Decompressive craniectomy for elevated intracranial pressure and its effect on the cumulative ischemic burden and therapeutic intensity levels after severe traumatic brain injury


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ABSTRACT

Introduction: Increased intracranial pressure (ICP) can cause brain ischemia and compromised brain oxygen (PbtO2 < 20 mmHg) after severe traumatic brain injury (TBI). In this study we examined whether decompressive craniectomy (DC) to treat elevated ICP reduces the brain’s cumulative ischemic burden (CIB) and the therapeutic intensity level (TIL).

Methods: Ten severe TBI patients (mean age 31.4 ± 14.2 years) who had continuous PbtO2 monitoring before and after delayed DC were retrospectively identified. Patients were managed according to the Guidelines for the Management of Severe TBI. The CIB was measured as the total time spent between a PbtO2 of 15-20 mmHg, 10-15 mmHg and 0-10 mmHg. The TIL was calculated every 12 hours. Mixed effects model were used to estimate changes associated with DC.

Results: Decompressive craniectomies were performed on average 2.8 days after admission. DC was found to immediately reduce ICP (mean [SEM] decrease was 7.86 [2.4 mmHg]; p = 0.005) and reverse a trend of increasing ICP before surgery. TIL, which was positively correlated with ICP (r = 0.46, p < 0.001), also was significantly reduced within 12 hours following surgery and therapeutic intensity levels continued to improve within the post-surgical monitoring period (p < 0.001). In the 12 hours before DC, 7 of the 10 patients had a PbtO2 < 20 mmHg. The duration and severity of CIB were significantly reduced as an effect of DC in this group. The overall mortality rate in the group of 10 patients was lower than predicted at the time of admission (p = 0.015).

Conclusion: These results suggest that a DC for increased ICP can reduce the brain’s cumulative ischemic burden after severe TBI. We suggest that DC be considered early in a patient’s clinical course particularly when the TIL and ICP are increased.