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Primary and Delayed Management of Frontal Bone Fracture - A Single Centre Study

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Abstract: ***Frontal bone fractures are commonly caused by high velocity injuries and such strong forces may be associated with intracranial injury. Frontal bone contains the frontal sinus and fractures of only the outer table or both the tables. Various treatment option include observation, open reduction internal fixation with titanium miniplates, sinus exanteration (Reidel's procedure) sinus cranialization. But primary reconstruction of frontal sinus fracture should be attempted as and when possible to prevent later deformity. If deformity develops, only secondary correction is advisable using PMMA, hydroxyapatite, rib graft, iliac graft etc.***

Keywords: Frontal bone, Frontal Sinus Fracture, sinus cranialization, PMMA, Bone cement

1. Introduction

Frontal Sinus Fractures (FSFr) represent only 5-12% of all facial fractures. The frontal bone is not prominent as nasal bones and need high-energy trauma to be fractured[1]. Frontal bone fractures offer significant challenges to surgeons and the treatment paradigm has been debated for many years. If untreated, they look un-esthetic Acute concerns also includes protection of intracranial structures, identification of associated injuries and control of cerebrospinal fluid (CSF) leakage[2]. After clinical and radiographic evaluation of the fracture, prompt surgical intervention should be immediately instituted and bony coverage of the region by immediate reconstruction using titanium miniplates and if delayed, elevation and fixation becomes difficult. If frontal bone is comminuted, it is difficult to replace the small bony fragment by rigid bone plate fixation. In such cases, it is prudent to leave the bony fragments where they are and camouflage the defect[3].

2. Materials and Methods

Twenty patients presenting to the Plastic Surgery out-patient clinic at Chengalpattu Medical college and Hospital between August 2018 and February 2019 were examined and CT facial bone were done and analysed. All these cases were been evaluated pre-operatively for head injuries. Management according to the designed algorithm with primary or delayed frontal bone repair were done with the use of titanium miniplates. Patients presented with contour deformities were subjected to camouflage procedures.

Technique

15 cases were subjected to surgery within 24 hours of injury and 5 cases after a period of 168 hours. In most of the cases Midas Rex pneumatic drill system was used to detach the fracture segments, taking utmost care to prevent further damage of the underlying sinus. Application of fibrin glue and pericranial patch was performed wherever it was indicated.

Reconstruction of the fracture segments was carried out by using C-1 drill point of 1.2 mm size for fixation. The implants used to for reconstruction were titanium mini plates of 1.5 mm size and screws of either 1.5 x 6 mm or 1.5 x 8 mm size according to the need in each case . Finally the segment were replaced to maintain the primary contour, and achieved good cosmetic results.

Concept

The concept of primary and delayed reconstruction was to close the defect with titanium miniplates and screws and preserve the anatomical barrier and to prevent further complications like CSF leak, pneumocephalus. The second reason for rigid fixation was to achieve good cosmetic results.

Indication for Titanium Miniplate

The titanium miniplate were used in case,(a) fracture over lying frontal region producing cosmetic deformity, (b) fracture involving the basifrontal region producing instability and (c) grossly comminuted fracture with significant bone loss.

3. Results

Nineteen patients were male and one patient was female. Road traffic accident was the major mode of injury, encountered in 18 patients, followed by fall from height and assaults(Table 1). The age ranged between 25 to 50 years. All patients were conscious with Glasgow coma scale of 13-15, at the time of admission. CT facial bone and brain scan were done, which revealed fracture involving depressed fracture frontal bone involving outer sinus plate region in 18(90%)patients and fronto-parietal region in 2(10%) patients (Table 2).

Simple depressed fractures with no underlying pathology were noticed in five patients. Compound depressed fractures

with underlying pathology like haematoma were noted in 15 patients.

Table 1: Incidence of aetiology of Frontal Sinus Fracture

No of Patients	Aetiology
18(90%)	Road Traffic Accident
01(5%)	Fall from height
01(5%)	Assault

Table 2: Patients descriptive data

No of patients (%)	CT Scan Findings
18(90%)	Frontal bone fracture involving outer sinus plate
02(10%)	Fracture involving fronto-parietal region

Twenty (100%) cases underwent titanium miniplate fixation. In one(5%) patient, apposition of bone was done by using nylon suture /titanium wire.

The correction of deformity was up to an acceptable level, which is more than 95% correction as compared to contra lateral site inspite of 5 patients undergoing delayed reconstruction. A better cosmetic result was noticed whenever miniplate was used. Infection and plate rejection was not observed in this study.

Figure 1 (a): Pre-op picture showing sutured wound over the glabella

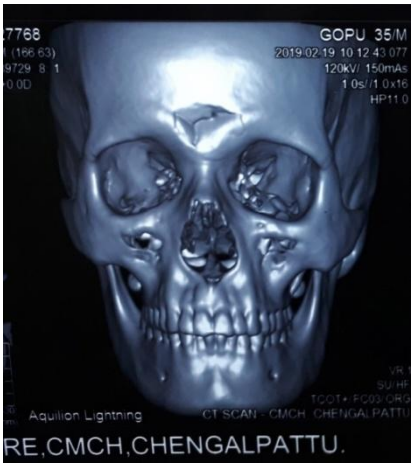

Figure 1 (b): CT facial bone showing depressed Frontal bone involving outer sinus table

Figure 1 (c): Intra-operative showing depressed elevated and fixed with titanium plate and

Figure 1 (d): Depressed Frontal Sinus Fracture frontal sinus fracture Screws

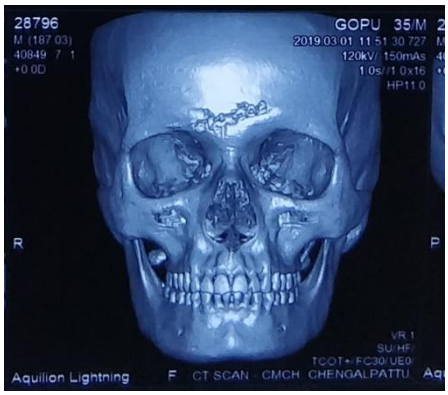

Figure 1 (e): Post-op CT Facial Bone

Figure 1 (f): Post-op picture

Figure 2 (a): Pre-op picture

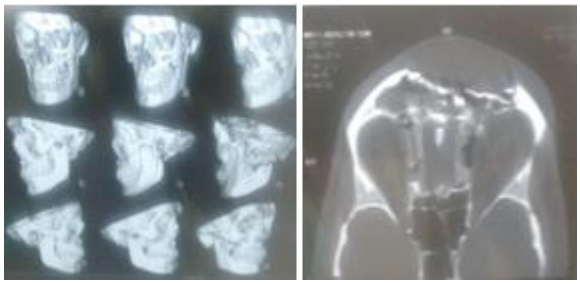

Figure 2 (b): (i) Depressed fracture of the frontal sinus (ii) Axial View

Figure 2 (c): Markings of the coronal incision

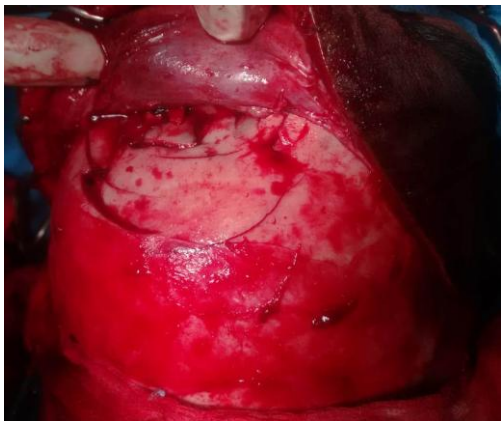

Figure 2 (d): Intra-operative showing depressed fracture Frontal bone

Figure 2 (e): Post-op picture

4. Discussion

Frontal sinus region is the forehead region and below the eyebrow so any fracture with depression results in cosmetic defect easily visible, so early surgical correction is important as delayed correction is difficult and may require contour correction surgery later which is cumbersome and time consuming.

It is very rare for post craniofacial trauma patients to require augmentation of depressed craniofacial skeleton. Reconstruction and recontouring of these defects in natural esthetic fashion can pose a challenge to plastic surgeons and also more dangerous complications such as the risk of infections like meningitis, mucocele, encephalitis and cerebral abscess.

Hence the necessity to recognize precociously and rightly the type of fracture and the intervening involvement of the adjacent structures in order to perform a proper surgical treatment according to the specific case, thus reducing the risk of infectious-related complications and either functional or aesthetical alterations at minimum[2]. To repair simple frontal bone fractures of the skull, wire ligatures are usually sufficient. However, complex depressed frontal sinus fractures of the skull in which the bone is smashed into several fragments are difficult to reconstruct by wiring, bone fragments tend to be mobile and may result in deformed appearance[4].

The authors have used bone fragments combined with titanium miniplates to repair depressed frontal sinus fracture using 1.5 mm size plate and precautionary use of either 1.5 x 6 mm or 1.5 x 8 mm size screws so as to not penetrate the sinus and thus avoid infection and later on discharging sinus.

The aim of frontal sinus fracture management is to create a safe sinus, restore facial contour similar to its original appearance, and avoid short and long term complications. In this study we achieved an acceptable cosmetic results in correcting the deformity, which is more than 95% correction as compared to contra lateral site, in spite of 5 patients undergoing surgery after a period of 168 hours..

Although various algorithms and protocols have been proposed for the management of frontal bone fractures treatment planning must be done on an individual basis

focussing on physical examination and data from computed tomography scans.

5. Conclusion

The management of frontal sinus fracture continues to challenge plastic surgeons because of the low incidence of injury and the absence of good data supporting clinical decision-making. Primary reconstruction of depressed frontal sinus fracture segment should be attempted whenever possible and if the repair is delayed elevation and fixation by titanium plates and screws becomes difficult and may require contour correction surgery later.

References

[1] Amir El-Barbary,M.D.; Khaled El-Gazzar, M.D. and Eman Yahya Sadek, M.D. Management Algorithm for Delayed Complications of Frontal Sinus Fractures. Egypt, J. Plast. Reconstr. Surg., Vol. 40, No. 2, July: 197-205, 2016.
[2] Surya Rao Rao Venkata Mahipathy, Alagar Raja Durairaj, Narayanamurthy Sundaramurthy, James Solomon Jesudasan. Frontal bone fracture- a report of three different methods of fixation. Int Surg J. 2017 Sep;4(9):3162-3165.
[3] J. K. Dayashankara Rao, Vijaylaxmi Malhotra, Ravi S. Batra, and Abhishek Kukreja. Esthetic correction of depressed frontal bone fracture. Natl J Maxillofac Surg. 2011 Jan-Jun; 2(1): 69–72.
[4] P K Nayak M Ch, A K Mahapatra M Ch. Primary reconstruction of depressed skull fracture - The changing scenario. Indian Journal of Neurotrauma (IJNT) 2007, Vol. 5, No. 1, pp. 35-38.