



Miniplate Removal in Mandibular Trauma Patients - A Single Institution Retrospective Study

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ABSTRACT

Fractures of the facial skeleton have become common with increased road traffic accidents and other injuries. Functional osteosynthesis using miniplates have become the standard of care in the management of maxillofacial trauma. It has been suggested that they are suitable as permanent implants because of their biological compatibility. Nevertheless, mini plates also have a complication rate, which varies between different studies, thereby requiring removal. The aim of this study is to evaluate the frequency of plate removal post-treatment for mandibular trauma. This is a retrospective study. We reviewed patient records and analysed the data of 86000 patients between June 2019 and March 2020. A total of 35 patients underwent treatment for mandibular trauma during this period. Each of those case sheets were reviewed and telephonic cross-verification done to account any cases of plate removal and plate related complications among these patients. Statistical analysis was done using SPSS Version 20 by IBM. The results were analysed using chi-square test. In this study, we observe that the number of plates placed in the mandible for trauma in one year are 35. The incidence of trauma are more in males than females. Among this only one plate was removed in one year with an implication of only 0.02% of the incidence of plate removal in one-year time post mandibular trauma. Within the limits of the study, the incidence of plate removal post mandibular trauma is 0.02% in one year period of time. This shows that miniplates removal can be minimized if proper surgical and post-surgical care are followed.

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INTRODUCTION

Facial skeleton are in a prominent position, making them prone to injuries and broken bones. Restoring their form and function, ensuring precise anatomic reduction and fixation of the fractured site offers better agony lightening, hastened practical recuperation, and quick return to normalcy (Brown *et al.*, 1989; Jesudasan *et al.*, 2015). Be that as it may, the standard utilization of internal hardware for fixation isn't related without detriments and complications (Pinsky *et al.*, 2011; Kumar and Rahman, 2017). Many maxillofacial surgeons supported routine removal of the hardware following three

months of fixation. At a normal of 4 to 6 weeks, the hardware gets old, when the fracture has recuperated, and bony union is achieved (Bhatt *et al.*, 2005; Rallis *et al.*, 2006; Christabel *et al.*, 2016).

The use of mini plates in the oral and maxillofacial surgery was introduced in the nineteenth century, since then there has been an increase in the utilization of mini plates (Packiri *et al.*, 2017; Marimuthu *et al.*, 2018; Haug, 1996). In 1978, Champy *et al.* presented a careful procedure where miniplates were utilized in the oral and maxillofacial surgery, and the miniplate increased utility for the treatment of maxillofacial injury and orthognathic surgery procedures (Champy *et al.*, 1978; Patturaja and Pradeep, 2016; Kumar, 2017a; Abhinav and Prabhu, 2019). Miniplates have normally been made out of titanium, stainless steel, as it has higher biocompatibility and preferred physical properties over different metals (Kumar, 2017b; Patil *et al.*, 2017; Rao and Kumar, 2018). The utilization of mini plates has expanded as of late (Breme *et al.*, 1988). However, there have been different reports of inconveniences, for example, metal harmfulness and hypersensitivity, stress protecting, metallosis, relocation, substantial-quality, and thermal sensitivity, brought about by the utilization of smaller than normal plates, and the suitable removal of mini plates stays questionable (Brown *et al.*, 1989; Alpert and Seligson, 1996; Bhatt *et al.*, 2005; Kumar and Sneha, 2016; Kumar, 2017c).

Most common indications for removing plates and screws included wound dehiscence, infection and plate/screw exposure. Murthy and Lehman stated that most infections after surgical procedure for maxillofacial trauma happen in the mandible and are the significant reason for miniplate removal (Murthy and Lehman, 2005). Studies have reported various values for the removal rate of miniplates. Some researchers recommend removal in general, while others do not recommend removal unless clinical symptoms or complications occur (Brown *et al.*, 1989; Matthew and Frame, 1999; Bhatt *et al.*, 2005). Clear proof for such a recommendation has not yet been confirmed. The aim of this study is to analyze the incidence of plate removal post-treatment for mandibular trauma in patients visiting Saveetha Dental College in a period of 1 year.

MATERIALS AND METHODS

This is a retrospective study regarding the incidence of plate removal post mandibular trauma in patients who visited our institution in between March 2019 March 2020. The approval for this university set-

ting study was obtained from the Institution Ethics Board. The sample size contained 35 patients. The study was reviewed by two reviewers and telephonic cross-verified.

Inclusion criteria

Patients treated with ORIF for facial fractures for mandibular trauma.

Exclusion criteria

Patients treated with ORIF for maxillofacial fractures excluding mandible.

We reviewed patient records and analysed the data of 86000 patients between June 2019 and March 2020. The data of these patients was tabulated. It included parameters - age, gender, plates placed, plates removed.

Statistical analysis

After further verification by an external reviewer, it was imported to the SPSS Version 20 by IBM for statistical analysis. Percentages, mean, standard deviation, frequency of parameter were employed in the analysis. Chi-square test was done to detect significance between age, gender, time of ORIF, time of plate removal.

RESULTS AND DISCUSSION

The result shows that the plate placed in males in one year's time are 32 and only three plates placed in females in 1 year time (Graph 1). where X-axis shows the number of patients in both gender (Male and female) and the Y-axis shows the number of ORIF done in patients. Pearson chi-square test of statistical significance was $p = 1.00$ (statistically insignificant).

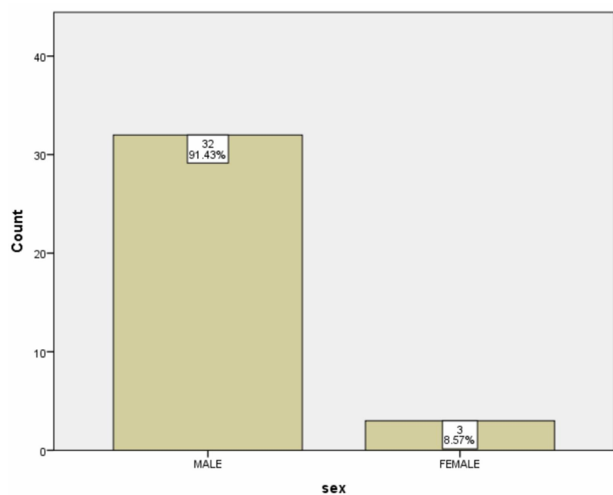
The number of plates placed in one year are 35, out of which 26 were stainless steel, and 9 were titanium. The number removed in the study period is one (Graph 2).

where blue bars are the number of plates placed, and the red bar is the number of plate removed.

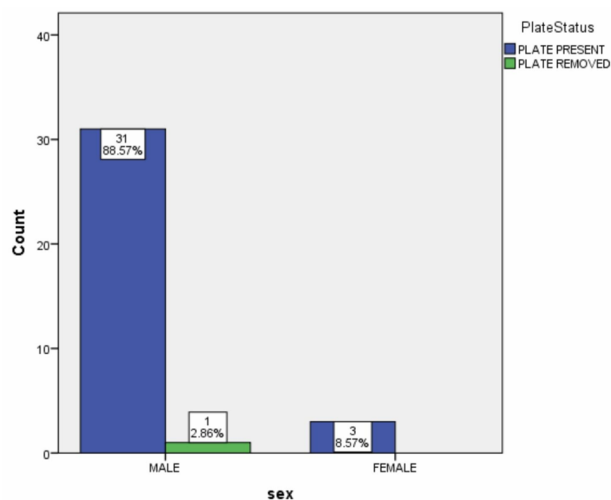
The plate that was removed after 11 months of fixation was stainless steel plate due to infection. There was no statistical significance in number of plate placed vs removed using the chi-square test of statistical significance $p = 0.171$ There was just 1 plate removed in males in 1 year period of time. No plates were removed in females in one year time (Graph 3).

where X-axis shows the number of patients in both gender (Male and female) Y-axis shows the number of plates present (blue bar) and number of plates removed (greenbar). Pearson chi-square test of

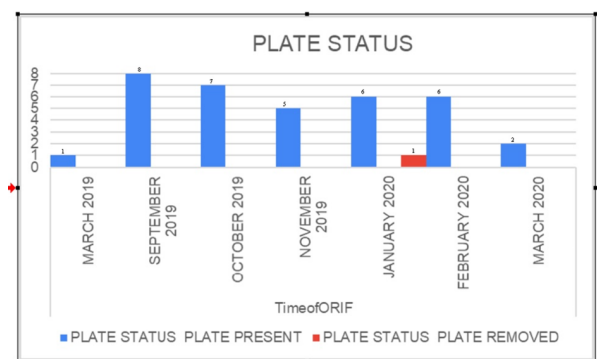
statistical significance was $p = 0.756$ (statistically insignificant).



Graph 1: Bar chart depicting the number of ORIF done in 1 year in male and female



Graph 3: Bar chart depicting the number of plates removed in 1 year time in males and female



Graph 2: Bar chart depicting the number of plates placed for ORIF and removed post-treatment during the study period

In numerous studies, the removal of mini plates has remained disputable. Proof has not yet upheld an overall accord for the removal of mini plates. A few analysts contend that a conventional mini plate ought to be expelled, though others keep up the mini plates and not be removed until the presence of clinical symptoms. Those who restrict removal of mini plate contend that its biocompatibility, low occurrence of entanglements, the dangers of general sedation during expulsion, conceivable harm to adjoining anatomical structures, and the cost of removal. Despite what might be expected, analysts who favour removal contend that the miniplate might go about as an foreign materials with the possibility to cause difficulties, and that mini plates create developmental/growth limitations among pediatric patients.

The routine removal of all miniplates following three months of fixation became the standard after reported by Champy (Brown *et al.*, 1989). Later, when vitallium was used considering it as an inert implant material, authors supported maintenance of vitallium miniplates (Michelet *et al.*, 1973). However, there was a report of 18% removal of vitallium plates (Frost *et al.*, 1983). In a timeframe, it was demonstrated that titanium (Ti) has alarming achievement in numerous surgeries. As indicated by Meningaud *et al.*, practically 100% of Ti is discharged at neighbourhood site during the osteosynthesis, in any case, Ti levels stay consistent and stable in the encompassing tissues and remain clinically inactive. Removal of Ti miniplates was not acknowledged as normal methodology aside from on account of contamination, dehiscence, hypersensitivity or screw loosening (Meningaud *et al.*, 2001). Matthew IR *et al.* was of the opinion that the removal of miniplates and screws helps overcome the side effects caused by them (Matthew and Frame, 1999). Authors have advocated postoperative removal of plates to preserve bone integrity (Cawood, 1985; Kennady *et al.*, 1989). (Iizuka *et al.*, 1990) were of the opinion that there is no purpose of leaving a foreign body after bone healing was achieved and thereby, routinely removed stainless steel miniplates around one year postoperatively. (Moberg *et al.*, 1989) likewise stated the removal of nickel-chromium and cobalt-chromium combination inserts after adequate bone healing, since metal components and particles discharged from the surface may cause unfavorably allergic reactions. (Rosenberg *et al.*, 1993) also removed titanium miniplates only if the patient had complaints. Most studies recommend

symptomatic miniplate removal and discourage routine removal of asymptomatic miniplates.

In the present study, we evaluated the incidence of plate removal with various factors with gender, time of ORIF, number of plate removal and number of plates placed.

The results show that ORIF was done more in males than in females in one year. This can be explained as men are more involved in driving, sports and other physical activities that can result in maxillofacial trauma (Iizuka *et al.*, 1990; Mesgarzadeh *et al.*, 2011; Jain *et al.*, 2019). Maxillofacial trauma caused by road traffic accidents can have serious implications on social and economic activities for the patient, his household and the society (Arangio *et al.*, 2014; Abhinav *et al.*, 2019). Some studies have reported (Oikarinen, 1995; Ogundare *et al.*, 2003) the other causes tend to be violence and sports injuries (Oikarinen, 1995; Ogundare *et al.*, 2003).

The number of plates placed in one year were 35 and the number of plates removed in one year time was only one (0.02%) in our study. In other reported study, the removal rate of miniplate in mandible was approximately 14.9% (Park *et al.*, 2016). Most of the cases plate were removed in one year (Park *et al.*, 2016). One more study by Ralles G et al the removal rate of miniplate was 6.9% (Rallis *et al.*, 2006). In a study by Bakhathir A et al states that 86% of the plates were removed within one year (Bakathir *et al.*, 2008).

The removal of miniplates is questionable with certain authors suggest routine removal and other for maintenance except if removal is clinically indicated (Champy *et al.*, 1978; Bhatt *et al.*, 2005). In different examinations, the purpose behind the removal of miniplates was on request of the patients, and such requests were believed to be founded on mental factors (Ogundare *et al.*, 2003).

The present study disagrees with the current rate incidence of infection and need for plate removal because the plate removed is less in our study. As in other studies, there is patient demand for plate removal, whereas here, the patient doesn't come until there is any symptom. Possible reasons are low socio-economic conditions and literary states of the patients.

The results suggest that the number of plates placed are more in males than in females in one year time and there is one plate removed in males and no plates removed in females. As discussed earlier men are at higher risk of injury than females. Maxillofacial trauma is mainly caused by traffic accidents as males are more involved in active trans-

port and outdoor activities. Whereas the number of plates removed in males are more as males have habit of smoking, use of alcohol or other intoxicating agents (Shankar *et al.*, 2012), which could probably increase the chances of infection in the immediate postoperative healing period. However, in our study, the plate removed was after 11 months, and the patient was a non-smoker. This means that the period of time needed for bone healing had been achieved. The overall frequency of removal in one year (0.02%) is very minimal, reflecting a high uneventful healing and success rate in mandibular trauma management in our study population.

CONCLUSION

Within the limits of the study, the incidence of plate removal post mandibular trauma is 0.02% in one year period of time. This shows that miniplates removal can be minimized if proper surgical protocols and post-surgical care are followed. A larger sample size and longer follow-ups have been planned for further study.

Conflict of interest

The authors declare that they have no conflict of interest for this study.

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