Available online at *www.ujpronline.com*
Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

RESEARCH ARTICLE

RETROSPECTIVE ANALYSIS OF 24 SURGICALLY TREATED ZYGOMATICOMAXILLARY COMPLEX FRACTURES USING TWO POINTS VERSUS THREE POINTS TECHNIQUES

Lutf Mohammed Al-Rahbi[1,2], Ayman Ahmad Amer[1], Hassan Abdulwahab Al-Shamahy[*3,4], Ahmed Abdulah Al-Ashwal[1,2]

[1]*Yemen Medical Specialist Council, Ministry of Health and population, Yemen.*
[2]*Department of Oral and Maxillo-Facial Surgery, Faculty of Dentistry, Sana'a University, Republic of Yemen.*
[3]*Department of Basic Sciences, Faculty of Dentistry, Sana'a University, Republic of Yemen.*
[4]*Medical Microbiology and Clinical Immunology Department, Faculty of Medicine and Health Sciences, Sana'a University, Republic of Yemen.*

Article Info:

Article History:
Received: 4 December 2025
Reviewed: 17 January 2026
Accepted: 19 February 2026
Published: 15 March 2026

Cite this article:
Al-Rahbi LM, Amer AA, Al-Shamahy HA, Al-Ashwal AA. Retrospective analysis of 24 surgically treated zygomaticomaxillary complex fractures using two points versus three points techniques. Universal Journal of Pharmaceutical Research 2026; 11(1): 26-32.
http://doi.org/10.22270/ujpr.v11i1.1486

***Address for Correspondence:**
Dr. Hassan A. Al-Shamahy, Department of Basic Sciences, Faculty of Dentistry, Sana'a University, Republic of Yemen.
Tel: +967-1-239551
E-mail: *hassanalshamahii@gmail.com*

Abstract

Background and aims: Mandibular fractures are the most common facial trauma injuries, followed by zygomaticomaxillary complex (ZMC) fractures. The aetiology of these fractures varies greatly between nations and even regions, despite the fact that their occurrence is uniform across geographic boundaries. This study compares the results of two-point versus three-point surgical treatments for ZMC fractures.
Subjects and methods: Patients with zygomatico-maxillary complex fractures who received surgical treatment at the Military Hospital in Sana'a, Yemen, in 2025 were the subject of a retrospective analysis. Regarding the two-point and three-point procedures, the patients were split into two groups. Demographic information, aetiology, fracture types location, any facial injuries, kind and timing of repair, were all gathered.
Results: The study involved 24 male patients with zygomatico-maxillary complex fractures, averaging 26.3 years in age, primarily due to road traffic accidents (70.8%). High Intraorbital Rim (IOR) involvement was observed in 95.8% of cases, with complications such as ocular muscle entrapment (33.3%) and inferior orbital nerve (ION) involvement (75%). Periorbital edema (79.2%) and ION paraesthesia (75%) were the most common complications. The three-point fixation technique showed a higher incidence of periorbital edema (100%) and numbness in the inferior oblique nerve (100% versus 50% for the two-point technique), alongside more lower eyelid deformities (83.3% vs 25%),
Conclusions: Road traffic accidents is most common aetiology of zygomatico-maxillary complex fractures, High intraorbital rim (IOR), ocular muscle entrapment , inferior orbital nerve (ION) involvement, Periorbital edema and ION paresthesia were the most common complications.
Keywords: Aetiology, complications, maxillofacial fracture, three-point technique, two-points techniques, zygomaticomaxillary complex fracture.

INTRODUCTION

The interactions between the zygoma and the face account for three of the four elements of the zygomaticomaxillary complex fracture, while the orbital floor makes up the fourth. Previously known as a tripod fracture or trimalar fracture, it is also known as a quadripod fracture or quadramalar fracture. Its specific locations include the zygomatic arch, the orbital floor close to the infraorbital canal, the separation of the maxilla and zygoma at the anterior maxilla (near the zygomaticomaxillary suture), and the lateral orbital wall (at its inferior junction with the zygomaticosphenoid suture at the sphenoid greater wing or its superior junction with the zygomatico-frontal suture)[1,2].

Upon physical examination, the fracture manifests as a wider face and a loss of cheek projection. Infraorbital nerve damage typically results in loss of feeling in the face and upper lip. Other indirect signs of the damage include facial bruising, periorbital ecchymosis, soft tissue gas, oedema, trismus, abnormal mastication, diplopia, and ophthalmoplegia, 1.5 cm behind the

zygomaticotemporal suture is where the zygomatic arch typically breaks[2,3].

Conservative treatment is an option for fractures that are not displaced or only slightly displaced. Internal fixation and open reduction are only used in patients that are substantially comminuted or angulated. Restoring the face's natural appearance is the goal of fixation. The location of the malar eminence and the lowering of orbital volume by zygoma and sphenoid realignment are specifically addressed. If the correction is not made, the eye may sink inward due to rotational malformation and an increase in orbit volume[4]. Surgery involving fracture reduction using miniplates, microplates, and screws is necessary for displacement fractures. For depressed zygomatic fractures, Gillie's method is applied[5]. Tripod fractures typically have a favourable outcome. Persistent facial asymmetry following surgery may occasionally occur, necessitating additional care[6].

Only mandibular fractures are more prevalent than zygomaticomaxillary complex (ZMC) fractures[7]. Fractures of the zygomatic complex that are not or are not sufficiently reduced may cause visible facial asymmetry, which may cause issues in social situations. As a result, it is essential to properly reduce and heal these fractures inside. While the distribution of fracture patterns appears to be comparable across different trauma centers, the aetiology varies, primarily due to national socioeconomic considerations. Road traffic accidents, interpersonal aggression, falls, sports injuries, and occupational injuries are a few typical causes[7,8]. This study compares the results of two-point versus three-point surgical treatments for ZMC fractures.

PATIENTS AND METHODS

Study design: This study examined the clinical records of individuals who had been diagnosed with ZMC fractures during a one-year period using a retrospective observational methodology.

Patient population: This study comprised patients with ZMC fractures who visited the Military Hospital's Department of Oral and Maxillofacial Surgery in Sana'a City, Yemen, between January 1 and November 31, 2025.

Ethical considerations: Every participant gave their written or verbal consent. Under registration number 2024-49, dated December 5, 2024, the Ethics Committee of the Military Hospital approved the study, which was carried out in compliance with the Declaration of Helsinki.

Inclusion criteria: First, the fracture must be in ZMC and caused by trauma; second, the patient must have received adequate follow-up (at least two follow-up visits after surgery or an initial consultation for one year); and the fracture must be confirmed by computed tomography.

Exclusion criteria: The study excluded patients with pathological fractures due to osteitis, radiation necrosis, cysts, or tumours; it also excluded patients with incomplete medical records and inadequate follow-up.

Clinical feature record: The writers reviewed medical documents that were obtained by a medical secretary. Patient charts were used to collect information on age, gender, comorbidities, fracture cause, anatomical location of the fracture, time from injury to consultation/treatment, type of treatment (one point or two points, with reconstruction plate with or without IMF), antibiotic regimen, occlusal status at the last visit, nerve impairment in relation to the inferior alveolar nerve (IAN), and the occurrence and management of any complications. Patients were divided into treatment groups based on clinical evaluation, which considered factors such fracture kind, displacement, occlusal stability, patient compliance, and functional impairment.

Statistical analysis

Typical descriptive statistics were used to sum the results. Numerical variables are summarised using mean values, whilst categorical data are displayed as counts and percentages. Table 1 displays the demographic information of the patients who were enrolled.

RESULTS

Table 1 shows the distribution of patients by sex and age who underwent different bone fixation techniques to repair zygomatico-maxillary complex fracture. The study included 24 patients, all male. The mean age of the patients was 26.3 ± 8.3 years, with a range of ages from 2 to 45 years. Looking at the age groups, 4.2% were under 21 years old, 50% were 21–25 years old, 29.2 % were 26–30 years old, and 16.7% were over 30 years old.

Table 1: Sex and age distribution of patients with zygomaticomaxillary complex fracture.

Characters	N (%)
Sex	
Male	24 (100)
Female	0 (0.0)
Total	24 (100)
Age groups (years)	
Less than 20 years	1 (4.2)
21 -25 years	12 (50)
26-30 years	7 (29.2)
More than 30 years	4 (16.7)
Mean	26.3 years
SD	8.3 years
Median	24 years
Mode	30 years
Range	2 to 45

Table 2: Distribution of fracture causes in patients with zygomaticomaxillary complex fracture.

Characters	N (%)
Assault	2 (8.3)
Explosion	1 (4.2)
Fall	0 (0)
Gunshot	4 (16.7)
Pathology	0 (0)
Road travel accident (RTA)	17 (70.8)
Total	24 (100)

Table 2 shows the distribution of fracture causes in patients with zygomaticomaxillary complex fracture who underwent different fixation techniques for fracture repair. The most common cause of fractures was road traffic accidents (70.8%), followed by gunshot wounds (16.7%), explosions (4.2%), and assault (8.3%). Table 3 shows the fracture type in patients who with zygomaticomaxillary complex fracture who underwent different fixation techniques for fracture repair. Displaced fracture accounted for 66.7%, un-displaced for 16.7% and comminated fractures for 16.7%.

Table 3: Fracture type in patients who with zygomaticomaxillary complex fracture.

Characters	N (%)
Displaced	16 (66.7)
Un-Displaced	4 (16.7)
Comminuted	4 (16.7)
Total	24 (100)

Table 4 shows the associated structures effected with zygomaticomaxillary complex fracture in the study patients. The percentages were IOR involvement IOR involvement 95.8%, ectara ocular muscle entrapment 33.3%, Eyes-ball injury 12.5%, ION involvements 75% and Soft-tissue injury counted 75%.

Table 4: Associated structures effected with zygomaticomaxillary complex fracture in the study patients.

Characters	N (%)
IOR involvement	23 (95.8)
Ectara ocular muscle entrapment	8 (33.3)
Eyes-ball injury	3 (12.5)
ION involvements	18 (75)
Soft-tissue injury	18 (75)
Total	24 (100)

Table 5 shows the type of fixation that applied to repair of zygomaticomaxillary complex fractures. 50% of patients had two points techniques, and 50% of them with three points techniques, and 12.5% had associated orbital reconstruction. Table 6 illustrates the complications in patients who underwent various bone fixation techniques to repair zygomaticomaxillary complex fracture. The total number of complications in the current study was 19 (79.2), with Peri orbital edema being the most common (79.2%), followed by Paresthesia or numbness of IO nerve (75%), Visual impairment counting 29.3%, Muscle entrapment 16.7%, lower eyelid deformity 54.5% , and Instability of fixation counting 8.3%.

Table 5: Type of fixation that applied to repair of zygomaticomaxillary complex fracture.

Techniques	N (%)
Two points	12 (50)
Three points	12 (50)
Associated orbital reconstruction	3 (12.5)
Total	24 (100)

Table 6: Early post operative Complications among patients subjected to different fixation types in repair of zygomatico maxillary complex fracture.

Complications	N (%)
Peri orbital edema	19 (79.2)
Wound dehiscence	0 (0.0)
Visual impairment	7 (29.2)
Muscle entrapment	4 (16.7)
Paresthesia or numbness of IO nerve	18 (75)
Iatrogenic injury of eyeball	0 (0.0)
Lower eyelid deformity	13 (54.5)
Infections	0 (0.0)
Instability of fixation	2 (8.3)
Total complications	19 (79.2)

Table 7 shows the early postoperative complications in patients who underwent different types of fixation for fracture repair of the zygomatic bone and maxilla. When comparing the incidence of periorbital edema with the two-point fixation technique versus the three-point fixation technique, the rate was significantly higher (100%) with the three-point fixation technique compared to 58.3% with the two-point fixation technique. The incidence of numbness or tingling in the inferior oblique nerve was 100% with the three-point technique, compared to 50% with the two-point technique. Lower eyelid deformity was also more common in patients undergoing the three-point technique (83.3%) compared to 25% with the two-point technique. Muscle contractures occurred in 25% of patients with the three-point technique, compared to 8.3% with the two-point technique. These results indicate the superiority of the two-point technique over the three-point technique. Table 8 shows the comparison of complications during follow-up periods for patients who underwent fixation techniques in the repair of a complex zygomatic bone and maxilla fracture. Visual impairment occurred in 70.8% of the patients after the surgery and decreased to 25% in the six months of follow up.

Table 7: Early post operative complications among patients.

Complications	Total N (%)	Two points N (%)	Three points N (%)	Associated orbital reconstruction N (%)
Peri orbital edema	19 (79.2)	7 (58.3)	12 (100)	3 (100)
Wound dehiscence	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Visual impairment	7 (29.2)	2 (16.7)	5 (41.7)	3 (100)
Muscle entrapment	4 (16.7)	1 (8.3)	3 (25)	1 (33.3)
Paresthesia or numbness of IO nerve	18 (75)	6 (50)	12 (100)	3 (100)
Iatrogenic injury of eyeball	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lower eyelid deformity	13 (54.5)	3 (25)	10 (83.3)	3 (100)
Infections	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Instability of fixation	2 (8.3)	1 (8.3)	1 (8.3)	1 (33.3)

Table 8: Comparison of complications during follow-up periods.

Complications	Post-operative N (%)	After 4 weeks N (%)	After 2 months N (%)	After 4 months N (%)	After 6 months N (%)
Peri orbital edema	19 (79.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Wound dehiscence	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Visual impairment	7 (29.2)	17 (70.8)	6 (25)	6 (25)	6 (25)
Muscle entrapment	4 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Paresthesia or numbness of IO nerve	18 (75)	17 (70.8)	10 (41.7)	7 (29.2)	8 (33.3)
Iatrogenic injury of eyeball	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lower eyelid deformity	13 (54.5)	14 (58.3)	13 (54.2)	11 (45.8)	11 (45.8)
Infections	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Instability of fixation	2 (8.3)	1 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)
Scar	-	18 (75)	18 (75)	-	-
Residual facial asymmetry	-	18 (75)	18 (75)	17 (70.8)	17 (70.8)
non-union	-	-	1 (4.2)	1 (4.2)	1 (4.2)
Mal-union	-	-	1 (4.2)	1 (4.2)	1 (4.2)
Persistent swelling	-	-	3 (12.5)	3 (12.5)	2 (8.3)

Paresthesia or numbness of IO nerve occurred in 75% of the patients after the surgery and decreased to 33.3% in the six months of follow up. Lower eyelid deformity persists six months after the procedure in 45.8% of patients. Residual facial asymmetry was also observed in 75% of patients four weeks after the procedure, and persisted even after six months of follow-up in 70.8% of patients. Table 9 compares postoperative and four-month complications between two-point and three-point fixation techniques in patients who underwent fixation for complex fractures of the zygomatic bone and maxilla. With the two-point technique, periorbital edema occurred in 58.3% of patients postoperatively, decreasing to 0.0% during the four-month follow-up period, while this decreased from 100% to 0.0% with the three-point technique. Visual impairment occurred in 16.7% of patients postoperatively with the two-point technique and persisted at the same rate (16.7%) during the four-month follow-up period, while this decreased from 41.7% to 33.30% with the three-point technique after four months of follow-up. Inferior oblique nerve palsy or numbness occurred in 50% of patients postoperatively with the two-point technique, decreasing to 16.7% during the four-month follow-up period. In contrast, this percentage decreased from 100% to 41.7% with the three-point technique after four months of follow-up. With the two-point technique, lower eyelid distortion occurred in 25% of patients post-operatively, and this percentage decreased to 8.3% during four months of follow-up. In contrast, this percentage remained at 83.3% with the three-point technique after four months of follow-up. With the two-point technique, no residual facial asymmetry was observed in any of the patients post-operatively, and this percentage increased to 50% during four months of follow-up. In contrast, this percentage increased from 0% to 91.7% with the three-point technique after four months of follow-up.

Table 9: Comparison of postoperative and 4-month complications for the two-point and three-point techniques for patients.

Complications	Post-operative 2 points N (%)	After 4 months 2 points N (%)	Post-operative 3 points N (%)	After 4 months 3 points N (%)
Peri orbital edema	7 (58.3)	0 (0.0)	12 (100)	0 (0.0)
Wound dehiscence	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Visual impairment	2 (16.7)	2 (16.7)	5 (41.7)	4 (33.3)
Muscle entrapment	1 (8.3)	0 (0.0)	3 (25)	0 (0.0)
Paresthesia or numbness of IO nerve	6 (50)	2 (16.7)	12 (100)	5 (41.7)
Iatrogenic injury of eyeball	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lower eyelid deformity	3 (25)	1 (8.3)	10 (83.3)	10 (83.3)
Infections	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Instability of fixation	1 (8.3)	1 (8.3)	1 (8.3)	0 (0.0)
Residual facial asymmetry	0 (0.0)	6 (50)	0 (0.0)	11 (91.7)
Persistent swelling	0 (0.0)	2 (16.7)	0 (0.0)	1 (8.3)
Total	10 (83.3)	6 (50)	12 (100)	11 (91.7)

DISCUSSION

The published document summarizes various studies related to maxillofacial surgery and dental implants, focusing on several topics: the effectiveness of dental implants in the posterior maxilla[9,10], aesthetic outcomes in unilateral cleft lip repair[11], the prevalence of long styloid processes[12], and comparisons of fixation techniques for mandibular fractures[13]. It also discusses treatment techniques for maxillofacial fractures[14], sensory nerve recovery following injuries[15,16], oral reactive hyperplasia[17,18], and bone grafting for fracture repairs[19-22]. Notably, it mentions a pioneering study comparing two-point and three-point surgical treatments for zygomatic bone fractures in Yemen.

This illustrates the two methods our institution uses to treat ZMC fractures. There have also been descriptions of other algorithmic methods[23-26]. The amount of fixation needed for ZMC fractures has been extensively researched; recommendations range from one to four

points of fixation[23,27-29]. Applying the least amount of fixation required to stabilise the ZMC and enable bony union should be the main objective. Consequently, one or two plates at the lateral buttress and the ZF suture may be sufficient for lower energy injuries without comminution[23,28]. An extra miniplate at the infraorbital rim can provide three points of fixation if more stability is needed.

This illustrates the two methods our institution uses to treat ZMC fractures. There have also been descriptions of other algorithmic methods[23-27]. The amount of fixation needed for ZMC fractures has been extensively researched; recommendations range from one to four points of fixation[23,27-30]. Applying the least amount of fixation required to stabilise the ZMC and enable bony union should be the main objective. Consequently, one or two plates at the lateral buttress and the ZF suture may be sufficient for lower energy injuries without comminution[23,28]. An extra miniplate at the infraorbital rim can provide three points of fixation if more stability is needed. Patients may report palpability or sensitivity to hardware in the thin skin covering the rim of the lower eyelid[29].

Zygoma fractures are frequently caused by a variety of factors, including assault, falls, and car accidents. In reference to the intersection of the zygoma with the frontal, maxillary, temporal, and sphenoid bones, zygomaticomaxillary complex (ZMC) fractures have also been referred to as tetrapod fractures[30].

According to Gutta *et al*.[31], the ratio of male to female injuries was 7.4:1. There were 24 patients in the current study, all of whom were men. This outcome can be explained by the fact that men are more likely than women to have ZMC fractures, mostly as a result of lifestyle and behavioural variables because they engage in high-risk activities. For both sexes, these activities result in distinct primary causes of damage. Since violence and personal assaults are a major cause of ZMC fractures in men in many developed nations and urban settings, they are also linked to men. According to certain research, attacks account for about half of all ZMC fractures in men, which is much more common than in women[31].

Risk-taking behaviours are especially important since young men, typically between the ages of 18 and 30, are more likely to drive carelessly, abuse drugs and alcohol, and participate in violent activities. Men are more likely to work in vocations that put them at risk for injury, such as outdoor activities, contact sports, and industrial jobs. Last but not least, although they affect both sexes, auto accidents are a major cause for men and are often the result of dangerous driving behaviours like speeding or not wearing seat belts and helmets[31,32]. Studies have shown that patients with ZMC fractures typically range in age from late twenties to early thirties, with an average age of 29 to 31 years. The patients in the current study ranged in age from 2 to 45 years, with a mean age of 26.3±8.3 years. People between the ages of 16 and 40 often have the highest prevalence because this is a crucial time in life when they are more likely to experience trauma from things like car accidents[33].

Road traffic accidents accounted for 70.8% of ZMC fractures in the current survey, with gunshot wounds coming in second at 16.7%, explosions at 4.2%, and assault at 8.3%. In contrast, Blumer M *et al*.[1], Wang and Dillon[23], and Gassner *et al*.[34], discovered that violence was the main reason for ZMC fractures. Furthermore, obtained results go counter to previous studies by Zix *et al*.[35], and Buchanan EP *et al*.[36], which showed that the majority of injuries were caused by auto accidents and sports injuries[35].Over the past ten years, the United States has seen a 22% rise in the prevalence of assault and interpersonal violence[37]. Violence in the community may have increased as a result of the economic crisis, drug and alcohol abuse, and a decline in social status. There have also been reports of multiple mandibular fractures connected to assault[38].

In the patients under investigation, the zygomatico-maxillary complex fracture affected the related structures was really high. IOR involvement (95.8%), Ectara ocular muscle entrapment (33.3%), eyes-ball damage (12.5%), ION involvement (75%), and soft-tissue injury (75%) were the percentages. This can be explained by the fact that the displacement of the zygomatic bone from its four articulations with the facial skeleton is referred to as a “quadruped” or “tripod” fracture of the zygomaticomaxillary complex (ZMC). Fractures of the zygomaticomaxillary complex damage many nearby bony, neurological, muscular, and ocular systems because of its central placement in the middle of the face and its function in producing the orbital cavity[23].

Open internal fixation, which usually entails stiff fixation with tiny titanium plates and screws, is the conventional therapy for zygomatic fractures with displacement. The degree of displacement, fragmentation, and stability determine the number of fixation sites (1, 2, 3, or 4), with three-point fixation regarded as the best option in complex situations[39]. Of the patients in this study, 50% had two-point procedures, 50% had three-point techniques, and 12.5% had orbital reconstruction. The gold standard, three-point fixation, offers better stability, particularly when there are comminated or displaced fractures. This kind of fixation immobilises the zygomatic bone at three important joints: the zygomaticobiliary brace (typically fastened via an intraoral incision for vertical stability), the infraorbital rim (which ensures lateral orbital wall alignment), and the frontozygomatic suture (which offers stability against rotation). The frontozygomatic suture and the zygomaticobiliary brace are frequently used in two-point fixation, which is appropriate for non-comminuted or mildly displaced fractures. When treating severely comminuted fractures, four-point fixation may entail making a coronal incision to fix the zygomatic arch with a plate[40].

The initial trauma, the surgical technique selected, or incorrect fixation can all lead to complications when using bone fixation procedures to repair complex maxillary zygomatic bone fractures. Rigid internal fixation has advanced, although problems are still probable, ranging from modest sensory abnormalities

to serious functional and aesthetic defects[1,23]. The most common complication in the current study was peri orbital oedema (79.2%), followed by paraesthesia or numbness of the IO nerve (75%), visual impairment (29.3%), muscle entrapment (16.7%), lower eyelid deformity (54.5%), and instability of fixation (8.3%).

The most frequent complication (found in 41–68% of cases in the majority of earlier research) was sensory and neuromotor deficits, including infraorbital nerve palsy, which resulted in numbness in the cheek, upper lip, and teeth. This is because the fracture passes close to the infraorbital foramen, causing nerve injury or stretching. Facial nerve palsy: A bilateral coronal or temporal approach may result in either temporary or permanent injury to the facial nerve[23]. Ocular and orbital issues with double vision: These can last if the orbital floor is not adequately rebuilt, but they are frequently caused by muscular constriction, oedema, or bruising during the initial injury[23].

Double vision, hypoplasia, and orbital deformity: Hypopigmentation of the eyeball is typically caused by either failure to reconstruct the orbital floor, which increases orbital volume, or insufficient stabilisation of the zygomaticopsophageal joint (e.g., zygomaticopso-phageal joint failure). Lower eyelid ectropion/ intropion: Excessive tears or lower eyelid malfunction (ectropion, intropion) are frequent side effects of surgical procedures (such as suborbital or sublash incisions). Retroembolic haemorrhage is an uncommon but significant complication (0.3% of cases) that can result in irreversible blindness if left untreated after lateral angle-and-groovectomy/lateral ligament release. Present study did not report any cases of this condition.

Malunion and nonunion are examples of structural and aesthetic issues: Malunion results from improper, unstable, or insufficient fixing of bone fragments. Incorrect fixation of the zygomatic arch causes facial asymmetry and cheekbone flattening. Retrograde displacement of the zygomatic arch, which compresses the coronal process or the temporalis muscle, is typically the source of jaw spasm, or restriction of mouth opening. Lastly, there are surgical and technical issues, such as infection. Although infections are uncommon, they can happen, particularly in indi-viduals with poor oral hygiene when using an intraoral technique (Kaine incision). However, no cases were found in present investigation. Persistent suborbital numb-ness is typically the most frequent consequence of zygomatic bone fractures, although malunion brought on by insufficient fixation is the most frequent complication necessitating retreatment[40,41].

Limitation of the study

The limitations of the current study, which compares two-point and three-point fixation for zygomatic fractures, include variations in measured parameters that hinder standardized comparisons, a small sample size of only 24 cases, and inconsistent definitions of fracture complexity. Other limitations include the retrospective design, short follow-up periods, and the failure to consider surgical experience or fracture fragmentation in the final surgical outcome.

CONCLUSIONS

Zygomatico-maxillary complex fractures are most frequently caused by automobile accidents. The most frequent consequences were high intraorbital rim (IOR), ocular muscle entrapment, inferior orbital nerve (ION) involvement, periorbital oedema, and ION paraesthesia. Compared to the two-point technique, the three-point fixation technique had a higher frequency of problems, indicating that the two-point technique is better. Although variations may result from the limited sample size, brief follow-up duration, and patients' comorbidities, the complication rates in this group are similar with published studies.

ACKNOWLEDGEMENTS

For their gracious collaboration, the writers would like to thank Sana'a City's Military Hospital.

AUTHOR'S CONTRIBUTIONS

Amer AA: formal analysis, conceptualization, data organization, laboratory exams. **Al-Rahbi LM:** conceptualization, data organization, supervision. **Al-Ashwal AA:** conceptualization, data organization, supervision. **Al-Shamahy HA:** critical review. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

Upon request, the associated author can furnish the empirical data that substantiated the study's findings.

CONFLICT OF INTEREST

Regarding this project, there are no conflicts of interest.

REFERENCES

1. Blumer M, Kumalic S, Gander T, *et al*. Retrospective analysis of 471 surgically treated zygomaticomaxillary complex fractures. J Craniomaxillofac Surg 2018 Feb;46(2):269-273. *https://doi.org/10.1016/j.jcms.2017.11.010*. PMID: 29233697
2. Fraioli RE, Branstetter BF, Deleyiannis, FW. Facial fractures: Beyond Le Fort. Otolaryngologic Clinics of North America 2008;41 (1): *51*–76. PMID 18261526 *https://doi.org/10.1016/j.otc.2007.10.003*
3. Winegar BA, Murillo H, Tantiwongkosi B. Spectrum of critical imaging findings in complex facial skeletal trauma. Radiographics 2013; 33 (1): 319. PMID 23322824 *https://doi.org/10.1148/rg.331125080*
4. Nissen NJ, Okhah ZI, Basta MN, *et al*. Underdiagnosis of nasoorbitoethmoid fractures in patients with zygoma injury. Plast Reconstr Surg 2020;145(04):1001–1008. *https://doi.org/10.1097/PRS.0000000000006626*
5. Swanson E, Vercler C, Yaremchuk MJ. Gordon CR. Modified Gillies approach for zygomatic arch fracture reduction in the setting of bicoronal exposure. The J Cranio Surg 2012; 23(3): *859*62. *PMID 22565912* *https://doi.org/10.1097/scs.0b013e31824dd5c3*
6. Linnau, KF, Stanley RB Jr, Hallam DK, Gross JA, Mann FA. Imaging of high-energy midfacial trauma: what the surgeon needs to know. European J Radiol 2003; 48 (1): *17*–32. *https://doi.org/10.1016/s0720-048x(03)00205-5*
7. Al-Shameri AM, Al-Rahbi LM, Al-Ashwal AA, Al-Shamahy HA. Evaluation of neurosensory recovery in infraorbital and

inferior alveolar nerve impairments after maxillofacial fractures: a systematic review. Universal J Pharm Res 2025;10(4):1-6. *https://doi.org/10.22270/ujpr.v10i4.1395.*

8. Awad MMA, Al-Rahbi LM, Al-Ashwal AA, *et al*. Comparative outcomes in mandibular angle fracture management reconstruction plates versus dual miniplates fixation Universal J Pharm Res 2025:10(3):1-6. *https://doi.org/10.22270/ujpr.v10i3.1349.*
9. Al-Rahbi LM, Al-Sharif WKA, Al-Shamahy HA, Al-Ashwal AA. Outcome of 3D reconstruction in orbital area after long period follow up in a Military hospital in Sana'a city, Yemen. Universal J Pharm Res 2025; 10 (5):1-8. *https://doi.org/10.22270/ujpr.v10i5.1421.*
10. Ahmed MAQ, Alrubaidi YAS, Alhadi YAA, *et al*. Primary stability for short dental implant with deep threaded in posterior maxilla during early healing period. Universal J Pharm Res 2025;10(5):1-8. *https://doi.org/10.22270/ujpr.v10i5.1423*
11. Al-Kebsi AA, Al-Rahbi LM, Al-Shoaibi MHM, *et al*. Aesthetic outcome comparison between millard and fisher technique in repair of unilateral cleft lip. Universal J Pharm Res 2025;10(5):1-8, *https://doi.org/10.22270/ujpr.v10i5.1425*
12. Sharf-Aldeen YAA, Al-Shamahy HA, Al-Kabsi TA. Prevalence of elongated styloid process in Yemeni population of Sana'a city, Yemen. Universal J Pharm Res 2025;10(5):1-8. *https://doi.org/10.22270/ujpr.v10i5.1426*
13. Al-Rahbi LM, Zayed OA, Al-Ashwal AA, Al-Shamahy HA. Comparative radiological study of bone density and thickness between open and closed reduction of comminuted mandibular bone fracture. Universal J Pharm Res 2025; 10(5):1-8. *https://doi.org/10.22270/ujpr.v10i5.1432*
14. Jahaf MYM, Alhadi YAA, Al-Shamahy HA. The effectiveness of modified occlusal splint in treatment of oromandibular dystonia for a sample of Yemeni patients. Universal J Pharm Res 2025;10(4):1-8. *https://doi.org/10.22270/ujpr.v10i4.1386*
15. Al-Sarori WEA, Abbas AMA, Al-Shamahy HA. Single insertion technique directed by the anterior-thumb and the posterior-finger for mandibular anesthesia. Universal J Pharm Res 2025;10(4):1-8. *https://doi.org/10.22270/ujpr.v10i4.1388.*
16. Abu-Taleb AM, Al-Rahbi LM, Al-Ashwal AA, Al-Shamahy HA. Maxillofacial fracture type and their management in individuals referred to the military hospital in Sana'a city, Yemen. Universal J Pharm Res 10(4):1-8. *https://doi.org/10.22270/ujpr.v10i4.1392.*
17. Al-Shameri AM, Al-Rahbi LM, Al-Ashwal AA, *et al*. Evaluation of neurosensory recovery in infraorbital and inferior alveolar nerve impairments after maxillofacial fractures: a systematic review. Universal J Pharm Res 2025; 10(4):1-8. *https://doi.org/10.22270/ujpr.v10i4.1395.*
18. Rajeh SAY, Al-Shamahy HA, Al-Kibsi TA. Prevalence of oral reactive hyperplastic lesions and associated risk factors in a sample of Yemeni dental patients in several universities and public hospitals. Universal J Pharm Res 2025;10(3):1-8. *https://doi.org/10.22270/ujpr.v10i3.1346.*
19. Al-Rahbi LM, Al-Sabri HN, Al-Ashwal AA, Al-Shamahy HA. Maxillofacial fractures at the time of hardware removal: aetiology, surgical therapy, identification of postoperative infections, and antibiotic pattern of isolates. Universal J Pharm Res 2026; 10(6):1-6. *https://doi.org/10.22270/ujpr.v10i6.1453*
20. Al-Rahbi LM, Abdulsattar AAA, Al-Shamahy HA, Al-Ashwal AA. Successful anterior iliac crest bone grafting for mandibular defect reconstruction: Evaluation and outcomes using NVBG technique in Yemen. Universal J Pharm Res 2026;10(6):1-6. *https://doi.org/10.22270/ujpr.v10i6.1458.*
21. Al-Rahbi LM, Alezzi AM, Al-Shamahy HA, Al-Ashwal AA. The impact of different osteosynthesis techniques on post-operative outcomes in mandibular fracture manage-ment. Universal J Pharm Res 2026;10(6):1-6, *https://doi.org/10.22270/ujpr.v10i6.1460.*
22. Al-Rahbi LM, Al Shami MM, Al-Ashwal AA, Al-Shamahy HA. Immediate implant placement in socket with periapical lesions: a study of the immediate dental implant procedure in patients with periapical lesions in Sana'a, Yemen. Universal J Pharm Res 2026; 10(6):1-6. *https://doi.org/10.22270/ujpr.v10i6.1461.*
23. Wang HD, Dillon J. Contemporary management of zygomaticomaxillary complex fractures. Semin Plast Surg 2021 Oct 7;35(4):256-262. PMID: 34819807 *https://doi.org/10.1055/s-0041-1735812*
24. Marinho RO, Freire-Maia B. Management of fractures of the zygomaticomaxillary complex. Oral Maxillofac Surg Clin North Am 2013;25(04):617–636. *https://doi.org/10.1016/j.coms.2013.07.011*
25. Ellis E III, Perez D. An algorithm for the treatment of isolated zygomatico-orbital fractures. J Oral Maxillofac Surg 2014;72(10): 1975–1983. *https://doi.org/10.1016/j.joms.2014.04.015*
26. Ellis E III, Kittidumkerng W. Analysis of treatment for isolated zygomaticomaxillary complex fractures. J Oral Maxillofac Surg1996;54(04):386–400. *https://doi.org/10.1016/s0278-2391(96)90107-x*
27. Yonehara Y, Hirabayashi S, Tachi M, Ishii H. Treatment of zygomatic fractures without inferior orbital rim fixation. J Craniofac Surg 2005;16(03):481–485. PMID: 8600255 *https://doi.org/10.1097/01.scs.0000157308.39420.74*
28. Fujioka M, YamanotoT, Miyazato O, Nishimura G. Stability of oneplate fixation for zygomatic bone fracture. Plast Reconstr Surg 2002;109(02):817–818. PMID: 11818879 *https://doi.org/10.1097/00006534-200202000-00068*
29. O'Hara DE, DelVecchio DA, Bartlett SP, Whitaker LA. The role of microfixation inmalar fractures: a quantitative biophysical study. Plast Reconstr Surg 1996;97(02):345–350, 351–353. PMID: 8559817 *https://doi.org/10.1097/00006534-199602000-00011*
30. Louis M, Agrawal N, Kaufman M, Truong TA. Midface Fractures I. Semin Plast Surg 2017;31(02):85–93. PMID: 28496388; *https://doi.org/10.1055/s-0037-1601372*
31. Gutta R, Tracy K, Johnson C, *et al*. Outcomes of mandible fracture treatment at an academic tertiary hospital: A 5-year analysis. J Oral Maxillofac Surg 2014 Mar;72(3):550-8. *https://doi.org/10.1016/j.joms.2013.09.005.* PMID: 24405632.
32. Hashemi H, Qundos Y, Farzad P. Management of mandibular fractures at a high-volume educational center- A retrospective study. J Clin Med 2025; 14: 6467. *https://doi.org/10.3390/jcm14186467*
33. Atilgan S, Erol B, Yaman F, *et al*. Mandibular fractures: A comparative analysis between young and adult patients in the southeast region of Turkey. J Appl Oral Sci 2010;18(1):17-22. *https://doi.org/10.1590/s1678-77572010000100005*
34. Gassner R, Tuli T, Hächl O, *et al*. Cranio-maxillofacial trauma: A 10 year review of 9,543 cases with 21,067 injuries. J Craniomaxillofac Surg 2003;31(01):51–61. *https://doi.org/10.1016/s1010-5182(02)00168-3*
35. Zix JA, Schaller B, Lieger O, *et al*. Incidence, aetiology and pattern of mandibular fractures in central Switzerland. Swiss Med Wkly. 2011 May 27;141:w13207. PMID: 21618147 *https://doi.org/10.4414/smw.2011.13207*
36. Buchanan EP, Hopper RA, Suver DW, *et al*. Zygomaticomaxillary complex fractures and their association with naso-orbito-ethmoid fractures: A 5-year review. Plast Reconstr Surg 2012;130(06):1296–1304. *https://doi.org/10.1097/PRS.0b013e31826d1643*
37. Langton L, Planty M, Truman J: Criminal Victimization 2012. Availableat*: http://bjs.ojp.usdoj.gov/index.cfm?ty=tp&tid=31*.
38. Lee KH. Epidemiology of mandibular fractures in a tertiary trauma centre. Emerg Med J. 2008 Sep;25(9):565-8. *https://doi.org/10.1136/emj.2007.055236.* PMID: 18723703.
39. Kasrija R, Gupta H, Mittal T, *et al*. Two-point versus three-point fixation in Zygomaticomaxillary Complex (ZMC) Fractures: A narrative review. Cureus 2025 Jun 9;17(6):e85659. PMID: 40642666 *https://doi.org/10.7759/cureus.85659*
40. Lee EI, Mohan K, Koshy JC, Hollier LH. Optimizing the surgical management of zygomaticomaxillary complex fractures. Semin Plast Surg. 2010 Nov;24(4):389-97. *https://doi.org/10.1055/s-0030-1269768*
41. Farber SJ, Nguyen DC, Skolnick GB, Woo AS, Patel KB. Current management of zygomaticomaxillary complex fractures: A multidisciplinary survey and literature review. Craniomaxillofac. Trauma Reconstr 2016; 9: 313-322. *https://doi.org/10.1055/s-0036-1592093*