Clinical Research in Brain and Neurological Disorders

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Decompressive craniectomy: A Retrospective Study and Clinical Complications

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Abstract

Decompressive craniectomy consists of removal of piece of bone of the skull in order to reduce intracranial pressure. It is part of the second level measures for the management of increased intracranial pressure refractory to medical management as moderate hypothermia and barbiturate coma.

Keywords: Decompressive; craniectomy; retrospective study

Introduction

Currently morbidity and mortality due to traumatic injuries are a well-recognized major public health problem. Similarly the traumatic brain injury (TBI) is a major public health concern worldwide, according to the predictions, neurotrauma will account an increasing number of deaths worldwide by 2020. Unfortunately, overall trauma ranks among the leading causes of death and occurs in all regions, affecting people in all age and income groups.

Severe head trauma can lead to brain swelling, increased intracranial pressure (ICP), reduced cerebral blood flow, inadequate oxygen delivery, ischemia, metabolic failure, and brain edema. Strategies to control ICP and maintain an adequate cerebral perfusion pressure (CPP) comprise a central principle in managing severe TBI. In some cases, hypertension is refractory to first- and second-level therapeutic measures, and requires emergency surgical intervention with decompressive craniectomy (DC). The DC procedure involves removal of portions of the cranial vault and subsequent durotomy to increase space that allows the swollen cerebral hemisphere to expand beyond normal cranial limits to immediately alleviate elevated ICP while avoiding internal herniation and brainstem compression. The increased space can lead to improved cerebral compliance, a reduction in ICP, and an increase in CPP that together increase both cerebral blood flow and cerebral microvascular perfusion.

The role of primary DC in TBI remains controversial. Current guidelines discourage DC as a first-line therapy prior to exhausting clinical management. However, DC is sometimes used as a first-line treatment due to high demand, low resources, and lack of institutional facilities for delivery of adequate care.

Goal of the study

In this large retrospective study, we aimed to evaluate the therapeutic effect of bovine-derived pericardium membrane as artificial dura material to repair dura defect of patients who had TBI.Patients <14 years-old were not included in the study. Medical records with incomplete information regarding patient identification, clinical data, or that lacked information about complementary tests, surgical description, or outcomes were excluded. Patients who had neurological deficits before the traumatic event and those having surgical lesions in other organs or systems were also excluded.After admission to the hospital, patients with TBI are directed to a neurosurgeon, who conducts a primary assessment and stabilization regarding advanced trauma life support guidelines. At HR, DC for TBI is indicated primarily, with consideration of the physical examination, the patient's clinical signs and symptoms on admission, and radiological changes suggestive of increased ICP. Considering the high demand, there is no immediate access for most patients to ICU beds, nor is an ICP monitor readily available. The standardized technique for performing DC is a large, fronto-temporo-parietal hemicraniectomy (15 × 12 cm minimum) with middle fossa decompression and dural opening.

Statistical Analysis

The data analysis considered sociodemographic factors, mechanism of injury, Glasgow Coma Scale (GCS) score at hospital admission, pupillary alterations, lesions on computed tomography (CT) of the head, timing from hospital admission to surgery, use of ICP monitoring, duration of the surgery, post-surgical destination and length of stay, occurrence of cerebrospinal fluid (CSF) leakage, and surgical site infection.

A variety of differently designed studies indicate that DC should significantly decrease the mortality of patients with severe TBI, but there still is no objective answer about which circumstances and which patients would realize the greatest benefit from DC. The main randomized controlled trials conducted to date, DECRA and Rescue ICP, did not clarify whether DC results in better clinical outcomes. TBI remains a substantial source of morbidity and mortality, mainly in areas with limited resources to adhere to Level 1 recommendation protocols, and particularly in those regions that have a higher burden of TBI mortality.

Discussion

Our meta-analysis revealed that early DC and standard medical management whether alone or accompanied by late DC has almost the same effect on the functional clinical outcome of the patients with TBI. However, early DC reduces the mortality rate as compared to the patients who underwent late DC.

Conclusion

This study shows that the DC procedure is commonly used to manage patients with TBI at HR. The majority of these patients were young adult males involved in motorcycle accidents and were admitted in critical clinical conditions (GSC score 3-8) with at least one intracranial lesion on CT scan. GCS score on admission evaluation was found to be a strong predictor of patient outcome. We also observed that critical patients (GCS score <9) who underwent surgery sooner after injury had the same clinical outcome as those who had a higher GCS score. The results may indicate that patients who underwent surgery sooner, despite having a worse condition on admission had similar clinical outcomes, thus emphasizing the importance of early DC in severe TBI management. However, clarification of whether these patients had, in most cases, a mass effect lesion requiring emergency intervention is needed.

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