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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 surprisingly
    - 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 ⇒ ↓↓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:
  - ↑ing coagulopathy - no hepatic clotting factors produced
  - ↑ing lactate ⇒ acidaemia
  - ↓Ca - blood transfusion & citrate accumulation
  - ↓BSL - absent gluconeogenesis
  - ↓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
Stages
1. perihepatic dissection
2. identification of vascular anatomy
3. may use intraoperative U/S to pinpoint lesions
4. resection

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

Pancreas Transplantation
- indication = type I DM & its complications
- 3 types:
  - SPK - simultaneous 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:

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**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
- anastomtic leak
- immunosuppressant SEs
- bladder problems
- SIRS/ Shock