

Editorial

DECRA...Where do we go from here?

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In the United States, about two million head injuries of all types (including skull and facial fractures) occur each year (175 to 200 per 100,000 population), with the annual cost around \$80 billion dollars.

It has been a year since the results of the randomized Decompressive Craniectomy (DECRA) trial were published on March 25 in the *New England Journal of Medicine*, *New Engl J Med*. Published online March 25, 2011. Since then, it has stirred up controversy in a number of circles amongst our colleagues. Over a period of eight years, the DECRA trial, identified 155 patients from 3478 screened, with severe diffuse TBI and intracranial hypertension refractory to first-tier therapies. These 155 were randomly assigned to either early decompressive craniectomy or standard of care therapy.

Patients in the craniectomy group, were found to have less time with intracranial pressures above the treatment threshold (20 mm.hg.), fewer interventions for elevations in intracranial pressure (ICP), and shorter lengths of stay (l.o.s), in the intensive care unit (ICU). Unfortunately however, patients that underwent decompressive hemi-craniectomy had worse scores on the Extended Glasgow Outcome Scale than those receiving standard care and ultimately greater risk of an unfavorable outcome. Rates of death at 6 months were similar in the craniectomy group (19%) vs. the standard-care group (18%).

The authors concluded that in adults with severe diffuse traumatic brain injury and refractory intracranial hypertension, early bifrontotemporoparietal decompressive craniectomy^[8] decreased intracranial pressure and the length of stay in the ICU but was associated with more unfavorable outcomes.^[5]

Their conclusions have raised a lot of eyebrows and significant criticism including senior members from the

Section on Neurotrauma,^[11] which had 5 major objections ranging from 1.) the Study's use of a small subset of patients with traumatic brain injury no (mass lesions); This clearly indicates a small and restricted subset of patient's with traumatic brain injury. 2.) An uncommon choice of operative technique (bifrontal procedures), thus limiting the procedural efficacy for lowering intracranial pressure), 3.) a long accrual time (over which theoretical differences in treatment might have evolved); 4.) differences in study groups (significantly more patients with bilaterally unreactive pupils were included in the surgical group, 5.) minimal mean elevations in intracranial pressure leading up to randomization (median for both groups during the 12 hours before randomization at the upper limit of normal, 20 mm Hg).

Since this study seems to focus primarily on intracranial pressure, it is also important to point out, that most Neurosurgeons and Neuro-intensivists that manage traumatic brain injury would rarely if ever entertain decompressive craniectomy in patients with an ICP of 20 mm Hg for such brief duration. Studies recording ICP following head injury show that thresholds of 25 mm Hg determine outcome,^[1,12] It follows, most likely, that patients who will benefit from decompression are those with intractable intracranial hypertension above 25 mm Hg. In a sense, the author's aggressive approach may

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be justified in order to decompress the brain as soon as possible, but in those patients with diffuse injury without mass lesions, many Specialists would use medical therapy for a longer period, leaving decompressive craniectomy as a last resort. The trial's criteria for craniectomy simply does not give current first tier protocols enough time to optimize management of ICP.^[2,3,12]

What this study does suggest is that the normalization of ICP achieved with decompressive craniectomy may not be the key to managing patients with diffuse, severe traumatic brain injury .

When ICP and cerebral perfusion pressure(CPP) are normalized, patients with severe traumatic brain injury often have severe cerebral hypoxia, with reduced oxygen tension in brain tissue, which may explain their poor outcome^[6] This has been shown in studies of hyperventilation and TBI.^[7,9] Strategies to improve cerebral oxygenation suggest the benefit of multimodality monitoring for these patients.

Brain ischemia/hypoxia is a key factor in Neurologic outcome following severe traumatic brain injury, Unfortunately, no concomitant measurements of cerebral blood flow (CBF), brain tissue oxygenation(PbtO₂), microdialysis or bio-markers were used while ICP was increasing.^[7,9,10]

Multi-modality monitoring should be seriously considered whenever we want to properly assess the value of an aggressive surgical approach such as decompressive hemi-craniectomy.^[4,10,12]

Unfortunately, the DECRA study leaves us with little evidence that aggressive Neurosurgical intervention aimed at reducing ICP, improves outcome. In closing, I would caution the readers not to close the door on this topic but rather, support work which will help define the optimal clinical setting for this procedure. We await the

results of the other ongoing trial of craniectomy for head injury called the Randomized Evaluation of Surgery with Craniectomy for uncontrollable Elevation of Intracranial Pressure(RESCUEicp), which has several differences in their design as compared to DECRA.

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