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Original Article

Retrospective Review and Analysis on Outcome of Cranioplasty: A Series of 38 Cases

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Abstract

Background: *Cranioplasty (CP) is a straightforward procedure, it may result in a significant number of complications. These include infections, seizures, intracranial hematomas, and others.*

Objective: *This was a retrospective study on outcome of Cranioplasty.*

Materials and Methods: *This retrospective study included patients who underwent decompressive craniectomy due to traumatic brain injury with raised ICP, acute subdural hematoma, compound comminuted skull fracture & ICH, between January January 2019 to December 2020 at Enam Medical College & Hospital, Savar, Dhaka. Data were collected in pre-designed data collection sheet and were analyzed using computer-based programme statistical package for social science (SPSS) windows version 25.*

Results: *This study showed maximum patients (34.2%) were between 21-30 years age. Majority were male (89.5%) and only 5.9% were female. Overall rate of complications was 10.5%. Among them new onset seizure (n = 4), indrawing of skin through bone gap (n=4), hemorrhage (n=2), infection (n = 1), HCP (n = 1), and exposed implant (n=1).*

Conclusion: *We have found the outcome of cranioplasty was better with titanium mesh plate and screw than conventional fixation of bone with polyglactin, polypropylene suture and titanium miniplate and screw. With polypropylene and polyglactin there is more chance of inward displacement of bone fragment and with miniplate and screw there is still chance of indrawing of bone fragment through the bone gap.*

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Introduction:

Cranioplasty is a common neurosurgical procedure to reconstruct a skull defect. It is commonly performed following a decompressive craniectomy (DC).[1] Other indications for cranioplasty include following the removal of bone-invading tumors or an infected boneflap.[2] Although cranioplasty (CP) is a straightforward procedure, a significant number of complications may occur, ranging from 10.5% to 50%. These include infections, seizures, intracranial hematomas, and rarely mortality.[3,4,5] Many reports have stated that early CP is associated with higher

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complications.[6-10] Studies examining the complications associated with cranioplasties mostly concentrate on the rate of infection.[11-16] Very little studies discuss the various complications that may be encountered when performing cranioplasties.[17] This study evaluated the outcome following cranioplasty with titanium mesh-plate and screw.

Materials and Methods:

This was a retrospective study. Permission was taken from the hospital authority to collect data. Patient who underwent cranioplasty between January 2019-December 2020 at Enam Medical College & Hospital, Savar, Dhaka was identified from medical record files. Patients who were lost in follow-up were excluded from the study. Duration of cranioplasty after decompressive craniectomy was about 3 months. Some patients were hospital bed ridden for long time, but we always sent them home for at least for 2 weeks for development of normal flora and limit the possibilities of hospital acquired infection. During home stay patients were without any antibiotic to facilitate the growth of normal flora. All the surgery were done with maximum aseptic precaution. We always prefer autogenous bone graft instead of hydroxyapatite or PMMA bone cement due to higher infection rate.[18] Patients autologous bone was collected from bone bank from our own institute and processed for sterilization. Further the graft was autoclaved 2 times. Previously we used mini plate and screw but now we use titanium mesh plate 2x4 inch and divide it into 4-6 small pieces as required. Number of screws- for bilateral cranioplasty were about 50, unilateral cranioplasty about 30 and for mini-cranioplasty 10-12. We placed suction drain- one in unilateral cranioplasty 2 in bilateral cranioplasty. Drain is placed in the most inferior cleft between temporalis muscle and the bone. In some cases, allogenic bone graft was used as autologous bone was discarded due to compound comminuted fracture with contamination. Allogenic bone graft was collected from Institute of Tissue Banking and Biomaterial Research of Atomic Energy Research Establishment, Savar. In some cases, with small bone gap was filled with allogenic bone dust which was also collected from same institute. We have found fixation of bones with titanium mesh plate and screw is much superior to miniplate and screw.

Data were collected in pre-designed data collection sheet. Data were analyzed using computer-based programme statistical package for social science (SPSS) for windows version 25.0.

Results:

Table-I

Mode of injury of study subjects

Mode of injury	Frequency	Percentage
RTA	29	76.31
Alleged physical assault	4	10.5
Fall from height	4	10.5
Drop of heavy object on head	1	2.6

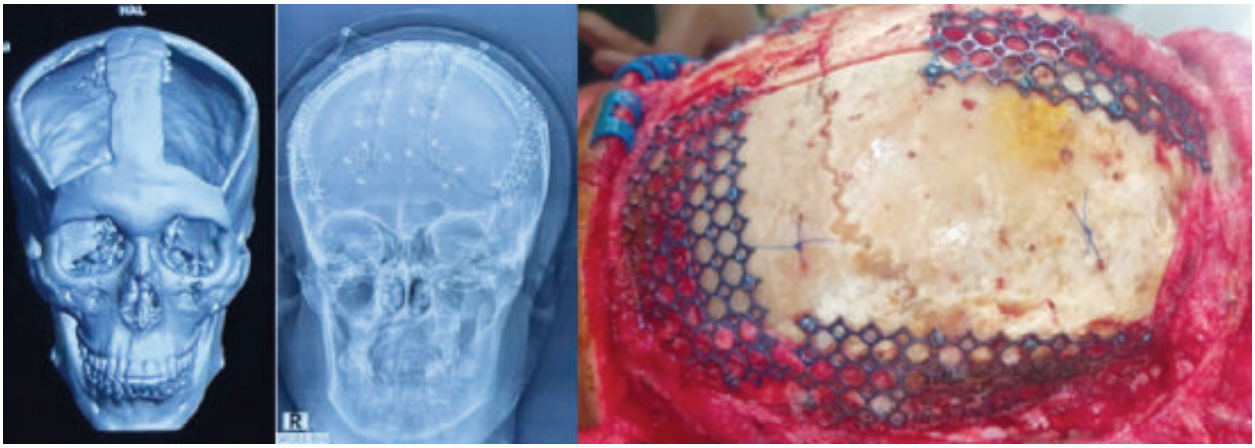

Fig.-1: *Pre-Operative CT scan showing bone gap of bilateral craniectomy (left), Post operative X-Ray Skull showing accurate placement of bone graft (middle) per-operative image of cranioplasty of a different patient showing bone gap and burr hole gap covered sufficiently with titanium mesh plate.*

Table-II
Type of Cranioplasty

Previous management	Frequency	Percentage
Unilateral Cranioplasty	17	44.7
Bilateral Cranioplasty	21	55.2

Table-III
Implants Used

Operation name	Frequency	Percentage
Mini Plate and Screw	4	10.5
Mesh Plate and Screw	34	89.5

Table-IV
Complications of study subjects (n=38)

Complication	Frequency	Percentage
Nil	34	89.5
Infection	1	2.6
HCP	1	2.6
New onset seizure	4	10.5
Exposed implant	1	2.6
Indrawing of skin through bone gap	4	10.5
Haemorrhage	2	5.3

Discussion:

This study shows maximum patients (34.2%) were between 21-30 years. The average age was 28.44±12.96 years. In a similar study Prasad et al.[6] reported the mean and median ages were 38.3 years (range 1–-68 years) and 38 years, respectively. We found majority were male (89.5%) and only 5.9% were female. These findings are in well agreement with other studies.[2,6]

This study shows road traffic accidents (RTA) were the most frequent causative event of traumatic brain injury. Since significantly more traffic accidents involved motorcycles (n=18) compared to other types of vehicles, motorcycle accidents should be analyzed separately from other traffic accidents. Similar findings also found in other studies.[3,4,5]

In this study overall rate of complications was 10.5%. There were 14 complications noted: new onset seizure (*n* = 4), indrawing of skin through bone gap (n=4), haemorrhage (n=2), infection (*n* = 1), HCP (*n* = 1), and exposed implant (n=1). These findings were consistent with Prasad et al.[6] Klinger et al.[19] , they analyzed 258 cranioplasties over a 10-years period and noted a 10.8% complication rate in their series. Other large studies that have shown the rate of complications in cranioplasties to be as high as 19.7 – 32%.[20-22] Most of these studies focused on the rate of infection and factors which contribute to it. It is however also important to understand and treat all the other different complications that might arise as cranioplasty has such a higher rate of complications.

We have found one exposed implant with infection. After surgery the patient did not come to follow-up. Possible factors of this complication include poor personal hygiene, inadequate nutrition, dressing and medication. This patient underwent re-exploration surgery.

Four patients suffered from indrawing of skin through the bone gap. The graft bones were fixed with titanium mini plates and screws. Al-though the bone gap was minimum but due to skin indrawing we subsequently fixed all the graft with titanium mesh plate and screw and did not find any complication. And also, we have found fixation of the graft is better than miniplate and screw and the bone gap was completely covered with the mesh plate.

Conclusion:

This study shows overall complication were 10.5% but infection rate was 2.6% and skin indrawing was 10.5%. The bone graft of all the patients with skin indrawing were fixed with miniplates and screws. To avoid these complications our recommendation was to use autologous bone graft as it has less chance of infection, and no implant related complication. We suggest to use mesh plate and screws instead of miniplate and screws as it limits the possibilities of skin indrawing and provides better bone fixation. We did not find such kind of complication in our series with mesh plate and screws.

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