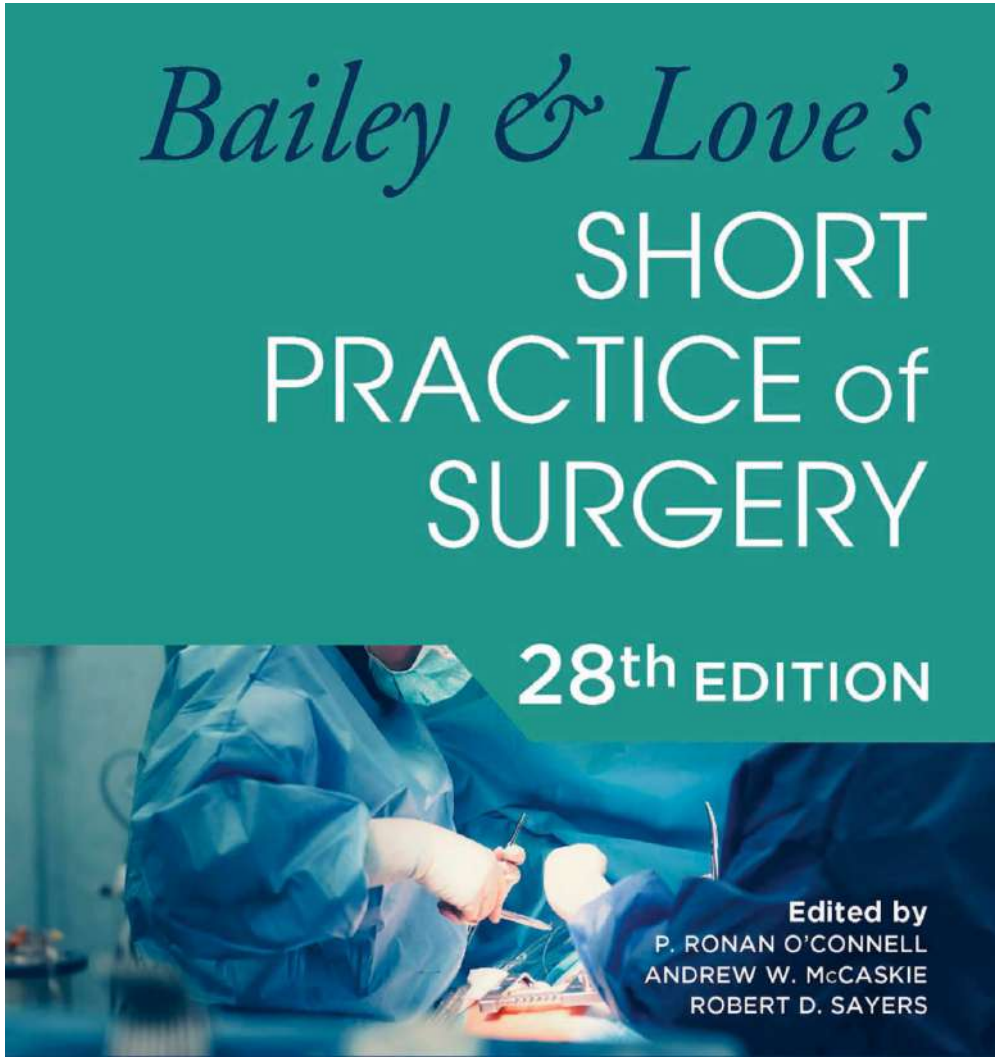
COMPILED MODULE: BAILEY-LOVE



PART 10: VASCULAR

PART 11: ABDOMINAL

PART 12: GENITOURINARY

PART 13: TRANSPLANTATION

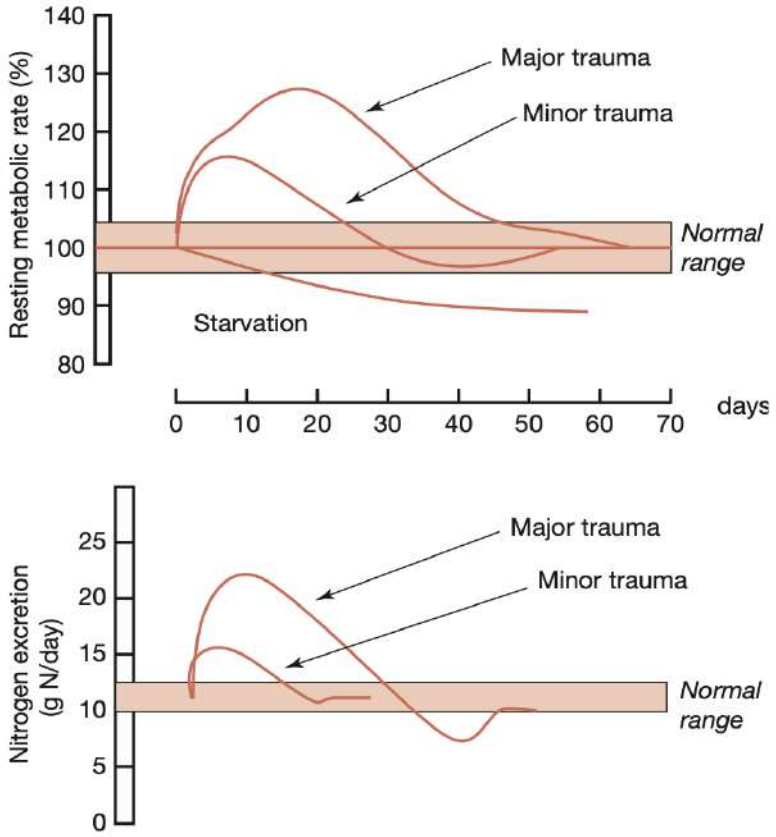
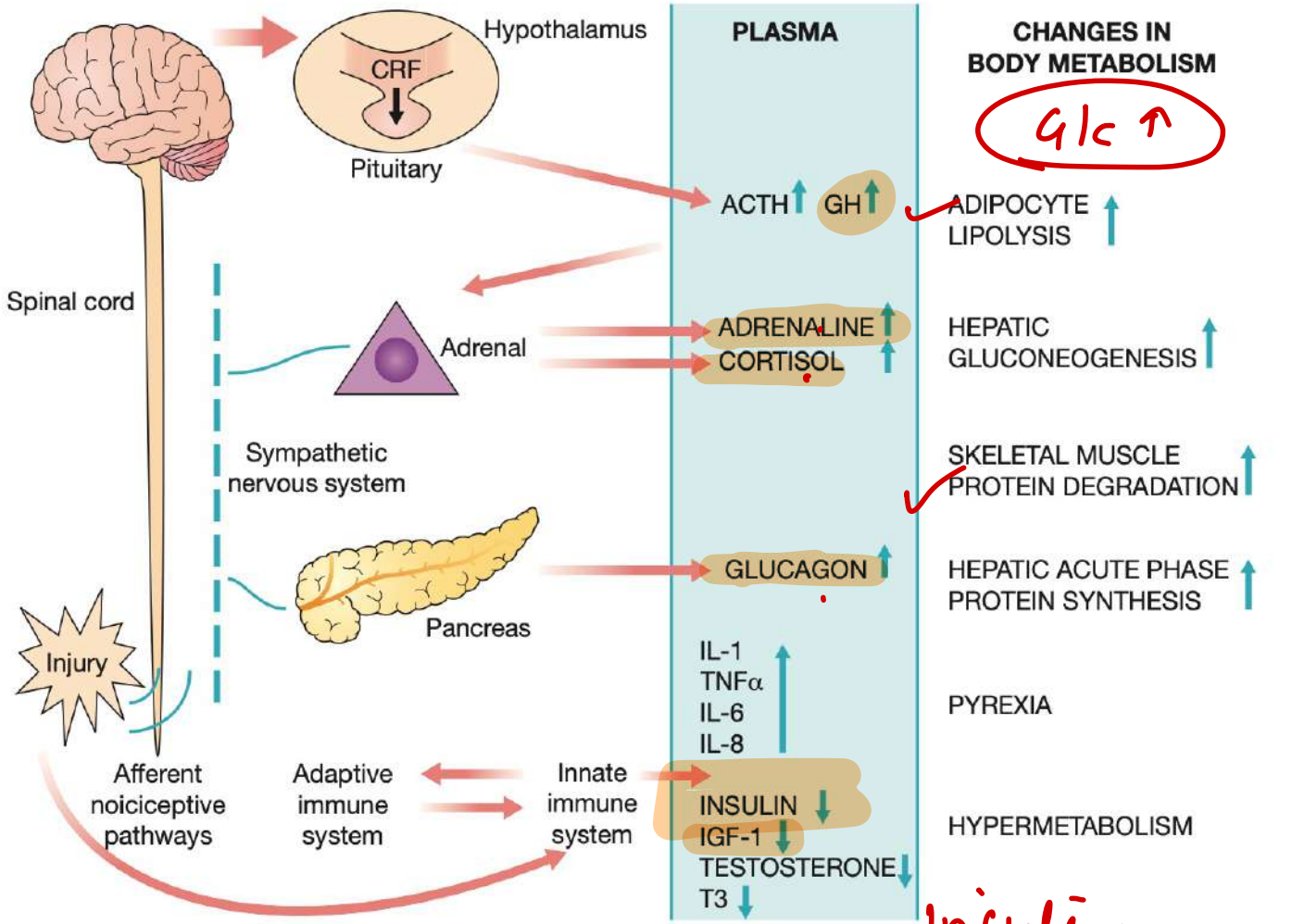


Figure 1.1 Hypermetabolism and increased nitrogen excretion are closely related to the magnitude of the initial injury and show a graded response.

Neuroendocrine response to injury/critical illness

The neuroendocrine response to severe injury/critical illness is biphasic:

- **Acute phase** (hours) characterised by elevated counter-regulatory hormones (cortisol, glucagon, adrenaline). Changes are thought to be beneficial for short-term survival
- **Chronic phase** (days) associated with hypothalamic suppression and low serum levels of the respective target organ hormones. Changes may contribute to chronic wasting



A proactive ERAS approach to prevent unnecessary aspects of the surgical stress response

- Minimal access techniques
- Blockade of afferent painful stimuli (e.g. epidural analgesia, spinal analgesia, wound catheters)
- Minimal periods of starvation
- Early mobilisation

epidurals. Adjuncts such as 'one-shot' spinal diamorphine and/or a 6–12-hour infusion of intravenous lidocaine have been suggested to be opiate sparing, to improve gut function and to enhance overall recovery.

QQ

Enhanced recovery after Sx

open Sx
(x laparoscopic Sx)

· ptnt-controlled analgesia

Monitoring for patients in shock

Minimum

- ECG
- Pulse oximetry
- Blood pressure
- Urine output

Additional modalities

- Central venous pressure
- Invasive blood pressure
- Cardiac output
- Base deficit and serum lactate

Responder

There is a good and sustained improvement in blood pressure in response to a bolus transfusion.

Transient responder

There is an improvement in the blood pressure but this is not sustained. The rate of haemorrhage is less than the rate of volume administration.

Non-responder

There is no improvement in the blood pressure to a bolus transfusion. The rate of haemorrhage is greater than the rate of volume administration.

CVP measurements should be assessed dynamically as the response to a fluid challenge. A fluid bolus (250–500 mL) is infused rapidly over 5–10 minutes.

The normal CVP response is a rise of 2–5 cmH_2O, which gradually drifts back to the original level over 10–20 minutes. Patients with no change in their CVP are empty and require further fluid resuscitation. Patients with a large, sustained rise in CVP have high preload and an element of cardiac insufficiency or volume overload.

Packed red cells

Packed red blood cells are spun-down and concentrated packs of red blood cells. Each unit is approximately 330 mL and has a haematocrit of 50–70%. Packed cells are stored in a SAG-M (saline–adenine–glucose–mannitol) solution to increase shelf life to 5 weeks at 2–6°C. (Older storage regimes included storage in CPD [citrate–phosphate–dextrose] solutions, which have a shelf life of 2–3 weeks.)

Fresh-frozen plasma

Fresh-frozen plasma (FFP) is rich in coagulation factors and is removed from fresh blood and stored at −40°C to −50°C with a 2-year shelf life. It is the first-line therapy in the treatment of coagulopathic haemorrhage (see *Management of coagulopathy*). Rhesus D-positive FFP may be given to a rhesus D-negative woman, although it is possible for seroconversion to occur with large volumes owing to the presence of red cell fragments and Rh-D immunisation should be considered.

Cryoprecipitate

Cryoprecipitate is a supernatant precipitate of FFP and is rich in fibrinogen, factor VIII and factor XIII. It is stored at −30°C with a 2-year shelf life. It is given in low-fibrinogen states or factor VIII deficiency.

Platelets

Platelets are supplied as a pooled platelet concentrate and contain about 250 × 10^9/litre. Platelets are stored on a special agitator at 20–24°C and have a shelf life of only 5 days. Platelet transfusions are given to patients with thrombocytopenia or with platelet dysfunction who are bleeding or undergoing surgery.

Prothrombin complex concentrates

Prothrombin complex concentrates are highly purified concentrates prepared from pooled plasma. They contain factors II, IX and X. Factor VII may be included or produced separately. It is indicated for the emergency reversal of anticoagulant (warfarin) therapy in uncontrolled haemorrhage.

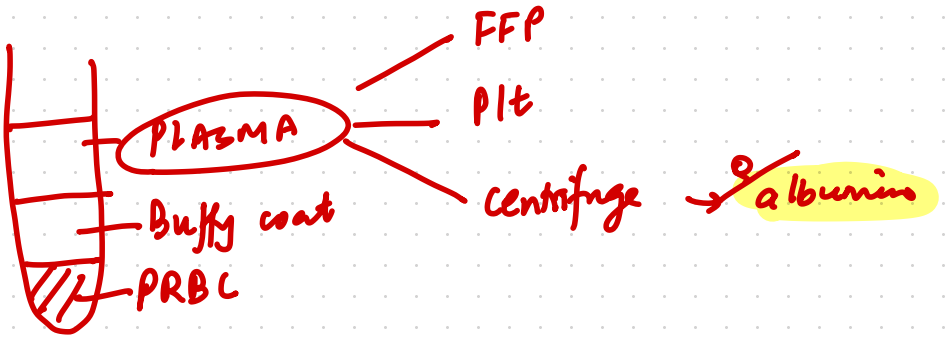
Complications from massive transfusion

Complications from massive transfusion include:

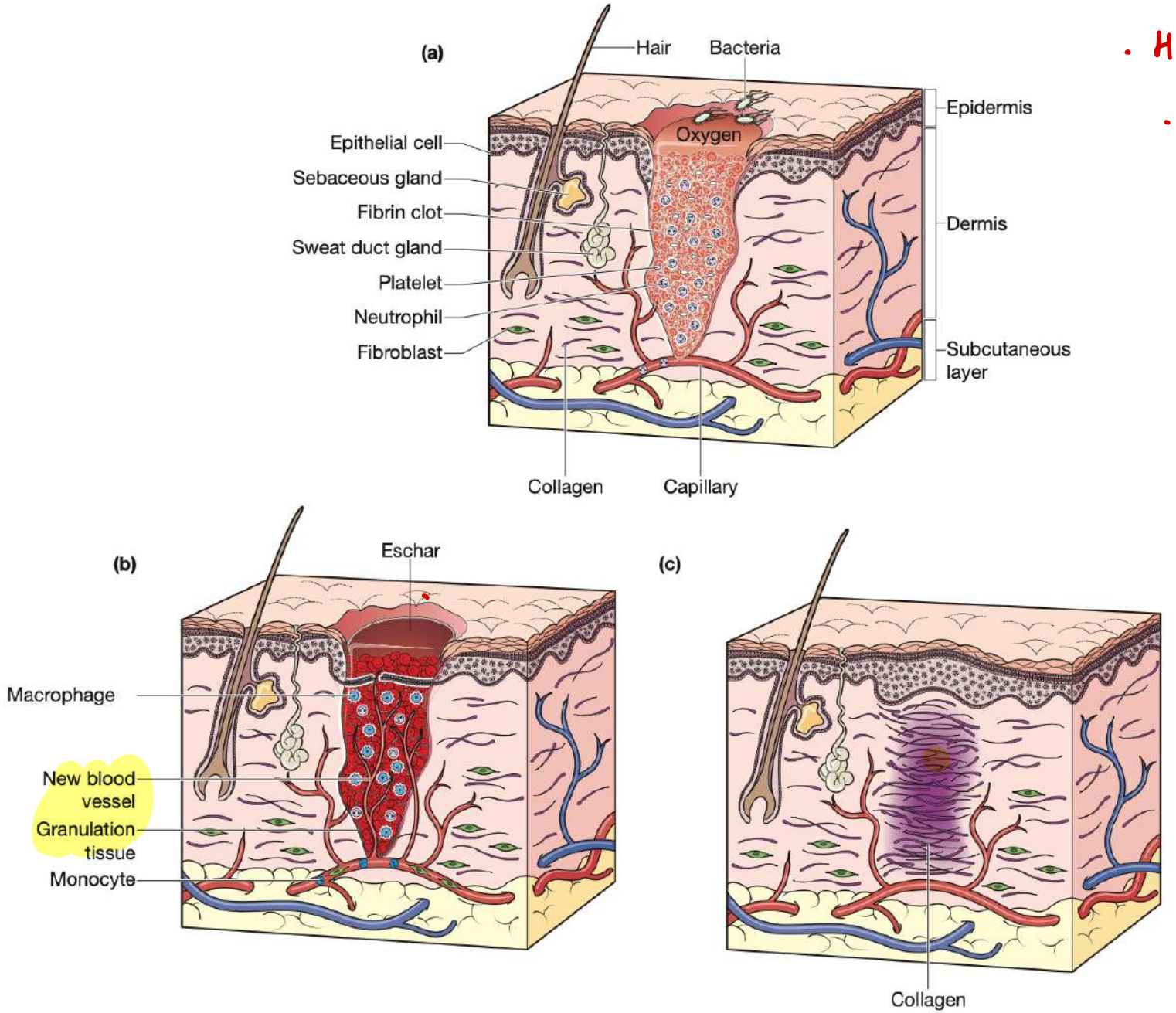
- coagulopathy;
- hypocalcaemia;
- hyperkalaemia;
- hypokalaemia;
- hypothermia.

In addition, patients who receive repeated transfusions over long periods of time (e.g. patients with thalassaemia) may develop iron overload. (Each transfused unit of red blood cells contains approximately 250 mg of elemental iron.)

Blood substitutes: Biomimetic VS Abiotic



Cryo-poor plasma → TTP



. Hemostasis
↓
. Inflammation : WBC → Mphges
1-3d 3-7d
↓
Prolifen / granuln tissue
7-14d
↓
Remodelling (14d)
Coll 3 → Coll 1
(N) Ratio : 4 : 1

of collagen. Type III collagen, which is prevalent during proliferation, is replaced by stronger type I collagen until the normal skin ratio of 4:1 type I to type III collagen is re-established. The collagen becomes more cross-linked and uniformly aligned. This maturation of collagen leads to increased tensile strength in the wound, which is maximal 12 weeks post injury and represents approximately 80% of the uninjured skin strength.

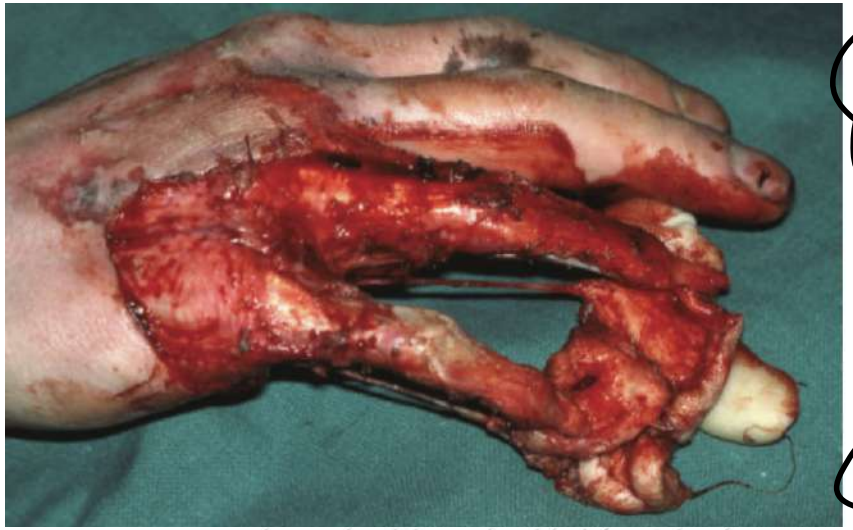
Figure 3.1 Classic stages of wound healing. (a) Inflammation. (b) Proliferation. (c) Remodelling. (Adapted by permission from Springer: Gurtner G, Werner S, Barrandon Y *et al*. Wound repair and regeneration. *Nature* 2008; **453**: 314–21. 2008).

TABLE 3.4 Types of debridement.

Surgical	Excision of non-viable tissue using surgical instruments such as a scalpel, curette, scissors or rongeur until healthy bleeding occurs at the wound edges
Mechanical	Non-selective debridement such as using irrigation, wet-to-dry dressings and hydrotherapy. Both non-viable and viable tissue may be removed
Autolytic	Using dressings such as hydrocolloids or transparent films to retain moisture and allow wound enzymes to selectively liquefy non-viable tissue
Enzymatic	Chemically liquefy necrotic tissue with enzymes using topical agents such as collagenase or papain–urea
Biological	Medical-grade larvae of *Lucilia sericata* release proteolytic and antimicrobial substances to remove necrotic tissue. They also directly promote wound healing

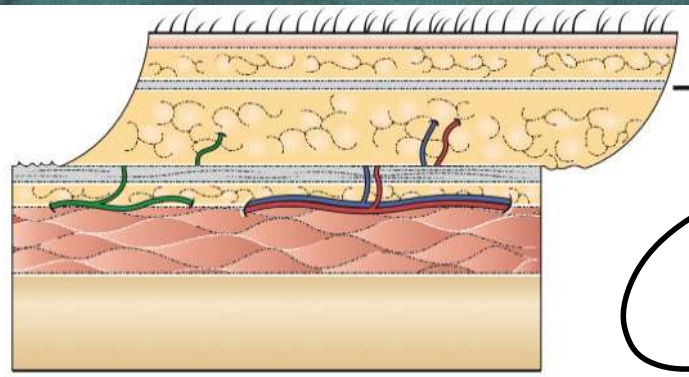
Classification of wound closure and healing

- Primary
  - Wound edges apposed
  - Normal healing
  - Minimal scar
- Secondary
  - Wound left open
  - Heals by granulation, contraction and re-epithelialisation
  - Increased inflammation and proliferation
  - Poor scar
- Tertiary (delayed primary)
  - Wound initially left open
  - Edges apposed later when healing conditions favourable



avulsion
lacerations
open
degloving
injury

FLAYING
- shearing



CLOSED
DEGLOVING

Q/ Morel Lavalle
lesion

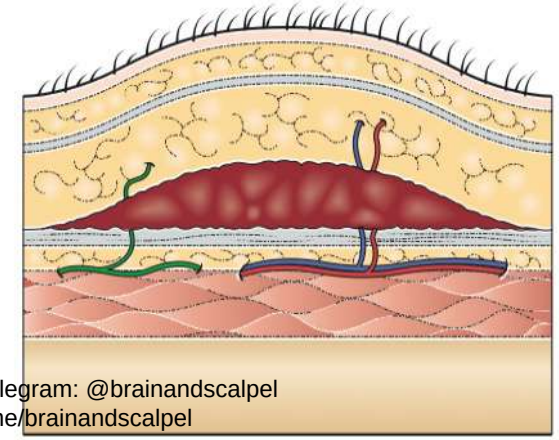
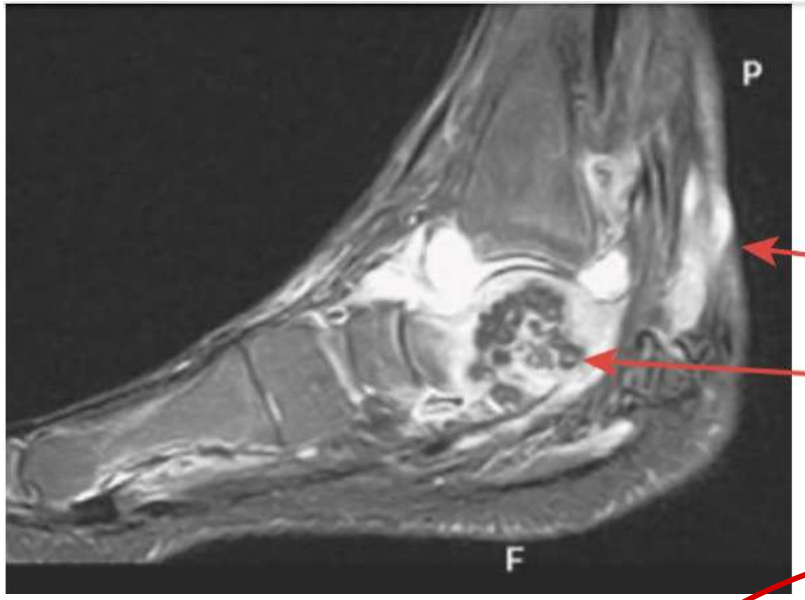


Figure 3.20 Multiple Z-plasty release of finger contracture.

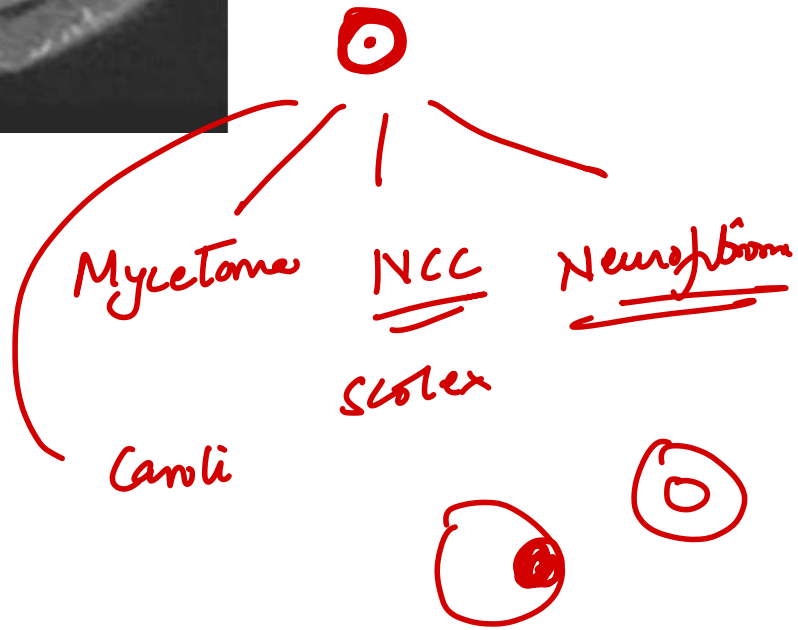
Mycetoma

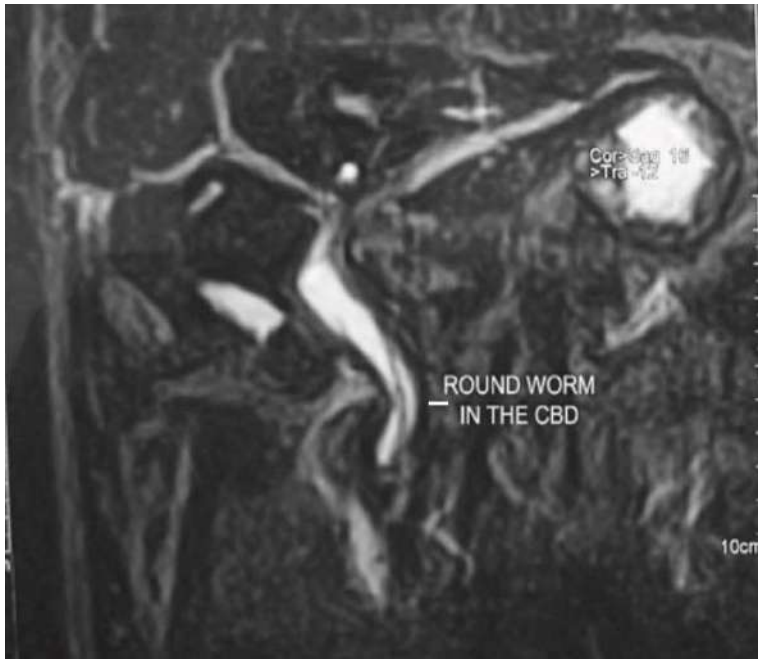


Q/

Granuloma

Dot-in-circle sign





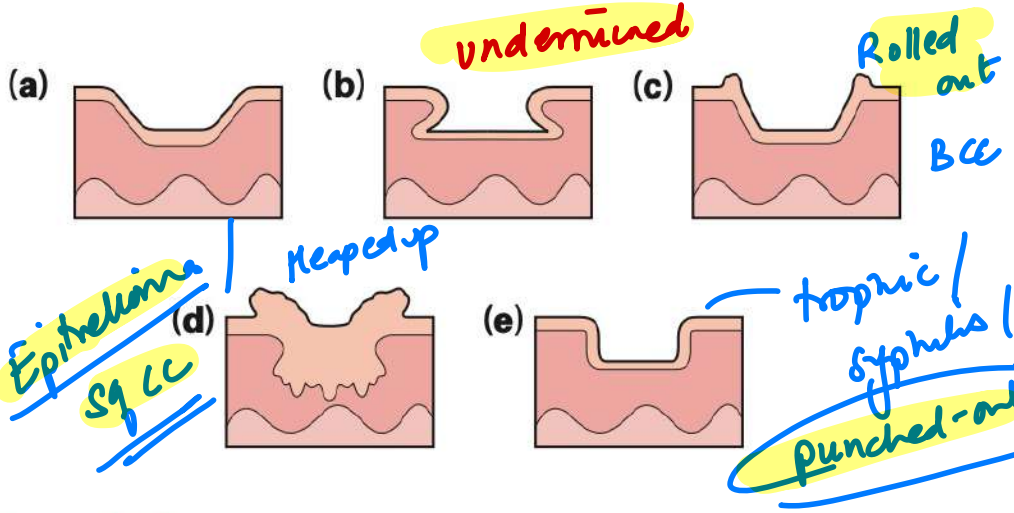


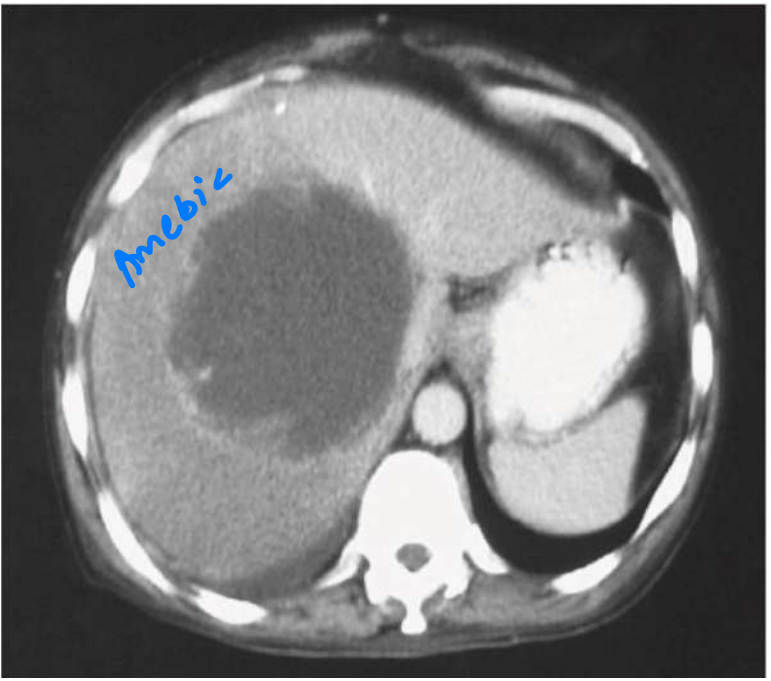
Figure 45.51 Some characteristic shapes of the edges of ulcers. **(a)** Non-specific ulcer: note the shelving edge. **(b)** Tuberculous ulcer: note the undermined edge. **(c)** Basal cell carcinoma (rodent ulcer): note the rolled edge, which may exhibit small blood vessels. **(d)** Epithelioma: note the heaped-up, everted edge and irregular thickened base. **(e)** Syphilis: note the punched-out edge and thin base, which may be covered with a 'wash-leather' slough.

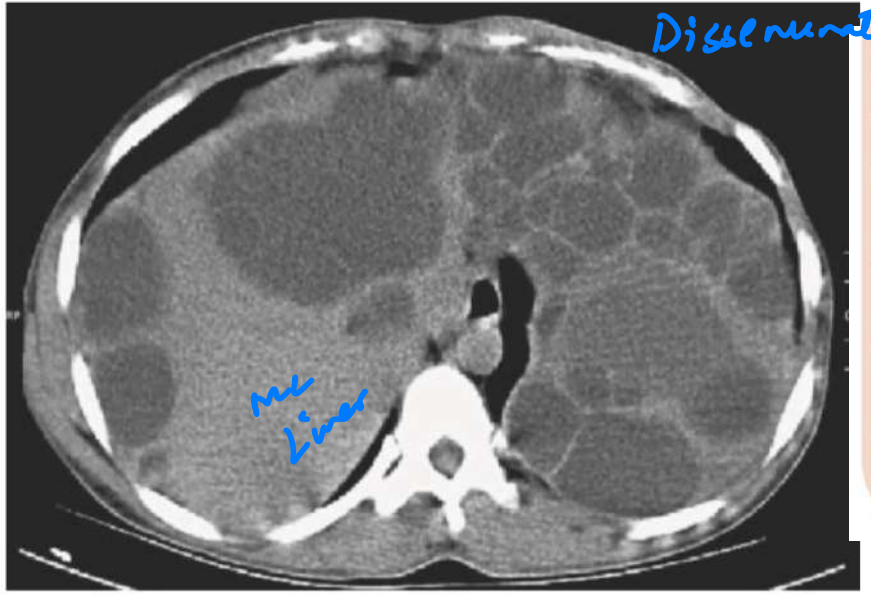
Figure 45.36 **(a)** A squamous cell carcinoma (SCC) on the face. **(b)** A recurrent SCC arising in a previously skin-grafted area of the scalp. **(c)** SCC arising on the dorsum of the hand in a renal transplant recipient on immunosuppressive therapy. **(d)** SCC arising on the lip of a smoker who worked outside on a farm. ((a–c) courtesy of Mr AR Greenbaum; (d) courtesy of St John's Institute for Dermatology, London, UK.)

↳ Marjolin's ulcer

venous : sloping edges

sqcc → skin venous

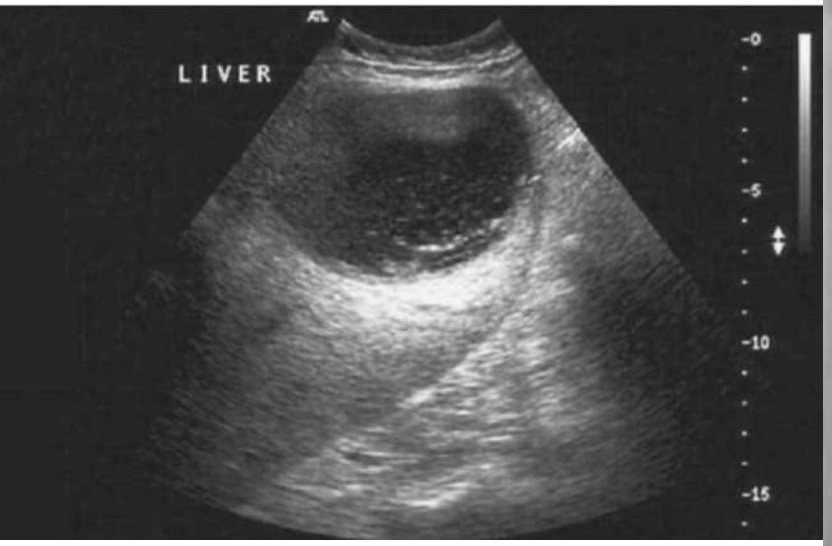




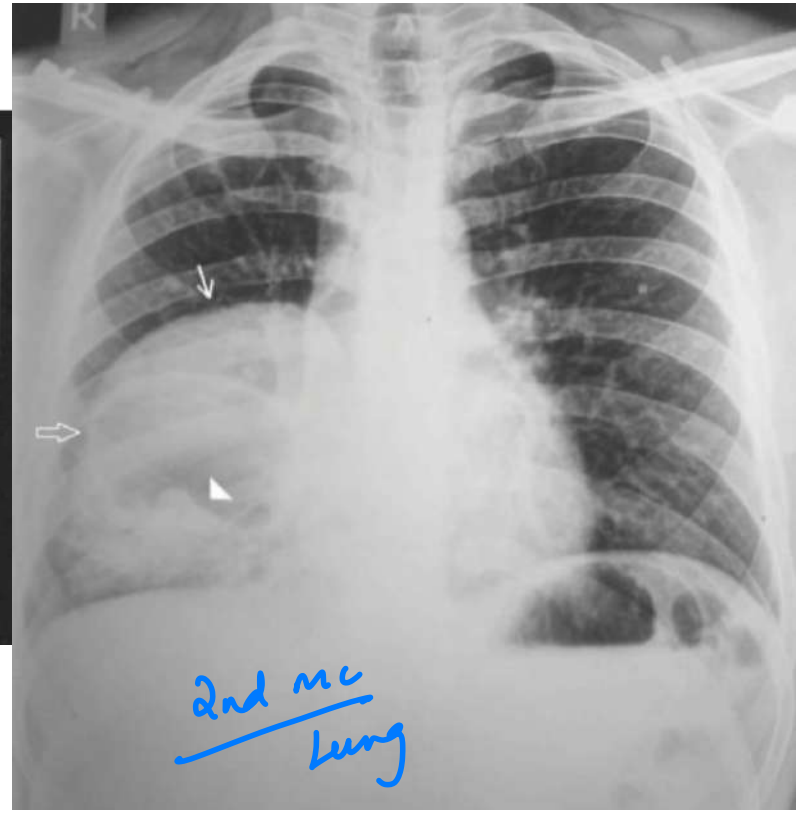
Hydatid disease: diagnosis

- In the UK, the usual sufferer is a sheep farmer
- While any organ may be involved, the liver is by far the most commonly affected
- Elective clinical presentation is usually in the form of a painful lump arising from the liver
- Anaphylactic shock due to rupture of the hydatid cyst is the emergency presentation
- CT scan is the best imaging technique – the diagnostic feature is a space-occupying lesion with a smooth outline with septa

x PNAC
IOC
disseminated



vs Pyogenic – multifocal



Amebic Liver abscess

Medical treatment is very effective and should be the first choice in the elective situation, with surgery being reserved for complications. Metronidazole and tinidazole are the effective drugs. After treatment with metronidazole and tinidazole, diloxanide furoate, a luminal amoebicide that is not effective against hepatic infestation, is used for 10 days to destroy any intestinal amoebae.

>5cm

Aspiration is carried out when imminent rupture of an abscess is expected, especially when involving the left lobe. Pigtail catheter drainage may be considered in those patients who are not responding to intravenous metronidazole in the first 48–72 hours to improve antibiotic penetration. If there is evidence of secondary infection, appropriate drug treatment is added. The threshold for draining a left liver lobe abscess

TABLE 5.2 Surgical site infection rates relating to wound contamination with and without using antibiotic prophylaxis

Type of surgery	Infection rate with prophylaxis (%)	Infection rate without prophylaxis (%)
Clean (no viscus opened)	1–2	1–2
Clean-contaminated (viscus opened, minimal spillage)	3	6–9
Contaminated (open viscus with spillage or inflammatory disease)	6	13–20
Dirty (pus or perforation, or incision through an abscess)	7	40

Risk factors for increased risk of wound infection

- Malnutrition (obesity, weight loss)
- Metabolic disease (diabetes, uraemia, jaundice)
- Immunosuppression (cancer, acquired immunodeficiency syndrome [AIDS], steroids, chemotherapy and radiotherapy)
- Colonisation and translocation in the gastrointestinal tract
- Poor perfusion (systemic shock or local ischaemia)
- Foreign body material
- Poor surgical technique (devitalised tissue, dead space, haematoma)

Antibiotic prophylaxis

- Not required in clean surgery unless a prosthesis is implanted
- Use antibiotics that are effective against expected pathogens within local hospital guidelines
- Plan for single-shot intravenous administration at induction of anaesthesia
- Repeat only during long operations or if there is excessive blood loss
- Patients with heart valve disease or a prosthesis should be protected from bacteraemia caused by dental work, urethral instrumentation or visceral surgery

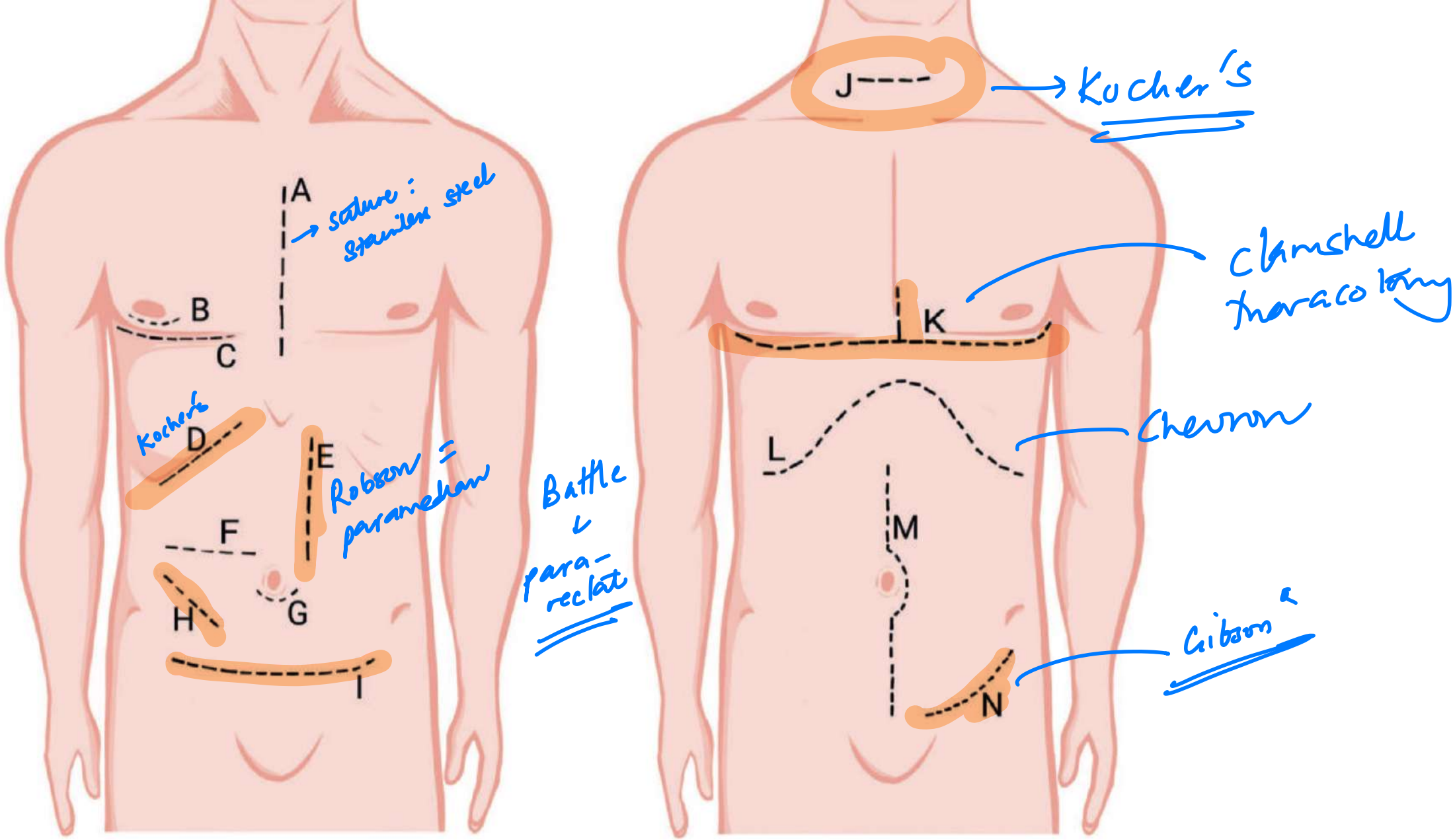


Figure 7.6 Skin incisions in general surgery. A, sternotomy; B, periareolar; C, inframammary; D, subcostal; E, paramedian; F, transverse; G, periumbilical; H, McBurney's; I, Pfannenstiel; J, Kocher's incision for thyroidectomy; K, clamshell thoracotomy; L, chevron incision; M, midline incision; N, inguinal incision (courtesy of Dr Vinay Timothy Kuruvilla).

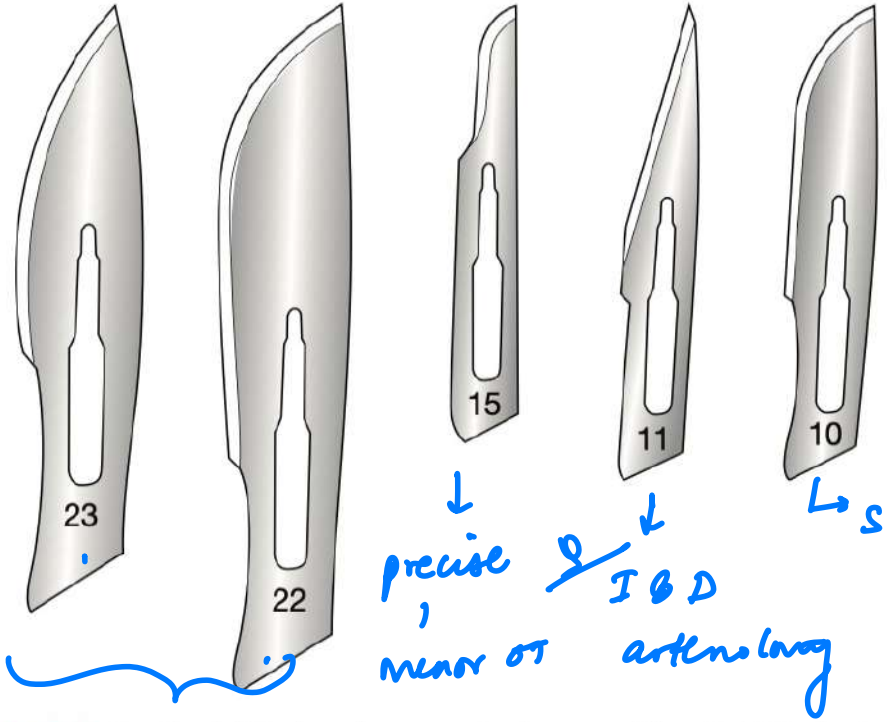


Figure 7.7 Scalpel blade sizes and shapes. The 22-blade is often used for abdominal incisions, the 11-blade for arteriotomy and abscess drainage and the 15-blade for minor surgical procedures.

As a rule, facial sutures are removed in 3–5 days after the operation, neck sutures in 5–7 days and abdominal sutures between 10 and 14 days.

face → neck → abdo

The benefits of laparoscopic surgery

- Less postoperative pain
- Better cosmesis
- Earlier return to normal physiology
- Shorter hospital stays
- Fewer intraoperative adhesions created
- Better perception of anatomy as image is often magnified

Open Hasson's technique for laparoscopic primary trocar insertion

In most cases, the umbilicus is the preferred site for a 10–12-mm initial port placement (*Figure 7.10a–e*).

1. A 10-mm incision in Palmer's point (3 cm below the left costal margin, in the mid-clavicular plane) is the location preferred by many surgeons for Veress needle insertion.
2. The needle is advanced until it reaches the muscle. The abdominal wall is then lifted and the needle advanced through the oblique muscles.
3. Classically, a 'pop' is heard and a 'give' felt on successful insertion into the peritoneal cavity.
4. The intraperitoneal placement is confirmed using a combination of the following techniques.
   - The hanging drop method, wherein a drop of water is placed in the hub of the needle; on elevating the abdominal wall the resultant loss of intra-abdominal pressure would result in the drop emptying into the abdominal cavity.
   - Free flow of saline into the peritoneal cavity and no return of bowel content or blood on aspiration.
   - Abdominal pressure reading of less than 10 mmHg.
5. Once the position is confirmed CO_2 insufflation at a slow pace is commenced until the target pressure is reached. The needle is now removed.

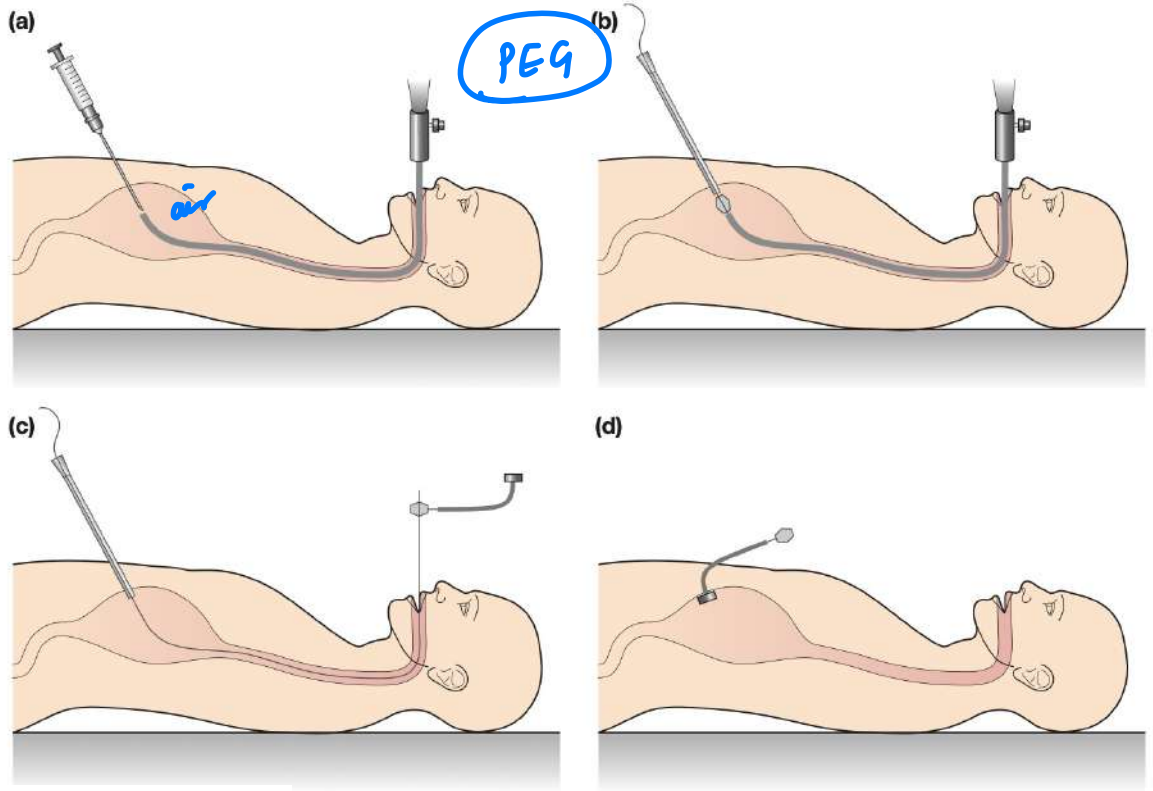
Placement of nasogastric tubes

Contraindications

- Suspected or proven base of skull fracture as this may result in inadvertent cranial injury
- Oesophageal stricture or recent oesophageal surgery (unless under vision)

Complications

- Upper airway damage – pressure necrosis of the nasal ala owing to the placement of an oversized tube or following prolonged placement
- Reflux oesophagitis
- Pulmonary aspiration due to impaired function of the lower gastro-oesophageal sphincter
- Inadvertent placement into the lungs
- Traumatic placement causing bleeding and perforation



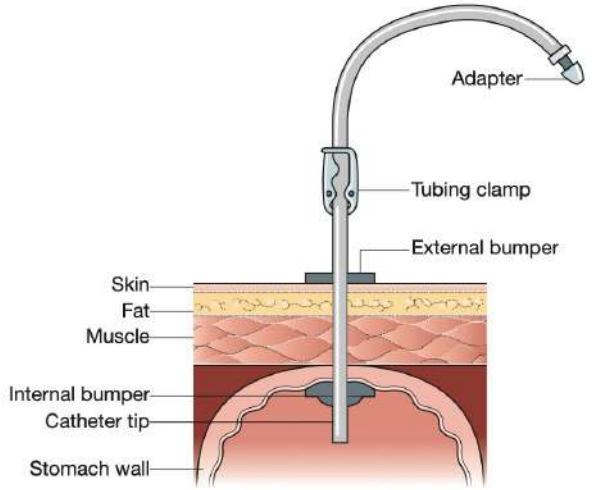
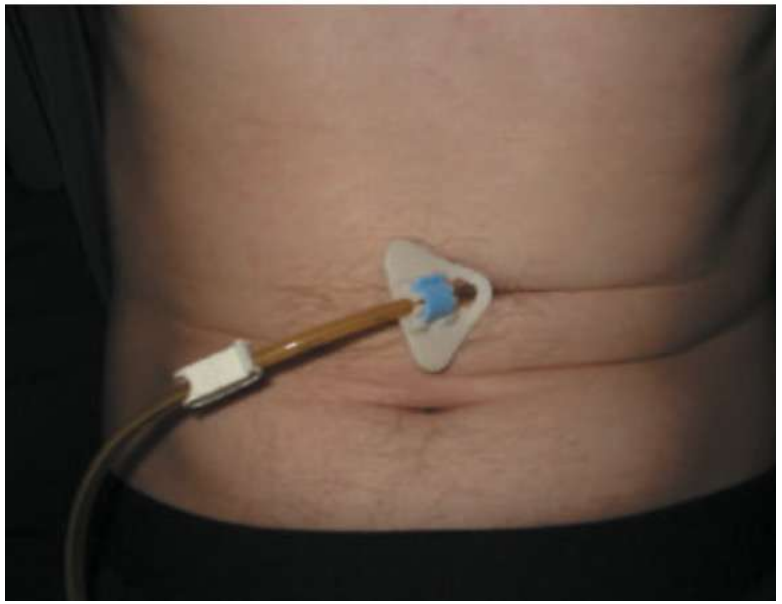


Figure 25.7 Cross-sectional appearance of a percutaneous endoscopic gastrostomy *in situ*, showing the abutment of the stomach to the abdominal wall to minimise risk of leakage and peritonitis.



Liver dysfunction. Long-term use of parenteral nutrition is associated with derangement of liver function tests in at least 25% of patients. Fatty liver is a common complication. This is worse in children, and the degree can be reduced by modifying the parenteral nutrition solution, such as alternating the use of lipid-free parenteral nutrition solutions. A smaller percentage of patients may subsequently develop liver fibrosis and cirrhosis. Once liver disease is established in these patients the term 'intestinal failure-associated liver disease' (IFALD) is used, as these cholestatic changes in liver function profile are difficult to separate from the effects of short bowel syndrome. Factors such as a lack of colonic continuity, extreme short bowel, lack of enteral intake and high energy and fat content in feed have all been associated with a higher risk of the development of IFALD.

Metabolic bone disease and vitamin deficiencies. Osteoporosis or osteomalacia are both known complications of long-term parenteral nutrition, leading to fractures or kidney stones. Supplementation of calcium, phosphate, vitamin D and sometimes bisphosphonates can both prevent and treat this complication. Excess or deficiency of vitamins or trace elements may occur, manifesting with non-specific symptoms such as anaemia, hair loss or neurological symptoms. Regular measurements and replacement, as well as clinical assessment, can prevent this from occurring.

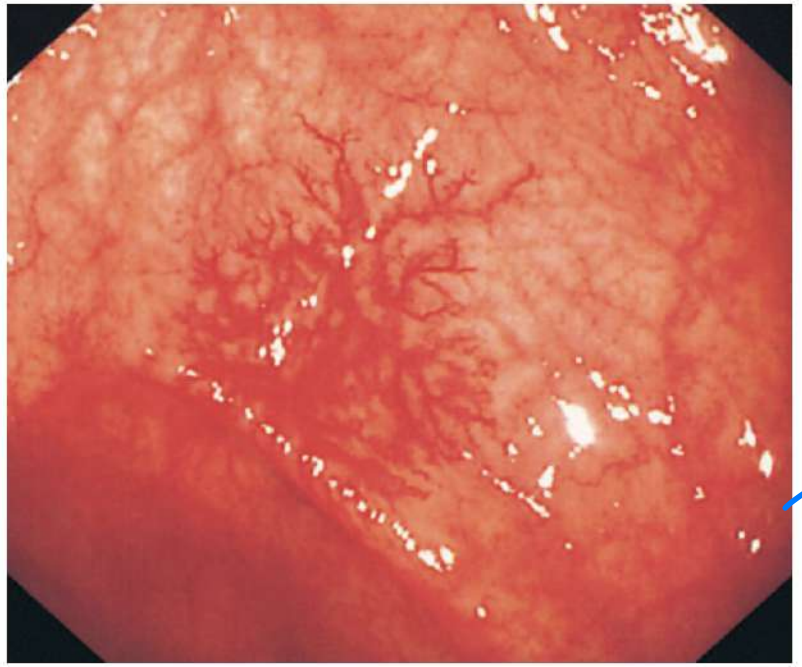
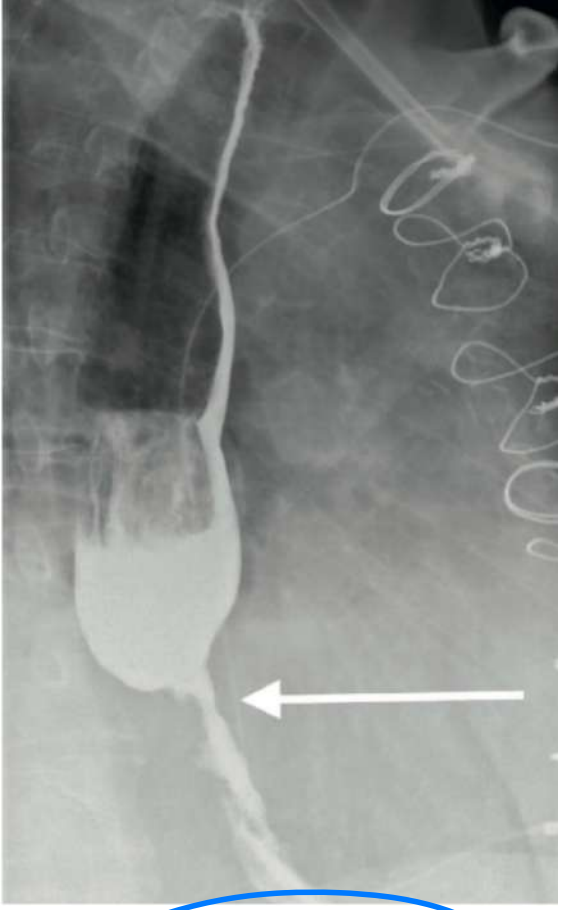


Figure 9.18 A large angioectasia of the colon. If this results in symptomatic anaemia, it should be obliterated with argon plasma coagulation.

Heyde's
↳ AS +
angiodysplasia

TPN ⟨ K ↓ Mg ↓ PO_4 ↓
MC → insulin R- ↑glycemia



Ca esophagus

TB ileocaecal junction

EUS

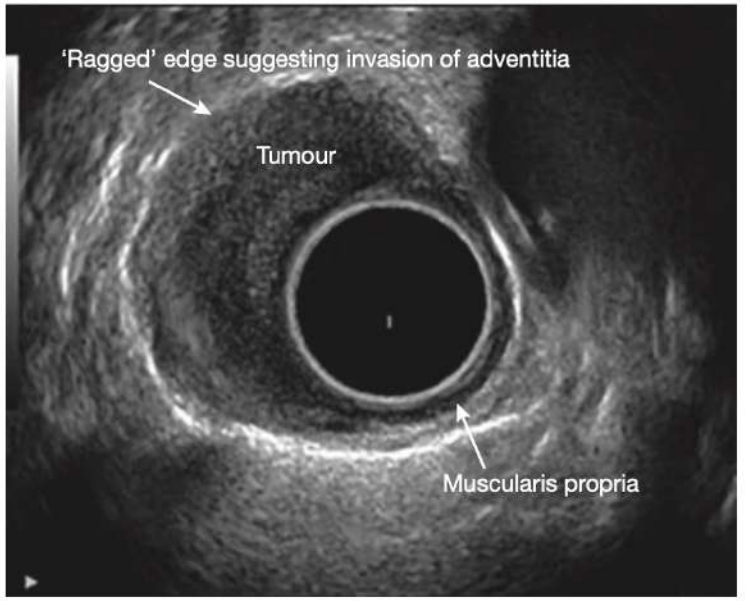
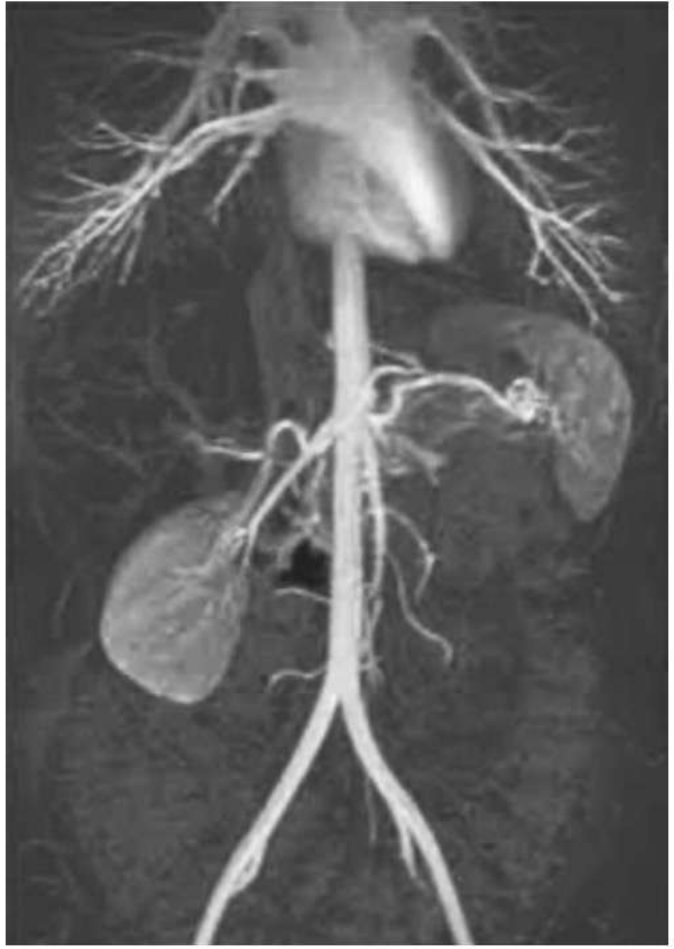


Figure 9.20 Endoscopic ultrasound image of an oesophageal tumour invading into the wall.

TABLE 9.6 Indications for endoscopic ultrasound.

Diagnostic	Staging of oesophageal/gastric malignancy
	Staging of hepatobiliary malignancy
	Diagnosis of choledochal microlithiasis
Therapeutic	Biopsy of paraoesophageal lymph nodes
	Biopsy of submucosal upper gastrointestinal lesions
	Biopsy of pancreaticobiliary mass
	Biopsy of portal lymphadenopathy
	Biopsy of left adrenal and left liver masses
	Transgastric drainage of pancreatic pseudocyst
	Coeliac plexus block

T staging
N



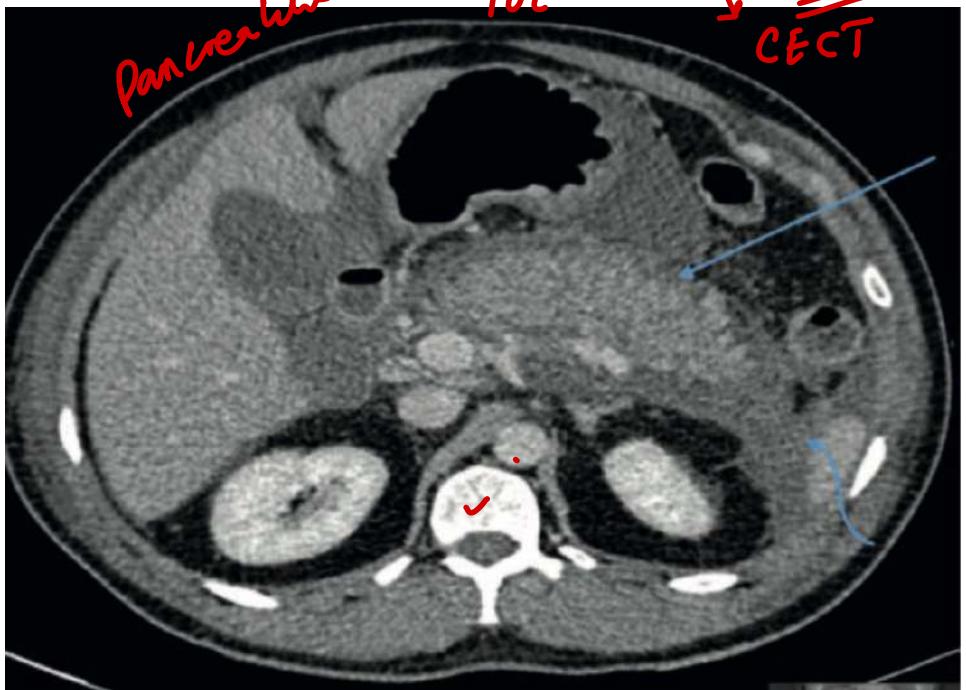
a) CTA

b) MRA

c) DSA

d) conventional angiogr

CBD stones



- Serpiginous pattern
- MRI T2W
- Medullary infarcts

Steroids / Sickle cell anemia

Some immunohistochemical stains used for tumours

- Cell type/site of origin
  - Epithelial (carcinoma): cytokeratins
  - Lymphoid (lymphoma): CD45, CD3 (T cells), CD20 (B cells)
  - Melanocytic (melanoma): S100, HMB45, Melan A
  - Neuroendocrine: synaptophysin, chromogranin /INSM
  - Vascular: CD31
  - Myoid: desmin, actin
- Site of origin/cell type
  - Prostate: prostate-specific antigen (PSA)
  - Lung: thyroid transcription factor-1 (TTF-1) → adenoca
  - Thyroid: thyroglobulin
  - Colorectum: cytokeratin 20 (CK20), CDX2 — CK20 + LRT- : Merkel colorectal
  - Liver: hepatocyte-specific antigen (HSA)
  - Gastrointestinal stromal tumour (GIST): CD117, DOG-1 — CKIT
- Prognosis and treatment — MC
  - Breast carcinoma and gastric carcinoma: HER-2
  - Neuroendocrine tumours: Ki67 proliferation index
- Screening for mutations
  - Colorectal carcinoma: mismatch repair proteins (MLH1, MSH2, MSH6, PMS2)

Detection methods for main molecular changes QQ

- Point mutations and small insertions and deletions: NGS, PCR
- Fusions: FISH, NGS, PCR — MAT : FISH
- Amplifications: FISH, NGS
- Tumour mutation burden: NGS
- Immunohistochemistry may be a very useful initial test, and is often sufficient

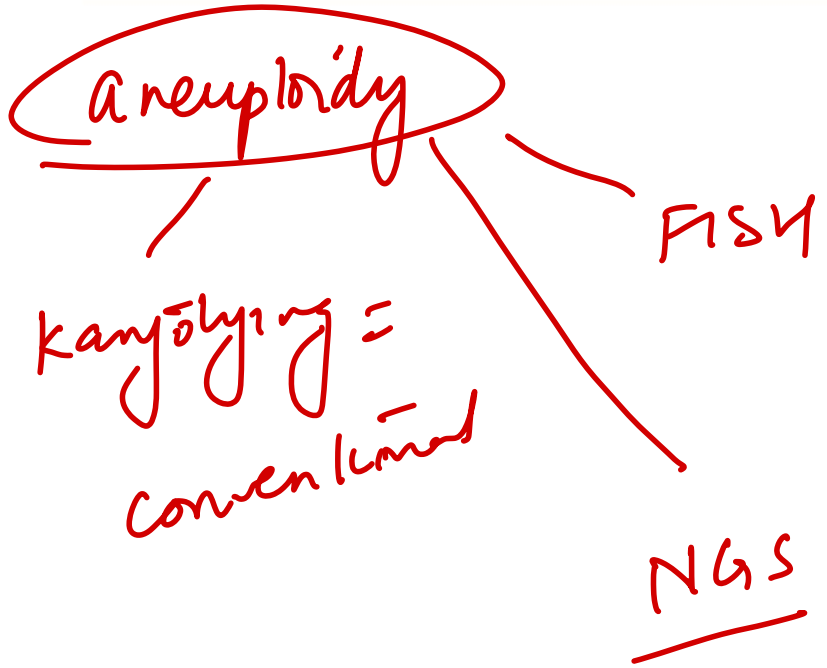


TABLE 21.11 The Revised Cardiac Risk index of Lee.

Risk factors	Risk of major cardiac complications (%)
History of ischaemic heart disease History of compensated or prior heart failure History of cerebrovascular disease Diabetes mellitus Renal insufficiency (creatinine >177 μmol/L) High-risk surgery	Number of factors 0 = 0.4 1 = 0.9 2 = 7.0 3+ = 11.0

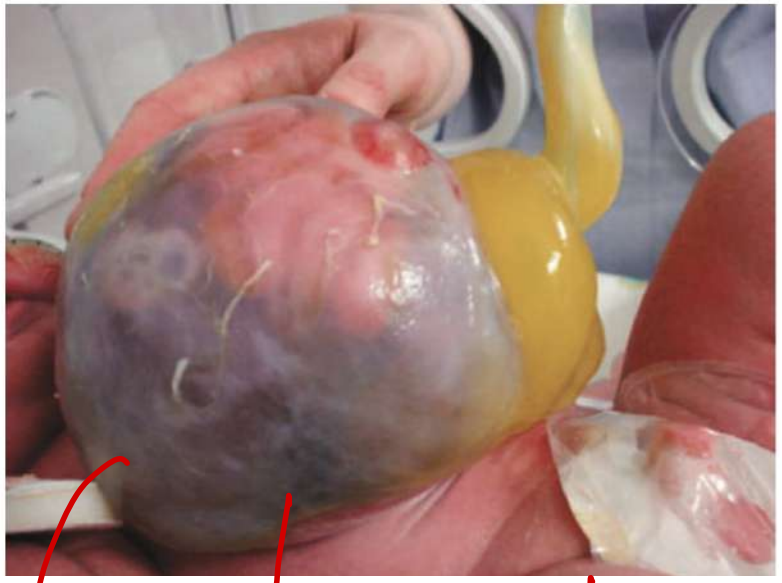
TABLE 21.5 Metabolic equivalent tasks (METs).

- 1 MET = 3.5 mL O_2/kg/min (oxygen consumption by a 40-year-old, 70-kg man at rest)
- 1 MET = eating and dressing
- 4 METs = climbing two flights of stairs
- 6 METs = short run
- >10 METs = able to participate in strenuous sport

ETC versus DCS

- ETC describes the definitive management of a patient's injuries within 36 hours of injury after a period of initial resuscitation
- DCS describes simultaneous resuscitation with early rapid life- and limb-saving surgery. Time-consuming definitive surgery is deferred until the patient's physiological status allows
- An ETC approach can be changed to a damage control approach if the patient's physiology deteriorates during definitive surgery

igure 23.5 Airtraq® intubating device.



omphalocele mjr

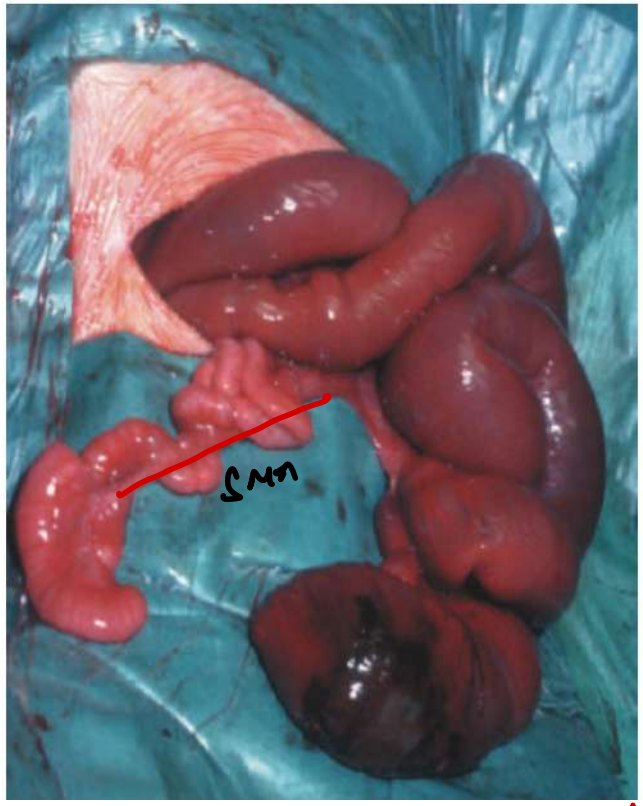
>5cm

Microcolon – meconium ileus

Mx → Gastrografin enema

↓ ×

Bishop Koop (× done)



apple peel deformity

(jejuno-ileal atresia

Exomphalos describes a central abdominal wall defect in which prolapsed viscera are covered in a thin, three-layered membrane (peritoneum, Wharton's jelly and amnion) in continuity with the umbilical cord. Exomphalos minor (<5 cm, liver not involved)

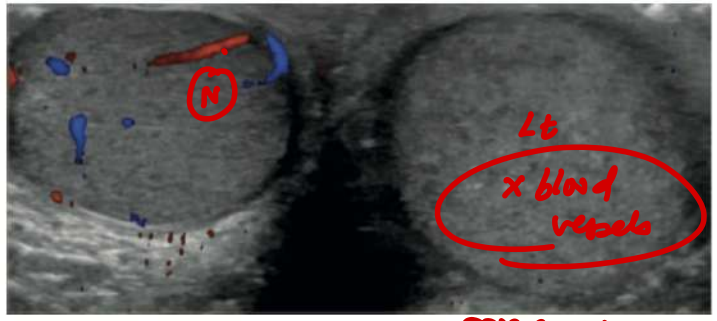


Figure 17.5 The red and blue colour on one testis shows normal blood flow whereas the contralateral testis has no blood supply, consistent with a torsion.

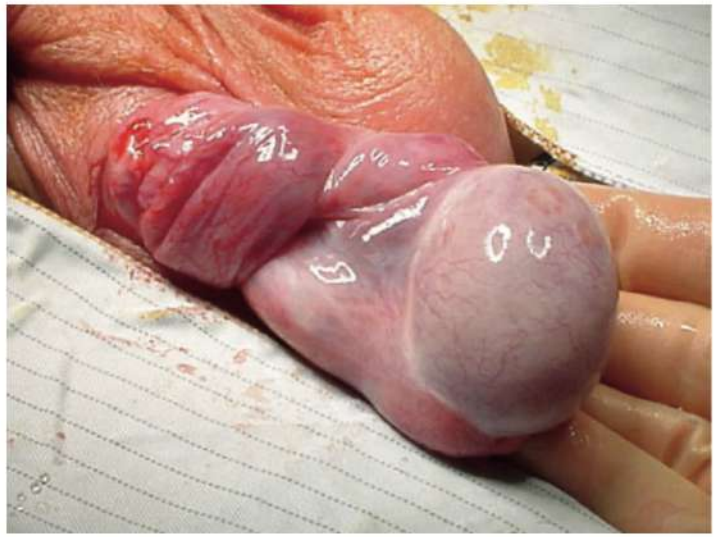


Figure 17.6 Torsion of the right testis with only modest vascular compromise in a boy with a history of intermittent pain.

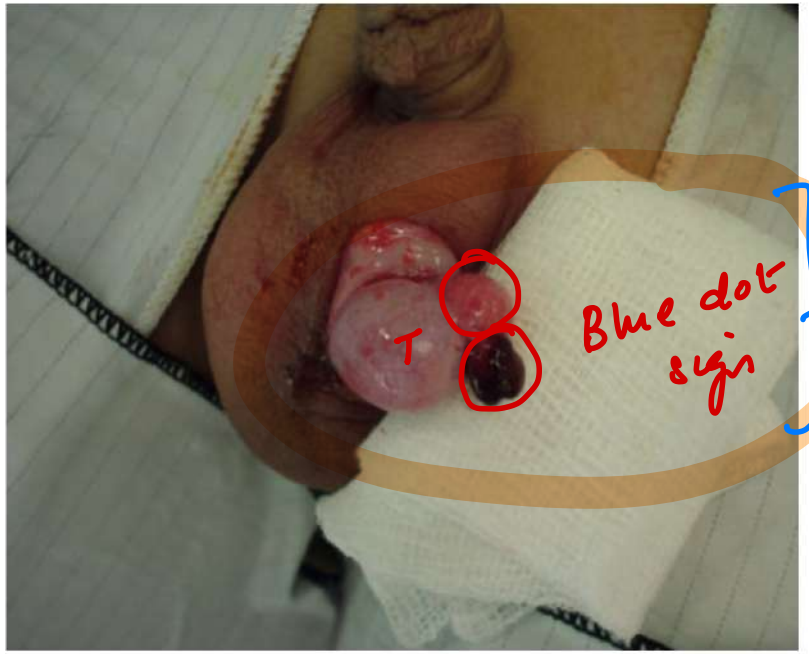


Figure 17.7 Two torted and infarcted hydatids, one arising from the epididymis and one from the testis.

Appendix testes - Mullerian/paramesonephric
Hydatid of Morgagni

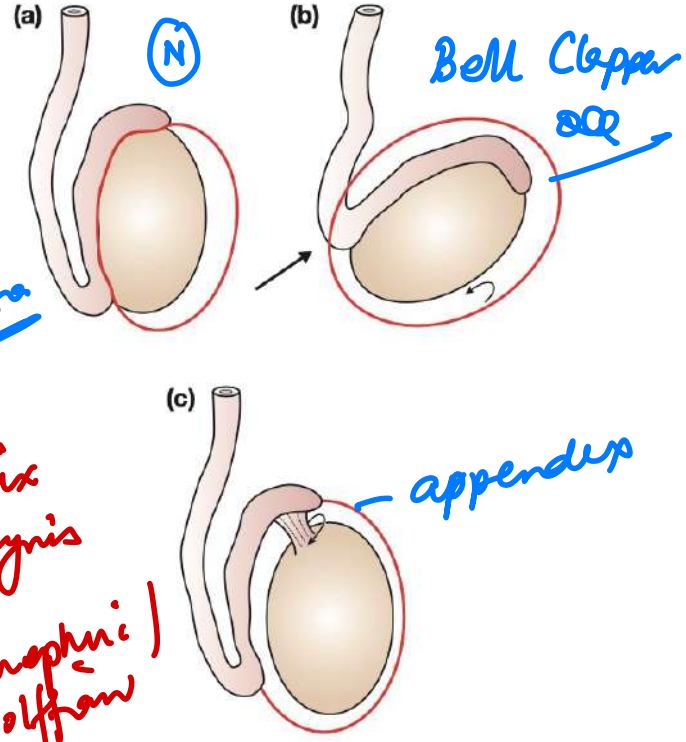
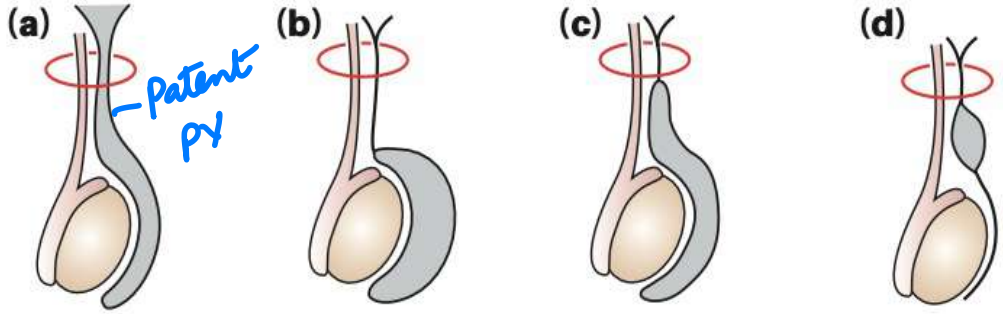


Figure 86.4 Testicular torsion. **(a)** Normal attachment. **(b)** An abnormally high attachment (arrow) of the tunica vaginalis predisposes to torsion – the 'bell-clapper'. **(c)** Separation of the testis from the epididymis – torsion about the pedicle between them.

Doppler ultrasound may help (*Figure 17.5*). Exploration within 6–8 hours of the onset of symptoms improves the chances of testicular salvage.

At operation, testicular viability is assessed after derotation (*Figure 17.6*). Only gangrenous testes should be excised since some severely compromised testes survive, and those that then atrophy are not harmful. If salvageable, three-point fixation of both testes with non-absorbable sutures is performed or a dartos pouch is fashioned.



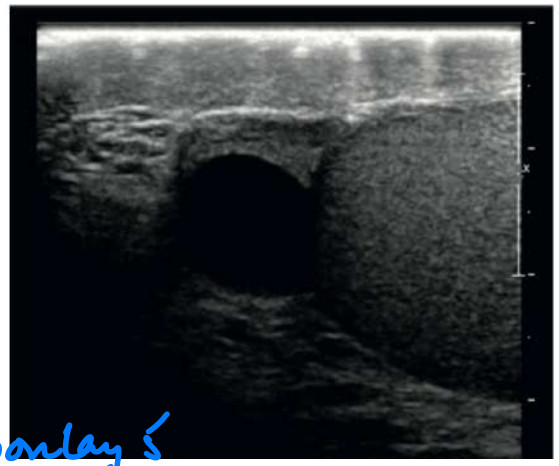


Figure 86.8 (a) Vaginal hydrocele (very common); **(b)** 'infantile' hydrocele; **(c)** congenital hydrocele; **(d)** hydrocele of the cord.

Lord / Tabanlay's mc

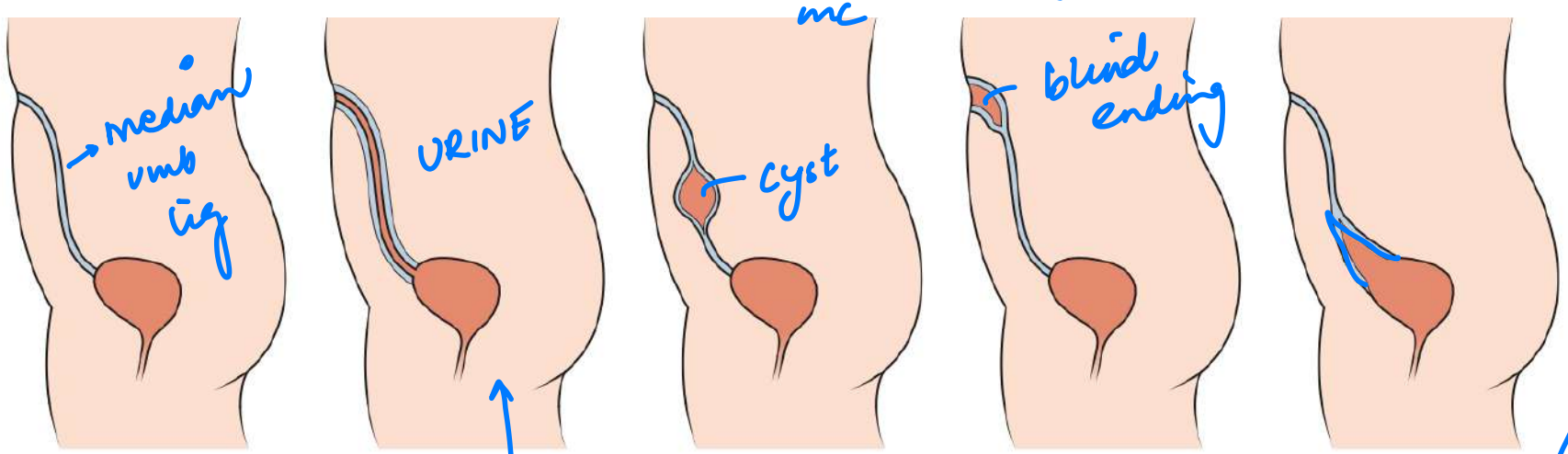
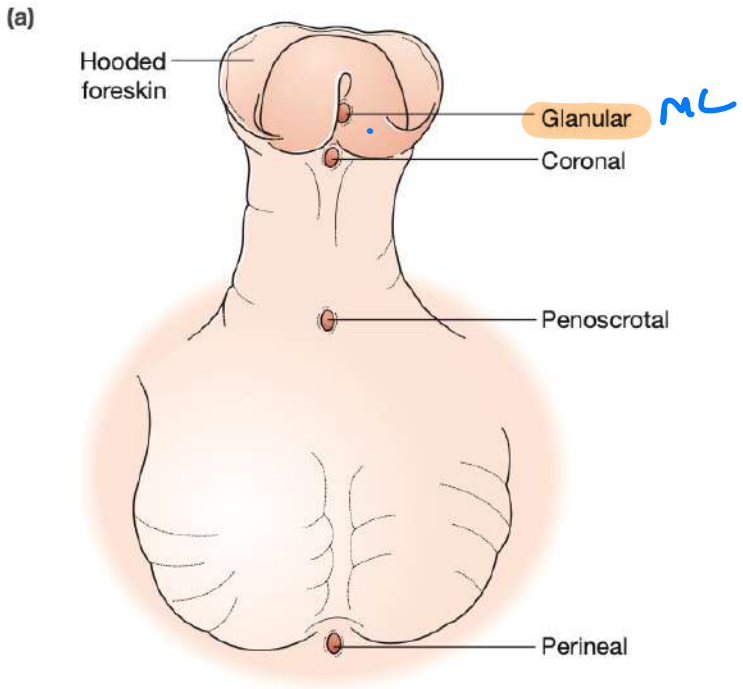


Figure 83.10 Urachal anomalies. **(a)** Normal; **(b)** patent urachus; **(c)** urachal cyst; **(d)** urachal sinus; **(e)** urachal diverticulum.

adenoca

Ectrophy UB
Epispadias
dorsal.



- Glanular hypospadias: the ectopic meatus is placed on the glans penis, but proximal to the normal site of the external meatus, which is marked by a blind pit.
- Coronal hypospadias: the meatus is placed at the level of the coronal sulcus.
- Penile hypospadias: the meatus is on the underside of the penile shaft.
- Penoscrotal hypospadias: the meatus is at the level of the penoscrotal junction.
- Perineal hypospadias: this is a rare and severe abnormality. The scrotum is bifid, and the urethra opens between

Figure 85.2 (a) Hypospadias classification. **(b)** Coronal hypospadias. **(c)** Midpenile hypospadias. **(d)** Hypospadias with penoscrotal transposition in which the scrotum is placed superior and anterior to the penis. **(e)** Urethrocutaneous fistula seen in multiple failed hypospadias surgeries.

Day surgery surgical criteria include the following:

- There must be a low risk of significant immediate postoperative complications, e.g. catastrophic bleeding or airway compromise.
- The patient should be able to eat and drink or take oral nutrition postoperatively.
- Postoperative pain needs to be managed by oral painkillers, which may be in conjunction with local anaesthetic infiltration or peripheral nerve block.
- The patient should be able to mobilise postoperatively with or without aid.

TABLE 22.2 Medical exclusions to day surgery.

- Unstable ASA 3
- ASA 4 or 5
- Any poorly controlled abnormality/comorbidity

TABLE 22.5 Discharge criteria.

- Vital signs stable for at least 1 hour
- Correct orientation as to time, place and person if appropriate
- Adequate pain control with supply of oral analgesia
- Understands how to use oral analgesia supplied
- Ability to dress and walk where appropriate
- Minimal nausea, vomiting or dizziness
- Has taken oral fluids
- Minimal bleeding or wound drainage
- Has passed urine (if appropriate)
- Has a responsible adult to take them home
- Written and verbal instructions given about postoperative care
- Knows when to come back for follow-up (if appropriate)
- Emergency contact number supplied

The operative management of liver injuries can be summarised as 'the four Ps':

- Pressure;
- Pringle;
- Plug;
- Pack.

TABLE 29.3 The 'deadly dozen' threats to life from chest injury.

Immediately life-threatening	• Airway obstruction • Tension pneumothorax • Pericardial tamponade • Open pneumothorax • Massive haemothorax • Flail chest
Potentially life-threatening	• Aortic injuries • Tracheobronchial injuries • Myocardial contusion • Rupture of the diaphragm • Oesophageal injuries • Pulmonary contusion

TABLE 28.3 UK National Institute for Health and Care Excellence (NICE) guidelines for computed tomography (CT) in head injury.

Indications for CT imaging in head injury within 1 hour

- GCS <13 at any point
- GCS <15 at 2 hours
- Focal neurological deficit
- Suspected open, depressed or basal skull fracture
- More than one episode of vomiting
- Post-traumatic seizure

Indications for CT imaging within 8 hours

- Age >65
- Coagulopathy (e.g. aspirin, warfarin or rivaroxaban use)
- Dangerous mechanism of injury (e.g. fall from a height, RTA)
- Retrograde amnesia >30 minutes

Utilisation of eFAST

- Detects free fluid in the abdomen or pericardium
- Will not reliably detect less than 100 mL of free blood
- Does not directly identify injury to hollow viscus
- Cannot reliably exclude injury in penetrating trauma
- May need repeating or supplementing with other investigations
- Is unreliable for assessment of the retroperitoneum

Diagnostic peritoneal lavage ← eFAST N/A

Diagnostic peritoneal lavage (DPL) is a test rarely used in modern-day practice but can be of value in resource-limited settings. It is a test used to assess the presence of blood or contaminants in the abdomen. A nasogastric tube is placed to empty the stomach and a urinary catheter is inserted to drain the bladder.

A cannula is inserted below the umbilicus, directed caudally and posteriorly. The cannula is aspirated for blood (>10 mL is deemed as positive) and, following this, 500 mL of warmed Ringer's lactate solution is allowed to run into the abdomen from a 1-litre bag. The bag, with 500 mL remaining, is placed on the floor and the intra-abdominal fluid is allowed to flow under the influence of gravity – this aids drainage. The presence of frank blood or similar contents to a nasogastric tube or urinary catheter denotes a positive DPL. If time allows and laboratory diagnosis is available, the presence of >100 000 red cells/μL or >500 white cells/μL is deemed positive (this is equivalent to 20 mL of free blood in the abdominal cavity), as is a raised amylase level. In the absence of laboratory facilities, a urine dipstick may be useful. Drainage of lavage fluid via a chest drain indicates penetration of the diaphragm.

Pericardial tamponade

- The presentation is similar to a tension pneumothorax – deteriorating cyanosis, tachycardia and agitation
- eFAST is diagnostic and may also detect free fluid in the abdomen or pericardium
- There is no role for pericardiocentesis in traumatic cardiac tamponade. A left anterolateral thoracotomy or sternotomy should be performed with evacuation of the haematoma and repair of the myocardium

Q

In penetrating injury to the heart there is usually a substantial clot in the pericardium, which may prevent aspiration. **Pericardiocentesis has no role in the management of cardiac tamponade secondary to penetrating myocardial injury**. The correct immediate treatment of tamponade is operative, either via a subxiphoid window or by open surgery (sternotomy or left anterolateral thoracotomy), with repair of the heart in the operating theatre if time allows or otherwise in the emergency department.

Level of neurological impairment

The extent of spinal cord injury is defined by the American Spinal Injury Association (ASIA) Impairment Scale (modified from the Frankel classification):

- **A:** complete spinal cord injury;
- **B:** sensation present, motor absent;
- **C:** sensation present, motor present but not useful (MRC grade <3/5);
- **D:** sensation present, motor useful (MRC grade ≥3/5);
- **E:** normal function.

TABLE 28.1 Head injury severity: clinical classification.

Minor head injury	GCS 15 with no LOC
Mild head injury	GCS 14 or 15 with LOC
Moderate head injury	GCS 9–13
Severe head injury	GCS 3–8

elective intubation

Summary box 30.3

Physical examination

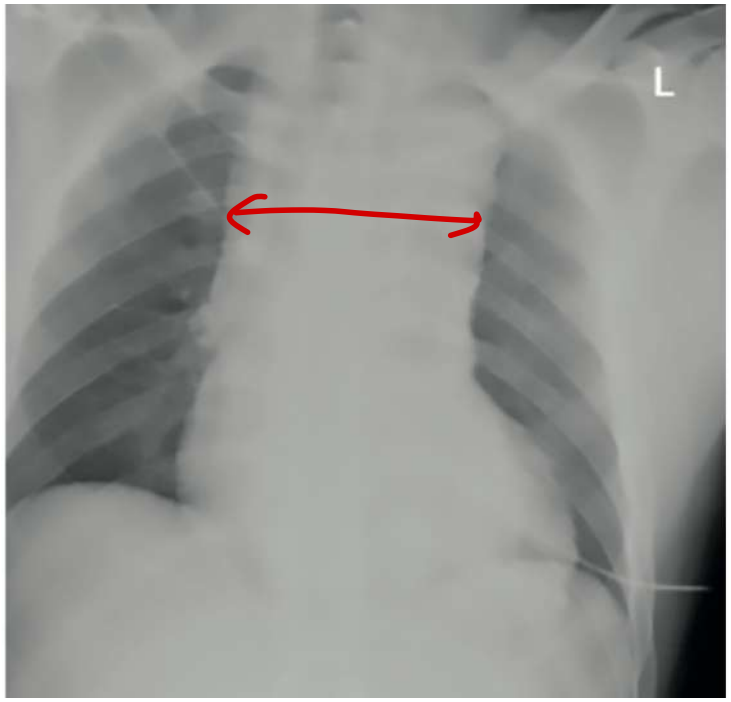
- The ASIA neurological scoring system should be used
- Functional motor power is MRC grade 3/5 or higher

Blue : moribund

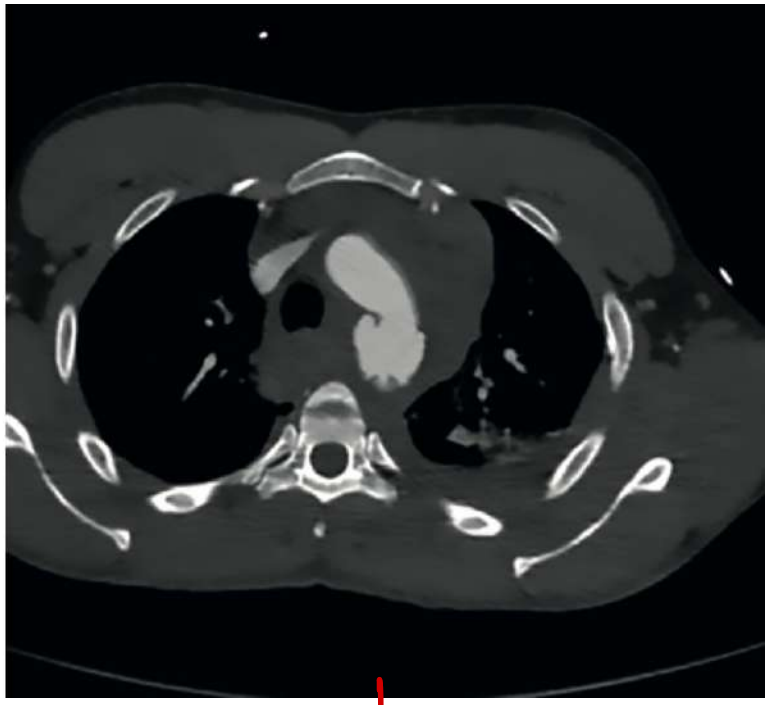
TABLE 33.1 Triage categories.

Priority	Colour	Medical need	Clinical status	Examples
First (I)	Red	Immediate	Critical, but likely to survive if treatment given early	Severe facial trauma, tension pneumothorax, profuse external bleeding, haemothorax, flail chest, major intra-abdominal bleed, extradural haematomas
Second (II)	Yellow	Urgent	Critical, likely to survive if treatment given within hours (6hrs)	Compound fractures, degloving injuries, ruptured abdominal viscus, pelvic fractures, spinal injuries
Third (III)	Green	Non-urgent	Stable, likely to survive even if treatment is delayed for hours to days	Simple fractures, sprains, minor lacerations
Last (0)	Black	Unsalvageable	Not breathing, pulseless, so severely injured that no medical care is likely to help	Severe brain damage, very extensive burns, major disruption/loss of chest or abdominal wall structures

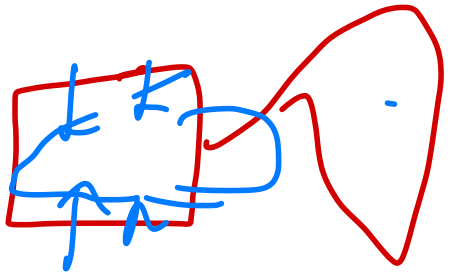
Chance #



mediastinal widening
>8cm



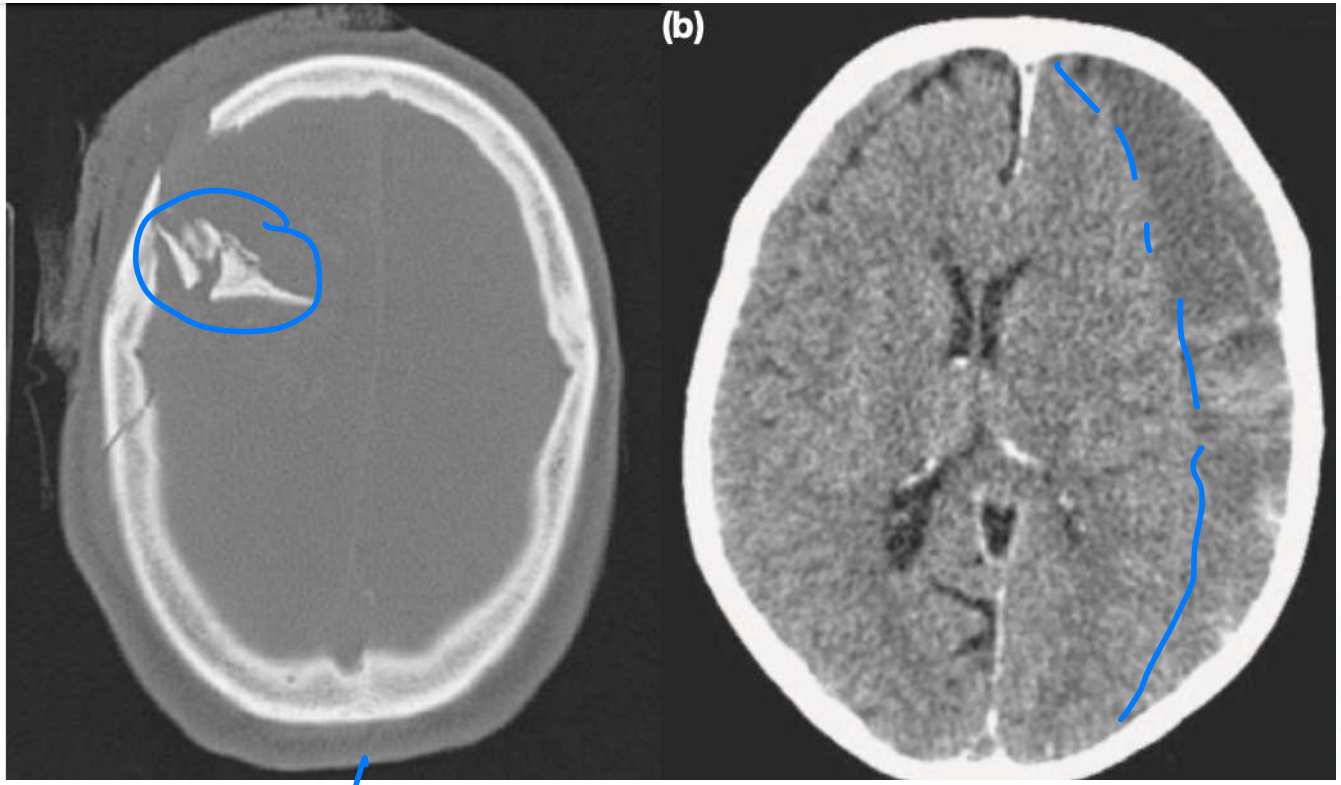
Aortic injury



Burst

Hangman #

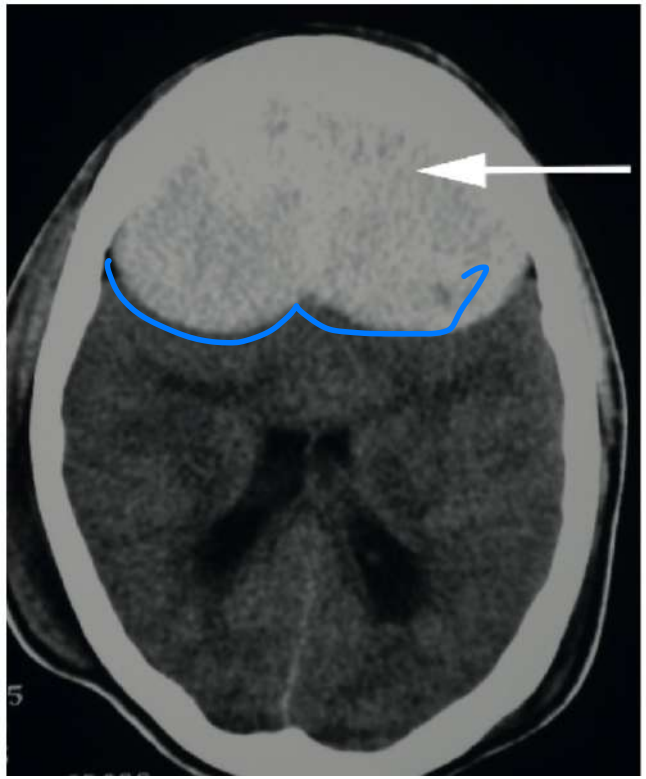
C2 - C3 sublux^{n}



Depressed comminuted

r/o contusion

Chronic SDH (LT)



EDH

✓ midline

✗ sutures