INTRACRANIAL HAEMORRHAGE: THERAPEUTIC INTERVENTIONS AND ANAESTHETIC MANAGEMENT

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INTRACRANIAL HAEMORRHAGE (ICH)

- Stroke
  - 4th leading cause of death in the USA
  - 2nd leading cause of death worldwide

- Key words: intracerebral haemorrhage, anaesthesia, therapy, and guidelines
AETIOLOGY OF ICH
**Table 1** Determination of the ICH score. GCS score indicates GCS score on initial presentation (or after resuscitation); ICH volume, volume on initial CT calculated using ABC/2 method; and IVH, presence of any IVH on initial CT. Reproduced from [15], with permission.

<table>
<thead>
<tr>
<th>Component</th>
<th>ICH score points</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS score</td>
<td></td>
</tr>
<tr>
<td>3–4</td>
<td>2</td>
</tr>
<tr>
<td>5–12</td>
<td>1</td>
</tr>
<tr>
<td>13–15</td>
<td>0</td>
</tr>
<tr>
<td>ICH volume (ml)</td>
<td></td>
</tr>
<tr>
<td>≥30</td>
<td>1</td>
</tr>
<tr>
<td>≤30</td>
<td>0</td>
</tr>
<tr>
<td>IVH</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Infratentorial origin of ICH</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Age (yr)</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>1</td>
</tr>
<tr>
<td>≤80</td>
<td>0</td>
</tr>
</tbody>
</table>

**Fig 1** ICH score and mortality. Reproduced from [15], with permission.

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*How do you know if someone's having a stroke? Think... F. A. S. T.*

- **F**: Check their FACE. Has their mouth drooped?
- **A**: Can they lift both ARMS?
- **S**: Is their SPEECH slurred? Do they understand you?
- **T**: TIME is critical. If you see any of these signs, call 000 now!

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*For more info call 1800 777 677 or visit strokefoundation.com.au*
PATHOPHYSIOLOGY OF ICH

Initial haemorrhage

ICH

Haematoma expansion

Brain oedema
INITIAL HAEMORRHAGE

- Volume
- Location
- Conscious level
INITIAL HAEMORRHAGE

Surgical evacuation

- Decreasing ICP
- Minimizing the effects of:
  - haematoma expansion
  - perihaemorrhagic oedema

Decompressive craniectomy

- GCS < 8 and haematoma volume < 60 ml
- Favourable outcome in 41% (5%)
- Overall mortality of 28% (91%)
HAEMATOMA EXPANSION

Within 24 hrs

30%
HAEMATOMA EXPANSION

Risk Factors

- Large initial haemorrhagic volume
- Delayed presentation for medical care
- Use of antithrombotic and antiplatelet medications
- The presence of the ‘spot sign’ in CTA
- The presence of the apolipoprotein E E2 allele
Fig 2  ICH spot sign and haematoma expansion. (a) CT demonstrating acute intracerebral haemorrhage of 18 ml. (e) CT angiogram demonstrating multiple spot signs in the anterior portion of haemorrhage. (c) CT 7 h after first: significant haematoma expansion to a calculated volume of 119 ml. Reproduced from 35, with permission.
HAEMATOMAS EXPANSION

Utilization of recombinant factor VIIa (rFVIIa)

Reduction in arterial pressure (INTERACT2)

On going study
PERI-HAEMORRHAGIC OEDEMA

- Develop within 3 h of haemorrhage
- Peaks 10–20 days after the initial haemorrhage
- Increases morbidity and mortality

Factors:
- Thrombin
- Haemoglobin and iron
- The inflammatory response
ANTICOAGULANT-ASSOCIATED ICH
ANTICOAGULANT-ASSOCIATED ICH

- Urgent reversal of antithrombotic effect

- Prothrombin complex concentrate (PCC), factors II, IX, X
- Factor VII
- FFP, Slower, Large volume
- Vitamin K, For maintain

Risk of a prothrombotic event
<table>
<thead>
<tr>
<th>Guideline</th>
<th>Preferred treatment</th>
<th>Evidence Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Stroke Organization 2014[^64]</td>
<td>I.V. vitamin K PCC or FFP</td>
<td>II</td>
<td>C</td>
</tr>
<tr>
<td>Ausralasian Society of Thrombosis and Haemostasis 2013[^65]</td>
<td>I.V. vitamin K, PCC, and FFP</td>
<td>II</td>
<td>C</td>
</tr>
<tr>
<td>British Committee for Standards in Hematology 2011[^66]</td>
<td>I.V. vitamin K and four factor (including VII) PCC</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>AHA/ASA 2010[^23]</td>
<td>I.V. rather than oral vitamin K (to maintain reversal from PCC which has a half-life of 6 h)</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>ACCP 2008[^57]</td>
<td>Reconstituent factor VIIa is not recommended for emergency warfarin reversal</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>Withhold warfarin</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>I.V. vitamin K (if warfarin)</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Replace factors to normalize INR</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Hold warfarin</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Administer FFP, PCC, or rFVIIa</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>I.V. vitamin K, 10 mg by slow i.v. infusion, repeated, q 12 h if needed</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
ANTICOAGULANT-ASSOCIATED ICH

Dabigatran (direct thrombin inhibitor)
Rivaroxaban and Apixaban (factor Xa inhibitors)

• Effective and less risk of ICH
• No evident reversal agents
• Try FFP (53%), PCC (61%), factor VIIa (24%), or haemodialysis (24%)
DUAL-ANTIPLATELET THERAPY (DAPT)

High mortality

Quantitative assessment for guiding therapy

Platelet transfusion
MANAGEMENT OF ICH

IICP
- External ventricular drain (EVD)
- Administration of mannitol or hypertonic saline, sedatives, and paralytics
- Mild hyperventilation

Control BP
- Maintenance of adequate cerebral perfusion pressure
- It’s safe to keep SBP < 140mmHg (if no obvious IICP)
MANAGEMENT OF ICH

Seizure prophylaxis
- Fewer than 7% of ICH patients present with seizure
- Not recommend for routine use

Blood glucose
- Independent predictor of mortality within 28 days
- Avoid blood glucose > 180 mg/dl
# MANAGEMENT OF ICH

**Table 3** Summary of American Heart Association/American Stroke Association and European Stroke Organization Guidelines for Management of ICH. Data from 23 64

<table>
<thead>
<tr>
<th>Diagnostic studies</th>
<th>CT/MRI/angiography to rule out ischaemic stroke or secondary ICH (i.e. aneurysm or AVM rupture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurointensive care</td>
<td>Patients have better outcome when managed in ‘stroke’ units</td>
</tr>
<tr>
<td>Anticoagulation</td>
<td>Reversal of any antithrombotic/antiplatelet therapy as rapidly as feasible given other potential contraindications (consultation with other specialities)</td>
</tr>
<tr>
<td>Airway/respiration</td>
<td>Ensure adequate airway protection, ventilation and oxygenation: intubation and mechanical ventilation if necessary</td>
</tr>
<tr>
<td>Intracranial pressure</td>
<td>Control of ICP using medical measures or placement of an external ventricular drain</td>
</tr>
<tr>
<td>Haemodynamic management</td>
<td>Within 6 h of onset of ICH, acute reduction (in &lt;1 h) of arterial pressure to a target SAP≤140 mm Hg is safe and may be superior than the previous target of SAP≤180</td>
</tr>
<tr>
<td></td>
<td>If SAP&gt;180 or MAP&gt;130 mm Hg and increased ICP is a possibility, monitor ICP and maintain cerebral perfusion pressure&gt;60 mm Hg; if no evidence of increased ICP reduced SAP to 160 mm Hg and MAP=110 Hg</td>
</tr>
<tr>
<td>Anticonvulsant medication</td>
<td>Prophylactic use of anticonvulsants is not recommended</td>
</tr>
<tr>
<td></td>
<td>Treat clinical seizures with antiepileptic medications</td>
</tr>
<tr>
<td></td>
<td>Continuous EEG monitoring may be indicated in patients with a more severely depressed mental status than expected from depth of brain injury</td>
</tr>
<tr>
<td>Blood glucose</td>
<td>Monitor blood glucose and avoid hyperglycaemia (&gt;180 mg dl⁻¹) or hypoglycaemia</td>
</tr>
<tr>
<td>Temperature</td>
<td>Avoid hyperthermia. The duration of fever in ICH patients is associated with poor outcome</td>
</tr>
<tr>
<td>Deep vein thrombosis prophylaxis</td>
<td>Utilize pneumatic compression devices</td>
</tr>
</tbody>
</table>
CONCLUSIONS

- Protect airway, mild hyperventilation
- Control ICP, mannitol / EVD
- Control BP, it’s safe to keep SBP < 140mmHg (if no obvious IICP)
  - If IICP possible, SBP > 180mmHg, MAP > 130mmHg, monitor CPP > 60mmHg
  - If no, reduce to SBP < 160mmHg, MAP < 110mmHg
- Avoid hyperthermia
- Keep glucose < 180 mg/dl
- Routine prophylaxis for seizure is not recommended
- PCC for anticoagulant-associated ICH, reversal of anticoagulant early
THANKS FOR YOUR ATTENTION !!!