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Treatment of mandibular angle fracture with single miniplate: Intraoral versus transbuccal approach: A novel plating system

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Abstract:
The major objective in treating mandibular fractures is to restore normal anatomy and function. Therefore, it is of interest to assess the treatment outcome of intraoral and transbuccal approaches in fixation of fractures of the angle of the mandible. Hence, 92 patients with mandibular angle fractures were treated with Intraoral (control) and Transbuccal (interventional) method. Time taken for fixation, quality of reduction and healing were assed post-operatively. Thus, the transbuccal method was effective and can be used for the management of mandibular angle fractures.

Keywords: Complications, intraoral approach, mandibular angle fracture, transbuccal approach, trocar and cannula

Background:
Road traffic accidents are increasing rapidly in developing countries like India due to urban expansion, growing numbers of high-speed vehicles and poor road conditions. As a result, maxillofacial injuries have become more prevalent. Among mandibular fractures, angle fractures represent a significant proportion, largely because impacted third molars commonly occupy this region and the mandibular angle acts biomechanically as a lever, making it more susceptible to fracture **[1, 2].** The main goal in treating mandibular fractures is to restore normal anatomy and function, ensuring proper occlusion and facial aesthetics. Current management commonly involves miniplate fixation with monocortical screws. The choice of surgical approach depends on factors such as the surgeon's experience, fracture displacement, comminution, infection, dental condition and mandibular atrophy, along with available facilities **[3-5].** The intraoral technique, described by Kazanjian in 1933, avoids visible scars and nerve injury but carries some risk of complications. The transbuccal method, introduced by Nishioka and Sickels in 1988, offers minimal scarring and promising outcomes, prompting comparison of both approaches **[2, 6 and 7].** Therefore, it is of interest to compare how effectively intraoral and transbuccal techniques fix fractures at the angle of the jaw.

Materials and Methods:
This prospective study involved 92 patients with mandibular angle fractures treated at the Oral and Maxillofacial Surgery Department, NIMS Dental College, Jaipur, from June 2024 to December 2025. Detailed medical histories were recorded and diagnoses were confirmed through thorough clinical and radiographic examinations. Routine laboratory and radiographic investigations were performed for all patients. The participants were haphazardly alienated into two groups of 46 each. Group I (control group) underwent fracture fixation using the intraoral approach alone, while Group II (intervention group) received treatment through a combined intraoral and transbuccal technique. Before surgery, each patient gave their informed permission. The control group was managed with open reduction and internal fixation using a single 2.0-mm non-compression titanium miniplate placed along the external oblique ridge via a modified Ward's incision. The intervention group received a 2.0-mm locking titanium miniplate positioned laterally using the combined approach. A soft diet was advised for two weeks, without postoperative maxillomandibular fixation and follow-up assessments were conducted up to three months. The study was done after considering inclusion and exclusion criteria. Pre-operative orthopentamograph (OPG) showing fracture of mandibular fracture **(Figure 1A)**. All surgeries were conducted under strict aseptic conditions, using either general or local anesthesia as required. A pressure dressing was applied for three days post-operatively. Patients received antibiotics (Cefixime 200 mg with Clavulanic acid 100 mg), analgesics (Aceclofenac 100 mg, Paracetamol 500 mg, Serratiopeptidase 10 mg) and Betadine mouth rinses for three days and were advised a liquid diet for 10 days followed by a semisolid diet for 10 days. In the control group, a modified Ward's incision was used to reveal the fracture following the installation of arch bars or eyelets. The associated gingiva surrounding the affected tooth would be included in the intraoral incision if teeth in the fracture line were to be extracted. After reducing the fracture, the jaws were inserted into MMF. The anterior and medial aspects of the external oblique ridge were fitted with a 2.0 mm, 4-hole, bar-equipped, non-compression titanium miniplate (Bioure), which was secured to the bone with 2.0 mm screws. In each part, two screws were inserted. The occlusion was examined after the plate was fastened and the MMF wires were taken out. There were no drains installed and the incision was sealed in a single layer. To reveal the fracture site, an intraoral incision was made for the intervention group. To insert the cannula, a tiny stab wound was made over the skin. Palpation was used to determine the location. The trocar-equipped cannula was passed through the face tissue and into the bone. In order to open the cannula as a channel for the screw insertion process, the trocar was removed. Over the cannula tip, the cheek retractor ring was positioned intraorally **(Figure 1B)**. The external handle was used to retract the soft tissues of the cheeks. This makes it possible to

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simultaneously view and manipulate the cannula tip inside the transoral surgical cavity. After that, a suitable drill guide was selected and put within the cannula. The drill guide-containing cannula tip was precisely positioned on the bony surface or onto an osteosynthesis plate hole at the desired screw position. A depth gauge was used to determine the proper screw length and a self-holding screwdriver was used to insert the screw. The proper drill guide and drill bit were then used to drill a hole. The screw and self-retaining screw driver were inserted into the cannula. Following reduction and the placement of the plate (**Figure 1C and Figure 2**), the occlusion was examined and MMF wires were taken out. There were no drains installed and the incision was sealed in a single layer. The 2 techniques were compared under the following parameters; after each surgery: Operative time taken for the surgery (Stop Watch). At the end of 1 day, 1 week, 1 month and 3 months for Pain. (VAS), Status of Occlusion (Serial Photographic Assessment), Stability of Occlusion (Bimanual Palpation). Amount of the inter-incisal mouth opening (Scale and Caliper), Degree of reduction achieved on the 1st post-operative day (OPG) and Healing at the fracture site (OPG) were assessed. Complications such as presence of wound dehiscence at incision site, paresthesia in distribution of inferior alveolar nerve and post-operative infections were assessed. At the end of the study all the recorded data was compiled and statistically evaluated.

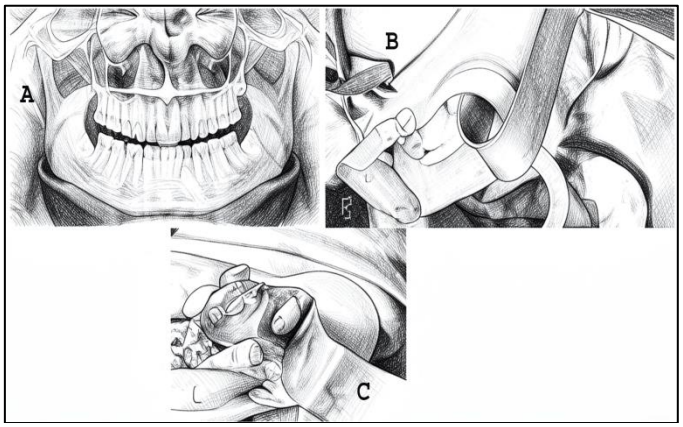

Figure 1: Mandibular angle fracture. 1A-OPG view of fracture, 1B-trocar retractor placed, 2 C- fracture reduced

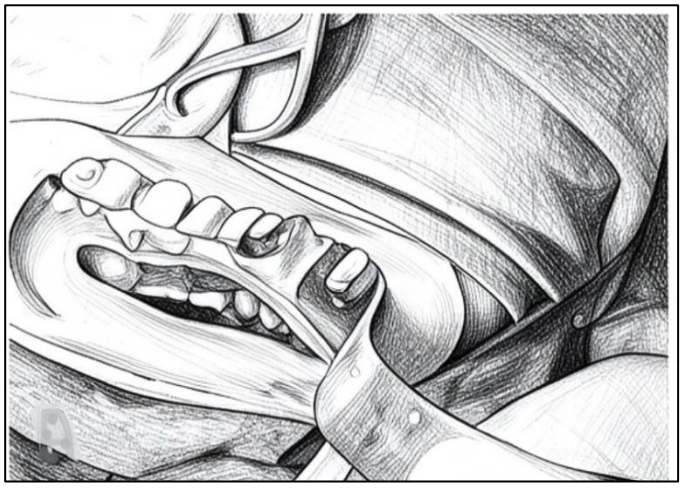

Figure 2: Fixed angle fracture

Results:

The mean operating time in the intra-oral group was 50.22 ± 11.15 minutes, while in the transbuccal group it was 48.48 ± 9.36 minutes. The variation was not statistically considerable (p = 0.42), indicating comparable surgical duration between the two techniques **Table 1.** Pre-operative and post-operative pain scores were evaluated using the Visual Analogue Scale (VAS) at multiple time points. **Table 2** indicates the pain experience at 7th post-operative day. There was decrease in pain score at the 7th day. The difference among the group was insignificant. There was improvement on mouth opening among the group post-operatives. The difference was insignificant (**Table 3).** There was improvement in occlusal adjustment (**Table 4).** This study of 92 mandibular angle fracture patients at NIMS Dental College, Jaipur, compared intraoral and combined intraoral–transbuccal approaches. Patients were evenly divided, with similar demographics. Road traffic accidents dominated the intraoral group, falls the transbuccal group. Both methods showed comparable operative time, pain reduction and satisfactory healing, with minor, self-limiting complications.

Table 1: Mean time taken (in minutes)

	Surgical Approach	N	Mean	Std. Deviation	p Value
Time	Transbuccal	46	48.48	9.361	0.42
	Intra-oral	46	50.22	11.153	

Table 2: Pain experience at 7th post-operative day

	Surgical Approach	N	Mean	Std. Deviation	p Value
PAIN	Transbuccal	46	3.59	1.543	0.071
VAS 7th P.O. DAY	Intra-oral	46	3.02	1.422	

Table 3: Maximal mouth opening at 90th post-operative day

	Surgical Approach	N	Mean	Std. Deviation	p Value
Maximal Inter-incisal Mouth Opening	Transbuccal	46	38.11	3.56	0.323
90th P.O. DAY	Intra-oral	46	38.96	4.565	

Table 4: Status of occlusion at 7th post-operative day

	Status of Occlusion 7th P.O. DAY		Total
	Acceptable	Unacceptable	

Surgical Approach	**Transbuccal**	Count	46	0	46
		Percentage	100.00%	0.00%	100.00%
	Intra-oral	Count	36	10	46
		Percentage	80.00%	20.00%	100.00%

Discussion:

A single non-compression miniplate placed along the superior border of the external oblique ridge is a commonly accepted form of functionally stable osteosynthesis for treating mandibular angle fractures. This technique, introduced by Michelet *et al.* and refined by Champy *et al.* in 1976, often eliminates the need for post-operative maxillomandibular fixation, enhancing patient comfort and allowing early jaw function **[3].** The transbuccal approach, involving a small extraoral stab incision and first described by Kazanjian in 1933, complements the intraoral method by providing improved access and instrument guidance. It permits screw insertion perpendicular to the lateral mandibular cortex while enabling intraoral visualization of occlusion. With the availability of advanced, user-friendly transbuccal instruments, this technique has become increasingly popular for managing mandibular angle fractures **[5, 8].** Studies suggest the transbuccal approach may reduce operative time due to easier plate bending and adaptation. In this study, mean operative times were similar for intraoral (50.22 ± 11.15 minutes) and a transbuccal (48.48 ± 9.36 minutes) technique with potential for further reduction as experience grows. Post-operative mouth opening, pain and radiographic healing at 30 and 90 days were satisfactory for both groups. However, stable occlusion was achieved in all transbuccal cases, compared to 80% in the intraoral group **[6, 9].** Complications were generally fewer with the transbuccal technique. Plate removal was more frequent in the intraoral group, likely due to thinner soft tissue coverage and proximity to teeth. Infection rates were low and no facial nerve injuries or hypertrophic scars occurred, supporting the transbuccal approach as a safe and effective alternative **[8, 9].** Single 3D plates showed a statistically negligible advantage over single miniplates, according to Mathew *et al.* **[10].** According to Singh *et al.*, the 3D miniplate system is superior to 2D miniplates in the treatment of mandibular angle fractures **[11].** For the treatment of non-comminuted mandibular angle fractures, Gamit *et al.* single, monocortical, non-compression, superior border new design miniplate proven to be effective **[12].** According to Singh *et al.*, compared to conventional 2D miniplates, the 3D miniplate system offers a dependable and successful treatment option for mandibular angle fractures **[13].** We discovered that mandibular angle fractures can be safely treated with the transbuccal technique. For mandibular angle fracture, Qamar *et al.* discovered that both transbuccal combined with transoral approach and transoral approach techniques provided outstanding stability and alignment **[14].** Pavithra *et al.* showed that the transbuccal technique improved post-operative mouth opening **[15]**. According some researchers, an intraoral method of stable angle fixation was made possible by the use of angulated screwdrivers and a single locking plate **[16]**. Mandal *et al.* came to the conclusion that trans-buccal lateral cortical plate fixation is a simpler and more effective way to reduce MAF than intraoral external oblique ridge fixation **[17]**.

Conclusion:

Managing mandibular angle fractures with a single miniplate generally uses either the intraoral or transbuccal approach. The Intraoral approach is faster and avoids external scars, while the transbuccal approach provides better access for placing screws perpendicular to the bone. Transbuccal approach can be safely used for the management of mandibular angle fractures.

Advancement to knowledge:

The transbuccal method enables superior radiographic fracture reduction and perpendicular screw implantation for mandibular angle fractures with little plate bending. On the other hand, the intraoral method entails technical challenges in correctly placing the posterior screws but offers aesthetic benefits with no external scars.

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