













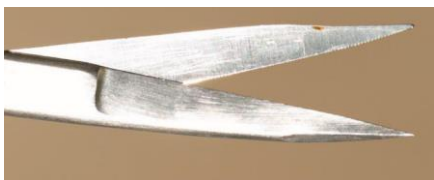

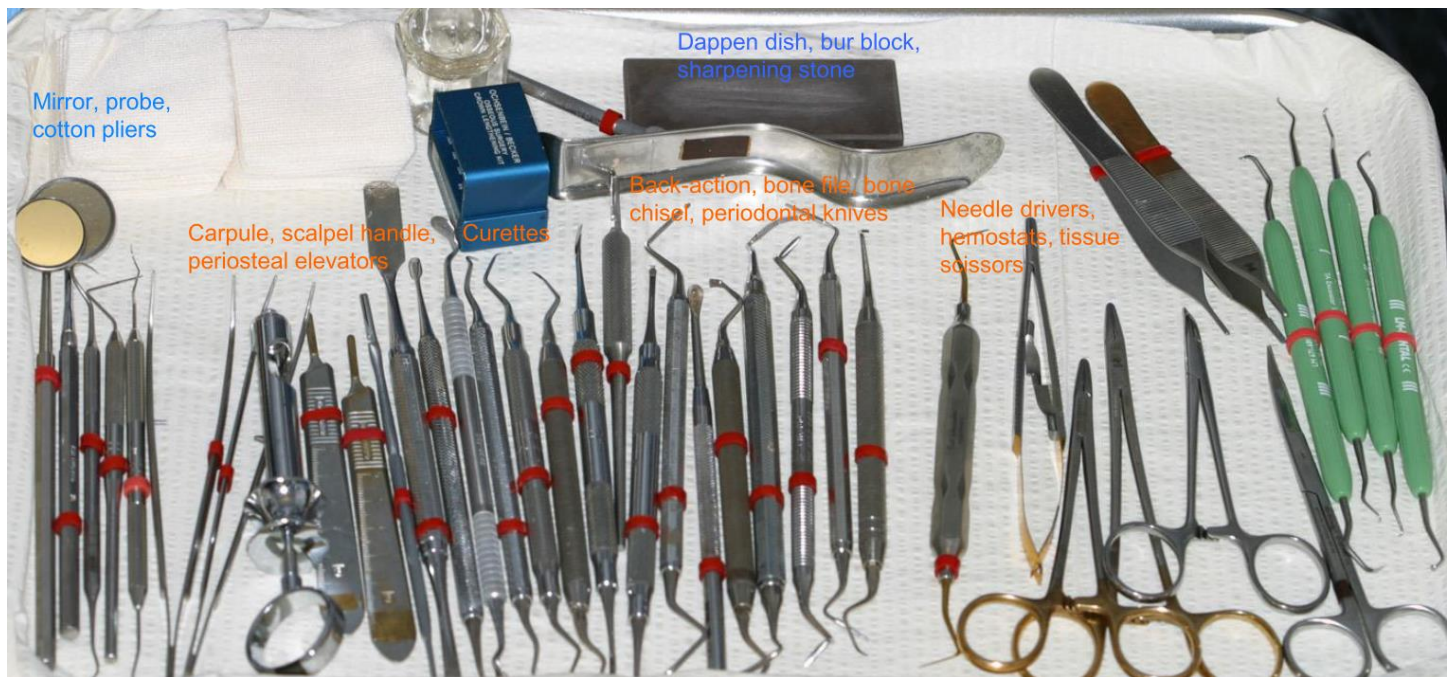


Principles of periodontal surgery

- Background
 - Definition of periodontal surgery: techniques that include intentional severing or incising of gingival tissues
 - Purpose
 - Controlling or eliminating periodontal disease
 - Correcting anatomic conditions that may favour periodontal disease, impair esthetics, or impede placement of prosthetic appliances
 - Goals of therapy
 - Elimination of infected pockets that have not responded to conservative treatment
 - Create conditions that guarantee efficient plaque control
 - Part of phase 2 treatment
 - Patient must be motivated with good plaque control
- Types of periodontal surgery
 - Pocket reduction surgery/Flap surgery
 - Eliminates a pocket wall, creates a stable and maintainable pocket, possibly promotes regeneration
 - Resective
 - Gingivectomy
 - Apically displaced flap
 - Undisplaced flap, but with/without osseous resection
 - Regenerative
 - Flaps with grafts, membranes, etc
 - Correction of Anatomic/Morphologic defects
 - Plastic Sx (techniques to widen attached gingiva)
 - Free gingival grafts
 - Esthetic Sx
 - Root coverage
 - Recreation of papillae
 - Pre-prosthetic techniques
 - Crown lengthening
 - Ridge augmentation
 - Vestibular deepening
 - Site development for implants
 - Guided bone regeneration
 - Sinus grafts
- Pre-operative treatment
 - Plaque and supragingival calculus should be removed, especially with mucogingival surgery
 - 0.12% chlorhexidine rinse
 - Anti inflammatory medication if needed (Dexamethasone 4mg before appt and 3 days after + ibuprofen)
 - Antibiotics if needed
- Measures to prevent transmission of infection
 - **Protective attire and barriers:** disposable sterile gloves, surgical masks, protective eyewear
 - **Wrapping surfaces** that cannot be sterilised: light handles, unit syringes, chair handles
 - **Aerosol producing** devices: avoid in patients with suspected infections
 - When **using or disposing needles and scalpel blades**, extreme caution should be exercised

- Surgical instruments

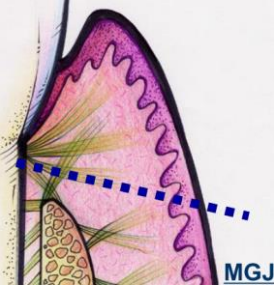
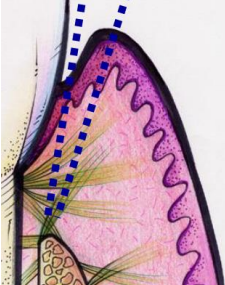
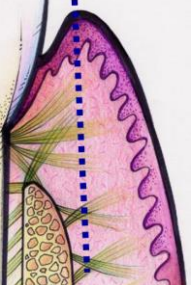
Instrument	Image		Purpose
Periodontal knife (AKA Kirkland knife)			-Incisional and excisional -Commonly used for gingivectomy -Entire periphery is a cutting edge
Interdental knife (AKA Orban knife)			-Incisional and excisional -Useful for tight papillae and interdental areas -Cutting edges on both sides -May be used to raise flaps
Scalpel blade (L = 12D) (R = 15C)			-Surgical blades -15C is narrower than the normal 15 -Discarded after one use
Surgical curettes (R = furcation scaler)			-Similar to universal scalers, but chunkier -Used to remove granulated tissue, fibrous interdental tissue, and tenacious subgingival deposits
Periosteal elevators (L = PPR3) (R = P20)			-Once the flap is reflected, it is used to keep the flap away from the area -Note that the pictures are grouped in two as it represents both sides of 1 instrument
Surgical chisels and hoes		This is one of the chisels, called the back hand action chisel	-Used for moving, reshaping, and smoothing bone -Can be used in the interdental area
Surgical files (L = Schluger) (R = Sugarman)			-Smoothen rough bony ledges and remove some areas of bone -Used with a push/pull stroke, primarily in the interdental areas
Tissue forceps			-Holds the flap during suturing -Used to position and displace flap after it has been reflected
Scissors			-Removes tabs of tissue -Trim flap margins -Enlarge incisions in periodontal abscess debridement -Blunt dissection in mucogingival surgery (e.g. removing muscle attachments)
Needle holder and sutures			-Used to suture the flap at the desired position after the surgical procedure has been completed -Perhaps the most important and delicate step in periodontal surgeries -Don't use Castroviejo on sutures 4-0 or thinner



- Tissue management

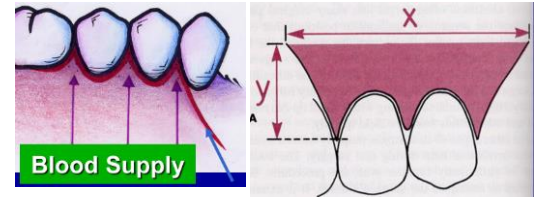
Operate gently	<ul style="list-style-type: none"> -Be considerate to the patient -Gentle tissue manipulation -Be thorough, precise, and avoid rushing
Observe patient at all times	<ul style="list-style-type: none"> -Patient's reactions, facial expressions may indicate pain -Pallor and perspiration may warn us of patient anxiety
Use sharp instruments	<ul style="list-style-type: none"> -Effectiveness related to sharpness -Dull instrument causes unnecessary trauma and lack of accuracy -Sterilized sharpening stone should always be available
Incision care	<ul style="list-style-type: none"> -Done with a sharp instrument -Long, continuous stroke preferred to short interrupted ones -Pay attention to anatomy in area being operated
Blade angulation	<ul style="list-style-type: none"> -If the surgeon plans to re-approximate the tissue, the blade should be inserted perpendicular to the epithelial surface -Squares wound edges → easier to suture and reduces chances of necrosis

- Types of incisions in periodontal surgery


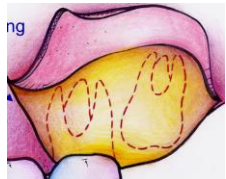
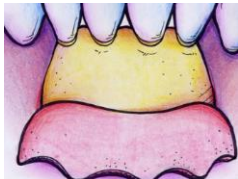
External bevel incision (gingivectomy incision)	Internal bevel incision (sulcular or crestal)	Internal bevel incision (partial thickness)
		
<ul style="list-style-type: none"> -Excisional removal of tissue for suprabony pockets -Used in areas of horizontal bone loss and adequate zone of keratinized gingiva (usually due to overgrowth) -Corrects deformities caused by pseudopocketing -Heals by secondary intention -Patient is given cement or putty to help with sensitivity 	<ul style="list-style-type: none"> -Mucoperiosteal incision (goes to bone) -Creates a flap to gain access and visibility for pocket elimination surgery or other procedures that need a <u>full thickness</u> flap 	<ul style="list-style-type: none"> -Creates a <u>partial thickness</u> flap, meaning periosteum covering bone is retained -Sharp dissection parallel to bone -Used in areas with thin bony plates and for mucogingival procedures

- Flap design

- A full thickness flap exposes bone by cutting down to the periosteum. A partial thickness flap stops in the CT
- Base dimension (X) should be 2x wider than the height (Y)
- The 2 side incisions should be parallel or converge towards the crown (apex of flap)
- This is to maintain adequate blood supply



- Types of flaps

Envelope flap	L shaped flap	2 releasing incision flaps
		
-Horizontal incision to create a single sided envelope flap -Avoids possibility of compromising blood supply	-When an envelope does not provide adequate access, one vertical “releasing” incision is made -Incision usually made at the line angle one tooth away from site of operation	-2 vertical releasing incisions -Not common in perio -May be necessary in regeneration and root coverage procedures

- Hemostasis

- Effective periodontal therapy relies on a dry operative field
- Always check for bleeding disorders or clotting related medications
- Hemostasis is initially obtained with the local anesthesia (with epi), and kept dry with an aspirator (suction) and moist gauze + pressure
 - The aspirator maintains a clear visual field and prevents seepage of blood into the mouth
- Most of the bleeding happens in the initial incisional steps
 - After the flap is raised and granulation tissue is removed, bleeding decreases significantly or disappears
 - Excessive bleeding may indicate severing of capillaries or vessels → keep in mind anatomy and flap design
- Maintaining hemostasis postoperatively
 - Hemostatic collagen: Collatape, Collaplug
 - Oxidized cellulose: Surgicel
 - Absorbable agents: Gelfoam

- Sedation and anesthesia

- Periodontal surgery should be painless
- Thoroughly anesthetized by infiltration or block anesthesia
- Intrapapillary injection may be indicated in certain occasions
- Apprehensive patients may benefit from sedation (inhalation, oral, IV)
 - Oral agents: triazolam, lorazepam, diazepam
 - IV sedation and inhalation (nitrous oxide) may benefit if the operator is trained

- Dressings

- In many perio surgeries, the area is covered with a dressing or a periodontal pack
- Purpose of periodontal dressings
 - Protect tissue from injury
 - Minimizes likelihood of postoperative hemorrhage
 - Facilitates healing by preventing surface trauma during mastication
 - Protects against pain induced by contact of the wound with food or tongue during mastication
- Coe Pack (zinc oxide non eugenol) that's mixed from 2 tubes until uniformly coloured
- Applied on facial and lingual surfaces, and mechanically locks into interdental spaces



- Suturing

- Purposes

- Used to provide adequate tension of wound closure without dead space, ischemia, and necrosis
 - Maintains hemostasis
 - Permit primary intention healing
 - Reduce postoperative pain
 - Prevent bone exposure resulting in delayed healing and unnecessary resorption
 - Permit proper flap positioning

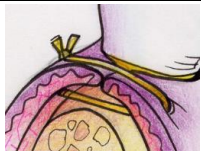



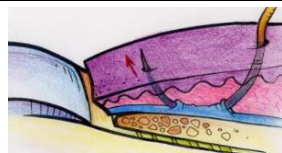
- Materials

Type	Properties	Handling
Silk	-Moderate tensile strength and increased tissue response	-Needs to be removed in 7 days -Easy to handle
Plain gut (collagen from mammals)	-Least suture tensile strength -Increased tissue response	-Lasts only for a few days -Does not need to be removed
Chromic gut (collagen + chromic salts)	-Low suture tensile strength -Moderate tissue response	-Used when wanting to last longer than plain gut -Does not need to be removed
Vicryl (Polyglactin 910 copolymer)	-Increased suture tensile -Mild tissue response -Prevents wicking (bacteria moving along the suture into deeper tissues)	-Lasts for several days -Easy to handle
Gore-Tex (expanded polytetrafluoroethylene)	-Very easy to handle -Increased suture tensile strength -Minimal tissue reaction -Ideal in GTR and GBR where regenerative membranes are being used	-Non resorbable – must be removed

- Principles of suturing

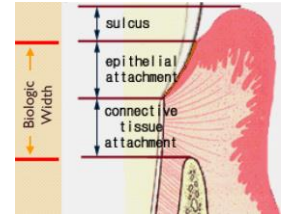
- Knot must be tight, firm, and tied so slippage will not occur
 - To avoid wicking of bacteria, knots should not be placed along incision lines
 - Knots should be small and the ends cut short (2~3mm)
 - Do not tie suture too tightly as tissue necrosis may occur. Tension should not blanch tissues
 - Suture should be removed as atraumatically and cleanly as possible within 1~2 weeks

- Techniques

Interrupted circumferential	Interrupted figure eight	Horizontal mattress	Vertical mattress	Periosteal suture
				
-Start 3~4mm away from tip of papilla -Circumferential will permit tucking down of the papilla when interproximal closure is critical, as there are no suture materials between flaps		-Used for greater flap control -Permits more precise flap placement -Recommended for bone regeneration (esp. vertical) because it permits maximum tissue closure		1. <u>Penetration</u> perpendicular to tissue surface 2. <u>Rotation</u> of needle while pressing gently on bone 3. <u>Glide</u> on bone briefly 4. <u>Rotation</u> about the needle body 5. <u>Exit</u> -Small needle and 4-0~6-0 suture

Restorative interrelationships

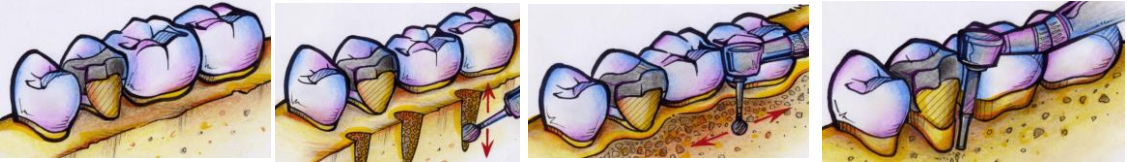
- Introduction
 - Periodontium must be healthy for long term survival of teeth and restorations
 - Restorations must be in harmony with periodontium to allow tissues to be healthy
 - Communication between periodontists and prosthodontists must be frequent and efficient
- Adverse effects of perio destruction (pockets, BOP, suppuration, tissue changes)
 - Persistent inflammation, bone resorption, and tooth loss
 - Impaired esthetics due to soft tissue changes
- Biologic width
 - The width of soft tissue attached directly to the tooth
 - Biologic width (2.04mm) = junctional epithelium (0.97mm) + connective tissue (1.07mm)
 - Note: average sulcus depths are 0.69mm
 - This BW acts as a protective seal around teeth
 - Restorations need to respect BW and not impinge on it. In other words, restorations must be >2mm away from the alveolar bone
- Restorative margins in relation to gingiva



Supragingival	Equigingival	Subgingival
-Safest for perio -Usually for unesthetic areas, but can be used in esthetic areas too (thanks to new translucent materials, adhesive dentistry, and resin cements) -Easier tooth prep -Easier impressions -Easy removal of excess material, cleansing, and detection of recurrent caries	-Past: Least desirable due to most plaque retention and gingival inflammation -Present: Possible to make a smooth interface at the margin	-Masks the tooth restoration surface -Placed too far into gingiva may violate BW -Greatest risk of inflammation, and especially in sites of KT <2mm -Changes to flora, increased plaque, more inflammation, pocket formation, increased GCF -Not accessible for finishing -Difficult for impression taking -If sub-G margin is necessary: correct crown contour in gingival third, polish and round margins, ensure sufficient attached gingiva, don't violate BW, frequent recall exams

- Extending restorations into gingiva
 - May be performed due to retention, preventing sensitivity, caries, tooth lacking contour, and masking margins
 - Restorations should be no more than 0.5mm into the sulcus, so that it can be cleaned by the patient
 - Toothbrush bristles reach 1mm subgingivally
 - Restorations should also be >2mm away from the alveolar bone
- Biologic width violation
 - Diagnosing BW violation
 - **Probing restoration margins:** if restoration extends into attachment, then BW is violated
 - **Bone sounding:** probe sulcus depth. Then, under LA, probe to bone. If $\Delta < 2\text{mm}$, then BW is violated. Do this on more than one area to be sure
 - **Radiographs:** can aid in finding interproximal BW violations
 - Note that BW can vary (research shows 0.75~4.3mm reported), so not always the same with every patient. This is due to varying thicknesses of JE or CT
 - Trauma from restoration preparation can cause recession
 - Highly scalloped and thin gingiva are at greatest risk
 - Inflammation causing pain (brushing + probing), BOP, localized hyperplasia with minimal bone loss, and recession
 - Possible attachment loss and apical migration of the junctional epithelium
 - Eventually leads to bone loss
 - This is the body trying to recreate space to allow tissue attachment
 - More common in areas of thin bone
 - If management is necessary, tooth must undergo **crown lengthening** or **orthodontic extrusion**

- Crown lengthening

What it is	-Procedure that lengthens the clinical crown of a tooth for esthetic or restorative purposes. This is accomplished by moving the gingival margin more apically, removing supporting bone, or both -If supporting bone needs to be removed, it is called an ostectomy -If non supporting bone needs to be removed, it is called osteoplasty
Objectives of treatment	-Enabling the restorative treatment without impinging on BW -Aiming for a good marginal seal with retention for both provisional and final restoration -Access for removal of subgingival caries -Cosmetic improvement -Correction of occlusal plane -Increase access to furcations for oral hygiene care
Indications	-Inadequate clinical crown for retention due to extensive caries, tooth fracture, root perforation, root resorption within cervical 1/3 of root -Inadequate interocclusal space for proper restorative procedures due to supraeruption -Short clinical crowns -Passive eruption -Excessive occlusal wear -Placement of subgingival restorative margins -Unequal, excessive, or unesthetic gingival margins -Violation of BW
Contra-indications	-Deep caries (>3mm subgingival) -Inadequate C:R ratio -Non restorable teeth -Unreasonable compromise of esthetics -Fracture -Post surgery creating unesthetic outcomes -Increased risk of furcation involvement -Unreasonable compromise on adjacent alveolar bone
Considerations	-Etiologic factors: caries, trauma, fracture, endo perf, external resorption, altered passive eruption, excessive gingival display, restorative requirements -Limiting factors: C:R ratio, maintainability, esthetics, furcations, predictability, adjacent periodontium, anatomic constrictions, amount of keratinized gingiva -Restorative factors: esthetics, form, function, retention, marginal seal -Restorative overhangs are a contributing factor to progression of periodontal disease. Proper use of matrix bands and wedges are recommended -Alternative options: ortho extrusion, root resection in molars, extraction + RPD/FPD/implant
Treatment details	-3mm of sound tooth structure must be exposed at time of surgery -If a ferrule is needed for an endo treated tooth + cast post and core, then 4~5mm clearance is needed -After bone reduction on the tooth of interest, adjacent bone needs to be recontoured too -Soft tissue flap is then placed more apically -If CEJ to restorative margin is >2mm, then a gingivectomy may be enough
Results	-Attachment of adjacent teeth is sacrificed -Esthetics may be compromised in the anterior zone (discussed in another lecture) -Black triangles may form interdentally -Root hypersensitivity -Tooth mobility
Healing	-4~6 months for full hard tissue maturation and stabilization -Tissue may rebound significantly up to 6~12 months after surgery -6 week post-operative exam needed before final restorative procedures -Prognosis depends on patient's healing characteristics, reformation of BW, positive architecture created during surgery, and post-op plaque control
Visual steps	

- Forced eruption – 2 methods

Low extrusion force	High extrusion force
-Low orthodontic extrusion causing forced eruption of teeth -When tooth is extruded, bone and gingiva follow. When extrusion is enough, crown lengthening is done to take away some bone to reveal the crown -Tooth is extruded until the bone level is apical enough. During this process, bone and gingival tissues follow -Tooth is stabilized in new position then crown lengthening	-Rapid extrusion combined with a weekly fiberotomy to speed up extrusion -Bone and gingiva do not follow the tooth -Tooth is stabilized in new position for ~12 weeks -Gingivectomy to correct gingival levels if needed

Drug induced gingival overgrowth

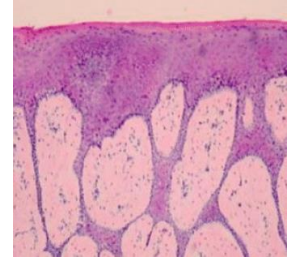
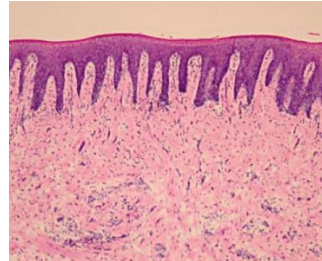
- Medications associated with gingival growth
 - Anticonvulsant:** phenytoin (Dilantin), valproic acid (Depakene)
 - Immunosuppressants:** cyclosporin (Neoral, Sandimmune), azathioprine (Imuran)
 - Calcium channel blockers**
 - Dihydropyridine derivatives:** amlodipine (Norvasc), felodipine (Plendil), nifedipine (Adalat, Procardia)
 - Benzothiazine derivatives:** diltiazem (Cardizem)
 - Phenylalkylamine derivatives:** verapamil HCl (Calan)

- Most common medications causing overgrowth

	Phenytoin	Nifedipine	Cyclosporine
Mechanism of action	-Reduces calcium influx across cell membranes -Stabilizes neuronal cell membranes to Na, K, Ca -Overgrowth relates to [metabolite] in serum, rather than dose	-Inhibits Ca influx in cardiac and smooth muscles -Interferes/blocks mobilization of Ca intracellularly -Less Ca → ↓ Ca dependent ATP ase → ↓ ATP breakdown → ↓ energy → ↓ muscle tension	-Inhibits synthesis of IL-2 → inhibits development of T lymphocytes -Also inhibits other factors: IL1, IL3, migration inhibitory factor (MIF), gamma interferon (IFN γ), lymphocyte directed chemotactic factor (LDCF), and macrophage activation factor (MAF)
Use	-Anticonvulsant used for seizures	-Lowering blood pressure due to relaxing heart tissues -Oxygenating heart tissues after MI/angina due to coronary vessel smooth muscle relaxation	-Used for diseases due to cell mediated immunological pathology. This includes diabetes (type 1), primary biliary cirrhosis, psoriasis, rheumatoid arthritis, erosive lichen planus, ulcerative colitis, Crohn's disease
Overgrowth prevalence	-Affects 50% of patients, more often on young	-Affects 6.4~44% of patients, more often in >50 -Males have 3x greater risk	-13~81% in kidney transplant patients
When growth starts	-3 months into use	-1~2 months into use	-1~3 months into use -Plateaus at 1 year

- Clinical features
 - Starts as painless enlargement of gingiva on facial and lingual sides. Interdental papilla grows too
 - If severe enough, interdental gingiva growth can push teeth apart
 - As lesions slowly grow into clefts, nodules, and lobules. They start to form and cover crowns of teeth
 - Firmer and paler than normal (if there's no associated inflammation). However, there could be some variation:
 - Colour could be more red than normal gingiva
 - Consistency could be softer and more edematous than normal gingiva
 - Usually generalized, but more severe in anterior and rare in edentulous areas
 - Stippling may disappear if inflammation is present
 - Makes OH difficult → secondary inflammation → condition worsens
 - Tends to recur after surgical removal, but spontaneous disappearance when drug is discontinued
 - Additive effect when more than one drug listed above is taken
 - Cyclosporine related overgrowth is hyperemic, edematous, lobulated, and has spontaneous hemorrhage

- Clinical complications of overgrowth
 - Esthetic concerns
 - Changes in mastication ability if gingiva grows to cover the masticatory surface
 - Inaccessible hygiene areas which worsens caries and periodontal disease
- Differential diagnosis
 - Idiopathic gingival overgrowth
 - Enlargements due to systemic conditions (leukemia, pregnancy, puberty, vit C deficiency, plasma cell gingivitis, tumors, etc)
 - False enlargement (of osseous or dental tissues)
- Histological presentation
 - Spinous layer is bigger (also called acanthosis)
 - Elongated rete ridges
 - Hyperkeratosis and parakeratosis
 - Epithelial thickening
 - Fibrotic CT with increased cells and collagen
 - Increased proteoglycans
 - Left = normal
 - Right = overgrowth
- Treatment
 - Good oral hygiene to resolve secondary inflammation
 - Initial debridement
 - SPT every 3 months
 - 0.12% chlorhexidine rinse
 - Consider change of medication (rarely possible)
 - Recurrence or some degree is common
 - Gingivectomy or flap procedure



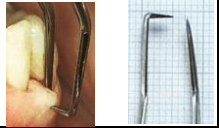


Gingivectomy

- Definitions
 - **Gingivectomy:** excisional removal of gingival tissue, usually to remove the soft tissue wall of a periodontal pocket for pocket reduction or elimination
 - **Gingivoplasty:** reshaping of gingiva to attain a more physiologic contour (rise of tissue interproximally and fall on labial and lingual surfaces)
 - **Attached gingiva:** not the same as keratinized gingiva. Attached gingiva is always keratinized, but keratinized gingiva is not always attached (i.e. at the gingival margin + sulcus)
 - Gingivectomy and gingivoplasty are usually performed at the same time
 - Less performed today due to better flap methods
- Indications for gingivectomy/gingivoplasty
 - Elimination of suprabony pockets with adequate zone of keratinized tissue
 - However, try scaling/root planing or a Widman-modified flap before gingivectomy
 - Used in cases where initial Tx does not lead to recession that's needed (like if tissue is fibrotic)
 - Very rarely performed for this reason today
 - Elimination of gingival enlargements
 - Usually drug related
 - But also due to pregnancy, idiopathic, and chronic inflammatory gingival enlargement (seen in ortho)
 - Non esthetic or asymmetrical gingiva
 - Most common in the anterior
 - Has to be done such that biologic width is respected
 - Establish physiologic gingival contours after necrotizing ulcerative gingivitis (NUG)
 - After NUG, cratering of gingiva impedes proper hygiene
 - Gingivoplasty restores healthy architecture




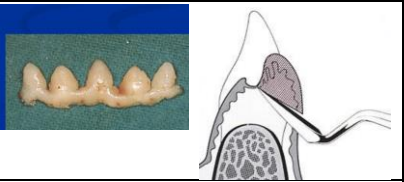

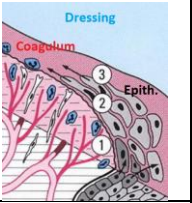
- Contraindications
 - Narrow zone or absent keratinized attached tissue
 - Infrabony pockets (need for bone surgery and/or examination of bone morphology)
 - Note that gingivectomy only removes soft tissue, there is no bone exposed
 - Highly inflamed or edematous tissue, poor oral hygiene
 - Presence of thick bony ledges or exostoses
 - Areas of esthetic compromise
- Advantages/disadvantages

Advantages	Disadvantages
-Predictable morphology is attained and simple procedure -Favourable esthetic results, if good case selection -Probing depth decreases	-Healing by secondary intention (postoperative discomfort) -Bleeding postoperatively -Loss of keratinized tissue -Inability to treat underlying osseous deformities

- Instrumentation

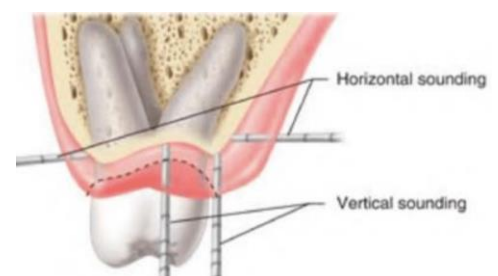
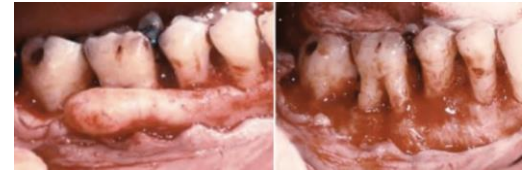
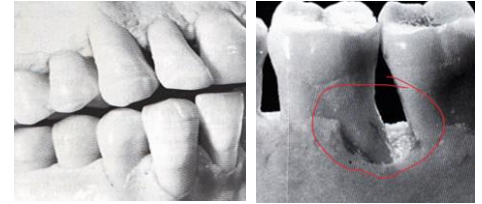
Pocket marking forceps or probes	-One side probes into the sulcus -Other side has a sharp point that creates a bleeding mark on the gingiva → shows where to cut	
Gingivectomy knives	-Kirkland knife -Orban knife -Universal knife	
Electrotomes, tissue nippers, diamond burs	-After excisions, the leftover soft tissue needs to be contoured -Blends the soft tissue ledges into a physiologic contour	
Dressings	-Open wounds should be covered with a dressing -For patient comfort	

- Procedure steps

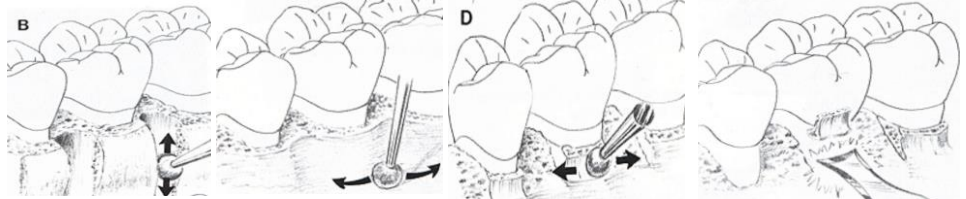
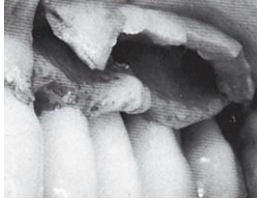
Presurgical phase	-Reduce gross inflammation by debriding and root planning -Remove irritants like calculus, plaque, overhangs -Will significantly reduce gingiva size, but enlargement still visible		
Pocket marking	-After normal anesthesia (blocks/infiltrations), also give injections to interdental papilla for more profound anesthesia and to reduce bleeding -Series of bleeding points are made to outline the base of pockets -Done with a pocket marking forcep (see above)		
Incisions/excisions	-Incisions follow the line marked by the pocket marker and in a 45 degree bevelled angle → best esthetic results as it follows gingiva contour -Incision line is always within the attached tissue -Mucogingival line is never approached as it does not heal fine		
Gingivoplasty	-Thins the tissue on the interradicular surfaces to establish a more fluid contour -Edges of incision line/wound margin must be rounded/smoothed -Will heal to be thin, scalloped, and flows from interdental area onto interradicular surfaces for easy passage of food		
Post operative phase	-Dressing placed for 7~10 days. Patient can resume careful oral hygiene after -Thin layer of blood coagulum coats the excised area. The coagulum separates the tissue from dressing -Basal cells differentiate and cause epithelium to migrate under the dressing -Thin epithelium forms, and granulation tissue below matures into the new CT -New epithelial attachment begins to form on root surface		
Post operative care	-Meticulous oral hygiene for at least 5 weeks after gingivectomy is crucial for good healing -When dressing is removed, resume light brushing (Bass method) or a new dressing for another week can be given if too sensitive. Tantum solution (benzydamine) can be used for pain too -Interproximal hygiene may be started after 10~14 days -Adjunct use of CHX 0.12% BID for 4~6 weeks -Follow up visits at 1 week, at 3 weeks, and then as necessary		

Osseous resection

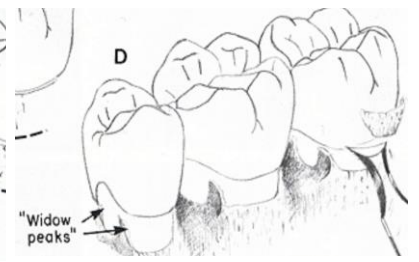
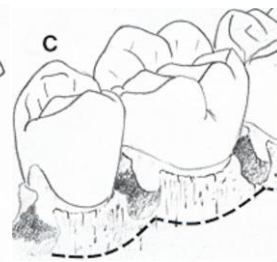
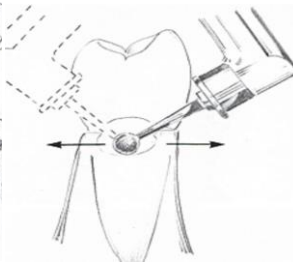
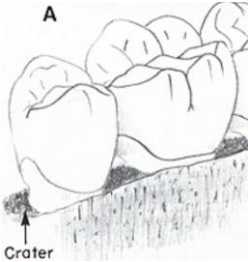
- Resective surgery
 - Surgery that aims to eliminate pockets and allows patient (and occasionally dentist) to reestablish oral health in an effective and economic manner
 - Resective surgery accomplishes this by removing hard and/or soft tissues
 - Soft tissue resective surgeries: gingivectomy, open flap curettage + Widman procedures, electrosurgery, wedges
 - Hard + soft tissue resective surgeries: flap access with osseous resection (osteoplasty or ostectomy) +/- regenerative therapy
- Principles of osseous resection
 - Naturally, the gingival margin follows a parabolic shape. It is high interdentally, drops in the crown areas (left)
 - The underlying bone also follows this contour when healthy
 - Periodontal disease will erode bone and cause soft tissue to replace the lost bone → forms a deep pocket (right)
 - The bone erosion also turns the bone into a rough, irregular, and jagged surface
 - Osseous surgery removes bone to smooth out deformities and re-establishes the healthy parabolic contour while avoiding furcation formation (bottom)
 - Unhealthy structure is called **reverse/negative architecture** and healthy structure is called **positive architecture**
- Osteoplasty
 - Reshaping of **non supporting bone** to achieve a physiological gingival and osseous contour
 - Non supporting bone = bone that does not provide attachment to PDL fibers
 - Does not result in loss of attachment
 - Indications
 - Tori removal
 - Pocket elimination
 - Infrabony defects adjacent to edentulous ridges
 - Reduction of thick ledges (bony margins) and exostoses
 - Shallow osseous craters
 - Blunted interdental septa
- Ostectomy
 - Reshaping of **supporting bone** to eliminate osseous deformities
 - Will have to sacrifice some attachment to create the positive architecture mentioned above
 - Allows gingiva to create a shallow pocket rather than bunching up and causing a deep pocket
 - Disadvantages: loss of attachment, esthetic compromise, root sensitivity (weeks~months), risk of root caries
 - Indications
 - Elimination of interdental craters
 - Infrabony defects not amenable to regeneration
 - Horizontal bone loss with irregular marginal bone height
 - Combination of defects
- If both osteoplasty and ostectomy need to be done, osteoplasty comes first
 - Remove all the NON supporting bone first, to better visualise what you're dealing with
 - Then, carefully remove the supporting bone to get the best contours
- Contraindications to osseous resections
 - Insufficient remaining attachment or where ostectomy might worsen the prognosis of adjacent teeth
 - Anatomic limitations (external oblique ridge, zygomatic arch, etc)
 - Esthetic limitations (anterior, high smile line, etc)
 - Effective alternative treatment available
- Treatment planning
 - Pockets should be probed, note furcations, and monitor disease progression prior to incision
 - Horizontal and vertical sounding is used to map the shape of the bone and all its defects prior to making the flap



- Step by step technique
 - Before surgery
 - Assess defects and aberrations using probe and radiographs
 - Primary and secondary incisions for flap thinning and removal of soft tissue
 - Visual and tactile confirmation of location and nature of bony defects
 - Scaling and root planing
 - Then continue with the procedures below
 - **Osteoplasty of a heavy ledge, thick margin, or blunted interproximal septa**



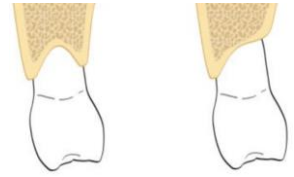
- Pockets are deep, but negative architecture is not seen
- First, vertical grooves are made **interproximally** on the buccal and lingual side
- Next, smooth out bone between grooves. This is called **radicular blending**
- Keep the interproximal bone cuts deeper than radicular bone. This gives the natural look of having alveolar bone be more prominent where the roots are
- **Scribing** is done to outline the bone that is going to be removed with hand instruments. Careful at this step to not touch the tooth with the bur
- Finally, a **minor ostectomy** is done to re-establish natural parabolic contour
- **Ostectomy to fix interproximal craters**



- **Horizontal grooves** are made with a round bur placed at the base of the osseous defect and extending it bucco/lingually
- If a defect is worse on one side, slope the horizontal groove to preserve bone on the less-affected side
- **Osseous scribing** is going to take place along the dotted line so hand instruments can be used
- Hand pieces are used to remove radicular bone and create positive architecture
- Widow peaks forming on line angles of teeth will be removed using hand instruments as well
- Factors influencing performance of osseous resection

Root form and root trunk	-Root trunk is area apical to the CEJ and coronal to the separation of roots -Longer root trunk is preferable for osseous resection, because it means you can do more bone removal without risking the creation of a furcation - Maxillary molars: 3mm = short trunk, 4mm = medium trunk, >5mm = long trunk - Mandibular molars: 2mm = short trunk, 3mm = medium trunk, >4mm = long trunk	
Tooth inclination	Mesial/distal tilt -May cause interproximal bone to be uneven too -Don't confuse this with bone loss → always connect CEJ to CEJ Buccal/lingual tilt -Mandibular teeth are inclined 20 degrees lingually → means the furcation is slightly lower on the lingual side → when making horizontal grooves on mand molars, remove more bone on lingual → this follows natural contour and does not increase risk of making a furcation -Also, the lingual bone is less parabolic and more flat	
Interdental crater	-Concavities in the crest of interdental bone between the lingual and facial walls -Essentially, buccal and lingual plate remain with no interdental bone -2x more frequent in the posterior segment than anterior -Shallow is 1~2mm, medium is 3~4mm, deep is >5mm	

Alveolar margin alterations	-Buccal exostoses, thick bone ledges, and tori need to be considered
Furcation involvements	<p>-Class I is $\leq 3\text{mm}$ horizontal attachment loss, Class II is $> 3\text{mm}$, Class III is through-and-through</p> <p>-Treat the furcation as the high point when considering parabolic contour</p> <p>-Area of most concern is the maxillary buccal furcation. Osteotomy in this area may cause an unwanted furcation to form</p> <p>-To prevent furcation formation on max molars, preserve the buccal bone and do palatal ramping by taking more bone off the palatal side</p> <p>-Mesiopalatal and distopalatal furcations are more apical</p> <p>Why a maxillary palatal approach is more favourable</p> <p>-Avoid creating a buccal furcations, and less risk of creating a mesio/distopalatal furcation</p> <p>-Narrow embrasures on buccal side, but wide embrasures on palatal side</p> <p>-Poor or difficult access via buccal</p> <p>-Thin buccal bone, dehiscences, or fenestrations may exist on the buccal side</p> <p>-Bone is thicker on palatal side from teeth 1~5 (distal of 5), but thinner on molars</p> <p>-Shallow buccal vestibular depth, narrow width of gingiva, or both</p> <p>-Palatal tissue is all keratinized</p>
Vertical angular defects	<p>-AKA, one walled defects</p> <p>-If present on the anterior teeth, try the palatal approach to minimize esthetic compromise</p> <p>-If buccal flap is mandatory, make sure patient agrees to the outcome:</p> <ul style="list-style-type: none"> -Loss of some papilla height \rightarrow black triangles -Gingival recession visible -New crowns may be needed (if prior ones exist)



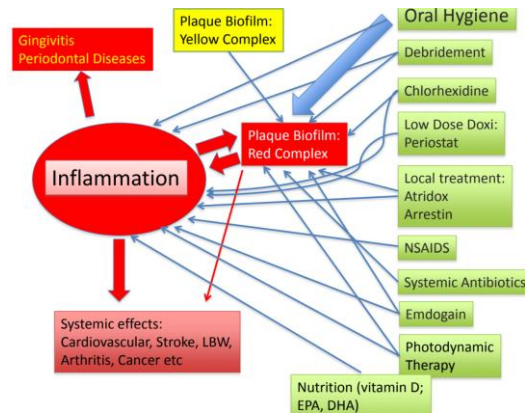
Management of inflammation in periodontal therapy

- Background
 - Periodontitis is associated with systemic markers for inflammation (CRP, IL6, IL18, fibrinogen)
 - CRP is elevated above the threshold considered at risk for atherosclerosis
 - Treatment of periodontitis decreases CRP, but benefits remain unknown
 - Periodontitis is associated with CVD, kidney disease, stroke, premature labor, rheumatoid arthritis, cancer
 - Causation is unknown and pathogenic mechanisms may vary
- Periodontitis and atherosclerosis
 - Some studies have shown causative relationship, but others have not
 - Inflammatory products from periodontal tissues could have a role in atherosclerosis
 - Oral bacteria (including perio pathogens) have been found in atheromatous lesions
 - Oral bacteria could cause autoimmunity as they have cross-reacting antigens
 - Increased carotid artery thickness (risk for stroke and MI) have been observed in periodontitis pts
 - Periodontitis has been proposed to be an independent risk factor for CAD, but more studies needed
 - What to inform the patient
 - Patients with periodontitis
 - Pts with mod~severe periodontitis should be informed that there may be \uparrow risk to atherosclerotic CVD
 - Pts with mod~severe periodontitis with 1 extra risk factor (smoking, family Hx, dyslipidemia) should consider a medical evaluation if they have not done so in the past 12 months
 - Pts with periodontitis with 2 extra risk factors should be referred for medical evaluation if they have not done so in the past 12 months
 - Patients with atherosclerosis and periodontitis
 - Pts with atherosclerotic CVD and previous Dx of periodontitis should be seen closely by the periodontist collaborating with the physician to reduce risk
 - Patients with atherosclerosis and no previous Dx of periodontitis
 - Perio exam done on pts with signs of gingival disease, significant tooth loss, unexplained elevations of hsCRP, or other inflammatory biomarkers
 - Exam should include BOP, signs of inflammation, loss of attachment, probing, bone loss
 - If periodontitis is diagnosed, periodontist + physician should closely collaborate

- **Periodontitis and cerebrovascular disease**
 - Periodontal disease is an important risk factor for all forms of cerebrovascular disease
 - Especially applies to non-hemorrhagic stroke
 - Many studies support this statement, but not all
- **Periodontitis and peripheral arterial disease**
 - Limited number of studies suggest a link
- **Periodontitis and cancer**
 - Infection and inflammation accounts for 10~15% of all malignancies
 - Periodontal disease has been linked to H&N cancer, lung cancer, and breast cancer
 - Associations too weak to establish whether periodontal disease is a true risk factor though
- **Periodontitis and pre-term low birth weight babies**
 - 10% of births are PLBW (<2.5 kg and <36 wks gestation)
 - 25% of these PLBW cases happen without known risk factors
 - Periodontitis has been found as an independent risk factor in several studies, but not all studies
 - Initial studies showed pregnancy may reduce pre-term births, but large clinical trials have not confirmed it
 - Possible mechanism: gram (-) bacterial infection → inflammation → LPS, PGE₂, TNFα → pre-term labor
 - PGE₂ and TNFα increasing in the intra amniotic space is the normal mediator for labor
- **Periodontitis and smoking**
 - Smoking alters the inflammatory response to pathogenic bacteria
 - Smokers have ↑ WBC's (16~30%) and ↑ CRP, but ↓ chemotaxis
 - Macrophages: ↓ phagocytosis ↑ secretion of pro-inflammatory cytokines
 - B/T lymphocytes: ↓ IgG₂, ↓ immune function, ↓ inflammatory cytokines, ↓ protective cytokines
 - Bacteria: Effect of smoking on subgingival biofilm is unclear
 - Smokers have a ↑ 2.5~6x risk of periodontitis, and its presentation is slightly different
 - Fibrotic gingiva common, ↓ BOP, ↑ alveolar bone loss with more smoking, ↑ tooth loss, ↓ healing
 - Heavier smoker = higher risk and severity of periodontitis
- **Periodontitis and diabetes**
 - Diabetic patients have an increased risk of periodontal disease (attachment loss + bone loss)
 - ↑ 2.8x CAL, ↑ 3.4x radiographic bone loss, ↑ 4.2x progressive alveolar bone loss
 - Younger the patient, the greater the odds for periodontal disease compared to non diabetics of same age
 - Significantly more missing teeth and sextants with deep pockets
 - Poor wound healing (↓ collagen from fibroblasts, ↑ collagenase)
 - Altered microbial flora (↑ Capnocytophaga, A.a, subgingival microbiota)
 - If diabetes is well controlled, treatment outcome is equal to non diabetics
 - Periodontal treatment may improve glycemic control
 - What happens in a hyperglycemic environment? (seen in uncontrolled diabetes)
 - Many proteins get glycosylated (glucose attaches to it) → forms advanced glycation endproducts
 - AGE alters function of extracellular matrix proteins, and modifies protein-protein functions
 - Adverse effect on target tissues, especially collagen and vascular integrity
 - AGE of collagen: ↑ crosslinking of collagen → ↓ solubility → ↓ turnover
 - AGE of basement membrane collagen: ↑ thickness of BM → ↓ turnover
 - AGE can also affect cells, by binding to AGE receptors (called RAGE)
 - AGE and macrophage/monocytes: ↑ IL1, TNFα, IGF, inflammation
 - AGE and endothelial cells: focal thrombosis and vasoconstriction
 - AGE related events are also responsible for retinopathy, nephropathy, neuropathy, and atherosclerosis
 - ↑ GCF, PGE₂, IL1, TNFα → indicators of periodontal disease is much higher in diabetics
- **Periodontitis and obesity**
 - Risk of having periodontitis is 2.13x greater compared to those of normal weight
 - Obesity can be seen as causing inflammation on a systemic scale
 - Inflammation is linked to insulin resistance, type 2 diabetes, CVD, cancer, immune fxn, and possible periodontitis

• Periodontitis and rheumatoid arthritis

- Arginine is a crucial amino acid because it acts as attachment sites for integrin proteins → cellular adhesion
- Enzymes like Peptidyl Arginine De-aminase (PAD) convert this arginine to citrulline (called citrullination)
 - PAD is found to be intensified in RA patients
- Bacterial infection in the mouth may cause body to make antibodies against citrulline bodies, as bacteria could have them too
- This causes body to attack citrulline bodies in the bacteria, but there is a cross-reactivity effect where all the citrullinated bodies in distant joints can become attacked by the immune system too



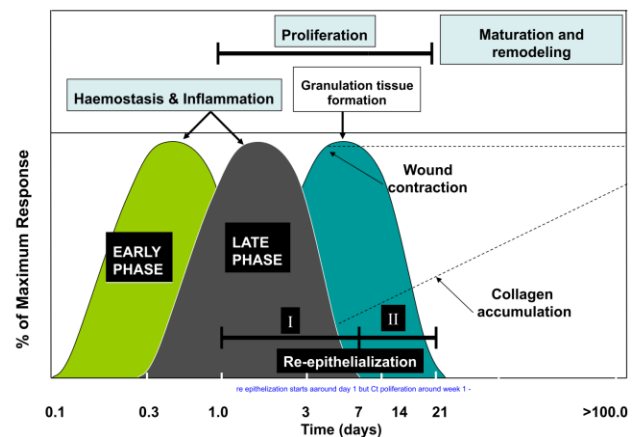
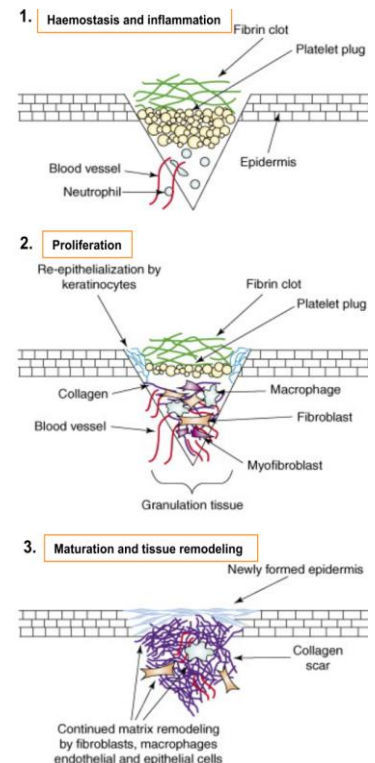
- Managing/treating periodontitis can be accomplished by resolving the inflammation and/or reducing the “red complex” of plaque biofilms

Management method	How it works	Level of evidence	↓ red complex or ↓ infl?
Oral hygiene and debridement	-Disrupts biofilm in deep pockets		-Both
Chlorhexidine full mouth disinfection	-Original protocol: <ol style="list-style-type: none"> 1. SRP x 2 days 2. 1% CHX gel applied on deep pockets for 10 mins and repeat 3x 3. Tongue brushing with 1% CHX gel for 1 min 4. 0.12% CHX rinse for 8 weeks -Effective against developing biofilm, but greatly reduced in existing biofilm -Reduces gingivitis -No clear contraindications -Consider if systemic abx are also being used	-No clear evidence if better than SRP, especially in mild chronic periodontitis -May help w. red complex in advanced periodontitis -If you give after SRP, it will help prevent new biofilm formation	-Both
Low dose doxy: Periostat	-20 mg doxycycline taken q12h -Avoid dairy, high fat, high protein -Separate dose at least 1h before meals -Effect is seen in a minimum of 3 months, best results seen maybe even later (9 months~lifetime) -100 mg BID for 2~3 weeks	Compared to 100mg BID x 2~3w: -Less doxy-resistant strains in mouth and colon -↓10~20x resistant bacteria in tonsils and sub-G plaque -↓10x enteric rods, yeasts, staph	-Inflam. only
Localized controlled release CHX, doxycycline, minocycline, or metronidazole	-Marginally effective over scaling and root planning -Some cases are ineffective, which may be due to resistant biofilms -Selective usage because it is laborious and expensive Example: Arestin (minocycline in PGLA polymer micro spheres) -Antimicrobial and anti-metalloproteinase effect that dissolves in ~2 wks -\$16 per site Example: Atridox (10% doxycycline hyclate in PLA polymer) -Antimicrobial and anti-metalloproteinase effect for 1 wk, resorbs in 3 wks -Sets with moisture	Arestin -Some clinical benefits over SRP in moderate pockets Atridox -Compares favourably with SRP and may offer benefits in combination tx -Successfully used in peri-implantitis and mucositis cases	-Both

Management method	How it works	Level of evidence	↓ red complex or ↓ infl?
Systemic antibiotics	<ul style="list-style-type: none"> -Reserved for those at high risk of breakdown (early onset, rapidly progressive, or associated with systemic disease) -Should always be used with mechanical therapy -Biggest risk is antibiotic resistance → routine use for chronic periodontitis is not justified 		
Emdogain			
Photodynamic theory	<ul style="list-style-type: none"> -Photosensitizer (methylene blue) is injected into the pocket for 1~3 mins → MB binds to bacteria → laser light is shined on tooth → oxygen radicals form → bacteria death -Light is applied for 60s per tooth (10s on each surface) -Kills planktonic red complex bacteria but less efficient in biofilms -Does not generate resistant microorganisms -Cons: cost, time, less efficient in biofilms 	<ul style="list-style-type: none"> -No clear evidence on efficacy beyond SRP -Might be due to its inefficiency against biofilms -Some studies report ↓ BOP 	-Both
NSAIDs	-Blocks COX enzyme, which is an enzyme responsible for a step in making pro-inflammatory cytokines	<ul style="list-style-type: none"> -Topical resolvin E1 prevents experimental periodontitis in rabbits (2006) -Pg induced bone loss is reduced by fish oil in animals (2006, 2009) 	-Inflam. only
Nutrition (fish oils, omega 3)	<ul style="list-style-type: none"> -Fish oils and plant oils are rich in omega 3 fatty acids, more specifically called EPA and DHA. The human body cannot synthesize this -EPA+DHA are turned into resolvins via COX2 and 5-LOX -Resolvins end inflammation and allow wound healing, stops fibrotic deposition, and re-establishes homeostasis 	<ul style="list-style-type: none"> -Higher DHA in diet is associated with lower prevalence of periodontitis (2010) -SRP + 900 mg fish oil + 81 mg aspirin showed gain of attachment (2010) -Improved surgical outcomes in pts taking low dose ASA + DHA 300 mg + EPA 150 mg 	-Inflam. only
Nutrition (vitamin D)	<ul style="list-style-type: none"> -Regulates bone health (Ca, PO4 levels) -Deficiency is linked to resp infections, diabetes, CVD, obesity, cancer, neurological fxn, stroke, GI disorders, kidney disease, mortality, etc -At high serum doses, has an anti inflammatory effect -Daily doses of 2000 IU (50 ug) needed to reach anti inflammatory levels 	<ul style="list-style-type: none"> -May reduce gingival inflammation (2005) -Inverse relationship with clinical attachment loss and vit D (2004) -Ca and Vit D may reduce tooth loss in elderly (2001) -Perio maintenance pts have better perio health if they take Ca + Vit D (2011) -Low vit D associated w. periodontal disease in pregnant women -Only 7% of perio pts have level of recommended vit D intake (2009) -Vit D sufficient pts have better outcome after periodontal surgery (2011) 	-Inflam. only
Nutrition (quercetin and others)	<ul style="list-style-type: none"> -Quercetin is found in apples, broccoli, berries, herbal tea, grapes, onions, and red wine -Only a small percentage is absorbed in the blood -Has an anti-inflammatory and anti-carcinogenic effect Others: -Curcumin in cumin -Epigallocatechin gallate in green tea -Resveratrol in red wine -All downregulate NF-kB (inflammatory mediator) 		

Wound healing

- Background
 - Evolution has favoured fast wound closure to prevent microbes seeping in
 - The trade-off for fast wound closure is that it leaves a scar, as it does not replace the exact tissues lost
 - Wounds heal with a scar which is esthetically and functionally weaker compared to normal tissue
- Why it is important for us to learn the mechanism of wound healing
 - We create wounds in surgery, biopsies, extractions, etc → must know if healing is progressing normally
 - Patients may present with wounds in the oral cavity
 - For scientific research
- Steps that are required for wound healing
 - Hemostasis: blood needs to clot
 - Inflammation: activated right away to deal with incoming microbes
 - Proliferation: epithelium seals the wound and granulation tissue forms below
 - Maturation and remodelling: gap has to be filled with new tissue
- Timing
 - Proliferation of epithelium starts in day 1, and lasts about 3 weeks
 - Collagen accumulates under the epithelial seal as time goes on → slow process
 - Hemostasis and inflammation lasts for about 1 week, and is divided into early phase and late phase
 - Will go over each stage in detail
- During wound healing, cell functions are spatiotemporally regulated by:
 - Mediators released from cells, blood, and ECM
 - Cytokines
 - Chemokines
 - Growth factors
 - Bioactive proteins/peptides from cell membranes or ECM
 - Structural ECM molecules
 - Cells can sense changes in their environment and change their function in response
 - Composition, organization, stress/strain of ECM molecules are monitored by the cell



Stage	Time	What happens	Significance
Primary hemostasis	-Minutes	-Vascular phase (vessels constrict) -Platelet phase (platelets aggregate and release chemotactic factors and growth factors (TGFβ) to attract and activate other cells)	-Clot serves as a scaffold for cell migration + proliferation -Clot is an important reservoir for growth factors, proteases, and protease inhibitors -Clot is an inducer and modulator of cell function
Secondary hemostasis	-After primary	-Clotting is induced by intrinsic and extrinsic pathways -Fibrinogen is turned into a fibrin network which strengthens and stabilizes a clot	-Prolonged bleeding or early loss of a clot may result in non healing or delayed healing -Clot eventually degrades (fibrinolysis) and replaced by underlying tissue
Early inflammatory phase	-Day 0~3	-PMN's like neutrophils peaks at the wound site at 24~48h -Excess microorganisms → more enzymes + toxic oxygen products → more tissue damage -When particle clearance is completed, neutrophils are removed by macrophages via phagocytosis	-Remove microbes and tissue debris -Produce cytokines and growth factors -If microbes continue to infect, then inflammatory phase is extended → delayed healing or turns into chronic non-healing wounds

Stage	Time	What happens	Significance										
Late inflammatory phase	-Day 1~7	-Circulating monocytes migrate to site of injury via chemotaxis -At the site of injury, they turn into macrophages M1 phase of macrophage activity -Pro inflammatory -Sustains inflammatory reaction M2 phase of macrophage activity -Reparative -Suppress inflammation and stimulate matrix deposition -Mast cells and T cells also participate, but as a much lower level	Macrophage functions: <table><tr><td>Debridement</td><td>-Phagocytosis -Enzymes(collagenase)</td></tr><tr><td>Angio-genesis</td><td>-GF: VEGF, bFGF -CK: TNFa</td></tr><tr><td>Cell activation</td><td>-GF: TGFb, PDGF, EGF, IGF -CK: TNFa, IL's</td></tr><tr><td>Anti-microbial</td><td>-Nitric oxide -Hydrogen radicals</td></tr><tr><td>Fibroblast remodelling</td><td>-GF: TGFb, PDGF, EGF -Enzyme: collagenase -CK: IL, IFN, TNFa -Prostaglandins</td></tr></table>	Debridement	-Phagocytosis -Enzymes(collagenase)	Angio-genesis	-GF: VEGF, bFGF -CK: TNFa	Cell activation	-GF: TGFb, PDGF, EGF, IGF -CK: TNFa, IL's	Anti-microbial	-Nitric oxide -Hydrogen radicals	Fibroblast remodelling	-GF: TGFb, PDGF, EGF -Enzyme: collagenase -CK: IL, IFN, TNFa -Prostaglandins
Debridement	-Phagocytosis -Enzymes(collagenase)												
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Fibroblast remodelling	-GF: TGFb, PDGF, EGF -Enzyme: collagenase -CK: IL, IFN, TNFa -Prostaglandins												
Proliferation phase (reepithelial-ization)	-Starts in 24h -Epithelium covers wound in 7 days -Complete epith + BM in 21 days	-CK's, GF's, and bioactive proteins released from clot, damaged cells, and inflammatory cells activate epithelial cells at wound edge -Usually around day 7, migration stops as the wound has been fully covered -Barrier function (including basement membrane) completely restored by day 21	-Quick restoration of barrier function -Coverage of epithelium is about 0.5mm/day, starting within 24 hours of injury Histological findings at epith. migration -Wide intercellular spaces -Epithelium lacks defined layers -Basement membrane is immature -Once wound is covered, keratinocytes differentiate into normal epithelial structure and cell-cell contacts are re-established										
Proliferation phase (granulation tissue formation)	-Day 3~21	-Granulation tissue is a "primitive" CT that is hypercellular -CT cells migrate into the clot at day 3: Endothelial cells -Forms vessels at edges of the wound -Starts day 3, peaks day 7~10 Fibroblasts -Produces type 1 collagen-rich ECM that is unorganized and loose -Also releases tenascin C, type 3 collagen, cellular fibronectins, hyaluronic acid -Fibroblasts come mainly from CT stroma and also blood (14%)+bone marrow (30%) Mesenchymal stem cells	-Replace the blood clot with normal connective tissue cells + ECM -Provide O ₂ and nutrients to cells in gran. tissue -No angiogenesis → chronic non healing wound -Not organized = granulation tissue cannot withstand tensile forces, unlike mature CT -This ECM acts as a template for mature CT -The other molecules are believed to be important to guide tissue formation and maturation -Fibroblasts from blood are called "fibrocytes" and they may also function in inflammatory secretion -Differentiates into cells needed in CT										
Maturation and remodelling (wound contraction)	-5~7 days after wounding -Peaks 10~14 days	-Myofibroblasts attach to the collagen fibers and pull on them -The random network of collagen fibers become aligned as they are pulled into parallel orientation	-Pulling on the fibrils brings the wound edges closer together and decreases the wound size -Wound is also better able to resist physical forces										
Maturation and remodelling (normalization)	-May continue 1~2 years after wounding	Normalization of CT composition and quantity -Fibroblasts phagocytose and endocytose ECM components and secrete ECM degrading proteases -Downregulation of ECM production by fibroblasts -Apoptosis of fibroblasts and endothelial cells Normalization of CT quality -Increased cross linking of collagen and other ECM molecules -Thicker collagen fiber bundles -Reorganization of collagen from parallel orientation to basket weave orientation	-During the granulation stage, much more ECM is made than is degraded -This leads to an accumulation of excessive tissue -Reorganization of tissue is done so that the tissue is stronger and better adapted to withstand external forces -After 21 days, tensile strength is still only 20% of normal tissue despite looking normal on the surface -After 6 months, better organized collagen fibers brings it up to 95%										

- Scar formation
 - Tissue structure not normalized during remodelling → accumulation of abnormally organized CT → scar
 - Scar tissue has more ECM (particularly collagen) but reduced tensile strength (70%)
 - Pathological scars (hypertrophic scars, keloids) may cause severe esthetic and functional defects
- Delayed wound healing and chronic wounds
 - Causes
 - External: infection, trauma, smoking, radiation therapy
 - Internal: diabetes, anemia, stress, bleeding disorder, atherosclerosis, tumor, aging
 - Signs that a wound is healing poorly
 - Prolonged/persistent bleeding
 - Persistent inflammation >7 days
 - Malodorous wound
 - Increased exudates
 - Delayed re-epithelialization
 - Maceration of surrounding tissues
 - Wound dehiscence
 - Presence of necrotic tissue

- Wound healing in the mouth is faster and heals with minimal scars. It is thought to be due to:

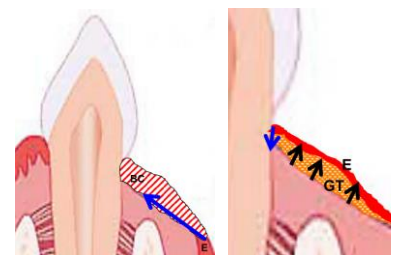
Saliva	-Moisture, ionic strength, growth factors, unknown factors
Bacteria	-Stimulation of macrophage influx -Direct stimulative action on keratinocytes and fibroblasts
Phenotype of cells	-Fetal-like fibroblasts with unique response -Specialized epithelium and connective tissue ECM
Reduced/altered inflammatory response	-Distinct expression of inflammatory and pro and anti fibrogenic cytokines

- Wound closure

Healing by primary intention	Healing by secondary intention
-Wound edges close to each other -Faster wound closure (epith. cells migrate less) -Very little granulation tissue -Very little scar formation -Goal in surgery	-Wound edges far apart -Slower wound closure -Abundant granulation tissue formation -Sometimes scar formation -If ideal wound closure is not possible, this is the mode of healing

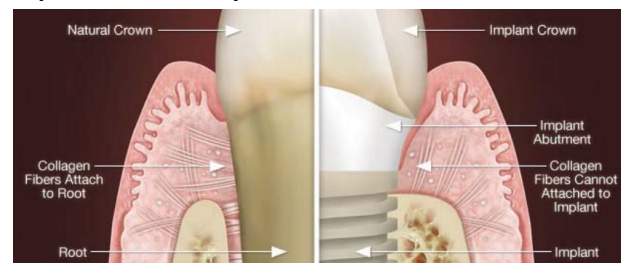
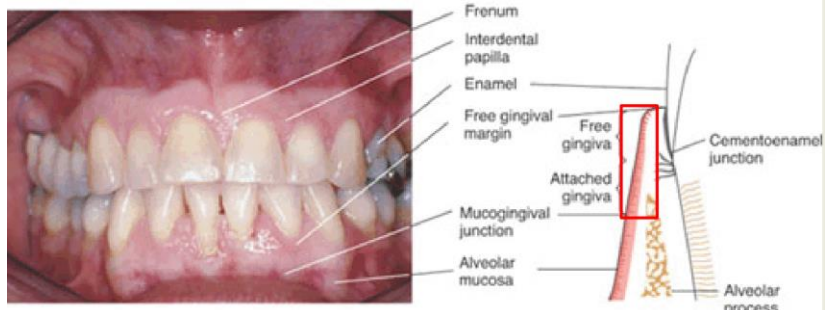
- Healing of a **gingivectomy**

- Hemostasis and inflammation
 - Blood clot established within hours
 - Inflammation starts within minutes, peaks at day 3, and may continue up to 14 days
- Re-epithelialization
 - Epithelial growth
 - Need to regenerate epithelium, attachment apparatus of junctional epithelium, and sulcular epithelium
 - Starts at 24 hours, whole wound is covered in 7 days, outer epithelium is healed and keratinized in 2 wks
 - Epithelium proliferates and migrates under a thin layer of clots, necrotic cells, and PMNs
 - After 3 weeks, outer gingiva looks clinically normal
 - Granulation tissue
 - Starts at day 2, peaks at day 3~4
 - Involves proliferation and migration of CT cells from gingiva to the blood clot
 - At day 7, primitive CT (granulation CT) grows up to create a sulcus along the tooth surface
 - Epithelial cells will cover this surface and migrate into the sulcus to form the new junctional epithelium and sulcular epithelium
- Maturation
 - 3~5 weeks and includes reformation and stabilization of dentogingival collagen fibers
 - Complete healing and formation of SE + JE may take up to 5 weeks
 - Meticulous oral hygiene should be maintained during this whole time

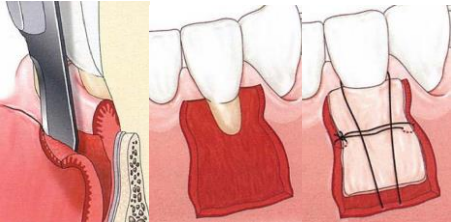




Mucogingival surgery

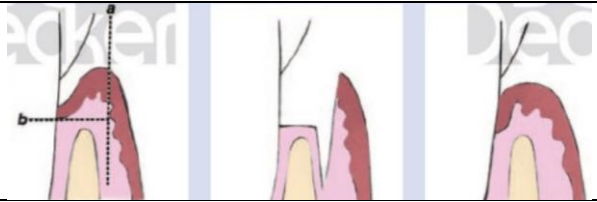
- Definition
 - Procedures designed to correct defects in the morphology, position, or enhance the dentogingival junction
 - **Procedures involving teeth:** gingival recession, lack of KT, aberrant frenum/muscle position
 - **Procedures involving edentulous ridges:** vertical/horizontal ridge deficiency
- Types of epithelia in the mouth
 - Specialized mucosa – on taste buds of dorsum of tongue
 - Lining (non keratinized) mucosa – lips, cheeks, floor of mouth, soft palate
 - Masticatory (keratinized) mucosa – gingiva, hard palate
- Terminology
 - Keratinized gingiva \neq attached gingiva. Keratinized gingiva includes the free gingival margin, which is not attached
 - Width of attached gingiva is the width of keratinized tissue minus the probing depth
- Do we need keratinized gingiva?
 - Thought that it is needed, because it is better than alveolar mucosa at protecting the teeth, retards inflammation, and protects the periodontium
 - Thought that 1mm of attached tissue is needed to maintain gingival health
 - 1985 (5 yr study): pts with minimal attachment and poor OH \rightarrow 90% showed recession over 5 years
 - 1987: if subG restorations are to be placed in areas of minimal KT and poor OH, augmentation to widen the KT may be warranted
 - Inadequate KT facilitates plaque formation, attachment loss, and recession
 - However, some studies have contradicted this
 - 1977: Sites with no attached gingiva were no more prone to develop inflammation
 - 1987 (5 yr study): pts with good oral hygiene that lack an adequate zone of attached gingiva did not result in an increased recession
 - 1992 (10 yr study): confirmed above
 - **Conclusion: patients who practice excellent oral hygiene may maintain healthy areas with almost no attached gingiva without further recession**
- Role of keratinized gingiva around implants
 - In implants, collagen fibers are all parallel
 - There is no PDL space and less vascularization
 - Therefore, periodontium is more susceptible to bacterial infiltration and it won't be able to respond adequately
 - Keratinized tissue \downarrow risk of peri-implant disease
 - However, KT has no effect on osseointegration
- Miller classification for recession (1985)
 - Identifies the severity of gingival recession and predicts its treatment outcome
 - Class I: Recession not to MGJ, no interproximal bone or papilla loss, 100% root coverage
 - Class II: Recession to or past MGJ, no interproximal bone or papilla loss, 100% root coverage
 - Class III: Recession past MGJ, interproximal bone or papilla loss, malposition, partial coverage
 - Class IV: Recession past MGJ, severe interproximal bone or papilla loss, malposition, NO root coverage
- Indications for surgically increasing attached gingiva
 - When there is ≤ 1 mm of attached gingiva and:
 1. Inability to perform oral hygiene due to impinging soft tissues
 2. Progressive recession
 3. Subgingival restorative margins
 4. Teeth undergoing orthodontic therapy



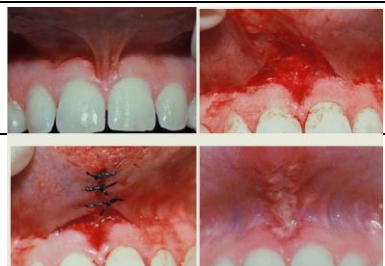
- Surgical procedures
 - Free gingival graft (AKA Free autogenous soft tissue grafts)
 - Apically positioned flap
 - Frenectomy
 - Surgical reconstruction of the alveolar ridge
- Free gingival graft

Indications	-Minimal keratinized tissue -Frenum pull -Shallow vestibule														
Contra-indication	-High esthetic demand														
Advantages	-Donor material readily available -Simple procedure -High degree of predictability -Treat multiple teeth at the same time														
Disadvantages	-Lack of predictability in root coverage -2 operative sites (donor and recipient sites) -Compromised blood supply and poor hemostasis -Colour mismatch -Greater discomfort														
Preparation of recipient site	<p>Non surgical</p> -Root debridement to remove biofilm -Root reduction (smooth root prominences, shallow root caries, root irregularities) -Root conditioning (citric acid, tetracycline, EDTA) to remove smear layer and expose collagen fibrils <p>Surgical</p> -Incision is made below MGJ, parallel to the alveolar process -Form a partial thickness flap that is 30% bigger than the defect (to compensate for contraction of graft) -Apical extension should be 3~5mm more apical to the most apical part of the exposed root -Flap may be sutured apically (with 5-0 or 6-0 sutures) -Donated tissue will be inserted with CT facing the periosteum of recipient site -Periodontal dressing optional 														
Preparation of donor site	<p>-Donor tissue should be 33% larger than the anticipated healed graft due to shrinkage</p> <table border="1"> <tr> <td>Thin graft</td><td><0.75 mm thick</td><td>Epithelium only</td><td>-Less immediate (1°) contraction, but more delayed (2°) contraction</td></tr> <tr> <td>Intermediate graft</td><td>0.75 ~1.25mm</td><td>Epithelium with some CT</td><td>-Intermediate thickness assures there is adequate CT</td></tr> <tr> <td>Thick graft</td><td>>1.25mm</td><td>Epithelium and all CT</td><td>-More immediate (1°) contraction, but less delayed (2°) contraction</td></tr> </table> <p>-Possible donor sites: edentulous ridge, tuberosity, palate (distal to rugae) -Tuberosity is the best due to minimal fat content, but it's hard to reach -Should be ≥ 2mm from any free gingival margin -Graft needs to be adjusted after it's taken out -Make thickness uniform -Remove glandular tissues</p> 			Thin graft	<0.75 mm thick	Epithelium only	-Less immediate (1°) contraction, but more delayed (2°) contraction	Intermediate graft	0.75 ~1.25mm	Epithelium with some CT	-Intermediate thickness assures there is adequate CT	Thick graft	>1.25mm	Epithelium and all CT	-More immediate (1°) contraction, but less delayed (2°) contraction
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Thick graft	>1.25mm	Epithelium and all CT	-More immediate (1°) contraction, but less delayed (2°) contraction												
Stabilization of graft	-Recipient site is irrigated to remove excess clotted blood -Firm finger pressure is used to apply the donor tissue to the recipient site -Sutures are applied (with pressure) to prevent dead space from forming -Pull on cheek to see if there's any mobility of the graft														
Clinical example															

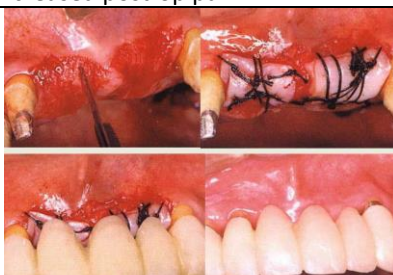
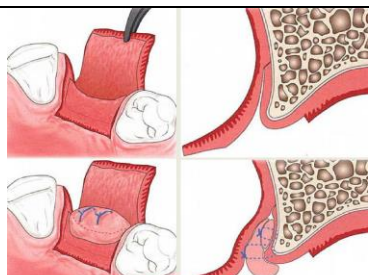
- Apically positioned partial thickness flap

Requirements	<ul style="list-style-type: none"> -Thick gingiva -Absence of need for extensive osseous resection -Adequate alveolar bone covering the root -Pre-existing keratinized gingiva
Procedure	<ul style="list-style-type: none"> -Crestal incision forming a partial thickness flap parallel to tooth (A) -Flap raised by sharp dissection (B) -Periosteum is preserved -Flap is placed more apically 
Indications	<ul style="list-style-type: none"> -Increases the attached gingiva -Elimination of periodontal pockets that extend beyond the MGJ with narrow attached gingiva
Contraindications	<ul style="list-style-type: none"> -Thin gingiva -Lack of keratinized tissue at the gingival margin -Extensive osseous surgery required

- Frenectomy




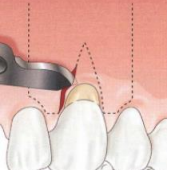




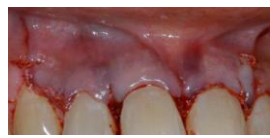
Procedure	<ul style="list-style-type: none"> -Complete removal of the frenum, including its attachments to the alveolar process -Can be performed on its own or with other procedures to increase attached gingiva 
Indications	<ul style="list-style-type: none"> -High frenums causing diastemas, gingival recession, or periodontal disease

- Ridge defects and reconstruction

Classification of ridge defects	<ul style="list-style-type: none"> -Based on amount of available ridge volume in horizontal/vertical aspects -Useful during planning and case discussion <p>Siebert (1983) classification of SITE</p> <ul style="list-style-type: none"> -Class I → Buccolingual loss with normal ridge height -Class II → Apicocoronal loss with normal ridge width -Class III → Buccolingual AND Apicocoronal loss <p>Allen (1985) classification of EXTENT</p> <ul style="list-style-type: none"> -Mild → < 3mm -Moderate → 3-6mm -Severe → > 6mm 	
About the surgeries	<ul style="list-style-type: none"> -Ridge augmentation is only done with soft tissue – no augmentation of bone -Predictability of surgery is dependent on extent of defect -Grafts shrink mostly at 6 weeks and 3 months for stabilization -Account for this shrinkage when taking the donor tissue 	
Procedure	Onlay graft ridge augmentation	Subepithelial CT graft ridge augmentation
Advantages	<ul style="list-style-type: none"> -Augmented vertical dimension of ridge -Increased KT 	<ul style="list-style-type: none"> -Increased vascularization of graft -Smaller wound on palate -Color match
Disadvantages	<ul style="list-style-type: none"> -May need multiple surgeries -Reduced blood supply to the graft -Color mismatch -Increased post-op pain 	<ul style="list-style-type: none"> -Technically demanding -Less increase in alveolar ridge height
Image		

Root coverage

- Indications for root coverage: esthetic concern, progressive recession, and hypersensitivity
- Factors that worsen the prognosis of root coverage treatment
 - Patient: poor oral hygiene, traumatic tooth brushing, smoker
 - Tooth/site: malposition, shallow vestibule, decay or concavity on exposed root, low interdental bone/papilla, thin flap, and lack of keratinized tissue
 - Technique: graft is not tension-free, operator skill, position of gingival margin, insufficient blood supply, poorly adapted donor tissue to recipient site, and graft mobility
- Other factors to consider
 - Donor tissues should be handled with care and not over-sutured or over-stretched
 - Slight mobility in the graft can cause it to necrose, especially in the first 5 days
- Techniques
 - Free gingival graft: already covered in previous lecture
 - Pedicle grafts (4 types)
 - Advantages: one surgical area, blood supply is preserved, and is esthetic
 - Disadvantages: for minor recession only

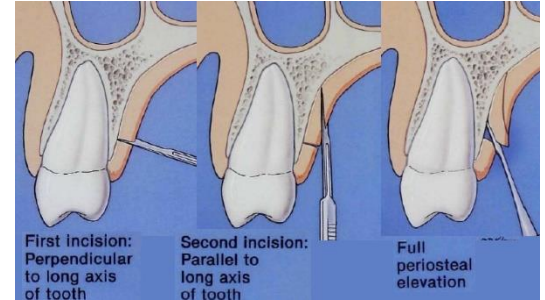
	Laterally positioned flap	Double papilla flap	Coronally positioned flap	Semilunar flap
Procedure	-Taking gingiva from the tooth distal/mesial to the recession and moving it over	-Papilla mesial/distal to the recessed tooth will be cut and pulled into root surface	-Creating a flap, then pulling on it to move flap coronally	Not learning?
Pre-requisites	-Adequate donor tissue in adjacent site -Adequate vestibular depth to allow lateral pulling -Adequate tissue width and thickness	-Sufficient width and length of papilla on both sides of recession	->3mm keratinized gingiva -Adequate vestibular depth	
Pros	-Maintains own blood supply -One surgical site -Good esthetic match	-Papillae supply more attached gingiva than radicular gingiva -Minimal resorption of interdental bone	-Treatment of multiple areas -No need to involve adjacent teeth	
Cons	-Possible recession of ~1mm at donor site	-Technically demanding -Variable predictability -If area of recession is wide, papilla will rest on an avascular surface and die off	-Vestibular shortening (so be careful not to do this on pts with strong muscle pulls or shallow vestibules)	
Steps	 <p>-V shaped incision around the recessed tooth</p>  <p>-Partial thickness pedicle flap in adjacent area</p>  <p>-Pull flap to recessed tooth and suture -Donor site will heal via secondary intention -Relieve tension with a vertical flap</p>	 <p>-V shaped bevelled incision -Remove V shape tissue</p>  <p>-Horizontal incision at base of papillae with 2 vertical incisions → releases the flap</p>  <p>-Suture papillae together</p>	 <p>-Horizontal incision at base of papilla and vertical incisions to release the flap</p>  <p>-Partial thickness flap, preserve the periosteum</p>  <p>-Suture flap more coronally</p>	

○ Connective tissue graft

- Most standard procedure for root coverage
- **Advantages:** better tissue match, dual blood supply (periosteum + flap), predictable (90% success), less painful at donor site (no open wound)
- **Disadvantage:** 2 surgical sites (donor + recipient), adequate donor tissue needed, and more challenging
- Preparation
 - Clean and debride the area of surgery
 - Remove any restorations, as gingiva will not bind to restorative materials
 - If the patient has deep root surface fillings, remove them even if it leaves a concavity in the root
 - Shallow and smooth composite restorations can be placed up to where the gingival margin is expected to be after the surgery
 - Alternatively, area can be re-restored after surgery has completely healed

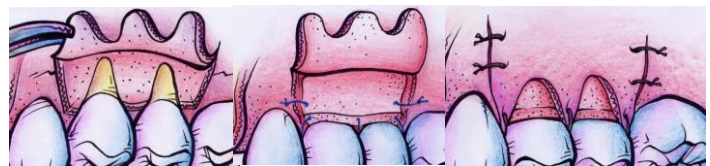
▪ Surgery at the donor site

- Start with one horizontal incision perpendicular to tooth
- Second horizontal incision parallel to tooth
- Harvest graft tissue via periosteal elevation
- Suture donor site closed
- Be cautious about the greater palatine nerve. The nerve is protected by a lot of fat



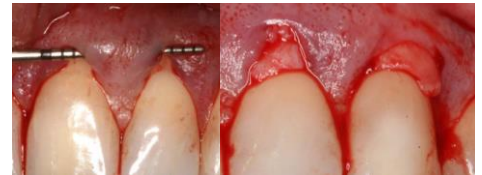
▪ Surgery at the recipient site (Langer technique)

- Cut a partial thickness flap (preserve periosteum) around recessed areas
- Insert graft tissue
- Suture closed



▪ Surgery at the recipient site (Raetzke pouch)

- No superficial incisions needed → more common nowadays
- Gingiva is separated from the tooth and bone
- **Papilla remain attached**
- Forms a "tunnel" which the graft can be shoved into



○ Alloderm

- Skin is donated from humans → epidermis and cells are removed as they can cause rejection
- Only thing left is the acellular dermal matrix
- Advantages
 - No need for 2nd surgical site, decreased patient morbidity, removes palatal harvesting limitations
 - Decreased chair time
 - Unlimited material supply, able to treat multiple recessions
 - Increased patient acceptance
- Like the Raetzke pouch, multiple teeth are tunnel prepped and Alloderm is guided into it



• Healing and success of root coverage procedures

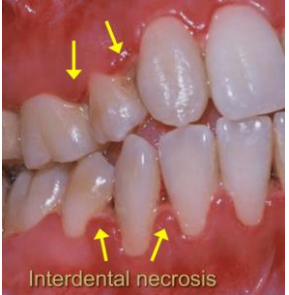
- Long junctional epithelium and connective tissue attachment is seen
- Complete root coverage obtained (CEJ is covered with soft tissue)
- Clinical attachment to root → probing depths ~2mm with no BOP
- Colour match

• Evidence of root coverage procedures

- All studies show a statistically significant reduction in GR and gain in CAL +/- improvement in KT
- There is great variability in the amount of root coverage obtained

Periodontal emergencies


- Necrotizing ulcerative gingivitis (AKA Vincent's disease, fusospirochetal gingivitis, or acute NUG)

Etiology	<ul style="list-style-type: none"> -Fusiform bacteria, Prevotella intermedia, Spirochetes (Treponema Pallidum) -Can occur free of any other gingival involvement or be superimposed on underlying chronic gingival disease
Predisposing factors	<ul style="list-style-type: none"> -Acute psychological/emotional stress -Immunosuppression, like when cortisol levels are high -Malnutrition and cigarette smoking -Pre-existing gingivitis and trauma
Clinical presentation	<p>These 3 must be present:</p> <ul style="list-style-type: none"> -<u>Pain</u>: intense pain with usually rapid onset -<u>Interdental gingival necrosis</u>: limited to the interdental and marginal gingiva but can spread to oral mucosa as well. Interdental papilla will appear "punched out" -<u>Bleeding</u>: with little or no provocation <p>Secondary features:</p> <ul style="list-style-type: none"> -Fetid breath -Systemic involvement -Gray/yellow pseudomembrane that wipes off to reveal bleeding gingiva -Fever, lymphadenopathy <p>4 layers/zones are found in NUG lesions:</p> <ul style="list-style-type: none"> -<u>Bacterial zone</u>: most superficial, composed of a mass of bacteria with varying morphocytes -<u>Neutrophil rich zone</u>: underneath bacterial, contains leukocytes with neutrophils predominating -<u>Necrotic zone</u>: disintegrating cells and many spirochetes -<u>Spirochetal inflammation zone</u>: well preserved tissue elements with spirochete infiltration 
Treatment	<ul style="list-style-type: none"> -Anesthetize the patient to address pain before proceeding with treatment -<u>Debridement</u>: removes local factors and reduces microbial accumulation <ul style="list-style-type: none"> -Ultrasonics are preferred as the water will clear the pseudomembrane layer -Deep scaling is recommended as papilla is mostly unattached and deep pockets exist -Do a 2nd debridement 1~2 days later -<u>Improve oral hygiene</u>: recommend soft toothbrush run under hot water to soften even more -<u>Chlorhexidine rinse</u>: plaque control and wound healing -<u>Systemic antibiotics</u>: as an adjunct to debridement, give metronidazole or penicillin -<u>Other recommendations</u>: ↓ smoking/alcohol, ensure adequate food intake -Improvement will happen in 4~6 days so follow up in 1 week
Treatment considerations	<ul style="list-style-type: none"> -Non surgical approach is preferred due to esthetic considerations -Most recurrences of NUG occur when deformities persist <ul style="list-style-type: none"> -Sometimes, healed NUG leaves a shelf-like gingival margin which is a plaque trap -Can be corrected with periodontal surgery -Inadequate local therapy (stopping tx when symptoms subside), inadequate plaque control, or heavy use of tobacco are possible reasons for recurrence -Educate patient of risk of permanent gingival deformity and high recurrence rate → follow up impt


- Necrotizing ulcerative periodontitis

Etiology	<ul style="list-style-type: none"> -Necrosis of gingival tissue, PDL, and alveolar bone -Most commonly observed in individuals with HIV, malnutrition, and immunosuppression -Study showed that HIV patients with NUP are 21x more likely to have CD4 counts below 200/mm³
Clinical presentation	<ul style="list-style-type: none"> -Similar to NUG, except patients also demonstrate clinical attachment loss and alveolar bone loss -Nearly 20% of HIV patients experience NUP as an early sign of their disease. It is crucial to detect this sooner than later
Treatment	<ul style="list-style-type: none"> -Same as NUG -However, systemic antibiotics may be avoided due to ↑ chance of opportunistic infection -Antifungals and antivirals may be considered depending on the patient's systemic condition


- Abscesses of the periodontium

	Gingival abscess	Pericoronal abscess	Periodontal abscess	
About	-Localized purulent infection involving the marginal gingiva or interdental papilla	-Localized purulent infection within the tissue surrounding the crown of a partially erupted tooth -Usually mand 3 rd molar	-Localized purulent infection within a periodontal pocket -May lead to destruction of PDL and bone	
Etiology	-Acute inflammation response to foreign substances forced into the gingiva (like a toothbrush bristle)	-Soft tissue flap on tooth crown acts as a trap for debris -Severity and abscess has been associated with Gram neg anaerobic pathogen such as P. gingivalis	-Abscess in a pocket -May be acute or chronic -When acute abscess drains through a fistula into the outer gingival surface or into a pocket, it may progress into a chronic abscess -When chronic abscess' fistula becomes blocked (due to food blockage or healing), it can turn into an acute abscess Chronic periodontal abscess vs periapical abscess  -Stick a gutta percha point into the fistula and take a radiograph -Periodontal abscess will yield a dull pain, and periapical will be sharp pain -If deep pockets present → periodontal abscess	
Clinical features	-Initially: usually asymptomatic or some red swelling of gingiva -In 24~48h: lesion becomes fluctuant and pointed. Orifice may form that expresses exudate -If untreated: ruptures spontaneously and may cause pulpal hypersensitivity	-Red and swollen flap -Infection may spread posteriorly (oropharyngeal area) or medially (base of tongue) and affect local lymph nodes -Pts usually have a history of pericoronitis, and dysphagia may be present -Fever, trismus	-Associated with advanced perio problems like: tortuous pockets, furcation involvement, intrabony defect, calculus	
			Acute -Ovoid elevation along gingiva near root -Swollen + red gingiva -Pus expressed with gentle pressure -Slight discomfort ~ severe pain -"Pressure in gums" -Tenderness to percussion or mastication	Chronic -May exist for a long time (usually asymptomatic) with intermittent exudation -Dull pain, slight elevation of tooth -Desire to bite tightly and grind -Usually has a fistulous tract connecting gingiva to deep tooth supporting tissues -Opening may have small pink mass of granulation tissue, or be very hard to find
Treatment	-Give LA -Explore area to see if any foreign bodies are stuck -If no foreign body → proceed to SRP -CHX may be given to support OH in the area	First visit -If trismus is present, give ABX -Give LA → rinse flap (warm H ₂ O) → lift flap with a curette → clear debris → rinse under flap (CHX) -Give CHX rinse 2x/day <u>-No surgery at first visit</u> Second visit -See patient 24h later -Consider extracting 3 rd molar -Advantage to exo: ↓ risk of bone loss around 7's, resolution of pericoronitis	-Give LA Draining thru pocket -Probe can be inserted into the pocket Draining thru external incision -Isolate, dry, disinfect -Deep vertical incision made on most fluctuant area -Irrigate w. saline or CHX after drainage -Occlusal adjustment may be needed if tooth became extruded	-Allow acute sx to subside -Give LA -Remove supragingival calculus -Flap operation may be necessary -Take radiograph to see extent of bone loss (endo may not be worth it if bone loss makes tooth hopeless)


- Acute herpetic gingivostomatitis

Etiology	<ul style="list-style-type: none"> -Primary infection by herpes simplex virus -HSV type 1 (usually infects oral cavity) and type 2 (usually infects genitals) exist -Transmitted through physical contact -Virus incubates for 1 week, then it can be asymptomatic (most cases) or turn into an infection called acute herpetic gingivostomatitis -Most commonly detected in children and ages 20~25
Predisposing factors	<ul style="list-style-type: none"> -Trauma: mechanical, sun exposure, psychological -Hormone imbalance -Inadequate diet
Clinical presentation	<ul style="list-style-type: none"> -Fever, painful swelling of lymph nodes -Acute, painful gingivitis with blister-like aphthae, erosive lesions on gingiva, mucosa, and lips -Spontaneously disappears in 1~2 weeks -Will heal without any scarring 
Treatment	<ul style="list-style-type: none"> -Aim for patient comfort until disease runs its course -Plaque, good debris, and superficial calculus removed to ↓ inflammation -Plaque inhibitory agent (CHX?) given to prevent bacterial superinfection -If bacterial superinfection happens, antibiotics may be given -Acyclovir is an antiviral that may be given for topical or systemic use -Valacyclovir is an antiviral that may be given for systemic use
Recurrent herpes infection "cold sore"	<ul style="list-style-type: none"> -After the first infection, herpes integrates into host DNA in nerve ganglions → never "cleared" -Multiple intraoral vesicles in the attached gingiva (buccal and palatal side), vermillion border, or commissures of the lips -Can be triggered by scaling/root planning, sun exposure, extreme cold, stress, menstruation, smoking -Valtrex (oral valacyclovir) 500 mg tablets: take 2 tablets (1g) BID -Zovirax (topical acyclovir) apply to affected area

- Periodontitis associated with endodontic lesions

Etiology	<ul style="list-style-type: none"> -Not to be confused with "endo-perio lesions" which involve 3 classes depending on the origin of the lesion -Happens when there is an interaction between a disease of endodontic origin and periodontal disease on a tooth -Perio or endo lesion can develop independently 	
Clinical example	<ul style="list-style-type: none"> -In this case, only the RCT was done and no periodontal treatment was necessary -The endo lesion preceded the perio lesion 	

- Combined periodontic-endodontic lesion

Etiology	<ul style="list-style-type: none"> -This is called the "endo-perio" lesion -Situation where there is a coalescence of endodontic and periodontic lesion -Classified into 3 groups. It is not based on initial etiology, and either perio or endo lesion may develop independently 	
Treatment	<ul style="list-style-type: none"> -Endo should be treated first -Then do perio 	

Postoperative care and complications





- General tips
 - Immediately after the surgery, inform patient on how to care for themselves for the next few days
 - Inform patient what they are likely to experience, why, and how to manage it
 - Verbal and written instructions in simple language
 - Include a phone number for emergency calls
- Day of surgery
 - Avoid physical exercise
 - Increases blood flow to surgical area → may cause post operative bleeding
 - Heavy exercise should be avoided for a few days, depending on nature and extent of surgery
- Periodontal dressing
 - 2 tubes of putty that are mixed and applied on area of surgery → hardens in 1 hour → left on until next appt
 - Does not help with healing
 - Helps with controlling bleeding (applies pressure), and protects area from trauma
 - Small particles may chip off the putty
 - If the putty comes off, its okay as long as the patient isn't bleeding. However, they should call surgeon to assess the situation
- Post operative bleeding
 - Sutures are placed for initial re-approximation of tissue and hemostasis
 - Periodontal dressings may be used as well
 - Symptoms that may worry the patient
 - Oozing of blood after surgery is normal
 - Blood mixing w/ saliva may give the impression of significant bleeding
 - Things patient should avoid
 - Avoid rinsing vigorously for the first few hours
 - First 1~2 days: avoid smoking, sucking through a straw, spitting (negative pressure + mechanical irritation)
 - No strenuous exercise
 - Avoid garlic, ginger, and ginseng (may increase bleeding)
 - Alarm symptoms
 - Prolonged bleeding
 - Bright red bleeding
 - Large blood clots
- Managing non stop bleeding
 - Elevate the head and compress area with a sterile gauze or damp teabag for 20~30 mins
 - If this doesn't stop bleeding, bring patient into office
 - Try to locate bleeding point
 - Re-approximate sutures if they have come loose
 - If open flap is not the issue, then place 1+ sutures distal to the bleeding site (this is called a **blind suture**)
 - This decreases blood supply to the bleeding point
 - Local injection of LA containing 1:50,000 epi may help initial clotting
- Ecchymoses/bruising
 - Blood oozes submucosally and subcutaneously → appears as bruises in the face
 - Usually seen in older patients due to ↓ tissue tone and weaker intercellular attachment
 - Not dangerous and doesn't increase pain or infection
 - Patient should be warned beforehand so they do not become apprehensive
- Edema
 - Most surgical procedures will cause edema, more so in osseous surgeries
 - Swelling is most severe 48~72 hours after surgery and usually resolved by 1 week
 - Management
 - Keep head elevated and use several pillows when sleeping
 - Ice packs 20 minutes on, 20 minutes off for the first 24h
 - After day 3, heat may help more, but not necessary
 - If swelling persists past day 3/4, it may indicate infection → contact surgeon

- Complications from LA
 - Trismus
 - Multiple injections of LA (esp. into masticatory muscles) may cause inflammation of muscles → trismus
 - Usually involves the medial pterygoid muscle which may be penetrated during IAN block
 - Not alarming an patient should be aware of this possibility
 - Paresthesia
 - Possible to injure a nerve during LA injection
 - Mental nerve damage → decreased sensation of ½ of lower lip and buccal gingiva on ipsilateral side
 - IAN damage → decreased sensation of lower lip, teeth, buccal gingiva of same quadrant
 - Lingual nerve damage → decreased sensation of lingual gingiva of same quadrant and anterior 2/3 of tongue
 - Normal function usually returns within a few weeks, but may take 6+ months
- Nutrition
 - Soft, cool, or lukewarm foods for few days after surgery
 - Icecream, milkshakes, etc, tend to keep area comfortable
 - Avoid spicy and hot foods
 - Use the opposite side of the mouth to chew
 - Ensure adequate nutritional intake
 - Diabetic patients should return to normal insulin and diet routine as soon as possible
- Oral hygiene
 - Right after the surgery
 - Advise patient that a cleaner mouth will yield quicker healing
 - Prescribe CHX rinse 10~15 mL for 30 secs ~ 1min BID x 2 weeks
 - Anything longer than 2 weeks will risk staining
 - Don't mix with toothpaste. So if patient brushes, tell them not to use toothpaste OR wait 30 minutes after brushing before doing CHX rinse
 - Other individualized instructions may need to be given
 - After 1st post-op visit (1/2 weeks later)
 - Remove periodontal dressing
 - 1 week post op, meticulous OH in areas around the surgery should be started
 - Gentle brushing with an extra soft toothbrush. Some bleeding expected
 - After week 2/3, may start using a rubber tip stimulator, proxabrush, and appropriate brushing technique
 - Restorative treatment may proceed at week 4~6 depending on rate of healing and extent of surgery
- Postoperative pain and discomfort
 - Some amount of pain is to be expected → make sure patient knows
 - Patient should be advised that analgesics are to manage pain, not eliminate it
 - Pain will peak in first 24h and diminish quickly after
 - Preoperative management
 - 400~600 mg ibuprofen right before surgery
 - When LA wears off, ibuprofen will be in effect and decrease inflammation too
 - Avoids the sharp pain that follows after LA wears off
 - Postoperative management
 - Mild over the counter analgesics
 - Stronger analgesics: Toradol (Ketoralac 10mg), Tylenol #3 (Acet 300, Codeine 30)
 - Always optimise non-opioid component before increasing opioid dose
 - 500~1000 mg of acet every 6 hours helps achieve maximum effectiveness of non-narcotics
 - Tooth sensitivity
 - Common after SRP or post surgical recession
 - Should be advised in advance and treated as needed
 - Could be transient or permanent
 - Increased tooth mobility
 - Advise patient it is possible
 - Stabilizes usually after 4 weeks, but could take up to 1 year
 - No treatment necessary, but splinting could be considered if mobility causes discomfort

- Control of infection
 - Common to prescribe antibiotics immediately after surgery in implant and bone regeneration surgeries
 - Immunocompromised patients may need antibiotics to prevent infection
 - Patients needing to take prophylactic antibiotics do not need additional postsurgical antibiotics
 - If swelling, redness, and pain persists after day 3, it should be assumed that an infection has developed
 - Possible reasons for infection
 - Excessive use of vasoconstrictor
 - Poor flap design
 - Excessively tight suturing
 - Bone exposure
 - All leads to ischemia and possible tissue necrosis
 - HSV patients
 - May have reactivated cold sores
 - No additional treatment is needed, just inform patient
 - Aphthous ulcers
 - Similar to HSV, may flare up an episode due to stress from surgery
 - No additional treatment is needed, just inform patient
- Post operative follow up visit
 - Ideally 1 week after surgery
 - Sutures may be removed at 1st week or 2nd week post-op visit
 - Individualized oral hygiene instructions should be given to patient
- Patient charting
 - Write everything discussed during each visit, every phone call, every text, every email
 - Include: Date, Patient's name, Diagnosis, Medical History, Vital signs, Oral examination, amount and type of Anesthesia, steps of the Procedure, Sutures, Discharge instructions, Prescription medications, Next visit, Signature of surgeon

Furcation management



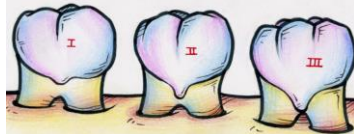

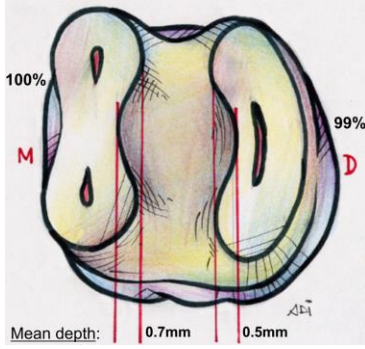
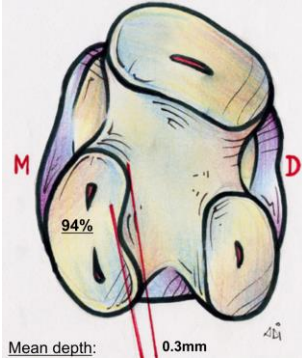
- Diagnosing furcations
 - Deep probings (6~7mm) in multi rooted teeth should always be followed up with a check for furcation
 - Vertical BW's and periapicals are taken in this situation to assist in diagnosis
 - Parallel PA's are preferred as they can be taken with minimal angulation (crest of bone is correctly oriented)
 - May be difficult to see furcation radiographically in maxillary molars, due to the palatal root
- Clinical significance of furcations
 - Molars affected by furcations are thought to have a high risk of tooth loss
 - Relative risk of tooth loss of a molar with furcation involvement compared to a non-involved tooth:
 - 1.46 in 10 years, 2.21 in 10~15 years
- Practical implications
 - Accurate periodontal therapy and maintenance should be planned, even in severely furcated teeth
 - Even teeth with 3rd degree furcations have good survival rates with supportive periodontal care
- Furcation classification
 - There are multiple methods of classification
 - Hamp and Glickman refer to horizontal component of furcations, whereas Tarnow deals with vertical

	Hamp, Nyman, Lindhe (1975)	Glickman (1953)	Tarnow, Fletcher (1984)	Charting
First grade	Class I -Horizontal attachment loss ≤ 3 mm -Nabers probe inserted into the furcation	Grade I -Early furcation involvement just into the fluting of the furcation -No significant bone loss or CT in the furcation -Feel a slight catch with a probe, but no radiographic evidence of furcation	Grade A -Vertical loss of 1~3mm	
Second grade	Class II -Horizontal attachment loss > 3 mm	Grade II -Distinct bone loss in furcation -Bone loss is not through and through -Further classified to shallow or deep	Grade B -Vertical loss of 4~6mm	
Third grade	Class III -Horizontal through and through destruction of periodontal tissue	Grade III -Bone loss through and through, with CT filling in the furcation -Instrument passes through -Furcation not visible due to CT covering it	Grade C -Vertical loss of 7+ mm	
Fourth grade		Grade IV -Bone loss through and through -Gingival recession leads to exposure of the furcation and is visible clinically		

- Etiology of furcations

Bacterial plaque	-Is the primary etiology -Secondary etiology also includes calculus and debris
Furcation anatomy	-Furcation may be shaped to favour accumulation of plaque
Thickness of alveolar process	-Thick buccal/lingual plates of bone will protect furcation, or support soft tissues and disguise the furcation
Enamel projection and pearls	-Anatomical anomaly that can lead to accumulation of plaque
Iatrogenic factors	-Perforation during endodontic procedure and leaking cement or causing a fistula to open up to the gingiva
Pulpal pathology	-Periapical radiolucency can cause bone destruction coronally up to the furcation area → "endo-perio issue" -Treat the endo first, then do non surgical debridement. Wait 2 months then see periodontal response. Perio surgery is then done if there is no bone healing
Trauma from occlusion	-Radiographically looks like an endo-perio lesion, but associated with a vital tooth -Fremitus is present at buccal plate when tapping on tooth -Occlusal adjustment and waiting for 2~6 weeks should resolve bone loss

- Local anatomy and developmental anomalies that affect furcations

Root trunk length	-Accepted values				
		Short	Average		Long
	Maxilla	3mm	4mm (3.6 mesial, 4.2 buccal, 4.8 distal)		5mm
	Mandible	2mm	3mm		4mm
	<ul style="list-style-type: none">-Short root trunks are more likely to get furcations-Long root trunks take longer to get to the furcation, but a furcation on a long root has a poorer prognosis as there is less root left and a lot of bone had to be lost-Long root trunk molars have poor response to periodontal therapy				
Inter-root separation and root fusion	<ul style="list-style-type: none">-Roots can be widely separated, narrowly separated, or fused but separated only at the apex-Widely separated roots are hard to regenerate bone due to it being such a wide area-However, narrow spaced roots display very rapid bone loss-Important in prognosis and Tx of furcations				
Cervical enamel projection	<ul style="list-style-type: none">-Class I: distinct change in CEJ, enamel projects to furcation-Class II: enamel approaches furcation, but not touching-Class III: enamel projection extends into furcation-Happens when amelogenesis fails to stop and continues-If a patient has a healthy periodontium but one furcation, then suspect a cervical enamel projection-Associated with poor perio prognosis, as periodontium can't attach to enamel → less support				
Enamel pearl	<ul style="list-style-type: none">-Usually spheroid, but other shapes are possible-Usually 1 present, but may have 2-Found in the concavities of molar furcations (mostly medial and distal of max 6's and 7's)-Less frequently on buccal and lingual of mandibular molars-Rarely on incisors and premolars-Blocks attachment and cannot debride around it-May contain pulp tissue inside the enamel pearl				
Intermediate bifurcation ridge	<ul style="list-style-type: none">-Between 2 roots, there is a bridge of cementum/dentin where the furcation should be-The bridge usually causes an uneven surface, leading to accumulation of plaque-Makes debridement more difficult-Grade I: <1mm-Grade II: <2mm-Grade III: 2+mm				
Root concavity in furcation area	Maxillary 1st premolar: <ul style="list-style-type: none">-Bifurcation location:<ul style="list-style-type: none">-35% apical 1/3-38% middle 1/3-27% cervical 1/3-Root trunk length: 4~14.6mm (mean 7.9)-Root length: 10~17.1mm-Root concavity always deeper on mesial-Deepens progressively from cervical ½ toward furcation	Maxillary molar: <ul style="list-style-type: none">-MB root 94%-DB root 31%-P root 17%	Mandibular molar:  <p>Mean depth: 0.7mm 0.5mm</p>		
		 <p>Mean depth: 0.3mm</p>			

- Objectives of treating furcations
 - Eliminate microbial plaque from exposed surfaces
 - Establishment of an anatomy that allows proper self-controlled plaque removal
- General principles of treating furcations
 - Regeneration of support is ideal, but not always possible
 - Most treatment is based on improving access to oral hygiene
 - Mode of therapy is based on degree of furcation involvement

- Treatment of furcation involvements

Class I	Class II	Class III
-Easiest to treat with best prognosis -Buccal furcations are easiest to access by patient, whereas lingual is not -M/D of maxillary molars are most difficult -Scaling and root planing -Furcation plasty	-Furcation plasty -Guided tissue regeneration -Tunnel preparation -Root separation and resection (RSR) -Extraction	-Tunnel preparation -Root separation and resection (RSR) -Extraction

- Factors that determine prognosis

- Tooth related:** furcation class, amount of remaining support, probing depth, mobility, endo conditions, available sound tooth substance, tooth position and occlusal antagonisms
 - Patient related:** value of tooth in relation to overall plan, functional demands, esthetic demands, patient's health, oral hygiene capacity

- Scaling and root planing

- Hopefully we know how to do this by now
 - Root planing the furcation areas are hard, as ~60% of molar furcations have a <0.75mm opening
 - Curette will not fit into most furcations, so they will need to be sharpened to access
 - Or, an ultrasonic instrument can be used

- Furcation plasty

- Step 1: odontoplasty
 - Flame shaped diamond finishing bur is used to blend and widen the furcation entrance
 - Step 2: osteoplasty
 - Use a round diamond bur to blend the bone crest into the furcation area
 - Note: recontour restorations as well
 - Crowns and restorations will need the furcation incorporated into the margins
 - Make the restoration adapt to the furcation entry



- Guided tissue regeneration

- Histologically, we are creating new cementum, new alveolar bone, and functionally oriented periodontal ligament
 - Main idea is to place a membrane over a bony defect. This blocks epithelium (which grows rapidly) from infiltrating into the missing bone and filling it with non-supportive soft tissue. The membrane allows bone to slowly grow in



- Predictability of GTR is limited, due to many variables. These include:
 - Morphology of defect (size)
 - Anatomy of furca
 - Changing location of soft tissue during healing
 - Predictability of GTR can be improved if such measures are taken:
 - Interproximal bone is located close to the CEJ → holds up membrane like a tent
 - Debridement of exposed root surface in furca
 - Space created between tooth and material
 - Primary closure of wound and allow healing for 6~8 months
 - Plaque control and OHI
 - Efficacy
 - Class I max/mand molar: usually not needed, but beneficial in certain cases
 - Class II max/mand molar: predictable, demonstrated histologically and clinically
 - Class III mand molar: one case report shows histological regeneration
 - Class III max molar: not predictable

- Tunnelling

- Usually done on mandibular molars
- Ideal traits
 - Molar has a short root trunk and widely spaced roots
 - Patient has excellent oral hygiene and low caries risk
 - Area is not too sensitive to thermal changes
 - Patient has the dexterity to keep the area plaque free
- Flap is raised and tissue within the furcation is removed, and bone is lowered such that the furcation will be easily cleansable
- Interdental brush should be able to clean the furcation through and through
- Root cavities are common, so excellent oral hygiene is a must



- Root separation and resection

- Separation: sectioning of the root complex and maintenance of all roots
- Resection: sectioning and removal of one or more roots
- Most commonly involves cutting the DB root off the maxillary molar
- Indications
 - Vertical bone loss around one root
 - Fracture in middle or apical third of root
 - Unfavourable root proximity
 - Endodontic perforation of a root
 - Inability to obturate the canal
 - Severe dehiscence of a root
 - Root caries too near the furcation area
- Factors to consider
 - Length of root trunk
 - Divergence between root cones
 - Length and shape of root cones
 - Amount of remaining support around individual roots
 - Stability of individual roots
 - Access for OH device
 - Ideally, tooth should be endo treated. Vital root amputations are possible but not ideal (70% success at 5 years), and endo must be done within 2 weeks

- Steps

- Raise a full thickness flap
- Osteotomy around root to be removed
- Root amputated with a carbide or diamond bur
- Reshape root trunk to minimize plaque retention
- Elevate root with no pressure on remaining tooth (remove root after tooth is completely smoothed, so that amalgam dust or debris doesn't fall into the extraction socket)
- Occlusion is adjusted to minimize lateral forces

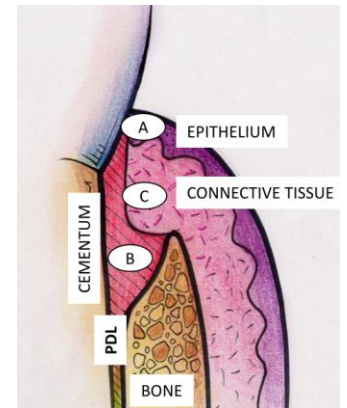
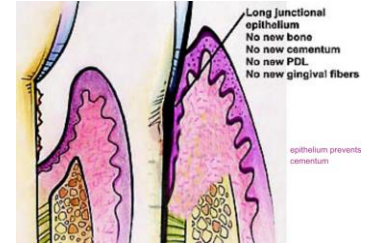
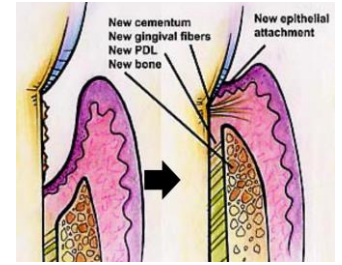


- Contraindications

- Systemic factors limiting dental treatment
- Unfavourable C:R ratio of remaining roots
- Adjacent teeth may support a fixed partial denture
- Patient has poor oral hygiene
- Retained root cannot be endo treated
- Retained root is fused to root that must be removed
- Remaining roots are too thin
- Root trunk too long (furcation close to apex)
- Inability to properly restore or splint the resected molar

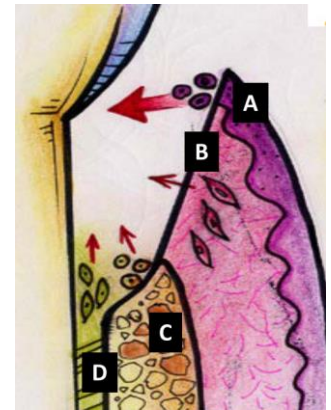
Periodontal regeneration

- Periodontal regeneration
 - Gingival tissues have the ability to regenerate to their original form and function
 - **Example:** In gingivitis, inflammation damages soft tissues and epithelium reversibly
 - In periodontitis, tissue damage is beyond repair and unable to fully reverse
 - Tissues that regenerate: PDL, gingiva (including dento-gingival fibers and epithelial attachment apparatus), cementum with inserting Sharpey's fibers, alveolar bone
- Periodontal repair
 - Healing that does not restore the architecture or function of the tissue
 - **Example:** formation of a long junctional epithelium with no new bone, cementum, PDL, or gingival fibers
- New attachment versus reattachment
 - Periodontal regeneration involves new attachment to the root surface that has been previously exposed to the periodontal pocket or covered by the pocket epithelium
 - Reattachment refers to the reunion of connective tissue and root surface after separation by incision or injury
- Ideal goal of periodontal treatment is to predictably achieve complete periodontal tissue regeneration. Some of these procedures are:
 - Soft tissue grafts
 - Bone replacement grafts
 - Root surface conditioning and biomodification
 - Guided tissue regeneration
 - Combination of the above
 - Novel approaches: using growth factors or stem cell therapies
- Success of current regenerative procedures
 - Clinically, these procedures have demonstrated reduced probing depth, clinical attachment gain, and radiographic bone fill
 - However, histologic observations show repair (long JE) is the most common outcome than regeneration
- Review of wound healing
 - A: borders of wound where epithelium will migrate into
 - B: fibrin clot
 - C: borders of wound where connective tissue will form
 - Stages of wound healing



Hemostasis	Minutes~6h	-Formation of blood clot -Adhesion of fibrin network and platelets to the root surface
Inflammation	Within 6h	-Lining of root surface with PMNs
	Up to 7d	-Inflammatory cell population switches from PMNs to macrophages -Area looks inflamed
	7~14d	-Inflammation is gradually reduced histologically and clinically
Re-epithelialization	3d	-Epithelial cells from gingiva migrate to root surface -Attaches to root surface and migrates apically to initiate JE formation
	7d	-New attachment has been established, but its maturation may still continue
	14d	-New epithelial attachment is completed -Barrier function restored
Hard and soft tissue healing	3~7d	-Formation of primitive ECM (collagen, angiogenesis, recruitment of stem cells)
	14d	-Gingival fibroblasts recruited -Blood flow normalized, collagen matures and reorganizes -Stem cells become PDL fibroblasts, cementoblasts, and bone cells
	21d	-Gingival and PDL collagen cells become organized at the tooth surface -Osteogenic and cementogenic activity present
	60d	-Dento-gingival and PDL fibers are established (new attachment, re-attachment) -Bone and cementum formed, but calcification continues for weeks
	6m	-Some tissue remodelling and bone regeneration happening

- Tensile strength of periodontal wounds during healing
 - Day 3: 225g → Day 7: 340g → Day 14: 1700g → Day 60: 90% of normal
 - Avoid brushing for 2 weeks, if possible. After 2 weeks, brush gently
 - No interdental brushing or flossing for 4 weeks
 - Avoid probing before 2~3 months
- What determines if healing will result in regeneration or repair?
 - When there is an injury, there is a race to repopulate the wound
 - A: gingival epithelium
 - B: gingival connective tissue
 - C: alveolar bone
 - D: PDL
 - Whoever wins the race will determine the outcome



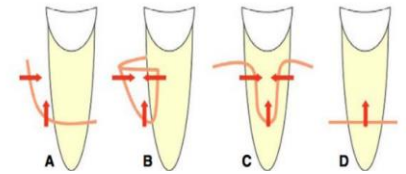
Outcome	Cell type responsible	About
Long junctional epithelium	-Gingival epithelium	-Most common outcome, as it proliferates the fastest and migrates apically -Extent of epithelial migration depends on: 1. Stability of the blood clot (clot retards migration) 2. Presence of Sharpey's fibers (stops epithelial cells from migrating further)
Collagen adhesion	-Gingival CT fibroblasts	-When these fibroblasts come to contact with an instrumented root surface, they may recognize it as a foreign body -Produces collagen fibers <u>parallel to the root surface</u> -Close approximation of gingival collagen and tooth matrix yields a <u>physicochemical valid attachment</u> -Some degree resistant to mechanical forces
Resorption	-Gingival fibroblasts or osteoclast-like cells	-Resorption is usually superficial and transient -Usually followed within weeks by deposition of new cementum -Periodontal surgery can sometimes cause aggressive inflammatory resorption, especially in the cervical region
Cementum formation and repair	-Cementoblasts	-Denuded root, surface resorption, or other factors can stimulate progenitor cells to differentiate into cementoblasts (CB) -Resorption layer can be seen (RL) -Cementoblasts deposit <u>repair cementum</u> (RC) -Sharpey's fibers (collagen from gingiva + PDL) anchor to this repair cementum, promoting new attachment and regeneration
Ankylosis	-Bone forming cells	-Rare, and usually in the cervical region -Rapid migration of bone cells ahead of PDL connective tissue cells
Regeneration	-All of the above	- Functional epithelial seal: only re-established at the coronal 2mm - New CT fibers (Sharpey's fibers): inserted into the previously exposed root surface to reproduce dento-gingival and PDL fibers - New cementum: to restore the previously exposed root surface and allow the insertion of Sharpey's fibers - New alveolar bone: restored to within 2mm of the CEJ -Only histological examination can show if regeneration has occurred

- One or more of the above, in one surgical site
 - Different outcomes depend on surgical technique and absence of microbes
- Favouring periodontal regeneration
 - **Main factor:** on the availability, recruitment, and activation of progenitor stem cells
 - **Other factors**
 - Elimination of agents of periodontal destruction (calculus, biofilm, contaminated cementum)
 - Presence of appropriate signals to induce proliferation, migration, and differentiation (growth factors)
 - Wrong cell types have to be excluded
 - Adequate space maintained for bone regeneration (prevent soft tissue collapsing into bone space)

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- When are current regenerative methods most effective and predictable?
 - Best prognosis in 3 walled (and sometimes 2 walled) vertical defects where pocket is <6mm and vertical bone defect is >4mm
 - Usual pocket reduction and bone fill is 60% at best
 - Horizontal defects cannot be treated with regeneration
 - Still need to be treated with open flap debridement and osteoplasty/osseous surgery

The more bony walls surround the vertical defect, the more access there is for progenitor cells from bone and PDL to the area; thus, 3-walled defects have the best chance for bone regeneration.

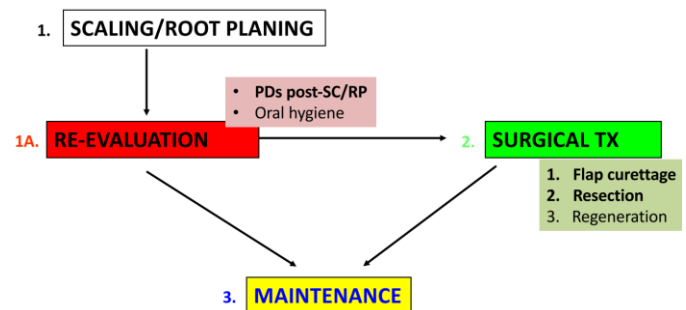


Periodontal regeneration part 2

- Goals of periodontal therapy
 - Removal of plaque and calculus deposits
 - Reinforce oral hygiene and home care
 - Reduce inflammation
 - Reduce pocket depths: facilitate long term maintenance and tooth longevity
- Repair vs regeneration
 - Repair: restoration of new tissues, but does not replicate the structure and function of the original tissues
 - Regeneration: biologic process where architecture and function of the lost tissue is restored
 - Relies on the presence and activity of pluripotent stem cells

3 surgical treatments

- Used when scaling and root planing is inadequate upon re-evaluation
- Open flap curettage and debridement
 - Achieve access, remove deposits
 - Pocket reduction via formation of long junctional epithelium
- Resective approach
 - Achieve access, remove deposits, corrections of irregularities (by resection)
 - Pocket reduction via an apically positioned flap
- Regenerative approach
 - Achieve access, remove deposits
 - Pocket reduction via new cementum, PDL, bone, and CT attachment
 - Main procedures involve guided tissue regeneration and bone grafting



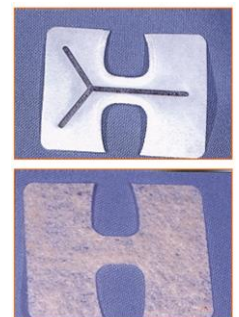
Guided tissue regeneration

- Indications: mandibular class II furcations, and to a lesser extent maxillary buccal class II furcations
- Mechanism is explained in previous lecture
- Procedure
 - Access defect using a flap
 - Thoroughly debride the root surface (if exposed)
 - Apply tetracycline (optional)
 - Place and suture membrane
 - Close and adapt gingiva over the membrane



Membranes

- Non resorbable ePTFE membranes (GoreTex)
 - Can be titanium reinforced to adapt on curvatures and defect widths
 - Removed 6~8w after placement
- Resorbable membranes
 - Collagen, polyglactic acid, etc (BioGide)
 - Starts dissolving in 4~6w
- No statistically significant difference between 2 types of membranes
- Has to be trimmed to proper size prior to placement
- Membranes can also be used during bone grafting for implant sites



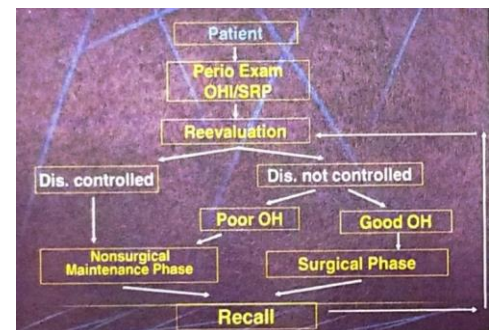
- Biomimetic (Emdogain)
 - Used as an adjunct to periodontal surgery
 - Indications
 - Intrabony defects (1, 2, 3 wall)
 - Furcation defects (class I or class II)
 - Procedure
 - Intrasulcular incision with a full thickness flap
 - Fully expose the defect
 - Remove granulation tissue, calculus, and plaque deposits
 - Condition the root with PrefGel (24% EDTA) then rinse with saline to remove smear layer
 - Apply Emdogain gel topically to exposed root surfaces
 - Complete coverage of interproximal area and soft tissue adaptation is essential
- Combination therapy
 - GTR + bone graft
 - Emdogain + bone graft
 - Regenerative approaches are often combined
- In conclusion
 - Scaling and root planing is the initial therapy, and should be re-evaluated for further need of treatment
 - Open flap curettage, resective osseous surgery, or regenerative surgery are the options
 - Regenerative therapy may involve bone grafts, GTR, biomimetics, or a combination
 - Proper case selection is critical



	OPEN FLAP CURETTAGE	RESECTION/OSSEOUS SURGERY	REGENERATION
ACCESS??	YES	YES	YES
POCKET REDUCTION ACHIEVED	Long junctional epithelium	Osseous resection Apically positioned flap	Restitution of original tissues (bone, PDL, cementum)
MODE OF REPAIR	REPAIR	REPAIR	REGENERATION
ADVANTAGES	Predictable (++)	Predictable pocket reduction (+++)	Potential for restoration of original tissues
DISADVANTAGES	- Recession - Sensitivity	- Bone removal - Recession - Sensitivity	- Predictability - CASE SELECTION

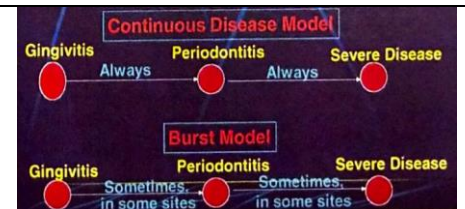
Periodontal re-evaluation and supportive periodontal care

- Management of a perio patient
 - Initial non surgical scaling and root planing is followed up with a re-evaluation
 - At the re-evaluation, it is determined whether the patient's disease has gotten worse or has been controlled
 - Uncontrolled patients can go for another round of cleaning if they have poor oral hygiene or proceed to surgical intervention if they have good oral hygiene
- When do you refer for surgical intervention?
 - Patient demonstrates adequate plaque control
 - Sites exhibit bleeding on probing
 - Inability to instrument subgingival areas (pockets 4~6mm are difficult, >6mm are poorly instrumented, and 60% of furcation entrances are smaller than periodontal instruments)



- Parameters assessed during a re-evaluation

Periodontal overview	<ul style="list-style-type: none">-Examine the colour, contour, consistency of gingiva-Want to assess if there is less inflammation, which will mean pocket depths have reduced-Provides information about patient's level of oral hygiene and contributes to overall oral assessment															
Plaque accumulation (measure of oral hygiene)	<p>Plaque control record</p> <ul style="list-style-type: none">-Good method to document change in plaque index over time-Provides a log of the changes that the care provider and patients can refer to-Patient know they're being evaluated, which may pressure them to better plaque control-Patient may brush excessively prior to appointment – looks like elevated bleeding and tissue trauma <p>Why patients may not comply</p> <div><div><ul style="list-style-type: none">-Patient may not care-Patient may not understand-Developmental anomalies challenge oral hygiene</div><div><ul style="list-style-type: none">-Patient may be too busy-Patient may not have the manual dexterity-Restorations limit access in some areas</div></div> <p>Responsibilities of the dentist and the patient</p> <ul style="list-style-type: none">-Dentist: review plaque control, suggest OH aids, maintain records on disease status and treatments, refer patients that need advanced periodontal tx-Patient: know what periodontal disease is, aware of current condition, apply the hygiene methods taught to them, self assess their home care practices <p>Behaviour modification</p> <ul style="list-style-type: none">-Difficult, but critical to do. Treatment failure is often due to absence of basic behaviours like brushing <table><tr><th>Antecedent</th><th>Behaviour</th><th colspan="2">Consequence</th></tr><tr><td rowspan="3">-Telling patient why they need to do a behaviour -“Mouth feels dirty after eating”</td><td rowspan="2">-Patient brushes their teeth</td><td>Positive consequence -Sense of cleanliness, appreciation, self esteem, reduction in anxiety, less worried about physical decline</td><td>-Increases long term compliance behaviour</td></tr><tr><td>Neutral consequence -Patient brushes, but patient sees no benefit or change</td><td>-Will decrease behaviour until extinction</td></tr><tr><td>-Patient does not brush their teeth</td><td>Negative consequence -Pain associated with sensitivity, seeing blood after brushing, being late for a social function</td><td>-Inhibits compliance behaviour</td></tr></table>			Antecedent	Behaviour	Consequence		-Telling patient why they need to do a behaviour -“Mouth feels dirty after eating”	-Patient brushes their teeth	Positive consequence -Sense of cleanliness, appreciation, self esteem, reduction in anxiety, less worried about physical decline	-Increases long term compliance behaviour	Neutral consequence -Patient brushes, but patient sees no benefit or change	-Will decrease behaviour until extinction	-Patient does not brush their teeth	Negative consequence -Pain associated with sensitivity, seeing blood after brushing, being late for a social function	-Inhibits compliance behaviour
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Bleeding on probing	<ul style="list-style-type: none">-There is a significant emphasis on repeated BOP during re-evaluations and recall-Absence of BOP indicates periodontal stability-Sites with consistent bleeding have a greater chance that attachment loss will occur-BOP indicates that inflammation is present and should be controlled															
Change in periodontal attachment	<div><div><ul style="list-style-type: none">-There are 2 proposed models of periodontal disease-Every recall should include charting the entire mouth, due to the nature of periodontal disease</div><div><p>Decreased PD</p><ul style="list-style-type: none">-Resolution of inflammation, increased tissue tone-Assess if pocket depths have been removed enough to be able to maintain them without surgical intervention-If embrasures have opened up, oral hygiene regimen should be modified to address this</div><div><p>No change in PD</p><ul style="list-style-type: none">-Minimal decrease in pocket depth is associated with fibrotic tissue-Residual calculus may be present-Access to furcation may limit periodontal debridement in the area-Local anatomy may limit any decrease in PD (external oblique ridge, shallow buccal vestibule)</div></div> <div><p>The diagram illustrates two models of periodontal disease progression. The Continuous Disease Model shows a linear progression from Gingivitis to Periodontitis to Severe Disease, with 'Always' transitions between each stage. The Burst Model shows a similar progression but with 'Sometimes, in some sites' transitions between Gingivitis, Periodontitis, and Severe Disease, indicating intermittent or localized disease activity.</p></div>															
Mobility and occlusion	<p>Etiology of tooth mobility</p> <table><tr><th>Primary</th><th>Secondary</th></tr><tr><td><ul style="list-style-type: none">-Trauma from occlusion is the primary factor in periodontal destruction-Normal alveolar support-Most frequently due to high restorations</td><td><ul style="list-style-type: none">-Loss of PDL support means tissues cannot withstand normal occlusal forces-Forces of occlusion may be within normal limits</td></tr><tr><td><ul style="list-style-type: none">-Managed with adjusting occlusion or restorations</td><td><ul style="list-style-type: none">-Splinting if moderate level of mobility, extract if severe-Assess whether there is loss of function or pain</td></tr></table> <ul style="list-style-type: none">-Radiographically will appear as widened PDL-Resin splints are more esthetic, but are likely to break			Primary	Secondary	<ul style="list-style-type: none">-Trauma from occlusion is the primary factor in periodontal destruction-Normal alveolar support-Most frequently due to high restorations	<ul style="list-style-type: none">-Loss of PDL support means tissues cannot withstand normal occlusal forces-Forces of occlusion may be within normal limits	<ul style="list-style-type: none">-Managed with adjusting occlusion or restorations	<ul style="list-style-type: none">-Splinting if moderate level of mobility, extract if severe-Assess whether there is loss of function or pain							
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Pain or discomfort	<ul style="list-style-type: none">-Acute: usually a periodontal abscess-Chronic: usually due to root sensitivity or occlusal disharmony															



- Long term periodontal stability – what to expect in the long run
 - Effectiveness of supportive periodontal therapy**
 - 14 year study of patients with advanced periodontitis showed that periodontal health can be maintained in most patients and sites, with no significant change in PD, attachment levels, and bone height
 - However, some individuals in a small number of sites had a substantial amount of attachment loss
 - This supports random burst model of periodontal disease, and therefore requiring full mouth probings at every recall appointment
 - Attachment loss**
 - 100 patients with periodontal disease were treated, maintained, and followed for 15 years
 - Teeth with furcations were most likely to be lost with time
 - Mandibular cuspids were least likely to be lost with time
 - Periodontal disease tends to be bilaterally symmetrical
 - Recurrent periodontitis**
 - Disease was once controlled, but has returned
 - Gingival changes and bleeding on probing seen, consistent with inflammation
 - Loss of attachment (increased pocket depth and/or recession)
 - Gradual radiographic bone loss
 - Gradual increase in tooth mobility
 - Reason for recurrence

Site related factors		Patient related factors
-Residual calculus, difficult to access	-Endo/perio lesion	-Changes in personal life
-Anatomy (external oblique ridge)	-Vertical root fracture	-Underlying systemic condition
-Tooth misalignment (mesioangular tipping)		-Habits
-Iatrogenic (open contact restos, overhangs)		
 - Risk factors for recurrence are mainly patient related
 - Advanced attachment loss in adolescence
 - Long term poorly controlled diabetes
 - Residual calculus
 - Smoking (#1 environmental risk factor)
 - NOT age
 - Refractory periodontitis**
 - Continuous progression despite adequate plaque control and regular maintenance
 - Multiple sites exhibiting clinically detectable disease progression
 - Progression is unrelated to previous severity, and even seen in sites with no previous disease
 - No clear cause determined, but may be genetics or host response
 - Frustrating and difficult to manage

- Endo/perio lesion classifications

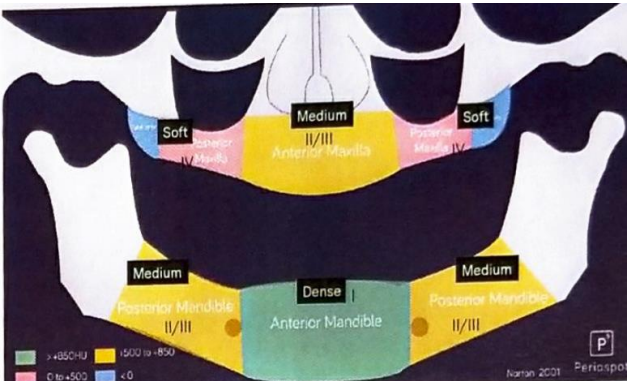
Class I	Class II	Class III
Primarily endodontic	Primarily periodontal	Combined endo and perio
-Infection via apex or accessory canals -Usually presents with a narrow and difficult to probe "drainage canal" in the gingival margin	-Infection of the pulp from the pocket via the furcation, apex, or lateral canal -Wide pocket can usually be probed	-Fusion of endo and perio lesions

- Maintenance intervals
 - Based on disease severity, age of the patient, and patient's ability to maintain plaque control
 - Young rapid disease has highest risk of attachment loss
 - Patients with advanced attachment loss are next
 - Elderly patients with minimal attachment loss are next
 - Set interval schedule
 - Patient needs to come in for fixed intervals, despite improvements
 - Dentists cannot demonstrate how the tx was altered in response to improved patient behaviour
 - Variable recall schedule
 - Oral hygiene and periodontal health at one recall determines the next recall appointment
 - Patient's behaviour can change due to stress and illness, hence affecting plaque control
 - Patient's biggest reward is extending the next recall appointment

Implant diagnosis and treatment planning

- Data collection

Chief complaint	
Patient's expectations	-Needs to be realistic
Age	-Implants can disturb the normal development of the jawbones -Between 9~25 years old: -Mx centrals move 6mm caudal and 2.5mm ventral -Mx 6's move 8mm caudal and 3mm ventral -Between 17~25 years old: -Mx centrals move 1mm caudal and 0.5mm ventral -Mx 6's move 1.5mm caudal and 0.8mm ventral -Ensure growth has stopped before considering placing implants -Cephs taken 6 months apart, waiting until there is no change over 1 year -Use growth indices like fusion of the epiphysis of the radius with the diaphysis
Medical history	-Take a thorough med Hx -ASA classification, medications, hospitalizations, allergies, alternative medicines, smoking, alcohol, blood pressure
Dental history	-Oral hygiene, frequency of dental visits, hygiene appointments, parafunctional habits, missing teeth (when? Why?)
Extra-oral exam	-Examine for skin lesions Smile line -Low: <75% of maxillary teeth exposed, seen in 20.5% of population -Medium: upper lip is about the height of the gingival margin -High: smile shows a lot of gingiva TMJ and muscles of mastication -Deviation: jaw moves to one side during opening, but corrects itself -Deflection: ask sunny. Jaw moves to one side, and does not correct Maximum unassisted incisal opening -<30mm: increased risk of not being able to access surgical site during first surgery -25mm is the absolute minimum cutoff ->35mm is desirable
Intra-oral exam	-Oral cancer screening and oral lesions Occlusal analysis -Arch shape, size, inter-arch relationship, CR/CO interferences -Occlusal scheme (cuspid guidance? Group function?) -Fremitus, parafunctional habits -Anterior guidance -If AG is absent → will overload lateral forces on posterior implants -If AG is excessive → will overload anterior implants Dentition -Caries, fractures, tooth wear, state of restorations, position of adjacent teeth (tipping) -Are the remaining teeth structurally adequate to remain? -Missing teeth, location of missing teeth, opposing dentition, presence of RPD/FDP Periodontium -Oral hygiene (plaque index), gingival inflammation, BOP, recession, KT, frenums, probing depths, furcation involvements, mobility Gingival biotype -Thick biotype: cannot see probe when it is inserted into the sulcus -Thin biotype: probe can be seen through the gingiva when inserted into the sulcus -Thin biotypes are more prone to recession and inflammation and are less stable to implants -May need to do a soft tissue graft in thin biotypes prior to implants, as doing a graft after the implant is placed is harder due to no underlying blood supply

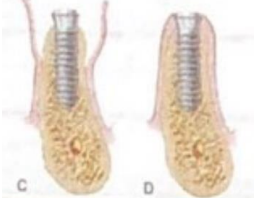

Examination of the edentulous area	<p>Distance between adjacent teeth</p> <ul style="list-style-type: none"> -Smallest implant is a 3mm abutment -Need to have a minimum of 1.5mm of bone between an implant and a root -In total, 6mm is the absolute minimum edentulous space that is acceptable <p>Distance from edentulous site to opposing dentition (intraocclusal space)</p> <ul style="list-style-type: none"> -7~9mm in posterior areas (minimum 5mm) -8~10mm in anterior areas -12mm in overdenture cases <p>Examination of the edentulous ridge</p> <ul style="list-style-type: none"> -Measure, palpate -Visualize in diagnostic casts -Sounding and ridge mapping -Radiograph <p>Edentulous ridge classification</p> <ul style="list-style-type: none"> -Class I: loss of tissue thickness (bucco-lingual thickness) -Class II: loss of height (cervical-apical height) -Class III: loss of both thickness and height <p>Distance to another implant</p> <ul style="list-style-type: none"> -If 2 implants are placed ≤ 3mm apart, they will experience an average of 1.04mm vertical bone loss -If they are played >3mm apart, they have an average of 0.45mm vertical bone loss <p>Distance from tooth-to-tooth contact and bony crest</p> <table border="1"> <thead> <tr> <th>Natural teeth</th><th>Tooth to implant</th></tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> -≤ 5mm: gingival papilla will fill in completely -6mm: papilla fill in 56% of cases, possible black triangle formation -7mm: papilla fill in 27% of cases, likely black triangle formation </td><td> <ul style="list-style-type: none"> <4mm: 100% cases have complete papilla fill -5mm: 88% cases have complete fill -6mm: 50% cases have complete fill </td></tr> </tbody> </table> <p>-Let patient know, but it could be fixed with making bulkier crowns</p>	Natural teeth	Tooth to implant	<ul style="list-style-type: none"> -≤ 5mm: gingival papilla will fill in completely -6mm: papilla fill in 56% of cases, possible black triangle formation -7mm: papilla fill in 27% of cases, likely black triangle formation 	<ul style="list-style-type: none"> <4mm: 100% cases have complete papilla fill -5mm: 88% cases have complete fill -6mm: 50% cases have complete fill
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Bone traits	<p>Bone dimensions</p> <ul style="list-style-type: none"> -Width, height, length, density -Bone length: the minimum distance between tooth and implant is 1.5~2mm -Bone width: the minimum distance between implant and bucco-lingual bone is 1.5~2mm -Lack of bone height is bad due to poor support and requiring a larger crown -Excessive bone height can also be bad as the implant crown can't have a proper emergence profile. In these cases, the implant may need to be sunk into the bone more -Assess if bone will need to be augmented -Inform patient about treatment time estimate – always overestimate, as bone takes time to heal <p>Bone quality</p> <ul style="list-style-type: none"> -Type I: hard to place implant, might not seat completely, limited blood supply, many drilling sequences. Entire bone is made of homogenous compact bone -Type II: thick layer of compact bone surrounding a core of dense trabecular bone -Type III: thin layer of cortical bone surrounding a core of dense trabecular bone -Type IV: very thin cortical bone with low density trabecular bone. Very soft and poor stability 				
Anatomical structures	<p>Mandibular structures</p> <ul style="list-style-type: none"> -<u>Inferior alveolar nerve</u>: stay at least 2mm coronal to the canal -<u>Mental foramen</u>: when IAN exits the foramen, it loops out, forming the anterior loop. It can loop almost 1cm anterior to the foramen, so always know where it is when dealing with anterior implants -<u>Lingual foramina</u>: could bleed if traumatized -<u>Mandibular incisive canal</u> -<u>Lingual undercut</u>: undercut is a site with vital structures that could be perforated with an implant -<u>Lingual nerve</u> 				

Anatomical structures	Maxillary structures - <u>Incisive canal</u> - <u>Nasal cavity</u> - <u>Maxillary sinus</u> : perforation could lead to sinusitis, implant loss, bone graft loss, and infection - <u>Greater palatine foramen</u> : could bleed if perforated - <u>Infraorbital foramen</u> : nerve could be damaged Radiographic examination -Assess proximity of vital structures -Assess quantity and quality of bone -Investigate for other pathology		
	Periapical	Panoramic	CT
	-Long cone paralleling technique brings distortion down to just 10% -Bisecting angle should be avoided as it distorts vertically -Bone height could also be seen -Lack of information on bucco-lingual dimensions	-20% horizontal magnification, but also variable -10% vertical magnification -Posterior is least distorted -Can use 5mm ball bearings as a reference	-Best estimations of bone width -Best way to visualize anatomical structures -Mandatory for implant treatment

Implant dentistry step by step

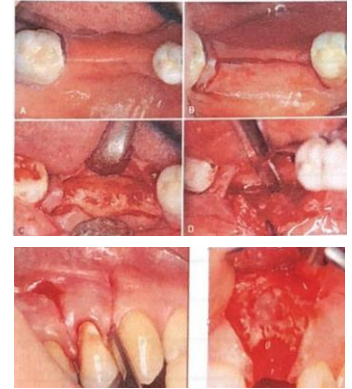
- Pre-surgical planning
 - Medical history
 - Clinical and radiographic examination
 - Pre-implant treatment
 - Number, location, size, length of implant
 - Provisional restoration and final restoration
 - Radiographic and surgical guides (partial/fully guided surgery)
 - Consent form
- Factors that determine successful osseointegration
 - Sterile surgical conditions
 - Atraumatic surgical technique – don't over torque the bone, as it will cause bone loss
 - 25~50N recommended torque, typically 35~40N
 - 10~15N is reached for primary stability. Then, assess whether to let it heal or torque it more
 - 30~40N at 3 months healing is considered restorable
 - If only 10~15N was reached, then bone graft and wait 4~5 months
 - Avoid heating the bone <44C
 - Implant placed with good primary stability
 - Healing period of 2~4 months or 4~6 months, depending on bone quality and implant stability
- Preparation for surgery
 - Patient should be draped
 - Every effort to maintain a sterile field should be taken
 - Patient should be given CHX to rinse for 1~2 minutes to reduce the bacterial load
 - Equipment
 - Standard osseous cassette
 - Implant handpiece (able to modify speed, torque, direction of spin, and water)
 - Anesthesia
 - Infiltrations and blocks with local anesthesia are enough
 - Implant surgery is generally very atraumatic
 - Pre-operative antibiotics
 - Evidence shows 2g of amoxicillin given 1h preoperatively significantly reduces implant failure
 - 6% of implants fail in patients not taking antibiotics

- One stage vs two stage surgery

One stage	Two stage
<ul style="list-style-type: none"> -Implant or the abutment emerges through the gingiva at the time of implant placement -No need for a second surgery to expose implant 	<ul style="list-style-type: none"> -Top of the implant and cover screw are completely covered under the flap after the initial surgery -Allows soft tissue management: Implant is re-exposed after 2~4 months and a healing abutment is placed to give the soft tissues the proper emergence profile 

- Flap design

- Incision to bone is made directly on the crest
- This flap is easier to manage (on KT), has less edema, and faster healing
- Intracrevicular incisions on adjacent teeth on each side
 - This step can be avoided (like in the pictures) if you have adequate space
 - Generally want to avoid this to preserve the papilla shape and esthetics
- Bone at implant site is debrided to remove all granulation tissue
- Smoothen bone to create an even levelled plane for implant placement
 - Sometimes, the crest is “knife edged” due to bone loss, a round bur can be used to shave it down to a flat surface
 - Make sure there is enough clearance from anatomic structures like the IAN before doing this
- Vertical releasing incisions + flap could be made if another procedure like bone grafting is planned
 - Always do the incisions on the mesial and distal line angles
 - Mid-facial incisions will cause recession



- Implant preparation – drilling

- Each implant system is designed with specific armamentarium and recommended use + drilling speeds
- Follow the instructions provided by the manufacturer
- Evaluate the quality of the bone during drilling
- General principles of drilling sequence

Drill	Purpose	Instructions
Pilot drill	-Initial marking of implant position on to the bone	-Use a round or pointy bur, depends on implant system
2mm twist drill	-2mm diameter drill bit is used to orient the implant hole -Used to make sure the implant path follows correct orientation and not encroaching any anatomical structures (like adjacent roots)	-Use copious irrigation (external or internal) to cool bone -Drill at 800~1500 rpm -Drill should be pumped (up + down) rather than pushing apically the whole time, to allow water to cool the apical site -Drill about 6~7mm first, insert a radiopaque guide pin, and check orientation by taking a PA -If orientation is good, proceed drilling to full depth (usually 10mm) -Proceed to the next implant site if planned (this way, ensures proper parallelism and optimum distance)
3mm twist drill	-Incrementally increase the width of the implant hole to accommodate the implant	-3mm is usually the final drill for a standard 4mm diameter implant, but there are larger drills for other implants -Copious irrigation, drill at 800 rpm, and use the pumping motion -Don't wobble or change directions of the drill
Counter-sink drill	-Optional drill for flaring the crestal bone -Implants that are slightly sub-crestal need the crestal bone to be flared to allow the implant head and cover screw to fit nicely over the bone	
Profile drill	-Optional drill for shaping the coronal part of the implant hole -Reduces the amount of expanding pressure the implant exerts on the bone at the crest, which could lead to bone resorption	
Bone tap	-Optional drill for creating threads in dense cortical bone or longer implants -Slow 25 rpm with steady pressure is used to tap the bone, then it is reversed out -Most implants are self-tapping, so they cut and thread the bone while inserting -In cases of soft, poor quality bone, tapping is not recommended	

- Implant insertion
 - Check label to confirm the correct implant that was selected during tx planning
 - Record implant info and lot # in patient chart
 - Pick implant using implant driver - nothing should touch the implant
 - Rotate handpiece at 25 rpm without water and push the implant into full seating position
 - Torque should not exceed 35~45 Ncm, depending on implant system
 - Final torquing and seating is done with a manual torque wrench
 - Sometimes, may need to go 1mm subcrestally
- Flap closure
 - Rinse area with saline
 - Insert the cover screw (2 stage procedure) or healing abutment (1 stage procedure) tightly
 - Any gaps between the cover screw/healing abutment and implant will cause soft tissue to infiltrate
 - Close flap
 - Take final radiograph to confirm final implant position
 - Suturing
 - Good approximation to allow primary closure
 - Use resorbable sutures
 - Interrupted sutures, horizontal mattress + single interrupted, or a continuous interlocking suture
- Provisional restoration
 - Fixed or removable provisionals should be checked and adjusted to minimize trauma to the surgical area
- Post operative instructions
 - Antibiotics (500 mg TID for 7 days) if not given prophylactically
 - Chlorhexidine gluconate 0.12% rinse for plaque control for 7~10 days
 - Ibuprofen 600~800 mg PRN for pain management
 - Cold packs for the first 24~48 hours
 - Soft diet, refrain from smoking, refrain from alcohol, and perform gentle OH
- Follow up
 - Dense cortical bone and good initial support: allow to heal for 2~4 months
 - Loose trabecular bone, grafted sites, or minimal support: allow to heal for 4~6 months
 - Follow up monthly to confirm adequate healing and condition of provisionals
 - Reinforce OH
- Second stage exposure surgery (if doing 2 stage technique)
 - Flap design
 - Simple circular punch or crestal incision – full thickness flap
 - Used in areas of KT
 - Not used often as it removes the valuable KT
 - Partial thickness repositioned flap
 - Vertical releasing incisions connected by a crestal incision (more on the lingual)
 - Preserves the 2~3mm of KT on the buccal, and preserves the minimal KT around the implant
 - Implant exposure
 - Cover screw is removed and head is cleaned of any hard/soft tissue overgrowth
 - Healing abutments or standard abutments are placed on the implant
 - Intraoral PA's should be taken to ensure complete seating
 - Soft tissue is sutured around the healing abutment
 - Maintain OH during healing
 - Impressions
 - Taken 2~6 weeks after exposure surgery, to allow healing and maturation of tissues

Periodontal considerations in the anterior esthetic zone

- Data collection

Chief complaint	
Medical history	-Medications, conditions, smoking
Extra oral	-Facial symmetry, midlines, face height -Lip: length, symmetry, thickness, smile line
Intra oral	Tooth appearance -Shape -Height of anatomical crown and clinical crown -Proportion: width/length = 0.75~0.8 -Widths of incisors, incisal/occlusal plane Gingival appearance -Width and thickness of keratinized attached gingiva -Gingival display -Level of alveolar crest relative to CEJ and gingival margin -Levels of gingival margins from central to canines

- Patient expectations

- Periodontal or implant surgery cannot fix face height, lip length, thickness, or vertical maxillary excess
- Risk factors can compromise esthetic outcomes in implant dentistry
- Temporary crowns are often required for long periods of time (~6 months) if tissue conditioning and remodelling

- Dentist considerations

- Beautiful faces do not always have perfect gingival contours at the anterior zone**
- Coordination of the restoring dentist and the periodontist is crucial for success
- If implants are involved, wax-ups and surgical guides are helpful. Alternatively, dynamic navigation can be used
- Anterior maxillary teeth should be viewed as a unit of 6~8 teeth, **not on a tooth by tooth basis**

- Ideal maxillary anterior dimensions

- Centrals are symmetric
- Central gingival margin is 1mm apical to laterals
- Smile exposes minimal gingiva apical to centrals and laterals
- Smile line follows convexity of the lip
- Gingival zenith: most apical point of gingival tissue is slightly distal to the long axis of the centrals and cuspids. The gingival zenith of the laterals and mandibular incisors coincides with the long axis
- Average heights: 10~11mm for centrals, 9mm for laterals, 10mm for canines





- Crown lengthening in the anterior zone

Objectives	-Enable restorative treatment while respecting biologic width -Access for removal of subgingival caries -Cosmetic improvement -Increased access to furcations for oral hygiene self care -Expose a subgingival perforation from endodontic treatment
Reasons for CL	-Caries, trauma, fracture, endo perforation, external resorption, altered passive eruption, gummy smile, restorative requirements
Considerations	-Esthetics, crown:root ratio, periodontal pockets, black hole disease, anatomic constrictions
Alternative options	-Orthodontic extrusion, extraction + implant, RPD, FPD
Basic concepts	Positive architecture with bone -See previous notes regarding ostectomy/osteotomy Biologic width -There must be at least 3mm between the most apical part of the restoration and the alveolar bone crest -This allows adequate attachment for CT and JE for a sulcus Restoration margin placement -Ideally should keep margins supragingival or equigingival. However, there are cases where it is better to do a subgingival restoration <u>-Indications for subgingival:</u> removal of caries or faulty restorations, development of adequate retention, prevention of root sensitivity, esthetics

- Crown lengthening steps – in the anterior zone
 - Elevation of flap, typically only a buccal flap is needed
 - Osseous surgery to position the bone 3mm apical of the intended gingival margin
 - Suture the flap to its original position
 - Scallop the gingiva at 90 degrees to the desired length and form
 - Laser use
 - Hard tissue lasers allow a flapless surgery, but are not recommended as they will leave bony troughs and pitted roots
 - Soft tissue lasers can be used, if you are aware of biologic width

- Crown lengthening cases

Tooth 24 + 25				
	-Lots of KT, so suitable for CL	-Slight gingivectomy so flap can be placed normally, rather than apically positioning it	-5mm tooth exposed: 3mm for BW 2mm for ferrule	-Final result. Both teeth are now suitable for restorations
Tooth 14 with lingual cusp fracture				
	-KT on palatal can always be removed, especially when there is no recession	-Buccal flap raised to reduce interproximal bone	-More osseous resection happens on lingual	
Max anteriors with 5~6mm pockets and invasion of BW				
Short clinical crowns				
Crown lengthening + veneers				

- Management of a patient who has periodontal disease at the maxillary anterior dentition
 - Flaps
 - Avoid traditional flaps to prevent recessions
 - Use mini flaps with one sided papilla elevation and regenerative materials
 - Consider curtain procedure (palatal approach) to preserve papillae
 - Consider conservative non surgical management whenever possible
 - Inform patient that there may be tissue shrinkage and black triangles. Papilla preservation is not predictable
 - Bone to tooth contact distance >5mm results in an unpredictable papilla fill
 - Crown lengthening is usually done on the buccal. Otherwise, higher chance of black triangles
 - Extractions should be done as conservatively as possible

Decision making/Referring to specialist

- Statistics
 - >80% of adults in the US have periodontitis at some point in their lives
 - >20% have moderate to severe forms of periodontitis
 - 74% of patients referred to perio were type IV
 - >30% of patients referred needed ≥ 2 extractions
 - From 1980 to 2000, referred patients have more missing teeth and a worse periodontal condition. Likely due to:
 - General dentists only referring severe cases
 - Delayed diagnosis or referral
 - Inappropriate treatment or a lack of treatment
 - Teeth with questionable prognosis are extracted and replaced with implants
 - Increase availability of non surgical adjunctive treatment
 - Financial incentive
- Why refer?
 - Keeping up with scientific knowledge is overwhelming, no single person can be skilled at every procedure
 - College urges dentists to recognize their own limitations and refer to more qualified colleagues when appropriate
 - Attempting treatment beyond a dentist's expertise is considered professional misconduct
 - Some cases may be difficult to diagnose
 - Dentist may not like to treat certain conditions
 - Dentist had failed attempts
 - Disease is too severe
 - Dentist fears the legal consequences or complications of treatment
 - Patient prefers a specialist
 - Ask yourself: would I be comfortable performing this procedure on a close family member?
- Deciding to refer – can happen at any stage







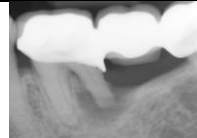
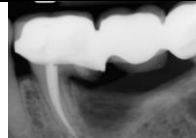


Initial exam	
Initial treatment	
Re-evaluation	Re-evaluation schedule -Usually every 3 months, but can be 2 months if patient is less compliant, or 4 months if they have demonstrated good oral hygiene Complete perio exam, and assess areas of previous concern -Did the pockets get deeper? -Was there continuous breakdown, or have all the defects resolved? -Is the result maintainable? -Patient's OH needs to be adequate to consider surgical options How efficient are we at plaque removal? -Pockets <3.7mm have all subgingival calculus removed, but >5mm has a higher chance of failure -Repeating SRP a second time is not helpful. Calculus missed the first time is often missed again the second time, for the same reason
Annual recall	Complete intraoral exam with updated radiographs -Check recession, PD, attachment loss, mobility, etc -Assess the long term stability of the disease -Progression of these parameters mean the patient would likely need to be referred for surgical tx -If the condition is stable, can re-evaluate every 4 months instead of 3

- Responsibilities of the referring dentist
 - Determine if the situation required emergency care
 - Make an effective referral: referral form should include: name, address, reason for referral (specific vs comprehensive), med Hx, personality issues, dental Hx, radiographs (with date), projected treatment needs beyond the referral
 - Explain reasons and benefits of the referral
 - Explain the risks of refusing treatment
 - Give only one specialist's name
 - Give the consultation fees, but treatment fees shouldn't be quoted
 - If the patient refuses or fails specialist treatment, document it

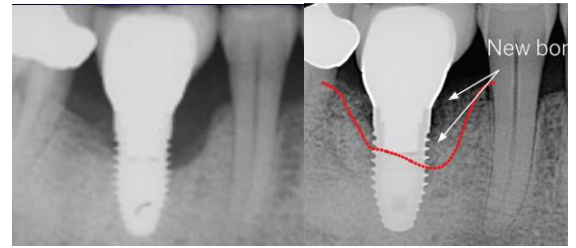
- 3 levels of patients
 - Guidelines set by the American Academy of Periodontology
 - Suggests certain patients can only be treated by a periodontist

Level 1	Level 2	Level 3
-Pt may benefit from co-treatment from dentist + periodontist	-Pt will likely benefit from co-treatment from dentist + periodontist	-Patient should be treated by a periodontist
Any patient with periodontal inflammation PLUS: -Diabetes -Pregnancy -Cardiovascular disease -Chronic respiratory disease Any patient at risk of periodontal infection due to: -Cancer therapy -Cardiovascular surgery -Joint replacement surgery -Organ transplantation	Any patient with periodontal risk factors: -Early onset periodontal disease (<35 years) -Unresolved inflammation (BOP, pus, redness) -Pocket depths $\geq 5\text{mm}$ -Vertical bone defects -Radiographic progressive bone loss -Progressive mobility -Progressive attachment loss -Anatomic gingival deformities -Exposed root surfaces -Deteriorating risk profile Any patient with medical or behavioural risk factors: -Smoking/tobacco use -Diabetes -Osteoporosis/osteopenia -Drug induced gingival conditions -Immunocompromised -Deteriorating risk profile	Any patient with: -Severe chronic periodontitis -Furcation involvement -Vertical/angular bone defects -Aggressive periodontitis -Periodontal abscess and other acute periodontal conditions -Significant or progressive gingival recession -Peri-implant disease

- Cases

	Before	After
1	 <ul style="list-style-type: none"> -“I don’t like my smile” -Malpositioning -Uneven gingival margins -Mobility + poor C:R ratio -Shade mismatch -Root resorption on 21 	 <ul style="list-style-type: none"> -Orthodontic extrusion was tried, but tooth was instead replaced with an implant
2	 <ul style="list-style-type: none"> -Recession -Shallow vestibule -No KT -Mobility + bone loss -Frenum pull 	 <ul style="list-style-type: none"> -Frenectomy -Free gingival graft -Apically positioned flap to deepen vestibule
3	 <ul style="list-style-type: none"> -Gingival hyperplasia -Phenytoin use 	 <ul style="list-style-type: none"> -Gingivectomy -May come back, but minimized with good OH
4	 <ul style="list-style-type: none"> -Severe chronic periodontitis -Furcation involvement -Perio-endo lesion -Poor restorative margins 	 <ul style="list-style-type: none"> -Root amputation and endo -Buys time, as long as patient bites lightly and doesn’t grind
5	 <ul style="list-style-type: none"> -Vertical/angular bony defect 	 <ul style="list-style-type: none"> -Guided tissue regeneration

- Peri-implantitis
 - Due to occlusal overload, grinding, or bacterial infiltration
 - Since there is no attachment of soft tissue to the implant, any inflammatory process will zip open the implant-tissue interface quickly
 - No PDL, so there is less blood supply to manage the inflammation
 - Treatment
 - Could resect the implant (open, clean, and reposition)
 - Could regenerate the bone
 - Regeneration was used to fill the bone cavity, but there will not be true re-osseointegration



Other course material (might be done, idk)

- Bill Williams PBL case
- Ien Kasvu PBL case
- Jon Seever PBL case
- Johnny Hodges PBL case
- Implant case documentation form
- Implant maintenance program form