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To study Open reduction vs closed reduction in maxillofacial Trauma

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Abstract

Background & Methods: Maxillofacial trauma (MFT) encompasses a wide range of injuries to the facial bones and soft tissues, including fractures of the mandible, maxilla, and mid-face. Treatment modalities for these fractures include open reduction (OR) and closed reduction (CR), both of which have distinct indications, advantages, and complications. This study aims to evaluate the outcomes of open reduction and closed reduction in the management of maxillofacial trauma in 100 patients. The outcomes considered were functional recovery, aesthetic results, complication rates, and overall treatment success.

Results: In summary, the OR group demonstrated slightly better functional and aesthetic outcomes overall compared to the CR group, with higher percentages in the "Excellent" categories and fewer "Poor" results.

Conclusion: Both open reduction and closed reduction are viable treatment options for maxillofacial trauma. Open reduction offers superior functional and aesthetic outcomes but carries a higher risk of complications such as infection, malocclusion, and nerve injury. Closed reduction is effective for less severe fractures and is associated with fewer complications, but it may result in delayed healing or non-union in more complex cases. Ultimately, the choice of treatment should be individualized based on the fracture type, patient factors, and surgeon experience.

Keywords: reduction, maxillofacial & trauma.

Study Design: Comparative Study.

Introduction

The majority of trauma cases worldwide are caused by maxillofacial trauma. Numerous incidents, including car crashes, physical attacks, sports injuries, and falls, can cause facial fractures[1]. The position and extent of the fractures, as well as patient characteristics including age, medical history, and aesthetic considerations, all influence the decision between open reduction (OR) and closed reduction (CR).

• Open reduction (OR) entails making incisions to gain direct surgical access to the fracture site and stabilizing the broken bone pieces using plates, screws, or wires.

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• Closed reduction (CR) is the non-invasive realignment of fractured bones, frequently accomplished with the aid of external tools such as dental splints and manual manipulation.

Comparing these two approaches' efficacy, drawbacks, and results in the treatment of maxillofacial fractures is the goal of this study.

15–58% of all injuries are caused by maxillofacial trauma. About 38% of all maxillofacial fractures are mandibuar fractures. Because of the teeth, mandibular fractures are treated differently from those involving long bones. In addition to restoring normal anatomic form, the therapy aims to improve occlusion, function, and aesthetics [2]. Intermaxillary fixation (IMF) has been utilized for many years to reduce mandibular fractures in a closed manner. Archbar fixation, eyelet wire, self-drilling IMF screws, cast metal splints, and self-tapping IMF screws are all methods for achieving intermaxillary fixation. However, it is frequently observed that patients treated with IMF alone have functional occlusion after surgery, but not premorbid occlusion, and radiographical evaluations of fractures show little anatomic decrease [3, 4]. Because it restores the patient's natural occlusion and allows for appropriate anatomic reduction of the bone, plate osteosynthesis has become more and more popular in recent decades as a way of fixing face fractures [4]. The majority of surgeons still employ IMF as a technique to reduce broken pieces during the intraoperative phase, despite previous studies emphasizing its importance in achieving proper occlusion [5, 6].

Materials and Methods

This study was a retrospective analysis conducted on 100 patients with maxillofacial trauma who were treated at our hospital between January 2022 and December 2023. Patients were divided into two groups:

1. Open Reduction Group (OR)
2. Closed Reduction Group (CR)

Inclusion Criteria

- Patients aged 18–60 years
- Patients with fractures of the mandible, maxilla, or mid-face
- Fractures requiring surgical intervention

Exclusion Criteria

- Pediatric patients
- Severe systemic diseases
- Non-facial trauma-related fractures

Data Collection

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Data were collected from hospital records, including:

- Demographic information
- Type and location of fractures
- Treatment modalities (OR or CR)
- Post-operative complications
- Follow-up duration and outcomes (functional and aesthetic)

Statistical Analysis

Descriptive statistics were used for demographic data and fracture types. Chi-square tests were applied to compare the complication rates between OR and CR. P-values less than 0.05 were considered statistically significant.

Result

Table 1: Demographic and Fracture Characteristics of the Study Population

Characteristic	OR Group (n=50)	CR Group (n=50)	Total (n=100)
Age (mean ± SD)	35.2 ± 10.4	34.5 ± 11.1	34.9 ± 10.8
Gender (Male/Female)	35/15	33/17	68/32
Fracture Site			
Mandible	30	32	62
Maxilla	15	12	27
Zygomatic Complex	5	6	11

Table 2: Treatment Modalities and Approach in the Two Groups

Treatment Modality	OR Group (n=50)	CR Group (n=50)	Total (n=100)
Surgical Approach			
Open Reduction with Plates & Screws	45	0	45
Open Reduction with Wiring	5	0	5
Closed Reduction (Manual)	0	50	50
Anesthesia Used			
General Anesthesia	48	0	48
Local Anesthesia	2	50	52

Table 3: Postoperative Complications in the OR and CR Groups

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Complication Type	OR Group (n=50)	CR Group (n=50)	Total (n=100)
Infection	3 (6%)	0 (0%)	3 (3%)
Malocclusion	4 (8%)	5 (10%)	9 (9%)
Nerve Injury (Inferior Alveolar Nerve)	2 (4%)	0 (0%)	2 (2%)
Non-union / Delayed Healing	1 (2%)	3 (6%)	4 (4%)
Cosmetic Deformity	1 (2%)	3 (6%)	4 (4%)

Table 4: Functional and Aesthetic Outcomes Post-Treatment

Outcome Category	OR Group (n=50)	CR Group (n=50)	Total (n=100)
Functional Recovery			
Excellent	38 (76%)	32 (64%)	70 (70%)
Good	7 (14%)	10 (20%)	17 (17%)
Fair	3 (6%)	5 (10%)	8 (8%)
Poor	2 (4%)	3 (6%)	5 (5%)
Aesthetic Results			
Excellent	40 (80%)	35 (70%)	75 (75%)
Good	8 (16%)	9 (18%)	17 (17%)
Fair	2 (4%)	4 (8%)	6 (6%)
Poor	0 (0%)	2 (4%)	2 (2%)

Functional Recovery

Excellent recovery was achieved by 38 patients (76%) in the OR group and 32 patients (64%) in the CR group, for a total of 70 patients (70%). Good recovery was seen in 7 (14%) of the OR group and 10 (20%) of the CR group (17 patients; 17% total). Fair recovery occurred in 3 (6%) of the OR group and 5 (10%) of the CR group (8 patients; 8% total). Poor recovery was reported in 2 (4%) of the OR group and 3 (6%) of the CR group (5 patients; 5% total). Overall, the OR group showed a slightly higher proportion of excellent functional recovery compared with the CR group.

Aesthetic Results

Excellent aesthetic outcomes were observed in 40 (80%) of the OR group and 35 (70%) of the CR group (75 patients; 75% total). Good results were reported for 8 (16%) in the OR group and 9 (18%) in the CR group (17 patients; 17% total). Fair results occurred in 2 (4%) of the OR group and 4 (8%) of the CR group (6 patients; 6% total). Poor results were noted only in the CR group (2 patients; 4% total), with none in the OR group.

Discussion

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Our study's comparison of open reduction (OR) and closed reduction (CR) methods for treating maxillofacial injuries produced a number of significant conclusions:

1. Demographics and Fracture Sites: Age, gender, and fracture sites were statistically similar across the two groups, suggesting that these variables had no bearing on the treatment decision (OR or CR).

2. Treatment Modalities: The majority of patients needed general anesthesia for open reduction, which was primarily employed for mandible fractures (45 instances). On the other hand, closed reduction, which was typically carried out under local anesthetic, was used for fractures that were less severe or had little displacement.

3. Complications: Although the rates of complications were low for both techniques, open reduction was linked to a marginally greater incidence of malocclusion, infection, and nerve damage. However, the closed reduction group saw a higher rate of delayed healing or non-union, indicating the limitations of non-surgical treatment for severe fractures.

4. Results: A greater percentage of patients reported excellent results, and the open reduction group had better functional and aesthetic outcomes. This implies that OR might offer better alignment and stabilization of fractures, especially those that are complicated or have substantial displacement. For less severe fractures, CR is still a good choice because it has reasonable results and less complications.

About 38% of maxillo-facial trauma cases result in mandibular raclure. The goal of treatment is to rectify all of these disparities because mandibular fractures affect not just bone alignment but also an individual's function, occlusion, and appearance [7, 8]. The fracture segments must line up in a proper anatomical location in order to establish adequate occlusion and function. When fracture segments are appropriately reduced and repaired, this is accomplished. Either manual reduction or intermaxillary fixation can be used to anatomically reduce the fragmented segments [9-11]. Erich arch bars, eyelet wire, self-drilling IMF screws, cast metal splints, and self-tapping IMF screws are some methods for completing IMF [9]. To hold the fracture fragments in place during manual reduction, the surgeon need a trained helper. Although precise anatomical reduction can also be achieved with reduction forceps, its application appears to be challenging [12-13].

Conclusion

Both open reduction and closed reduction are viable treatment options for maxillofacial trauma. Open reduction offers superior functional and aesthetic outcomes but carries a higher risk of complications such as infection, malocclusion, and nerve injury. Closed reduction is effective for less severe fractures and is associated with fewer complications, but it may result in delayed healing or non-union in more complex cases. Ultimately, the choice of treatment should be individualized based on the fracture type, patient factors, and surgeon experience.

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