

# Three Dimensional Miniplates In Management Of Mandibular Fractures

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## Abstract

The management of mandibular fractures has seen advancements over time, ranging from different techniques such as wiring, splinting, intermaxillary fixation, rigid fixation, compression plates, and mini plates. However, in all these approaches, there remains a risk of potential infection, need of intermaxillary fixation and improper healing at the site of mandibular fractures. Therefore, in our study, we employed three-dimensional titanium miniplates to secure and stabilize the mandibular fracture site. The use of 3D stainless steel miniplates demonstrated superior stability, fixation, and adaptability, resulting in more favorable outcomes compared to traditional miniplates.

**Key words:** Trauma, 3D miniplates, Mandible fracture, Rigid Fixation

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## I. INTRODUCTION

The face serves as both our window into the outside world and a portal into how others see us. Mandibular fractures, or fractures of the lower jaw, have been known to mankind since time immemorial and have been a common occurrence resulting from various traumatic events, such as wars, accidents, sports injuries, or altercations. These fractures not only lead to significant functional impairments but also have a profound impact on an individual's facial aesthetics and overall quality of life. Effective management of mandibular fractures is essential to restore both form and function to the injured area. (1) Trauma care has evolved over time transitioning from semi-rigid fixation, trans-osseous wiring, extraoral pins, circummandibular wiring, resorbable & compressible plates, and a variety of splinting techniques. (2) This was succeeded by the rigid fixation technique, which has since been replaced by the semi-rigid fixation with mini plates (Champy.M.et al)(3). In recent years, the utilization of three-dimensional (3D) mini plates has emerged as a cutting-edge approach in the treatment of mandibular fractures. This innovative technology offers numerous advantages over traditional methods, providing improved stability, accuracy, patient outcomes and obviating the use of inter-maxillary fixation. A 3D plating system works on the principle (Farmand 1993) of providing support through geometrically stable dimensions of the fracture site offering resistance against torque forces. (4)

## II. MATERIAL AND METHODS

The study was conducted in the Department of Oral and Maxillofacial Surgery (OMFS) of People's Dental Academy, Bhanpur, Bhopal. Patients with confirmed diagnosis of mandibular symphysis fracture who gave written informed consent and were willing for follow-up visits, aged between 20-50 years with satisfactory general health conditions without any systemic disease were included in the study. Eight patients were included in this study who presented in the Department of OMFS with facial trauma. Proper history of the patients were taken along with detailed clinical examination to assess the severity of the facial trauma. Radiological assessment was done in the form of PA view of mandible, to confirm the diagnosis. Preoperative hematological investigations were done & the patients were treated by open reduction and internal fixation (ORIF) using 2.0mm 3D stainless-steel (SS) miniplate under local/general anaesthesia (GA). Intra oral translabial approach was used. MMF was done. Fracture site exposed, reduced to achieve occlusion & fixed with 2mm 3D SS miniplate using screws 2mmX10mm. Closure was done in one layer using 3.0 RB vicryl suture. Pressure dressing was done. Postoperatively antibiotics were given, analgesics & anti-inflammatory were given for 5 days. Follow-up was done for all the patients at 1 week & 3 weeks postoperatively. All the patients were

subjected for post operative radiographs at the interval of 1 & 4th week.



**Figure 1. 2mm SS 3D miniplate with 2mmX10mm screws**



**Figure 2. Pre operative PA view of mandible showing symphysis fracture line**



**Figure3. 3D miniplate fixation at the fracture site**



**Figure 4. Post operative PA view of mandible showing 3D plate fixation**

### III. RESULT

Table 1 shows the sex wise distribution of the patients in the present study. The maximum patients in the present study were 75% males while 25% female.

**Table 1**

Gender	No of patient	Percentage
Male	6	75%
Female	2	25%
Total	8	100%

Table 2 shows the age wise distribution of the patients in our study. All the patient in this study were in the age group of 20- 50 years. In our study, maximum cases lay in 31-40 years age group.

**Table 2**

Age Group	No. of patient	Percentage
20-30 years	3	37.5%
31-40 years	4	50%
41-50 years	1	12.5%
Total	8	100%

Table 3 gives an idea about the etiology of fracture. The road traffic accident was responsible for majority of cases (50%). In 25% patient, fracture was occurred because of assault and in 25% patient fracture resulted due to fall.

**Table 4**

Etiology	No of patient	Percentage
Road traffic accidents	4	50%
Assault	2	25%
Others- Fall etc	2	25%
Total	8	100%

#### IV. DISCUSSION

There is a limited number of studies in existing literature that have conducted study on 3D miniplates for the treatment of specific mandibular sites i.e. symphysis fractures. Farmand and colleagues (1992)5 introduced the concept of 3-D miniplates, which are based on the geometric stability of a quadrangular shape to provide robust support.

The term "3-D miniplates" is somewhat misleading, as the plates themselves are not three-dimensional, but they effectively secure fracture segments by resisting the three-dimensional forces, such as shearing, bending, and torsional forces, that occur at the fracture site during function6.

Their advantages include easy application, avoiding the time-consuming extraoral approach and associated complications over traditional miniplates7. Another advantages are the simplified adaptation to the bone without causing distortion or displacement of the fracture& improved biomechanical stability compared to conventional miniplates (Feledy et al.)8. Enhanced plate stability can potentially reduce the risk of postoperative infections. Use of 3D miniplates obviates the need of IMF post operatively.

In our study, a total of 8 patients were treated with 2mm 3D SS miniplates using intraoral approach & found that 50% of mandibular fractures were due to road traffic accidents, which can be attributed to the lack of comprehensive traffic safety rules in the region. Interpersonal violence& miscellaneous causes like falls and sports were accounted equally for 25% of mandibular fractures, which aligns with the findings from previous studies of Rowe & Killey(1968)9.

Out of the total number of patients included in this study 75% of the population was male and only 25% of the population was female. Majority of the affected population belonged to the age group of 31-40 years (50%) indicating that young males belonging to this age group are most involved in social interactions at various levels leading to higher numbers of fractures. This correlated with the study carried out by **RajendraPrabhuAbhinav et al (2019)10**.

The 3-D plate design conceptually consists of two linear plates connected by vertical struts, providing greater resistance against gap opening at the inferior border due to biting forces. The 3-D plates were positioned to ensure the horizontal bar was perpendicular and the vertical bar was parallel to the fracture line.

To conclude, the study suggests that 3-D miniplates are effective for fixing symphysis and parasymphysis fractures, with morbidity and infection rates comparable to conventional miniplates. However, their use in cases involving the mental nerve may be more challenging. Further studies with larger sample sizes are needed to validate these findings for wider clinical use.

#### Take Home Message

1. Minimal tissue dissection hence reduced post operative edema.
2. Easy adaptation hence less operative time.
3. Post operatively MMF not required.
4. Configuration of 3D miniplates provides good stability.

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