



**MANAGEMENT OF ZYGOMATICO-MAXILLARY COMPLEX FRACTURES WITH THREE POINT FIXATION – A CLINICAL CASE PRESENTATION**

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**ABSTRACT**

**Background:** The zygoma plays an important role in the facial contour for both cosmetic and functional reasons; therefore zygomatic bone injuries should be properly diagnosed and adequately treated. Comparison of various surgical approaches and their complications can only be done objectively using outcome measurements which require protocol for management and long-term follow up. The objectives of this article to check the efficacy of zygomatic bone after treatment with Open reduction internal fixation (ORIF) using 3 point fixation.

**Case Report:** Patient reported to the Department of Oral & Maxillofacial Surgery at Swargiya Dadasheb Kalmegh Smruti Dental College & Hospital, Nagpur with chief complaints of pain & swelling over right side of face with Periorbital edema & Subconjunctival hemorrhage. On investigation it was diagnosed as Unilateral Displaced ZMC Fractured which was treated with Open reduction internal fixation (ORIF) using 3 point fixation technique.

**Conclusion:** We found that postoperative facial & neurological complications are minimum in three point fixation technique. Based on this study open reduction and internal fixation using 3 point fixation by miniplates is sufficient and the best available method for the treatment Zygomatico-Maxillary Complex Fractures (ZMC) fractures.

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**INTRODUCTION**

The face occupies the most prominent position in the human body rendering it vulnerable to injuries quite commonly. Zygoma plays an important role in the facial contour for both cosmetic and functional reasons; therefore zygomatic bone injuries should be properly diagnosed and adequately treated. Because of its position, it is the second most common mid-facial bone fractured after the nasal bones and overall represents 13% of all craniofacial fractures.<sup>1</sup>

Zygomatic bone contributes significantly to the strength and stability of the mid face and it articulates with the frontal, temporal, sphenoid and maxillary bones.<sup>2</sup> The zygomatic bone forms the cheek prominence, part of lateral and inferior orbital rim and the orbital floor. The zygomatic complex is important in the function of globe, facial symmetry and also gives passage to infraorbital nerves and vessels that innervates the mid facial region.<sup>3</sup> The first description of this type of fracture comes from the *Papyrus of Edwin Smith*, but *Duverney*<sup>4</sup> was the first to describe the ZMC. The main objectives of this case presentation evaluate the efficacy of zygomatic bone after treatment with ORIF using 2 point fixation.

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**CASE REPORT DISCRIPTION**

A 24-year-old man complaints of pain & swelling on the upper front-side of his face as patient met with Road traffic accident (RTA). Physical examination of the face showed enlargement and swelling in the upper region area. Subconjunctival Ecchymosis, Periorbitaloedema and asymmetry of malar process was seen. Frontal and Bird's eye views were taken for assessment for malar depression and globe abnormalities (Figure 1 & 2).

Panoramic radiographic images showed a radiolucent appearance step deformity in the Frontozygomatic, Infraorbital rim and Zygomatico-maxillary buttress area (Figure 11). Based on the results of the clinical and radiographic examinations, the patient was diagnosed with a Displaced Zygomatico-maxillary fracture on right side of the face. Informed consent was taken from the patients before inclusion in the study.

Under General Anesthesia, Naso Endotracheal intubation was done. Patients was scrubbed and draped in standard fashion. 2% lignocaine with 1 in 80000 adrenaline was injected at the local site for hemostasis. Incision was given in the upper buccal sulcus and reduction of the fractured zygoma was done via Keens approach using Howarths periosteal elevator or Bristow's elevator (Figure 3&4). Intraoperative assessment of stability of the repositioned Zygomatico, as performed with

the help of digital manual palpation method to determine the need for applying fixation devices. After achieving adequate reduction, Infraorbital incision was given to expose the Fracture site at this region, followed by fractured fronto zygomatic region was exposed by lateral eye brow incision (Figure 7). After visualization of fractured areas, fixation of reduced fractured segments was done with 4 to 6 holed, 1.5mm to 2mm miniplate at Zygomatico maxillary buttress (ZMB) (Figure 5), 4 holed, 1.5mm miniplate at Infraorbital region (Figure 6) and 1.5mm to 2mm Frontozygomatic (FZ) area (Figure 8). After achieving adequate hemostasis, muscle layer was closed with 3-0 vicryl and mucosa was closed with 3-0 black braided silk and skin suture were placed with 5-0 prolene. Facial assessment (Figure-9&10), Radiological assessment (Figure-11,12&13). & Neurological Assessment (Figure-14& 15) were performed preoperatively, after 1 month and after 6 months of surgery. Interincisal mouth opening was also increase preoperatively (18mm), after 1 month (22mm) and after 6 months of surgery (31mm) (Figure-16,17& 18).

**Preoperative Clinical Photograph**



Fig 1 Front view showing facial asymmetry



Fig 2 Bird's eye view showing malar asymmetry

**Intraoperative Clinical Photograph**



Fig 3-Showing incision at ZMB area



Fig 4-Showing fracture site at ZMB area



Fig 5-Showing fixation at ZMB



Fig 6-Showing fixation at infraorbital rim



Fig 7-Showing fracture at FZ area



Fig 8-Showing fixation at FZ area

**Facial Assessment**



Fig 9 Showing 1 month follow up with facial asymmetry



Fig 10 Showing 6 months follow up with facial symmetry & stability

**Radiological Assessment**

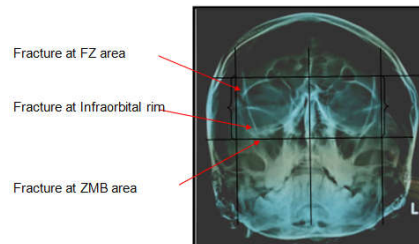


Fig 11- Showing preoperative radiograph

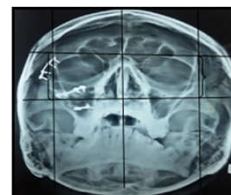


Fig 12- Showing 1 month follow up

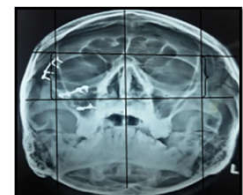


Fig 13- Showing 6 months follow up

**Neurological Assessment**

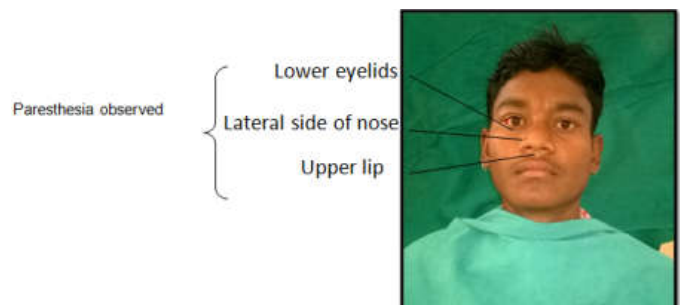


Fig 14 Showing 1 month follow up

Paresthesia observed at Lower eyelids



Fig 15 Showing 6 months follow up

#### Interincisal Mouth Opening



Fig 16- Showing preoperative 18mm mouth opening at 1 month follow up

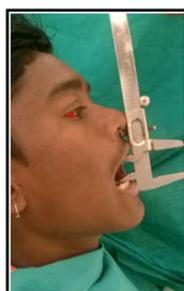


Fig 17- Showing 22 mm mouth opening at 1 month follow up



Fig 18- Showing 31 mm mouth opening at 6 months follow up

Miniplates used in this case were made of stainless steel and they were non compression miniplates. 1.5 to 2 mm, 2 hole, 4 hole, 6 hole L- miniplates were used in this study. Screws used in this study were made up of stainless steel with a thread diameter of 1.5mm, pitch was 1mm, and head diameter was 3mm.

## DISCUSSION

Intraoperative assessment of stability of the repositioned ZMC, as performed with the help of digital manual palpation method. This study has also been advocated by Zingg<sup>5</sup> et al used digital pressure after reduction to determine the need for applying fixation devices. In our study showed adequate intra and postoperative stability and fracture site.

Two point fixation is done at ZMB and FZ suture. Because the soft tissue overlying the FZ area is very thin, to prevent visibility, sensibility and palpability it is considered as second point. CP et al<sup>6</sup> suggested that primary location for fixation should be in vertical plane to resist the vertical displacing force either at the frontozygomatic suture or the zygomatic buttress.

Karlan MS and Cassisi NJ<sup>7</sup> concluded that alignment of the fracture at three points and fixation at two stable points provide the most accurate and satisfactory postoperative results. Two-point interosseous fixation at the "buttress"

fracture and the FZ fracture is suitable for routine surgery. The results of these studies confirms with the present study that two point fixation provided better stability in patients with clinical and radiological evidence of fracture in fronto zygomatic and ZMB area.

In 3 point fixation was done at ZMB, FZ suture and inferior orbital rim. This result confirm with the study conducted by Parashar A et al<sup>8</sup> in which vertical dystopia, enophthalmus, malar projection and malar height show significant enhancement in three point fixation group. They recommended three point fixation with miniplates for management of displaced zygomatic fractures.

In a study conducted by Makowski GJ et al (1995)<sup>9</sup> seven (51%) patients appeared to have symmetric malar prominence and another five (35%) patients were mildly asymmetric. He emphasized that three point visualization and liberal rigid fixation for ZMC complex fracture treatment results in a low incidence of complications that are proportional to the severity of injury. This is in accordance with the present study where there was poor cosmetic result which ranges from mean facial aesthetic at 1 months was  $2.70 \pm 0.82$  and at 6 months it was  $2.40 \pm 0.69$  ( $t=1.40, p\text{-value}=0.019$ ) and mean radiological assessment at 1 months was  $2.36 \pm 0.29$  and at 6 months it was  $1.76 \pm 0.36$  ( $t=5.69, p=0.0001$ ). According to Pearl it is essential to reposition the zygoma at a minimum of three locations to achieve correction in three dimensions. But the study conducted by Rana M et al<sup>10</sup> where postoperative complication like decreased malar height and vertical dystopia were more common in those patients who were treated by two point fixation than those who were treated with three point fixation.

In the present study, three point visualization and fixation resulted in untoward complications like post-operative visible scars and reduce mouth opening which ranges from preoperative it was  $21.80 \pm 3.25$ mm, at 1 month it was  $23.50 \pm 4.03$ mm ( $t=2.29, p=0.043$ ) and at 6 months it was  $26.10 \pm 3.66$ mm ( $t=2.59, p=0.029$ ). These result confirm with the study conducted by Kurita M et al<sup>11</sup> where scores for annoyance were significantly higher for paresthesia than for deformity pain or trismus with increasing annoyance resulting from all types of symptoms. Finally, ratings for total satisfaction tended to decrease.

In the present study infra-orbital paraesthesia were maximum in three point fixation group compared to two point fixation group. Degree of paresthesia has been mentioned by Score 0- No Paresthesia and Score 1- Paresthesia present. Mean neurological assessment at 1 months was  $0.20 \pm 0.42$  and at 6 months it was  $0.90 \pm 0.31$  ( $t=4.58, p=0.001$ ). But the study conducted by Kovacs et al<sup>12</sup> in which infra orbital sensations were diminished in three point fixation group. This may attribute to the risk of additional trauma to infraorbital nerve, even if great care is taken leading to its compression. This is in contrast to the study conducted by Vriens JP et al<sup>13</sup> where infra orbital nerve function following treatment of orbitozygomatic complex fractures were more pronounced and severe in patients who underwent closed reduction without miniplate fixation. Post-operative complications in three groups were very minimal. Minimal infection which developed after fixation of plates was resolved by routine antibiotic therapy. Gilhooly MG et al<sup>14</sup> reported a case of orbital subperiosteal abscess complicating a minimally displaced



zygomatic fracture. In the present study any life threatening complications were not encountered.

In a review of 55 patients, who had internal fixation devices removed after many types of cranio maxillofacial surgery, including trauma, Oringer *et al* found palpable plates and screws to be the most common reason (35%) followed closely by pain, infection or loosening of the fixation device (25%). In our study we also experience with complication of fixation of zygoma fractures is mainly limited to palpable plates and screws at the FZ suture and infra orbital rim and none of the plates were removed. Post-operative infection may be an infrequent occurrence, but it is a problem that threatens all the patients in the post-operative period. A study by *Zachariades et al*<sup>15</sup> of 223 patients treated with rigid internal fixation of facial bone fractures reported that interosseous wiring resulted in a greater rate of infection when compared to bone plates. While 4.5% of patients suffered from both early and late infection. Only 0.8% of infections were located in the mid face. Sinusitis has been found to be the most common type of infection seen in postoperative patients but preseptal cellulitis and dacryocystitis also may occur.

## CONCLUSION

Zygoma and maxilla forms a critical portion of the orbit and therefore contributes to the deformities that may remain even after fracture treatment. Proper planning for ZMC fracture treatment is necessary to minimize the occurrence of deformities like enophthalmos, dystopia and loss of zygomatic prominence. Stainless steel plates used in case was very economical and provide better stability using 3 point fixation technique. Postoperative aesthetic appearance was acceptable. 3point fixation yields promising results in terms of Malar symmetry, Interincisal mouth opening and providing adequate postoperative stability as well as minimized incision, duration of surgery and postoperative complications.

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**Informed Consent:** Informed consent was obtained from patient as a standard protocol.

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