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Comparison of One Point Fixation Versus Two Point Fixation in the Treatment of Zygomatico Maxillary Complex Fractures

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INTRODUCTION: Zygomatic fractures constitute of 20-40% of all facial fractures. The signs and symptoms of zygomatic fractures include sub conjunctival and periorbitaloedema ,hypoesthesia or anaesthesia in part or all of the branches of the infra orbital nerve, enophthalmos, diplopia, limitations of jaw movement because when the zygomatic arch is depressed medially, the coronoid process strikes against the depressed malar eminence thereby restricting the movement of the jaw and loss of prominence of the malar eminence. Three point of fixation is associated with extensive periosteal stripping, extreme retraction of bone edges and increased operating time. The approaches for FZ suture include lateral eyebrow incision, infra orbital rim can be approached via sub ciliary, sub tarsal, trans conjunctival or infra orbital incision.

AIM: The purpose of this study was to compare one point fixation in zygomatic buttress area and two point fixation in zygomatic buttress and frontozygomatic region in zygomatic maxillary complex fractures.

MATERIALS AND METHODS: Ten patients with zygomatico maxillary fractures were included in this prospective study with 5 patients in each group allocated randomly. The surgical treatment planned in group I patients were one point fixation at zygomatic buttress and in group II patients two point fixation at frontozygomatic and zygomatic buttress region. The inclusion criteria were fractures of zygomaticomaxillary complex. The exclusion criteria were severely comminuted fractures infected fractures, medically compromised patients and orbital fractures for both group I and II patients. The surgical procedure in GROUP I patients included a vestibular incision in relation to maxillary first molar. In GROUP II patients a lateral eyebrow incision was given.

RESULTS: All the patients underwent open reduction and internal fixation. Comparing the operating time, the treatment time in Group I patients was one hour and in Group II patients, two hours showing that one point fixation had shorter operating time.

CONCLUSION: 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. 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 zygomaticomaxillary buttress.

KEYWORDS: Oral fracture, Dentistry, Zygomatic Bone

INTRODUCTION

Zygomatic fractures constitute of 20-40% of all facial fractures, most common among the males between the second and fourth decades of life. The ratio of the incidence between females and male is 1: 4.¹ The zygomatic bone occupying a prominent position in the face determines the facial width.² It also acts as a major buttress for the mid face between the maxilla and cranium and it is this prominent location which makes it more prone to injury. Zygomatic fractures include those injuries that disrupt the five articulations of the zygoma with the adjacent craniofacial skeleton. These articulations are at the Zygomatico Frontal suture, Infra orbital rim, Zygomatico maxillary buttress, the zygomatic arch and the zygomatico sphenoid sutures.³ The signs and symptoms of zygomatic fractures include sub conjunctival and periorbitaloedema ,hypoesthesia or anaesthesia in part or all of the branches of the infra orbital nerve, enophthalmos, diplopia, limitations of jaw movement because when the zygomatic arch is depressed medially, the coronoid process strikes against the depressed malar eminence thereby

restricting the movement of the jaw and loss of prominence of the malar eminence. Various treatment modalities have been advocated for management of zygomatic complex fractures such as conservative management, indirect reduction with no fixation, temporary support, direct fixation, indirect fixation, direct reduction and fixation and immediate reconstruction by grafting.⁴ According to Pearl,⁵ it is essential to reposition the zygoma at minimum three locations (FZ suture, inferior orbital rim and zygomatic maxillary buttress) to achieve three dimensional corrections. However three point of fixation is associated with extensive periosteal stripping, extreme retraction of bone edges and increased operating time. The approaches for FZ suture include lateral eyebrow incision, infra orbital rim can be approached via sub ciliary, sub tarsal, trans conjunctival or infra orbital incision.⁶ The zygomatico maxillary buttress can be approached intra orally using buccal sulcus incision.

The purpose of this study was to compare one point

fixation in zygomatic buttress area and two point fixation in zygomatic buttress and frontozygomatic region in zygomatic maxillary complex fractures.

MATERIALS AND METHODS

Ten patients with zygomatico maxillary fractures were included in this prospective study with 5 patients in each group allocated randomly. The surgical treatment planned in group I patients were one point fixation at zygomatic buttress and in group II patients two point fixation at frontozygomatic and zygomatic buttress region. The inclusion criteria were fractures of zygomaticomaxillary complex. The exclusion criteria were severely comminuted fractures infected fractures, medically compromised patients and orbital fractures for both group I and II patients. In all the patients, the chief complaint was depression of the malar eminence and history of

trauma. Pre-operative assessment of the patients in Group I/II included thorough history, clinical examination, and photographs in frontal, profile, WORM'S view and intraoral photographs. The parameters assessed in both Groups I and Group II included 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 included digital PNS view, CT scan in all 3 planes (axial, coronal, sagittal and 3D reconstruction).

The surgical procedure in GROUP I patients included a vestibular incision in relation to maxillary first molar and elevation of mucoperiosteal flap and the fracture site at zygomatic buttress was exposed and reduced and fixed with 2mm 'L' plate or 2mm four-hole miniplate and 2X6mm screws and the



Figure 1 (a). Vestibular incision



Figure 1 (b). Reduction of the fracture at zygomatic buttress



Figure 1 (c). Fixation of fracture at zygomatic buttress

wound was sutured with 3-0 vicryl (Figure 1a, 1b&1c.) In GROUP II patients a lateral eyebrow incision was given, layer wise dissection was done, periosteum was incised. The fracture site was exposed and zygoma fracture was elevated through

Rowe's zygoma elevator and fracture site at frontozygomatic region was reduced and fixed with 2mm two hole miniplate and 2X6 mm screws sutured with 3-0 vicryl and 3-0 prolene layer wise and the zygomatic buttress fracture was addressed in a



Figure 2 (a). Exposure of fracture at frontozygomatic region through lateral eyebrow incision



Figure 2 (b). Reduction of the fracture at frontozygomatic region



Figure 2 (c). Fixation of fracture at frontozygomatic region

similar manner as GROUP I patients (fig 2a, 2b, 2c).

RESULTS

10 patients, 5 in each group (Group I and Group II), all male patients with a mean age of 35 years (20-45 years) diagnosed with zygomatico maxillary complex fractures were included in the study. All the patients underwent open reduction and internal fixation. Alteration of occlusion was present in one patient; however it did not correlate with zygomatico maxillary complex fracture. 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, subconjunctival haemorrhage in 70% of the patients. There was associated mandibular fracture in only one patient.

Remaining 90% of the patients had isolated zygomatic maxillary complex fractures (table 1).

In Group I patients' one point fixation was done in the zygomatic buttress with 2 mm "L" plate and 2X6 mm screws. In Group II patients, two-point fixation was done in the zygomatic buttress with 2mm 'L' shaped plate and 2X6 mm screws and fronto-zygomatic fixation was done using 2mm two hole mini plate and 2X6 mm screws. In 60% patients, right side was more commonly involved. The follow-up period was one year in Group I and Group II patients. 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 as seen in figures 3a,3b & 4a,4b) However the reduction was very stable in all patients. Clinically the prominence of the malar eminence,



Figure 3 (a). Pre-operative PNS view showing right ZMC fracture



Figure 3 (b). Post-operative PNS view showing one point fixation at zygomatic buttress



Figure 4 (a). Pre-operative PNS view showing right ZMC fracture



Figure 4 (b). Post-operative PNS view showing two point fixation at zygomatic buttress and frontozygomatic region

S.no	Age	Sex	Side	Orbital symptom	Depression of malar prominence	Mouth opening	Clinical displacement	Radiological displacement
1.	31	M	Rt	No	Yes	40mm	f-z region	f-z region & buttress region
2.	29	M	Lt	No	Yes	20MM	F-z region & buttress region	F-z region & buttress region
3.	46	M	Lt	no	yes	38mm	F-z region	F-z region
4.	29	M	Rt	No	Yes	20mm	Buttress region	Buttress region
5.	42	M	Rt	No	Yes	40mm	Buttress region	Buttress region
6.	40	M	Lt	No	Yes	20mm	F-z region	F-z region & buttress region
7.	29	M	Rt	No	Yes	42mm	Buttress region	f-z region & buttress region
8.	19	M	Rt	No	Yes	25mm	f-z region & buttress region	f-z region & buttress region
9.	22	M	Rt	yes	Yes	40mm	Buttress region	Buttress region
10.	27	M	Lt	No	Yes	35mm	f-z region & buttress region	f-z region & buttress region

Table 1. Demographic Details of the Study Population

infection, wound dehiscence, foreign body reaction neurological deficit, palpability of the implant was considered. In Group I patients, there was persistent paraesthesia of the infra orbital nerve even after six months in one patient and in one patient there was comminution of the zygomatic buttress which made the fixation difficult. However there was no incidence of wound infection or dehiscence or foreign body reactions or palpability of plates in any patients. In one patient the fixation at one point was unstable and there was bony movement at frontozygomatic region. 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 unsightly scars in frontozygomatic region. Comparing the operating time, the treatment time in Group I patients was one hour and in Group II patients, two hours showing that one point fixation had shorter operating time. (Table 2 and Table 3).

DISCUSSION

Zygomatico maxillary complex fractures are more common in the 2nd and 3rd decade of life. In the current study, the age of patient ranged from 20-45

S.no	Wound Infection/ Dehiscence	Scar	Palpability of plates	Sign of Clinical and radiological union	Operating time
1.	no	no	no	yes	45 mins
2.	no	no	no	yes	1 hr
3.	no	no	no	no	55 mins
4.	no	no	no	yes	1 hr 10 mins
5.	no	no	no	yes	40 mins

Table 2. Showing different characteristics in Group I

S.no	Wound Infection/ Dehiscence	Scar	Palpability of plates	Sign of Clinical and radiological union	Operating time
1.	no	no	no	yes	1 hr 30 mins
2.	no	no	yes	yes	1 hr 45 mins
3.	no	yes	no	yes	1 hr 15 mins
4.	no	yes	no	yes	1 hr 55 mins
5.	no	no	yes	yes	1 hr 20 mins

Table 3. Showing different characteristics in Group II

years and 100% of the patients were male and 80% sustained fracture in the right side. The most important principle in the treatment of zygomaticomaxillary complex fractures is proper reduction. But the treatment of the patients in the reported study did not use the 3- point fixation proposed by Karlan M, Cassisi.⁷ In the present study as far as the stability is concerned, two point fixation was more stable compared to the one point fixation at the zygomatic buttress similar to the study by Davidson et al.⁸ who stated that one point fixation produced unstable fixation in their in vitro studies and proposed that the two point fixation provided a degree of stability compared to three point fixation regardless of the site at which they were fixed. But it was seen that when the fracture was not comminuted, the one point fixation at zygomaticomaxillary buttress was stable confirming the studies of Fujioka et al.⁹ The technique of fixation at zygomaticomaxillary buttress has some advantages such as no palpability of the implant, shorter operating time, no facial scars, re-operating for a infected implant is also easier. On the contrary in case of extensively comminuted and mal-aligned fractures, one point fixation at zygomatic maxillary buttress area always resulted in poor stability as reported by Chuong R and Kaban.¹⁰

Another complication with the fixation at the zygomatic maxillary buttress is most of the times the zygomatic maxillary buttress pillar is the most comminuted and fixation becomes difficult according to Ellis E 3rd and Kittidumkerng¹¹ and similar difficulty had been encountered in the current study.

According to Manson et al.¹² the zygomatic buttress can be effectively used to align the fractured fragments whereas the frontozygomatic suture region is favourable site for rigid fixation of the fracture. In the present study in the Group II

patients, this concept of Manson have been used however fixation has been done both at frontozygomatic and zygomatic maxillary buttress regions. In spite of the excellent stability against rotation and correct alignment to pretraumatic state provided by the two point fixation and though the scars were hidden in eyebrow, 2 patients complained of unsightly scar in the lateral eyebrow region and postoperative swelling was more in Group II patients because of severed muscle and soft tissue in frontozygomatic region. Operating time was also more and two patients complained of palpability of plates.

The results of studies by Zingg et al¹³, Markowitz and Manson¹⁴ showed that the greater wing of sphenoid is a key area in determining the final result in the treatment of zygomaticomaxillary complex fractures. Undetected axial rotation of zygoma at the greater wing of sphenoid is often the reason for an unsatisfactory outcome. But in the reported study, no attempt has been made for fixation in this suture area.

SUMMARY AND 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 un-aesthetic 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 post-operative 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

zygomaticomaxillary buttresses, 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.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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