Cardiovascular

2003a(10)/1999a(6): Describe the factors influencing hepatic blood flow

Total hepatic blood flow = 1500ml/min
- 30% of CO

Liver is supplied from 2 sources
- Portal vein from intestines
  o 75% of flow
    ▪ 1000-1200ml/min
  o Mean pressure 10mmHg
  o Not autoregulated
- Hepatic artery
  o 25% of flow
    ▪ 300-500ml/min
  o Mean pressure 90-100mmHg
  o Subject to some autoregulation
- Hepatic vein pressure 5mmHg

Reciprocal relationship exists between the 2 blood supplies to maintain relatively constant blood flow
- ↑hepatic artery flow → ↓portal vein flow and vice versa

Flow is dependent on pressure and vascular resistance such that:

Hepatic aa flow = MAP – hepatic venous pressure
Hepatic artery resistance (HAR)

Portal vv flow = Portal vv pressure – hepatic vv pressure
Hepatic vein resistance (HVR)

Hepatic sinusoids provide a low pressure microcirculation (pressure 18mmHg)
- Sphincters at the hepatic arteriole have high resting tone → ↑HAR → ↓pressures from 90mmHg → 18mmHg
  o HAR >>> HVR

Pre-sinusoidal sphincter tone determined by:
- Local myogenic control
  o ↑portal vein flow (therefore P) → reflex hepatic arterial constrict
  o Arteriolar stretch (↑MAP) → reflex constriction
  o ↑hepatic venous pressure (CCF, fluid overload, PEEP, IPPV, inspiration) → stretch arterioles → reflex constriction
- Local metabolic factors
  o ↑tissue demand / metabolite production → dilation hepatic artery
- Vasoactive Substances ‘hepatic arterial buffer response’
  o ↓MAP → ↓splanchnic blood flow → ↓portal venous flow → build up of adenosine → direct dilation of hepatic arterioles
    ▪ Ceiling effect at 50% total liver blood flow
- Extrinsic sympathetic nerve control
  o Constricts sinusoidal capacitance vessels → mobilises blood reservoir (~500ml)
  o ↓splanchnic blood flow → ↓portal venous flow / ↓hepatic artery flow

Anaesthetic Effects on hepatic blood flow:
Halothane → Inhibits local myogenic response to ↓MAP
↓pCO₂ → Directly ↓BF
Anaesthesia → ↓MAP

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