The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 8, 2025

FREQUENCY AND REASONS FOR REMOVAL OF BONE PLATE IN MAXILLOFACIAL TRAUMA PATIENTS

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DOI: https://doi.org/10.5281/zenodo.19754819

Keywords
Bone plate, Maxillofacial, Trauma

Article History
Received: 04 August 2025
Accepted: 12 August 2025
Published: 16 August 2025

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Abstract

Objective: *To determine the frequency of bone plate removal in maxillofacial trauma patients*

Study Design: *Cross-sectional study*

Place & duration of the study: *Department of Maxillofacial Surgery, Bolan Medical College/Hospital Quetta, from May 2025 to July 2025*

Methodology: *A total of 273 fulfilling the criteria were selected for the study purpose using non-probability purposive sampling. All individuals above the age of 18 years. Patients with maxillofacial fractures treated with rigid internal fixation using a titanium miniplate osteosynthesis system. Clinical records of patients with maxillofacial fractures treated with titanium miniplate fixation were reviewed. Data on demographics, type and location of fractures, reasons for plate removal, and complications observed post-removal were extracted from patient medical records, radiographs, and clinical follow-up notes. The data was entered and analyzed through SPSS version 26. A p-value of ≤0.05 was considered statistically significant.*

Results: *The frequency of bone plate removal in maxillofacial trauma patients in our study was 143 (52.38%). Most common reasons for removal of bone plate were site infections 44.06% (P-value 0.003). Causes of trauma were seen and most common trauma was road traffic accident 50.91% (P-value 0.003). Most common type of fracture were Mandibular fractures 58.97% (p-value 0.052), Time Interval between Plate Fixation and Plate Removal was 6–12 months 53.48% (P-value 0.001).*

Conclusion: *Bone plate removal is often required following maxillofacial surgery due to infection, pain, and exposure. The removal of the plates and screws was primarily due to the patient's desire and infections. Usually, six to twelve months after the initial surgery, the plate was removed.*

INTRODUCTION

One of the most frequent injuries seen in trauma cases is maxillofacial fractures, which are frequently caused by falls, industrial catastrophes, interpersonal aggression, and auto accidents. Due to the physical, financial, and psychological burden they cause, maxillofacial trauma that

results in both hard and soft tissue injuries have a significant social impact. They are a significant source of death and morbidity when linked to cerebral trauma, particularly in underdeveloped nations.[1] The adoption of diverse protective gear was limited due to rapidly urbanizing areas and a very variable geographical environment. To recover the appearance and functionality of the face, these injuries must be effectively managed.[2] Predicting injury patterns, assessing the efficacy of fixation procedures, and creating the most predictable therapeutic strategy all require a grasp of biomechanics. With benefits including three-dimensional stabilization, early mobilization, and quicker healing, open reduction and internal fixation (ORIF) with titanium miniplates has emerged as the gold standard for treating maxillofacial fractures.[3] Miniplates are frequently used to fix fractures of the orbit, frontal bone, zygoma, maxilla, and mandible. They are a popular option for fracture care due to their low-profile design, great biocompatibility, and mechanical strength.[4]

Miniplates also make it simpler to remove the fixation device, which lowers the possibility of problems and the need for further procedures. Miniplates have worked well, but it's important to take their restrictions into account. Miniplates are widely used, although there are certain issues with them. As foreign bodies, they may lead to infection, plate exposure, screw loosening, palpability, or thermal sensitivity.[5] These complications can compromise patient comfort and stability, prompting the need for plate removal. Additionally, stress shielding—a phenomenon where the presence of hardware decreases bone density around the implant site—raises concerns about the long-term structural integrity of the bone.[6]

Internal fixation device-related postoperative infections might result in delayed union, a longer recovery period, higher morbidity, and higher costs. While hardware removal eliminates the risks of infection and discomfort, the procedure itself carries inherent challenges, including anesthesia-related risks, surgical complications, and additional costs.[7]

The decision to remove or retain miniplates remains a topic of debate. Some advocate for prophylactic removal after the fracture has healed, citing potential long-term complications, while others recommend retention unless clinical symptoms, such as infection or exposure, arise.[8] Studies report varying rates of plate removal, ranging from 7% to 33.8%, depending on the indication and patient population. Many patients still require additional procedures for plate removal despite improvements in plate design and surgical methods, which raises concerns about the variables affecting these results.[9] The most commonly cited reasons for plate removal include infection at the surgical site, hardware exposure, and patient discomfort. However, there is still conflicting data about the advantages and disadvantages of routine removal as opposed to retention. But in actual practice, the necessity of plate removal because of complications including infection, pain, and other related problems continues to be a major worry.[10]

Locally, there is limited data on the frequency and reasons for bone plate removal in maxillofacial trauma patients. This study aims to address this gap by evaluating the frequency of plate removal and analyzing the associated factors in a tertiary care setting. The findings will contribute to a better understanding of the clinical decision-making process and the outcomes of plate removal in the management of maxillofacial trauma.

MATERIAL AND METHODS: This cross-sectional study was conducted in the department of Maxillofacial Surgery, Bolan Medical College/Hospital Quetta over a period of three months from May 2025 to July 2025 after approval from institute Vide letter No. CPSP/REU/DSG-2023-001-4599, dated: 02-05-2025). A total of 273 participants fulfilling the criteria were selected for the study purpose using non-probability purposive sampling. All individuals above the age of 18 years. Patients with maxillofacial fractures treated with rigid internal fixation using a titanium miniplate osteosynthesis system. Patients with complete and accessible medical records for evaluation and proper follow up were enrolled. Patients with

heavily comminuted fractures of the maxillofacial skeleton were excluded.

Following informed and signed consent, data was collected from patients treated at the Maxillofacial Surgery Ward of Bolan Medical College/Hospital Quetta. Eligible participants were classified on the basis of inclusion and exclusion criteria through non-probability purposive sampling. Information about their health, sociodemographic details, the time interval between fixation and plate removal, reasons for removal were gathered using a specially created questionnaire. Data on demographics, type and location of fractures, reasons for plate removal, and complications observed post-removal was extracted from patient medical records, radiographs, and clinical follow-up notes. Clinical records of patients with maxillofacial fractures treated with miniplate fixation were reviewed. Complications leading to plate removal, such as infection, plate exposure, screw loosening, broken devices, or palpable plates, were recorded. Non-complication-related reasons, including patient request, reconstructive purposes, or prosthodontic interference, was also documented. To rule out known medical conditions and co-morbidities, the presence of previous health or medical data was also collected.

Data was analyzed using SPSS version 26.0. Quantitative variables, such as age and time interval between fixation and removal, were expressed as means and standard deviations. Qualitative variables, including reasons for plate removal (e.g., infection, plate exposure, screw loosening) and type of fracture, were presented as frequencies and percentages. The frequency of plate removal was calculated as a proportion of the total patients treated with titanium miniplates. Associations between reasons for plate removal and patient demographics or fracture types were analyzed using chi-square or Fisher's exact tests for categorical variables. Independent t-tests or Mann-Whitney U tests were applied for continuous variables, depending on data distribution. A p-value of ≤0.05 will be considered statistically significant.

Identification of the Study Variables:

Independent Variable: Removal of bone plates in maxillofacial trauma patients

Dependent Variable: Common reasons for removal of bone plates in maxillofacial trauma patients (Infection, Delayed Healing, Re-fracture).

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RESULTS

Table No. 01: Socio demographic information of the Study Participants (n=273)

Sr. No.	Characteristics	Category	Frequency (%)
1	**Age of the study participants**	16-30 years	25 (9.16)
		31-45 years	132 (48.35)
		46-60 years	75 (27.47)
		> 60 years	41 (23.23)
2	**Gender**	Male	189 (56.01)
		Female	84 (43.98)
3	**Socioeconomic Status of Participants**	Lower Class	75 (34.85)
		Middle Class	138 (55.60)
		Upper Class	60 (12.86)

As shown in above table age distribution of the participants 16 to 30 were 25 (9.16%), 31 to 45 were 132 (48.35%), 46 to 60 years were 75 (27.47%) and > 60 years were 41 (23.23%), males were 189 (56.01%), while females were 84 (43.98%). Socioeconomic status was measured and 75 (34.85%) were from lower class, 138 (55.60%) from middle class and 60 (12.86%) were from upper class.

Table No. 02: Primary cause, Type of fracture and time duration between removal in in maxillofacial trauma patients (n = 273)				
Sr. No.	**Characteristics**		**Frequency (%)**	**P value**
1	Primary cause of maxillofacial trauma	Road traffic accidents	139 (50.91)	0.003
		Interpersonal violence	35 (12.82)	
		History of Fall	27 (9.89)	
		Sports injury	20 (7.32)	
		Industrial accidents	16 (5.86)	
		Other	36 (13.18)	
2	Type of fracture treated with the bone plate	Mandibular fracture	161 (58.97)	0.052
		Maxillary fracture	80 (29.30)	
		Zygomatic fracture	32 (11.72)	
3	Time Interval between Plate Fixation and Plate Removal	6–12 months	146 (53.48)	0.001
		12-24 months	84 (30.77)	
		> 24 months	43 (15.75)	

In our study cause of trauma were seen and most common trauma was road traffic accidents 139 (50.91%) **(p-value 0.003),** interpersonal violence was 35 (12.82%), fallings was 27 (9.89%), sports injury was 20 (7.32%), Industrial accidents were 16 (5.86%), and other causes were 36 (13.18%). Most common type of fracture were Mandibular fractures 161 (58.97%) (p-value 0.052), Maxillary fractures were 80 (29.30%), and Zygomatic fractures were 32 (11.72%). Time Interval between Plate Fixation and Plate Removal was 6–12 months 146 (53.48%) (P-value 0.001), 12-24 months were 84 (30.77%), and > 24 months were 43 (15.75%).

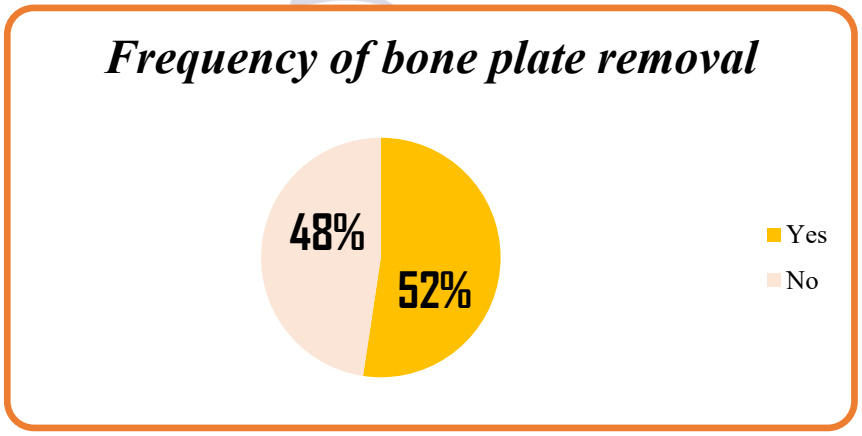

Figure No. 01 Frequency of bone plate removal in maxillofacial trauma patients (n = 273)

The frequency of bone plate removal in maxillofacial trauma patients in our study was 143 (52.38%)

Table No. 03: Most common reasons for removal of bone plate in study participants (n = 143)			
Sr. No.	***Reasons***	***Frequency (%)***	***P value***

1	Site Infection	63 (44.05)	*0.001*
2	Bone Plate exposed	24 (16.78)	*0.024*
3	Discomfort	16 (11.19)	*0.062*
4	Pain at site	17 (11.89)	*0.032*
5	On patient request	12 (8.39)	*0.127*
6	Plate fixation Failure or reconstruction indicated	11 (7.69)	*0.059*

In our study Most common reasons for removal of bone plate were site infections 63 (44.06%), bone plate was exposed 24 (16.78%), discomfort 16 (11.19%), pain 17 (11.89%), on patient request 12 (6.99%), and Plate fixation Failure or reconstruction indicated were 11 (7.69%).

DISCUSSION

Numerous studies have shown that the need to remove miniplates when hardware causes a number of issues and physical discomfort. Tooth extractions, infections, and patient requests were the main causes of plate removal. The mandible was the most common location for plate removal, which typically occurred over a period of six to twelve months. These results highlight the importance of long-term monitoring to evaluate the course of miniplates in craniofacial surgery and offer insightful information for upcoming clinical choices.[5]

In a cohort of recently trained orthopaedic surgeons in the United States, hardware removal—one of the most common orthopaedic procedures—was linked to an overall complication rate of 9.6% (95% CI, 9.1% to 10.1%). Surgeons and patients should be informed that hardware removal poses a certain risk, even though particular complications including infection, refractures, and nerve injury were documented to have relatively low rates of occurrence and related life-threatening consequences happened seldom.[12]

In our study the frequency of bone plate removal in maxillofacial trauma patients was 143 (52.38%). Most common trauma was road traffic accidents 139 (50.91%) **(p-value 0.003),** and interpersonal violence were 35 (12.82%) was 2nd common cause. Most common type of fracture were Mandibular fractures 161 (58.97%) (p-value 0.052), Maxillary fractures were 80 (29.30%), and Zygomatic fractures were 32 (11.72%). In a study conducted by Zahoor S, et al concluded that the most common fracture site was mandible 84.9% followed by maxilla 6.4%, mandible and maxilla 4.6% and least common fracture site was zygomatico maxillary complex 4.1%.[13]

Time Interval between Plate Fixation and Plate Removal was 6–12 months 146 (53.48%) (P-value 0.001), 12-24 months were 84 (30.77%), and > 24 months were 43 (15.75%). In a study conducted by Hussain M, et al. concluded in a study that between six and twelve months after they were initially fixed, the majority of the plates were removed. The primary reasons for removal were infection (31.7%), plate exposure (21.7%), and pain/discomfort (18.3%). Psychological issues and technical failure were less frequently mentioned factors.[14]

In our study most common reasons for removal of bone plate were site infections (44.06%), bone plate was exposed (16.78%), discomfort (11.19%), pain (11.89%), on patient request (6.99%), and Plate fixation Failure or reconstruction indicated were (7.69%). In a study conducted by analyzing the removal of bone plates in maxillofacial trauma patients identified the most common reasons. The most frequent causes of plate removal were persistent discomfort (70%), infection (91%), and plate exposure (28%). Results were strongly impacted by gender ($p<0.001$), occupation ($p<0.001$), and trauma etiology ($p<0.001$). Complication rates were higher for mandibular plates (63%) and titanium alloy plates (70%). 56% of patients reported being satisfied after surgery, however 84% needed more procedures ($p < 0.001$).[15] In another study by Fahimuddin et al also concluded that the patient's request was the most

frequent cause of plate removal in our study (34.28%), followed by infection (27.14%), pain following plating (20.71%), and scheduled removal (17.85%).[16]

CONCLUSION

Bone plate removal is often required following maxillofacial surgery due to infection, pain, and exposure. The findings demonstrate the importance of proper surgical technique, patient education, and personalized postoperative care. More research on bioresorbable materials and improved fixation methods is recommended to reduce long-term problems.

Conflict of interest: There is no conflict of interest in this study

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