Can be associated with neurological symptoms such as seizure and trigeminal neuralgia, migraine, horner syndrome and hemiplegia

the skin overlying the affected area may become hyperpigmented

may lead to atrophy of the of the upper lip and tongue leading to exposure of teeth roots

female: male ratio 1.5:1

facial atrophy in the distribution of trigeminal nerve

Second most common facial deformity after cleft lip and palate

Tessier 4 :

cleft lip lateral to the philtral column and Cupid’s bow

passes onto the cheek and curves on the lower lid disrupting the lower canaliculus

can result in anophthalmia

towards the alar margin

soft tissue deficiency in he medial lower lid malposition and medial canthal dystopia

nasolacrimal duct abnormalities and inferior canalicular system malposition

passes between the **piriform aperture and the infraorbital foramen**

lateral to cubid’s bow and lateral to the nasal ala, terminating in the lower eyelid medial to the punctum

**medial canthus is not affected** (affected in #3)

Iodine and Chlorhexidine: toxic to bone

triple antibiotic wash: with Clindamycin, gentamicin and polymyxin

PMMA polymerization is exothermic reaction: need saline irrigation to dissipate the heat

Pfeiffer: broad toes and thumbs

Metopic ridge:

thickening is normal of the metopic suture

No trigonocephaly

no retrusion of the supraorbital and lateral rims

No hypotolerism

biparietal widening

radiaographic: omega sign

metopic suture closes normally in the first year of life 6-8 months

Proboscis lateralis: failure of fusion of the medial and lateral nasal prominences

cleft lip: failure of fusion of the **maxillary prominence** with **medial nasal prominence**

Tessier 0: failure of fusion of the medial prominences

Choanal atresia: failure of oronasal membrane to rupture

Mandibular prominence: failure of fusion of the mandibular prominence

Morphea en coup de Sabre Vs. Parry-Romberg:

vertical furrow

atrophy of the tonge and upper lip

absent or flattened zygoma

orbital rim and hypoplastic maxilla and mandible

lateral open bite

Sensation intact

may begin as a circumscribed patch of scleroderma in the frontal region of the scalp with loss of hair extending down to the midface

this scar is referred to as Coup de Sabre

Symptoms start in the first and early second decade

Tessier #3:

when affecting the alveolus, between the lateral incisor and canine

Floor of the nose, through the nasolacrimal system and orbital floor involving the **medial canthal region**

extends through the maxilla into the lacrimal bone

involves the **lateral nasal ala and medial canthus** of the eye

displacement of medial canthus

patient can have coloboma of the nasal alae and the lower eyelid medial to the punctum

shortening of the nose

lip deformity similar to cleft lip

Branchio-oto-renal (BOR) syndrome:

AD

EYA1 and SIX1 genes

auricular malformation

preauricular skin pits

hearing loss

branchial fistula

external auditory canal stenosis

renal anomalis

Need audiology and renal US

Oculo-auriculo-vertebral (OAV):

variant of hemifacial microsomia

mandibular, facial and ocular findings

VSD

Tetralogy of Fallot

PHACE syndrome:

Posterior fossa

Hemangioma

Arterial anotmalies

cardiac defects

eye anomalies

Need MRI of the brain for facial hemangioma

CHARGE syndrome:

Coloboma of the eye

cleft lip and or palate in 20%

heart defects

atresia of the nasal choanae

retardation of growth and development

genital and urinary abnormalities

ear abnormalities and deafness

Microdeletion or mutation in CHD7

Second most common syndrome for cleft lip and palate following Van der Woude

Common observations in VPI:

hypernasality

facial grimacing

nasal air emission

Compensations of VPI: maladaptive patterns

glottal stop

consonant emission

Saether-Chotzen syndrome:

brachycephaly

prominent crus of helix

low frontal hairline

maxillary hypoplasia

syndactyly

ptosis of eyelids

Antley-Bixler:

craniosynostosis

choanal atresia

radiohumeral synostosis

Deformational plagiocephaly:

posterior occipital flattening

compensatory ipsilateral bossing

**anterior** shifting of the **ear** on the same side

can be treated with behavioral modification and positional changes up to 7-8 months of life

narrowing of ipsilateral palpebral fissure with lower eyebrow

**inferiorly** positioned ipsilateral **ear**

Parallelogram shaped skull

skull base horizontal, level and unaffected in posterior deformational plagiocephaly

When kids have central sleep apean: trach and ventilate if they are under 6 as they will relapse

LeFort 1 osteotomy will injury:

descending palatine artery

during pterygoid osteotomy

prior to its division to greater and lesser palatine arteries

Goldenhar syndrome:

Oculoauriculovertebral spectrum

Faulty neural crest cell migration: cause is disruption of normal developmental sequence

ear anomalies

epibulbar dermoids

facial and mandibular hypoplasia

vertebral anomalies

microtia

preauricular skin tags

mandibular hypoplasia

may involve facial nerve

VSD

Tetralogy of Fallot

Beckwith-Wiedmann syndrome:

Chromosome 11

macrosomia

macroglossia

omphalocele

auricular abnormalities

Binder syndrome:

congenital facial malformation

low-set and flat nasal tip

short nose

short, retracted columella

upper lip is drawn into the floor of the nostrils

retrusion of midface

nasomaxillary or premaxillary hypoplasia

convex lip

nasolabial angle is acute

convex upper nasal tip with a wide, shallow philtrum, crescent shaped nostrils without a sill

anterior nasal spine and frontonasal angle are absent

hypoplasia of anterior nasal floor (fossa praenasalis)

localized symmetric maxiallary hypoplasia

perpendicular alar cheek junction

Angle Class III malocclusion

vertically short nose

flat frontonasal angel

absent anterior nasal spine

limited nasal mucosa

hypoplastic frontal sinuses

caused by disturbance of the prosencephalic induction center at critical phase of development

Goal of surgery: increasing the length of the nose and the projection of the nasal tip

LeFort 1, LeFort 2 or a combination of both.

Cerebral salt wasting:

renal sodium and fluid loss after intracranial surgery

leading to negative sodium balance and volume contraction

responds to fluid and salt replacement

increase urine output

The gold standard for calvarial defect is split calvarial bone grafting

Cleft number 5 involves the lower eyelid

Tessier cleft:

midline and paramedian: 0-14, 1-13, 2-12

oro-nasal-ocular 3-11, 4-10, 5-9

lateral 6,7,8

Cleft 0-6 below the orbit

8-14 above the orbit

7 true lateral

number 7 is the most common cleft in the region of zygomaticotemporal suture: macrostomia and hypoplasia of the zygoma

Van Der Woude:

 AD

lower lip pits: are accessory salivary glands

cleft lip, palate or both

high arched palate

hypodontia

with or without missing second premolar

most common single gene syndrome causing cleft lip and palate

IRF-6 on chromosome 1

Account for 1% of of syndromic cleft palate

orofacial clefting

popliteal pterygium

Kleeblattschädel deformity:

multisuture craniosynostosis

coronal, lambdoid and part of sagittal

can result in significant increase in intracranial pressure: produce moth-eaten skull

Neurofibromatosis is associated

with pulsatile exophthalmos and absence of greater wing of sphenoid

due to brain herniation through the middle cranial fossa into the orbit. vertical dystopia

surgery includes reduction of the temporal lobe into the middle cranial fossa and reconstruction of the sphenoid bone with titanium mesh and bone grafts

most common tumors are neurofibromas and optic glioma

plexiform neurofibromas are found in 25% of patients

Neurofibroma consists of a network of neurofibroma tissue and grows along the length of the nerves

7-13% risk of malignant peripheral nerve sheath tumor (MPNST) from pre-existing plexiform neurofibroma, rapid growth is indication for biopsy

Coronal craniosynostosis:

superior displacement of the lesser wing of sphenoid secondary to synostosis of the coronal suture

harlequin sign on xray: radiographic appearance of oblique opacity from inferior, medial, to superior and lateral through the orbital aperature

possible strabismus due to paresis of the superior oblique muscle

flattening of the forehead and frontoparietal region on the ipsilated side

bulge in the opposite frontoparietal skull

**ear anteriorly displaced**

**nasal radix towards the fused side**

**tip of the nose towards the opposite side**

petrous part of the temporal bone that contains **glenoid fossa is displaced forward**

flattening of the forehead and occiput on the same side

**widening of the ipsilateral palpebral** fissure

superior and posterior displacement of the of the supraorbital rim

**higher ipsilateral ear**

the anterior fontanelle displaced away from the affected suture

FGFR3 mutation on chromosome 4.16 causes unicoronal synostosis

FGFR regulate cell growth and bony proliferation

does not affect the occlusion

**shortening of the orbital roof** on the affected side which results in strabismus due to **paresis of the superior oblique muscle** (eye covering can resolve the head tilt)

Metopic suture craniosynostosis:

closes at 8 months

trigonocephaly

bifrontal narrowing

biparietal widening

hypotolerism

trigonocephaly

wedge shaped skull

keel-shaped skull

decreased interorbital distance due to inhibited perpendicular growth to the suture

associated with abnormalities of **corpus callosum**

children with trigonocephaly: higher incidence of developmental delay

Age of onset correlates with the with the degree of bony hyoplasia in Parry Romberg syndrome

Lambdoid craniosynostosis:

flattening of one side of the occiput

**ipsilateral mastoid bossing**

protuberance of the contralateral side

**posterior** displacement of the **ipsilateral ear**

posterior plagiocephaly

Tx: posterior vault expansion and remodeling

No Tx: increased ICP

Causes trapezium shaped skull with occipitoparietal flattening

growth parallel to the fused suture: contralateral parietal bossing

Velocardiofacial DiGeorge: medialization fo the internal carotid arteries

Neural crest cells from ectodermal layer give rise to craniofacial region and conotruncal endocardial cushions (which separates the aortic and pulmonary tracts) the cardiac septum. this association happens in treacher collins, Pierre Robin sequence, Di George and oculoauriculovertebral syndrome

Sagittal craniosynostosis:

biparietal narrowing

scaphocephaly

frontal bossing

occipital coning

McCune -Albright syndrome:

polyostotic fibrous dysplasia: most commonly skull, long bones and ribs.

On skull may cause impingement of the optic nerves, mass effect on brain or disfigurment

precocious puberty

cafe au lait spots

low nasal bridge

short neck

Pamidronate: bone resorption-inhibiting bisphosphonate

Autosomal dominant

mutation affecting receptor binding to adenylate cyclase

DiGeorge 22q11.2 deletion: Velocardiofacial syndrome, also called Shprizten

AD

cardiac: VSD, TOF, right-sided aortic arch

renal immune

speech

feeding

mental health

developmental delay

cleft palate: submucous or complete

calcium regulation issues

monitor for post-operative hypocalcemia

Broad prominent nose

malar flattening

narrowing of palpebral fissure

small ears

epicanthal folds

retrognathia

vertical maxillary excess

MRA to look at carotid vasculature: medialization of internal carotid

FISH to diagnose

Endoscopic-assisted wide strip craniotomy: 6 months

spring-mediated cranioplasty: 9 months

Bicoronal craniosyniostosis: crouzon, pfeiffer and apert

VACTERL:

vertebral defects

anal atresis

cardiac defects

TE fistula

renal anomalies

limb anomalis

Syndactyly:

Apert

Down

Carpenter

Webbing of the neck:

-Noonan

-Klipper-Feil: congenital fuisoon of any two of the severe C-vertebrae, short neck, low occipital hairline, restricted mobility of upper spine, celt palate

-Turner

TESSIER No. 7:

most common

failure of fusion of the **maxillary and mandibular processes of the first pharyngeal arch**

macrostomia repair in first month of life

**duplicate maxilla with macrostomia**

**supernumerary teeth**

mandibular/condylar anomalies

alveolar clefting

**zygomaticotemporal suture**

through the lateral zygomatic arch

Traverses the **maxillary second molar**

Characterized by incomplete development of external and middle ear, mandible, zygoma, maxilla, temporal bone, parotid gland, tongue and musles of the palate, mastical and fiacla expression

LeFort III:

**limit is 10-12 mm** limited by soft tissue advacement

Distraction osteogenesis: **up to 30 mm**

HIV-lipodystrophy:

**protease inhibitor treatment for over one year**

peripheral wasting

facial fat atrophy and central adiposity

TESSIER #0-14

medial craniofacial dysraphia

they have failure of closure of foramen cecum

involves midline of the upper lip and nose

#14 is the cranial extension

Tessier #9:

the least common

extends from the superolateral orbital into the temporal region

Hemifacial microsomia:

**increased risk of VPI**

thought to be due to vascular injury: occlusion of **stapedial artery or development of hematoma**

no genetic component

affect the f**irst and second branchial** arch

also includes Tessier #7: Characterized by incomplete development of external and middle ear, mandible, zygoma, maxilla, temporal bone, parotid gland, tongue and musles of the palate, mastical and fiacla expression

lack of formation of the mandibular ramus and condyle

during 30-45th day of pregnancy

VPI in 15% of patients with hemifacial microsomia

OMENS: orbital, mandibular, ear, nerve and soft tissue

**Macrostomia** should be the first to be repaired within the first few months of life

skeletal repair done at age 5-6 yrs: **mandibular deformities first then maxillary defects then soft tissue after finishing reconstruction** of the skeleton

Most common facial anomalies:

mandible 89-100%

Ear 66-99%

vertebrae and ribs 16-60%

Ipsilateral facial nerve 10-45%

genitourinary 4-15%

Orbital hypertolerism:

increased distance from dacryon (junction of frontal, lacrima and maxillary bones) to dacryon.

Interorbital hypertolerism:

the distance between the medial orbital walls is increased but the lateral orbital walls are in the normal position

Telecanthus: increased distance between the medial canthal ligaments but the interorbital distance is normal

Anterior and posterior hillocks: form the external ear

cleft lip: maxillary prominence and medial nasal prominence

Frontonasal prominence: central forehead, nasal and perinasal structures, central portion of the upper lip and the premaxilla

Paget disease:

osteitis deformans

enlarged deformed bone

3rd and 4th decade of life

alkaline phosphatase

Proteus syndrome:

atypical development of bone and skin overgrowth

ext rare

Renal osteodystrophy:

bone mineralization def

electrolytes and endocrine abnormalities

chronic kidney diseas

Suture closure:

Metopic: 6 months

Sagittal: 22 years

Coronal: 24 years

Lambdoid: 26 years

Squamosal 35 years

Sagittal craniosynostosis:

**endoscopic correction** with synostectomy and microfracturing of the parietal bones and postoperative **orthotic use**

ideal time 2-4 months

TESSIER #4:

from upper lip

around alar base

along nasomaxillary junction

across tear duct and medial orbital tissue

TESSIER #6:

disrupt the soft tissue and bone along the lateral lower eyelid

associated with colobomas

extend to involve the frontal bone

TESSIER #10:

superior orbital rim and medial third of the orbit

Vertical maxillary excess: Long face deformity or long face syndrome

excessive length of the lower third of the face

vertical maxillary hyperplasia

malocclusion

retrusive chin

gummy smile

lip incompetence with the lips in repose: mentalis strain

large interlabial gap

excessive maxillary incisor show with the upper lip at rest (normal maxillary incisor show 2-3mm)

nasolabial angle is obtuse

alar bases are narrow and constricted

Class II malocclusion with anterior open bite

Chin is long and retruded

decreased SNA and SNB (they are both increased in vertical maxillary deficiency with class II malocclusion)

type II malocclusion is most common

Treatment is LeFort I osteotomy with superior repositioning of the maxilla and genioplasty

Pierre Robin sequence:

retrognathia

posterior and elevation position of the tongue in the oropharynx

failure of fusion of the palatal shelves: cleft palate

if left untreated: patient will have failure to thrive, chronic hypoxemia and cor pulmonale

PRS can result from either:

malformation in Stickler syndrome

Disruption: amniotic band syndrome

deformation: oligyhydramnios

Stickler syndrome:

hereditary arthro-ophthalmopathy

Most common syndromic cleft palate: 25% of all syndromic cleft palate occur in Stickler

flat facies

spondyloepiphyseal dysplasia

associated with cleft palate

40% of PRS

caused by one of 3 collagen mutations

Abnormal formation of collagen II

COLD2A1

Ocular manifestations: retinal detachement, myopia, blindness

facial abnormalities: flat nose, small mandible, cleft palate

hearing loss

degenerative join disease

Nager syndrome:

acrofacial dysostosis

AR

craniofacial and upper extremity abnormalities

hypoplasia of zygoma, maxilla, mandible, soft palate

auricular defects

hypoplasia or agenesis in the radius, thumbs and metacarpals

radioulnar synostosis and elbow joint deformities

Short stature

cleft palate

acrofacial dysostosis

Mobius syndrome:

congenital facial diplegia

abnormal ocular abduction (strabismus)

weakness of CN 6,7

mask like appearance is pathognomonic

Limb abnormalities: club feet, syndactyly and rudimentary fingers and toes in 25%

Other CN nerves that can be involved: 3,5,9,11,12

Klippel-Tranauny syndrome:

port-wine stain

varicose veins

bone and soft tissue hypertrophy involving an extremity

Dermoid cyst:

nasal dermoids: most common congenital nasal mass

most dermoid cyst in the lateral eyebrow or midline glabellar region

intracranial communication should be ruled out with CT scan

grow slowly

intracranial: increase intercanthal distance and broadening of nasal root

When there is intracranial component, it requires transcranial and local excision

In pediatric patients: 3 subgroups

brow region

orbital region

nasoglabellar region

most located in the lateral brow region

brow and orbital do not have intracranial extension and can be excised locally

10-45% of nasoglabellar dermoid cyst have sinus tracts and occasional intracranial extensions: need MRI or CT scan

frontotemporal dermoid may also have intracranial extension

Hemangioma increase when crying

encephalocele: soft and increase size when crying and also most common site is the occiput in America, in asia more common in frontoethmoidal region. prognosis depends upon the presence or absence of herniated brain tissue

Angle Occlusion classification:

Class I: mesiobuccal cusp of the maxillary first molar with the mesiobuccal groove of the mandibular first molar

Class II: alignment of the buccal groove of the lower first molar distal to the mesiobuccal cusp of the upper first molar

Division I: with flaring of the maxillary incisors and increased overjet

Division II: ligually displaced maxillary teeth with excessive labial inclination of the maxillary central incisors

Class III: alignment of the buccal groove of the mandibular first molar mesial (anterior) to mesiobuccal cusp of the upper first molar

Fibrous dysplasia:

bony dysplasia

localized bony deformity (ground glass appearance on CT)

Monostotic

Polyostotic in McCune-Albright syndrome

Carpenter syndrome: acrocephalopolysyndactyly

rare AR

**RAB23 gene**

brachycephaly due to variable synostoses

cardiovascular, musculoskeletal and genital systems

craniosynostosis: **lambdoid  and sagittal**

shortened fingers

**soft tissue syndactyly**

**preaxial polydactyly**

congenital heart disease hypogenitalism

obesity

umbilical hernia

Ectordermal dysplasia:

x-linked recessive

hypoplastic skin and sparse dermal appendages

Virchow’s law:

growth is restricted perpendicular to the suture and accelerated parallel to that suture

Tongue-lip adhesion:

In PRS

to improve airway

The papilla of the parotid duct is adjacent to the second maxillary molar: via Stensen’s duct

Bell’s palsy: demyelinating inflammatory process of the facial nerve

Facial nerve VII: comes from second branchial cleft arch:

 exits the skull from stylomastoid foramen

contains motor and sensory nerves

auricular branch separates before the parotid gland

Tessier #1:

just lateral to midline

begins at Cupid’s bow

continues to nasal ala passing through the dome

lateral to anterior nasal spine

septum unaffected

hypertolerism and encephalocele maybe associated

Tessier #2:

exceedingly rare

Tessier #5:

begins behind the canine

extends through maxillary sinus to the orbital floor

colobomas of the lateral lower eyelid

clefting of the upper lip medial to oral commisure

Tessier #9 is the suraorbital extension

Mandibular distraction osteogenesis:

central region of the gap: fibrous zone

transitional zone adjacent to fibrous zone: fibrous tissue undergoing ossification

zone of remodeling bone

then zone of mature bone

Chondrocytes are presents only when there is excessive motion

TGF-Beta: found in animal models to be associated with fusion of cranial sutures

Also b-FGF

Anterior fontanelle: closes between 18-24 months

Posterior fontanelle: closes at 2 months

Glioma: does not transilluminate

Encephalocele: transilluminate, compressible and increases when the baby is crying

Risk of complication of LeFort 3:

20%

Frontal sinus is expected to be seen at the age of 6 years

including in patients who had FOA for metopic craniosynostosis

Most common cause of scaphocephaly without craniosynostosis is:

prematurity (positional plagiocephaly)

Successful midface distraction with LeFort III:

decrease SNB

increase ANB

increase upper airway volume

decrease negative overjet

Decreased exorbitism

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| **In-Service Questions Notes: Microsurgery** |

Mechanism of action of tPA:

cleavage of plasminogen to plasmin

Plasmin is a direct fibrinolytic

Heparin mechanism of action:

activation of antithrombin III

inactivates thrombin and factor Xa though an antithrombin dependent mechanism

Activated Protein C:

inhibits factor V and VIII

Near-infrared spectroscopy: NIRS

continuous monitoring of tissue oxygenation and perfusion

measures the relative changes in the concentration of oxygenated hemoglobin and deoxygenated hemoglobin

StO2: the **percentage of tissue that is oxygenated**

it measures both venous and arterial

reflects both oxygen delivery and consumption

The main advantage of tissue oximetry over hand-held doppler:

improved flap salvage rate

it measures the relative concentration of oxygenated and deoxygenated blood

it measures tissue oxygenation rather than flow:

less susceptible to artifacts

Effect of vasopressors:

no increased in flap complications

Sympathetic denervation: due to flap transfer, sympathectomy with adventitial removal and topical use of vasodilators such as papaverine or nicardipine

PAP flap:

pierces the adductor magnus

Parascapular flap:

consistent and persistent septocutaneous perforator between the triceps, teres major and teres minor

The use of tPA with re-doing arterial microanastomosis vs. no tPA:

decrease incidence of fat necrosis

no effect on flap salvage rate

no risk of hematoma

Papaverine:

works by inhibiting Phosphodiesterase

increase in cAMP

causing smooth muscle relaxation

Nifidipine:

calcium channel blocker

Advantage of end-to-side anastomosis:

preserve perfusion distally

Multiple explorations have been shown to be predictor of unsuccessful free flap salvage

Higher free flap salvage is observed when vascular compromise occurs early

Patients with BRCA1 and BRCA2 gene mutation have not been shown to increase thrombotic risk of free flap

Arterial thrombosis results in lower salvage rate that venous thrombosis

more likely to be associated with endothelial injury than venous thrombosis

Aspirin:

inhibits cyclooxygenase

decrease formation of thromboxane

Dextran:

decreases platelet aggregation by altering the electric charge of platelets

decrease blood viscosity

acts like a volume expander

Hirudin:

inhibits thrombin

Heparin:

activates antithrombin III and inhibits thrombin and clotting factors 9, 10, 11, 12

Streptokinase:

activates plasminogen to plasmin

Plasmin breaks down fibrin

Systemic thrombolytics should not be administered for flap salvage

The only proven benefit of venous coupler:

decreasing operative time

Vascular compromise to a flap occurs within:

0-1 days

When exploring flap for thrombus in artery and vein:

after thrombectomy: inject intra-flap tPA injection

Heparin: prevents further clot formation

Dextran:

causes acute renal failure

can also causes anaphylaxis

volume overload

pulmonary edema

most serious ARDS

cerebral edema

platelet dysfunction

decreasing platelet aggregation

increasing fibrin degradation

inhibiting alpha-2 antiplasmin

decreasing factor VII and Von Willbrand factor; altering platelet function

act as volume expander

increased electronegativity of the platelets in the endothelium

prevent platelet aggregation

modify the structure of fibrin: increasing its suseceptibilty to degradation

has the potential for antigenicity

patients who are at risk:

DM

CRF: hence recommended to avoid giving Dextran

Vascular disorders

Rate of flap re-exploration: 5-25%

higher salvage rate if re-explored within 5 hours

Head and neck reconstruction with free flap:

first 12 hours has the highest rate of microvascular thrombosis

90% within the first 24 hrs

Success of anastomotic patency: depends on **surgical skill**

no effect of anticoagulation

no effect of end to side vs end to end

no effect of running vs. interrupted

no effect of loupes vs microscope

Question #26: coding question

The most sensitive method to detect early anastomotic thrombosis:

implantable doppler monitoring of the gastroepiploic vein

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| **In-Service Questions Notes: Skin, fat and cartilage graft** |

The highest degree of pain from dressing at the skin graft donor site:

xeroform: considered non-moist dressing

infection and cosmetic results are not different with different dressings

The application of wound VAC over integra:

results in increase in matrix take

increased take from 78% to 98%

The interval to skin graft decreased from 24 to 10 days

hence decrease in hospital stay

Cancellous bone graft vs. Cortical bone graft:

Improved osteogenic potential

Cancellous have more osteoblasts and osteocytes therefore superior osteogenic potential

Cortical bone:

dense with significant structural support leading to improved stability

slower resorption compared to cancellous bone

lower concentration of osteoblasts and osteocytes thus lower osteogenic potential

Non-vascularized bone autografts:

cancellous

cortical

bone marrow aspirate

Bone autograft:

gold standard due to

immunogenic capability

osteoinduction

osteoconduction

osteogenic healing properties

The most appropriate material to reconstruction cranium:

cranial bone grafts

in the operative field

least likely to resorb

however, difficult to splint in young childern because the diploic space is not developed yet until the age of 5 yrs

Autologous bone graft for cranium reconstruction is preferred in pediatric patients

As the bone osseointegrates and grows with the child

Alloplastic: can get dislodged as the cranium is growing and can also restrict brain growth

Iliac and rib:

graft resorption

significant donor site morbidity

The most effective strategy to improve long-term viability of fat grafts:

inject fat with low-shear device

Harvest site has nothing to do with it

Lidocaine inhibits growth and metabolism of fat but effect is gone once lidocaine is removed

no difference harvesting with syringe or suction device

no evidence that centrifugation affects the viability of the cells

injection with large cannula improve fat viability

Vascularized bone graft:

heal by **osteogenesis**

involve the formation of new bone by osteoblasts from both the flap and recipient site

Non-vascularized cortical bone grafts:

healing by osteoconduction or creeping osteogenesis

the bone acts like a template for the ingrowth of cells and blood vessels from the recipient bed

Cancellous bone graft and deminieralized bone matrix:

osteoinduction

in this process: bone morphogenetic protein stimulates mesenchymal cells at the recipient site to differentiate into osteoprogenitor cells

Vascularized bone graft:

advantage: ability to place in hostile environment such as irradiated wound bed and immediate structural support with shortened time to bony union

Endochondral ossification:

the process in which a soft cartilage callus covering the fracture becomes ossified

Neovascularization of osteoconduction of cortical bone is complete by 6-8 weeks

the ultimate strength not seen until 6-12 months: at which it is comparable to vascularized bone graft

Healing of skin graft donor site and formation of multipotent stem cells:

starts from hair follicles

stem cells reside in the bulge area of the hair follicle

The most common complication of fat grafting:

fat resorption

Volume retention: 50-80%

Skin grafting of the wound:

must be clean of all necrotic tissue and eschar

split-thickness skin graft results in higher skin graft take

avoid shear force

Factors that improve the success of fat grafting:

grafting soon after harvest

the longer the fat is exposed to room temperature, the lower the adipocytes viability

there is complete loss of stem cells viability within 4 hrs at room temperature and 24 hrs at 4 C

No evidence that centrifugation or rinsing increases fat viability

no evidence of enhance fat survival based on location of harvest

less mechanical trauma and low-shear harvesting improved the viability

The healing process using hydroxyapatite for cranial reconstruction:

Osteoconduction

Autologous bone graft is the gold standard for cranial reconstruction:

low risk or rejection and infection

Have several drawbacks:

unpredictable resorption

donor site morbidity

limited availablity

prolonged surgery

The ideal bone substitute:

chemically inert

easily contoured

stable shape overtime

strong

resistant to infection

inexpensive

able to osseointegrate

MMA has issues with

infection

plate fracture

lack of osseointegration

difficulty shaping after polymerization

necrosis of the surrounding tissue due to exothermic reaction

Placement of integra:

need to eliminate polymicrobial infection

exposed bone and tendon are not contraindicated

Skin graft take:

Imbibition: the first 48 hours: diffusion of serum in the first 48 hours

Followed by second stage: revascularization and inosculation: 4-5 days for vascularization

max flow at 29 days

Inosculation: the process in which blood vessels from the recipient bed connect with blood vessels from graft

Primary contraction:

due to recoil of elastic fibers within the dermis

full-thickness skin graft has higher primary contracture than split thickness

Secondary contraction:

due to myofibroblasts

occurs in grafts with thinner dermis (such as split-thickness)

larger dermal component appears to suppress  proliferation of myofibroblasts

For donor site of skin graft:

Alginate dressing with occlusive dressing is best:

absorptive, non-adhesive, antibacterial and moist environment for wound healing

Split thickness skin graft:

less metabolic demand than full-thickness skin graft

Placement of fat graft in small aliquots:

increases the availability for vascularity and creating a lattice-like framework

Advantages of integra:

improved cosmesis

diminished scar contracture

development of hypertrophic scar

off the shelf availability in large quantities

increased elasticity

ability to use thinner skin grafts

Disadvantages:

high cost

steep learning curve

2 stage surgeries

Ribs: 5-7 are idea donors for cartilage for nose reconstruction

7th rib: added advantage of being situated over the abdominal wall

less change of pneumothorax

ribs 5-6: in women can hide in inframammary crease

Split-rib offers the advantage of bone regrowth and the area can be re-harvested in the future

Rib can provide both cancellous and cortical bone

The most consistent complicartion of cartilage grafting:

the propensite to change shape or warp over time.

due to presence of perichondrium or due to non-uniform composition of the matrix which can affect the shape when it is placed

grafts with perichondrial layer will curl and the shape is unpredictable

When harvesting the septal or auricular cartilage:

must remove the perichondrium and the outer cartilage layer to get to the more solid layer

Bilaminate neodermis: Integra

outer silicone layer

inner bovine collagen and glycosaminoglycan (from shark) that act as a scaffold

host fibroblast will migrate to the matrix

then they produce collagen

followed by vascularization and formation of neodermis

this process takes 4 weeks without wound VAC

This process can be accelerate to 7 days if wound VAC is applied

When they place integrs: the answer might be skin graft

also pay attention to the site of defect and if a pedicled one would reach or not

Gerdy’s tubercle: lateral tibial tubercle: the cortical window is made just proximal and medial to tibialis anterior origin

on the proximal lateral tibia

excellent source of cancellous bone

Gerdy’s tubercle is located between the lateral tibial tubercle and patellar tendon insertion to the medial side and the head of the fibula to the lateral side

bone is harvested through 3-4 cm oblique incision

There is similar risk profile in HIV-positive patients requesting facial rejuvenation because with fat grafting to the normal HIV-negative population

no risk of higher resorption rate

Warping of the cartilage can occur over period of weeks or months

Cartilage is composed of hyaline and elastic with only 1-10% cells so can easily survive transplantion

Early contour deformity can occur due to malposition but after 6 months due to warping

Hydroxyapatite (HA)

has the ability to osteoconduction and osteoinduction

PMMA:

extreme exothermic reaction

deleterious to bone and soft tissue

need vigorous saline irrigation

Titanium:

osseointegrate but not osseoconduct

Bone allograft:

can be used to nasal reconstruction

Iliac bone crest:

has osteoinductive and osteoconductive propreties

Bone morphogenetic protein:

osteoinductive only

faster surgery

no donor site morbidity

greater volume of material

Not approved for kids less than 12 yrs old

need a carrier such as demineralized bone putty

A patient that presents to clinic with microabscese, erythematous nodules and areas of induration like 5 weeks after fat grafting to the face

PCR for nontuberculous

Most fat retention after fat injection at 6 months about 64% +/-11

Apligraf:

stimulate wound healing by release of matrix proteins

bilayered constructs of bovin collagen and human keratinocytes and fibroblasts

the viable cells in the contruct release and stimulate growth factors and matrix proteins to encourage wound healing

The skin on the palm has specialized encapsulated nerve endings called Meissner Corpuscle in the dermal papilla and Vater-Pacini corpuscles in the deep dermis

these are unique for glaborous skin

(dermal neural mechanoreceptors)

Any transplant from another human called: Allograft

Isograft: from genetically identical donor such as identical twin

Morbidity from auricular cartilage harvest:

early: hematoma and sensory impairment

late: sensory impairment

overall confined to concha

Cauliflower ear:

long-standing loss of blood supply to the ear cartilage and formation of neocartilage from disrupted perichondrium

seen with auricular trauma and never from harvesting for grafting

Autogenous bone graft:

once healed, they have the same properties as the native bone in terms of strength, growth potential, stability and resistance to infection

In pediatrics: other site for bone grafting are little volume and more resorption compared to cranial bone

Cranial particulate bone grafting can be harvested when the diploic space is not formed yet (before age of 4 yrs and by some 9 yrs)

they provide same long term as effective as split calvarial bone

Fat grafting in Parry Romberg is not adequate for one setting

In a severely burned patient:

can use integra to improve cosmesis and reduce contracture and hypertrophic scarring in burn patient

To optimize skin graft take: #49 bad question

most important aspect: meticulous hemostasis

Cultured epidermal autografts:

keratinocytes from patient are taken and expanded over tissue culture within 2-3 weeks

there is no dermal matrix: hence grafts lack elasticity of normal skin or STSG

results in wounds that are stiff with limited mobility around the joint and face

easy shearing and frequent blistering

high cost and delay in availability of tissue

Cartilage graft with perichondrium:

curls and causes warping

Occlusive dressing:

Duoderm (can be the answer if semi-occlusive is not in the options)

Semi-occlusive dressing:

Tegaderm

Opsite

Semi-open dressing:

Xerform

The superior dressing for skin graft donor site:

semi-occlusive dressing

fastested healing time: 9 days to re-epithelialization

lowest pain score

lowest infection rate

some fluid accumulates and promotes wound healing

Healing of the donor site is inversely related to the thickness of the harvested skin graft

Placement of skin graft:

first 24 hours: serum imbibition

after 24 hrs: edema for about 30%

by 24 hours: donor site vessels begin to invade the graft: process called inosculation

Circulation is established by 4-5 days at the earliest

graft maturation and collagen turnover occur over weeks to months

To reduce the risk of warping of cartilage:

insertion of the graft at least 30 mins after carving

wait at least 30 mins after carving the graft to allow initial warping to occur

the majority of warping occurs within 30-60 mins

suture fixation does not prevent warping

Scoring of the graft will result in warping of the graft

central cuts of the cartilage graft are less likely to warp than peripheral cuts

Cancellous bone vs. cortical bone:

More osteoconductive

More osteoinductive

More quickly revascularized (within 2 weeks of grafting)

More easily remodeled

Ideal for bridging bone grafts less than 5-6 cm

Lack of structural rigidity until 6-12 months after grafting but generally as strong as cortical bone grafts

One of the steps taken to minimize warping of the cartilage when using cartilage graft for

Alloderm:

can be used for correction of retraction of the lower eyelid after blephroplasty

The best donor site for delayed multiple harvesting of STSG:

The back

The number of times harvesting from a donor site depends on the thickness of the dermis

Autologous cancellous:

exhibits the greatest inductive capacity

they contain morphogenic proteins that stimulate bone growth

The use of dermal regeneration template (integra) instead of thin split-thickness skin graft

improved cosmesis

wound contracture is less

does not eliminate donor site morbidity

but skin graft in the second stage is thinner

The graft that has minimal resorption and loss of volume:

cartilage

lowest metabolic rate

Free vascularized bone graft:

does not rely on creeping substitution as a mode of remodeling

All nonvascularized bone graft undergo a degree of resorption and remodeling including creeping substitution and have some degree of inductive capacity

The only biologic dressing that contains human only-derived materials:

Alloderm

The main advantage of using integra:

the use of thinner skin graft

(revascularized in two to three weeks) and allow for fibroblast ingrowth into the dermal replacement layer

Osteoinduction:

the process in which tissue induces cellular differentiation through their actions on each other.

Bone morphogenetic protein is stimulated to induce the transformation of perivascular mesenchyme-like cells

Endochondral ossification:

formation of new bone within a hyaline cartilage framework in the epiphysis of the long bones

Membranous ossification:

Bone formation for bone formation in the cranial vault and face

the process involves the condensation of mesenchymal tissue

Wolff’s law:

The factor critical to the long-term survival of grafted bone: stress

Stress is necessary for preservation of the strength and volume of grafted bone

Side notes:

membranous bone has longer longevity compared with endochondral grafts

preservation of intact periosteum increases graft survival at all stages of transplantation

Lip augmentation using ADM:

submucosal placement along the wet/dry vermillion border of the lip

Full-thickness skin graft is expected to grow with the child proportionally

Unilaminar skin substitute:

Have been proven to aid in wound debridement and fluid absorption

decrease bacterial count within the wound

fluid absorption

Mechanical protection provided by synthetic material is poor

Bovine collage is injected into dermis

deeper: it will be absorbed

and if in the epidermis: then contour irregularities

Hydroxyapatite:

causes peripheral ingrowth of the bone

has osteoconductive properties

resulting ingrowth of new bone over several months

recommended for nonstress areas

Does not interfere with craniofacial growth in children

similar density to bone. No scatter on CT scan

Question number #76

very outdated I think

Full-thickness skin graft inhibits wound contracture:

dissolution of fibroblasts from wound bed

the percentage of dermis in full-thickness skin graft has the greatest effect on imbibition of wound contraction, rather than the absolute thickness of the total graft

The most common complication of fat grafting:

undercorrection

The most common complicatio of ADM use for lip augmentation:

resorption

Inection of fat in the glabella:

highest risk of fat embolism and blindness

The lowest count of bacteria that results in infected cultured epithelial autografts:

102-103

vs STSG 104-105

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| **In-Service Questions Notes: Wrist** |

Prophylactic anrtibiotics:

There is growing evidence that prophylactic abx are not indicated for clear plastic cases except Breast

Level 1 evidence that use of prophylactic antibiotics is not needed for clear hand cases lasting less than 2 hours

The vascular pedicle of medial femoral condyle:

runs posterior to vastus medialis (reflected anteriorly) and anterior to adductor tendon

Descending genicular artery is the vascular pedicle

pedicle length is 11 cm

pedicle is off the popliteal artery

can alternatively use the superficial descending genicular artery

High energy wrist injury to the wrist:

can cause perilunate dislocation

ligamentous only (lesser arc)

or bony (greater arc) and termed fracture dislocation

In type IV perilunate dislocation: from radial to ulnar

injury to SL ligament

disruption of lunocapita

injury of lunotriquetral

dislocation of lunate from its fossa at the radiocarpal joint volarly into the carpal tunnel

On PA x-ray: disruption of Gilula lines

on lateral: spilled teacup sign

For suspected scaphoid fracture:

always get x-ray first

MRI is good for ruling in

other test for ruling out

When planning for basal joint arthritis surgery:

Need to also assess STT joint arthritis

patients can continue to have symptoms if they have unrecognized STT joint symptoms

presence of carpal tunnel syndrome

thumb MP joint (if there is hyperextension)

must be evaluated for collapse or hyperextension particularly during pinch

failure to correct MP hyperextension, especially beyond 30 degrees will result in persistent pain and thumb collapse

X-ray for scaphoid fracture:

wrist in ulnar deviation 20 degrees

extension in  20 degrees

plain x-rays have 85% sensitivity

In a patient with perilunate dislocation s/p ORIF:

this patient will have evidence of post-traumatic arthritis and 80% of grip strength compared with opposite side

these evidence ranging from 50-100%

various degrees of SLAC, SNAC or avascular necrosis

radiographic evidence do not correlate with functional outcome

patients will achieve 65-70% flexion/extension and 80% grip strength

When doing closed reduction and casting: results are inferior

Non-displaced Scaphoid fracture:

not evident on x-ray

can be seen on CT scan

non-displaced distal pole and tubercle fracture:

immobilization for 6-12 weeks

CMC joint:

saddle shaped

Dislocation rare: 1% of all injuries

Stabilizing ligaments of CMCJ:

anterior oblique (volar)

ulnar collateral

intermetacarpal

dorsoradial and dorsal (posterior) oblique

Volar oblique and dorsoradial ligaments:

are the most resistive to dislocation in cadavers

CMC joint dislocation:

dorsal vector

injury to dorsoradial and posterior oblique ligament

most critical for restraints and injured in dorsal dislocation

Once reduced: must be placed in a splint or cast for 4-6 weeks

Some people say need closed reduction and K-wire placement

or open reduction, ligament reconstruction if treatment is delayed beyong 3 weeks

When there is x-ray of the hand:

make sure to look at SL interval

Scapholunate angle:

a line perpendicular to the distal surface of the lunate and along the axis of the scaphoid on lateral view

angle between 30-60 degrees

Tear in SL ligament:

scaphoid: volar flexion

Lunate: dorsiflexion (extension)

Resulting in increase in SL angle

If tear is left untreated: result is SLAC wrist

increase interval between scaphoid and lunate

with capitate descending into this intervening space

Arthritis occurs in:

radioscaphoid joint first

then scaphocapitate and capitolunate

Radiolunate joint is spared until later advanced stage

Basal joint arthritis:

trapeziectomy alone is equal to trapeziectomy with LRTI

but fewer complications

Watson classification of SLAC wrist:

Stage 1: arthritis between the scaphoid and radial styloid

Stage 2: arthritis between the scaphoid and entire facet of the radius

Stage 3: arthritis between the capitate and lunate

Stage 4: when the scapholunate is affected

Radiolunate is not affected by SLAC wrist

Osteoid Osteoma:

benign tumor of the bone

arises from osteoblasts

main presenting symptom is pain: focal at the site of lesion

CT is the best imaging study

Detects the nidus: radiolucent area

within the radiolucent nidus: a central area of high attnuation representing mineralized osteoid

The most appropriate imaging modality for proximal pole of scaphoid fracture:

MRI with gadolinium

for avascular necrosis of the proximal pole

Blood supply to the scaphoid enters distally then proceeds proximally

 therefore fracture of the proximal pole is the most difficult to heal due to distant blood supply

Ganglion cyst:

70% dorsal arises from scapholunate joint

20% volar arises from radioscaphoid, scaphotrapezial (STT)

10% arises from flexor tendon sheath

To minimize the movement between the scaphoid and the lunate:

Dart thower range of motion

from radial extension to ulnar flexion

bones of the proximal row: scaphoid, lunate and triquetrum remain stationary

motion occurs through the midcarpal joint

To visualize thumb joint subluxation:

best view is Eaton stress view

radial border of thumb phalanges pressed together

this assesses the laxity of the basal joint

subluxation of the thumb metacarpal on the trapezium

Check Question number 19:

Brewerton view: for metacarpal heads  to demonstrate degenerative disease or occult fracture

Bett (Gedda) view:

to visualize trapeziometacarpal head

used for visualizing metacarpal base fracture (Bennett’s fracture)

Roberts view:

trapeziometacarpl joint

does not show subluxation

Scaphoid oblique view:

ulnar deviation

beam angled 20 degrees distal to proximal

STT arthritis:

pain is more proximal than basal joint arthritis

no pain to grinding maneuver

imaging studies that show OA degeneration at STT instead of trapeziometacarpal joint

Treatment:

arthroplasty

arthrodesis

In a patient with occult scaphoid fracture:

place in thumb spica and repeat imaging in 2 weeks

or get other imaging studies

Patient presenting several months after falling from ladder and x-rays never show fracture

patient still has tenderness with radial deviation and painful clunk on palpation to scaphoid

think of SL instability

Stress view should be obtained: clenched-pencil view

wrist arthroscopy is the gold standard

(therapeutic procedures such as debridement and thermal shrinkage)

SL ligament:

the dorsal component of SLIL is the primary restraint to distraction, torsion and translational force

intact secondary stabilizers prevent changes seen on a normal static x-ray study such as SL dissociation and increased SL angle

Kienböck disease:

lunate collapse due to vascular insuffiency and avascular necrosis

wrist pain, loss of dorsiflexion and tenderness of the dorsal wrist over lunate

For detecting scaphoid fracture:

if x-ray does not show anything

then MRI

Before performing proximal row carpectomy:

need to make sure that the capilolunate articulation does not have arthritis and intact

because the capitate will rest on the lunate fossa of the radius

SLAC:

radioscaphoid

then scaphocapitate and capitolunate

Triquetral:

the second most common carpal bone to be fractured

Order of carpal bones fracture:

scaphoid

triquietral

trapezium

lunate

hamate need

In perilunate dislocation:

the initial injury that leads to dislocation of the lunate is:

scapholunate ligament

Question #29

In a patient who had a histroy of scaphoid fracture that healed with casting but continues to have dorsoradial pain, weak grip strength and reduced wrist extension:

all this suggest scaphoid malunion

need minimum of 45 intrascaphoid angle to surgically intervene

this angle is normally 30-40 degrees

Eaton classification for CMC arthritis:

Stage 1: widening of the joint due to effusion

splinting

anti-inflammatory meds

trapezial hemi-resection

metacarpal osteotomy

Stage 2:

TM joint narrowing and minimal sclerosis with articular surface

Stage 3:

TM joint narrowing with cystic or sclerotic changes in the articular surface

there is dorsal subluxation

adduction contracture

Stage 4: TM and ST joints completely destroyed

To view the hook of hamate fracture:

need carpal tunnel view

hyperextension of the wrist: displaying carpal bone to carpal tunnel relationship

can view the hook of hamate, pisotriquetral joint, palmar surface of the trapezium, pisiform and triquetrum

Widening of the SL gap:

Angle between the scaphoid and the lunate more than 60 degrees

Gap called : terry-thomas sign

Ring sign: found on the distal pole of the scaphoid moving relatively closer to the proximal scaphoid cortex

In perilunate dislocation: the following ligaments must be ruptured for lunate to rupture:

scapholunate ligament

lunotriquetral ligament

For CMC arthroplasty:

biomaterial most appropriate: Polyureathanurea (Artelon)

|  |
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| **In-Service Questions Notes: Chest wall/abdominal wall/Gynecomastia** |

Posterior component separation:

TAR: transverse abdominis muscle release

it preserves the innervation to the rectus muscle

allows for sublay muscle between the rectus muscle and the posterior sheath (retrorectus)

The anterior rectus sheath, external oblique and transversalis fascia are preserved

(unrelated: division of the internal oblique: divides the nerves going to rectus abdominis muscle)

Radiation:

causes the generation of oxygen free radicals

causing tissue injury and injury to progenitor cells

Radiation can cause:

osteoradionecrosis

skin ulceration

radiation-induced sarcoma

Negative pressure:

increases capillary blood flow

cellular proliferation

Hyperbaric oxygen:

giving 100% oxygen in pressurized chamber

lead to neovascularization and wound healing

Hernia repair:

recurrence rate about 20%

Lowest rate:

primary fascial closure with underlay mesh repair

retrorectus repair:

behind the rectus: Rives-Stoppa repair

Below the transverse abdominis muscle (TAR)

The most important predictor of hernia repair recurrence:

ability to make repair submuscular and close the muscle and the anterior rectus sheath

Bridging mesh repair is associated with 33% hernia recurrence when associated with bridging mesh vs. fascial closure at midline 6.2%

Skin dehiscence is increased in overweight patients but not hernia recurrence

Hernia recurrence is increased in pts with parastomal hernia

Pectus excavatum:

most common congenital chest wall deformity

1/400

more common in males

30-40% positive family history

etiology: multifactorial and increased incidence of congenital cardiac defects, connective tissue disease and scoliosis

Nuss Procedure and minimally invasive surgery for repair of pectus excavatum

Ideal timing for repair is 6-12 years

Breast development:

bilateral ectodermal thickening along the milk line or mammary ridge from axilla to the inguinal region

Failure of regression of mammary ridge results in accessory breast: polymastia or accessory nipples:l polythelia

Accessory breast tissue occurs in 1-2% of patients

most commonly in axilla

Inverted nipple:

due to failure of the mesenchyme to proliferate above the level of the skin

Poland syndrome:

abscence of the sternal head of pectoralis major

abscence of pectoralis minor

upper extremity abnormalities

hypoplasia of the breast and nipple

Brachysyndactyly

think about embryonic blood supply to the upper extremity

male: female is 3:1

right side predominance in boys 2:1

Can  have other abnormalities such as: absence of breast, nipple or areola

cardia anomalies can also be present

ipsilateral extremity is smaller or hypoplastic

there might be webbing of the fingers

abcense of anterior axillary fold

Most common neural tube defect is myelomeningocele

dorsal hernia of spinal cord and meninges dorsally through the vertebral body

results in motor and sensory deficit

prenatally: alpha-feto protein and US

Goal is infection prevention and protection of the spinal cord and CSF leak

Must be repaired within 24-48 hrs

Muscle flaps, fasciocutaneous flaps or both

repaired with local fascial flaps and skin advancement

no improvement in early neurological symptoms but there is improvement of neurogenic bladder

Prenatal reconstruction showed improvement of motor function outcome and decrease need for shunt placement

When there is deep sternal wound that needs to be filled:

omentuml flap is the best answer

Lateral thoracic artery is one of two dominant pedicles supplying the serratus anterior muscle

Skeletal reconstruction of the rib cage in chest reconstruction:

defect more than 5 cm

more than 4 ribs involved

Gynecomastia:

Grade 1: mild hypertrophy, no ptosis

Grade 2: moderate hypertrophy without ptosis

Grade 3: severe hypertrophy with grade 2 ptosis

Grade 4: severe hypertrophy with grade 3 ptosis: mastopexy with free nipple grafting

Gastroschisis:

3-4/10,000

ful-thickness

para-umbilical abdominal wall

with eviscerated bowel

Elevated MSAFP

abnormal karyotype in 1%

Omphalocele:

midline

partial thickness

covered by a membrane of amnion and peritoneum

Elevated MSAFP

trisomy 18, 13, 21, turner and triploidy

Cardiac tamponade after sternal wound washout:

beck triad:

muffled heart sound

hypotension

tachycardia

distended jugular vein

Pectus excavatum:

contour abnormality due to thoracic cavity and small portion due to breast hypoplasia or asymmetry

re-insertion of correction bars is not always successful

Do customized silicone elastomer implants in conjunction with augmentation mammoplasty

Desmoid tumor:

rare

locally infiltrative mesenchymal tumor

adolescents and young adults

does not metastasize

unpredictable and aggressive natural history

tx from observation to radical excision with wide margins

Mesoderm: Muscles of the trunk and extremities

Notochord: vertebral bodies and spinal cord

Endoderm: epithelium of the respiratory and GI tract

Ectoderm:

    Ectoderm: gives rise to epidermis, adnexal structures of the skin and mammary gland

    Neuroectoderm: CNS, neural ganglia and branchial arches

Component separation:

preservation of intercostal nerves is critical

make longitudinal incision in external oblique aponeurosis, just lateral to linea semilunaris

the segmental intercostal nerves run between the internal oblique and transversalis muscle

Pectoralis major muscle:

3 main blood vessels

Internal mammary artery perforators

thoracoacromial artery

lateral thoracic artery (in about 6% is the dominant pedicle) and needs to be incorporated

Posterior component separation:

vertical incision in the posterior rectus sheath about 0.5 cm medial to linea semilunaris

Continue laterally in avascular plane posterior to transversalis muscle

can extend as far posteriorly as the psoas muscle

if posterior layer cannot be approximated in the midline, patch of omentum or mesh can be used

non-absorbable mesh can be used in conjunction

benefit is the preservation of lateral neurovascular bundle

Biologic mesh:

degraded overtime by collagenase

hence higher recurrence rate than synthetic

The best way to distinguish gynecomastia from pseudogynecomastia:

physical examination

increased estrogen or decreased androgen

transient imbalance during puberty, medication use or drug use, testicular, thyroid or liver disease

Pseudogynecomastia: fat deposition in the breast throughout, no enlargement of subareolar tissue

most important thing when doing gynecomastia is to resect glandular tissue to prevent recurrence and give the best possible results, so do subtotal glandular resection

Prerenal failure:

UA is normal

BUN: Serum Cr > 20:1

Urinary Na concentration < 50

urine osmolaluity > 500

FeNa < 1%

Intrinsic renal failure:

normal BUN and serum Cr

urinary Na > 40

Urine osmolality < 350

abn. UA

Postrenal failure:

elevated BUN to serum Cr

FeNa > 1%

Normal UA

Omphalocele:

< 5 cm: component separation

If large and with diaphragmatic hernia: then need extended CS

Or staged procedure with tissue expanders

Waardenberg syndrome:

hearing loss

pigmentation changes of the hair, skin and eyes

Popliteal pterygium syndrome:

cleft lip/palate

webbing of the popliteal space

syndactyly of the hands and toes

Axillary web syndrome or cording:

after axillary node dissection

Pubertal gynecomastia:

best treatment is observation and reassessment

surgery is not recommended in the first 6 months of onset

Gynecomastia:

is benign proliferation of breast tissue in men

40-50% of men above 40

etiology:

excess circulating estrogen

decrease androgen

deficiency in androgen receptors

In middle-aged men:

increased aromatization of the androgen to estrogen

Leuprolide acetate (Lupron):

used in treatment of certain cancers such as prostate, endometriosis and precocious puberty

GnRH agonist: works on pituitary, decreasing FSH and LH, hence decreasing estrogen and androgen

Gynecomastia and breast tenderness are known side effects

Tx: tamoxifen which is Selective Estrogen Receptor Modulator

Radiation also decreases the side effects of Leuprolide

Galactorrhea:

Dopamine depleting drugs such as methyldopa

that cause receptor block such reglan

inhibit the release such as codeine and morphine

Histamine receptor blockade: cimitidine

Componenet separation:

release of fascial lateral to rectus abdominus

just lateral to linea semilunaris

dissecting the external oblique of the internal oblique

4 cm can be gained in the epigastric and suprapubic area

10 cm at the waist/umbilicus

least amount of advancement at the subcostal margin

neurovascular bundle to rectus muscle courses under the internal oblique

High mortality rate from deep sternal infections:

8-14%

For abdominal wall reconstructions:

need to make sure there is adequate skin and soft tissue: otherwise tissue expansion

Abdominal compartment syndrome:

vascular compression: decreased flow in IVC and increased renal vascular resistance

elevation of the diaphragm: decrease flow to IVC, increase intrathoracic pressure, decrease preload

direct organ compression: increased systemic afterload

For posterior vaginal wall defects:

abdominally based flaps are preferred

good bulk and surface area

Retrorectus mesh placement:

lowest rate of hernia recurrence

Drawback of ADM:

stretch about 50% of the original size

post-operative bulging is common

must suture it under maximal tension

also use porcine as it lasts longer

After abdominoplasty:

the area below the umbilicus and above the incision is the area that has the tendency the most to have decreases sensation

The anterior nerve branches of the 6-12 intercostal nerves between the internal oblique and transverse abdominus

Rigid chest wall reconstruction:

more than 5 cm defect

if 4 or more consecutive ribs

Lateral border of the breast:

anterior axillary line or slightly behind it

does not extend to the midaxillary line

Inverted nipples at birth:

observation as the mesoderm will proliferate during the first several weeks of life and case the inverted nipple to protrude

there may not be functional consequenceg

Grading system:

I: can be made to protrude manually and stay

II: nipple fail to maintain projection after manipulation

III: cannot be pulled manually

Tx: constricting the base of the nipple can create projection

myotomy

Anabolic steroids:

development of gynecomastia

increase conversion of testosterone to estradiol by enzyme aromatase

Superior epigastric artery:

from internal mammary vessels

Superficial inferior epigastric artery comes from the femoral vessel

Gynecomastia:

benign proliferation of glandular breast tissue

ductal epithelial hyperplasia

stroma and fibroblast proliferation

can resolve within 2 yrs

if persist above 21 then unlikely to resolve

Pseudogynecomastia:

breast enlargement secondary to fat deposition without glandular proliferation

Polymastia:

in the milk line

breast tissue is responsive to hormonal influence

cyclical pain coinciding with menses and with milk letdown

surgical excision is performed

Nipple inversion:

failure of the mesenchyme to proliferate above the level of the skin

Most common longterm complication of vaginal reconstruction:

vaginal stenosis

Brachial plexus injury:

thoracic intercostal nerve can provide graft material of 12 cm

minimal numbness

can be done open or endoscopic (harvesting)

The intercostal nerve leaves the spinal cord and splits into dorsal ramus

ventral ramus runs between the inner and innermost intercostal muscles before crossing over the internal thoracic vessels

Intrinsic thoracic chest muscles:

external thoracic

internal thoracic

innermost thoracic

transverse thoracic muscles

Ideal vaginal reconstruction:

adequate dimension

texture

appearance

sexual function

without excessive donor site morbidity

DIEP: non-hair bearing, insensate, less bulky

Pudendal flap (Singapore): thin, sensate, based on posterior labial arteries (from perineal artery), can cause hair growth in vagina

Dorsal nerve of the clitoris is a branch of the pudendal nerve:

lateral antebrachial nerve is attached to it

Lower abdominal wall reconstruction:

sometimes you need fascia for closure and if both rectus muscles are cut, then you can do pedicled ALT

Penile replantation:

deep dorsal artery (pudendal)

dorsal veins

dorsal nerves

Keep suprapubic cath for 2-3 weeks

**Post-sternotomy mediastinitis:**

0.2-8%

Risk factors:

obesity

Diabetes

advanced age

reoperation for bleeding

use of bilateral mammary arteries

Most common organisms: Staph aureus and epidermidis

Abx should cover MRSA and pseudomonas

**Vaginal reconstruction:**

posterior thigh flap:

based on the descending branch of the inferior gluteal artery (terminal branch of inferior gluteal artery)

proximal pedicle and provides abundant amount of soft tissue

good for anterior or posterior vaginal reconstruction

sensation based on the posterior cutaneous nerve (S1-S3)

allows the flap to be used as sensate flap

**Pudendal fasciocutaneous flaps:**

based on branches of the superficial perineal vessels (terminal branch of internal pudendal vessels)

superficial perineal nerve

**Component separation:**

aponeurotomy of the external oblique aponeurosis

Division of the external oblique is lateral to lineal semilunaris

(the lateral border of the rectus sheath)

Above the arcuate line:

the three layers split around the rectus muscle at the level of internal oblique

Below arcuate line: all three layers form the anterior rectus sheath and there is no posterior rectus sheath

**After release of the external oblique muscle:**

Trunk flexion is preserved by the preservation of nerves between the internal oblique and transversalis muscle

where the segmental nerve supply come from, in the plane between these muscles

**Blood supply to abdominal wall: (not well explained in this question)**

Mid-epigastrium: by the Deep epigastric arcade

Lower epigastrium: epigastric arcade and external iliac artery

flanks and lateral abdominal wall: intercostal, subcostal and lumbar arteries

**Unacceptable results of gynecomastia include:**

scarring

tethering and malposition of the nipple

Ultrasound assisted lipectomy improved the results

start liposuction deep for fat and fibrous tissue then transition to a subdermal plane to allow for skin retraction

disruption of the IMF will allow the skin to drape more naturally onto the abdomen

Feathering during liposuction does not improve contour

The most common **hyperplastic childhood breast anomaly:**

Gynecomastia first

then Juvenile hypertrophy

The likelihood of malignancy in **adolescents undergoing subcutaneous mastectomy for gynecomastia**:

1%

In a patient with APR, posterior vaginectomy, hx of irradiation:

VRAM is better

large skin paddle: can resurface perineum and vagina

robust blood supply

low donor site morbidity

**Anterior rectus sheath:**

Proximal to arcuate line:

anterior rectus sheath: composed of the external oblique aponeurosis and the anterior leaf of the internal oblique

posterior rectus sheath: deep leaf of internal oblique muscle, transverse abdominis muscle and transversalis fascia

At the level of arcuate line: the deeper leaf of internal oblique and the transversus abdominius aponeurosis travel superficial to the rectus abdominis muscle

**When harvesting TRAM and patient develops hernia:**

likely due to going below arcuate line where the anterior rectus sheath is weak

the deepest layer of anterior rectus sheath below the arcuate line is **Transverse abdominis aponeurosis**

**Above the arcuate line: internal oblique**

In a patient with longstanding gynecomastia: best next step is surgical excision

occurs due to transient alterations in estradiol levels

androgen-to-estrogen ratio is altered

Incidence 65% between 14-17 yrs

after 17 years of age: 7.7%

Prepubescent boys with gynecomastia: concerning

adult man with 6-months of unilateral gynecomastia: concerning

Kleinfelter syndrome: concern for cancer

**Poland syndrome:**

absence of subcutaneous tissue

anterior rib anomalies

subclavian venous abberancy and dysplasia of LD, supra and infra-spinatus muscle

Most consistent is absence of pectoralis major: total or partial

hypoplasia of the upper extremity: brachy-symphalangism

Amastia or hypomastia

Latissimus dorsi muscle is one of the main approaches used for breast reconstruction

can have absence of ribs on associated side

(one of the questions the answer was absence of 12th rib)

**Associated syndromes:**

Mobius syndrome

neuroblastoma

Wims tumor

myelomeningocele

leukemia

non-hodgkin’s lymphoma

**Cause:**

Unknown but could be related to vascular anomaly

Kinking of subclavian artery during 6th week of gestation

**Most likely adverse outcome of labioplasty:**

incomplete correction

Goal is for labia minor to be at the level or posterior to the labia majora

Avoid direct amputation-excision

Use inferior wedge resection with superior flap technique

**Acellular Dermal Matrix mesh (ADM):**

successful application in contaminated scenario

due to ability to revascularize

**Gynecomastia:**

Recommendation to wait for 12 months prior to intervention

The average male nipple diameter is **2.8 cm**

sternal notch to nipple is **20 cm**

**18 cm from midclavicular line**

**Ideal nipple to nipple is 21 cmx**

These numbers may change with obesity and weight loss

91% of men have oval shaped nipple

vertical to horizontal diameter **27:20 mm**

The center of the nipple-areola complex is found to be

fourth intercostal in 75%

fifth intercostal in 23%

**The surgical technique least likely to preserve innervation of the rectus muscle:**

Use of rectus muscle medial turnover flap:

this will divide the intercostal nerves

**Urachal sinus:**

a baby that presents shortly after birth with redness and drainage from umbilicus with pinpoint epithelialized tract

surgical excision to prevent future infection and potential malignant degeneration

Urachal cyst: closed from both ends, asymptomatic, present in adults as abdominal mass and can cause pain

**Omphalitis:**

infection of the umbilicus

polymicrobial

There is strong association between renal disease and polythelia:

should have UA and US

other issues with heart and GI system

Gynecomastia triple distribution:

neonates

early adolescent

advanced age

preponderance of estrogen over androgen

it is considered physiologic in this case

Do testicular examination and ultrasound

**Metformin:**

has not been implicated in the development of gynecomastia

Question #96: shows a list of meds that cause gynecomastia

**Amastia**: absence of breast and nipple

**Amazia:** absence of breast

**Athelia:** absence of nipple

**Poland syndome:**

absence of the sternal head of pectoralis major: most indicative of **POLAND SYNDROME**

absence of pectoralis minor

hypoplasia of the breast or nipple

deficiency of subcutaneous fat and axillary hair

syndactlyly

hypoplasia of the upper extremity

**Accessory breast tissue:**

from axilla to groin

most common in the axilla

**Ectopic mammary structures:**

found outside the embryonic milk line

Found midline of the face, ear, neck, back, buttock and outer thighs

Management of Poland syndrome:

first step is the placement of adjustable tissue expander

Do not rush into reconstruction until growth is completed otherwise the results will be asymmetrical

Once expansion is over, can be reconstructed with LD and prosthesis under it

Post-Sternotomy wound infection is classified according to the duration:

type 1: within one week, no bony involvement

type 2: 2-4 weeks, some bony involvement but no chondritis

type 3: months to years, with costochondritis, osteomyelitis and retained foreign body

Component separation gives:

10 cm epigastrium

20 cm umbilical

6 cm lower abdomen