ORIGINAL ARTICLE

Decompressive Hemicraniectomy in Hypertensive Basal Ganglia Hemorrhages

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Abstract

Objectives: The aim of this study was to analyze efficacy and safety of decompressive hemicraniectomy (DHC) in hypertensive basal ganglia hemorrhage (HBGH). Neurosurgical management of HBGH is still a controversial issue. Surgical techniques are diverse, from the open large craniotomy, to the minimally invasive techniques like stereotactic aspiration of the HBGH, endoscopic evacuation and stereotactic catheter drainage after instillation of thrombolytic agents. Decompressive hemicraniectomy lowers intracranial pressure and improves outcome in patients with HBGH. **Methods:** 8 patients with HBGH who underwent decompressive craniectomy in the last 2 years were analyzed. Parameters investigated included clinical presentations, radiologic profile, time interval from ictus to surgery, and modified Rankin Scale score at 6 months. **Results:** The patients mean age 55 years, the mean Glasgow Coma Scale (GCS) score was 7 (range 5–13), the mean ICH volume was 58 ml (range 40–70 ml), and the mean midline shift was 10.62 mm (range 6-16 mm). The outcome after 6 months was appreciated as good (modified Rankin Scale 0–4) or poor (modified Rankin Scale 5-6). Five patients had good and three had poor outcomes (including two deaths). **Conclusion:** We conclude, based on this small cohort, that DC can reduce mortality in some cases. Larger prospective studies are needed to assess safety and efficacy of this method.

Introduction

The neurosurgical management of hypertensive basal ganglionic hemorrhage (HBGH) is still a controversial issue. The aim of this study was to analyze efficacy and safety of decompressive craniectomy (DHC) in deep HBGH. Hypertensive basal ganglionic hemorrhage (HBGH) is defined as a bleeding into the brain parenchyma which occurs in the absence of trauma or surgery. Surgical techniques are diverse, from the open craniotomy, to the minimally invasive techniques like stereotactic aspiration of the HBGH and endoscopic evacuation. Decompressive hemicraniectomy lowers intracranial pressure and improves outcome in patients with intracerebral hemorrhage. The idea of applying it in spontaneous intracerebral hematoma comes from results obtained by applying this method in massive ischemic stroke, in sinus thrombosis or in traumatic pathology. The toxic effects of hematoma degradation and the complications of mass effect are the main reasons for surgery.[1,2]

Material and method

We identified 8 patients with hypertensive basal ganglionic hemorrhage (HBGH) who had

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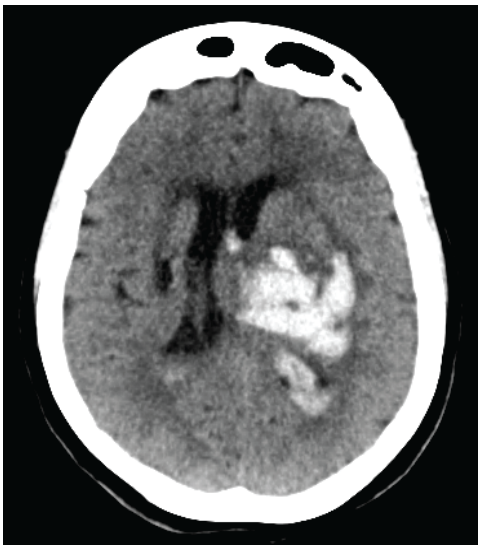
undergone DHC between February 2012 and February 2014. Review of medical records and CT images provided preoperative and intraoperative clinical data and postoperative outcome data. To determine the hematoma volume and maximal midline shift, we reviewed radiologists' reports, when the midline shift was not specified in a report, it was measured at the foramen of Monroe by using digital measuring tools available on our viewing software.

Preoperative CT scans



Postoperative CT scans

Surgical Procedure

DHCs were generally trauma-type flap intended to maximize decompression of the cerebral hemisphere. The opening of the dura was performed in a stellate fashion, and the exposed brain was covered by augmentive duraplasty with galea aponeurotica.

Results

During the study period, 8 patients were treated with DHC without clot evacuation for hypertensive basal ganglionic hemorrhage (HBGH). Mean age was 58 years, and 6 patients were male and 2 patients were female. The hemorrhage lateralized to the left in 6 patients and to the right in 2 patients. On admission mean GCS score was 7 (range 5-13), mean hematoma volume was 58 ml (range 40-70 ml), mean midline shift was 10.62 mm (range 6-16mm).

Table I: Outcome table

		No. of patients
mRS	0-4	5
	5-6	3
Total		8

Table II: Summary of literature on hematoma evacuation and DHC in SICH.

Authors & year	No. of cases	Dominant side	>60ml	Mortality	Term	Good outcome	Term
Decompressive craniectomy with clot evacuation							
Dierssen et al., 1983	73	53%	unknown	33%	2 yrs	45%	2yrs
Ma et al., 2010	38	unknown	unknown	32%	1 month	55%	6 months
Maira et al., 2002	15	unknown	unknown	20%	1 yr	73%	1 yr
Murthy et al., 2005	12	8%	67%	8%	discharge	50%	17 months
Total	138			29%		51%	
DHC without clot evacuation							
Ramnarayan et al., 2009	23	43%	30%	13%	3 months	56%	3 months
Fung et al., 2012	12	58%	50%	25%	6 months	50%	6 months
present series	08	75%	50%	25%	6 months	62%	6 months
Total	43			19%		56%	

Outcome

Outcome was assessed by the modified Rankin Scale score, when patients returned to our outpatient clinic after 6 months. Good outcome was defined as modified Rankin Scale of 0-4 and bad outcome as modified Rankin Scale of 5-6. Five patients (62%) had good and three patients (38%) had poor outcome.

Discussion

Intracerebral hemorrhage incites ICP elevation by several distinct mechanisms. Initially, the hematoma volume itself, which can expand for up to 24 hours after the ictus[4,6] impacts the intracranial volume buffer capacity. Subsequently, osmotically active proteins in the hematoma cause edema formation in the surrounding tissue, with approximately 75% of patients experiencing an increase in perihematomal edema within the first 24 hours.[8,17] Rather counter intuitively, surgical clot evacuation may in some cases also contribute to ICP elevation, as it bears the potential to induce edema formation through tissue manipulation and/or venous interruption.[5,10] Although the topic of clot evacuation in ICH has gained increased attention in recent years[11,14] following a relatively silent period after the 1961 landmark paper by McKissock et al.,[13] the role of decompressive craniectomy in large ICHs has only scarcely been explored. The majority of the reports on decompressive craniectomy following ICH involve a combination of decompression with concurrent clot evacuation. The mortality rates for patients undergoing such intervention in these studies were considerably better than the natural history, as the mortality of the latter approaches 86%.[3,9] Moreover, the results for concurrent DHC and clot evacuation were favorable compared with results for patients managed with craniotomy and clot evacuation, suggesting a therapeutic effect of decompression.[11,12]

Clinical outcomes for decompressive hemicraniectomy with clot evacuation have been reported for a total of 138 patients in the literature, rendering an overall 29% mortality rate and 51% favorable outcome rate, with follow-up duration ranging from discharge to 2 years (Table II). In light of the negative conclusions of the STICH trial[15] and studies implicating an exacerbation of tissue damage from clot evacuation, decompression alone, without attempts at concurrent hematoma removal, may prove a better option than others for the management of medically refractory large ICH. Ramnarayan[16] were the first to explore the impact of DHC without clot evacuation and reported on a series of 23 patients with putamen ICH. At 3-month follow-up, 56% had a favorable outcome and only 13% had died. Fung[7] likewise reported results of DHC without clot evacuation in ICH. Of their 12 patients, of whom half had an ICH volume greater than 60 cm^3, 25% died and 50% gained functional independence at 6 months. A summary of the literature on DHC without clot evacuation in ICH, including the results of the present study, yields 43 cases, with an 19% mortality rate and 56% good outcome rate after a follow-up ranging from 3 to 6 months (Table II).

This finding suggests that the harm caused by the surgery outweighs the benefit of the clot removal and that decompression with preservation of brain integrity may prove a

better therapeutic technique in ICH. Advantages of DHC include no trauma to brain, ease and speed of the procedure and no issues of brain parenchymal hemostasis. The presented data, combined with data from the literature, suggest that DHC is feasible in patients with large HBGH. Nonetheless many additional factors are involved in driving outcome following ICH, and therefore large, multicenter, randomized trials are needed to accurately assess the role of DHC in optimal ICH management.

Conclusions

Our data indicate that DHC with preservation of brain integrity in patients with spontaneous dominant ICH and medically refractory ICP elevation is feasible. Large randomized controlled trials are needed to further investigate the therapeutic value of DHC in ICH.

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