Surgery

Susmit

2022-06-24

Contents

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

Blood transfusion

2.1 Indications

- Acute blood loss
- Periop anaemia
- Symptomatic chronic anaemia

2.2 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

2.3 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

2.4 Clinical factoids

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

Chapter 3

Burns

3.1 Mechanism of fluid loss

Intense inflammation in burnt areas $\rightarrow$ $\uparrow$ permeability $\rightarrow$ leakage of fluid into extravascular compartment

3.2 Assessment

- Rule of 9:
  - First approx
  - Adult
    - Head-neck $\rightarrow$ 9%
    - Each upper limb $\rightarrow$ 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 $\approx 1\%$.

3.3 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 $\rightarrow$ crystalloid only (massive fluid shift to extravascular compartment takes protein out with it)
- Then add colloid (human albumin solution)
  - Provides necessary oncotic pressure for keeping infused fluid within the vascular compartment

3.4 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

Chapter 4

Grafts and Flaps

4.1 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.

4.2 Flap

- Tissue transferred *with its original blood supply*

4.3 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
  - hence, contraindication to grafting

Chapter 5

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; 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 6

Deadly Dozen and ATLS

6.1 "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 7

Lung cancer

7.1 Types

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

7.2 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

7.3 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)

7.4 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 8

Orthopaedics

8.1 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

8.2 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

8.3 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

8.4 Low Back Pain (LBP)

Causes

- **Strenuous work**
- **Primary Back Pathologies**
  - *Spondylosis*: degenerative arthritis of the spine
  - *Spondylolysis*: defect in pars interarticularis without slippage
  - *Spondylolisthesis*: forward slippage of vertebral body
  - Lumbar *disc herniation*
  - *Spinal stenosis*: narrowed spinal canal → compression of spinal cord/nerve roots
  - *Fractures*
  - *Cauda equina syndrome*
    - Compression of cauda equina nerve roots
    - Most freq cause ⇒ lumbar disc protrusion at L4/5
  - *Scoliosis*
  - *Discitis*
- **Infections**
  - *Epidural abscess*
  - *Pott's disease*
- **Metastatic disease**
  - Sources:
    - Thyroid
    - Breast
    - Lung

        * Kidneys
        * Prostate

- **Autoimmune conditions**

    - *Ankylosing spondylitis*

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 9

Breast cancer

9.1 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

9.2 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

9.3 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)

9.4 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 10

Random-ish general surgery concepts

10.1 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

10.2 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

10.3 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 11

Vascular surgery

11.1 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

11.2 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**

11.3 Varicose veins

Management principles

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

Chapter 12

Splenectomy

12.1 Indications

(*Indications marked with ⋆ are absolute indications*)

- Traumatic rupture ⋆
- 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 13

Urology

13.1 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

13.2 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

13.3 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*

13.4 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**.

13.5 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