VOLUME - 10, ISSUE - 02, FEBRUARY - 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Neurosurgery

POST DECOMPRESSIVE CRANIECTOMY HYDROCEPHALUS IN TBI PATIENTS: A TERTIARY CARE CENTRE EXPERIENCE

Srikrishna Majhi	Assistant Professor, Department of Neurosurgery, IPGME&R and Bangur Institute of Neurosciences, Kolkata West Bengal, India.
Sanjeev Kumar Chhabra*	Resident, Department of Neurosurgery, IPGME&R and Bangur Institute of Neurosciences, Kolkata, West Bengal, India. *Corresponding Author
Subhasis Ghosh	Professor & Head, Department of Neurosurgery, IPGME&R and Bangur Institute of Neurosciences, Kolkata.
Sudipta Chatterjee	Professor & Unit Head, Department of Neurosurgery, IPGME&R and Bangur Institute of Neurosciences, Kolkata.

ABSTRACT

BACKGROUND : Decompressive craniectomy (DC) in patients of traumatic brain injury (TBI) is a life-saving procedure for reduction of medically refractory raised intracranial pressure, it is still riddled with a spectrum of complications, Hydrocephalus is one of the commonest complication after DC. The present study aims to investigate incidence, the risk factors for hydrocephalus occurring after DC and its impact on the final outcome.

METHODS : 516 patients that underwent decompressive craniectomy after enduring a traumatic brain injury between Dec 2018 to Dec 2019 were included in this study. All patients were followed up for 1 year, The incidence, risk factors for developing post-traumatic hydrocephalus (PTH) analyzed.

RESULTS: , Post decompressive craniectomy hydrocephalus was the most common complication in our study and was observed in 10.5% (49 out of 465) patients. Of these 49 patients, 43 had an unfavourable outcome (GOS 1,2,3) and 6 had a favourable outcome (GOS 4,5) at the end of one year follow up. Statistically significant associations between hydrocephalus and final outcome was found.

CONCLUSION: For patients who are subjected to DC following severe head trauma, hydrocephalus is a common complication. Careful follow-up monitoring for the potential progression into hydrocephalus is needed as development of hydrocephalus after DC in TBI patients significantly affects final outcome of the patients .

KEYWORDS : Decompressive Craniectomy, Hydrocephalus, TBI

INTRODUCTION:

Although decompressive craniectomy (DC) in patients of TBI is a life-saving procedure, it is still riddled with a spectrum of complications. These include haemorrhagic complications like expansion of preexisiting hematoma, new hematoma formation, subdural effusion; paradoxical brain herniation, wound infections, CSF leak or fistulae, seizures and syndrome of trephined. One of these many complications is post-operative hydrocephalus. Hydrocephalus can develop either acutely in the immediate perioperative period following DCS surgery or chronic variety being diagnosed during follow-up period while awaiting cranioplasty. It could be either obstructive or rarely communicating variety.[1]

According to existing literature, the reported incidence varies from as low as 0.7% to as high as 86% [2,3], which does not shed much light on this non trivial complication of a frequently done procedure. The current study aimed at identifying the incidence of hydrocephalus in patients undergoing decompressive craniectomy for traumatic brain injury. Along with this, we also studied the correlation of development of hydrocephalus to the final outcome of the patient after 1 year (if any) as measured by Glasgow outcome scale.

MATERIALS AND METHODS:

We conducted a non randomized prospective observational study in the department of neurosurgery, IPGME&R and Bangur institute of Neurosciences, Kolkata. The duration of study was 2 years (from December 2018 to December 2020) which included a one year follow up of patients enrolled in the study. All patients that underwent decompressive craniectomy after enduring a traumatic brain injury were included in this study. The exclusion criteria included patients/guardians not willing to participate in the study, intra operative deaths, patients undergoing DC for non trauma related reasons like malignancy or stroke and patients lost to follow up.

All patients with traumatic brain injury that underwent decompressive craniectomy at BANGUR INSTITUTE OF NEUROSCIENCES & SSKM HOSPITAL, IPGME&R, KOLKATA in the period Dec 2018 to Dec 2019 were included and then further followed up for a period of one year, Dec 2019 to Dec 2020.

Various complications of decompressive craniectomy were noted during the hospital course and up to the 1 year of follow up. The outcome was measured in terms of Glasgow Outcome score at the time of discharge, three months, six months and 1 year post intervention. Outcomes were divided into two groups – good/favourable(F) (Score of 4 or 5) and poor/unfavourable (U) (score 2 or 3 or death).

The data obtained was tabulated and analyzed statistically.

RESULTS:

A total of 516 patients were recruited for the prospective study over a period of one year (From December 2018 to December 2019). Patients were followed up over a period of 1 year to identify the complications and outcome after DC. Of the 516 patients, there were 51 patients lost in follow up. For the remaining 465 patients, there were 48 mortalities. So, 100% follow up could be achieved for 1 year for remaining 417 patients.

Epidemiologically, 80% patients in this study were males and most common age group was 21-30 years (32.3%). The most common mode of trauma was road traffic accidents (69.6%) followed by fall from height and assault. Most commonly, pre operative Glasgow Coma scale score was 9-12 (68.3%).

In 90.3% of the patients fronto-temporo-parietal decompressive craniectomy was done while in 9.7% bifrontal decompressive craniectomy was done.

Although immediate postoperative neurological status worsened only in 18.1%, improved in 60.8% and remained same in 21.1 %; nearly 47% patients suffered from atleast one of the complications in the post-operative period.

A total of 13 complications were seen and recorded during this research study. In descending order of incidence they were, Post DC hydrocephalus (10.5%), pseudomeningocele (8.8%), expansion of haematoma (8.4%), subdural effusion (7.1%), new haematoma formation (6.2%), paradoxical herniation of brain (5.8%), skin flap infection (5.2%), seizures (2.6%), CSF leak (1.7%), syndrome of trephined (1.5%), meningitis (1.3%) and abscess (1.1%).

Hence, Post decompressive craniectomy hydrocephalus was the most common complication in our study and was observed in 10.5% (49 out of 465) patients.(Table 1) Of these, 33 patients were managed by Ventriculo-Peritoneal (VP) shunt and in 23 patients improvement in GCS was seen post shunting. In 7 patients, external ventricular drainage (EVD) was placed due to poor GCS. Out of these 7 patients GCS improvement was seen in 3 but in 4 patients no improvement in GCS after EVD. The 3 patients that improved post EVD underwent VP shunt. 9 patients of hydrocephalus were managed conservatively.

Table- 1. Post decompressive craniectomy hydrocephalus

Post decompressive craniectomy Hydrocephalus	Frequency	Percentage
Yes	49	10.5
No	416	89.5
Total	465	100

Of these 49 patients, 43 had an unfavourable outcome (GOS 1,2,3) and 6 had a favourable outcome (GOS 4,5) at the end of one year follow up.

DISCUSSION:

In the current study, hydrocephalus was the most common complication after decompressive craniectomy and was seen in 10.5% patients. Numerous studies have had variable results regarding the incidence of hydrocephalus after decompressive craniectomy. Dissimilar definitions of hydrocephalus and study inclusion and definition criteria in the past studies utilized for the assessment and management of hydrocephalus led to nonuniformity of use of the terms "ventriculomegaly and hydrocephalus" and consequently resulted in very wide variation of reported incidence ranging from 0.7% to 88%.[1] S.Honeybul et al found it to be 11%.[4] Hee Jong ki et al reported the incidence as 26.09%.[5] Dhakre et al report an incidence of 6.5%.[6] Huang et al[7] found it in 8% patients. Arabi et al[8] found 5 (10%) out of 50 patients and Yang et al[9] found 20 (21%) out of 68 patients. Choi et al[10] found 20.7% incidence of post DC hydrocephalus.

In the past, few studies relied solely on computed tomography (CT) scan criteria for selection of hydrocephalus cases, whereas few studies utilized combination of radiological and clinical features criteria. With the recent trend of combining clinicoradiological evaluation findings in addition to assessment of intraoperative CSF pressure monitoring to differentiate ventriculomegaly with cases of true hydrocephalus, these incidence related variations are bound to minimize with more future studies. These multifaceted diagnostic elements will also aid in deciding the need of appropriate CSF diversion surgery methods and sparing others of surgery and shunt-related complications.[11,12,13]

Of the 49 patients developing hydrocephalus, 9 patients had GCS above 12 and were managed conservatively. 33 patients were either between a GCS of 5-12 or between 12-15 but with clinical implications of hydrocephalus and were managed with ventriculo-peritoneal shunting. GCS score of 7 patients was below 5 and these subset had to be managed by external ventricular drainage (EVD). The 3 patients that improved after EVD were then taken up for VP shunting.

Of these 49 patients, 43 had an unfavourable outcome (GOS 1,2,3) and 6 had a favourable outcome (GOS 4,5) at the end of one year follow up. The correlation between the final outcome and incidence of hydrocephalus was statistically significant (p value <0.05) on chi square test. On the contrary, Dhakre et al[6] did not find any significant correlation between development of hydrocephalus post DC and final outcome ($p=0.582$). Some of the plausible reasons for this difference in conclusions could be that in Dhakre et al study, the sample size was much smaller (96 patients as compared to 465 patients in our study), the duration of follow up was lesser (3 months as compared to 1 year in our study) and exclusion of more complications prone age groups like $<$ 18 years or >60 years in their study.

CONCLUSIONS:

With the rise in advanced imaging and utilization of clinic-radiological and intraoperative assessment of CSF pressure, the exact incidence of hydrocephalus is likely to be much less than earlier reported. More studies should be done to further investigate this finding. Also, we conclude that development of hydrocephalus after DC in TBI patients significantly affects final outcome of the patients and should be managed promptly.

REFERENCES:

1. Postdecompressive Craniectomy Surgery, Ventriculomegaly, or Hydrocephalus Development: Imaging, Prevention, and Management. Guru Dutta Satyarthee. J Neurosci Rural Pract. 2018 Apr-Jun; 9(2): 177–179. doi: 10.4103/jnrp.jnrp_547_17
2. De Bonis P, Sturiale CL, Anile C, Gaudino S, Mangiola A, Martucci M, et al. Decompressive craniectomy, interhemispheric hygroma and hydrocephalus: a timeline of events? Clin Neurol Neurosurg. (2013) 115:1308–12. doi: 10.1016/j.clineuro.2012.12.011
3. Post-Traumatic Hydrocephalus after Decompressive Craniectomy: An Underestimated Risk Factor De Bonis et al. Journal of Neurotrauma Vol. 27, No. 11 https://doi.org/10.1089/neu.2010.1425
4. S. Honeybul, K.M. Ho: Long-term complications of decompressive craniectomy for head injury. J Neurotrauma. 28:929-935 2011 21091342
5. The Risk Factors for Hydrocephalus and Subdural Hygroma after Decompressive Craniectomy in Head Injured Patients. J Korean Neurosurg Soc. 2015 Sep; 58(3): 254–261. 2015 Sep 30. doi: 10.3340/jkns.2015.58.3.254
6. Dhakre G, Dagar A, Gupta LN. A prospective study of complications and outcome after decompressive craniectomy in traumatic brain injury in a tertiary care hospital. International Journal of Research and Review. 2019; 6(8):347-363.
7. Huang AP, Tu YK, Tsai YH, Chen YS, Hong WC, Yang CC, Kuo LT, Su IC, Huang SH, Huang SJ. Decompressive craniectomy as the primary surgical intervention for hemorrhagic contusion. Journal of Neurotrauma. 2008 Nov1;25(11): 1347-54.
8. Aarabi B, Hesdorffer DC, Ahn ES. et al. Outcome following decompressive craniectomy for malignant swelling due to severe head injury. J Neurosurg. 2006;104:469–479.
9. Yang XF, Wen L, Shen F, Li G, Lou R, Liu WG, Zhan RY. Surgical complications secondary to decompressive craniectomy in patients with a head injury: a series of 108 consecutive cases. ActaNeurochirurgica. 2008 Dec1;150(12): 1241-8.
10. Clinical Factors for the Development of Posttraumatic Hydrocephalus after Decompressive Craniectomy J Korean Neurosurg Soc. 2008 May; 43(5): 227–231. Published online 2008 May 20. doi: 10.3340/jkns.2008.43.5.227
11. Agrawal D, Pandey N, Sinha S, Gupta D, Satyarthee GD, Singh PK. Subdural effusion with ventriculomegaly after decompressive craniectomy for traumatic brain injury: A challenging entity. Ind J Neurotrauma. 2014;11:97–102.
12. The influence of decompressive craniectomy on the development of hydrocephalus: a review. Ding J, Guo Y, Tian H Arq Neuropsiquiatr. 2014 Sep; 72(9):715-20.
13. Postoperative hydrocephalus in patients undergoing decompressive hemicraniectomy for ischemic or hemorrhagic stroke. Waziri A, Fusco D, Mayer SA, McKhann GM 2nd, Connolly ES Jr Neurosurgery. 2007 Sep; 61(3):489-93; discussion 493-4.