“Complex Cases”

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Today’s Topics

- Perioperative management of the chronically anticoagulated patient
- Anaesthetic management of the head-injured patient

The Anticoagulated Patient

- This presentation is adapted from the excellent review article by SA Watts & NM Gibbs in “Anaesthesia & Intensive Care” Volume 2 2003

The Anticoagulated Patient

- Most patients can be managed as outpatients prior to elective surgery

The Anticoagulated Patient

- Preoperative management depends on:
  - Original indication for A/C
  - Interval since last T/E event
  - Extent and type of surgery planned

The Anticoagulated Patient

- Need to weigh against one another:
  - Risk of thromboembolism if anticoagulation ceased
  - Risk of major bleeding if anticoagulation continued
The Anticoagulated Patient

- Only patients who are having major surgery and are high risk for recurrent T/E need preoperative admission to hospital for conversion to IV heparin

- The remainder require cessation of oral anticoagulation and alternative thromboprophylaxis preoperatively

- This can be achieved as an outpatient using LMWH

Indications for chronic anticoagulation

- Atrial fibrillation
- Mechanical heart valves
- Others
  - Venous thromboembolism
  - Certain patients with PVD
  - Certain patients with carotid stenosis

Anticoagulation in atrial fibrillation

- Average yearly risk stroke 5%
- 17% all ischaemic strokes
- Large meta-analysis:
  - Warfarin causes relative risk reduction 62%, ARR 2.7%, NNT 37
  - Secondary prevention 8.4% ARR, NNT only 12.3
  - Aspirin RRR 22%, ARR 1.5%, NNT 115

Factors increasing stroke risk in AF

- High risk factors
  - Associated mitral valve disease
  - Thromboembolic event last 30 days (greatest risk)

- Intermediate risk
  - Past history thromboembolism
  - Age > 75 years
  - Poor LV function or LA enlargement
  - IHD
  - Hypertension
  - Diabetes
Factors increasing stroke risk in AF
- Low risk
- All other patients with AF

Mechanical Heart Valves
- Annual risk arterial T/E without thromboprophylaxis = 8%
- Reduced to 2% with anticoagulation (NNT = 16.6)
- Spectrum of risk depending on other factors

Mechanical Heart Valves
- High risk
  - Recent T/E event < 30 days
  - Recent valve replacement < 90 days
  - Mitral position
  - First Generation Valve design
  - AF
  - Poor LV
  - Previous T/E
  - Pregnancy
- Intermediate Risk
  - Tissue valves < 90 days after placement

Carotid stenosis
- Accounts for 50% of all strokes
- Asymptomatic stenosis/bruit
  - 1.5 - 2% annual stroke rate
- Previous TIA
  - 6% annual stroke rate
- Aspirin agent of choice in most cases
- Warfarin risk/benefit compared to aspirin controversial
- All patients with this indication low risk for T/E if warfarin

Peripheral Vascular Disease
- Low risk for temporary cessation warfarin
**DVT/PE**
- 40% recurrence annually if A/C ceased within 1 month of an acute event
- 10 – 15% per annum 1 – 3 months
- 5% per annum if ceased > 3 months after acute event
- Recurrence risk affected by other factors

**What is the risk of bleeding?**
- High risk
  - Recent T/E event < 30 days
- Intermediate risk
  - T/E event 1 – 3 months
  - Malignancy
  - Obesity
  - Familial prothrombotic state
  - Preoperative immobility
- Low risk
  - T/E event > 3 months
  - No other risk factors

**Low Risk Of Bleeding**
- Minor procedures on skin, S/C tissues
- Cataracts
  - Type of block
- Oral A/C can be continued perioperatively

**High risk of bleeding**
- These patients require normal coagulation during surgery and in immediate postoperative period
- Warfarin needs to be ceased several days preoperatively
- Need for alternative thromboprophylaxis preoperatively depends on risk of thromboembolism if A/C ceased

**Preoperative Thromboprophylaxis**
- LMWH preferred for outpatient management
- Better safety profile than UFH
- Serum levels predictable after S/C administration
- Low protein binding
- Not taken up by reticuloendothelial system
- Doesn’t require routine laboratory monitoring
- Equal efficacy to UFH
Choice of LMWH

- My experience is with Enoxaparin (clexane)
- Low dose - 20 to 40 mg per day - effective antithrombotic
- At higher doses - 1.0 to 1.5 mg per kg per day - effective anticoagulant - an alternative to therapeutic doses of UFH IV

Safety and Reversibility

- Only 60% of antithrombotic activity is reversible with protamine
- Appropriate interval between last dose and surgery minimises risk of abnormal bleeding
- 12 hours for prophylactic dose and 24 hours for full anticoagulant dose

Management preoperatively

- If surgical team agreeable, patients with low risk surgical bleeding to continue oral anticoagulant
- All others to cease warfarin at least 5 days preop
- This will allow INR to fall to 1.5 or less by the day of surgery
- Alternative thromboprophylaxis to commence 4 days preop
- Form will depend on patient’s risk category

Recent T/E Event < 30 Days

- Defer surgery if possible
- Otherwise cease warfarin 5 days preop
- Admit to hospital 4 days preop and commence IV heparin

No T/E Event <30 Days but other High Risk

- Cease warfarin 5 days preop
- Commence clexane 4 days preop at 1.0 to 1.5 mg per kg per day as outpatient
- Self administered or community nurse or local doctor
- Minimum 24 hrs interval between last dose and surgery; measure INR
- Recomence clexane 12-24 hrs post op and continue until INR therapeutic

Intermediate Risk

- Clexane 40mg per day
- 12 hour interval per surgery
- Measure INR day before surgery and repeat on day of surgery if still > 1.5
Low risk

- 20 mg per day
- 12 hour interval
- Measure INR day before surgery and repeat on day of surgery if still > 1.5

Prothrombinex

- A plasma derived blood product
- Freeze-dried concentrate of human coagulation factors II, IX and X
- Each vial contains 500 IU of each factor -II, IX and X; antithrombin 25 IU and heparin 200 IU
- Also contains human plasma proteins 400 mg (which includes low levels of factors V and VIII), sodium citrate, sodium phosphate and sodium chloride

Anaesthesia for Head Injury

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Anaesthetic Priorities in Severe Head Injury

- Resuscitation in ED - note different MAP endpoints than torso trauma
- Early attendance by anaesthetist
- Communication and preparation
- Prevent secondary brain injury

Resuscitation

- Airway, breathing, oxygenation
- Restore circulating blood volume (avoid hypotonic fluids) - ? Hypertonic saline
- Hypotension and hypoxaemia significantly increase mortality and morbidity - a single hypotensive episode < 90mm Hg systolic doubles mortality in severe head injury (SHI)
- Hypotension one of the 5 major prognostic determinants in SHI

Cerebral Perfusion Pressure

- Aim for a CPP (ie MAP-ICP) of > 60 - 70 mmHg by maintaining an adequate MAP (use vasopressors if necessary) and control of ICP (NB the choice of this threshold is based on class III evidence)
- Studies using SjvO2 +/- transcranial doppler have shown cerebral perfusion begins to deteriorate below CPP 60 - 70 mm HG
- Assume ICP (prior to insertion of monitor) in SHI of at least 25 - 30 mm Hg
- Aim for MAP > 90 mm Hg to maintain adequate CPP

Indications for ICP Monitoring

- Severe head injury with abnormal admission CT (ie haematoma, contusion, oedema, or compressed basal cisterns)
- Severe head injury and normal CT but 2 or more of: age > 40 yrs, unilateral or bilateral motor posturing, systolic BP < 90 mm Hg

Hypotension

- Hypotension will reduce perfusion pressure in the brain. This has two adverse effects:
  - Cerebral blood flow will fall, reducing cerebral oxygen flux
  - Autoregulatory vasodilatation increases cerebral blood volume, increasing ICP and further compromising cerebral perfusion
Sjv02 Monitoring

- Theory is marginal or inadequate CBF will → increased O2 extraction, widened A-V content difference and a decreased Sjv02
- Assesses global O2 extraction so low sensitivity for highly focal events
- Normal range 50 - 75 %
- Abnormally high Sjv02 may identify hyperaemia as a contributing factor in raised ICP

The “Tight Brain” Checklist

- Pressures controlled?
  - Jugular venous pressure
  - Airway pressures
  - PaO2, PaCO2
  - Arterial pressure
- Metabolic rate controlled?
  - Pain, arousal
  - Seizures
- Vasodilators in use?
  - N2O, volatiles, SNP
- Mass lesions? Blood, air, N2O

Methods To Rapidly Reduce ICP/Brain Volume

- Hyperventilation
- Mannitol
- CMR02 suppression (usually STP)
- Restoration of normotension
- CSF drainage

Hyperventilation

- To PaCO2 of 30 - 35 mm Hg
- Used for acute management of rises in ICP
- Not for prophylactic or chronic use, particularly in first 48 hours after SHI
  - Can produce ischaemia
  - Temporary effect only (6 - 12 hours)
  - Rebound hyperaemia when normal ventilation resumed
**Mannitol**

- **Immediate and delayed effects**
  - Increases CBF via plasma expanding/blood viscosity reducing effect -> autoregulatory vasoconstriction -> decreases ICP
  - Osmotic brain dehydration

- **Dosing**
  - 0.25 – 1 g/kg as bolus followed by 0.25 – 0.5 g/kg Q6H IV

- **Euvolaemia** should be maintained by adequate fluid replacement
- May cause cardiovascular collapse in hypovolaemic patient. Contra-indicated in the unresuscitated patient
- Not for prophylactic use
- Risk of ARF, particularly if serum osmolality > 320 mOsm

**Barbiturates**

- **Decrease ICP**
- High dose barbiturate therapy may be considered in haemodynamically stable salvageable patients with intracranial hypertension refractory to maximal medical and surgical ICP lowering therapy.
- Titrate dose to achieve EEG burst suppression

**Seizures**

- **Increase CMR02**:
  - Increase O2 demand
  - Increase CBF and therefore ICP
  - Anticonvulsants recommended to prevent early post-traumatic seizures perioperatively
  - Phenytoin 15mg/kg no faster than 50mg per minute
  - Note there is usually no need to give it this fast and doing so may drop MAP and CPP - give it slowly!

**Hyperglycaemia**

- Exacerbates ischaemic cerebral damage
- Tight BSL control in these patients may produce a better outcome
Steroids
- Majority of evidence indicates these neither lower ICP nor improve outcome
- Routine use not recommended

Therapeutic Hypothermia
- 2004 Cochrane Review:
  - “Hypothermia therapy after traumatic brain injury has not been shown to reduce death or disability, and it increases the risk of pneumonia”

Brain Trauma Foundation
- “Guidelines for the Management of Severe Traumatic Brain Injury”
- American Association of Neurological Surgeons, Joint Section on Neurotrauma and Critical Care
- www2.braintrauma.org
- Guidelines based on scientific evidence, mostly level II or III