Critical Management of Raised ICP

**Aim:** To provide guidance on the management of raised ICP on neurosurgical ICU for non-anaesthetic trained junior doctors and new ICU doctors

**Scope:** All I Level 3 adult patients in neurosurgical ICU with monitoring of ICP.

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**STAGE 1:** ICP >20mmHg for >5mins

*See patient urgently*

- Check transducer height, ICP waveform and consider BIS
- **Bolus propofol 2%:** 1-2ml
- **Bolus fentanyl 50mcg/ml:** 1-2ml
- **Increase baseline rate of both propofol and fentanyl**
  - Propofol maximum – 4mg/kg/hr or 400mg/hr
  - Fentanyl maximum 12ml/hr of 50mcg/ml concentration

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**STAGE 2:** ICP >20mmHg not responding to sedation

*Contact ICU SpR and Neurosurgical SpR*

- **Start PARALYSIS and PREPARE FOR CT**
  - **Bolus:** Muscle relaxant of choice (atracurium/rocuronium)
    - Infusion: 180 micrograms/kg/hr of cis-atracurium

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**Head injury parameters:**

- PaO2 13kPa
- PaCO2 4.5-5kPa
- Hb 80-100 g/L
- ICP <20mmHg
- CPP 60-70mmHg OR MAP 80-90mmHg if no ICP sensor
- CVP 8-10mmHg
- BIS 20-30
- Core temp 36-37
- Blood glucose 4.5-10mmol/L

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**CONSIDER AND CORRECT CAUSES OF RAISED ICP**

| Space occupying lesion – haematoma/critical oedema – Imaging required then – needs evacuation or surgical craniectomy – contact surgeons |
| Venous obstruction – 30 degrees head up or reverse trendelenberg, anchorfast to secure ETT, well fitted collar, avoid hyperextension of neck and excessive hip flexion |
| Obstruction of CSF flow – May need drainage (EVD if in situ or therapeutic LP) – contact neurosurgeons |
| Seizure – Control seizure activity with phenytoin or levetiracetam (Keppra) – consider reloading – consider sub-clinical seizures especially if paralysed. |
| Inadequate sedation – optimise sedation, bolus as required |
| Repeated succioning/clustering of activities – ensure activity (washing, turning, succioning etc.) is spread out. |
| Pyrexia/infection – aggressivel treat pyrexia with paracetamol and active cooling if needed. |
STAGE 3: ICP >20mmHg
Contact ICU Consultant and Neurosurgical SpR
Prepare for transfer to CT

EITHER: Manitol 20%

0.25-1g/kg
over 15-30 mins

CVC or large peripheral cannula

Check serum osmol <320mOsm/L
Check serum Na <155mmol/L

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Dose manitol 20% (ml)</th>
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<tbody>
<tr>
<td>50</td>
<td>52.5 – 250</td>
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<tr>
<td>60</td>
<td>75 – 300</td>
</tr>
<tr>
<td>70</td>
<td>87.5 – 350</td>
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<tr>
<td>80</td>
<td>100 – 400</td>
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<tr>
<td>90</td>
<td>112.5 – 450</td>
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<tr>
<td>100</td>
<td>125 – 500</td>
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</tbody>
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OR: Hypertonic saline
5% - polyfuser

1-2mls/kg
over 15-20mins

CVC only

Can be given after 2 doses of manitol

Caution in hyponatraemia – risk of central pontine myelinolysis

Check serum osmol <320mOsm/L
Check serum Na <155mmol/L

STAGE 4: ICP >20mmHg
Contact ICU Consultant and Neurosurgical SpR
Prepare for transfer to CT

Hyperventilation if >24 hours post insult. Ensure delivery of 100% O2.

AIM: PaCO2 4.0-4.5kPa

Aggressive hyperventilation to PaCO2 <4kPa is a consultant ONLY decision to buy time to transfer to CT/theatre.

Consider barbiturate coma and decompressive craniectomy – Consultant decision