



Original Article



Outcomes of One Point versus Two Point Fixation in Zygomatic Bone Fracture

Maria Jabbar¹, Uzair Bin Akhtar¹, Komal Akram¹, Shoaib Younas², Mustafa Ayub Khawaja¹ and Muhammad Khalil¹

¹Department of Oral and Maxillofacial Surgery, Sharif Medical and Dental Hospital, Lahore, Pakistan

²Department of Oral and Maxillofacial Surgery, Combined Military Hospital, Lahore, Pakistan

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***Corresponding Author:**

Maria Jabbar
Department of Oral and Maxillofacial Surgery, Sharif Medical and Dental Hospital, Lahore, Pakistan
drmarijabbar@gmail.com

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ABSTRACT

Fractures of the zygomatic bones are quite common injuries. There are several different surgical methods for fixing zygomatic bone fractures, and there is no universally accepted one.

Objective: To compare the outcomes of one-point and two-point fixation in zygomatic bone fractures. **Methods:** This prospective comparative study was carried out on 60 patients admitted to the Department of Oral and Maxillofacial Surgery at Sharif Medical and Dental Hospital, Lahore, from September 2023 to August 2024. The patients were divided into two groups (A/B). Thirty consecutive patients in group A received one-point fixation, and thirty consecutive patients in group B received two-point fixation for their zygomatic fracture repair. The outcomes of procedures were evaluated by assessment of the bone diastasis at the inferior orbital margin and frontozygomatic suture on postoperative CT scan, and evaluation of malar height clinically. **Results:** There was a non-significant association between bone reduction in the Frontozygomatic suture and method of fixation ($p=0.237$). The association between bone reduction in the infraorbital margin and method of fixation was significant ($p=0.005$). For malar height, a statistically non-significant difference in the post-operative malar height among the groups that had undergone one and two-point fixation ($p=0.067$). **Conclusion:** The majority of individuals who had two-point fixation exhibited appropriate reduction at the infra-orbital margin and frontozygomatic suture. Those who had one-point fixation treatment exhibited higher post-operative malar height.

INTRODUCTION

Facial bone fractures have been known for a very long period, and attempts to cure them efficiently continue to date. Fractures involving the zygomatic complex are the most common occurrence in the maxillofacial region. Trauma from attacks, falls, and injuries related to sports, road traffic accidents, and civilian combat are some of the types of injuries [1]. Direct trauma can cause damage to the zygomatic arch, a laterally placed portion of the skull that is made up of the zygoma as well as the temporal bone. Approximately 10% of all zygomatic fractures result in isolated zygomatic arch fractures, which produce a pronounced depression over the arch fracture area. A fractured arch tends to apply pressure on the coronoid process, which impedes mouth opening [2]. Nevertheless,

the prevalence of facial bone fractures is also highly dependent upon sociodemographic and environmental factors [3]. ZMC fractures are typically diagnosed clinically. A CT scan aids in the diagnosis of these fractures significantly by providing three-dimensional reconstruction films, axial and coronal planes, which confirm the diagnosis [4]. ZMC fractures that have no or very little displacement are managed conservatively without surgical procedures, whereas fractures that have functional or aesthetically problematic issues like diplopia, a limited range of movement in the mouth, or a depression of the malar eminence need to be managed surgically [5]. To get excellent results, a variety of surgical procedures have been used, including the Gillies' temporal procedure,



upper eyelid, lateral brow, subciliary, transconjunctival, and intraoral routes [6]. Restricted mouth opening, major arch flattening, as well as diplopia are some of the important aesthetic as well as functional issues associated with displaced zygomatic bone fractures [7]. Stable and appropriate reduction needs to be accomplished to reestablish function, along with the appearance of the face. Since the zygoma can get fractured within a range of patterns, an extensive range of therapy suggestions have developed: compared to the minimum reduction procedures conducted without fixation, to complex kinds of open reduction. The zygomatic bone can be fixed by using different types of fixations [8]. The type of post-fixation segment stability is determined by the fixation technique, which is dependent on the impact of trauma [9]. Several studies have examined the results based on the variety of fixations, despite earlier research reporting that one-point fixation using the oral technique is adequate [10]. On the other hand, two-point and three-point fixation have been compared in numerous studies. According to one study that used X-rays to assess one-point and two-point fixation, two-point fixation was better for bone stability than one-point fixation [11]. Although three-point fixation has historically been considered the traditional method for managing displaced ZMC fractures, recent literature indicates that comparable stability can often be achieved with fewer fixation points, especially in non-comminuted unilateral fractures [7]. Three-point fixation also requires additional surgical exposure, greater operative time, and a higher risk of visible scarring, which makes it less favorable in cases where adequate reduction can be achieved with fewer fixation points [12].

Despite the widespread use of one-point and two-point fixation techniques for isolated unilateral ZMC fractures, there remains inconsistency in clinical decision-making regarding the optimal approach to achieve adequate stability with minimal morbidity. There is a lack of robust comparative evidence, particularly in similar clinical settings, evaluating functional and aesthetic outcomes between one-point and two-point fixation, underscoring the need for further focused investigation. This study aimed to focus specifically on comparing one-point and two-point fixation, as these represent the most commonly used contemporary approaches for isolated unilateral ZMC fractures while balancing surgical access, stability, and aesthetic outcomes.

METHODS

This prospective comparative study was conducted after attaining ethical approval from the Sharif Medical Research Center (SMRC) (Ref. no SMDC/SMRC/311-23). The sample size was calculated using the WHO sample size formula, taking malar symmetry in one point fixation group as 94.1%

with 95 % confidence level at 0.06 precision [3]. A total of 60 patients having zygomatic complex fractures, visiting the Oral and Maxillofacial OPD at Sharif Medical and Dental Hospital, Lahore, from September 2023 to August 2024, were included. After informed consent, using a non-probability convenience sampling technique, patients were allocated into two groups of 30 patients each: group A and group B. All patients aged > 18 years diagnosed with isolated unilateral zygomatic bone fracture, diagnosed on CT scan, were included. Patients with comminuted zygomatic bone fracture, or having other facial fractures associated with zygomatic bone fracture, bilateral fractures, old fractures (>2 weeks), or medically unfit patients were excluded from this study. Under General Anesthesia, thirty consecutive patients in Group A underwent one-point fixation at the zygomaticomaxillary buttress, and 30 consecutive patients in Group B underwent two-point fixation at the zygomaticomaxillary and the frontozygomatic region. Oral and maxillofacial surgeons carried out a standard procedure for fracture repair. In the maxillary vestibular region, above the mucogingival junction, an incision was made; zygomaticomaxillary and nasomaxillary buttresses were exposed. The frontozygomatic junction and infraorbital ridge were palpated to assess correct reduction. The zygomatic complex fracture was stabilized with a miniplate and screws at the zygomaticomaxillary buttress in group A. The frontozygomatic junction was exposed for a second fixation point through the lateral eyebrow incision, which was then stabilized by miniplates in group B. The sulcus and the lateral eyebrow incisions were closed using sutures (Vicryl 3-0) and (Prolene 5-0), respectively. The follow-up was done on the 7th day and after one month of the procedure. Clinically, malar height was measured using two reference points: point A at the intersection of the mid-sagittal line with the intercanthal line, and point B at the maximum prominence of the malar region, viewed from the vertex perspective. The distance between the two points was measured with a vernier caliper, and all postoperative results depended on this measurement. All measurements were performed by a single calibrated maxillofacial surgeon to minimize inter-observer variability. Radiologically, post-operative stability of the zygomatic segments was evaluated using maxillofacial CT scans (1-1.25 mm slices). Assessment included alignment of the frontozygomatic suture, infraorbital rim, zygomaticomaxillary buttress, and lateral orbital wall compared with the contralateral side. Displacement was measured in axial, coronal, and sagittal views (less than 3mm is adequate, and more than 3 mm is inadequate) [13]. Malar projection symmetry and orbital floor continuity were also reviewed. All radiological measurements were

performed independently by two surgeons, with discrepancies resolved by consensus. All data were analyzed using SPSS version 23.0. Nominal data were presented as frequencies and percentages, and numeric data as mean ± standard deviation. The Shapiro–Wilk test was used to assess the normality of continuous variables, and Levene's test assessed equality of variances. The independent t-test was used for normally distributed continuous variables with equal variances, while the Chi-square test and Fisher's exact test were applied to categorical variables. No formal adjustment was made for multiple comparisons due to the limited number of primary outcomes; p-values were interpreted cautiously, with p<0.05 considered statistically significant.

RESULTS

Among all 60 included patients, the mean age was 30.75 ± 11.12 years. A total of 95% were males and 5% were females. Half of the patients underwent one-point fixation, while the remaining half received two-point fixation. A statistically non-significant association was found between bone reduction at the frontozygomatic (FZ) suture and the fixation method (p=0.237). Among patients with adequate bone reduction, a higher proportion belonged to the two-point fixation group (Table 1).

Table 1: Association Between Bone Reduction at the Frontozygomatic Suture and Method of Fixation

Radiological Assessment of the FZ suture	One-Point Fixation	Two-Point Fixation	Total	p-value
Adequate Bone Reduction (≤3 mm)	27 (47.4%)	30 (52.6%)	57	0.237
Inadequate Bone Reduction (>3 mm)	3 (100%)	0 (0%)	3	

A statistically significant association was identified between bone reduction at the infra-orbital margin and the fixation method (p=0.005). Patients with adequate reduction were predominantly from the two-point fixation group (Table 2).

Table 2: Association Between Bone Reduction at the Infra-Orbital Margin and Method of Fixation

Radiological Assessment of Infra-Orbital Margin	One-Point Fixation	Two-Point Fixation	Total	p-value
Adequate Bone Reduction (≤3 mm)	19 (40.4%)	28 (59.6%)	47	0.005*
Inadequate Bone Reduction (>3 mm)	11 (84.6%)	2 (15.4%)	13	

There was a non-significant difference in postoperative malar height between the two groups (p=0.067). Although not statistically significant, patients treated with one-point fixation showed slightly higher postoperative malar height (Table 3).

Table 3: Post-Operative Malar Height Comparison Between One-Point and Two-Point Fixation

Group	n	Mean ± SD	p-value
One-Point Fixation	30	63.27 ± 2.26	0.067
Two-Point Fixation	30	62.30 ± 1.73	

DISCUSSION

Zygomatic bone fractures are difficult to treat because of their intricate three-dimensional dynamic structure. Fixation must be carried out with the right technique and precise reduction in order to produce good surgical outcomes, both aesthetically as well as functionally. Although three-point fixation with the three-point approaches technique has been the historically recommended method for zygomatic bone surgery, research has found that one-point as well as two-point fixation could produce stability comparable to that of three-point stabilization [14]. According to one study, one-point fixation over the zygomatico-frontal suture can help achieve both functional as well as aesthetic goals [15]. According to other research, one-point fixation by the oral technique could produce good surgical outcomes. However, there is still disagreement over how many plates are necessary for proper fixing [16]. With parameters taken at precisely the same fixation points as in our investigation, a prior study compared the surgical outcomes of one-point versus two-point fixation in zygomatic bone fractures using X-ray images. According to that study, two-point fixation produced better bone stabilization outcomes [11]. CT is a better way to assess whether sufficient postoperative outcomes have been obtained in the facial bone because it is the gold-standard method for assessing postoperative outcomes and taking anatomical assessments of facial bone fractures that constitute a complicated three-dimensional framework [17]. In current study, bone loss in the Frontozygomatic suture and fixing technique was not significantly correlated (p=0.237). Among those with sufficient bone reduction, it was observed that a larger proportion belonged to the two-point fixation group. These results are consistent with a study that found that one-point fixation of fractures of the zygomatic bone could yield adequate stability as well as aesthetic outcomes in 94.1% of instances. Its benefits include preventing external scarring and plate palpability, lowering the risk of infection of the wound, and increasing the overall satisfaction of patients about the procedure (94.1%) [18]. On the other hand, it has drawbacks, such as the failure to produce satisfactory outcomes in cases where the zygomatic buttress was crushed, which happened in 5.9% of cases. Nonetheless, in 97% of cases, two-point fixation of the zygomatic bone may result in acceptable stability alongside aesthetically pleasing outcomes. Nevertheless, it has drawbacks, including the possibility of unsightly scarring in 41.2% of cases, palpable plate in 35.3% of cases, a higher risk of infection from the wound in 17.6% of cases, and less favorable satisfaction rates (58.8%) [19]. As far as the malar height is concerned, according to our study a difference between both groups

that went through one-point and two-point fixation in terms of post-operative malar prominence that was statistically insignificant ($p=0.067$) [20]. Those that received one-point fixation had a higher post-operative malar height than those who had two-point fixation, even though the disparity was not statistically significant, these results are contrary to a study stated that they concluded that the malar height, which demonstrated that two-point fixation produced better correction outcomes than one-point fixation. Disparities between these two operative techniques were statistically significant ($p<0.001$) [9]. Although two-point fixation provided better radiological reduction, one-point fixation remains a viable option in specific clinical scenarios. Patients with isolated, non-comminuted fractures, minimal displacement, and an intact zygomaticomaxillary buttress may benefit from one-point fixation due to reduced surgical exposure, lower risk of scarring, and shorter operative time. Additionally, one-point fixation may be preferred in patients with great cosmetic concerns or in settings where additional surgical sites increase morbidity. Present study supports that with careful patient selection, one-point fixation can achieve satisfactory functional and aesthetic outcomes.

A limitation of our study is the relatively short follow-up period of 1 month, which may not fully reflect long-term radiologic stability and bone healing. Previous studies suggest that postoperative assessment of zygomatic fracture alignment and malar prominence is ideally conducted at 3-6 months to account for remodeling and late changes. Future studies with extended follow-up are warranted to confirm the durability of one-point versus two-point fixation outcomes.

CONCLUSIONS

Fixation using two points showed better radiologic results, with the percentage of patients with sufficient reduction in both the frontozygomatic suture and the infra-orbital margin being greater. On the contrary, one-point fixation led to a very minor increase in postoperative malar height, which was not statistically significant. Generally, although two-point fixation was the best in terms of anatomy, one-point fixation was still acceptable, which suggests that both methods could be used in case of fracture pattern and clinical needs.

Authors' Contribution

Conceptualization: MJ

Methodology: MJ, UBA, KA, SY, MK

Formal analysis: MAK

Writing and drafting: MJ, UBA, SY, MAK, MK

Review and writing: MJ, UBA, KA, SY, MK, MAK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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