Decreased Distance from Midline in Decompressive Craniectomy Predicts Development of Hydrocephalus

John Ross Williams MD; R. Michael Meyer MD; Jocelyn Richard; Randall M. Chesnut MD, FCCM, FACS
University of Washington Department of Neurological Surgery

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Introduction

Wide variation has been reported for symptomatic hydrocephalus following traumatic brain injury (TBI), largely due to differences in definition. However, the incidence of post traumatic hydrocephalus (PTH) reported in TBI patients in general (0.7-29%) is considerably less than patients treated with craniectomy (10-40%). Additional data has shown that there is a lower rate of symptomatic hydrocephalus in patients requiring decompressive craniectomy if the superior medial aspect of the bone flap is greater than 25mm off midline. We sought to provide additional data supporting both removal of a bone flap via craniectomy and distance from the midline in the most superior medial aspect of the bone flap are independent and modifiable iatrogenic risk factors in developing PTH.

Methods

380 patients were retrospectively identified as status post craniectomy for TBI from a single, level-one trauma center from 2005-2014. We defined "symptomatic PTH" as those cases requiring ventriculoperitoneal shunt (VPS) placement. 24 patients (6.3%) met crieteria for symptomatic PTH, 354 (93.7%) did not. Craniectomy distance from midline was calculated for each patient. Mean distance for each group was compared using an unpaired two -tailed t test.

Results

The mean axial distance from midline in the PTH group was 12.8mm and 16.6mm in the non-PTH group. This difference was significant ($p = 0.037$). Only 6.3% of patients met criteria for symptomatic PTH.

Conclusions

These data reinforce previously published data that correlate craniectomies approaching midline with a higher incidence of TBI-related hydrocephalus. This supports the concept that both craniectomy and the proximity of the craniectomy to midline are both independent, modifiable risk factors in the development of PTH. Furthermore, when symptomatic PTH is defined as requiring VPS placement, the incidence may be lower than previously reported.

Learning Objectives

By the end of this session, participants should be able to 1) understand craniectomy and craniectomy distance from midline as modifiable risk factors for PTH and 2) discuss proposed theories for the contribution of bone flap removal in the development of PTH.

References

1. Fodstad, H., Love, J.A., Ekstedt, J., Fride´n, H., and Liliequist, B. (1984). Effect of cranioplasty on cerebrospinal fluid hydrodynamics in patients with the syndrome of the trephined. Acta Neurochir. (Wien.) 70, 21–30.

2. Aarabi, B., Hesdorffer, D.C., Ahn, E.S., Aresco, C., Scalea, T.M., and Eisenberg, H.M. (2006). Outcome following decompressive craniectomy for malignant swelling due to severe head injury. J. Neurosurg. 104, 469–479.

3. Groswasser, Z., Cohen, M., Reider-Groswasser, I., and Stern, M.J. (1988). Incidence, CT findings and rehabilitation outcome of patients with communicative hydrocephalus following severe head injury. Brain Inj. 2, 267–272.

4. Guyot, L.L., and Michael, D.B. (2000). Post-traumatic hydrocephalus. Neurol. Res. 22, 25–28.

5. Licata, C., Cristofori, L., Gambin, R., Vivenza, C., and Turazzi, S. (2001). Post-traumatic hydrocephalus. J. Neurosurg. Sci. 45, 141–149.

6. Takeuchi et al. (2013). Hydrocephalus after decompressive craniectomy for hemispheric cerebral infarction. Journal of Clinical Neuroscience. 20, 377-382.

7. Mazzini et al. (2003). Posttraumatic Hydrocephalus: A Clinical, Neuroradiologic, Neuropsychologic Assessment of Long-Term Outcome. Acta Phys Med Rehab. 84, 1637-1644.