

# Surgery

Susmit

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## Contents

<b>Deep Vein Thrombosis (DVT)</b>	<b>4</b>
Virchow's triad . . . . .	4
Factors . . . . .	4
Common sites . . . . .	4
Prevention . . . . .	4
<b>CABG</b>	<b>5</b>
Investigations for IHD . . . . .	5
Indications for surgery . . . . .	5
Graft selection . . . . .	5
Types . . . . .	5
<b>Blood transfusion</b>	<b>6</b>
Indications . . . . .	6
Complications . . . . .	6
Single transfusion . . . . .	6
Massive transfusion . . . . .	6
Blood & blood products . . . . .	6
Clinical factoids . . . . .	7
<b>Burns</b>	<b>8</b>
Mechanism of fluid loss . . . . .	8
Assessment . . . . .	8
Fluid resuscitation . . . . .	8
Indications . . . . .	8
Principles . . . . .	8
Definitive management . . . . .	8
Superficial partial-thickness burns . . . . .	8

Deep partial-thickness/full-thickness burns . . . . .	9
Nanocrystalline silver dressing . . . . .	9
<b>Grafts and Flaps</b>	<b>10</b>
Graft . . . . .	10
Types of skin graft . . . . .	10
Flap . . . . .	10
Causes of graft failure . . . . .	10
<b>Important anticancer drugs</b>	<b>11</b>
<b>Varicose veins</b>	<b>12</b>
Management principles . . . . .	12
<b>Deadly Dozen and ATLS</b>	<b>13</b>
“Deadly dozen” of chest injury . . . . .	13
Immediately life threatening . . . . .	13
Potentially life threatening . . . . .	13
<b>Lung cancer</b>	<b>14</b>
Types . . . . .	14
Features . . . . .	14
Investigations . . . . .	14
Diagnostic . . . . .	14
Staging . . . . .	14
Treatment . . . . .	15
<b>Low Back Pain (LBP)</b>	<b>16</b>
Causes . . . . .	16
Investigations . . . . .	16
<b>Orthopaedic emergencies</b>	<b>17</b>
<b>Osteomyelitis</b>	<b>18</b>
Types . . . . .	18
Acute . . . . .	18
Causative organisms . . . . .	18
Clinical features . . . . .	18
Radiology . . . . .	18
Chronic . . . . .	18

Causative organisms . . . . .	18
Clinical features . . . . .	19
Sequestrum . . . . .	19
Involucrum . . . . .	19
Radiology . . . . .	19
Management . . . . .	19
Complications of osteomyelitis . . . . .	19
<b>Congenital clubfoot / talipes equinovarus</b>	<b>20</b>
Terminology . . . . .	20
Deformities in Congenital Clubfoot . . . . .	20
Treatment . . . . .	20
Conservative: Ignacio Ponceti method . . . . .	20
Surgical: PMR (postero-medial release) . . . . .	20
<b>Breast cancer</b>	<b>21</b>
Aetiology . . . . .	21
Features . . . . .	21
Staging . . . . .	21
TNM . . . . .	21
Manchester . . . . .	22
Treatment . . . . .	22
Options . . . . .	22
Protocol . . . . .	22
<b>Random-ish general surgery concepts</b>	<b>23</b>
Sepsis, SIRS, MODS, MSOF . . . . .	23
SIRS (Systemic inflammatory response syndrome) . . . . .	23
MODS (Multiple organ dysfunction syndrome) . . . . .	23
MSOF (Multiple system organ failure) . . . . .	23
Haemorrhage . . . . .	23
1°: Occurs immediately due to injury/surgery. . . . .	23
Reactionary: Within 24h . . . . .	23
2°: Within 7-14d . . . . .	23

# 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

# CABG

## 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

## 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*)

## 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

# Blood transfusion

## Indications

- Acute blood loss
- Periop anaemia
- Symptomatic chronic anaemia

## 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

## 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* and *fibrinogen*
    - \* Stored at -30°C
    - \* 2y shelf-life
  - Platelet concentrate
  - Prothrombin complex concentrate

## Clinical factoids

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

# Burns

## Mechanism of fluid loss

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

## 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%.

## 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

## 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

# Grafts and Flaps

## 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.

## Flap

- Tissue transferred *with its original blood supply*

## Causes of graft failure

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

## 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 → ↓ testosterone (Prostate ca)
  3. Flutamide: Androgen antagonist (Prostate ca)
  4. Bromocriptine: D2 agonist; blocks ant. pituitary stimul (Pituitary tumour)

# 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*)

# Deadly Dozen and ATLS

## “Deadly dozen” of chest injury

### Immediately life threatening

*Manage in 1<sup>o</sup> survey*

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

### Potentially life threatening

*Manage in 2<sup>o</sup> survey*

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

# Lung cancer

## Types

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

## 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

## 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)

## 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

# 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



# Orthopaedic emergencies

*Open DESC*

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

# 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:
    - \* osteopenia
    - \* periosteal new bone formation

## Chronic

### Causative organisms

- TB (*Mycobacterium TB*)
- Syphilis (*Treponema 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

# Congenital clubfoot / talipes equinovarus

## Terminology

- Talipes = clubfoot
- Equinus deformity  $\Rightarrow$  dorsiflexed foot
- Varus deformity  $\Rightarrow$  plantar surface turned *inwards* (in-verted)
- Valgus deformity  $\Rightarrow$  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

# Breast cancer

## Aetiology

- Age
- Sex
- Genetic: family history (BRCA1, BRCA2, TP53)
- Geographic:  $\uparrow$  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

## 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

## Staging

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

## TNM

- **T:** Tumour size
  - 1:  $< 2\text{cm}$
  - 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)

## 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

# Random-ish general surgery concepts

## Sepsis, SIRS, MODS, MSOF

### SIRS (Systemic inflammatory response syndrome)

- Any two of
  - Hyperthermia ( $>38^{\circ}\text{C}$ ) or hypothermia ( $<36^{\circ}\text{C}$ )
  - Tachycardia or tachypnoea
  - Leucocytosis or leucopenia
- 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

## 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