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# Reduction of Zygomatic Complex Fracture Using Combination of Microplate and Miniplate Osteosynthesis

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**Abstract** Zygomaticomaxillary complex (ZMC) fracture is the second most common facial bone fractures after nasal bone and has been extensively described in the literature. Numerous techniques have been described for the reduction of ZMC fracture. This case report presents a 21-year-old man who was involved in a traffic accident and who subsequently presented with a ZMC fracture. The patient was treated through an open reduction and internal fixation procedure using a titanium microplate and miniplate combination.

***Keywords:*** *Zygomaticomaxillary complex fracture, microplate, miniplate*

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## 1. Introduction

Due to the morphologic prominence of the zygomatic region, it is the second most common mid-facial bone fractured and overall represents 13% of all craniofacial fracture. [1,2] Although the main etiologic factor is road traffic accidents, the incidence and etiology varies from country to country. The bigger prevalence age for the zygomatic bone vary of 21 to 40 years. [3]

Treatment modality in zygomaticomaxillary complex (ZMC) fractures is still controversial. The first concerns the best way for surgical reduction of the fractures. The second is related to the necessity to fix them or not after the reduction, and the third concerns the number of fixation points necessary so that the fractures of the ZMC are stabilized. The common goal of all treatments is an exact three-dimensional restoration of the disturbed anatomy. [4]

This case report presents a trauma resulting from traffic accident that caused ZMC fracture and the treatment of a patient using the combination of microplate and miniplate system.

## 2. Case Report

A 21-year-old man admitted to our department with a history of a road traffic accident. On clinical examination revealed swelling over the left side of the face with restricted mouth opening, periorbital ecchymosis and subconjuctival haemorrhage without posterior limit in left eye was found. (Figure 1)


**Figure 1.** Preoperative a) anterior and b) left oblique images of the patient

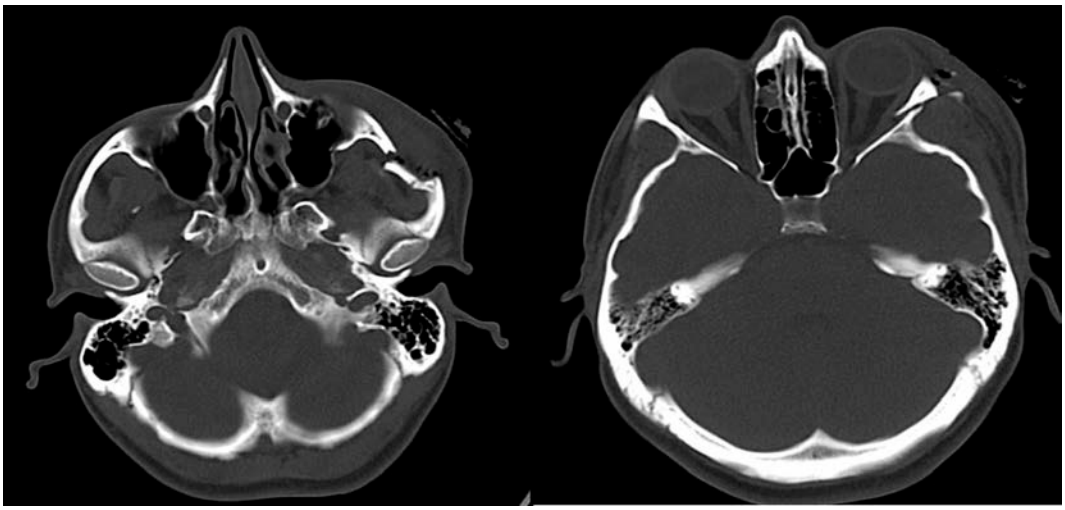

**Figure 2.** Preoperative axial computed tomography scans showing a displaced zygomatic complex

Radiographic examination revealed multiple fractures of the following bones; Frontal, maxillary and infra orbital processes of zygoma and left zygomatic arch. (Figure 2)

Under general anesthesia, patient underwent open reduction and internal fixation of zygomatic complex fractures through combination of lateral eyebrow, subciliary and intraoral incision. Firstly, left fronto-zygomatic area was opened by lateral eyebrow incision along with the old scar present over the face. Layer-wise dissection was done to expose the fracture line. After that fronto-zygomatic fracture was reduced and fixation achieved using a 6-holed 2 mm titanium miniplate.

Subciliary incision was used to reach the orbital rim. The incision was made 2 mm below the lower-lid margin and dissection was performed underneath the tarsus, dividing the orbicularis muscle from the orbital septum and following the septum to the floor of the orbit. Then the periosteum over the orbital rim was incised and adequate exposure of the orbital rim floor was obtained. 5-holed titanium microplate (0.5 mm) was used to fix the infra orbital rim.

Intraoral vestibular approach was used access to the zygomatico-maxillary buttress upto the inferior orbital rim. Vestibular incision was made in the upper vestibular region from the first canine to second molar. With the mucoperiosteal flap elevation, exposure of the zygomatico maxillary buttress was obtained. L shaped miniplate was used to fix the maxillary process. Zygomatic arch fracture was reduced by the Gillies approach with the use of the elevator. A temporal incision 2 cm in length, made 2.5 cm superior and anterior helix, within hairline. After incision the subcutaneous and superficial temporal fascia were dissected to the level of the temporalis muscle to reach the underlying temporal surface of the zygomatic bone; an elevator was then used to reduce the fracture.

Following plating, the surgical site was thoroughly cleansed and the flap was repositioned. Layer wise suturing was done using 4-0 Vicryl for the muscular layer and 6-0 Prolen for the skin layer. The intraoral wound was closed using 3/0 Silk suture.

One month after the surgery the patient was assessed and there were no instances of malar asymmetry, diplopia and infection. (Figure 3) Postoperative radiographic examination showed excellent reduction of the fractures. (Figure 4)

**Figure 3.** Postoperative photographs of the patient revealing excellent functional and cosmetic result. a) anterior b) left oblique

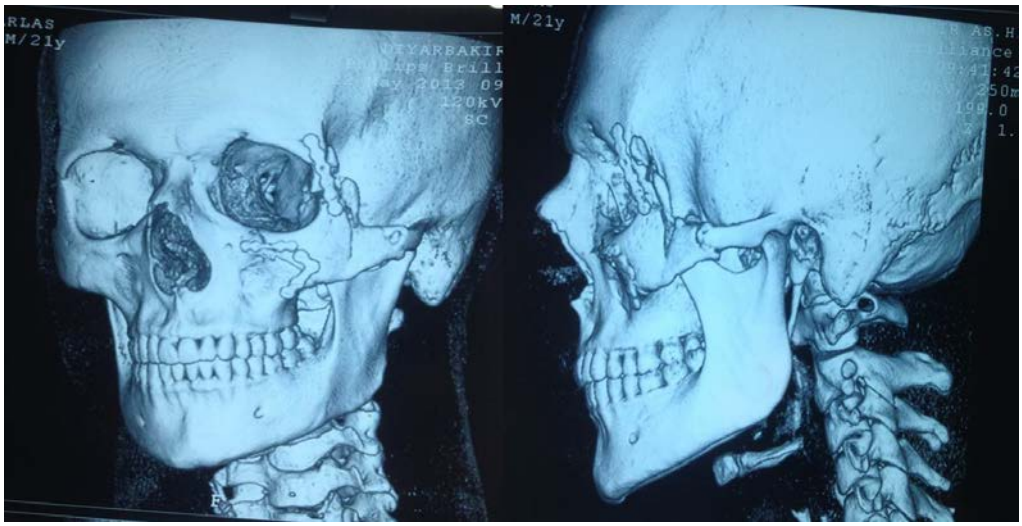

**Figure 4.** Postoperative three-dimensional computed tomographic scans showing the zygomatic complex, which was anatomically reconstructed using microplate and miniplate combination

## 3. Discussion

Many techniques to the ZMC fracture have been described in maxillofacial surgery studies over the years, ranging from the simple close reduction without fixation to invasive open reduction and internal fixation. The degree of displacement and comminution, the age of the patient and preexisting skin creases or lacerations should be taken into account for surgical treatment planning. [5]

One of the most controversial topics in the literature is about the number of fixation points that are necessary to avoid the post-surgical dislocation of the fractured ZMC. [6] The great majority of the authors are divided about the need for two or three places, with a variation of the complexity of the trauma and the degree of dislocation of the fractured segment. [7] Davidson et al. [8] analyzed different combinations of miniplate fixation for stabilizing fractured zygoma in human skulls. This experimental study found that three-point fixation at fronto-zygomatic suture; inferior orbital rim and zygomatico-maxillary buttress conferred maximum stability against forces matching physiological stresses. Similar results were found by O'Hara et al. [9] in another experimental biophysical study. For the most accurate reduction of the zygomatic fracture, the zygomaticofrontal articulation, infra orbital rim, and zygomatic-omaxillary buttress should be exposed and properly aligned. In the present study, we performed three-point fixation at fronto-zygomatic suture; infra orbital rim and zygomatco-maxillary buttress via the lateral eyebrow, subciliary and intraoral approaches.

The conventional miniplates had inherent disadvantages in the form of overlying soft tissue distortion, particularly when used in orbital areas. When this is problem for the patient, a secondary procedure may be required for the removal of plates and screws. In addition, the sizes of existing plates and screws (minifixation) are not easily adaptable for the use in the infra orbital rim. [10] In addition, inferior orbital rim fixation through a transconjunctival lower lid incision can cause complications such as bleeding, infection, scarring, contracture, and ectropion of the lower eyelid. [11] In the presented case report we used 5-holed microplate to repair the infra orbital rim via the subciliary approach. This approach was preferred as there was no need to expose the medial or the lateral orbital wall. Furthermore, the scar is not evident.

Strong and Sykes [12] propose a combination of systems of miniplates and microplates in the different buttress of support of the ZMC fracture. They recommend the use of microplates of 1.0 or 1.2 mm in the infra orbital border. We used 0.5 mm thickness microplate to reduction infra orbital fracture.

This study using microplate and miniplate combination has given us promising result, hence may be considered as a valid tool in the ZMC fracture.

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