

## Topic: Measurement of Normal Intracranial Pressure and Treatment of ICP Hypertension

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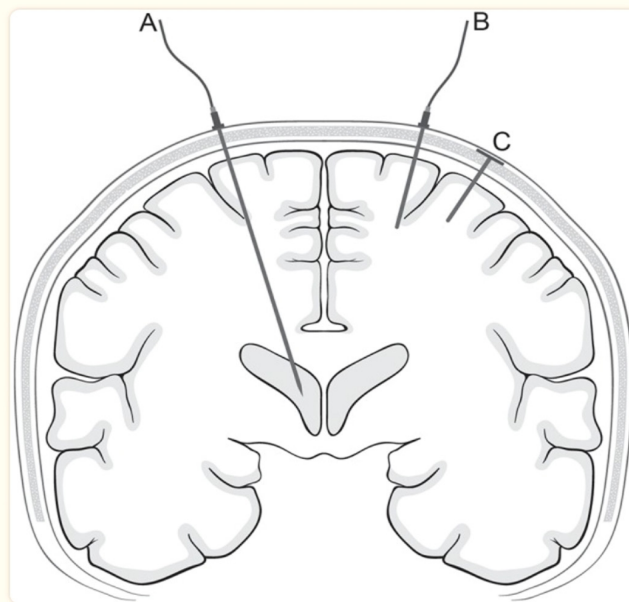
### Abstract

It deals with the monitoring of intracranial pressure and its measurements and different techniques dealing with its measurements of intracranial pressure. How to reduce it during the various situation also deals with ICP guidelines.

**Keywords:** Intracranial Pressure (ICP); Age-Dependent; Reference Values; Traumatic Brain Injury (TBI); Head Trauma; Children; Pediatric; Guidelines

### ICP monitoring technology

Measurements of ICP through an external ventricle drain.



**Figure 1**

ICP monitoring technologies. The figure is a schematic [1] representation of different ICP monitoring devices in a coronal plane. The placement of an EVD (just side to Kocher's point) (A), a parenchymal ICP (intra cranial pressure) sensor (B), and a telemetric ICP sensor (C) [2].

### ICP in children's

Figure 2 ICP and pulse wave amplitude. The two pressure curves illustrated ICP tracings at mean ICP 5 mmHg (A) and mean ICP 20 [3] mmHg (B). At 20 mmHg (recommend treatment threshold), the amplitude is higher consistent with increased pulsatility and decrease in compliance [4]. The abnormal ICP patterns (A waves

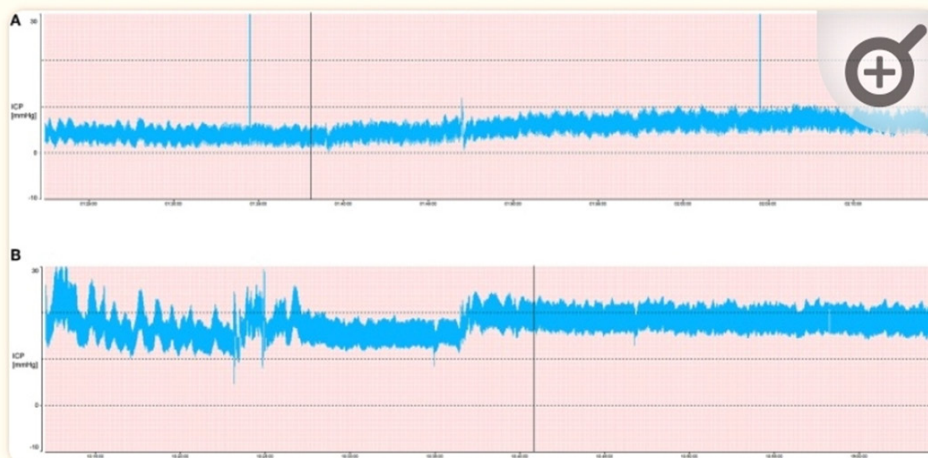


Figure 2

and tall B waves) also occur frequently greater than or equal to 20 mmHg, but are not seen at 5 mmHg, where the signal is more uniform and stable [5].

Figure 3 ICP tolerance. This figure was adapted and used with permission from Intensive Care Medicine Journal. It shows correlation [6] between outcome on the Glasgow Outcome Scale and the time burden of intracranial hypertension in a [7] pediatric population with traumatic brain injury. Red episodes illustrate a low score on the Glasgow [8]. Outcome Scale (worst outcome), while blue episodes illustrate a high score (better outcome). The black curve is named as a transition curve and which illustrates zero correlation [9].

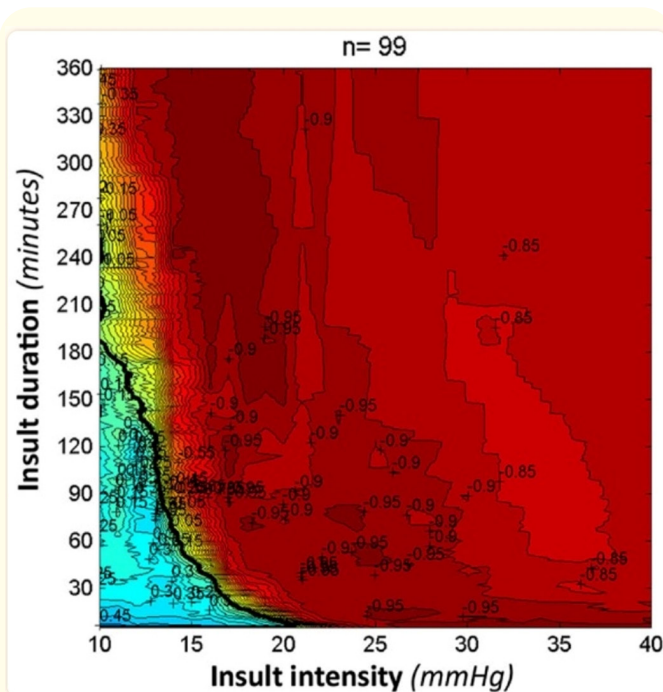


Figure 3

**Threshold treatment**

Treatment threshold for ICP in a paediatric patient is based on the 12 retrospective and prospective studies examining targeted values for lowering ICP to improve clinical condition [10]. Most studies applied an ICP threshold of 20 mmHg and reported lower ICP values in patients with a favourable outcome compared to those with an unfavourable outcome. Few studies examined if different threshold values resulted in different outcome [respectively 14/20/30 mmHg and 15/20 mmHg]. ICP values > 20 mmHg were found to be associated with an unfavourable outcome, but no difference in outcome across the different threshold values could be detected. Two studies even applied thresholds of 35 and 40 mmHg and found, not surprisingly, that values higher than the applied threshold were associated with an unfavourable outcome. Based on these findings, the guidelines suggest a treatment threshold of 20 mmHg for 5 min (level III recommendation).

**Discussion**

- ICP
- ICP monitoring in children’s
- Threshold treatment

**Conclusion**

ICP hypertension most common in the traumatic brain injury patient in children.

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