



# Transbuccal Approach in Management of Mandible Angle Fracture

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**Abstract** With expanding dimensions and an eminent member of trauma team many Ear Nose Throat specialists are exposed to Oro-maxillofacial trauma. Mandibular angle is a difficult region to operate owing to its unique anatomy. Angle fractures form around 30–40% of the mandibular fracture. Open reduction and internal plating is the management of choice in most angle fractures and various approaches have been described in literature. We conducted a study of trans-buccal approach for management of mandibular angle fractures. It was a non-randomised observational study. 57 patients of mandible angle fractures were included in the study. The ORIF was done in these pts under general anaesthesia after careful surgical planning using trans-buccal approach. This approach included an intraoral exposure with stab incision for the trans-buccal passage of drill and screw driver. Out of 57 cases in our study 33 were males and 24 were females. 23/57 patients were in age group 25–35 years whereas 19/57 patients were in age group 15–25 years. All 57 patients had good fracture healing. Occlusion dysfunction was seen in only 1 case. Infection was seen in 3 cases while intraoral exposure of

plates occurred in 2 cases. Average mouth opening was 43.3 mm at 6 weeks with progressive improvement on follow up. Extraoral scar healed well with very good cosmesis in all cases. We strongly suggest the use of transbuccal approach for ORIF in mandibular angle fractures owing to the ease of procedure, comfort of surgeon and less complication rate.

**Keywords** Mandible angle fractures · Transbuccal approach · Combined approach · Extraoral approach · Intraoral approach · Modified transbuccal approach

## Introduction

Fractures through the angle of the mandible represent roughly around 30 percent of most common causes of mandibular angle fractures are motor vehicle collisions and assaults. The main reasons for these fractures are the presence of a thinner cross-sectional area relative to the neighbouring segments of the mandible, acute leverage at this region due to the biomechanical consideration of change in angle and the presence of third molars, particularly those that are impacted, thereby weakening the region [1–4].

The angle of mandible is best described as an anatomic region rather than a precise anatomic location. The region is designated as a triangular area with the superior edge being the junction of the horizontal body and vertical ramus, usually where the third molar is or was located. The anterior border of the masseter muscle forms the anterior border and the posterior border of the triangle is formed by an oblique line extending from the third molar region to the posterior superior attachment of the masseter muscle [5].

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Due to the superior pull of masticatory muscles and inferior pull of suprahyoid muscles the fractures of angle are often but not always displaced. Hence open reduction and internal fixation (ORIF) is mostly required. However the approach for the ORIF in the region of angle is still under debate [6, 7]. The present study was conducted to see the results of trans-buccal approach for ORIF of angle fractures which involves an external stab incision with intraoral exposure for fixation of reconstruction plates,

## Methods and Materials

Present study was a observational study conducted in department of ENT at Sri Guru Ram Das University Of Health Sciences, Vallah, Sri Amritsar from August 2016 to August 2019 on patients presenting with maxillofacial trauma involving the angle of mandible to the emergency department of the hospital. All the necessary ethical clearance, a structured informed consent and assent in case of minors was obtained according to the institutional policies before commencing the study. Present study is a non-funded study and all necessary steps were taken to maintain patient confidentiality at all points of study.

### Inclusion Criteria

1. Patients with unilateral mandibular angle fractures (displaced/undisplaced) with deranged occlusion
2. Mandibular angle fractures associated with other maxillofacial injuries

### Exclusion Criteria

1. Edentulous patients
2. Patients with medical co-morbidities
3. Patients with osteoporosis and osteopetrosis
4. Patients on chemotherapy and/or on radiotherapy.
5. Patients with loss of soft tissue over fracture line were excluded.
6. Patients < 16 and > 60 years of age

### Pre-operative Work Up

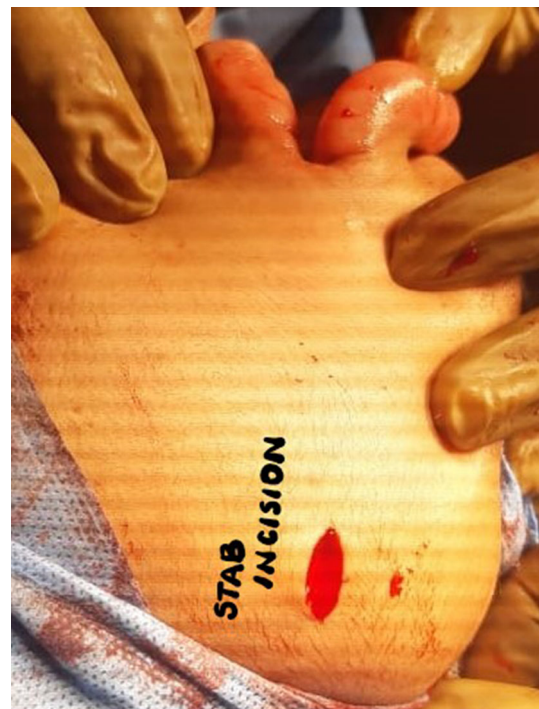
All patients presented to emergency department for maxillofacial trauma after getting neurosurgical clearance were evaluated with 3-D CT SCAN of face and following parameters were evaluated

1. Site of fractures
2. The type of fracture (displaced/un-displaced; favourable/unfavourable)

### 3. Status of Occlusion

## Surgical Procedure and Data Collection

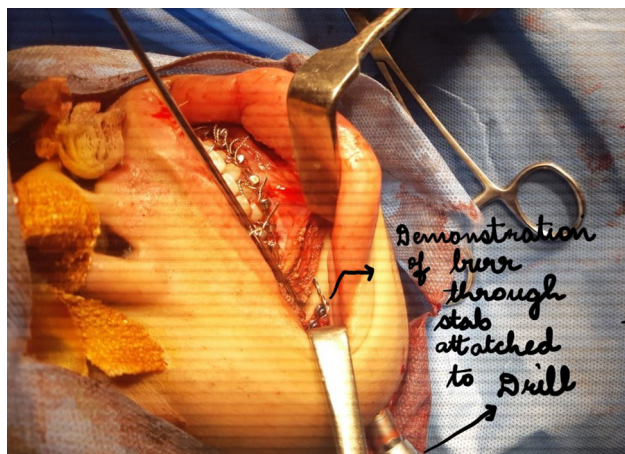
57 patients were included in the study group after following the inclusion and exclusion criteria. They were operated under general anaesthesia after getting thorough neurosurgical and anaesthesia clearance. Arch bars were applied in all patients. The fracture of the angle of the mandible was approached through combined approach. An intraoral trans-buccal incision was taken from second premolar anteriorly till the oblique line posteriorly about 1 cm lateral to the lower gingivobuccal sulcus over the bone. Muco-periosteal flap was raised and fracture site was exposed. The fracture segments were manipulated and reduced; (Intermaxillary fixation) IMF was done. A small extraoral stab incision (about 1 cm) (Fig. 1) was given corresponding to the fracture site. Appropriate titanium miniplates were placed and held at the fracture site intraorally by the assistant. Blunt dissection through the extraoral stab incision (Fig. 2) was done to facilitate the entry of drill and screw holder cum diver (Figs. 3, 4) till the fracture site. Holes were drilled and screws were placed and tightened till proper depth and control was achieved. The occlusion was confirmed and IMF was released. Elastic bands were applied. Incisions were sutured. The Arch bars were removed 2–3 weeks postoperatively.



**Fig. 1** Demonstrating the stab incision given on the skin after intraoral exposure; This stab incision corresponds to the fracture site



**Fig. 2** Assessment of adequacy of the stab incision after soft tissue dissection to check if the instrumentation will easily pass or more soft tissue dissection is required

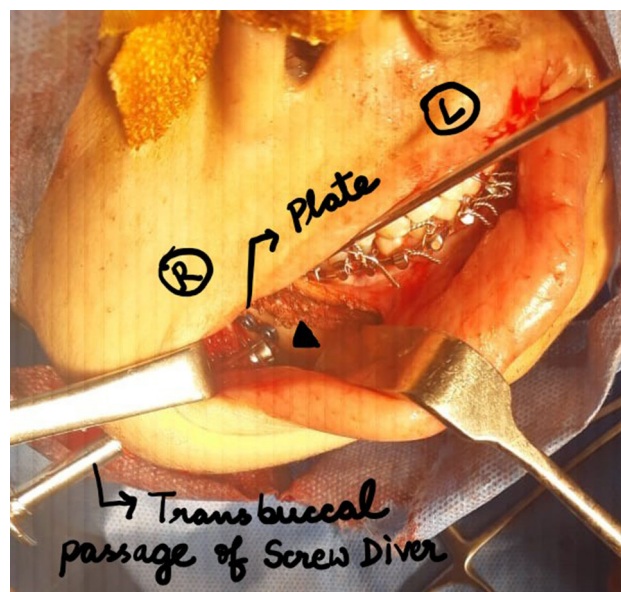


**Fig. 3** Burr is being passed through the incision and is comfortably reaching the fracture site

Patient was recommended soft diet for 4–6 weeks following surgery. Following parameters were recorded for data analysis.

1. Osteosynthesis
2. Functional occlusal Discrepancies
3. Mouth opening & trismus
4. Infection
5. Exposure of plates/screws
6. Paraesthesia/neurosensory involvement
7. Vitality of tooth
8. Scar

Osteosynthesis or Fracture healing was assessed at 5–6 weeks for patients under 18 years of age and at 9–10 weeks for patients more than 18 years of age by an OPG. Functional occlusal discrepancies were noted at 4–6 weeks. Angles class 3 malocclusion and open bite were considered as gross derangements; while class 2



**Fig. 4** Demonstration of passage of screw driver through the stab incision

derangements and bilateral contact were considered as moderate derangements. Mouth opening was measured as the maximal inter-incisal width (mesio-incisal angle of the right upper and lower central incisors) using a divider and a calibrated ruler and the value recorded. If incisors are missing, adjacent teeth are considered. Infection at the fracture site was assessed by any swelling, pain, tenderness, wound dehiscence or pus discharge at the operated site. Mild to moderate infection was managed with post-operative antibiotic therapy and/or incision and drainage. Paresthesia/neurosensory involvement, scar, non-infective exposure of plates and screws was assessed clinically after 3 months postoperatively. The statistical operations were done through SPSS (Statistical Presentation System Software) for Windows, version 10.0 (SPSS, 1999. SPSS Inc: New York).

## Results

Out of 57 cases in our study 33 were males and 24 were females (Table 1). 23/57 patients were in age group 25–35 years whereas 19/57 patients were in age group 15–25 years (Table 1). All 57 patients had good fracture healing. Moderate occlusal dysfunction was seen in only 1 case. Infection was seen 3 cases while intraoral exposure of plates occurred in 2 cases. Average mouth opening was 43.3 mm at 6 weeks with progressive improvement on follow up (Table 2). Extraoral scar was cosmetically acceptable in all cases.



**Table 1** Demographic variables of the study

Variable	Categorisation	Number
Gender distribution	Male	33
	Female	24
Age distribution	15–25 years	19
	25–35 years	23
	35–45 years	08
	45–55 years	05
	55–65 years	02
Laterality of angle fracture	Right	39
	Left	18

**Table 2** the following parameters were observed during follow up

Parameter	Number of cases n = 37
Osteosynthesis	57/57
Functional occlusal	Moderate: 1/57
Discrepancies	Gross: None
Mouth opening	At 4 weeks : 37.7 mm(average)
	At 6 weeks : 43.3 mm(average)
Infection	3/57
Exposure of plates/screws	2/57
Paraesthesia/neurosensory involvement	3/57
Scar	None
Tooth in fracture line	None
Contour of the face	Maintained in all cases

## Discussion

Results of present trial clearly indicated that trans-buccal approach with a stab extraoral incision for instrumentation and intraoral exposure for fractures of angle of mandible is associated with good cosmesis, minimum scar, less chance of injury to marginal mandibular nerve, good exposure along with advantage of applying plate under direct vision leading to complete union of fracture with a satisfactory functional occlusion.

Though careful selection of patients, well designed protocols, stringent and regular follow up, meticulous data recording, homogenous cohort, fairly adequate length of study and thorough preoperative evaluation were few strengths of current trial, however few potential limitations of this trial included it being just an observational study and not a randomised controlled trial and secondly there being concerns regarding the reproducibility of the results due to small sample size.

Extra oral approach was once the most standard traditional and popular approach for management of mandibular

angle fractures when compared to transoral approach due to good exposure and direct application of plate but however due to the increasing aesthetic demands of the patient and increased risk of facial nerve injury transoral/intra-oral approach gradually overcame the extraoral approach [7–9].

The disadvantages of intraoral approach included the inability to manage the fractures occurring in the posterior angle region, lack of perpendicular orientation of the drilling device, contamination of the operated site with saliva containing bacteria and food debris if the surgical site doesn't have a water tight closure [7, 10, 11].

Keeping in mind the advantages and disadvantages of both these approaches, a combined approach—'Trans-buccal approach' came into use. This procedure provided excellent visibility and accessibility with inconspicuous scar [11].

In the current study total of 143 patients presented to the emergency department with mandibular fractures, Out of these 57 (39.8%) patients had fracture angle of mandible. Right sided fracture was more common as compared with left side (39 versus 18 cases) (Figs. 5, 6) Males outnumbered females (1.37:1) (Table 1).

Age group of 25–35 years was most commonly affected followed by 15–25 years (Table 1). Similar results were also present in study conducted by Singh and Gupta et al. where in males outnumbered females and with mean age of 30 years [12].

The treatment of angle fractures is difficult due to posterior position and biomechanics of the region [13]. A meta-analysis conducted by Al-Moraissi and Edward Ellis III concluded that the trans-buccally placed lateral miniplate was better at reducing the incidence of postoperative complications than one placed on the external oblique ridge using a transoral approach [14].

In our study It was observed that after 1/57 patient had moderate occlusion discrepancy though, 3 patients had paraesthesia, 3 patients had infection out of which plate removal was needed in 2 patients, average mouth opening was 37.7 mm at 4 weeks which improved to 43.3 mm at 6 weeks, no patient complained of scar and all patients had good fracture healing on post-op X ray (Table 2).

Apart from the trial by Moraissi et al. several other studies in literature by Sugar et al., Kumar et al., Laverick et al., Wan et al. and Patter et al. have observed significant difference in post-operative infection, wound dehiscence, paraesthesia between trans-orally placed miniplates along the external oblique ridge and miniplates placed along lateral cortex using trans-buccal instrumentation. This could be because of the anatomic position of the external oblique ridge plate, which is covered by thin soft tissue. In addition, a plate inserted trans-orally will sit closer to the dentition, allowing an easier and shorter path of bacterial pathogens to transgress from the periodontal sulcus to the



**Fig. 5** 3-D CT Scan face showing a right sided mandible angle fracture



**Fig. 6** Lateral view of a 3D CT face showing mandible angle fracture

fixation hard-ware. In contrast, plates fixed to the lateral aspect of the mandible using trans-buccal trocar instrumentation will be covered by a greater bulk of soft tissue, which might decrease the risk of dehiscence of the incision and hardware exposure [15–21].

Studies by Sugar et al. and Khandeparker et al. strongly advocate the use of trans-buccal approach in mandible angle fractures and have summarised the reasons as ease of use, minimal requirement or plate bending, and facilitation of plate placement in the neutral mid-point area of the mandible [15, 22]. Moreover, our experience also supports the use of trans-buccal approach in angle fractures as we observed that the orientation of drill is much better and convenient leading to better placement of miniplate in this region compared to typical trans-oral approach. The only disadvantage is that assistant has to apply good retraction which can sometimes become a confounding factor.

The intra-oral exposure with trans-buccal instrumentation combines the advantages of both the extraoral and intraoral approaches to Mandibular angle fractures. Decision regarding treatment approaches for open reduction of mandible angle fracture often relates to surgeon's expertise, accessibility of fracture site, patients aesthetic demands and ease of procedure [22]. In meta-analysis by Al-Moraissi and Ellis it is suggested that whether a surgeon wants a trans-buccal instrumentation approach or transoral approach for isolated un-displaced/displaced but non comminuted fractures of angle of mandible is purely a matter of choice but for comminuted fractures with loss of bone at superior border or where an inferior load bearing plate is required then for an easier placement of a reconstruction bone plate trans-facial approach should be preferred [13].

## Conclusion

Trans-buccal approach for management of angle fractures should be a standardised approach due to its various advantages, the foremost being the ease of procedure and application of reconstruction plates under direct vision. Though ours is an observational study but its inference clearly is in favour of trans-buccal approach. A multi-institutional comparative analysis of all three popular approaches (intraoral/extraoral/transbuccal) or a meta-analysis of existing literature is strongly suggested so that the technique is even more popularised.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical Approval** Before starting the study ethical clearance was taken from institutional ethical committee as per Declaration of Helsinki.

**Informed Consent** Informed consent was taken by all the patients before surgery and enrolment into the study.

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