

Case Report

Interesting Case of Pan facial Fracture

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Background : Pan Facial Fractures to the facial region are common in Road Traffic Accidents. The association of fractures extending into the surrounding structures (Skull) should not be neglected. Duty Medical Officers should be aware of the life-saving initial management and stabilization of the patient in Pan Facial Fractures.

Case Report : We report here an interesting case of Pan Facial Fracture and its management and outcome.

Conclusion : Duty Medical Officers should be aware of Pan Facial Fractures. Increasing incidence of High-velocity injuries in Road Traffic Accidents causes a higher rate of Pan facial injuries in association with head injuries. Early reconstruction with the precision of facial bones injury and fractures with buttresses provides good results anatomically, surgically, functionally and cosmetically. With the establishment of advanced trauma care in all institutions in one state, it's mandatory to know about Pan Facial Fractures and their management.

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Key words : Pan Facial Fracture, Road Traffic Accidents, Buttresses, Open Reduction and Internal Fixation.

Global status report on Road Safety (2015) states that 15-20 million injuries and more than 1.25 million deaths occur in Road Traffic Accidents (RTA)¹. In India according to the Ministry of Road Transport and Highways (2019) the total number of accidents was 4,49,002, of which 4,51,361 injuries and 1,51,113 deaths were reported². Drunken drive and high speed have been shown to increase RTA. Social factors ie, interpersonal violence is also a cause of Pan facial injuries. Pan Facial Fractures are fractures involving the upper third, middle third and lower third of the face³. Fractures of the frontal bone, maxilla, zygomatic complex, Naso-ethmoid Orbital (NEO) region are more common⁴. Bony buttresses - Vertical and Horizontal, define the vertical height, width of the face and provide the bony support required for mastication⁵. We share our experience in managing an interesting case of Pan Facial Fracture.

CASE REPORT

53-year-old male came with an alleged history of RTA. The patient had sustained a head injury along with injuries to the face, right hand and left forearm referred from a private hospital.

Examinations — Patient conscious, oriented, Blood Pressure-120/80 MmHg, Pulse-70/Min, Saturation- 97% after stabilization, Patient had left subconjunctival hemorrhage, B/L cheek swelling with tenderness, b/l maxillary, frontal, ethmoid sinus tenderness present. He had multiple abrasions over the chin, sutured wound over the right 2nd finger, abrasions over the left forearm.

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Editor's Comment :

- Early primary stabilization should be done in the golden hour which is life-saving and provides a better outcome for the patient.

Initial management was based on the Algorithmic protocol of Advanced Trauma Life Support (ATLS)⁶. This patient (Fig 13 - pre-operative picture) belongs to pan facial fractures and was managed under anesthesia with implants (miniplate, compression plate)^{7,8}. CT scan Brain-plain showed the normal study. CT scan findings showing multiple Pan Facial Fractures along with Temporo-mandibular Joint (TMJ) dislocation are listed in Table 1, CT scan 3-dimensional images showing multiple fractures are shown in Figs 1,2. CT scan showing b/l TMJ dislocation (Figs 3a & 3b), Fractures of the mandible (Fig 4), Maxilla (Fig 5), Nasal Bone (Fig 6), Hard palate (Fig 7), Orbit (Fig 8).

Procedure — Under Anaesthesia, the patient was placed in the supine position, parts painted and draped, eyelet wiring/IMF done. Through the extraoral approach, fracture site left parasymphysis mandible exposed, reduction done and fixed wiring was done with 5-hole plate and 4-hole plate with screws. Through Intra Oral approach fracture maxilla exposed in the gingiva-alveolar sulcus, a reduction is done and fixed with a 3-hole plate with screws, open reduction and internal fixation was done to the hard palate and closed (Fig 12). Through the Infra Orbital approach, Blowout orbital fracture was exposed on both sides, herniated contents (Fig 9) reduced and floor of orbit repair was done with prolene mesh (Fig 10).

Fracture right orbit wall fixed with 2hole plate with screws. IMF in situ. No CSF Rhinorrhea was seen, frontal sinus fracture was managed conservatively. Comminuted nasal bone fractures closed reduction done. Complete hemostasis obtained, wound closed in layers. The list of Pan Facial Fractures and their management are in Table 2.

Postoperatively the patient (Fig 14) was treated with Intravenous (IV) fluids, IV antibiotics, IV antiemetics,

Table 1 — CT scan plain (axial) findings showing multiple Pan Facial Fractures are listed below

| Bone | Type of Fractures | No of Fractures |
|----------------|--|-----------------|
| MANDIBLE | Comminuted displaced fracture noted at the left Para symphysis Menti with B/L TM Joint dislocation | 1 |
| MAXILLA | Comminuted fractures are seen in anterior, medial, posterolateral walls of the B/L maxillary sinus. | 6 |
| SPHENOID | Comminuted fractures seen on B/L medial and lateral pterygoid plates | 4 |
| HARD PALATE | Linear displaced fracture seen in left paramedian hard palate extending into the alveolar process of the anterior maxilla | 1 |
| NASAL BONES | Comminuted fractures are seen in B/L Nasal bones and nasal septum | 4 |
| BONY ORBIT | Blow out fracture seen in the floor of both orbits with herniation of orbitalfat into B/L maxillary sinus. Comminuted fracture at the medial and superior wall of both orbit and lateral wall of the left orbit. | 6 |
| ZYGOMATIC BONE | Fracture is seen in the left zygomatic arch | 1 |
| FRONTAL BONE | Comminuted displaced fractures are seen in anterior and posterior walls of the frontal sinus | 2 |
| NASO-ETHMOID | Comminuted displaced fractures are seen in the roof of the ethmoid and B/L fovea ethmoidalis | 3 |
| TOTAL | | 28 |

analgesic, antihistamines, anti-inflammatory drugs. Supportive care was given. The patient was doing well and was discharged in a good condition at the time of discharge.

Fracture classification¹⁴. In 1998 Hendrickson classified palatal fractures¹⁵.

Pan facial fractures are the combination of fractures

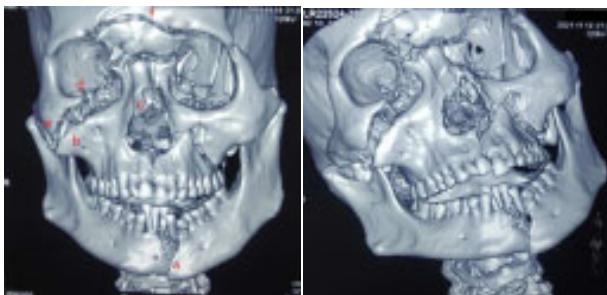


Fig 1 — 3-dimensional CT scan frontal view showing pan facial fractures of Mandible(a), Maxilla(b), Sphenoid, Hard Palate, Nasal Bone(c), Bony Orbit(d), Zygomatic Bone(e), Frontal Bone(f), Naso-ethmoid Bone

Fig 2 — 3-dimensional CT scan Oblique view showing pan facial fractures of Mandible, Maxilla, Sphenoid, Hard Palate, Nasal Bone, Bony Orbit, Zygomatic Bone, Frontal Bone, Naso-ethmoid Bone

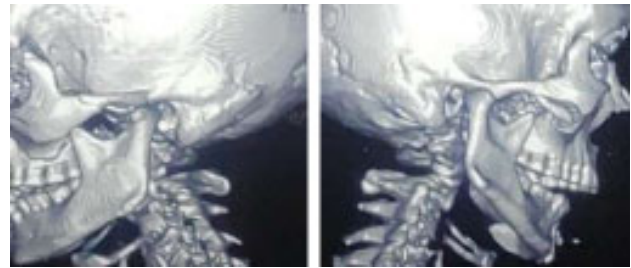


Fig 3a & 3b — CT scan Facial bones lateral view finding showing B/L TMJ Dislocation

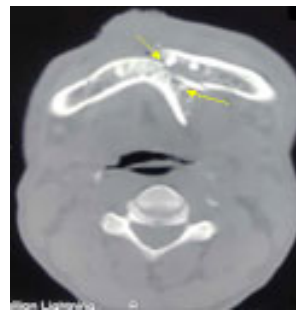


Fig 4 — mandibular fracture

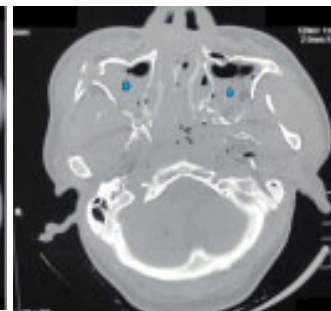


Fig 5 — maxilla fracture with B/L Haemosinus (blue-dot) CT scan Axial section showing

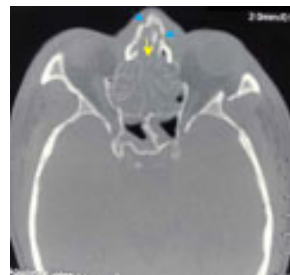


Fig 6 — Nasal bone fracture and nasal septum

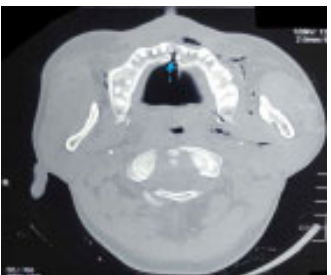


Fig 7 — Hard palate

mainly involving the upper third, middle third, and lower third of the face³. Initial management was done according to the algorithmic protocol of Advanced Trauma Life Support (ATLS)⁶.

Table 2 — Pan Facial Fractures and their management are listed below

| Fracture | Management |
|-------------------|---|
| Orbital floor B/L | Open Reduction and Internal Fixation, Herniated contents reduced and prolene mesh placed in situ. |
| Maxilla | Open Reduction and Internal Fixation (ORIF). |
| Mandible | Open Reduction and Internal Fixation. |
| Zygomatic bone | Open Reduction and Internal Fixation. |
| Nasal bone | Closed reduction. |
| Naso-Ethmoid | Reconstruction. |
| Frontal | Conservative. |
| Sphenoid | Conservative. |
| Hard palate | Open Reduction and Internal Fixation, Palatal repair was done. |

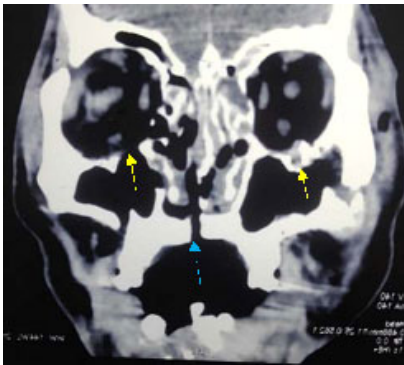


Fig 8 — CT scan coronal section frontal view showing Orbital and Hard palate fracture



Fig 9 — Blowout left eye orbital floor fracture with herniated content (fat- yellow arrow) into the left side maxillary sinus



Fig 10 — Left eye prolene mesh repair done and Prolene mesh (yellow arrow) placed in situ

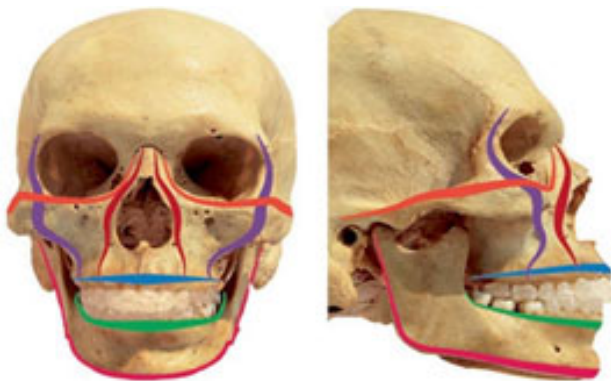


Fig 11 — Facial skeleton buttresses²⁰

| Table 3 — Horizontal and vertical buttresses of face ¹⁹ | |
|--|-----------------------|
| Vertical buttresses | Horizontal buttresses |
| Nasomaxillary (red) | Frontal (orange) |
| Zygomaticomaxillary (purple) | Zygomatic (orange) |
| Pterygomaxillary | Maxillary (blue) |
| Condyle and posterior mandible (pink) | Mandibular (green) |

Epsteen and Dingman¹². The importance of this relationship to the cranial base was finalized by Ferret, *et al* in 1993 Marciani modified Lefort's¹³.

Buttress — Buttresses are the regions of thick bones that neutralize the forces applied to them¹⁶. The proper outcome of maxillofacial reconstruction in terms of restoration of facial height, width and projection in addition to restoring the occlusion depends upon the proper reduction of buttresses^{17,18}. Vertical and horizontal buttresses should be established and fixed before the orbital wall and rim correction¹⁸. The vertical and horizontal buttresses of the face are shown in Table 3 correlates with Fig 11 showing markings of facial skeleton buttresses^{19,20}.

DISCUSSION

At first, French Surgeon Rene Le Fort (1901) described Standard fracture patterns classically as Le Fort 1,2,3 and the lines of weakness in the midface⁹. Later Cryer in 1916 made descriptions of buttresses¹⁰. Vertical pillars and horizontal buttresses Illustrations were also made¹¹. Palatine and maxillary fractures are important for the structural stability of the midface which was described by



Fig 12 — Hard palate fracture reduced and sutured.



Fig 13 — Preoperative picture of the patient.



Fig 14 — Postoperative picture of the patient

Sequencing — There are two approaches for sequencing, (1) Bottom to Top or Inside out. (2) Top to Bottom or Outside in^{21,22}.

In this case, we have done the bottom to top approach with reduction and rigid fixation using occlusion as a guide. Dental Occlusion was maintained by Intermaxillary Fixation (IMF) and eyelet wiring²³. The fracture mandible was repaired first which was used as a guide for the establishment of height, width and projection of the lower face. The mandible was exposed through an extraoral approach that will facilitate the repair and minimize the risk of intraoral dehiscence. Mandibular buttresses along the left para symphysis menti are fixed with a 5-hole plate and 4-hole plate with screws made up of Titanium⁸. Temporomandibular joint was reduced along the condyle and posterior mandibular vertical buttresses. Through intraoral approach maxilla was exposed in the region of gingiva alveolar sulcus along the maxillary horizontal buttresses, the hard palate fracture which is linearly displaced in the left paramedian region extending into the anterior maxilla is reduced, approximated, and restored providing a Le Fort 1 level fixation with 3-hole plate with screws and palatal repair was completed. Our goal of fixing the mandibular maxillary unit as a single block to articulate with the skull base to restore the spatial relationship between them was achieved and proper occlusion was restored²⁴. In mid-face thicker bone for fixation is seen in the lateral and medial zygomatic maxillary buttress, whereas the central area over the maxillary sinus in the zygomatic horizontal buttress is thin and tends to fracture usually, so screw fixation is not done routinely in the central region²⁵. Through infraorbital approach along the zygomaticomaxillary vertical buttress and zygomatic horizontal buttress blow out orbital fracture exposed on both sides, herniated contents are reduced, orbital floor repair completed with prolene mesh. Midface height, width, and projection was restored. Frontal Bone Fracture and sphenoid bone fracture was managed conservatively. The postoperative period was uneventful and the patient was discharged in a good condition.

Complications — Usually in Pan Facial Fractures we may expect, Immediate-Bleeding, CSF Rhinorrhoea or Otorrhea, Intermediate-Infection, Foreign body reaction.

Late-Palatal fistula, Telecanthus, Enophthalmos, malunion, Nonunion, Wound dehiscence.

In our case there was minimal bleed, no CSF rhinorrhoea and no signs of infections were seen.

Points to be Noted :

- (1) Pan Facial Fractures are usually associated with a head injury and the patient may need ventilator support.
- (2) Documentation of injury details is needed for medico-legal reasons.
- (3) Explanation about the outcomes of surgery to the patient's relatives.
- (4) Patient's photograph prior to injury acts as a guide for the surgeon in treatment goals. A preoperative and postoperative photograph is a good practice for documentation and comparison.
- (5) Before orbital walls and rim correction vertical and horizontal buttresses are established and fixed.
- (6) In fractures involving Fronto nasal orbital ethmoid region (FNOE) attention is to be paid to soft tissue repair. Delayed and inadequate FNOE complex fractures treatment leads to complications.
- (7) For proper occlusion mandibular and maxillary fixation is mandatory.
- (8) In fractures involving Orbital walls forced duction test is necessary before and during surgery.
- (9) Look for prolapse of orbital floor contents, CSF rhinorrhoea, Facial nerve paralysis, Trigeminal nerve Injury, Infraorbital paraesthesia, neurological complications, different modalities of management.

CONCLUSION

Early primary intensive care and stabilization should be done in the golden hour which is life-saving and provides a better outcome for the patient. Duty medical officers should be aware of airway compromise, Nasal bleed, Alveolar bleed, Tongue injury, Head injuries, Cervical spine injuries associated with Pan Facial Fractures. Sequencing of the Pan Facial Fracture management depends more on the clinical situation than predefined algorithms, as in Pan Facial Fractures there will be different clinical presentations. Alignment of buttresses is very important to provide a 3 dimensional functional and cosmetic correction for the patient.

Conflict of Interest : None

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