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# **Original Research**

# Titanium Lag Screw Versus Miniplate fixation in the treatment of anterior mandibular fractures

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# ABSTRACT:

**Background:** To study and compare titanium lag screws with miniplate fixation in management of mandibular fractures. **Materials & methods:** A total of 20 patients were managed by open reduction and internal fixation utilizing the miniplate and lag screw technique for fractures of anterior mandible. The patients were randomly divided into two groups. Subsequent follow up was done at 3, 6, 12, 24 weeks, postoperatively. The data was analysed using SPSS software. The p- value less than 0.05 was considered significant. **Results:** The mean duration of surgery (hours) was 1.91 for (Miniplates) group I and 1.23 for group II (lag screw). The difference was found to be statistically significant (p value < 0.05). The mean Pre-operative radiographic evaluation of distances in (mm) at point 1—3.0, point 2—2.25, point 3—2.08 and point 4—2.18 were measured in mini-plate group. **Conclusion:** Lag screws has several advantages over miniplates. **Keywords:** Mandibular fracture, Miniplates, Lag screws.

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# INTRODUCTION

Fracture of mandible occurs more frequently than any other fracture of facial skeleton and they outnumber zygomatic and maxillary fractures by a ratio of 6:2:1 respectively. The etiology of mandibular fractures mainly includes assaults, road traffic accidents (RTA), falls and sports injuries. 1 Although there is a wide variance in the reported percentage of fractures of the anterior mandible, aggregate analysis places this at approximately 17% of all mandibular fractures. 2 Mandibular body fractures usually occur between the distal aspect of the canine and a hypothetical line that corresponds to the region of anterior attachment of the masseter muscle. They may be classified based on the anatomic location, the direction of the fracture line, position of teeth relative to the fracture, and favorableness. 3.4 Based on the fracture line direction and the effect of muscle distraction on the fracture fragments, the body fractures can classify into two types (favorable and unfavorable). In favorable

fractures, the bony fragments are drawn together by the muscle distraction, whereas in unfavorable fractures, the bony segments become displaced by the muscle forces.

Miniplates have been widely used for decades for the fixation of mandibular fractures owing to their easy handling and adaptation, in addition to providing functionally stable fixation. 5 Different designs of miniplates, varying from the conventional form by Champy, have been proposed to provide extra stability of the fracture. A biomechanical study has shown that double Y-shaped miniplates provide greater resistance to displacement in comparison to conventional straight miniplates. 6 Lag screws have been described as a reliable, stable and safe method of internal fixation for anterior mandibular fractures. The absence of anatomical hazards, thickness of the bone cortices and curvature of the anterior mandible are all factors contributing to the suitability and success of using lag screws in that region. 7 Hence, this study

was conducted to study and compare titanium lag screws with miniplate fixation in management of mandibular fractures.

# **MATERIALS & METHODS**

A total of 20 patients were managed by open reduction and internal fixation utilizing the miniplate and lag screw technique for fractures of anterior mandible. The patients were randomly divided into two groups. Group I: (10 patients) were treated with 2.0 mm titanium mini plates system with self-tapping screws and Group II: (10 patients) were treated with 2.4 mm cortical lag screw. Intraoperatively duration of surgery was measured from the time incision was placed till the closure of wound. Subsequent follow up was done at 3, 6, 12, 24 weeks, postoperatively. Pre **Table 1: Mean duration of surgery**  and postoperative radiographs were taken to assess the gap between fracture segments. Results were evaluated using Chi square test. The data was analysed using SPSS software. The p- value less than 0.05 was considered significant.

# RESULTS

The mean duration of surgery (hours) was 1.91 for (Miniplates) group I and 1.23 for group II (lag screw). The difference was found to be statistically significant (p value < 0.05). The mean Pre-operative radiographic evaluation of distances in (mm) at point 1—3.0, point 2—2.25, point 3—2.08 and point 4—2.18 were measured in mini-plate group. Lag screws all measuring distances at point 1—2.16, Point 2—2.20, Point 3—2.24 and Point 4—2.20 were recorded.

	Implant used	Mean	P - value
Duration of	Miniplates	1.91	0.001*
surgery (hours)	Lag screws	1.23	

# Table 2: Preoperative radiographic evaluation

Preoperative	Implant used	Mean	P – value
radiographic evaluation			
Point 1	Miniplate	3.0	0.2
	Lag screw	2.16	
Point 2	Miniplate	2.25	0.8
	Lag screw	2.20	
Point 3	Miniplate	2.08	0.7
	Lag screw	2.24	
Point 4	Miniplate	2.18	0.8
	Lag screw	2.20	

The mean Post-operative radiographic evaluation (distance between fracture fragments in mm.) of all distances at Point 1—1.14, point 2—1.37, point 3—

1.03, point 4-0.92 were measured in mini-plate group. Among the lag screws the distance at point 1 was 0.24, Point 2-0.19, Point 3-0.12, Point 4-0.15 were measured.

Table 3: Postoperative radiographic evaluation

Postoperative	Implant used	Mean	P – value
radiographic evaluation			
Point 1	Miniplate	1.14	0.001
	Lag screw	0.24	
Point 2	Miniplate	1.37	0.001
	Lag screw	0.19	
Point 3	Miniplate	1.03	0.001
	Lag screw	0.12	
Point 4	Miniplate	0.92	0.001
	Lag screw	0.15	

#### DISCUSSION

By and large, the therapeutic goal of any fracture management is to restore original anatomic form and function at the earliest without least morbidity. Ideally, this should be accomplished expeditiously and with least patient discomfort. The management of mandibular fractures has evolved significantly in the past half century. Historically these fractures were managed through closed techniques, such as maxilla mandibular fixation (MMF), splints, and external fixation. The modern era of fracture treatment has given the way to the use of rigid internal fixation to allow rapid return of function and significantly shorter convalescence. <sup>8</sup> Hence, this study was conducted to study and compare titanium lag screws with miniplate fixation in management of mandibular fractures.

In the present study, the mean duration of surgery (hours) was 1.91 for (Miniplates) group I and 1.23 for group II (lag screw). The difference was found to be statistically significant (p value < 0.05). The mean

Pre-operative radiographic evaluation of distances in (mm) at point 1-3.0, point 2-2.25, point 3-2.08 and point 4-2.18 were measured in mini-plate group. Lag screws all measuring distances at point 1-2.16, Point 2-2.20, Point 3-2.24 and Point 4-2.20 were recorded. A study by Goyal M et al, the mean duration of surgery (hours) was  $1.97 \pm 0.52$  for group I and 1.26  $\pm$  0.55 for group II. The difference was found to be statistically significant (p value 0.001). i.e. more time was taken in case of surgery with miniplates when compared to the lag screw. Short surgical procedure reduces the incidence of infectious complications, which significantly lowers the financial burden. The mean post-operative radiographic distance between all measuring points were considerably more in case of mini-plate group as compared to lag screw group. Lag screw group showed faster improvement in terms of biting efficiency as compared to mini-plate group which showed a tendency to masticate only medium hard food items by 24 weeks. In both groups, no postoperative malocclusion was noted. In initial weeks, neurosensory deficit was seen more in miniplate group as compared to lag screw group but after six weeks all patients showed improvement in neurosensory function without any permanent nerve damage. Rigid internal fixation provided by lag screw technique for anterior mandibular fracture offers several advantages over conventional bone plating. It is an excellent means of achieving rapid and safe fixation which is followed by primary bone healing in anterior mandibular fractures, without any major complications.9

In the present study, the mean Post-operative radiographic evaluation (distance between fracture fragments in mm.) of all distances at Point 1-1.14,point 2—1.37, point 3—1.03, point 4—0.92 were measured in mini-plate group. Among the lag screws the distance at point 1 was 0.24, Point 2-0.19, Point 3—0.12, Point 4—0.15 were measured. Another study by Tiwari M et al, fifty patients reporting to the department of oral and maxillofacial surgery with noncomminuted anterior mandibular fractures were randomly divided into 2 groups of 25 patients each. Patients in group A were treated with 2.5-mm lag screws 22 to 26 mm in length and those in group B were treated with 2.0-mm 4-hole miniplates with a gap using monocortical screws. The mean age of the patients in this study was  $29.1 \pm 8.32$  years (range, 18 to 67 yr). The mean postoperative fracture gap was considerably larger in group B. The mean duration of surgery (minutes) was  $37.60 \pm 9.30$  for group A and  $47 \pm 6.55$  for group B. The difference was statistically significant (P = .001). The lag screw group showed faster improvement in biting efficiency compared with the miniplate group.Lag screw fixation was found to have good stability and rigidity, was inexpensive, and was less time consuming in treating anterior mandibular fractures compared with miniplates.<sup>10</sup>Champy et al. studied these movements

with regard to a mathematical model and as a result was able to determine the ideal line of osteosynthesis to overcome these displacing forces. Champy et al. <sup>11,12</sup> advocated the use of one bone plate in most regions of the mandible except symphysis and parasymphysis region where two bone plates needed which prevents torsional movement in the anterior mandible.Goyal et al. 9compared the efficacy and surgical outcome of treatment of anterior mandibular fracture using either 2.0 mm  $\times$  4 hole with gap titanium miniplate and 2.4 mm  $\times$  26 mm titanium lag screw. They concluded that lag screw fixation of anterior mandibular fracture is a simple and successful method of rigid fixation across fracture segments. Ellis and Ghali<sup>7</sup> had used lag screws ranging from 12 to 40 mm in length for providing rigid internal fixation of mandibular symphysis and parasymphysis fractures. They stated that lag screw length up to 40 mm should be available before attempting to treat the different site of fracture in the mandible. In the present study, lag screws of lengths 2.5 mm  $\times$  24 mm were used for all the patients in Group A, and adequate stability of the fracture was achieved.

# CONCLUSION

Lag screws has several advantages over miniplates.

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