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Comparison between intraoral and transbuccal approaches for the treatment of mandibular angle fractures: An observational comparative study

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Abstract:

Mandibular angle fractures are technically demanding because restricted access, unfavorable biomechanics and post-operative trismus can influence early recovery after fixation. Therefore, it is of interest to evaluate the short-term functional outcomes of intraoral and transbuccal approaches for open reduction and internal fixation of isolated unilateral displaced mandibular angle fractures. Forty-eight adults were allocated into intraoral (n=24) and transbuccal (n=24) groups and followed for 1, 3 and 6 weeks using maximum mouth opening, facial swelling, visual analogue pain score and early complication assessment. At 6 weeks, the transbuccal group showed significantly greater mouth opening (45.1 ± 4.0 mm vs 40.8 ± 4.4 mm; $p=0.003$) and lower residual swelling (102.4 ± 5.8 mm vs 106.2 ± 6.5 mm; $p=0.038$), with low complication rates in both groups. Thus, both approaches were effective, but the transbuccal approach provided better short-term functional recovery with lower swelling and earlier pain reduction.

Keywords: Mandibular angle fracture, intraoral approach, transbuccal approach, open reduction, internal fixation, mouth opening, facial swelling

Background:

Mandibular angle fractures are common facial skeletal injuries and are difficult to manage because the angle region is exposed to muscular pull, torsional stress and complex occlusal forces [1]. Open reduction and internal fixation has replaced prolonged maxillomandibular fixation in many displaced fractures because it enables early function, better oral hygiene and more predictable occlusal restoration [2, 3]. The intraoral approach avoids a visible facial scar and provides direct access to the external oblique ridge, but restricted working space may make plate adaptation and screw angulation challenging [4]. The transbuccal technique adds a small cheek puncture and trocar-assisted instrumentation, allowing improved screw trajectory while preserving the advantages of intraoral fracture exposure [5]. Previous comparisons have focused strongly on infection, plate failure and need for reoperation; however, early post-operative recovery is also important because swelling, pain and limited mouth opening directly affect nutrition, speech, oral hygiene and patient satisfaction [6, 7]. Variation in fracture characteristics, surgeon preference, third molar status and fixation method has contributed to inconsistent conclusions regarding the ideal approach for mandibular angle fractures [8]. A prospective comparison by Sehrawat *et al.* found the transoral and transbuccal techniques broadly comparable for several clinical and radiographic outcomes, while reporting negligible scarring with transbuccal access and concluding that it was an efficient option [9]. Therefore, it is of interest to compare early functional outcomes after intraoral and transbuccal approaches for fixation of isolated unilateral mandibular angle fractures.

Materials and Methods:**Study design and setting:**

A hospital-based observational comparative study was conducted in the Department of Oral and Maxillofacial Surgery, Government Dental College and Government Medical College Hospital, Alappuzha, Kerala, India. The study period extended from February 2025 to February 2026.

Sample size:

Forty-eight adult patients were enrolled, with 24 treated through an intraoral approach and 24 through a transbuccal-assisted approach. The sample size was based on detecting a clinically

meaningful difference in post-operative mouth opening with 80% power and 5% alpha error.

Eligibility criteria:

Patients aged 18-45 years with isolated unilateral displaced mandibular angle fracture requiring open reduction and internal fixation was included. Patients with bilateral fractures, associated midface fractures, systemic contraindications, edentulous anterior segments, delayed presentation beyond 72 hours, or inability to attend follow-up were excluded.

Surgical procedure:

All procedures were performed under general anesthesia with nasoendotracheal intubation. Intraoral cases were managed through a vestibular incision and miniplate fixation along the superior border. Transbuccal cases were exposed intraorally, with trocar-assisted drilling and screw placement through a small cheek puncture.

Post-operative care:

Antibiotics, analgesics, mouth rinse instructions, soft diet advice and follow-up appointments were standardized. Occlusion was checked immediately after fixation and at each review visit.

Outcome assessment:

Maximum interincisal mouth opening was measured with a Vernier caliper. Facial swelling was recorded as tragus-to-menton linear distance using a sterile thread and ruler. Pain was recorded on a 10-cm visual analogue scale. Early complications were documented clinically.

Statistical analysis:

Continuous variables were expressed as mean $\pm$ standard deviation and categorical variables as frequency and percentage. Independent-samples t test compared continuous variables between groups, repeated-measures ANOVA assessed change over time and chi-square or Fisher exact test compared categorical variables. A p value <0.05 was considered significant. Pre-operative imaging included orthopantomography for all patients, with additional posteroanterior mandible view when displacement assessment required confirmation. Baseline occlusion was recorded using clinical notes and patient-reported

premorbid bite characteristics. Mouth opening was measured three times at each visit and the average value was used for analysis. Swelling measurements were performed by the same examiner to reduce interobserver variation. Patients were instructed not to take rescue analgesic within four hours before pain scoring whenever possible. All patients received instructions for oral hygiene, chlorhexidine mouth rinse and a soft diet. Compliance with follow-up was encouraged through appointment reminders and any unscheduled visit for pain, swelling, or occlusal concern was recorded. Complications were defined before analysis. Wound infection required clinical discharge or need for additional antibiotics, occlusal discrepancy required detectable change from intraoperative occlusion and scar concern was recorded only when the patient reported it spontaneously or on direct questioning. Analgesic consumption was reviewed at follow-up as a supportive clinical observation, although pain VAS remained the primary pain outcome. Any patient requiring additional unscheduled analgesic prescription was documented. Data entry was checked by a second investigator before analysis. Outlying values for mouth opening or swelling were verified against the original case record form rather than being removed automatically.

Results:

A total of 48 participants completed the study, with 24 patients in each group. Baseline demographic and injury-related characteristics were comparable between groups, including age, sex distribution, mechanism of injury, side of fracture and time from trauma to surgery (**Table 1**). Both groups showed

progressive improvement in maximum mouth opening across follow-up. The transbuccal group had significantly greater mouth opening at 1, 3 and 6 weeks, with the largest functional difference observed at 6 weeks. Facial swelling decreased in both groups, but residual swelling remained lower in the transbuccal group at each post-operative follow-up (**Table 2**). Pain scores declined steadily and early pain was significantly lower in the transbuccal group at weeks 1 and 3. Minor complications were infrequent and managed conservatively (**Table 3**). Baseline distributions of age, sex, mechanism of injury, fracture side and time from trauma to surgery were comparable between the groups. No participant required conversion from one approach to another during surgery. The transbuccal group showed a larger gain in mouth opening from baseline to 6 weeks. Swelling declined in both groups, but the residual tragus-to-menton distance remained lower in the transbuccal group at each postoperative assessment. The difference in pain was greatest at the first postoperative week and narrowed by the sixth week. This indicates that both approaches ultimately achieved satisfactory recovery, but the transbuccal technique may provide a more comfortable early postoperative course. No major hardware failure, nonunion, or need for secondary fixation was observed during the follow-up period. Minor complications were distributed without statistically significant intergroup difference. Patients in the transbuccal group returned to near-normal oral intake slightly earlier based on follow-up notes, although this observation was not treated as a primary endpoint in the statistical analysis.

Table 1: Baseline demographic and clinical characteristics of the study groups

Variable	Intraoral (n=24)	Transbuccal (n=24)	p value
Age (years), mean $\pm$ SD	30.4 $\pm$ 7.5	29.3 $\pm$ 6.8	0.603
Male sex, n (%)	20 (83.3)	21 (87.5)	0.682
Road-traffic accident, n (%)	19 (79.2)	18 (75.0)	0.731
Right-sided fracture, n (%)	13 (54.2)	12 (50.0)	0.773
Time from trauma to surgery (days)	2.1 $\pm$ 0.7	2.0 $\pm$ 0.6	0.589
Baseline mouth opening (mm)	18.9 $\pm$ 3.6	19.4 $\pm$ 3.9	0.653
Baseline swelling (mm)	126.3 $\pm$ 8.7	124.8 $\pm$ 8.4	0.552
Baseline VAS pain score	7.3 $\pm$ 1.1	7.1 $\pm$ 1.0	0.491

Table 2: Comparison of post-operative mouth opening and swelling between the two approaches

Follow-up variable	Intraoral (mean $\pm$ SD)	Transbuccal (mean $\pm$ SD)	p value
Mouth opening at 1 week (mm)	26.8 $\pm$ 4.6	29.7 $\pm$ 4.2	0.031
Mouth opening at 3 weeks (mm)	34.9 $\pm$ 4.8	38.7 $\pm$ 4.5	0.017
Mouth opening at 6 weeks (mm)	40.8 $\pm$ 4.4	45.1 $\pm$ 4.0	0.003
Swelling at 1 week (mm)	118.9 $\pm$ 7.9	113.6 $\pm$ 7.1	0.018
Swelling at 3 weeks (mm)	111.7 $\pm$ 7.2	107.2 $\pm$ 6.3	0.025
Swelling at 6 weeks (mm)	106.2 $\pm$ 6.5	102.4 $\pm$ 5.8	0.038

Table 3: Comparison of postoperative pain and early complications

Outcome	Intraoral (n=24)	Transbuccal (n=24)	p value
Pain VAS at 1 week	4.3 $\pm$ 1.2	3.5 $\pm$ 1.0	0.015
Pain VAS at 3 weeks	2.1 $\pm$ 0.9	1.5 $\pm$ 0.8	0.019
Pain VAS at 6 weeks	0.8 $\pm$ 0.6	0.5 $\pm$ 0.5	0.066
Wound infection, n (%)	2 (8.3)	1 (4.2)	0.551
Temporary occlusal discrepancy, n (%)	2 (8.3)	1 (4.2)	0.551
Inferior alveolar paresthesia, n (%)	1 (4.2)	1 (4.2)	1.000
Visible scar concern, n (%)	0 (0.0)	2 (8.3)	0.149

Discussion:

The study found that both surgical approaches were effective for managing isolated mandibular angle fractures, but the transbuccal group showed better early mouth opening and lower residual swelling during follow-up. The functional advantage of the transbuccal approach may be related to improved screw angulation and easier plate adaptation. Less intraoral manipulation during drilling may reduce soft-tissue trauma and post-operative edema [10]. Pain reduction followed the same direction as swelling reduction. When edema is lower and fracture stability is adequate, protective muscular spasm may decrease earlier, allowing more comfortable jaw movement [11]. The intraoral approach remains important because it avoids a visible scar and can provide excellent outcomes when access is adequate. The present results do not suggest abandoning intraoral fixation; instead, they identify situations where transbuccal assistance may improve technical control [12]. Complications were infrequent in both groups. Minor infection, transient occlusal discrepancy and temporary paresthesia were managed conservatively. Visible scar concern occurred only in the transbuccal group but was uncommon and did not outweigh the functional advantages in this short follow-up [13]. The observational design is a limitation because the surgical approach was not randomized. Surgeon preference, fracture line orientation, third molar status and soft-tissue condition may have influenced treatment allocation. The 6-week follow-up also prevents conclusions about late hardware removal or long-term scar perception. Future randomized studies should include operative time, three-dimensional swelling assessment, patient-reported outcome scores, cost analysis and longer follow-up. Such work would better define the fracture patterns most likely to benefit from transbuccal assistance. The magnitude of mouth-opening improvement is clinically meaningful because trismus can interfere with oral hygiene and diet during the period when wound care is most important. Even a few millimeters of additional opening may improve the patient's ability to brush, rinse and maintain nutrition. The small cheek puncture used in the transbuccal technique must still be discussed with patients. In this study, scar concern was uncommon, but cosmetic expectations vary and informed consent should include both the functional benefit and the possibility of a visible mark. The study also demonstrates the value of reporting repeated early follow-up rather than only final union. A fracture may heal satisfactorily in both groups, yet the patient experience during the first 6 weeks may differ in ways that influence satisfaction and return to routine activity. The transbuccal approach may be especially helpful when the posterior screw position is difficult to achieve through an intraoral route alone. Better screw orientation may improve plate seating and reduce the need for repeated intraoral manipulation. However, technique selection should remain individualized. A minimally displaced fracture with favorable access may be managed efficiently through an intraoral route, whereas a posteriorly located angle fracture with difficult screw trajectory may justify transbuccal assistance. The study findings are applicable mainly to short-term recovery. Long-term comparisons should include plate removal, neurosensory status, patient scar satisfaction and occlusal

stability beyond the early postoperative phase. The recovery pattern supports the idea that surgical access can influence post-operative function even when fixation hardware is similar. Better access may reduce repeated manipulation and improve confidence in screw placement. The findings also encourage documentation of patient-centered variables in maxillofacial trauma studies. Radiographic union and occlusion are essential, but swelling, pain, diet and speech influence everyday recovery. A larger study could stratify fractures by third molar status and displacement pattern. Such stratification may show that the benefit of transbuccal assistance is greater in some anatomical situations than in others. The follow-up schedule captured the most symptomatic period after fixation. By the sixth week, pain scores were low in both groups, but the earlier differences remained clinically relevant because they occurred during the phase of maximum patient discomfort and dietary limitation. The results have relevance for centers where both approaches are available but case selection is inconsistent. A structured comparison of early outcomes can help surgeons explain why a transbuccal puncture may be justified in selected fractures. The cosmetic concern of the transbuccal approach should be balanced against function. In this series, scar concern was uncommon, but longer follow-up would be needed to assess pigmentation, hypertrophy, or patient satisfaction after complete soft-tissue maturation. Swelling measurement with linear facial distances is simple and practical, which makes it suitable for routine clinical research. However, future three-dimensional facial scans could provide a more sensitive assessment of postoperative edema. The study also shows the importance of standardized post-operative care. Differences in antibiotics, analgesics, physiotherapy, or diet advice could confound recovery outcomes if they are not controlled across surgical groups. For practice, the transbuccal technique may be most useful when access for posterior screw placement is restricted. The intraoral approach remains appropriate when exposure and screw trajectory are adequate without additional instrumentation. The findings can be interpreted alongside Sehrawat *et al.* [9], who reported broadly comparable transoral and transbuccal outcomes for access, occlusion, infection and fracture gap, with negligible scarring in the transbuccal group and an overall preference for transbuccal efficiency. More recent evidence also supports individualized fixation: A 2024 European prospective multicentre study found that mandibular angle fractures were commonly treated with nonrigid osteosynthesis and observed no significant differences in malocclusion or infection across osteosynthesis types [14]. In 2025, Qamar *et al.* reported excellent stability and alignment with both transbuccal-assisted and transoral-only fixation, but better early occlusal outcomes with the transbuccal-assisted approach [15]. A 2026 systematic review and meta-analysis found no significant difference in overall complications between single- and dual-miniplate fixations, while single-plate fixation was associated with fewer hardware complications and less wound dehiscence [16]. Together, these data support choosing the surgical access and fixation strategy according to fracture anatomy, screw

trajectory, soft-tissue considerations and patient priorities rather than relying on a single approach for all angle fractures.

Conclusion:

Both intraoral and transbuccal approaches produced satisfactory short-term outcomes after open reduction and internal fixation of isolated unilateral mandibular angle fractures. The transbuccal approach was associated with greater post-operative mouth opening, lower residual swelling and lower early pain scores. Data shows that improved access for plate adaptation and screw placement may translate into better early functional recovery.

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