

## **Chapter 3**

# **Exploring the Limits of Survivability: Rational Indications for Decompressive Craniectomy and Resection of Cerebral Contusions in Adults**

Austin R. T. Colohan, M.D., Samer Ghostine, M.D., and Domenic Esposito, M.D.

In 1901, Kocher (25) astutely described the mechanism of action of decompressive craniectomy (DC): “If there is no CSF [cerebrospinal fluid] pressure, but brain pressure exists, then pressure relief must be achieved by opening the cranium. Relief of pressure by trephination is clearly indicated in all cases of brain pressure” and “There are two problems regarding the effectiveness of the measure: in the early stage, it is not easy to diagnose increased brain pressure; and in the late stage, the performance of the procedure alone will be of no further use.” In 1905, Cushing (12) published a case of DC in a patient with a brain tumor that was exerting a mass effect and causing intracranial hypertension. He went on to advocate the use of subtemporal DC in traumatic brain injury (TBI) (13). Since then, DC has been performed to relieve increased intracranial pressure (ICP) regardless of the etiology, including traumatic head injury, edema resulting from vasospasm secondary to subarachnoid hemorrhage, encephalitis, intracerebral hematoma, cerebral venous and dural sinus thrombosis, cerebellar infarction, and supratentorial strokes with resultant massive edema.

Early reported results of DC performed on TBI were not very encouraging (2, 5, 7, 9, 14, 17–19). However, recently, the use of DC has regained popularity as a treatment modality of TBI with associated increased ICP refractory to medical treatment. Furthermore, some authors advocate that DC could be performed prophylactically, especially in developing countries, where neurointensive care resources may not be readily available.

At this time, there is no Class I evidence to support the use of DC, and prospective studies are being organized by both the European and American Brain Injury Consortiums. There are many studies in the literature with Class II and III evidence that have shown that DC might play a role in severe brain injury refractory to medical therapy (Table 6.1). Our understanding of the different factors that determine prognosis after severe brain injury has allowed for improvement in the management of brain injury (10, 11, 15, 21, 22, 26, 27, 31, 37, 41, 42, 46).

In 1997, a report published by Polin et al. (41) reported that DC was beneficial in patients with severe brain injury. They performed a retrospective study of bilateral DC in 35 patients in whom medical therapy had failed to treat elevated ICP and compared their results with a matched group from the Traumatic Coma Data Bank (TCDB) that was treated medically (16). Thirty-seven percent of patients who had DC had good outcome compared with 16% in the matched TCDB control group. Since then, many other studies have confirmed that DC may yield better results than medical treatment alone in TBI, especially if performed on the correct group of patients. However, Messing-Junger et al. (32) did not find a statistically different outcome with DC in a series of 87 patients. At this time, the indications and contraindications of DC are not clear.