Evaluation of outcomes in conservative versus surgical management of zygomatic complex fracture in Bhairawaha, Nepal

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ABSTRACT

Introduction: Zygomaticomaxillary complex (ZMC) fractures are among the most common facial fractures and can be managed either conservatively or surgically depending on severity and clinical presentation. However, the optimal approach remains debated, particularly in terms of functional and aesthetic outcomes. Hence, this study aimed to compare the clinical outcomes and complications associated with conservative versus surgical management of ZMC fractures and to identify predictors of favorable recovery. **Methods:** A comparative study was conducted on 60 patients diagnosed with isolated ZMC fractures, divided equally into conservative (n=30) and surgical (n=30) management groups. Demographic characteristics, fracture patterns, treatment outcomes, and complications were recorded. Clinical outcomes were categorized as excellent, good, fair, or poor. Multivariable logistic regression analysis was performed to identify factors associated with favorable recovery. **Results:** Patients in the surgical group were older on average than those managed conservatively. Excellent outcomes were more frequent in the surgical group (50.0%) compared to the conservative group (33.3%), while poor outcomes were less common (3.3% vs. 10.0%). Enophthalmos and cosmetic deformity were notably higher in the conservative group, affecting 26.7% and 36.7% of patients, respectively, compared to 6.7% and 13.3% in the surgical group. The incidence of nerve paresthesia, trismus, and diplopia was similar across both groups. Although surgical patients demonstrated better outcomes, surgical management was not an independent predictor of favorable recovery in multivariable analysis ($p = 0.21$). Cosmetic deformity was the only significant predictor of poorer recovery ($p = 0.04$). **Conclusions:** Surgical management of ZMC fractures appears to provide better clinical and aesthetic outcomes with fewer complications compared to conservative treatment. Cosmetic deformity negatively impacts recovery, highlighting the importance of appropriate treatment selection for optimal patient outcomes.

Keywords: Fracture, surgical, zygomatic bone, zygomaticomaxillary complex.

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INTRODUCTION

The craniofacial skeleton is formed by the coordinated structure of the eight cranial and fourteen facial bones of the human skull.[1] Among them, the zygomatic bone which is commonly known as the cheek bone, is a prominent and critical component of the midface contributing significantly to facial aesthetics. It articulates with the frontal, maxillary, temporal, and sphenoid bones to form the zygomatico-maxillary complex (ZMC).[2,3]

Being one of the major structural buttresses, the ZMC maintains midfacial width, supports the orbit, and helps in the distribution of masticatory and traumatic forces.[4] Owing to its prominence, it is highly susceptible to injury and accounts for approximately 13% of craniofacial fractures.[1,5,6] ZMC fractures commonly result from road traffic accidents, falls, assaults, sports injuries, and occupational trauma, with young adult males most frequently affected.[5,7,8] Clinical presentation depends on fracture severity and may include malar flattening, periorbital edema, trismus, infraorbital nerve paresthesia,

diplopia, or enophthalmos.[9-13]

A meticulous clinical evaluation, complemented by high-resolution CT imaging, is fundamental to precise fracture assessment.[14,15] In principle, ZMC fracture can be managed: by observing the injury without using fixation, by performing a closed reduction without using fixation, or by doing an open reduction with fixation at one or more buttress points.[7] The choice between these approaches is highly dependent on the degree of fracture displacement, stability, and the presence of functional or aesthetic compromise. Making clinical decisions for managing ZMC fracture is often difficult, and although several treatment guidelines have been proposed, still there is no universal agreement.

The present study aimed to evaluate the outcomes associated with the conservative versus surgical management of ZMC fractures, highlighting the ongoing debate and individualized approach required for optimal patient care.

METHODS

This prospective comparative study was carried out (March 2022 – September 2025) to evaluate functional, esthetic, and neurological outcomes of conservative versus surgical management of zygomatic complex fractures at the Department of Oral and Maxillofacial Surgery, UCMS College of Dental Surgery, Bhairahawa. Total sixty patients (30 in each group) meeting inclusion criteria were enrolled using convenience sampling.

Group Allocation

The patients were divided equally into two groups (n = 30 each).

Group A (Surgical group): Patients who underwent Open Reduction and Internal Fixation (ORIF) under general anesthesia.

Group B (Conservative group): Patients managed with non-surgical (conservative) treatment.

Inclusion and Exclusion Criteria

Patients aged 18–60 years diagnosed with isolated zygomaticomaxillary complex (ZMC) fractures, and willing to participate by providing informed consent, were included in the study. Patients presenting with associated facial fractures, a history of previous facial trauma or surgery, those who were medically compromised or contraindicated for surgery, and patients who were lost to follow-up were excluded from the study.

Data collected via a structured proforma included demographic details, etiology of injury, clinical findings (facial asymmetry, periorbital swelling, mouth opening, and infraorbital nerve paresthesia), and radiographic findings from CT scans.

Outcomes were graded as Excellent, Good, Fair, or Poor.

- Excellent: Complete recovery with no functional or aesthetic deficits.
- Good: Minor residual issues not affecting function or appearance significantly.
- Fair: Moderate deficits that may impact function or appearance but do not require immediate intervention.
- Poor: Significant functional or aesthetic impairment requiring additional management.

For the logistic regression, outcomes were dichotomized into 'Favorable Recovery' (Excellent + Good) and 'Unfavorable Recovery' (Fair + Poor)

Data were analyzed using SPSS 25 with chi-square, t-tests, and logistic regression ($p < 0.05$). Written informed consent was obtained from all participants. The ethical clearance (Ref. No. UCMS/IRC045/22) was obtained from institutional review committee.

RESULTS

A total of 60 patients with zygomaticomaxillary complex (ZMC) fractures were included in the study, with 30 patients managed conservatively and 30 undergoing surgical intervention.

As shown in Table 1, the mean age of patients in the surgical group (39.8 ± 9.4 years) was higher than that in the conservative group (34.2 ± 8.1 years). The majority of patients in both groups were male, with 83.3% in the conservative group and 66.7% in the surgical group. The distribution of fracture side and fracture type was comparable between the two groups. Regarding clinical outcomes, a higher proportion of patients in the surgical group achieved excellent outcomes (50.0%) compared to the conservative group (33.3%).

Table 1: Demographic and clinical outcomes of conservative and surgical management of zygomatic fractures

Variable	Conservative (n=30)	Surgical (n=30)	p-value
Age (mean ± SD)	34.2±8.1	39.8±9.4	0.04*

Gender	Male 25(83.3%) Female 5(16.7%)	Male 20(66.7%) Female 10(33.3%)	0.18
Side of fracture	Left 19(63.3%) Right 11(36.7%)	Left 13(43.3%) Right 17(56.7%)	0.12
Fracture type	Type A 10(33.3%) Type B 15(50.0%) Type C 5(16.7%)	Type A 7(23.3%) Type B 16(53.3%) Type C 7(23.3%)	0.62
Outcome	Excellent 10(33.3%) Good 14(46.7%) Fair 3(10.0%) Poor 3(10.0%)	Excellent 15(50.0%) Good 12(40.0%) Fair 2(6.7%) Poor 1(3.3%)	0.03*

*p<0.05 denotes statistical significance

The comparison of complications between the two groups is presented in Table 2. Enophthalmos was more common in the conservative group (26.7%) compared to the surgical group (6.7%), with a relative risk of 0.25 (95% CI: 0.06–1.06). Similarly, cosmetic deformity was higher in the conservative group (36.7%) than in the surgical group (13.3%) (RR = 0.36; 95% CI: 0.13–1.01). Other complications, including nerve paresthesia, trismus, and diplopia, showed no notable differences between the two groups.

Table 2: Comparison of complications between conservative and surgical management

Complication	Conservative	Surgical	Relative Risk (95% CI)	p-value
Enophthalmos	8(26.7%)	2(6.7%)	0.25(0.06–1.06)	0.04*
Nerve paresthesia	9(30.0%)	8(26.7%)	0.89(0.39–2.01)	0.77
Trismus	7(23.3%)	4(13.3%)	0.57(0.18–1.81)	0.33
Cosmetic deformity	11(36.7%)	4(13.3%)	0.36(0.13–1.01)	0.03*
Diplopia	2(6.7%)	1(3.3%)	0.50(0.05–5.30)	0.56

*p<0.05 denotes statistical significance

While the descriptive data favoured surgery, the multivariable regression did not find surgery to be an independent significant predictor of recovery, likely due to the small sample size (n=60). Only cosmetic deformity (p = 0.048) was statistically significant in Table 3. Multivariable increasing age showed a trend toward reduced likelihood of favorable recovery (adjusted OR = 0.95). Gender and enophthalmos were not strong predictors.

Table 3: Multivariable logistic regression for favorable recovery

Variable	β Coefficient	Adjusted OR	95% CI	p-value
Surgical management	+0.91	2.5	0.6 – 10.6	0.21
Age	–0.05	0.95	0.90 – 1.01	0.08
Gender (male)	+0.59	1.8	0.4 – 7.8	0.43
Enophthalmos	–0.92	0.4	0.1 – 1.6	0.20
Cosmetic deformity	–1.20	0.3	0.09 – 0.99	0.04*

*p<0.05 denotes statistical significance

DISCUSSION

Currently, there is no consensus on ZMC fracture treatment regarding indications for surgery and the technique used.[16] Male predominance and the distribution of fracture types were consistent with patterns reported in various literature, where zygomatic complex fractures frequently result from trauma in young to middle-aged adults.[5,7,8,17]

The findings in present study demonstrate that surgically treated patients showed better clinical outcomes, including higher rates of excellent recovery and lower rates of enophthalmos and cosmetic deformity. However, multivariable analysis did not identify surgical management as an independent predictor of favorable recovery. In this study, 50% of surgically treated patients achieved excellent recovery, compared with 33.3% in the conservatively managed group. This aligns with evidence that displaced or unstable zygomatic fractures benefit from operative reduction to restore malar projection, orbital support, and masticatory function.[16] Additionally, many experts also consider persistent enophthalmos or diplopia as indications for orbital floor surgery.[18] Researchers also found that 90% of zygomatic fractures are managed using open reduction.[19] In cases, where there were no sign of displaced fractured segments, many surgeons concur that conservative management of ZMC fractures is suitable and approach should always be followed with strict advice to have a soft, non-chewable diet for about 2 to 6 weeks while being closely monitored for any signs of displacement.[20]

In this study, surgical management resulted in significantly lower rates of enophthalmos and cosmetic deformity, which are the complications closely linked to fracture complexity and inadequate repositioning of the zygoma or orbital floor involvement.[21] The relative risk analyses reinforce this trend, showing a 75% reduction in enophthalmos and a 64% reduction in cosmetic deformity in patients undergoing surgery. Crumley RL et al. also found that complication such as enophthalmos and diplopia resulted with delayed surgical repair of complex ZMC fractures.[18] In a study done by Tadj et al. less 4.5% had enophthalmos postoperatively with open reduction and fixation.[6] In contrast, conservative treatment showed higher rates of persistent cosmetic deformity and enophthalmos, likely due to inadequate repositioning of the malar complex. Nyachhyon et al. also found that cosmetic deformity after treatment was higher in closed reduction group (14%) as compared to open reduction (4%).[22]

Complications such as paresthesia, trismus, and diplopia were similar in both groups, reflecting their multifactorial nature which can arise from nerve contusion or soft-tissue involvement rather than solely from bony displacement, and the possibility of spontaneous improvement over time. However, the literature shows the occurrence of persistent sensory dysfunction in 22-65% for open reductions and

9-40% for closed reductions cases.[18] The post-operative surgical pain, swelling and trauma to the muscle may have resulted in immediate post-operative trismus.[22] Also, diplopia as a postoperative complication was reported among 9% of subjects undergoing open reduction by Tadj et al. The contracture of surgical scar, injuries to nerve and adhesion within ocular muscles may have led to persistent diplopia.[6] Multivariable analysis identified cosmetic deformity as the only significant negative predictor of favorable recovery, emphasizing its importance in functional and psychosocial outcomes. Although surgical management showed a trend toward improved recovery, the association did not reach statistical significance, probably due to the sample size.

This study has limitations, including its modest sample size and single-center design, which may reduce generalizability. Despite this, the results add meaningful evidence that surgical management offers superior functional and aesthetic outcomes for patients with zygomatic complex fractures, particularly when displacement is present. Larger studies with longer follow-up may help refine treatment selection and further clarify predictors of recovery.

CONCLUSIONS

Overall, surgically treated patients demonstrated better descriptive outcomes, including lower rates of cosmetic deformity and orbital complications. However, surgical management was not an independent predictor of favorable recovery in the multivariable analysis. Conservative treatment may be appropriate for minimally displaced fractures, provided that patients are carefully selected and closely followed. Future studies with larger sample sizes and standardized outcome measures are needed to clarify which patients benefit most from operative management.

CONFLICTS OF INTEREST: None

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AUTHORS' CONTRIBUTIONS

The concept was designed by RM; the literature search was conducted by DY, RM, SP and LK; data were collected by DY, RM, LK, SP and ST; data analysis was performed by RM and HS; all authors contributed to drafting the manuscript and approved the final version, taking full responsibility for its content.

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