Contents

By Surgery

Liver Transplantation

- 4-10hr surgery
- all ages from paeds to >70yr olds
- indications:
  - cirrhotic disease
  - cancers
  - cholestatic disease
  - acute liver failure
  - others eg budd-chiari, failure prev transplant
- potential benefit 10-20yrs

Preoperative Management

- either have acute or end-stage hepatic failure
- most common cause = end stage hepatitis C cirrhosis
- scoring system = model for end stage liver disease (MELD)/paediatric end stage liver disease (PELD):
  - informs risk of dying while awaiting transplant
  - MELD (>12yrs) - (BIC):
    - bili
    - INR
    - creatinine
  - Child Pugh:
    - bili
    - albumin
    - INR
    - Ascites
    - Encephalopathy

- history: varices, ET-OH intake

- PMHX;
  - diabetes,
  - pHTN - not CI to transplant but mortality ↑s
    ↳ ie >55mmHg (severe pHTN = 100% mortality
  - other organ dysfunction

- examination;
  - jaundice,
  - ascites,
  - pleural effusions,
  - hypotension,
  - cardiac failure,
  - poor nutritional state + decreased muscle mass,
  - **portopulmonary syndromes** (right ventricular failure from severe portal & pulmonary hypertension),
  - **hepatopulmonary syndromes** -
    - ie triad liver disease, hypoxaemia on RA, pulmon vascular dilatation
    - not a CI - may resolve post transplant

- investigations;
  - bloods:
    - hyponatraemia (correct <125),
    - coagulopathy, low platelet count - generally not corrected pre-op unless severe
      ↳ little relation with intra-op blood loss surprinsgly
    - fibrinolysis, anaemia
  - ECHO, CXR
  - PFTs

- formal pulmon artery studies if suspect pHTN
- stress cardiac tests eg exercise, stress ECHO
- CPET for high risk/marginal cases

- blood products; 10U cross-match, 12 FFP

Intraoperative Management

- establish IV access pre-induction
- standard induction
- fulminant liver failure = raised ICP (manage standard neuro cares +/- indwelling iCP monitoring)
- invasive monitoring
- desflurane maintenance - lowest hepatic metabolism
- avoid N2O
- actively warm
- transfuse blood:FFP (1:2) - target HCT 0.26-0.32
- monitoring coag's frequently and TEG
- maintain glucose with IV dextrose
- methylprednisolone given prior to graft reperfusion
- monitor Ca2+ closely
- use cell salvage
- use anti-fibrinolytic (transexamic acid 15mg/kg bolus -> 5mg/kg/hr)

- venovenous bypass VVB
  - used in some centres
  - some surgery may clamp portal vein, hepatic artery & IVC $\Longrightarrow$ $\downarrow\downarrow$VR to heart
  - cirrhotic tolerate better as established collateral flow
  - VVB limits CVS instability by providing a bypass:
    - lines (femoral and RIJ -> 21Fr)
  - flow through bypass ~20% of CO

- haemodynamic instability from:
1. cardiac involvement (alcoholic cardiomyopathy)
2. pericardial effusion
3. systemic vasodilation

Stage 1
- laparotomy
- dissection
- slings placed around major vessels

Stage 2
- anhepatic phase
- division of hepatic artery, portal vein, hepatic vein, bile duct
- removal of liver and part of IVC -> anastomoses of donor and recipient vena cava and portal vein
- VR severely compromised -> haemodynamic instability
- venovenous bypass (femoral to RIJ) to help
- see:
  - $\uparrow$ing coagulopathy - no hepatic clotting factors produced
  - $\uparrow$ing lactate $\Longrightarrow$ acidaemia
  - $\downarrow$Ca - blood transfusion & citrate accumulation
  - $\downarrow$BSL - absent gluconeogenesis
  - $\downarrow$Mg

Stage 3
- post-reperfusion phase
- re-establishment of blood flow through liver (portal vein to IVC)
- Prior to reperfusion:
  - methylprednisolone 10mg/kg - protects against reperfusion injury
  - Ca - cover sudden rush of hyperkalaemic fluid into circulation

- reperfusion syndrome:
  - caused by: cytokine release, complement activation
  - defined ↓MAP of 30% within 5mins reperfusion & lasting ≥1min (may persist for 1hr)
  - see hypothermia, arrhythmias, hypotension, hyperkalaemia, bradycardia
- hepatic artery re-anastomosis and bile duct reconstruction
- post reperfusion:
  - will need inotropes

Postoperative Management

- some ICU, some on table extubation
- PCA or epidural (uncommon due to coagulopathy)
- ICU admission - keep CVP <12
- avoid NSAIDS
- watch for complications:
  1. whether graft is non-functioning ie ↑ing K, ↓BSL, ↑acidaemia, coagulopathy
     ↳ will need urgent retransplantation
  2. hepatic artery thrombosis -> thrombectomy or retransplantation
  3. sepsis
  4. acute graft rejection

- will start on immunosuppressants early - tacrolimus & steroids

Hepatic Resection

- usual indication = metastatic colorectal adenocarcinoma or cholangiocarcinoma
  ↳ improves 5yr survival from 0 to 30%
- major resection = 30-75% liver removed

Anatomy

- highly vascular ~1.5L/min
  - 80% from portal vein
  - 20% hepatic artery
- regeneration from hyperplasia of remnant

Preoperative Management

- avoid drugs which may compound post op hepatic encephalopathy ie benzo's
- standard Ix:
  - chemo/radio
  - Ax for ↑R sided heart pressures/CVP
- Child Pugh Clinical Scoring system can be used to grade amount of resection possible:
  - Ascites
  - Encephalopathy
  - Albumin
  - Bili
  - PT/INR
- Other tests = indocyanine green retention = measures liver perfusion & bilary excretion

Intraoperative Management

- be prepared for catastrophic blood loss (10U crossmatch)
- use shorting acting drugs that ideally minimally metabolised by liver
- invasive monitoring -/+ CVP monitoring
- massive access (12Fr CVL or 7.5Fr Swan-Ganz introducer)
- thoracic epidural effective but RCTs show wound catheters just as good and assoc with ↓LOS
- preserve hepatic blood flow (use isoflurane or desflurane) (avoid N2O)
- permissive hypotension - SBP 70-80mmHg (decreases bleeding and congestion)
- keep CVP low ⟹ ↓blood loss:
  - epidural boluses
  - head up or head down position

    - restrict pre-restriction fluid
    - diuretics or GTN infusion
    - minimal PEEP
    - aim for CVP ≤5
- actively warm
- monitor BSl carefully
- use TXA
- NG/NJ tubes passed
- subarachnoid morphine
- remifentanil
- clonidine 1-2mcg\kg IM

Stages
1. perihepatic dissection
2. identification of vascular anatomy
3. may use intraoperative U/S to pinpoint lesions
4. resection

- resection causes bleeding that may need to be controlled using
    - Pringle's Manoeuvre:
        - intermittent cross clamping of vascular inflow (portal & hepatic vessel)
        - ⟹ ↓10% CO & ↑afterload by 20-30%
        - may cause ischaemic injury
    - Total occlusion of supra & infra hepatic vena cava
        - significant CVS compromise
        - ↓CO by 60%

Postoperative Management

- HDU\ICU cares
- early enteral feeding
- monitor for post op liver failure:
    - incidence 3% peaks at 72hrs post op
    - signs = coagulopathy and encephalopathy
    - techniques to avoid:
        - radiological ligation/embolisation of lobe to be resected ⟹ hypertrophy of rest of liver pre-op as preconditioning
        - ischaemia-reperfusion:
            - ischaemic pre-conditionning: short ischaemia, reperfusion then long ischaemia
            - intermittent clamping 10-15min, then 5min perfusion
            - Anti-oxidants - NAC infusion
- Peak disturbance in coagulation @ Day 3: INR 1.2-1.8 + on LMWH!
  ↳ just when you want to pull epidural - use FFP cover
- PCA
- post op complications (in 30%):
    - major bleed
    - liver/renal dysfunction: measure ammonia if encephalopathy is queried
    - resp failure
    - sepsis
    - intra-abdo infection
- expected self limiting ascites in 1st 48hrs

Pancreas Transplantation

- indication = type I DM & its complications
- 3 types:
    - SPK - simulatneous pancreas & kidney transplant (most common)
    - PAK - pancreas after kidney

    - PAT - pancreas alone transplant
- General criteria =
    - renal dysfunction
    - <50
    - BMI<30
    - low cardiac risk
- 5-7hr surgery

Preoperative

- ECG, ECHO, radionuclear stress test
- Bloods: UEs, ABG, coags, LFTs, X match 4 units
- dialyse to 0.5kg of target weight
- Examine for complications of DM:

Table 2 Complications of diabetes mellitus

General
Infections
Joint contractures
Hypoglycaemia/hyperglycaemia
Diabetic ketoacidosis
Non-ketotic hyperosmolar state
Macrovascular
Ischaemic heart disease
Hypertension
Stroke and peripheral vascular disease
Microvascular
Peripheral vascular disease
Nephropathy and renal failure
Retinopathies
Neuropathies (autonomic and somatic)

Perioperative

Surgery:

- midline incision
- intraperitoneal procedure
- iliac vessel clamping & unclamping:
    - risk of ↓MAP compromising graft on release

Induction

- sliding scale insulin
- methylprednisolone 1g
- NG tube
- CVL - for post of PN
- A line - BSL, & pressure monitoring
- ETT - DM & ↑reflux risk
- atracurium

Maintenance

- TIVA or volatile fine
- +/- epidural - risks = coagulaopthy, difficult volume assessment but beneficial post op
- @pancreatic anastomosis:
    - stop insulin
    - monitor BSL every 15mins - often need dextrose infusion
- iliac unclamping:
    - ↓MAP
    - ↑K

Postop

- Generally HDU/ICU
- Watch for complications:
    - graft thrombosis
    - pancreatitis
    - infection

- anastomic leak
- immunosupressant SEs
- bladder problems
- SIRS/Shock