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# FLOATING ANCHORED DECOMPRESSIVE CRANIECTOMY IN PATIENTS WITH TRAUMATIC BRAIN INJURY: A CASE SERIES

Neurosurgery

**Rajesh Kumar Barooah** — Associate Professor Department of Neurosurgery, Gauhati Medical College & Hospital.

**Dr. Nayan Jeet Deka*** — Senior Resident Department of Neurosurgery, Gauhati Medical College & Hospital. *Corresponding Author

## ABSTRACT

**Introduction:**Raised intra cranial pressure following traumatic brain injury have been managed classically with a decompressive craniectomy (DC). However the survivor of DC has a lot more in his hand other than the financial burden and his own disability. Some of these complications like subdural hygroma, syndrome of trephined and the need for subsequent cranioplasty can be reduced by the means of floating anchored DC.

**Aim and objective:**To design a novel method of decreasing ICP in traumatic brain injury patients and prevent the need for subsequent cranioplasty.

Materials and method

We did a case series of floating anchored decompressive craniectomy in 25 patients. Patients were selected based on CT criteria and clinical detoriation. Midline shift of >5 mm, effacement of basal cisterns, blood volume of >25ml and fall in the GCS by more than two points or GCS <8 were selected for the study. Patients were evaluated based on Radiological improvement like improvement in the mid-line shift, opening up of cisterns, Glasgow outcome scale (GOS) at the time of discharge, Length of stay (LOS) & Mortality rate.

**Results and observation:** A total of 25 cases were operated, of which 19 cases had acute SDH, 4 cases had acute SDH with multiple haemorrhagic contusions and 2 cases had traumatic ICH (Intracerebral Haemorrhage). Overall mortality rate was 36%, LOS was 12.4 days and GOS at time of discharge was 2.76.

**Conclusion:** The surgical technique is good in reducing the ICP in traumatic brain injury cases. However this cannot be applied to all cases. Patients with only acute sdh without multiple haemorrhagic contusions are the better candidates. Still further study is required so as to come up with preoperative criteria so that patient selection for floating anchored decompressive craniectomy can be better.

## KEYWORDS

Decompressive craniectomy, Floating Anchored Decompressive Craniectomy

## INTRODUCTION

Decompressive craniectomy has been performed for the treatment of uncontrolled cerebral edema from trauma or other conditions [1-6]. Traditionally it has involved removal of adequate size bone from the cranium and large opening of duramater to relieve ICP [7, 8, 9]. If the outcome is favourable the bone flap is replaced or sometimes with a substitute cranioplasty after 6 week or months later [10,11].

The absence of a bony flap has many complications which includes syndrome of trephined, subdural hygroma, seizure and vertigo/ dizziness [12, 13, 14]. A subsequent cranioplasty has again its own complications.

We have introduced this technique of floating anchored decompressive craniectomy which is aimed to reduce the complications as mentioned above and also reducing the financial burden on the patient without the need for a subsequent cranioplasty.

## MATERIALS AND METHOD

A total of 25 patients underwent the procedure for traumatic brain injury. Patients were evaluated based on pre-operative GCS, Length of stay (LOS), GOS (Glasgow Outcome Scale) and Mortality rate.

*Selection criteria*: Patients were selected based on CT criteria and clinical detoriation. Midline shift of >5 mm, effacement of basal cisterns, blood volume of >25ml and fall in the GCS by more than two points or GCS <8 were selected for the study.

### Surgical technique

Patient was placed in supine position with head turned to opposite to the site of lesion. The head end was elevated to 30 degree and head supported with silicon padded horse shoe. The skin incision was made in a standard reverse question mark incision in front of tragus, extending above and behind the ear to approximately posterior mastoid line and then carried forward to within 1cm from midline to the hairline.

First burr hole was made at the key hole point and other were placed a the temporal base and a craniectomy was made by use of drill or gigli wire. Dura was incised in a curvilinear manner and edges were incised perpendicularly were need to release the edema. The dura was closed with the help of artificial dura (Duragen, Gpatch).

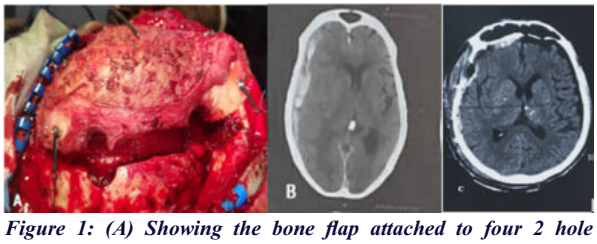

***Figure 1: (A) Showing the bone flap attached to four 2 hole miniplates & the other end hooked to pericranium. (B) Same patient showing acute sdh with midline shift and effacement of basal cisterns. (C) Post-op (POD 7) image of the same patient with reduction of midline shift and opening up of basal cisterns.***

The bone flap was connected with four 2 hole plates with screws at four corner. The screws were not tightly fitted leaving a gap of 1 mm between the plate and screw for free movement of the craniotomy flap. The other end of the plate was loosely sutured with the pericranium with 2-0 vicrly round body. (*Figure 1*)

To facilitate the expansion of the brain and elevation of the bone flap the scalp was dissected of the skull bone on all sides up to a length of 5-7 cm. The scalp and pericranium are closed in layers and a negative suction sub-galeal drain was kept. (*Figure 2*)

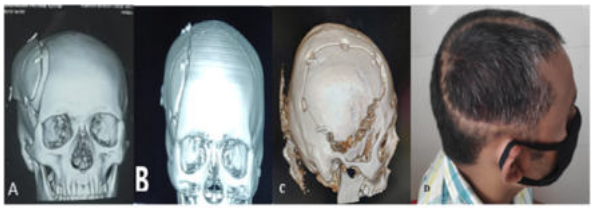

***Figure 2: (A) CT with 3D reconstruction (POD 2) showing elevation of the bone flap due to raised ICP. (B) POD 7, the bone flap has placed in position after the ICP has reduced. (C) & (D) showing patient on follow up after 3 month we can see that the bone flap has been fussed and the patient has minimal deformity of the skull.***

All patients were followed up with post-operative CT scan to look for midline shift and effacement of basal cisterns in pre and post-operative scans

## RESULTS AND OBSERVATION

A total of 25 cases were operated, of which 19 cases had acute SDH, 4 cases had acute SDH with multiple haemorrhagic contusions and 2 cases had traumatic ICH (Intracerebral Haemorrhage) Table 1. Average GCS during the pre-operative period was 8.6, average LOS was 12.4 days and GOS (Glasgow Outcome Scale) at the time of discharge was 2.76 and Mortality rate was 36%.

***Table 1***

| Total number of case: 25 | | | |
|---|---|---|---|
| Diagnosis | (n) | Mortality | GOS average |
| Acute SDH | 19 | 3 | 3.21 |
| Acute SDH with multiple Haemorrhagic contusions | 4 | 4 | 1 |
| Intra Cerebral Haemorrhage | 2 | 1 | 2 |
| Average GOS: 2.76 | | | |
| Average LOS: 12.4 days | | | |
| Average mortality rate : 36% | | | |

Mortality rate among patients with Acute SDH with haemorrhagic contusions was highest. All the 4 patients died following surgery, 3 need revision surgeries where the bone flap was removed due to uncontrolled cerebral edema. Patients with only acute subdural hematoma had a better outcome, it had a mortality rate of 15.8% and GOS at the time of discharge was 3.21. One patient with traumatic ICH died after surgery. However there was no associated uncontrolled cerebral edema. The patient had other associated trauma (femur fracture) and cause of death was thought to fat embolism.

## CONCLUSION

We have come to a conclusion that this new surgical technique is indeed good in nullifying the need for a subsequent cranioplasty. However we believe that patient selection, for this technique, is required. Patients with multiple haemorrhagic contusions along with acute subdural hematoma are poor candidates for this method. Also intraoperative decision making by the surgeon is also necessary weather to go for floating craniotomy or a classic decompressive craniectomy. We need to come up with criteria for floating anchored decompressive craniotomy for which further studies are required.

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