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RESEARCH ARTICLE **OPEN ACCESS**

COMPARISON OF 1-POINT FIXATION WITH 2-POINT FIXATION IN TREATING TRIPOD FRACTURES OF THE ZYGOMA

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ABSTRACT

A ZMC fracture is also known as a tripod, tetrapod or quadripod fracture, trimalar fracture or malar fracture. They can account for approximately 40% of mid-face fractures. They are the second most common facial bone fracture after nasal bone injuries. For the reduction of ZMC fractures various surgical techniques including one, two and three point fixation have been used, these are based on the severity and the extent of the fracture, Several approaches are used namely lateral eyebrow, sub ciliary, intra oral incisions for fixation of ZMC fractures. At this time it remains unclear which treatment is best. This present study is aimed to compare the efficacy of one point versus two point fixation following repair of zygoma fractures in 10 patients and to compare the treatment outcomes of one point versus two point fixation.

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INTRODUCTION

The zygomaticomaxillary complex (ZMC) plays a key role in the structure, function, and aesthetic appearance of the facial skeleton. The fracture complex results from a direct blow to the malar eminence and results in three distinct fracture components that disrupt the anchoring of the zygoma[1]. In addition, the fracture components may result in impingement of the temporalis muscle, trismus (difficulty with mastication) and may compromise the infraorbital foramen/nerve resulting in hypesthesia within its sensory distribution. The etiology of zygomatic complex fractures includes road traffic accidents, assaults, falls, sports, and missile injuries. For the reduction of ZMC fractures various surgical techniques including one,two andthree point fixation have been used, these are based on the severity and the extent of the fracture, Several approaches are used namely lateral eyebrow, sub ciliary, intra oral incisions for fixation of ZMC fractures[10,11].

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AIMS AND OBJECTIVES

- The aim of this study is to compare one point fixation with two point fixation in zygomatic buttress and fronto-zygomatic region in zygomatic maxillary complex fractures (tripod fractures)
- This study is to be done to compare the postoperative outcome both clinically and radiographically to assess the alignment and approximation of fracture fragments.

MATERIALS AND METHODS

This clinical study and design will be carried out on 10 patients presenting with zygomatico-maxillary complex fractures who reported at the department of Oral and maxillofacial Surgery, SreeBalaji Dental College and Hospital, Chennai.

Patients with comminuted zygomatic complex fractures and undisplaced zygomatic complex fractures were excluded from the study. Institutional ethical committee clearance was taken for the study. Both male and female patients aged between 14-60 years were included in the study. The patients were divided into two groups 1 and 2 with 5 patients in each group allocated randomly. Two standardized surgical techniques were used to treat these patients. The surgical treatment planned in group I patients is one point fixation at zygomatic buttress and in group II patients- twopoint fixation at frontozygomatic and zygomatic buttress .Pre-operative assessment of the patients in Group I/II includes thorough history, clinical and radiological examinationand photographs.

STUDY PARAMETERS

The parameters to be assessed in both Groups I and Group II includes intraoperative time taken, unsightly scars, palpability of plates, clinical union at 4 weeks, radiographic union at 6 months, signs of wound infection or dehiscence and plate exposure and need for plate removal. Radiographic analysis includes digital PNS view, CT scan in all 3 planes (axial, coronal, sagittal and 3D reconstruction).

INCLUSION CRITERIA

- Fractures of zygomatico-maxillary complex
- Patients with isolated minimally displaced zygomatic bone fracture determined on clinical and radiographic findings
- Patients with isolated zygomatic bone fracture more than 15days old
- Age between 14 and 60 years

EXCLUSION CRITERIA

- Comminuted zygomatic bone fractures
- Gunshot injuries
- Medically unfit for surgery, who are unfit to undergo surgery under General Anesthesia
- Infected fractures
- Pathological fractures

RESULTS

The present study was conducted on ten patients, 5 in each group (Group 1 and Group 2) with zygomatico maxillary complex fractures. All of these patients had isolated and displaced zygomatic complex fractures without any other maxillofacial fractures. There was depression of malar eminence in all the patients and paraesthesia of infra orbital nerve in 50% of patients. There was diplopia in one patient and restricted mouth opening in 40% of the patients. The other symptoms seen were oedema, ecchymosis, sub conjunctivalhaemorrhage in 70% of the patients. All the patients were treated using open reduction and internal fixation.The age group of the patients varied from 18 to 60 years. Road traffic accident was the cause of fractures in nine of the patients except one. The highest incidence of fracture was seen between the age group of 20 and 40 years. Post-operatively patients were evaluated radio graphically by pre and postoperative radiographs (Digital Paranasal Sinus View) to assess the alignment and approximation of fracture fragments. However the reduction was very stable in all patients.

Clinically the prominence of the malar eminence, infection, foreign body reaction, neurological deficit, palpability of the implant was considered. In Group I patientsthere was no incidence of wound infection or dehiscence, scars, foreign body reactions or palpability of plates in anypatients. Paraesthesia was present in one patient. In Group II patients, there was no paraesthesia in any patient there was no evidence of wound dehiscence or foreign body reactions. However, two patients complained of palpability of plates and mild scars in frontozygomatic region. It is seen that in terms of stability, it is definitely two-point fixation which is superior. However, it had its own disadvantages of implant palpability and unesthetic scars. But the fixation at the ZM buttress was quicker, no scars, no implant palpability but fixation was inadequate in case of extensively comminuted or displaced fractures.On the basis of detailed pre-operative and post-operative observations, one point fixation at zygomatic buttress is a viable option for minimally displaced ZMC fracture and it is not feasible in patients with comminuted zygomatic fractures, incomplete reduction through buccogingival incision and fixation at zygomaticomaxillarybuttrres, fractures with orbital complications. In such cases two- or three-point fixation is better alternative.

DISCUSSION

Zygomatico maxillary complex fractures are more common in the 2nd and 3rd decade of life. This study recorded that more males than females sustained zygomatic complex fractures. This is consistent with other reports[12]. Male patients 20–40year age group were most often involved, and road traffic accidents were the leading etiologic factor. Many studies have shown that young adult males were commonly affected. The role of road traffic accidents as an etiologic factor in zygomatic complex fractures has been identified by some studies. The key to management of facial trauma is to operate the cases as soon as clinical conditions permits with a special emphasis on function and aesthetics. The most important principle in the treatment of zygomaticomaxillary complex fractures is proper reduction[13]. The zygomaticomaxillary complex is an essential element of the facial configuration. The zygoma is a diamond-shaped bone located in the middle third of the face, and has relations with the orbit, the maxilla, and the temporal fossa. The four articulations of the zygoma include the fronto-zygomatic suture (FZS), infraorbital rim, zygomaticomaxillary buttress, and zygomaticotemporal suture. Because of its location, it is subjected to trauma more often than any other element of the face except the nose. Although some injuries will involve an isolated orbital rim or antral wall fracture, most injuries will include the zygomatic bone, and thus the term “zygomaticomaxillary.

Eye injury is very common in mid face trauma; therefore a thorough Optholmological examination is mandatory in all suspected malar fractures[14]. An external examiantion should note any lacerations, assess extraoccular motility visual acuity, visual fields and the pupillary light reflex. The patient must be assessed for diplopia, opthalmoplegia, enopthalmos (sunken eye) and proptosis. The integrity of the optic nerve must be established even if the eye is closed by soft tissue swelling. This is accomplished by shining a light over the closed eye and getting the patient to confirm the presence or absence of light. An opthalmological review is essential in the presence of a through and through lid laceration.

The present study recorded more fractures of the zygomatic bone than those of the arch alone and combined zygomatic bone and arch. Isolated fractures of the arch are uncommon. This was probably because of the predominant role of road traffic accidents, in which most impacts to the face were most likely frontal. Arch fractures are more likely to involve some form of lateral impact and were more often encountered in cases of falls, assaults, and sports injuries.

Banks and Brown have summarized the indications for treatment as follows: to restore the normal contour of the face both for cosmetic reasons and to establish skeletal protection for the globe of the eye, to correct diplopia and to remove any interference with the range of movement of the mandible. Flattening of the cheek was encountered among the patients in this study. This is usually seen in tripod fractures that are most often displaced in wards to a greater or lesser extent. Diplopia was observed. Mixing wires with miniplates reduced the stability in proportion to the number of wires used. Minimal increases in stability were added using three-pointminiplate fixation when compared to two-point miniplate fixation, regardless of the application site. The authors concluded that a stable fixation can be achieved with a miniplate on the frontozygomatic suture line and a second buttress[19]. Acceptable stability can be achieved with single-point miniplate fixation at the frontozygomatic suture line or the infraorbital rim. These results do not take into account variables like fracture comminution rotatory forces of the masseter muscle or the type of skin incision necessary to apply the fixation. The need for one-point, two-point, three-point, or four-point fixation should be based on fracture stability, and applying the minimum amount of hardware to maintain fracture reduction throughout the process of healing. This approach has been termed functionally stable fixation (Bradley Strong and Gary, 2017). In the present study as far as the stability is concerned, two-point fixation was more stable compared to the one point fixation.

Studies have suggested that 1-point fixation is sufficient to maintain stability and to obtain a good outcome in selected cases. In cases of simple tripod fractures, many surgeons have used 1-point fixation through a lateral eyebrow incision. However, 1-point fixation in the FZ area through a lateral eyebrow incision usually leaves external scars, palpability of plates, and swelling resulting from severed muscle and soft tissue. Because the soft tissue overlying the FZ area is very thin, thin plates must be used to prevent visibility, sensibility, and palpability. One-point fixation in the ZM area does not leave external scars or palpability of plates or screws. In this study none of the group 1 patients complained of aesthetic problems related to external scars. However, one out of five patients in group 2 complained of external scars related to lateral eyebrow incisions. Chakranarayan *et al*. (2009) recommended 2-point fixation with mini plates for rigid internal fixation of the fractured complex. Whereas, Ramesh Candamourty *et al.* stated 3-point fixation provides a better stability of displaced zygomaticomaxillary complex. Most studies stated the unacceptable postoperative scars in patientsundergoing infraorbital exploration. In this study, lateral brow incision was used to explore the frontozygomatic region.

CONCLUSION

In the prospective study, it is seen that in terms of stability, it is definitely two-point fixation which is superior. However it had its own disadvantages of longer operating time, implant palpability and unaesthetic scars. But the fixation at the ZM buttress was quicker, no scars, no implant palpability but fixation was inadequate in case of extensively comminuted or displaced fractures. On the basis of careful and detailed pre-operative and postoperative observations, we conclude that one point fixation at zygomatic buttress is a viable option for minimally displaced ZMC fracture and this one point fixation is not feasible in patients with comminuted zygomatic fractures, incomplete/unsatisfactory reduction through buccogingival incision and fixation at zygomaticomaxillarybuttrres, fractures with orbital complications. In such cases two or three point fixation is better alternative. Therefore an individualistic approach is required for deciding the treatment plan for ZMC fractures based on extent and amount of displacement rather than fixed protocol.

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