SURGERY

Susmit Islam

Surgery

Susmit

Contents

Preface

What follows are my own notes on various topics in surgery, mostly based off of *Bailey and Love's 27th ed.* The date below tells you the last time when I edited this document, so refer to that if you're worried about the temporal validity of the contents. The chapters are arranged somewhat at random, somewhat reflecting the order in which I studied these before my finals. These notes are, first and foremost, for my personal use, so pardon the inconvenience. Over time I'll try tidying things up more. There's probably plenty of mistakes, all my own. **Use at your own peril.**

Susmit Islam

2022-07-09

Chapter 1

CABG

1.1 Investigations for IHD

- ECG (first line)
- Cardiac enzymes (in acute coronary syndrome)
- Exercise tolerance test
- Echo: Evaluate
  - ventricular function
  - regional wall motion abnormalities
  - valvular lesions
- **Coronary angiography: gold std**
  - Extent, severity and location of stenoses
  - > 70% reduction of diameter (i.e. >90% reduction of cross-sec) => severe

1.2 Indications for surgery

- > 50% stenosis of the left coronary artery ("*left main stem*")
- > 50% stenosis of the proximal *LAD*
- 2/3 main coronary arteries diseased (*RCA, LAD, LCx*)

1.3 Graft selection

Types

- **Venous**: long saphenous vein
- **Arterial**:
  - LIMA most common
    - left internal mammary / left internal thoracic artery
    - Branch of *left subclavian*
  - Others
    - RIMA

- Radial
- Gastroepiploic
- Inf epigastric

Chapter 2

Shock

2.1 Definition

It is a state of **systemic hypoperfusion** that is **inadequate** for normal **cellular respiration**.

2.2 Pathophys

Cellular

- ↓ Perfusion → anaerobic meta → **lactic acidosis**.
- Eventually, *glucose runs out* → no more meta → ↓ ATP → **failure of Na-K pump** → **release of lysosomal enzymes** → intracellular contents e.g. K released into the bloodstream.

2.3 Classification

- **Hypovolaemic**
- **Cardiogenic**: MI, cardiomyopathy, valvular disease
- **Obstructive**: tamponade, tension pneumo, massive PE
- **Distributive**: systemic vasodilation, due to *histamine* (anaphylaxis) or *nitric oxide* (sepsis) or *failure of neuroregulation* (neuro shock)
  - **Septic**
  - **Anaphylactic**
  - **Neurogenic**
- **Endocrine**: hypo/hyperthyroid, adrenal insufficiency (Addisonian crisis).

2.4 Features

- Cold, clammy skin: due to vasoconstriction (to maintain BP)
- Tachycardia: due to baroreflex response (to maintain BP)
- Hypotension
- Low urine output

Exceptions

- **distributive shock → vasodilation → warm skin**
- **neurogenic shock → loss of baroreflex response → bradycardia**

2.5 Sequelae of shock

- **Unresuscitable shock**
  - unresponsive to therapy
  - compensatory abilities lost due to cell death caused by prolonged ischaemia
  - death inevitable
- **Multi organ failure**
  - $\geq$ 2 failed organ systems
  - Cardiac: failure
  - Lung: ARDS
  - Kidney: Acute renal insufficiency
  - Clotting: DIC

2.6 Pathogenesis of Septic Shock

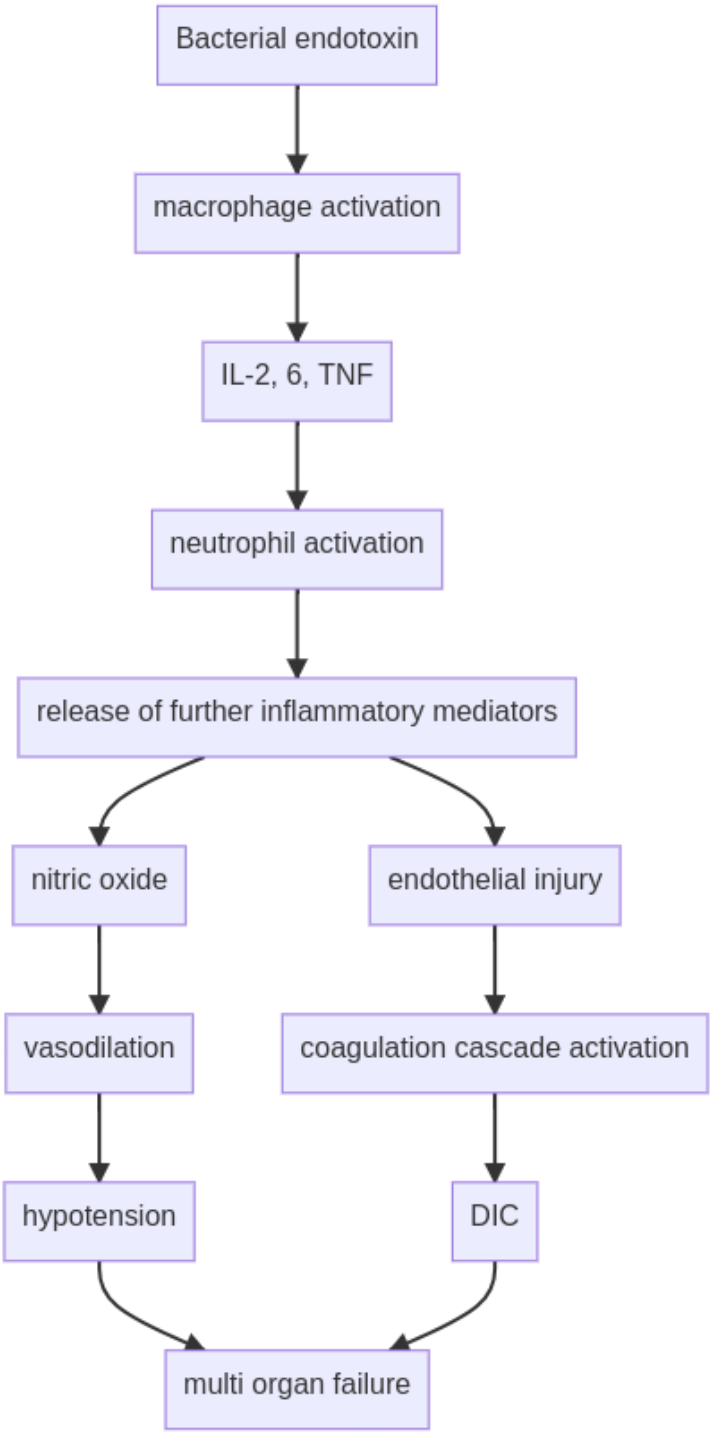


Figure 2.1: Pathogenesis of septic shock

2.7 Pathogenesis of Anaphylactic Shock

Allergen
↓
bind to IgE on mast cell
↓
cross-linking of IgE receptors
↓
mast cell degranulation
↓
histamine
↓
vasodilation
↓
shock

2.8 Management principles

General

- **Maintenance of ABC**
- **Monitor**
  - Minimum: **ECG, BP, pulse oximetry, urine output**
  - Additional:
    * CVP
    * Cardiac output
    * Base deficit
    * Serum lactate
- **Resuscitate**

Specific

- **Haemorrhagic**: blood trasnfusion
- **Cardiogenic**: inotropes (e.g. dobutamine)
- **Anaphylactic**:
  - epinephrine
  - antihistamines
  - steroids
- **Septic**:
  - norepinephrine/phenylephrine
  - broad spec antibiotics

Chapter 3

Blood transfusion

3.1 Indications

- Acute blood loss
- Periop anaemia
- Symptomatic chronic anaemia

3.2 Complications

Single transfusion

- Haemolysis (haemolytic transfusion reaction)
- Fever (febrile transfusion reaction)
- Allergic reaction
- Infections
  - Hep B, C
  - HIV
  - Malaria
  - Bacterial inf
- Air embolism
- Thrombophlebitis
- TRALI

Massive transfusion

- Coagulopathy
- Hypothermia
- Hypo-Ca
- Hypo-K
- Hyper-K

3.3 Blood & blood products

- Whole blood
- Components
  - Packed red cells
  - FFP
    - Plasma stored at -40 to -50°C
    - Rich in *coagulation factors*
    - 2y shelf-life
  - Cryoprecipitate
    - Supernatant of FFP
    - Rich in factor VIII, fibrinogen, and vWF (von Willebrand factor)
      - Without vWF, factor VIII has a very low half life. So normally in blood it's transported bound to vWF.
    - Stored at -30°C
    - Indications:
      - Haemophilia
      - Fibrinogen deficiency
      - Von Willebrand disease
  - Platelet concentrate
  - Prothrombin complex concentrate

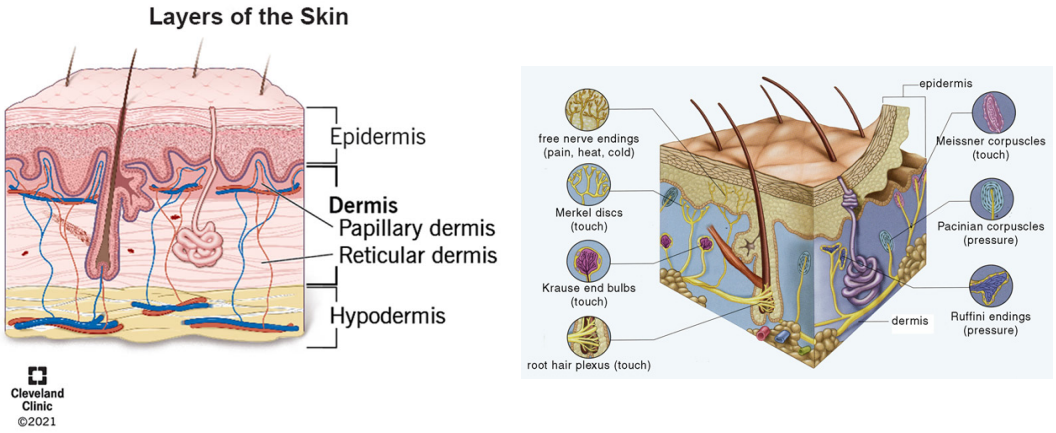
3.4 Clinical factoids

- Target Hb level: 10g/dL
- 1 unit transfusion = 1g/dL improvement

Chapter 4

Burns

4.1 Relevant skin histology



(a) Layers of the skin (b) Tactile receptors in the skin

Figure 4.1: Clinically relevant skin histology

- **Epidermis:** basal layer contains stem cells from which the epidermis can regenerate
- **Dermis:**
  - Papillary dermis: superficial
    - mostly loose areolar tissue
    - contains subpapillary vascular plexus
  - Reticular dermis: deep
    - mostly collagen
    - contains pilosebaceous units, sweat glands, nerves, deep vascular plexus (extending into subcutaneous layer)
    - some keratinocytes around the hair follicles and sweat glands (help in regeneration i.e. healing without scarring)
- **Blisters:**

  - fluid collection between epidermis and dermis
  - due to loss of adhesion in dermoepidermal junction

- **Tactile receptors:**
  - Most are within dermis. Epidermis only contains free nerve endings and Merkel cells.
  - *Free nerve endings:*
    * heat, cold, pain, itching
    * located in papillary dermis and lower epidermis

4.2 Classification

Superficial partial-thickness burns

- Extend upto at most papillary dermis
- **Types**
  - **1st degree:**
    * extend upto *epidermis*
    * no blisters (as no loss of dermoepidermal adhesion)
  - **2nd degree:**
    * extend upto *papillary dermis*
    * blisters
- *Blanch* on pressure (as dermal capillaries are mostly unscathed)
- *Painful* (irritation of free nerve endings)
- Pinprick sensation intact
- As the deeper (reticular dermis) keratinocyte reserves are unscathed, *heal without scarring* in 2 wks.

Deep partial-thickness burns

- Extend upto reticular dermis (but not its entirety)
- 2nd degree
- May blister
- *Less/no blanching* (as dermal capillaries have been burnt)
- *Sensation reduced*; unable to distinguish fine and crude touch
- As the reticular dermis has been burnt, the deeper keratinocyte reserves can no longer help with regeneration, so these *heal with hypertrophic scarring* and contractures (so need *grafting*)

Full-thickness burns

- Destroy the whole thickness of dermis
- *3rd degree*
- *No blanching*
- *Completely anaesthetised* (nerve endings have been burnt off)
- Needle prick causes neither pain nor bleeding (capillary plexuses have been burnt off)

4.3 Mechanism of fluid loss

Intense inflammation in burnt areas → ↑ permeability → leakage of fluid into extravascular compartment

4.4 Assessment

- Rule of 9:
  - First approx
  - Adult
    - Head-neck → 9%
    - Each upper limb → 9%
    - Torso front 18%
    - Torso back 18%
    - Each lower limb 18%
    - Perineum 1%
- Lund and Browder chart
  - More accurate
- For smaller burns, a piece of paper about the size of the hand to measure the burnt area directly. Size of hand ≈ 1%.

4.5 Criteria for admission

- Suspected inhalation injury / airway injury
- Any burn likely to require fluid resuscitation / surgery
- Any burns in the extremes of age
- Significant burns to the hands, feet, face or perineum
- Any suspicion of non-accidental injury
- Any burn with potentially serious sequelae (e.g. high tension electrical burns)

4.6 Fluid resuscitation

Indications

- **If >10% TBSA in children or >15% TBSA in adults** (B&L)
- To correct hypovolaemia
- " " electrolyte imbalance
- To prevent shock
- To provide nutrition

Principles

- **Parkland formula**: $4 \cdot W \cdot A$ mL fluid for the 1st 24h
  - Infuse $\frac{1}{2}$ over 8h, $\frac{1}{2}$ over 16h
- First 12h → crystalloid only (massive fluid shift to extravascular compartment takes protein out with it, so colloids of no use)
- Then add colloid (human albumin solution): Provides necessary oncotic pressure for keeping infused fluid within the vascular compartment

4.7 Definitive management

Superficial partial-thickness burns

- **Regular dressing**
- Heal spontaneously within 2 wks without scar irrespective of choice of dressing

Deep partial-thickness/full-thickness burns

- **Nanocrystalline silver dressing** until surgery (to prevent colonisation)
- Escharotomy for circumferential full-thickness burns
- **Debridement + split-skin grafting**
- Without surgery, heal by hypertrophic scarring

Nanocrystalline silver dressing

- 1% silver sulfadiazine
- 0.5% silver nitrate
- Mafenide nitrate
- Silver sulfadiazine + cerium nitrate

4.8 Prevention of post-burn contracture

- Joint exercise in full range during recovery period
- Topical silicon sheeting
- Saline expanders for scars

Chapter 5

Grafts and Flaps

5.1 Graft

- Tissue transferred *without its original blood supply*
- Need to revascularise in recipient site

Types of skin graft

- **Split-thickness skin graft**: epidermis + part of dermis
- **Full-thickness skin graft**: epidermis + whole dermis
- **Composite skin graft**: skin + cartilage, skin + fat etc.

5.2 Flap

- Tissue transferred *with its original blood supply*

5.3 Causes of graft failure

- Inadequate vascularity of recipient site: due to
  - residual pus
  - residual exudate
  - residual dead tissue
- Haematoma
- Shearing forces
- Group A β-haemolytic streptococcal infection
  - can destroy grafts completely, so contraindication to grafting

Chapter 6

Important anticancer drugs

- **Mitosis interferers**
  1. Vincristine
  2. Vinblastine
  3. Taxanes (e.g. Paclitaxel)
- **Antimetabolites** (i.e. DNA synthesis inhibitors)
  1. Methotrexate
  2. 5-FU
- **DNA damagers**
  1. Platinum drugs
     - Cisplatin
     - Carboplatin
     - Oxaloplatin
  2. Cyclophosphamide
  3. Bleomycin
  4. Doxorubicin
  5. Etoposide
- **Hormones**
  1. Tamoxifen: ER blocker (Breast ca)
  2. Goserelin: GnRH analogue/LHRH agonist; downregulate ant. pituitary $\rightarrow \downarrow$ testosterone (Prostate ca)
  3. Flutamide: Androgen antagonist (Prostate ca)
  4. Bromocriptine: D2 agonist; blocks ant. pituitary stimul (Pituitary tumour)

Chapter 7

Deadly Dozen and ATLS

7.1 "Deadly dozen" of chest injury

Immediately life threatening

Manage in 1° survey

- Airway obstruction
- Tension pneumo
- Open pneumo
- Massive haemothorax
- Flail chest
- Pericardial tamponade

Potentially life threatening

Manage in 2° survey

- Tracheobronchial injury
- Oesophageal injury
- Aortic injury
- Myocardial contusion
- Pulmonary contusion
- Diaphragm rupture

Chapter 8

Lung cancer

8.1 Types

- Non-small cell (NSCLC)
  - Squamous
  - Adeno
  - Large cell
  - Carcinoid
- Small cell (SCLC)

8.2 Features

- Cough (esp. changing cough)
- Dyspnoea
- Haemoptysis
- Wt loss
- Chest pain
- Clubbing
- Pancoast → compress sympathetic trunk → *Horner's*
  - Miosis
  - Enophthalmos
  - Anhidrosis
  - Partial ptosis
- Paraneoplastic features (SCLC)
  - SIADH
  - Cushing
  - Lambert-Eaton
  - Hypercalcaemia
  - Carcinoid syndrome

8.3 Investigations

Diagnostic

- Chest X-ray
- Chest CT
- Sputum cytology
- Bronchoscopy + biopsy
- PET-CT

Staging

- USG whole abdomen
- X-ray skull
- Bone scintigraphy (aka isotope bone scan)
- Pleural fluid cytology (if effusion)

8.4 Treatment

- If NSCLC && within T3 N1 M0
  - Surgery: Choice depends on extent of pathology
    1. Segmentectomy
    2. Lobectomy
    3. Pneumonectomy
  - Chemo:
    1. Platins
    2. Gemcitabine
  - Radio
- Else (i.e. SCLC and > T3N1M0 NSCLC)
  - Palliative therapy
  - Surgery not helpful
  - Median survival: a few months

Chapter 9

Orthopaedics

9.1 Orthopaedic emergencies

Open DESC

- Open fracture
- Dislocation
  - Because dislocation ⇒ ruptured synovial membrane ⇒ stoppage of synovial fluid production ⇒ articular cartilage, which has no blood supply and derives nutrition from synoFlu, eventually dies ⇒ waiting too long can lead to permanent joint immobility
- Epiphyseal injury
- Septic arthritis
- Compartment syndrome

9.2 Osteomyelitis

Types

According to duration, *acute* and *chronic*.

Acute

■ Causative organisms

- *Staph aureus*
- *Strep pyogenes*
- *Strep pneumo* (pneumococcus)
- *Salmonella*
- *Pseudomonas*

■ Clinical features

- Severe pain
- Tenderness
- Restricted movement
- Raised local temperature
- Fever (high grade)
- Tachycardia

■ Radiology

- Early phase
  - MRI: more sensitive in early phase
    - bone oedema
    - periosteal elevation
  - X-ray:
    - may be normal
    - soft tissue swelling
- 5-7d later
  - X-ray:
    - osteopoenia
    - periosteal new bone formation

Chronic

■ Causative organisms

- TB (*Myco TB*)
- Syphilis (*Trepo pallidum*)
- Fungal
- Parasitic

■ **Clinical features**

- Chronic discharging sinus
- Pieces of bone may come out through the sinus
- Joint swelling, stiffness
- May be past history of acute osteomyelitis
- May be recurrent pain, fever, swelling (acute on chronic)

• **Sequestrum** A segment of bone that is

- Devitalised
- Avascular
- Surrounded by pus/granulation tissue

• **Involucrum**

- Subperiosteal bone deposition surrounding the sequestrum.
- Purpose: walling off the sequestrum
- *Cloaca*: opening in involucrum due to rising pressure of the pus underneath

■ **Radiology**

- Bony destruction
- Surrounding soft tissue swelling
- Sequestrum
- Subperiosteal reaction (involucrum)

■ **Management:**

Sequestrectomy and saucerization followed by **antibiotic therapy for 6 wks** according to C/S report of pus

Complications of osteomyelitis

- Chronic osteomyelitis (if acute)
- Deformity
- Pathological fractures
- Septic arthritis
- Septicaemia

9.3 Congenital clubfoot / talipes equinovarus

Terminology

- Talipes = clubfoot
- Equinus deformity ⇒ dorsiflexed foot
- Varus deformity ⇒ plantar surface turned *inwards* (in-verted)
- Valgus deformity ⇒ plantar surface turned *outwards* (e-verted)

Deformities in Congenital Clubfoot

CAVE

- Forefoot **C**avus
- Midfoot **A**dductus
- Hindfoot
  - **V**arus
  - **E**quinus

Treatment

- **Conservative: Ignacio Ponceti method**
  - Serial plastering over 6 wks to correct deformities
- **Surgical: PMR (postero-medial release)**
  - If conservative fails

9.4 Low Back Pain (LBP)

Causes

- **Mechanical:** strenuous work
- **Intervertebral disc pathologies**
  - **PLID** (Prolapsed lumbar intervertebral disc)
  - **Disc degeneration**
  - *Discitis*
- **Spinal pathologies**
  - **Spondylosis**: degenerative arthritis (osteoarthritis) of the spine
  - **Ankylosing spondylitis**
  - **Fractures**
  - **Paget's disease**
    - dysregulated remodelling: excessive resorption followed by disorganised osteogenesis
  - *Spondylolysis*: stress fracture in pars interarticularis
  - *Spondylolisthesis*: spondylolysis + forward slippage of vertebral body
  - *Spinal stenosis*: narrowed spinal canal → compression of spinal cord/nerve roots
  - *Scoliosis*
- **Neuropathic**
  - *Cauda equina syndrome*
    - Compression of cauda equina nerve roots
    - Most freq cause ⇒ lumbar disc protrusion at L4/5
- **Infectious**
  - **Pott's disease**
  - *Epidural abscess*
- **Metastatic cancer**
  - Sources:
    - Thyroid
    - Breast
    - Lung
    - Kidneys
    - Prostate

Investigations

- Plain X-rays
- CT: Best for assessing **bone anatomy**
- MRI: Detailed visualization of
  - Spinal cord

  - Meninges
  - Epidural space
  - Discs
  - Nerve roots
  - Bone marrow

- Bone scintigraphy
- DEXA (dual energy x-ray absorptiometry) scan: measure bone density
- Provocative discography
- Spinal biopsy

Chapter 10

Breast cancer

10.1 Aetiology

- Age
- Sex
- Genetic: family history (BRCA1, BRCA2, TP53)
- Geographic: ↑ in West
- Diet:
  - Low in phytoestrogens
  - High in alcohol
- ***Endocrine***: due to less exposure to *oestradiol*
  - More in
    - *Nullipara*
    - *Obese*: fat converts steroid hormones to oestradiol
    - *OCP/HRT* users
    - *Early menarche*
    - *Late menopause*
  - Less in
    - Breastfeeders
    - First child at early age

10.2 Features

- Hard lump (painful in <10%)
- Nipple discharge
- Nipple retraction
- In *advanced*,
  - Peau d'Orange ($\geq T_3$): due to lymphatic congestion
  - Ulceration ($\geq T_3$)
  - Fixation to chest wall ($\geq T_3$)
  - Palpable axillary nodes ($\geq N_1$)

- Constitutional
  - Wt loss
  - Anaemia
  - Anorexia

10.3 Staging

1. TNM
2. Manchester (i, ii, iii, iv)

TNM

- **T**: Tumour size
  - 1: < 2cm
  - 2: 2-5cm
  - 3: 5-10cm
  - 4: >10cm
- **N**: Nodal involvement
  - 0: No palpable axillary nodes
  - 1: Mobile palpable axillary nodes
  - 2: Fixed palpable axillary nodes
  - 3: Palpable supraclavicular nodes
- **M**:
  - 0: No distant mets
  - 1: Distant mets

Manchester

- **Stg-I** = $T_1N_0M_0$
- **Stg-II** = $T_2N_1M_0$
- **Stg-IIIa** = $T_3N_2M_0$
- **Stg-IIIb** = $T_4N_3M_0$
- **Stg-IV** = M_1 (irrespective of T and N stage)

10.4 Treatment

Options

- Surgery
  - Conservative
    - Lumpectomy
    - Quadrantectomy

        * Oncoplastic lumpectomy (lumpectomy + reconstruction to restore normal appearance)
    - Mastectomy
        * Simple
        * Radical
        * Modified radical mastectomy (MRM = simple + axillary node dissection)

- Chemo
- Radio
- Hormone: *tamoxifen*
- Immuno: *herceptin* (trastuzumab)

Protocol

- Stg-i: conservative surgery
- Stg-ii:
    - MRM + chemo + horm (if ER+) + immuno (if HER+)
- Stg-iii:
    - Neoadjuvant chemo 2-3 cycles to downstage
    - Then mx of stg-ii
- Stg-iv:
    - Palliative
    - Toilet mastectomy + chemo + radio + horm + immuno

Chapter 11

Random-ish general surgery concepts

11.1 Sepsis, SIRS, MODS, MSOF

- **SIRS (Systemic inflammatory response syndrome)**
  - **Any two** of
    - Hyperthermia (>38°C) or hypothermia (<36°C)
    - Tachycardia or tachypnoea
    - Leucocytosis or leucopoenia
  - Causes
    - Sepsis
    - Polytrauma
    - Burns
    - Pancreatitis without infection
- **Sepsis**
  - SIRS + documented infection
- **MODS (Multiple organ dysfunction syndrome)**
  - Systemic effect of SIRS
- **MSOF (Multiple system organ failure)**
  - End stage of uncontrolled MODS
  - Includes
    - Heart failure
    - Liver ""
    - Pulmonary ""
    - Shock

11.2 Haemorrhage

- **1°: Occurs immediately due to injury/surgery.**
- **Reactionary: Within 24h**
  - Due to
    - dislodgement of clot as a result of resuscitation and blood flow restoration
    - *slippage of ligature*
- **2°: Within 7-14d**
  - Due to sloughing off of vessel wall
    - Precipitated by
      - Infection
      - Pressure necrosis
      - Cancer
- **Principles of haemorrhage control**
  - Pressure
  - Position (elevation in case of limb)
  - Packing
  - Cautery (diathermy)
  - Ligation

11.3 Incisions in abdominal surgery

■ Upper midline

- xiphoid → umbilicus
- **Structures cut**
  - Skin
  - Subcutaneous tissue
  - Linea alba
  - Fascia transversalis
  - Parietal peritoneum
- Advantages
  - Rapid
  - Less vascular area ⇒ less bleeding
- Disadvantages
  - Less vascular area ⇒ heals late
  - ↑ wound dehiscence, incisional hernia

■ Kocher / right subcostal

- From xiphoid, start cutting 2.5cm below parallelly to the costal margin
- Keep cutting till cut length = 10cm
- **Structures cut**: ???
- Use: gallbladder surgeries, rt hepatic lobectomy

■ Pfannenstiel

- Curved, 2.5cm above and parallel to the arch made by inguinal ligaments, extend equally on both sides of the midline
- Done in
  - Caesarean section
  - Prostatectomy
  - Bladder surgery

Chapter 12

Vascular surgery

12.1 Deep Vein Thrombosis (DVT)

Formation of semisolid coagulum in a deep vein.

Virchow's triad

- Abnormal surface (endothelial damage)
- Abnormal flow (stasis / turbulence)
- Abnormal blood (thrombophilia)

Factors

- Immobility
  - Age
  - Obesity
  - Prolonged surgery
  - Pregnancy
  - Puerperium
  - Varicosity (effect of immobility, the rest are causes)
- Hormone-replacement therapy (high oestrogen)
- Previous DVT / PE
- Thrombophilia

Common sites

- Popliteal vein
- Femoral ""
- Iliac ""

Prevention

- Early mobilization
- Hydration

- Compression stockings
- Prophylactic LMW heparin
- Calf pumps
- Minimal use of tourniquets

12.2 Ischaemic limb

(Ischaemia = reduced blood flow, NOT cell death)

Features

- **Intermittent claudication**
  - Debilitating crampy myalgia that is
    - reliably brought on by walking
    - not present on taking the first step
    - reliably relieved by rest
  - Raised workload while walking → anaerobic metabolism → intermittent claudication
- **Rest pain**
  - Advanced ischaemia
  - Anaerobic metabolism occurring even at rest
  - Exacerbated by lying down / foot elevation (due to loss of gravitational aid in flow) → *pain worse at night* and *relieved by hanging the foot out of the bed.*
- Coldness, numbness, paraesthesia, colour change
- Ulceration
- Gangrene
- **Absent/diminished arterial pulse**
- Arterial bruit
- **Slow capillary refill**

Investigations

■ Specific

- Doppler USG
- Duplex scan:
  - Duplex = plain USG + doppler
  - Plain USG shows anatomy, doppler shows flow patterns
- Digital subtraction angiography
- CT angiography, MR angiography

■ General

- CBC (see if anaemia)
- RBS

- Lipid profile
- Serum urea and electrolytes

Treatment

■ **Non-surgical**

- **Smoking cessation**
- Regular exercise
- Wt loss if obese
- **Drugs**
  - Beta blocker contraindicated: as sympathetic increases blood flow to muscles
  - Statin
  - Clopidogrel/aspirin
- **Angioplasty** with/without stenting

■ **Surgical**

- **Bypass operation**

12.3 Peripheral Artery Disease (PAD)

6Ps of PAD

- Pain
- Paraesthesia
- Pulselessness
- Pallor
- Paralysis
- Polar (cold)

PAD vs PVD

- P**A**D relieved by h**a**nging the limb down, P**V**D relieved by ele**v**ating the limb up.

Investigations

- ABPI: ankle-brachial pressure index
  - <0.9 indicates PAD
- Doppler
- Duplex
- DSA
- CTA, MRA

12.4 Varicose veins

Management principles

- **Avoid prolonged standing**
- **Compression stockings**
- **Endothermal ablation**
  - *Laser ablation*
  - *Radiofrequency ablation*
- **US-guided sclerotherapy**
  - Sclerosing agent: sodium tetradecyl sulfate
- **Surgery**
  - Sapheno-femoral junction (SFJ) ligation + great saphenous vein (GSV) stripping (*Trendelenburg operation*)

Chapter 13

Splenectomy

13.1 Indications

(*Indications marked with ⋆ are absolute indications*)

- Traumatic rupture with unsalvageable spleen ⋆
- Splenic tumours (primary or secondary) ⋆
- Bleeding varices due to splenic vein thrombosis ⋆
- Hereditary spherocytosis ⋆
- Splenic abscess
- Hypersplenism
  - Hypersplenism = splenomegaly + any cytopoenia(s) + improvement of symptoms after splenectomy
- ITP
- Thalassaemia major

Chapter 14

Urology

14.1 LUTS (lower urinary tract symptoms)

- **Storage symptoms**: FUN
  - Frequency
  - Urgency
  - Urge incontinence
  - Nocturia
- **Voiding symptoms**: IHPS
  - Intermittency
  - Hesitancy
  - Poor stream (reduced stream)
  - Straining (muscular effort to initiate maintain or improve urinary flow)
- **Post-micturitional symptoms**
  - Incomplete emptying
  - Post-mic dribble

14.2 Renal stones

Features

- Asymptomatic
- Ureteric colic: loin → groin
- Renal pain: dull loin pain
- Haematuria
- Features of UTI, e.g.:
  - Frequency: too frequent voiding
  - Urgency: sudden compelling desire to urinate
  - Dysuria: burning pain during urination
  - Features of pyelonephritis (if ascending infection), e.g.:
    - Fever with chills

        * Vomiting
        * Renal angle tenderness
        * Rigidity, guarding

Investigations

- X-ray KUB, IVU
- USG KUB
- CT KUB
- Urine RME, culture

Treatment

- Assess size of stone by USG/CT
- **Small ($\leq$ 5mm)**:
    - Conservative management
    - 90% pass spontaneously
    - Drink plenty of water
    - Analgesics, antispasmodics
    - Antiemetics
    - Mobility
- **$>$ 5mm**:
    - ESWL
        * for $\leq$ 1.5cm stones
        * cystine stones resistant
        * results in *steinstrasse* ("stone street")
        * contra
            · obese
            · pregnant
            · patients on oral anticoagulants
    - Ureteroscopy + retrieval by Dormia basket: for <6mm stones in distal ureter
    - PCNL
        * for larger stones / ESWL contraindications / ESWL resistant stones
    - Open surgeries: depending on location of stone
        * Nephrolithotomy
        * Pyelolithotomy
        * Ureterolithotomy

14.3 Bladder stones

Features

- 8x more common in males
- Asymptomatic
- Frequency
- Sense of incomplete voiding
- Pain (strangury)
  - at the end of micturition
  - referred to the tip of the penis or the labia majora
- Haematuria: terminal, few drops, bright red

Investigations: usual

Treatment

- *Perurethral litholapaxy*
- *Percutaneous suprapubic litholapaxy*
- *Suprapubic cystolithotomy*

14.4 Ruptured urethra

Features

- Perineal bruising & haematoma
- Bleeding from urethral meatus
- Urinary retention
- Pain

Investigations

Confirmed by **urethrography** with water-soluble contrast

- Urethrogram = insert catheter upto urethral meatus, then inject contrast and image with x-rays

Management

- Antibiotics
- Analgesics
- **Catheterisation** by percutaneous suprapubic puncture (Seldinger technique)
- *After bruising and swelling have setted* (8-12wks later), **delayed anastomotic urethroplasty**.

14.5 Bladder cancer

Painless haematuria in 60yo male

4T

- Tumours
  - ***Painless gross haematuria, until proved otherwise, is bladder cancer***
- TB
- Tension (hypertensive nephropathy)
- Tubular necrosis (ATN)

Features

- Painless gross haematuria
  - may lead to large clots in the bladder → clot retention
- Frequency
- Pain may arise in later stages due to
  - extravesical spread
  - pyelonephritis

Investigations

- Urine culture and cytology for malignant cells
- Hb, urea, electrolytes
- CT, MRI, USG, IVU
- *Cystourethroscopy*

Treatment

- **Non-muscle invasive tumour**: (does not invade the detrusor)
  - **Endoscopic resection** followed by **intravesical BCG** chemotherapy
- **Muscle-invasive tumour**
  - External beam radiotherapy
  - Surgery
    - Partial cystectomy
    - Radical cystectomy and pelvic lymphadenectomy

14.6 Prostate cancer

Features

- Asymptomatic until advanced
- In advanced,
  - Bladder outlet obstruction (boo) → retention
  - Pelvic pain
  - Haematuria
  - Bone pain, arthritis
  - Renal failure
  - Anaemia, pancytopoenia
- DRE:
  - Hard irregular lump
  - Median sulcus obliterated
  - Examining finger blood stained

Investigations

- **Prostate biopsy**
  - *Transperineal* approach: under G/A
  - *Transrectal* approach: under L/A
- **PSA**
  - Normal: < 4ng/mol
  - > 10ng/mol: suggestive
  - > 35ng/mol: almost diagnostic of advanced carcinoma
- LFT: liver mets
- ALP: liver or bone mets
- Chest x-ray: lung/rib mets

Treatment

- **Early stage**:
  - *radical prostatectomy*
  - radiotherapy
    - external beam radiotherapy or
    - brachytherapy
- **Late stage**:
  - *orchidectomy* ("surgical castration")
  - *medical castration*
    - stilbestrol
    - LHRH agonists: goserelin

  - radiotherapy
  - chemo: docetaxel

14.7 Testicular tumours

Classification

- Germ cell tumours
  - Seminoma
  - Nonseminomatous GCT
    - Embryonal carcinoma
    - Yolk sac tumour
    - Choriocarcinoma
    - Teratoma
- Interstitial cell tumours
  - Sertoli → *feminizes*
  - Leydig → *masculinizes* (secretes androgens)
    - layDICK → masculin
- Lymphoma

Features

- Painless testicular lump
- Heaviness (if 2-3x enlarged)
- Gynaecomastia (especially with *NSGCT*)
- Acute swelling and severely painful testis
  - due to bleeding in the tumour
- Metastatic features
  - abdominal mets: abdominal pain
  - lung mets: dyspnoea, chest pain, haemoptysis

Investigations

- **Confirmed by USG**
- AFP: ↑ in NSGCT
- hCG: ↑ both seminoma and NSGCT
- X-ray / CT of chest, abdomen, pelvis: for staging

Treatment

Orchidectomy, followed by

- Histopathology: for histological classification

- Stg I
  - **Seminoma**: radiosensitive, only radiotherapy + follow-up
  - **NSGCT**
    - not radiosensitive
    - **BEP chemotherapy**
      - Bleomycin
      - Etoposide
      - Platinum (cisplatin)
- Stg II-IV
  - **BEP chemotherapy** for both seminoma and NSGCT

Chapter 15

GIT, hepatobiliary, pancreas

15.1 Acute Pancreatitis

Causes

- Gallstone
- ERCP
- Trauma
- Alcoholism
- Hyperparathyroidism
- Hypercalcaemia
- Autoimmune
- Drugs: corticosteroids,azathioprine

Features

- Pain
  - Severe epigastric pain
  - Radiates to back in 50%
  - Relieved by leaning forwards
  - Can mimic most other causes of acute abdomen
- Nausea, vomiting, retching
- Shock
  - Tachycardia, tachypnoea, hypotension
  - SIRS
- Bleeding into fascial planes → bluish discoloration of
  - Flanks: Gray-Turner's
  - Umbilicus: Cullen's
- Muscle guarding
- Pleural effusion

Investigations

- Clinical assessment + **serum amylase (>3x above normal)** indicative of acute pancreatitis
- Serum lipase: more sensitive and specific
- USG: detect gallstones
- X-ray, CECT: exclude other causes of acute abdomen

Severity assessment

- Ranson, Glasgow, APACHE scoring
- Atlanta classification
  - Mild:
    - no organ failure
    - no local/systemic complis
  - Moderate: transient organ failure (resolves by 48h)
  - Severe: persistent organ failure (>48h)

Treatment

- **Mild**
  - observation
  - IV fluid
  - analgesic (no need for antibiotics)
  - antiemetic
- **Severe**
  - HDU/ICU admission
  - IV fluids
  - Analgesic: pethidine (morphine contraindicated; causes sphincter of Oddi dysfunction)
  - Antibiotics: IV cefuroxime, or imipenem, or cipro+metro
  - O2 inhalation
  - Invasive monitoring of vitals, CVP, blood glucose
  - ERCP within 72h if severe gallstone pancreatitis/signs of cholangitis

Complis

- Systemic (mostly manifest within the 1st wk)
  - CVS: Shock
  - Haemato: DIC
  - Resp: ARDS
  - Renal: Acute renal failure
  - Metabolic:
    - Hypo-Ca
    - Hyperglycaemia

        * Hyperlipidaemia

- Local (usually occur after the 1st wk)
    - Pseudocyst
    - Abscess
    - Pancreatic necrosis
    - Peripancreatic fluid collection
    - Pancreatic ascites
    - Pleural effusion
    - Portal/splenic vein thrombosis

15.2 Pancreatic pseudocyst

Definition

Collection of amylase-rich fluid enclosed by a wall of fibrous/granulation tissue.

Diagnosis

- History of recent pancreatitis ($\geq$ 4wks)
- USG
- CT
- FNA of fluid under EUS guidance and measurement of
    - CEA
    - amylase
    - cytology
- Differentiating from cystic neoplasm:
    - history
    - appearance in US, CT
    - Aspiration:
        * CEA: $\uparrow$ in tumour
        * Amylase: $\uparrow$ in pseudocyst
        * Cytology: inflammatory cells in pseudocyst

15.3 Chronic pancreatitis

- Mostly due to chronic alcoholism

Features

- Pain
    - may radiate to back
    - dull, gnawing

- Nausea, vomiting
- Wt loss (due to anorexia)
- Steatorrhoea
- Symptoms of DM

Investigations

- Serum amylase: ↑ in early stg
- X-ray abdomen, CT: calcifications
- CT, MRI
- MRCP: identify biliary obstruction, condition of pancreatic duct
- ERCP

Treatment

- Relieve pain
- Cure addiction
- Diet: low fat, high protein & carb
- Fat-soluble vitamin supplementation
- Pancreatic enzymes supplementation
- Insulin therapy
- Steroid for autoimmune pancreatitis

15.4 Gallstones

Types

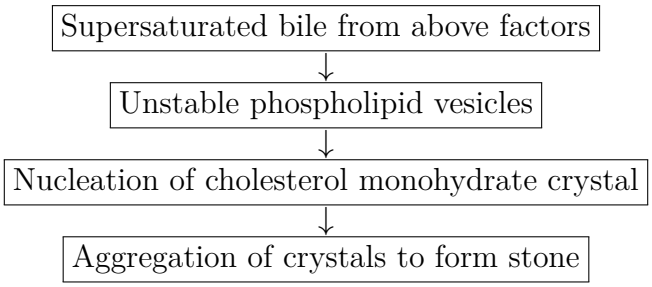
- Cholesterol: more common in USA
- Pigment: more common in BD
  - Black: haemolysis
  - Brown: bile stasis
- Mixed

Factors

- **Supersaturated bile**: female fair fatty forty fertile
  - Age: Forty (>40y)
  - Sex: Female
  - Fatty (obese)
  - Fair-skinned
  - OCP
  - Diet: Fat high, fibre low
- **Impaired GB function**
- **Cholesterol nucleating factors**
- **Enterohepatic circulation of bile**

- ileal resection → ↓ enterohepatic circulation → depletion of bile pool → increased cholesterol with respect to bile → supersaturation

Pathogenesis



15.5 Carcinoma head of the pancreas

Treatment options

- **Whipple's**:
  - in resectable cases
  - pancreaticoduodenectomy
- **Palliative**:
  - unresectable cases
  - if detected to be unresectable during laparotomy (to do Whipple's), then choledochoenterostomy to relieve jaundice
  - if detected by imaging, dilate by ERCP to relieve jaundice
  - enzyme replacement
  - treatment of DM
  - chemotherapy