Surgery

Susmit

2022-06-24

HELLO

Contents

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, 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

Clinical factoids

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

Burns

Mechanism of fluid loss

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

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%.

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)
- 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 β-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 $\rightarrow \downarrow$ 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° 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

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 ⇒ 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

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

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

Breast cancer

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

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: < 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)

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°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

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

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

Vascular surgery

Features of ischaemic limb

(Ischaemia = reduced blood flow, NOT cell death)

- **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**

Splenectomy

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

Urology

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
- 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