E-ISSN 2250-0944

ISSN 2250-1150

doi: 10.48047/ijprt/15.02.535

**Research Article**

# Clinical Outcomes of Condylar Fracture Management: Open vs. Closed Reduction in a Local Population

**Aisha Nadir[1], Sufyan Ahmed[2], Salwa Imran[3], Tehreem Rafiq[4], Kinza Shafaqat[5], Tallal Ejaz[6]**

PGR, Department of OMFS, Abbasi Shaheed Hospital, Karachi, Pakistan.

Associate Professor, Oral & Maxillofacial Surgery, Karachi Metropolitan University, Abbasi Shaheed Hospital, Karachi, Pakistan.

General Dentist, Oral and Maxillofacial Surgery.

Dental Surgeon, Bakhtawar Amin Medical and Dental College.

House Officer, Azra Naheed Dental College (CMADH).

Demonstrator, Department of Operative Dentistry & Endodontics, Azra Naheed Dental College.

**Corresponding author: Aisha Nadir**

**Abstract:** Condylar fractures constitute a significant proportion of mandibular injuries and remain a subject of debate regarding optimal management strategies. This prospective comparative study evaluated clinical outcomes of open reduction and internal fixation versus closed reduction in patients with mandibular condylar fractures within a local population. A total of 214 patients were enrolled and allocated into open reduction (n = 108) and closed reduction (n = 106) groups. Outcomes were assessed using maximal mouth opening, occlusal stability, pain scores, mandibular deviation, and temporomandibular joint function over a six-month follow-up period. The open reduction group demonstrated significantly greater mean mouth opening (41.6 ± 4.2 mm) compared to the closed reduction group (36.3 ± 5.1 mm; $p < 0.001$), along with superior occlusal outcomes ($p = 0.002$) and reduced mandibular deviation ($p = 0.001$). Pain scores at three months were also significantly lower in the open reduction group ($p = 0.004$). These findings indicate that open reduction provides superior functional outcomes in selected condylar fractures. This study contributes novel population-specific prospective data supporting evidence-based decision-making in maxillofacial trauma management.

**Keywords:** mandibular condyle; open reduction; closed reduction

**Introduction:** Mandibular condylar fractures represent one of the most common injuries of the maxillofacial skeleton, accounting for a substantial proportion of mandibular trauma cases worldwide. These fractures frequently result from road traffic accidents, interpersonal violence, and falls, and they pose unique challenges due to the anatomical complexity of the temporomandibular joint and its critical role in mastication, speech, and facial symmetry. Appropriate management of condylar fractures is essential to restore mandibular function and prevent long-term complications.[1-3]

The treatment of condylar fractures has long been controversial, with ongoing debate between advocates of open reduction and internal fixation and proponents of closed reduction with maxillomandibular fixation. Historically, closed reduction has been favored due to its noninvasive nature and avoidance of surgical risks such as facial nerve injury and scarring. However, concerns regarding inadequate anatomical reduction,

persistent malocclusion, limited mandibular mobility, and temporomandibular joint dysfunction have prompted reevaluation of this approach.[4-5]

Open reduction techniques have evolved significantly with advances in surgical instrumentation, fixation systems, and imaging modalities. Modern open reduction allows direct visualization of fracture segments, precise anatomical alignment, and stable fixation, potentially enabling early mobilization and improved functional recovery. Despite these advantages, apprehensions regarding operative morbidity and technical complexity persist, particularly in resource-limited settings.[6-8]

Recent literature suggests that treatment outcomes may depend on multiple factors, including fracture displacement, patient age, dentition status, and surgeon expertise. While several studies have reported improved functional outcomes with open reduction in displaced condylar fractures, others have demonstrated acceptable results with conservative management. The heterogeneity of study designs, outcome measures, and patient populations has contributed to inconsistent conclusions.[9-12]

In developing regions, where trauma incidence is high and access to specialized maxillofacial care may be variable, treatment decisions are often influenced by institutional protocols and surgeon preference rather than standardized evidence. Furthermore, population-specific data comparing open and closed reduction outcomes remain limited, restricting the applicability of international guidelines to local clinical practice.

Functional outcomes such as mouth opening, occlusal stability, pain, mandibular deviation, and temporomandibular joint function are critical parameters in assessing the success of condylar fracture management. Long-term impairment in these domains can significantly affect quality of life and socioeconomic productivity, emphasizing the importance of evidence-based treatment selection.

This prospective study was designed to compare clinical outcomes of open versus closed reduction in mandibular condylar fractures within a local population. By systematically evaluating functional parameters over a defined follow-up period, this research aims to provide robust, population-specific evidence to guide clinical decision-making and optimize patient outcomes.

**Methodology:** This prospective comparative study was conducted at a tertiary care maxillofacial surgery center Abbasi Shaheed Hospital, Karachi, Pakistan over an 18-month period from July 2022 to December 2023. Patients aged 18 years and above presenting with unilateral or bilateral mandibular condylar fractures confirmed by radiographic imaging were consecutively enrolled. Verbal informed consent was obtained after explaining the treatment options and study objectives.

Participants were allocated into two groups based on the treatment modality decided by the treating surgical team according to fracture characteristics and clinical indications. The open reduction group underwent surgical exposure of the condylar region with internal fixation using miniplates and screws, while the closed reduction group received conservative management with maxillomandibular fixation followed by functional therapy. Both groups received standardized postoperative physiotherapy protocols.

Sample size calculation was performed using Epi Info software, assuming a mean difference of 4 mm in maximal mouth opening between groups, a standard deviation of 8 mm, 95% confidence level, and 80% power. The minimum required sample size was calculated as 198 patients; a total of 214 patients were included to account for attrition.

Inclusion criteria included isolated condylar fractures, dentate or partially dentate patients, and presentation within seven days of injury. Exclusion criteria comprised comminuted mandibular fractures, pathological fractures, pre-existing temporomandibular joint disorders, edentulous patients, and systemic conditions impairing bone healing.

Clinical outcomes were assessed at 1, 3, and 6 months post-treatment. Parameters included maximal interincisal mouth opening measured in millimeters, occlusal stability assessed clinically, pain evaluated using a visual analog scale, mandibular deviation on opening, and temporomandibular joint sounds or dysfunction. Statistical analysis involved independent t-tests for continuous variables, chi-square tests for categorical outcomes, and repeated measures analysis for follow-up comparisons. Statistical significance was set at $p < 0.05$.

## Results

**Table 1. Demographic and Injury Characteristics**

| Variable | Open Reduction (n = 108) | Closed Reduction (n = 106) |
|---|---|---|
| Age (years) | 32.4 ± 9.1 | 33.7 ± 8.6 |
| Male (%) | 74 (68.5) | 71 (67.0) |
| Unilateral fracture (%) | 82 (75.9) | 85 (80.2) |
| Displaced fractures (%) | 79 (73.1) | 76 (71.7) |

This table shows comparable baseline characteristics between treatment groups.

**Table 2. Functional Outcomes at 6-Month Follow-Up**

| Outcome | Open Reduction | Closed Reduction | p-value |
|---|---|---|---|
| Mouth opening (mm) | 41.6 ± 4.2 | 36.3 ± 5.1 | <0.001 |
| Pain score (VAS) | 1.3 ± 0.8 | 2.1 ± 1.0 | 0.004 |
| Mandibular deviation (%) | 9.3 | 24.5 | 0.001 |
| Stable occlusion (%) | 94.4 | 83.0 | 0.002 |

This table demonstrates significantly superior functional outcomes in the open reduction group.

**Table 3. Temporomandibular Joint Complications**

| Complication | Open Reduction (%) | Closed Reduction (%) | p-value |
|---|---|---|---|
| Joint sounds | 11.1 | 26.4 | 0.006 |
| Limited movement | 7.4 | 21.7 | 0.003 |
| Chronic pain | 4.6 | 14.2 | 0.012 |

This table highlights a higher incidence of temporomandibular joint complications following closed reduction.

**Discussion:** The findings of this prospective study demonstrate that open reduction and internal fixation provide superior functional outcomes compared to closed reduction in the management of mandibular condylar fractures. Patients treated with open reduction achieved significantly greater maximal mouth opening, improved occlusal stability, and reduced mandibular deviation, underscoring the benefits of anatomical realignment and stable fixation.[13-15]

Enhanced mouth opening observed in the open reduction group reflects early mobilization and restoration of mandibular mechanics. In contrast, prolonged immobilization associated with closed reduction may contribute to muscular stiffness and joint hypomobility, potentially explaining the inferior functional outcomes observed in this cohort.[16-17]

Pain outcomes further favored open reduction, with significantly lower pain scores at follow-up. Persistent pain in the closed reduction group may be attributed to malalignment, altered joint biomechanics, and increased incidence of temporomandibular joint dysfunction. These findings emphasize the importance of achieving precise anatomical reduction to minimize long-term discomfort.[18-20]

Occlusal stability is a critical determinant of successful mandibular fracture management. The higher rate of stable occlusion in the open reduction group supports the role of direct visualization and fixation in restoring pre-injury dental relationships. In contrast, reliance on indirect reduction techniques in closed management may result in residual malocclusion.

Temporomandibular joint complications were significantly more prevalent among patients managed conservatively. Joint sounds, limited movement, and chronic pain were observed more frequently, suggesting that inadequate condylar positioning and prolonged immobilization may predispose patients to joint dysfunction.

The strengths of this study include its prospective design, standardized outcome assessment, and adequate sample size. However, limitations include the nonrandomized allocation and single-center setting, which may affect generalizability. Future multicenter randomized trials with longer follow-up are warranted to validate these findings.

Overall, the results support a selective approach favoring open reduction in displaced condylar fractures where surgical expertise and resources are available. Individualized treatment planning remains essential, considering patient factors, fracture characteristics, and institutional capabilities.

**Conclusion:** Open reduction and internal fixation of mandibular condylar fractures result in superior functional and occlusal outcomes compared to closed reduction. This study provides population-specific prospective evidence supporting surgical

intervention in appropriately selected cases. The findings address a critical clinical debate and inform evidence-based management strategies for condylar fractures.

**References:**


1. Chrcanovic BR. Open versus closed treatment of mandibular condylar fractures. Oral Maxillofac Surg. 2021;25:1–13.
2. Boffano P, et al. Condylar fracture management outcomes. Int J Oral Maxillofac Surg. 2022;51:1081–1088.
3. Vesnaver A, et al. Surgical treatment of condylar fractures. J Craniomaxillofac Surg. 2021;49:1015–1022.
4. Haug RH, et al. Functional outcomes of mandibular fractures. J Oral Maxillofac Surg. 2022;80:212–220.
5. Gupta A, et al. Comparative analysis of condylar fracture treatment. J Maxillofac Oral Surg. 2023;22:123–130.
6. Schneider M, et al. Conservative management of condylar fractures. Craniomaxillofac Trauma Reconstr. 2021;14:210–217.
7. Neff A, et al. Indications for open reduction in condylar fractures. J Oral Maxillofac Surg. 2022;80:1460–1468.
8. Loukota R, et al. Treatment protocols for condylar fractures. Br J Oral Maxillofac Surg. 2021;59:1075–1081.
9. Yang R, et al. TMJ outcomes after condylar fracture. Clin Oral Investig. 2023;27:3451–3460.
10. Rai A, et al. Mandibular trauma patterns in South Asia. Oral Surg Oral Med Oral Pathol Oral Radiol. 2022;134:450–456.
11. Eckelt U, et al. Open reduction advantages in displaced fractures. Int J Oral Maxillofac Surg. 2021;50:1350–1357.
12. Singh V, et al. Long-term outcomes of condylar fractures. J Oral Biol Craniofac Res. 2023;13:172–178.
13. Kolk A, et al. TMJ dysfunction following fracture management. J Craniomaxillofac Surg. 2022;50:365–372.
14. Malhotra R, et al. Functional rehabilitation after mandibular fractures. Clin Oral Investig. 2021;25:689–696.
15. Manisali M, et al. Surgical approaches to condylar fractures. Oral Surg Oral Med Oral Pathol Oral Radiol. 2022;133:15–22.
16. Chen Y, et al. Pain outcomes after mandibular fracture treatment. J Oral Rehabil. 2023;50:511–519.
17. Bouchard C, et al. Occlusal outcomes in mandibular trauma. J Stomatol Oral Maxillofac Surg. 2021;122:485–491.
18. Gupta S, et al. TMJ complications in conservative fracture management. J Maxillofac Oral Surg. 2022;21:875–882.
19. Al-Moraissi EA, et al. Meta-analysis of condylar fracture management. J Oral Maxillofac Surg. 2023;81:453–462.
20. Kanno T, et al. Advances in fixation of condylar fractures. J Craniomaxillofac Surg. 2024;52:112–120.