



Research Article

OUR EXPERIENCE WITH CORONAL APPROACH TO PAN FACIAL FRACTURES

*Dr Sunil Vasudev, Dr Gowrishankar R, Dr Sahana M S and Dr Bhumika R

RV Dental College, CA-37, 24th Main Rd, ITI Layout, 1st Phase, J. P. Nagar, Bengaluru, Karnataka 560078

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ABSTRACT

Pan facial trauma in our field poses a clinical challenge right from its inception in diagnosis to its approach due to lack of clarity amongst surgeons regarding various principles and protocols. Advanced imaging from 3D reconstructions provide a at par level idea into the real of complex fractures but fail when clinically opened by the surgeon. One way to avoid mulitple scars and provide satisfaction to the patient as well as the surgeon is in applying an old but simple technique being the bicoronal approach. A mix of top to bottom and inside out approaches also pave way to a new advent in apporaching pan facial trauma. Our case report shows the simple use of a coronal flap, although very technical and complicated, showed almost no post operative complications with satisfactory results.

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INTRODUCTION

Traumatic panfacial fracture repair is one of the most complex and challenging reconstructive procedures to perform. Several principles permeate throughout literature regarding the repair of panfacial injuries in a stepwise fashion. The primary goal of management in most of these approaches is to restore the occlusal relationship at the beginning of sequential repair so that other structures can fall into alignment. [1]

The craniofacial skeleton can be divided into three main bony subunits: the frontal bone, the midface, and the occlusal unit. Panfacial trauma involves two or more of these regions, typically from a high-energy injury such as a high-speed motor vehicle collision, a fall or jump from three or more stories, a severe crush injury, or a close-range gunshot wound. These can be distracting injuries in an unstable patient and, as in any trauma, Advanced Trauma Life Support (ATLS) protocols should be followed. The airway should be secured, bleeding controlled, and sequential examinations should take place to avoid overlooking injuries. [2]

There can be significant edema or packing within the nose in combination with mandibular–maxillary fixation that also leads to concern about maintaining airway patency. Submental intubation has been shown to be a safe approach with the tube out of the way, but the postoperative issues in regards to nasal packing and mandibular–maxillary fixation still exist. A tracheostomy allows the tube to be away from the structures being repaired and also has postoperative control of the airway. Of course, there are concerns about postoperative tracheostomy-related complications; however, the risk of tracheostomy is relatively low when compared with the risk of airway management postoperatively.

Once the airway has been established, the repair of panfacial injuries follows a systematic approach. There are different philosophies about inside-out or bottom-up versus outside-in or top-down approaches. The inside-out thought process is reconstructing the maxillary–mandibular unit as the first major step and then focusing on the midface structures. This would allow the occlusal relationship to be restored and then “built out” from that process. The outside-in, or top-down, mentality would be reconstructing the outer facial frame and the bony pillars, such as the zygomatic arch and the frontal areas, and then addressing the interfacial frame.^{3 4} These two thought processes have permeated the literature and teaching for decades. In actuality, the best course of action is to follow a combined process. The primary goal would be to restore the occlusal relationship and then the spatial relationship between the occlusal structures and the skull base [1]

Coronal scalp incisions have been widely used by neurosurgeons for various intracranial and extra cranial acc ss and has been incorporated by maxillofacial surgeons in their repertoire of surgical approaches for accessing and treating upper mid face fractures.

It was first described by Hartley and Kenyon in 1907, and two decades later was advocated by Sachs for bilateral frontal lobe exposure. Tessier and later Henderson and Jackson started using it for Lefort II and III Osteotomies and gained popularity among maxillofacial surgeons for to establish facial projection established the role of coronal incision to expose the zygomatic arch for accurate reduction and fixation.

Coronal incision in the hair bearing scalp effectively hides the incision and allows wide and adequate exposure of the upper mid face including frontal, Nasal, Medial nasoorbitothmoid (NOE), roof, lateral and medial wall of orbit, zygomatic body

*Corresponding author: **Dr Sunil Vasudev**

RV Dental College, CA-37, 24th Main Rd, ITI Layout, 1st Phase, J. P. Nagar, Bengaluru, Karnataka 560078

and zygomatic arch. This wide exposure provided by the coronal approach allows surgeons to adequately visualize and reduce complicate fractures of upper mid face in all three dimensions thus restoring the facial width, height and sagittal projection. [5]

Here, we discuss a case of panfacial trauma treated by tracheostomy followed by bicoronal approach for extensive reduction and fixation.

CASE REPORT

A 40 year old man reported to Fortis Hospital, Bannerghata road with an alleged history of a road traffic accident and sustained injuries to the face. He was diagnosed with fractures of the mandible, bilateral maxilla, bilateral nasal bones and bilateral zygomatico maxillary fractures (FIGURE 1). Clinical parameters showed low and consistently dropping hemoglobin from initial value of 13.9 to 8. Patient was intubated orally at the primary hospital and was later shifted to Fortis. Clinical presentation of GCS was 5/15 and was then shifted to the Medical intensive care unit and was stabilised, ventilated and paralyzed.

Patient was given 3 units of packed red blood cell transfusion with no reactions. A call on tracheostomy was taken and the patient underwent percutaneous tracheostomy for the same post which he was taken up for surgery.

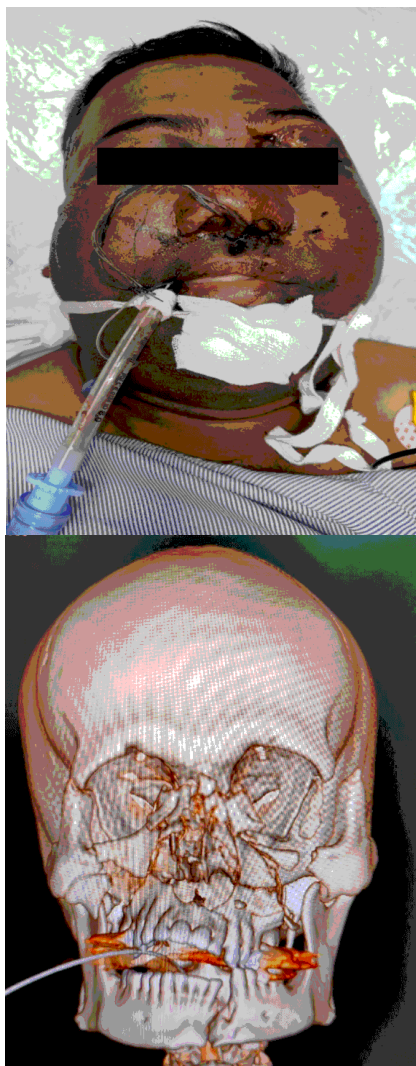


Figure 1 Pre Operative Presentation

Surgical Procedure

General anaesthesia was achieved via the tracheostomy tube. Painting and drapping was done following standard aseptic protocols. 2 % lignocaine with 1:80,000 adrenaline was injected to the proposed surgical sites.

A bicoronal incision was placed and the surgical site exposed. Fixation of the frontozygomatic region bilaterally followed by the supraorbital regions were accomplished. This was followed by the plating of the right zygomatic arch. Plates used were 1.5mm in profile (FIGURE 2). This was followed by maxillomandibular fixation with the maxilla being fixed last.

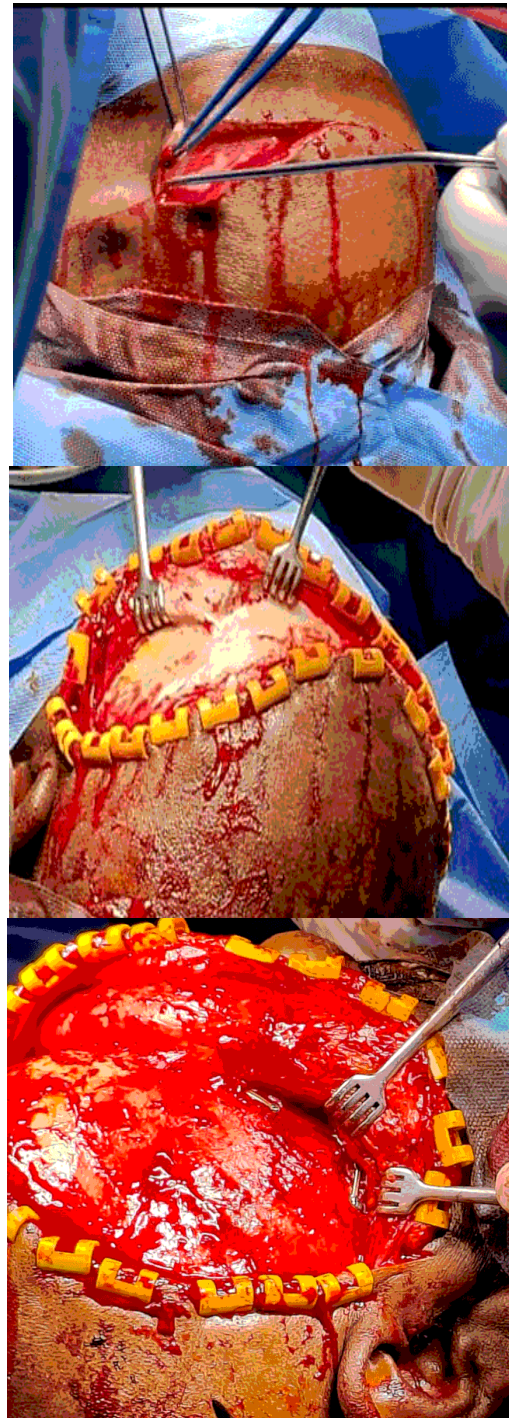


Figure 2 Bicoronal Incision Followed By Supraorbital And Frontozygomatic Suture Plating

Arch bars placed in both the jaws followed by intermaxillary fixation with wires was done.

Vestibular incision placed in the lower labial vestibule and fixation of the parasymphysis fracture was done using 4 holed plates with gap with a profile of 2mm (Figure 3).



Figure 3 Mandibular Plating with 2mm Profile Miniplates

This was followed by bilateral maxillary vestibular incisions placed to view to fracture complexes. Plating of bilateral maxillae with 1.5mm profile plates followed by 2mm profile plates in the zygomatic buttress to achieve stabilisation of the zygomaticomaxillary complex was achieved. Finally, bilateral infraorbital incisions placed and fracture sites fixed using 1.5 mm profile orbital plates (FIGURE 4).

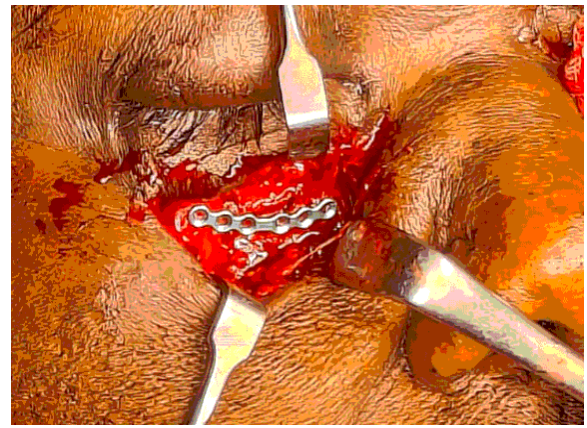
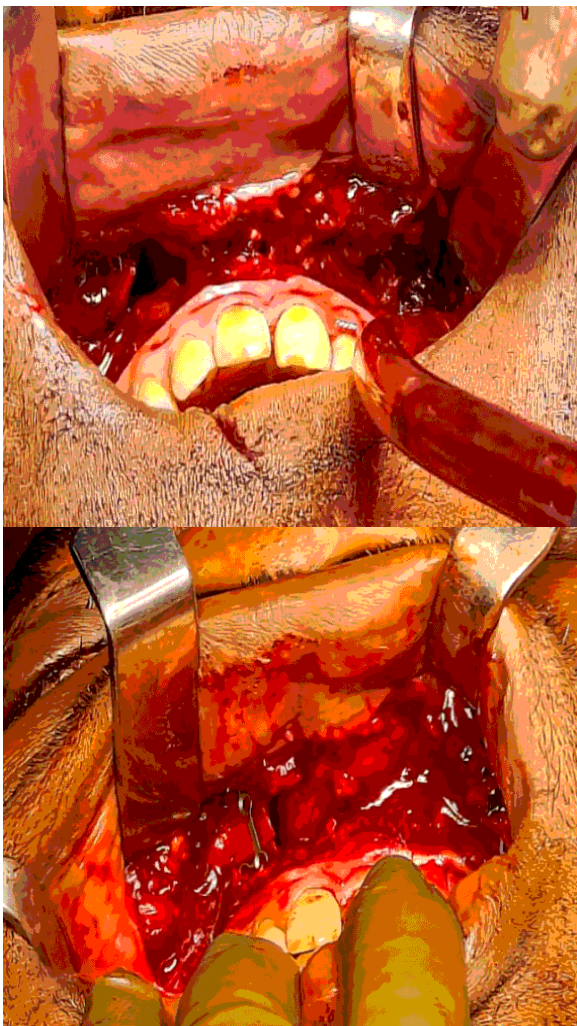


Figure 4 Bilateral maxillary vestibular plating and infraorbital fixation in order to stabilise the pre operative maxillary dysjunction

Closure was achieved by 4-0 vicryl intraorally and 5-0 prolene in the infraorbital region. Bicornal flap was secured by using staples. Patient was shifted to recovery uneventfully.

DISCUSSION

Most controversies in pan facial fractures are brought down to sequencing of surgical repair. The key to sequencing in panfacial fracture management is to understand both the principles of buttress reconstruction and the need for restoring the spatial relationship of the occlusion in the skull base. With panfacial fractures, there is a compromise of the mandibular–maxillary unit and the relationship between these two structures and the skull base. The midface is also violated with the loss of key components necessary for anatomical alignment. For example, the repair of mandibular–maxillary fractures often will rely on the stable structure of the upper face and vice-versa. With panfacial fractures, there is a loss of the customary structures for anatomical alignment. The sequencing that will be described assumes that all of the structures have been violated with the loss of anatomical stability. If there are any components that are minimally injured or not fractured, those can be assumed as “repaired” in the sequencing structure. [1]

Following a thorough craniofacial examination, CT imaging is the preferred way to diagnose bony facial trauma. For panfacial trauma, where there is loss of many reference points in the axial, sagittal, or coronal views, three-dimensional (3D) reconstruction of CT scans is critical. Identification of fracture patterns directs the operative protocol, as we work from the known and stable bony structures to reduce the unknown and unstable bony structures.

The facial skeleton consists of multiple bones that form a vertical and horizontal buttress framework. There are five horizontal buttresses: supraorbital bar, infraorbital rims and zygomatic arch, lower maxillary and palate, upper mandibular, and lower mandibular buttresses. There are four paired vertical buttresses: posterior vertical mandibular, pterygomaxillary, maxillary-zygomatic-frontal, and the medial maxillary naso-frontal buttresses. [2]

When geometry of dental arches is disturbed Kelly et al suggested reducing hard palate as guide for mandibular reconstruction. Gruss et al advised reduction of zygomatic arch and malar projection first to reestablish the “Outer facial frame” before NOE or “Inner facial frame” is reduced.

Merville recommended “Top to Bottom” sequence in 1974 if NOE was involved in panfacial fracture. Tulio and Sesenna believed establishment of condyles together with mandibular arch is the appropriate first step. [3]

Some authors recommend that surgical correction of facial fractures be performed immediately after completion of cranial repairs. They advocate the reduction and fixation of complex injuries within 48 h when initial edema has resolved and a thorough clinical and radiological exam has been completed. For patients who are medically unstable because of associated neurologic or systemic injuries, facial fracture repair may have to be delayed beyond a reasonable time. A delay of 2 weeks for definitive repair increases the difficulty in obtaining adequate reduction of fracture dislocations. Carr and Mathog believe bone healing beyond 3 weeks is in a “grey stage”—the edges of the fragment begin to absorb and remodel, which makes it very difficult to obtain anatomic reduction. This can lead to bone malunion, delayed union, nonunion, and bone defect. Quick management is also critical within 10 days because soft-tissue stiffening and interfragmentary healing make delayed corrections very difficult. [4]

Coronal approach to upper midface provides the best possible wide exposure required to reduce and fix the bones of upper midface in frontal, NOE and comminuted ZMC fractures. Multiple fractures of zygomatic arch with periosteal tear are unstable after closed reduction and lead to cosmetic deformity which is not tolerated by younger patients and also cause functional impairment of mandibular movements.

Some authors also suggest patients desire to not have facial incisions as indication for coronal approach as the incision scar in hidden inside hair and there is no visible scar on face.[5]

The usual complications seen with coronal flaps are hematoma which was not encountered. A 4.8% infection rate as standard is seen and in our case it was hospital acquired and treated with broad spectrum antibiotics after precise culture and antibiotic sensitivity was performed. Dehiscence of incision site usually occurs due to either failure to approximate the incision or infection at suture site. Closure of scalp layer with staplers led to better approximation and hence no dehiscence in our case. The technique we used combined both the inside out and top to bottom approach wherein, the frontozygomatic and supraorbital fractures were fixed primarily from above to the maxillomandibular complex fixed next from inside to out. Hence, always following a fixed protocol may not be as feasible or even ideal as the conglomerate of different principles being inculcated, as per the demand of each case. On recovery the patient had restored facial height, facial profile and width, patent airway with normal vision and extraocular movements. No aesthetic complications were encountered and patient had no other post operative incidents [Figure 5].



Figure 5 Post Operative Immediate Vs 3 Months

CONCLUSION

Panfacial fractures are complex and require timely intervention, astute planning and careful initiation of the right treatment protocols. From the airway to the general stability of the patient, pan facial fractures span weeks of personnel requirements and an accurate record of progression of events. During surgery, one might look for alternatives that are easy to convene and at the same time meet the patient's expectations. One such approach would be the bicoronal flap. The surgical field is enhanced for the surgeon to perform and follow the

principles of pan facial fixture as deemed necessary without significantly causing surgical site morbidity all of which hides the scar in the hairline and ensuring minimal aesthetic scar.

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