

## Treatment of Zygomatic Complex Fractures Using Two Point Fixation under General Anaesthesia

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**Abstract:** To evaluate the advantages and efficacy of two point mini plate fixation for the zygomatic complex fractures using lateral eye brow and infra orbital approaches for fixing the fronto zygomatic fracture and infra orbital fracture. The zygomatico-maxillary complex functions as the principle buttress of the face and is the cornerstone to an individual's aesthetic appearance. The zygomatic complex also helps in transmitting the occlusal forces to the skull base. Zygomatic complex fractures are one of the frequently occurring maxillofacial injuries owing to its position and facial contour. Assaults, road traffic accidents and falls are the common causes leading to fracture of the zygomatic bone. Displacement of the fractured fragments leads to aesthetic and functional disturbances. Thorough anatomical knowledge is required to correct the deformity in a better way. Treatment modality is based on the type and severity of the fracture.

**Key words:** Zygomatic Complex • 2-Point Fixation • Fronto Zygomatic Region • Infra Orbital Rim • Mini Plates

### INTRODUCTION

Zygomatic bone also known as malar bone provides prominence to the cheek region owing to its convex external surface. ZMC fractures are one of the most frequently seen facial injuries due to its lateral prominence and articulation of zygoma with other facial bones [1, 2].

Displaced Zygomatico-Maxillary Complex (ZMC) fractures can lead to visual and ocular disturbances, malar flattening and disturbed or deranged occlusion. Closed reduction without surgical incisions doesn't provide satisfactory stability and results in displaced zygomatic complex fractures [3]. In 1909, Keen was the first to describe an intra oral upper buccal sulcus incision to elevate and reduce the zygomatic complex. Gillie's in 1927 described the extra oral temporal approach to reduce the depressed zygomatic bone. Treatment of fractured zygomatic complex should be aimed at restoring the aesthetics and function. Biomechanically, the fractured zygoma has six possible directions of motion: translation across X, Y and Z axis; rotation about X, Y and Z axis. Various surgical techniques have been used for reducing and fixing the fractured ZMC. One of the topics of

controversy here is the amount of fixation required to accurately stabilise and prevent the displacement of the zygomatic complex post operatively. In our study, patients were evaluated in terms of post operative stability, aesthetics, restoration of function using two points of fixation achieved through lateral eye brow incision and infra orbital incision.

### MATERIALS AND METHODS

Twenty patients who fulfilled the inclusion criteria of displaced ZMC fracture, restricted mouth opening, malar depression and patients with paresthesia of the infra orbital nerve with fractured zygomatic complex were selected for the study. Study duration was from Jan 2012 to July 2013. Institutional Ethical committee clearance was taken for the study (SBDCECM 104/13/24). Informed written consent was obtained from all the patients. Detailed medical history of the patients was taken at the time of admission.

All the patients were treated with two point fixation at the fronto-zygomatic suture region and infra-orbital rim region after being elevated through keen's intraoral

technique. The fracture sites were fixed using mini plates. Para-Nasal S inus (PNS) view, 3D -CT, CT (coronal and axial view) of the skull was taken for the preoperative and PNS X- ray was taken for postoperative assessment for all the patients.

**Investigations:** One or more of the following radiographs were taken: PNS, SUB-MENTO VERTEX, CT-AXIAL AND CORONAL VIEW, 3D-CT. All other standard routine investigations were carried out which were required for the General Anaesthesia.

**Treatment Planning:** After careful clinical and radiological examinations, the cases were discussed and selected for two point mini plate osteosynthesis. The procedure was explained to the patients. Informed written consent was obtained from the patient and their close relatives. Preoperative antibiotics and all other routine preparations for general anaesthesia were done.

**Surgical Technique:** After administering the General Anaesthesia (Propofol) through oro-endotracheal intubation, ophthalmic antiseptic ointment was applied in both the eyes and sterile pad was placed. Face was prepared with povidone-iodine painting. Intra oral preparation was also done using povidone-iodine.

After preparing and draping the face, reduction of the zygomatic complex was achieved using keen's intra oral technique.

Keen's intra oral technique was employed for the reduction of fractures. Before making an incision, 2% xylocaine with 1:80,000 adrenaline was infiltrated at the site of incision to achieve local vasoconstriction. A small incision (1cm approximately) is made in the mucobuccal fold, just beneath the zygomatic buttress of the maxilla. The incision can be made from anterior to posterior or from medial to lateral and should extend through mucosa, sub mucosa and any buccinators muscle fibres. The sharp end of a No.9 periosteal elevator or Howarth's elevator is inserted into the incision. Using a side to side sweeping motion, contact was made with the infra temporal surface of the maxilla, zygoma and zygomatic arch and the soft tissue dissection was done in a supraperiosteal manner. Rowe's zygomatic elevator was then inserted behind the infra temporal surface of the zygoma and bone was reduced into its correct anatomical position using superior, lateral and anterior force. An audible click and fullness of the cheek together with palpation for normal contour of the zygomatic bone and orbital rim gave an idea about the adequacy of the reduction. One hand over the side of the face was used to assist in the reduction.

Care was also taken to avoid using the anterior maxilla as a point of fulcrum.

Following infiltration using local anaesthesia with adrenaline 1:80000, a lateral eye brow incision over the fronto-zygomatic suture region was made supporting the skin over the orbital rim using two fingers and an incision approximately 1.5cm in length was made Aligned fractured fragments were then fixed using mini plates and screws. Copious saline irrigation was done while drilling. The 702 bur was passed in one stroke into the outer cortical plate and perpendicular to the bone surface. Eye ball was protected using periosteal elevator to prevent any accidental injury from bur while drilling at fronto zygomatic region.

Infraorbital incision was made after infiltrating local anaesthesia in the region, fracture site was exposed and reduction was accomplished. Placing the plate in correct position, the first hole was drilled in the unstable fragment. Finally, all the screws were tightened. Wound irrigation was done and wound was closed in layers using vicryl (4-0) and ethilon (5-0) sutures. Operating time taken on an average was one hour. Patients were discharged from the hospital after three days following surgery. All the patients were kept on post op medications for seven days. Sutures were removed on seventh post op day. PNS view was taken 24 hrs after surgery. Patients were recalled for review at regular intervals. Infra orbital nerve status, wound healing, facial symmetry of the patient was evaluated post operatively.

**Case Photos:**



Fig. 1: Preoperative PNS water's view

Fig. 2: Lateral brow Incision placed



Fig. 6: Sutures *in situ*



Fig. 3: Infraorbital incision placed



Fig. 7: Six months post op appearance

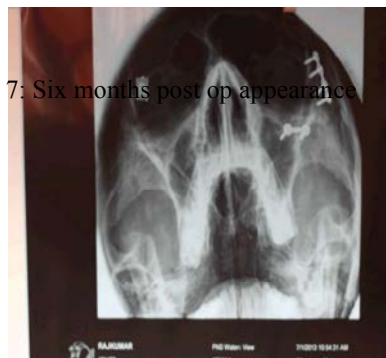


Fig. 4: Intra op-fixation at frontozygomatic region

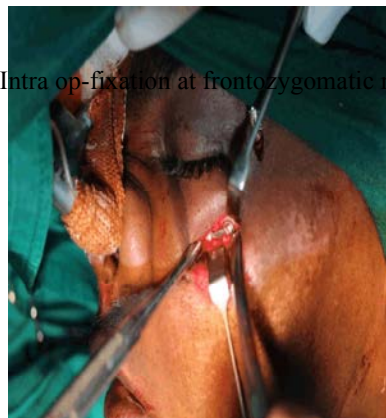


Fig. 8: Post op PNS water's view (6 months)

Fig. 5: Intraoperative –fixation at infra- orbital region



## RESULTS

Twenty patients were examined for an average of six months after open reduction and internal fixation of their ZMC fractures. All patients showed satisfactory facial symmetry. Road traffic accident was found to be the leading cause of trauma. Eighteen of our patients had met with RTA.

Post operative complications were minimal. All patients showed significant stability. One of our patient showed signs of infection in the fronto zygomatic region which was resolved using antibiotics. Another patient had mildly palpable mini plate at fronto zygomatic region. Other 18 patients had an almost imperceptible scar. In addition to the presence of an almost imperceptible scar, the main advantage of this method is clear visualisation of the fractured fragments, which helps in successful reduction.

All our patients were satisfied with the results achieved.

## DISCUSSION

Facial asymmetry due to any injury leads to mental and social discomfort in the present society. Hence, the surgical treatment to restore the form, aesthetics and function becomes a necessity. Many treatment modalities have been proposed for zygomatic complex fractures. The susceptibility of zygomatic fractures is explained by Dawson 1953 as the most common facial fracture. NYSINGH [4] stated that zygomatic fractures are second in frequency after nasal fractures.

Ophthalmic opinion is mandatory in most of the zygomatic complex fractures. As mentioned by Peter B Grey *et al.* [5], delayed retro-bulbar haemorrhage and transient blindness can be the result of fracture. In our study, ophthalmic evaluation was done for all patients.

The principle of fracture management involves the reduction of fractured fragments to their normal anatomic relationship to provide bony contact and alignment. We have followed Keen's intra oral approach to reduce or elevate the fractured zygomatic complex. Balasubramaniam *et al.* [6] in their study stated that less force was required with this technique for elevation as compared to external approach and intra oral approach can be performed in minutes, with minimum chances of haemorrhage. They also stated that buccal pad of fat was too small for dehiscence to occur during the surgery. Scar alopecia was absent with intra oral approach.

Keen [7] advised an intra oral approach to reduce the fracture, which has been reviewed by various authors. We followed this approach for reduction in all patients. In all cases; fractured fragment was unstable after reduction. Courtney [8] stated that the upper buccal sulcus approach has advantages over the Gillie's temporal approach for reducing the fractures of zygomatic body and arch.

Any mobility of fractured bone fragments impedes healing. As stated by Zigmunt [9], fixation in addition to accurate reduction is often necessary to achieve healing of fractured bone. This was followed in our study.

Paik-Kwoon Lee *et al.* [10] stated that two-point mini plate fixation at the infra orbital rim and fronto zygomatic suture region would provide significant amount of stability, provided the comminution of zygoma is not severe. Davidson *et al.* [11] stated that the two-point fixation using mini plate alone conferred a degree of stability comparable to most methods of three-point fixation regardless of the site in which the miniplates were applied.

Olate *et al.* [12] through their research analysis stated that infra orbital and zygomatico frontal suture

approaches should be used to treat displaced zygomatic complex fractures. Balasubramanian *et al.* [13] discussed the various management options available to treat the fractured zygoma. They treated 82 patients for a period of 3 years (2010-2012). They stated that two point fixation is sufficient in a majority of patients. Fixation was done at fronto - zygomatic region and infra orbital region.

In all cases, we have used the lateral eyebrow approach to expose the fracture in the fronto zygomatic suture region. After exposing the fracture, the fragments were aligned and fixed with mini plate. Michael and Jeffrey [14] presented the report of an anatomic study of 20 adult skulls to place the screws above the fronto zygomatic suture. It was found that 6-8mm screws can be safely placed above the suture. We have also used 6mm screws in our study. There were no complications.

Infra orbital rim incision as proposed by Fonseca and Marciani [15] and others was used. In ten of our cases, the patients had already existing laceration in infra orbital region, so we preferred the infra orbital approach. In other cases also, we approached the infra orbital rim through the infra orbital rim incision.

There was excellent exposure of the fracture site, infra orbital nerve was found compressed in fifteen of our patients between the fracture lines and was released. Fractured fragments were aligned and fixed using mini plates. Wound closure was done in layers. Post operative scar was imperceptible.

This was done as advocated by De Man and Bax Wa [16] and various other authors who stated that the patients treated with mini plate osteosynthesis exhibit a trend for higher recovery rate of the infra orbital nerve. All of our patients regained infra orbital sensation post operatively.

As advocated by Lisa and David [17], the importance of post op radiographs in the management of zygomatic fractures. We had post-op radiographs of all the patients and follow up of the patients.

Post operative complications were minimal. One of our patient had infection in the frontozygomatic region which was resolved using antibiotics. Another patient had mildly palpable mini plate at frontozygomatic region.

## CONCLUSION

In our study with limited period of follow up; we conclude that two point mini plate fixation at infra orbital and fronto zygomatic region yields promising results in

terms of post operative stability, aesthetics and also leads to resolution of infra orbital paresthesia in ZMC fractures.

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