



Joint position statement by the Councils of the Neuroanaesthesia Society of Great Britain and Ireland (NASGBI) and the Society of British Neurological Surgeons (SBNS) with regards to the calculation of cerebral perfusion pressure in the management of traumatic brain injury



Position Statement

NASGBI and SBNS recommend zeroing the arterial transducer for calculation of cerebral perfusion pressure in the management of traumatic brain injury at the level of the tragus.

Rationale

The councils of NASGBI and SBNS acknowledge that there has been recent controversy regarding the evidence base for the measurement of intracranial pressure (ICP) and cerebral perfusion pressure (CPP) and that questions regarding ICP and CPP directed management remain unanswered. However, currently, monitoring and management of ICP and CPP based on the Brain Trauma Foundation Guidelines remains a standard of care following traumatic brain injury (TBI). This has recently been reviewed by Kirman and Smith in the *Br J Anaesth* 2014;112:35-46 and previously in an editorial by Kosty and Kofke in *J Neurosurg Anaesthesiol* 2012;24:1-2.

The calculation of CPP is an integral part of this strategy, as described by Rosner and colleagues in their seminal paper in *J Neurosurg* 1995;83:949-962. In this article CPP was calculated in supine patients at the level of the middle cranial fossa.

In 2013 Subhas, Wilson and Jain conducted a national survey of cerebral perfusion pressure measurement practices in Great Britain and Ireland. Their results were presented at the NASGBI meeting in Cardiff and the abstract published in the *Journal of Neurosurgical Anaesthesiology (J Neurosurg Anaesthesiol* 2013;25:361-369). They revealed that, in calculating CPP, 58% of Neurosurgical ICUs place the arterial transducer at the level of the heart and 42% place it at the level of the tragus. No-one routinely nursed their patients in the supine position and 84% nursed patients 30 degrees head up. They also demonstrated that 94% of respondents wished NASGBI to endorse a consensus statement on standardisation of CPP measurement practices in Great Britain and Ireland.

This has been considered by the Councils of NASGBI and SBNS who wish to make the following statements:

Research involving CPP calculation or CPP derived variables

Councils of NASGBI and SBNS recommend that all research articles relating to CPP measurement or CPP derived variables in the management of TBI should explicitly state in their methodology as to where the arterial transducer was zero referenced.

Councils endorse zero referencing the arterial transducer to the level of the middle cranial fossa which can be approximated to the tragus of the ear.

Clinical practice involving CPP based targets and management based on recommendations by the Brain Trauma Foundation

Whilst not wishing to dictate local clinical practice, based on the available evidence, the Councils of NASGBI and SBNS endorse zero referencing the arterial transducer for CPP based management of TBI at the level of the middle cranial fossa which can be approximated to the tragus of the ear.

They also recommend that the arterial transducer is re-zeroed following changes in body elevation / position.

Councils do not endorse zeroing the arterial transducer at heart level for CPP based treatment decisions as there is a requirement for subsequent cerebral mean arterial pressure (MAP) to be calculated which is dependent on the relationship:

$$\text{MAP brain} = \text{MAP heart} - (\text{water column between heart and brain} \times C)$$

where C is a coefficient, always lower than 1, dependent on the anatomy of venous outflow which is variable between individuals.

For centres that wish to continue to zero reference at the level of the heart for CPP based TBI management they should have explicit guidance within their TBI protocols on how they take account of this difference and its subsequent effect on CPP calculation for patient management.

NASGBI and SBNS

May 2014

