Effect of decompressive craniectomy on bispectral index and memory

Editor—We report a case in which after a brain injury, a patient with a Glasgow coma scale (GCS) of 14 had an unexpectedly low bispectral index (BIS) of 55. This increased after an emergency decompressive craniectomy.

A 29-yr-old, previously well, female developed sudden onset headache with vomiting and weakness. CT scans demonstrated a right frontal lobe intracerebral haemorrhage secondary to arteriovenous malformation. After 3 weeks of conservative management, she became symptomatic of an acute increase in intracranial pressure (ICP). Further CT revealed a large intracerebral haematoma with significant midline shift, and she was listed for emergency decompression.

Before operation, the patient’s GCS was 14. Although nauseated and photophobic, she was communicative and made appropriate responses. A BIS electrode (BIS-XP v4.0) was applied to the left side of the forehead before induction; initial BIS readings were no higher than 55. Anaesthesia was induced with target-controlled infusions of propofol and remifentanil. During intubation (facilitated with rocuronium), the BIS briefly increased above 60, before decreasing to 20. Intraoperatively, the BIS remained between 20 and 40. Anaesthesia was discontinued after the 3 h evacuation of haematoma, upon which the BIS increased to 92 (Fig. 1).

Episodic memory formation with a BIS value $<60$ is highly unlikely; however, occasional reports of intraoperative recall do occur at such levels. To help determine if this was the case, our patient underwent two modified Brice interviews, once in post-anaesthesia care unit (PACU) and again on the ward 72 h later. During both interviews, she stated that her last memory before waking in PACU was of being on the ward some hours previously. She had no recollection of the anaesthetic pre-operative visit or of any events in the anaesthetic room.

Positron emission tomography scanning has confirmed that BIS correlates closely with cerebral metabolic rate for oxygen consumption (CMRO$_2$) during anaesthesia. This may help explain why a brain-injured patient with raised ICP, reduced cerebral perfusion, and consequent reduced CMRO$_2$ may exhibit a low BIS value. In our case, the BIS of 55 appeared consistent with preoperative ‘awareness with no recall’, and surgical restoration of normal perfusion was associated with an rise increase in BIS to 92.

Conflict of interest
None declared.

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Fig 1 Changes in BIS (trends merged into one figure) showing the beginning and end of the case.

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