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Comparison of Outcomes of Transbuccal Approach Versus Transoral Fixation in Open Reduction and Internal Fixation of Mandibular Angle Fracture

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ABSTRACT

Fractures of the mandibular angle pose surgical challenges due to limited access and complex anatomy. The transbuccal approach improves access but requires a small skin incision, while the transoral approach avoids external scars but may limit visualization. **Objectives:** To compare transbuccal and transoral approaches for open reduction and internal fixation (ORIF) of mandibular angle fractures with respect to surgical time, intraoperative access, and postoperative occlusion. **Methods:** Eighty patients with isolated unilateral mandibular angle fractures were prospectively assigned to transoral (n=40) or transbuccal (n=40) fixation. Surgical time, intraoperative accessibility (scored 1–3), and postoperative occlusion were recorded. Data normality was assessed using the Shapiro-Wilk test, and comparisons were made using the Mann–Whitney U test ($p<0.05$). **Results:** The transoral approach significantly reduced median surgical time compared to transbuccal fixation (41 (15) vs. 69 (4) minutes; $U=4.000$, $p<0.001$). Conversely, intraoperative accessibility was superior with the transbuccal approach (1 [1] vs. 2 (0); $U=314.000$, $p<0.001$). Postoperative occlusion was comparable between groups (0 (0) vs. 0 (0); $U=783.000$, $p=0.765$). **Conclusions:** Both approaches provide similar postoperative occlusal outcomes. The transbuccal method offers enhanced intraoperative access, whereas the transoral technique reduces operative time and avoids external scars. Surgical technique should be selected based on case complexity, access requirements, and cosmetic considerations.

INTRODUCTION

About two-thirds of all fractures of the maxillofacial region are mandibular. Angle fractures make up 26-35% of the mandibular fractures [1]. Mandibular, zygomatic, along midface fracture occurrence has been estimated by Haug et al. to be 6:2:1 [2]. Mandibular angle fractures continue to present uncertain outcomes and management challenges in comparison with fractures in other mandibular anatomical regions, despite advancements in internal fixation employed for such fractures [3]. Numerous studies confirm that no single strategy has consistently shown to be the best. Angle fractures were traditionally mostly treated with closed reduction. However, the extraoral technique was initially used when the open reduction was thought to be necessary. With the introduction of mini plates, the transoral method became widely used. The key challenge in these methods was customising and placing the plate along the appropriate osteosynthetic line [4]. The surgical access required to insert the posterior screws is typically subpar. Consequently, compared to other sites of mandibular fracture, the rate of plate exposures and screw unlocking is higher [5]. With the advent of new techniques and the creation of miniplates, as shown by Champy, the procedure can be carried out using a transbuccal access in an anatomically optimal position [6]. Transbuccal approaches are still largely unappealing due to the potential risk of damaging the affected nerve and unsightly

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scarring as they include the introduction of a trocar via stab incision from skin into the oral cavity [7]. Since it results in minimal or no formation of scars and allows direct visualisation and evaluation of adequate occlusion throughout plate fixation, the transbuccal technique is typically supported [8]. Another strategy, known as the "transoral or intraoral technique," was put out to address these drawbacks. This method, which is commonly employed, entails operating solely via an incision created in the vestibular or oral mucosa [9]. Comparing and identifying the most effective method for just one adaptational monocortical superior border plating for mandibular angle fracture is the rationale of our investigation. Based on the relative advantages and disadvantages of the transoral and transbuccal methods, we theorized that the transbuccal method would be accessible in the intraoperative period and the transoral technique would reduce the operative time, but both would result in similar postoperative occlusion.

There is limited comparative evidence evaluating transoral and transbuccal approaches specifically for single monocortical superior border miniplate fixation of mandibular angle fractures, particularly with respect to operative time, intraoperative accessibility, and postoperative occlusal stability. This study aims to compare the use of transoral and transbuccal approaches in the open reduction and internal fixation of fractures of the mandible angle to assess the time involved in surgery, accessibility, and postoperative occlusal stability.

METHODS

The prospective comparative study was conducted on patients visiting the Oral and Maxillofacial Outpatient Department (OPD) during 1 year from April 2024 to March 2025. The study was conducted after ethical approval from the Sharif Medical Research Center (SMRC) (Ref. no SMDC/SMRC/331-24). This study was done on 80 patients. The sample size was obtained with the help of the WHO sample size determination software in comparing two proportions. According to the past literature, 94.1% was the estimated success rate of the transoral approach [8]. Based on the assumption of 95% confidence and a desired level of precision (margin of error) of 6% (0.06) to reconcile feasibility and statistical power, a two-sided test with 0.05 = 10 was used. This gave a minimum required sample size of 40 patients per group, which gave a total of 80 patients as the study sample. The precision level of 0.06 was found to be reasonable to identify clinically significant changes in postoperative outcomes, whilst having a manageable size of sample size in a single-center study. After informed consent, using a non-probability convenience sampling technique, patients were allocated into two groups of 40 patients each: group A and group B, until each group reached the required sample size. All patients aged >18 years old diagnosed with isolated unilateral angle fracture, diagnosed on CT scan, were included. Patients with comminuted fractures or having other facial fractures associated with angle fractures were excluded from this study. Patients in group A were treated with a transoral approach, and group B underwent a transbuccal approach. All patients underwent a comprehensive preoperative evaluation, including general physical examination and a maxillofacial assessment for swelling, ecchymosis, step deformity, tenderness, occlusion, and neurosensory function. Preoperative radiographic assessment was performed using a Siemens SOMATOM Definition Flash CT scanner. Axial and coronal images were acquired with 0.5 mm slice thickness, 120 kVp, and 200 mA. Three-dimensional reconstruction was performed using the Siemens Syngo software to confirm fracture location and displacement before surgery. After general anesthesia and aseptic measures, local anaesthesia infiltration (2% lignocaine with 1:100,000) was done at the site of exposure. All fractures were fixed with OM (Orthopaedic and Medical Germany) ®5-hole titanium miniplates with 0.9 mm thickness, and 7mm screws. In group A, the incision was given in the buccal vestibule distal to the second premolar till ascending ramus with Monopolar cautery, and full full-thickness mucoperiosteal flap was raised till the lower border of the mandible. The fracture was exposed and reduced, the occlusion was achieved with intermaxillary fixation, and the fracture was fixed with a 5-hole plate and 4 screws. The incision was closed with vicryl 4.0. In group B, a transoral incision was made along with a small extraoral stab puncture to make room for a transbuccal cannula. The position of the facial vessels and the fracture line were taken into consideration when choosing the incision site. Similar to that of the transoral method, a long drill bit was used for drilling and screw placement following blunt dissection and trocar insertion. After fixation of the fracture with a 5-hole plate and 4 screws, the trocar was taken out, and vicryl 4.0 and Prolene 5.0 sutures were used to close the mucosa and skin incision. A single team of surgeons who operated used a Visual Analogue Scale (VAS), which was also used to measure the subjective rating in clinical and surgical research, to determine intraoperative accessibility at the fracture site on a 10-cm Visual Analogue Scale. VAS is composed of a horizontal line that has anchors on both ends with descriptors indicating extremes of accessibility: 1 good access, 2 fair access, and 3 poor access. The operating surgeon indicated the point of the scale that corresponded to the perceived access when placing the plates. The straight line between the lowest point in the scale and the mark gave the accessibility score of each patient. This is a way of standard and reproducible

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measurement of subjective intraoperative experiences [10, 11]. For every patient, the same electronic clock was used to record the amount of time needed for the surgery from the point of incision to the skin's closure [10]. On the 1st post-operative day, the occlusion was assessed by a gap in the upper and lower molars. Occlusion was classified as satisfactory (0mm gap), mildly deranged (1–2mm gap), or deranged (>2mm gap) during maximum intercuspation [12]. Data were analyzed using SPSS version 24.0. Descriptive statistics were computed for all variables, and the Mann-Whitney U test was applied to compare outcomes between groups. A p-value <0.05 was considered statistically significant.

RESULTS

Eighty patients were included (40 per group). Group A (transoral) had a median age of 32 [22–45] years with 28 male (70%) and 12 female (30%). Group B (transbuccal) had a median age of 34 [21–47] years, with 26 males (65%) and 14 females (35%). Most fractures were on the left side (Group A: 23; Group B: 21) and were caused primarily by road traffic accidents (Group A: 25; Group B: 27). Preoperative CT confirmed isolated unilateral angle fractures with minimal displacement in 45% and moderate displacement in 55% of patients in both groups (Table 1).

Table 1: Demographic and Baseline Characteristics of Patients

Characteristics	Group B (Transbuccal) (n=40)	Group A (Transoral) (n=40)
Age		
Median [IQR] (Years)	32 [22–45]	34 [21–47]
Sex, n (%)		
Male	28 (70%)	26 (65%)
Female	12 (30%)	14 (35%)
Side of Fracture, n (%)		
Left	23 (57.5%)	21 (52.5%)
Right	17 (42.5%)	19 (47.5%)
Cause of Fracture, n (%)		
Road Traffic Accident	25 (62.5%)	27 (67.5%)
Assault / Fall / Other	15 (37.5%)	13 (32.5%)
Preoperative Displacement, n (%)		
Minimal	18 (45%)	18 (45%)
Moderate	22 (55%)	22 (55%)

Median VAS scores for accessibility were 2 [0] in Group A and 1 [1] in Group B, showing better access with transbuccal fixation. Median surgical time was significantly shorter for the transoral group (41 [15] min) compared to the transbuccal group (69 [4] min). On postoperative day 1, occlusion was satisfactory (0 mm gap) in 38 patients in Group A and 37 patients in Group B; mild derangement (1–2 mm gap) was seen in 2 patients (Group A) and 3 patients (Group B). No patient had a severely deranged occlusion (>2 mm gap). Mann–Whitney U test confirmed significant differences in surgical time (U = 4.000, p<0.001) and accessibility (U = 314.000, p<0.001), whereas postoperative occlusion did not differ significantly (U = 783.000, p=0.765) (Table 2).

Table 2: Intraoperative and Postoperative Parameters

Parameters	Group A (Transoral) Median [IQR]	Group B (Transbuccal) Median [IQR]	Mann–Whitney U	p-value
Surgical Time (min)	41 [15]	69 [4]	4.000	<0.001
Intraoperative Accessibility (VAS)	2 [0]	1 [1]	314.000	<0.001
Postoperative Occlusion (mm gap)	0 [0]	0 [0]	783.000	0.765

DISCUSSION

This study examined the differences in postoperative occlusion, accessibility, and surgical time between transoral versus transbuccal methods for fixing mandibular angle fractures. In contrast to the transbuccal method, which offered greater accessibility to the fracture site, our data showed that the transoral approach dramatically decreased surgery time. The two methods' postoperative occlusal results were similar. The transoral approach's shortened surgical time is in line with earlier research showing that transbuccal instrumentation and avoiding an external incision shorten operating stages and overall length [13, 14]. But in cases of complex or adversely displaced fractures, this method is frequently linked to restricted access from the posterior mandible [15]. Present results of the transbuccal approach's greater accessibility are consistent with previous studies showing that transbuccal instrumentation improves angulation and visualization for screw placement, especially in the posterior mandible region [16, 17]. The transoral approach in the current study had a very big influence because it shortened the surgical time when compared to the transbuccal approach (median difference = 28 minutes; 41 [15] vs. 69 [4] minutes; U = 4.000, p<0.001; effect size r=0.82), and thus, a big effect. The transbuccal method was more accessible (median difference = 1 point; 1 [1] vs. 2 [0]; U = 314.000, p<0.001; r=0.57), which is a moderate-to-large effect size. The difference in postoperative occlusion was not significant (0 [0] vs. 0 [0]; U = 783.000, p = 0.765), and this indicates a small impact. The addition of these effect sizes and median differences indicates the additional benefit of not just statistical significance but also clinical significance of the reported differences. Postoperative occlusal results were similar between the two methods in spite of the variations in operational factors [18]. This is consistent with previous research showing that the two methods can produce similar functional and aesthetic outcomes when used properly [17]. This implies that the surgeon's preference, the complexity of the case, and the weight assigned to surgical time compared to

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intraoperative accessibility may all influence the method selection [19, 20]. Current findings generally favored the transoral method in simpler cases requiring shorter operational times and less external scarring, even though the transbuccal procedure might be useful in circumstances requiring superior access for precise reduction and fixation. More multicenter trials with larger sample sizes and longer follow-up are recommended to further evaluate patient-centered outcomes such as pain after surgery, neurosensory defects, and scarring.

This study was limited by its single-center design and relatively small sample size, which may restrict the generalizability of the findings. Additionally, complex and severely displaced mandibular angle fractures were underrepresented, potentially limiting the applicability of the results to such cases. More multicenter trials with larger sample sizes and longer follow-up are recommended to further evaluate patient-centered outcomes such as pain after surgery, neurosensory defects, and scarring.

CONCLUSIONS

In patients having an isolated fracture of the mandibular angle, the transoral and transbuccal approach can produce similar postocclusional effects. The transbuccal method offers better intraoperative exposure, whereas the transoral method saves on a lot of surgical time. Hence, surgical technique must be based on clinical priorities, weighing between the necessity of better access to the fracture site and the surgery efficiency as well as the aspect of patient cosmetics.

Authors' Contribution

Conceptualization: MK
Methodology: MK, UBA, KA, MAK, MJ, AA
Formal analysis: KA
Writing and drafting: MK, UBA, MJ, AA
Review and editing: MK, UBA, KA, MAK, MJ, AA

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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