

SECTION IV: Neurosurgery Focus

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available at the
time of publication

Advanced Neuromonitoring in Severe TBI Patients

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Case Study:

A 37 year-old woman presented after a gunshot wound to the head. Her initial Glasgow Coma Score was 7 with localization to painful stimuli and no eye opening or verbal response. Head CT scan revealed a left occipital entry wound and a bullet fragment lodged in the right parietal region. There was a skim subdural hematoma on the right, a left occipital contusion, and diffuse brain edema. She was taken to the operating theater for debridement. She was treated with antibiotics and anticonvulsants per our protocol for penetrating brain injury. An external ventricular drain for ICP monitoring and therapeutic drainage of CSF was placed. A Licox brain tissue oxygen monitor and HEMEDEx™ cerebral blood flow monitor were placed for Advanced Neuromonitoring. The patient's initial ICP was 16-20 mmHg. On the second post-injury day the patient's ICP rose to 25 mm Hg as brain edema increased and mannitol was given to maintain ICP below 20 mmHg. As part of our monitoring protocol a pressure challenge was performed. MAP was slowly increased by 10 mmHg with phenylephrine drip over 15 minutes and the changes in cerebral physiology observed at bedside. As mean arterial pressure rose, cerebral blood flow increased from 15-18 cc/100gm/min to around 25 cc/100gm/min. Concomitant with the increase in CBF, ICP rose by 3-4 mmHg, from a baseline of 17-18 mmHg to 20-21 mmHg. The results of the pressure challenge indicated that the patient had impaired cerebral autoregulation with a rise in MAP leading to a rise in CBF and ICP ("pressure passive"). Based on the results of the challenge the CPP goal for this patient was set at 50-60 mmHg. Using this therapeutic strategy the patient was maintained on a medical regimen for ICP control. After several days the patient developed acute lung injury with poor systemic oxygenation. Advanced cerebral monitoring indicated poor brain oxygenation and it became more difficult to control ICP. The patient was taken for a right decompressive craniectomy which resulted in good ICP control and improved cerebral physiology. The patient eventually returned to consciousness and went on to rehabilitation. The Glasgow Outcome Score at six months post-injury was four, indicating a return to home with only mild to moderate functional deficits.

The above case illustrates how Advanced Neuromonitoring can be used to optimize care in individual TBI patients. Important decisions regarding medical management and CPP goals can be facilitated based on measurements of cerebral blood flow and ICP during a MAP challenge. The decision to intervene surgically when medical measures fail is also facilitated by close monitoring of cerebral physiology in addition to intracranial pressure. Further studies will show whether these advances in cerebral monitoring can lead to improved outcomes in severe TBI patients.

References

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