Section: Neuro Surgery

Original Article

ISSN (0): 2347-3398; ISSN (P): 2277-7253

Assessment of Outcome of Decompressive Craniectomy in Traumatic Closed Head Injury

Biju C Jose[1]

[1]Associate Professor, PK Das Institute of Medical Sciences, Vaniamkulam, Ottapalam, Kerala, India.

Abstract

Background: To assess outcome of decompressive craniectomy in traumatic closed head injury. **Subjects and Methods:** Fifty- eight patients with traumatic closed head injury of both genders were included. All the patients were followed for 3 months. Good functional outcome was assessed using Glasgow outcome score (GOS). **Results:** Out of 58 patients, males were 38 and females were 20. At discharge, there were dead 24%, vegetative state 14%, severely disabled 18%, moderately disabled 17% and good recovery 27%. At 1 month, there were dead 24%, vegetative state 14%, severely disabled 17%, moderately disabled 18% and good recovery 27%. At 3 months, there were dead 24%, vegetative state 14%, severely disabled 15%, moderately disabled 20% and good recovery 27%. **Conclusion:** Patients undergoing decompressive craniectomy in traumatic closed head injury had favourable outcome.

Keywords: Decompressive Craniectomy, traumatic closed head injury, Glasgow outcome score.

Corresponding Author: Biju C Jose, Associate Professor, PK Das Institute of Medical Sciences, Vaniamkulam, Ottapalam, Kerala, India

Received: May 2018
Accepted: June 2018

Introduction

Among patients who are hospitalized with severe traumatic brain injury, 60% either die or survive with severe disability.[1] In the United States, the annual burden of traumatic brain injury is more than $60 billion. After severe traumatic brain injury, medical and surgical therapies are performed to minimize secondary brain injury. Increased intracranial pressure, which is typically caused by cerebral edema, is an important secondary insult.[2]

Morbidity and mortality of patients with severe traumatic brain injury (TBI) is high. Raised intracranial pressure (ICP) does not respond to medical management, mannitol and hyperventilation in 10%–15% of patients with severe TBI. Surgical decompressive craniectomy (DC) is recommended in such cases, intervention being aimed at lowering ICP to minimize secondary brain damage.[3]

DC has been used to treat severe intracranial hypertension secondary to various causes. This involves removal of a part of the calvarium, with or without duraplasty to create extra volume for intracranial contents thereby reducing ICP. DC may improve oxygen delivery to brain cells by improving blood flow.[4] Primary DC occurs when the bone flap is not replaced when an intracranial mass lesion is evacuated early after a head trauma.[5] Secondary DC involves the removal of the bone flap later in the patient's course–typically to treat the elevation of ICP refractory to other treatments. Over the last century, the use of DC has been controversial. Technical aspects of the surgery, timing, and patient selection continue to be debated, and there has even been disagreement as to whether this procedure should be performed at all.[6] Considering this, we conducted present study to assess outcome of decompressive craniectomy in traumatic closed head injury.

Subjects and Methods

A sum total of fifty- eight patients with traumatic closed head injury of both genders were included. The study was approved from institutional ethical and review committee. The consent from all patients was obtained.

Demographic profile was recorded. Under general anesthesia, incisions were given and scalp flap was raised. After making burr holes, craniotome was used to raise a bone flap, which was removed and stored in refrigerator. The dura was incised (durotomy) and then augmented using temporal fascia, pericranial fascia, or artificial fascia (duroplasty). Patients were ventilated for 24–48 hours. All the patients were followed after discharge for outcome. Good functional outcome was assessed using Glasgow outcome score (GOS). Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 21. Results were assessed statistically. P value less than 0.05 was considered significant.

Results

Out of 58 patients, males were 38 and females were 20 [Table

1, Figure 1].

At discharge, there were dead 24%, vegetative state 14%, severely disabled 18%, moderately disabled 17% and good recovery 27%. The difference was non- significant (P> 0.05) [Table 2, Figure 2].

At 1 month, there were dead 24%, vegetative state 14%, severely disabled 17%, moderately disabled 18% and good recovery 27%. The difference was non- significant (P> 0.05) [Table 3, Figure 3].

Table 1: Distribution of patients

Total- 58		
Gender	**Male**	**Female**
Number	38	20

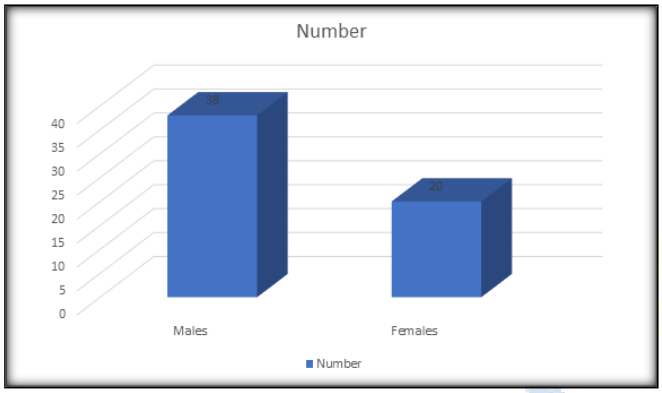

Figure 1: Distribution of patients

Table 2: Assessment of Glassgow outcome score at discharge

At discharge	Percentage	P value
Dead	24%	>0.05
Vegetative state	14%	
Severely disabled	18%	
Moderately disabled	17%	
Good recovery	27%	

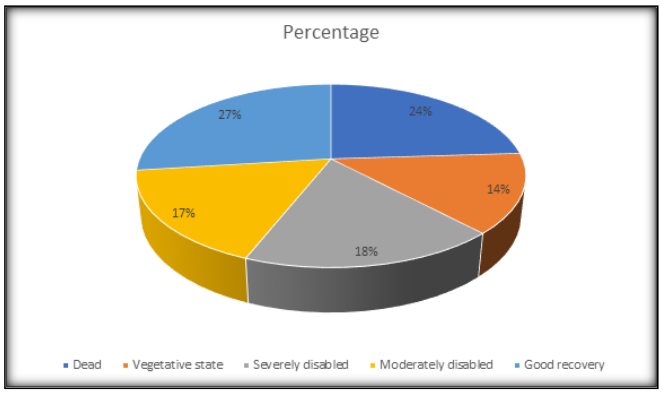

Figure 2: Assessment of Glassgow outcome score at discharge

Table 3: Assessment of Glassgow outcome score at 1 month

At 1 month	Percentage	P value
Dead	24%	>0.05
Vegetative state	14%	
Severely disabled	17%	
Moderately disabled	18%	
Good recovery	27%	

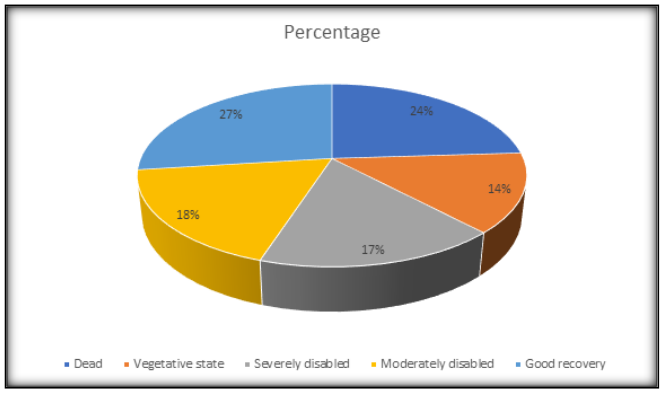

Figure 3: Assessment of Glassgow outcome score at 1 month

Table 4: Assessment of Glassgow outcome score at 3 months

At 3 months	Percentage	P value
Dead	24%	>0.05
Vegetative state	14%	
Severely disabled	15%	
Moderately disabled	20%	
Good recovery	27%	

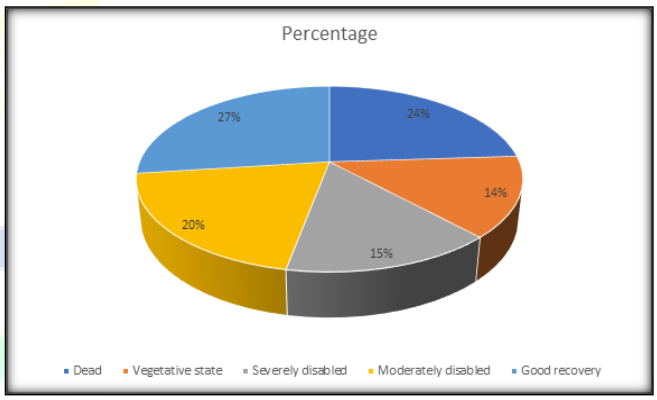

Figure 4: Assessment of Glassgow outcome score at 3 months

At 3 months, there were dead 24%, vegetative state 14%, severely disabled 15%, moderately disabled 20% and good recovery 27%. The difference was non- significant (P> 0.05) [Table 4, Figure 4].

Discussion

Traumatic brain injury (TBI) remains one of the most serious public health problems worldwide, and in particular in low- and middle-income countries (LMICs). Decompressive craniectomy (DC) has been used for the management of intracranial pressure (ICP) with severe TBI patients as a primary or prophylactic intervention, or as a secondary intervention when first-line therapies fail.[7] Some studies in TBI populations have shown that DC improves ICP and cerebral perfusion pressure (CPP), contributing to improved long-term functional outcomes and reduction in costs.[8,9] However, other studies show opposite results. Given the variation in results, leading to uncertainty about the actual benefit or not of the procedure, multiple systematic reviews and meta-analyses have been conducted to synthesize the results of the individual studies.[10] We conducted present

study to assess outcome of decompressive craniectomy in traumatic closed head injury.

We observed that out of 58 patients, males were 38 and females were 20. Laghari et al,[11] in their study seventy-two patients underwent DC for raised and refractory ICP. Glasgow Outcome Scale (GOS) at discharge, 1-month and 3-month follow-up were reported. GOS at 3-month follow-up showed 21 patients (29.2%) patients had a good recovery, moderate disability was reported in 16 patients (22.2%), and severe disability in 12 patients (16.7%), persistent vegetative state was seen in five patients (6.9%). Eighteen patients had in hospital mortality (25.0%). Tracheostomy and sphenoid fractures were found to be negative predictors of good functional outcome.

We found that at discharge, there were dead 24%, vegetative state 14%, severely disabled 18%, moderately disabled 17% and good recovery 27%. Rubiano et al,[12] found that of 973 citations from the original search, five publications were included in our review. Four of them included meta-analyses. For mortality, three reviews found a positive effect of DC compared to medical management and two found no significant difference between groups. The four reviews that measured neurological outcome found no benefit of DC. The two reviews that assessed ICP both found DC to be beneficial in reducing ICP. DC demonstrated a significant reduction in ICU length of stay in the one study that measured it, and a significant reduction in hospital length of stay in the two studies that measured it. According to the AMSTAR 2 criteria, the five reviews ranged in levels of confidence from low to critically low.

We observed that at 1 month, there were dead 24%, vegetative state 14%, severely disabled 17%, moderately disabled 18% and good recovery 27%. Grindlinger et al,[13] examined the clinical and neurological outcome of patients who sustained a severe non-penetrating traumatic brain injury (TBI) and underwent unilateral decompressive craniectomy (DC) for refractory intracranial hypertension. 31 patients aged 16–72 of either sex who sustained a severe, non-penetrating TBI and underwent a unilateral DC for evacuation of parenchymal or extra-axial hematoma or for failure of medical therapy to control intracranial pressure (ICP). Review of the electronic medical record of patients undergoing DC for severe TBI and assessment of extended Glasgow Outcome Score (e-GOS) at 6-months following DC. The mean age was 39.3y ± 14.5. The initial GCS was 5.8 ± 3.2, and the ISS was 29.7 ± 6.3. Twenty-two patients underwent DC within the first 24 h, two within the next 24 h and seven between the 3rd and 7th day post injury. The pre-DC ICP was 30.7 ± 10.3 and the ICP was 12.1 ± 6.2 post-DC. Cranioplasty was performed in all surviving patients 1–4 months post-DC. Of the 29 survivors following DC, the e-GOS was 8 in seven patients, and 7 in ten patients. The e-GOS was 5–6 in 6 others. Of the 6 survivors with poor outcomes (e-GOS = 2–4), five were the initial patients in the series.

We observed that at 3 months, there were dead 24%, vegetative state 14%, severely disabled 15%, moderately disabled 20% and good recovery 27%. Cooper et al,[14] randomly assigned 155 adults with severe diffuse traumatic brain injury and intracranial hypertension that was refractory to first-tier therapies to undergo either bifrontotemporoparietal decompressive craniectomy or standard care. The original primary outcome was an unfavorable outcome (a composite of death, vegetative state, or severe disability), as evaluated on the extended Glasgow outcome scale 6 months after the injury. The final primary outcome was the score on the Extended Glasgow Outcome Scale at 6 months. Patients in the craniectomy group, as compared with those in the standard-care group, had less time with intracranial pressures above the treatment threshold (P<0.001), fewer interventions for increased intracranial pressure (P<0.02 for all comparisons), and fewer days in the intensive care unit (ICU) (P<0.001). However, patients undergoing craniectomy had worse scores on the Extended Glasgow Outcome Scale than those receiving standard care (odds ratio for a worse score in the craniectomy group, 1.84; 95% confidence interval [CI], 1.05 to 3.24; P=0.03) and a greater risk of an unfavorable outcome (odds ratio, 2.21; 95% CI, 1.14 to 4.26; P=0.02). Rates of death at 6 months were similar in the craniectomy group (19%) and the standard-care group (18%).

Conclusion

Patients undergoing decompressive craniectomy in traumatic closed head injury had favourable outcome.

References

1. Syed AB, Ahmad IH, Hussain M, Al-Bya F, Solaiman A. Outcome following decompressive craniectomy in severe head injury: Rashid Hospital experience. Pan Arab J Neurosurg 2009;1:29-35.
2. Gupta R, Connolly ES, Mayer S, Elkind MS. Hemicraniectomy for massive middle cerebral artery territory infarction: A systematic review. Stroke 2004;35:539-43.
3. Honeybul S, Ho KM, Gillett GR. Reconsidering the role of decompressive craniectomy for neurological emergencies. J Crit Care 2017;39:185-9.
4. Jagannathan J, Okonkwo DO, Dumont AS, Ahmed H, Bahari A, Prevedello DM, et al. Outcome following decompressive craniectomy in children with severe traumatic brain injury: A 10-year single-center experience with long-term follow up. J Neurosurg 2007;106:268-75.
5. Veen EV, Aerdts S, Brink WV. Decompressive (hemi) craniectomy for refractory intracranial hypertension after traumatic brain injury. Crit Care 2006;10:1.
6. Stiver SI. Complications of decompressive craniectomy for traumatic brain injury. Neurosurg Focus 2009;26:E7.
7. Georgiadis D, Schwarz S, Aschoff A, Schwab S. Hemicraniectomy and moderate hypothermia in patients with severe ischemic stroke. Stroke 2002;33:1584-8.
8. Phan K, Moore JM, Griessenauer C, Dmytriw AA, Scherman DB, Sheik-Ali S, et al. Craniotomy versus decompressive craniectomy for acute subdural hematoma: Systematic review and meta-analysis. World Neurosurg 2017;101:677-8500.
9. Picetti E, Caspani ML, Iaccarino C, Pastorello G, Salsi P, Viaroli E, et al. Intracranial pressure monitoring after primary decompressive craniectomy in traumatic brain injury: A clinical study. Acta Neurochir (Wien) 2017;159:615-22.
10. Chesnut RM. Craniectomy for traumatic intracranial hypertension. N Engl J Med 2016;375:2403. 18. Hayman EG, Kurland DB, Grunwald Z, Urday S, Sheth KN, Simard JM, et al. Decompressive craniectomy in neurocritical care. Semin Neurol 2016;36:508-19.
11. Laghari AA, Bari ME, Waqas M, Ahmed SI, Nathani KR, Moazzam W. Outcome of decompressive craniectomy in traumatic closed head injury.

Asian J Neurosurg 2018;13:1053-6.
12. Rubiano AM, Carney N, Khan AA, Ammirati M. The role of decompressive craniectomy in the context of severe traumatic brain injury: summary of results and analysis of the confidence level of conclusions from systematic reviews and meta-analyses. Frontiers in neurology. 2019:1063.
13. Grindlinger GA, Skavdahl DH, Ecker RD, Sanborn MR. Decompressive craniectomy for severe traumatic brain injury: Clinical study, literature review and meta-analysis. Springerplus 2016;5:1605.
14. Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davies AR, D' Urso P, et al. Decompressive craniectomy in diffuse traumatic brain injury. N Engl J Med 2011;364:1493-502.

How to cite this article: Biju C Jose. Assessment of Outcome of Decompressive Craniectomy in Traumatic Closed Head Injury. Asian J. Med. Res. 2018;7(2):NS01-NS04.
DOI: dx.doi.org/10.21276/ajmr.2018.7.2.NS1

Source of Support: Nil, **Conflict of Interest:** None declared.