

Evaluating the efficiency of transbuccal instrumentation in open reduction and internal fixation of zygomatic arch fracture – A clinical study

¹Dr. Alpha Mary Mathew, ²Dr. Satya Prakash Gupta, ³Dr. Khalid Mohammed Agwani, ⁴Dr. Ramank Mathur, ⁵ Dr. Musunuri Manoj Kumar, ⁶ Dr. Ramanpal Singh Makkad

¹MDS in Oral and Maxillofacial Surgery, Assistant Professor, Rungta College of Dental Sciences and Research, Bhilai, Chhattisgarh.

²Reader, Department of Oral and Maxillofacial Surgery, Chandra Dental College and Hospital, Safedabad , Barabanki Lucknow, U.P.

³Professor & Head, Department of Oral and Maxillofacial Surgery, Darshan Dental College and Hospital, Rajasthan University of Health Sciences, Ranakpur Road, Loyara, Udaipur – 313011, Rajasthan.

⁴Reader, Department of Oral & Maxillofacial Surgery, Darshan Dental College and Hospital, Loyara, Udaipur -313011, Rajasthan.

⁵Associate Professor, Department of Oral & Maxillofacial Surgery, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, Pin- 522509.

⁶Professor, Department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh.

Corresponding author: Dr. Ramanpal Singh Makkad, Professor, Department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh.
drramanpal@gmail.com

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Abstract

Background:

Zygomatic arch fractures are common facial injuries resulting from trauma and require precise anatomical reduction to restore facial symmetry and function. Open reduction and internal fixation (ORIF) using transbuccal instrumentation has emerged as a minimally invasive technique to achieve accurate realignment of the zygomatic complex. This study evaluates the clinical outcomes of ORIF of zygomatic arch fractures using the transbuccal approach in terms of function, aesthetics, and complication rates.

Materials and Methods:

This prospective clinical study was conducted on 30 patients diagnosed with isolated zygomatic arch fractures. Patients underwent ORIF using transbuccal instrumentation under general anesthesia. A 2 mm titanium miniplate was fixed at the zygomatic arch using screws inserted through a transbuccal trocar. The follow-up period extended for 6 months, with assessments of postoperative swelling, mouth opening, and aesthetic restoration at intervals of 1 week, 1 month, 3 months, and 6 months.

Complications such as infection, plate exposure, and malunion were recorded.

Results:

Out of 30 patients, 28 (93.3%) achieved satisfactory anatomical reduction and aesthetic restoration, while 2 patients (6.7%) required revision surgery due to plate displacement. Average postoperative mouth opening improved from 20 mm to 40 mm over 3 months. Minimal postoperative swelling subsided in 95% of cases by the end of the first month. Two patients experienced mild temporary paresthesia of the infraorbital nerve, which resolved within 3 months. No infections or hardware-related complications were observed during the follow-up period.

Conclusion:

ORIF using transbuccal instrumentation is a safe and effective technique for treating zygomatic arch fractures, providing excellent functional recovery and aesthetic outcomes with minimal complications. This method offers a reliable alternative to conventional techniques, particularly for isolated zygomatic arch fractures.

Keywords:

Zygomatic arch fracture, ORIF, transbuccal instrumentation, facial trauma, aesthetic restoration, miniplate fixation.

Introduction

Zygomatic arch fractures are common maxillofacial injuries, accounting for approximately 10% of facial fractures. These injuries are often caused by road traffic accidents, sports-related trauma, or interpersonal violence, leading to both aesthetic deformity and functional impairment, such as restricted mouth opening (1,2). Due to the zygomatic arch's pivotal role in facial contour and its contribution to mastication by maintaining the integrity of the masseter muscle, early and precise intervention is crucial (3).

Conservative management may suffice in non-displaced fractures, but open reduction and internal fixation (ORIF) are required for displaced fractures to restore anatomical alignment and function (4). The traditional ORIF approach, however, involves incisions such as the Gillies or bicoronal approach, which may lead to visible scarring, prolonged recovery time, and potential complications like facial nerve injury (5). To minimize these drawbacks, the transbuccal approach has been introduced, allowing the insertion of fixation hardware via a small trocar through the buccal mucosa, reducing the risk of visible scars and providing direct access to the fracture site (6).

Several studies have reported favorable outcomes with the use of transbuccal instrumentation, highlighting its efficacy in improving aesthetics and mouth function with a lower complication rate (7,8). However, there remains a need for more clinical data to support its widespread adoption. This study aims to evaluate the clinical outcomes of ORIF of zygomatic arch fractures using the transbuccal approach, focusing on parameters such as functional recovery, aesthetic restoration, and complications over a six-month follow-up period.

Materials and Methods

This prospective clinical study was conducted on 30 patients diagnosed with isolated zygomatic arch fractures.

Inclusion and Exclusion Criteria:

Patients included in the study were aged 18–60 years, with isolated zygomatic arch fractures confirmed by clinical examination and radiographic imaging (3D CT scans). Patients with comminuted fractures, associated midfacial fractures, pathological fractures, or those with systemic conditions contraindicating surgery were excluded.

Surgical Procedure:

All surgeries were performed under general anesthesia. A transbuccal trocar and cannula were used to facilitate the insertion of instrumentation for open reduction and internal fixation (ORIF). After the patient was prepped and draped, a stab incision was made through the buccal mucosa using the trocar to access the fracture site. The fractured zygomatic arch was reduced with bone-holding forceps, and fixation was achieved with a 2 mm titanium miniplate and screws. In each case, intraoperative fluoroscopy was used to confirm proper alignment. Hemostasis was achieved, and the stab incision was closed with 3-0 absorbable sutures.

Postoperative Care and Follow-Up:

Patients were administered antibiotics and analgesics for five days postoperatively. Routine postoperative care included mouth rinses with chlorhexidine to prevent infections. Patients were instructed to avoid excessive chewing for two weeks. Clinical assessments were performed at 1 week, 1 month, 3 months, and 6 months postoperatively. Parameters evaluated included postoperative swelling, mouth opening (measured as interincisal distance), aesthetic outcomes (assessed subjectively by the patient and surgeon), and complications such as infection, paresthesia, and hardware exposure.

Outcome Measures:

- **Primary Outcome:**
 - Improvement in mouth opening (measured as the change in interincisal distance).
- **Secondary Outcomes:**
 - Aesthetic restoration (evaluated based on pre- and postoperative photographs).
 - Incidence of complications (e.g., infection, paresthesia, hardware exposure).

Statistical Analysis:

All data were analyzed using SPSS version 26.0. Continuous variables, such as mouth opening, were expressed as mean \pm standard deviation and compared using paired t-tests. Categorical variables, including complications, were expressed as percentages and analyzed using chi-square tests. A p-value <0.05 was considered statistically significant.

Results

This section summarizes the clinical outcomes of 30 patients who underwent open reduction and internal fixation (ORIF) of zygomatic arch fractures using the transbuccal approach.

Patient Demographics

Table 1 displays the demographic characteristics of the study participants. The mean age of the patients was 32.5 years, with a male-to-female ratio of 3:2.

Characteristic	Value
Total Patients	30
Male	18
Female	12
Mean Age (years)	32.5

Improvement in Mouth Opening

The interincisal distance, a measure of mouth opening, showed significant improvement over time, as summarized in **Table 2**. The mean preoperative interincisal distance was 20 mm, which increased to 40 mm at 6 months postoperatively.

Time Point	Interincisal Distance (mm)
Preoperative	20
1 Week	25
1 Month	32
3 Months	38
6 Months	40

Aesthetic Outcomes and Complications

The study reported excellent aesthetic outcomes, with 28 patients (93.3%) achieving satisfactory aesthetic restoration. Complications were minimal, with only two cases (6.7%) requiring revision surgery due to plate displacement. No cases of infection or hardware exposure were recorded. Details of the outcomes and complications are provided in **Table 3**.

Outcome/Complication	Patients Affected
Satisfactory Aesthetic Outcome	28
Mild Swelling (Resolved by 1 Month)	29
Temporary Paresthesia (Resolved by 3 Months)	2
Plate Displacement (Required Revision Surgery)	2
Infection or Hardware Exposure	0

Summary of Results

- **Functional Recovery:** Mouth opening improved from 20 mm preoperatively to 40 mm at 6 months.
- **Aesthetic Restoration:** 93.3% of patients achieved excellent outcomes.

- **Complications:** Temporary paresthesia was noted in 2 patients (6.7%), with resolution by 3 months. Two cases required revision due to plate displacement, with no infections or hardware exposure reported.

These results demonstrate that ORIF using transbuccal instrumentation is an effective method for treating zygomatic arch fractures, yielding excellent functional and aesthetic outcomes with minimal complications.

Discussion

The present study demonstrates that open reduction and internal fixation (ORIF) of zygomatic arch fractures using transbuccal instrumentation provides excellent functional and aesthetic outcomes with minimal complications. The results align with existing literature, where the transbuccal approach has been highlighted for its ability to minimize scarring and provide direct access to the fracture site (1,2). This technique allows precise reduction and stable fixation using miniplates, facilitating faster recovery compared to traditional approaches (3).

Mouth opening, measured as interincisal distance, showed significant improvement from a mean of 20 mm preoperatively to 40 mm at 6 months postoperatively. This is consistent with previous studies reporting improved mandibular function following early surgical intervention (4,5). The use of intraoperative fluoroscopy in our study ensured accurate alignment, contributing to the high rate of satisfactory outcomes (6).

The aesthetic outcomes were also favorable, with 93.3% of patients achieving satisfactory restoration of facial symmetry. Similar studies have reported comparable results, suggesting that the transbuccal approach offers distinct cosmetic advantages by avoiding external incisions (7). In addition, mild postoperative swelling was observed in most patients but resolved within one month. Temporary paresthesia of the infraorbital nerve was noted in two cases, which fully resolved within three months, as reported in other studies (8).

Two patients required revision surgery due to plate displacement, a complication previously identified as a potential risk with transbuccal instrumentation (9). However, no cases of infection or hardware exposure were recorded, demonstrating the safety and efficacy of the procedure. These findings are in agreement with other clinical studies that report low complication rates with this technique (10).

One limitation of the study is the relatively small sample size, which may limit the generalizability of the findings. Future studies with larger cohorts and longer follow-up periods are recommended to validate the long-term outcomes of this technique. Moreover, exploring the use of resorbable fixation systems could further enhance patient outcomes by eliminating the need for hardware removal surgeries (11-13).

Conclusion

In conclusion, ORIF using transbuccal instrumentation is a reliable and effective approach for treating zygomatic arch fractures, offering excellent functional recovery and aesthetic restoration with minimal complications. This method presents a viable alternative to conventional techniques, especially for isolated zygomatic fractures requiring stable fixation with minimal visible scarring.

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