

ORIGINAL ARTICLE

Frequency of reasons of plate removal following maxillofacial trauma in patients presenting to Ayub Teaching Hospital Abbotabad.

Maryam Jadoon¹, Khurshid Alam², Aqsa Munir³, Muhammad Masood Khan⁴, Anoosha Sajid⁵, Sidra Qadir⁶

ABSTRACT... Objective: To find out the incidence and causes of plate removal in cases of maxillofacial trauma at a tertiary healthcare facility. **Study Design:** Cross-sectional study. **Setting:** Department of Oral and Maxillofacial Surgery, Ayub Teaching Hospital, Abbottabad. **Period:** October 2025-March 2026. **Methods:** A total of 133 patients having undergone ORIF surgery for maxillofacial fractures and who later needed plates to be removed were selected by non-probability consecutive sampling. Information related to demographic characteristics, location of fractures, and causes of plate removal was collected on a predesigned questionnaire. SPSS version 26 was used for data analysis. **Results:** A total of 133 subjects were contained in the study; of these subjects, 97 (i.e., 72.9%) were males and 36 (i.e., 27.1%) were females. The maxilla was the most common fracture location (53.4%). 46 (i.e., 34.6%) patients had surgical site infections as the rationale for removing the plate implant. Plate exposure (27 patients; 20.3%), pain or discomfort due to the implant (19; 14.3%), mechanical failure of the implant (15; 11.3%), and the desire for reconstructive surgery (7; 5.3%) were additional reasons for removal of the implants. No statistical association was found between the indication for plate removal and the patient's gender ($p=0.110$), age category ($p=0.505$), or the fracture's location ($p=0.523$). **Conclusion:** Surgical site infection remains the predominant reason for plate removal after treatment of facial trauma. Improved postoperative care can potentially reduce the incidence of complications associated with the use of plate implants for treatment of facial trauma

Key words: Mandibular Fractures, Maxillofacial Trauma, ORIF, Plate Removal, Surgical Site Infection.

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INTRODUCTION

Management of maxillofacial trauma has evolved significantly with the widespread use of open reduction and internal fixation (ORIF) using titanium or stainless-steel miniplates.¹ These fixation systems provide stable bone healing, early functional recovery, and improved patient outcomes.² However, despite their biocompatibility and mechanical strength, these plates are not entirely free from complications.^{3,4} Over time, retained hardware may act as a foreign body and lead to clinical issues such as infection, plate exposure, palpability, screw loosening, or hardware failure, necessitating a secondary surgical procedure for removal.⁵ The decision to remove plates remains controversial, as routine removal is not universally recommended in adults unless symptomatic, while in certain cases removal becomes unavoidable due to postoperative complications or patient-related concerns.⁶

Several studies have evaluated the frequency and reasons for plate removal following maxillofacial trauma. Gul et al. reported infection as the most common indication, occurring in up to 91% of cases, followed by persistent pain (70%) and plate exposure (28%).⁷ Similarly, a study conducted in Pakistan by Dildar et al. found that 35.2% of patients presented with pus discharge (infection), while 47% underwent elective removal due to patient demand, and smaller proportions reported pain (7.8%) and hardware palpability (9.8%).⁸ Rallis et al. also highlights infection and plate exposure as leading causes, along with patient request and hardware-related discomfort.⁹ Additionally, Cahill et al. suggest that approximately 5% of patients with craniomaxillofacial trauma develop hardware-related infections, which often necessitate removal.¹⁰ These findings indicate that both biological complications and subjective patient factors contribute significantly to plate removal.

1. BDS, PGR Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.

2. BDS, FCPS, Chairperson Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.

3. BDS, PGR Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.

4. BDS, FCPS, Associate Professor Oral & Maxillofacial Surgery, KMU, KIDS.

5. BDS, PGR Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.

6. BDS, PGR Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.

Correspondence Address:

Dr. Khurshid Alam
Department of Oral & Maxillofacial Surgery, Ayub College of Dentistry, Abbottabad.
kurshid810@gmail.com

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Despite the availability of such data, there remains a lack of region-specific and institution-based evidence regarding the frequency and spectrum of reasons for plate removal, particularly in tertiary care settings of developing countries like Pakistan. Variations in trauma patterns, surgical techniques, patient compliance, and postoperative care may influence outcomes and indications for hardware removal. Furthermore, limited local data restricts the ability to develop standardized guidelines tailored to the regional population. Therefore, this study aims to determine the frequency and reasons for plate removal following maxillofacial trauma in patients presenting to Ayub Teaching Hospital Abbottabad, with the objective of providing locally relevant evidence to guide clinical decision-making and improve patient management.

METHODS

This study was conducted using a descriptive cross-sectional design at the Department of Oral and Maxillofacial Surgery, Ayub Teaching Hospital, Abbottabad. The duration of the study was six months from October 2025-March 2026 after obtaining approval from the institutional ethical review committee via letter Ref No.RC-EA-2024/030 dated 31-01-2024. All patients presenting during the study period who had previously undergone open reduction and internal fixation (ORIF) with miniplates for maxillofacial trauma and subsequently required plate removal were considered for inclusion.

The sample size was calculated using the WHO sample size calculator based on the single population proportion formula, taking a 95% confidence interval, absolute precision of 5%, and an anticipated frequency of 9.5% for plate removal in maxillofacial trauma due to elective (prophylactic) hardware removal. A final sample of 133 patients was calculated. A non-probability consecutive sampling technique was used.

Patients of both genders, aged 18–60 years, who had undergone plate fixation for maxillofacial fractures and later presented for plate removal were included in the study. Patients with pathological fractures, congenital craniofacial anomalies, immunocompromised conditions, or incomplete medical records were excluded to minimize

confounding factors.

Data were collected using a structured proforma. Variables recorded included demographic details (age, gender), fracture site, and the time interval between fixation and plate removal. The primary outcome variable was the frequency of reasons for plate removal, including infection (characterized by pus discharge, swelling, or sinus formation), plate exposure, pain, hardware failure (loosening or fracture), and patient demand without clinical indication. All patients were assessed clinically, and relevant radiographic investigations were reviewed where necessary to confirm the indication for removal.

Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics were calculated for all variables. Frequencies and percentages were used for categorical variables such as gender and reasons for plate removal, while mean and standard deviation were calculated for continuous variables such as age and duration between fixation and removal. Stratification was performed to control for potential effect modifiers such as age, gender, and fracture site. Post-stratification, the chi-square test was applied, and a p-value of ≤ 0.05 was considered statistically significant.

All ethical considerations were strictly followed. Informed consent was obtained from all participants, and confidentiality of patient data was ensured. No additional risk was imposed on patients, as the study involved observational data collection only.

RESULTS

A total of 133 patients analyzed in the study had a mean age of 38.55 ± 12.46 years and the time to removal was 12.64 ± 6.42 months. The largest number of subjects was represented by males (97, 72.9%) as compared to females (36, 27.1%). The commonest location of fracture was at the mandible (71, 53.4%), followed by zygoma (36, 27.1%) and maxilla (26, 19.5%). The most common cause of plate removal was surgical site infection (46, 34.6%), followed by plate exposure (27, 20.3%), pain/discomfort and patient request (19, 14.3% each), mechanical plate failure (15, 11.3%) and

reconstructive indication (7, 5.3%) (Table-I).

Analysis using stratification revealed that the major cause of plate removal in the same way in terms of all categories included gender, age group and fracture type was surgical site infection. Amongst males, the incidence of infection was the highest at 38.1% whereas in females, plate exposure and pain/discomfort had higher occurrences at 25.0% each. Within the category of age wise distribution, the highest incidence of infections was among the 51–60 years age group (45.5%). Also, amongst

the fracture types, the incidence of infections was the highest for mandibular fractures (38.0%). Statistically, there was no significant relationship between the causes of plate removal and gender ($p = 0.110$), age group ($p = 0.505$) or fracture site ($p = 0.523$) (Table-II).

DISCUSSION

The current study was aimed at establishing the rate and causes of plate removal following maxillofacial trauma among patients attending a tertiary health facility.

TABLE-I

Distribution of study participants according to gender, fracture site, and reasons for plate removal (n = 133).

Variables	Categories	n (%)
Gender	Male	97 (72.9%)
	Female	36 (27.1%)
Fracture Site	Mandible	71 (53.4%)
	Maxilla	26 (19.5%)
	Zygomatic Complex	36 (27.1%)
Reasons for Removal	Mechanical Plate Failure	15 (11.3%)
	Pain/Discomfort	19 (14.3%)
	Patient Request (Psychosocial)	19 (14.3%)
	Plate Exposure	27 (20.3%)
	Surgical Site Infection	46 (34.6%)
	Reconstructive Indication	7 (5.3%)

TABLE-II

Association of gender, age group, and fracture site with reasons for plate removal among patients undergoing hardware removal following maxillofacial trauma.

Variables	Reasons for Removal						P-Value
	Mechanical Plate Failure	Pain/ Discomfort	Patient Request	Plate Exposure	Recon-structive Indication	Surgical Site Infection	
Gender							
Male	12 (12.4%)	10 (10.3%)	13 (13.4%)	18 (18.6%)	7 (7.2%)	37 (38.1%)	0.110
Female	3 (8.3%)	9 (25.0%)	6 (16.7%)	9 (25.0%)	0 (0%)	9 (25.0%)	
Age Group							
18-30 years	5 (13.2%)	8 (21.1%)	5 (13.2%)	6 (15.8%)	1 (2.6%)	13 (34.2%)	0.505
31-40 years	1 (3.1%)	6 (18.8%)	5 (15.6%)	7 (21.9%)	4 (12.5%)	9 (28.1%)	
41-50 years	4 (13.3%)	3 (10.0%)	5 (16.7%)	7 (23.3%)	2 (6.7%)	9 (30.0%)	
51-60 years	5 (15.2%)	2 (6.1%)	4 (12.1%)	7 (21.2%)	0 (0%)	15 (45.5%)	
Fracture Site							
Mandible	4 (5.6%)	11 (15.5%)	9 (12.7%)	16 (22.5%)	4 (5.6%)	27 (38.0%)	0.523
Maxilla	6 (23.1%)	5 (19.2%)	3 (11.5%)	4 (15.4%)	1 (3.8%)	7 (26.9%)	
Zygomatic Complex	5 (13.9%)	3 (8.3%)	7 (19.4%)	7 (19.4%)	2 (5.6%)	12 (33.3%)	

From the results obtained, infection of the surgical site accounted for 34.6% of cases of plate removal, while plate exposure accounted for 20.3% and pain/discomfort and patient request accounted for 14.3% each. Plate failure due to mechanical breakdown made up 11.3%, while reconstructive indication made up 5.3%. Furthermore, no significant correlation was established between the cause of plate removal and gender, age or fracture site. Infection emerged as the primary cause irrespective of age groups or fracture sites.

Results from the current study are justified by other scholarly articles on the topic. According to a review article on the causes of maxillofacial hardware complication by Rosa et al., infection is the most prevalent cause of plate removal in all reviewed studies and accounted for rates varying from 34% to 68%.¹¹ Ali et al. also found that the majority of the plates 32 (68.08%) were removed from the mandible. The most common reason for plate removal was infection 20 (42%).¹² In a similar context, Rehman et al. showed that mandibular body is the most common location (33.33% cases) from where plates were taken out, followed by frontozygomatic suture, and infection was the most common cause of plate removal (37.04%), thus giving strong support to results obtained in the current study.¹³ All these results are highly consistent with the results obtained in the current study and strongly reinforce the importance of infection as the most prominent reason for hardware removal.

Supportive evidence can be gathered from retrospective studies as well, wherein Aramanadka et al. showed that infection/osteomyelitis has been identified as the most important reason for plate removal, especially mandibular fracture cases.¹⁴ Likewise, Thorén et al. showed that wound dehiscence and infection form the most common objective reasons for removal of plates, and thereby support the importance of infection as the major reason for plate removal.¹⁵ The percentage of plate exposure (20.3%) in the current study is also consistent with the reported values ranging between 20–30%.

Nevertheless, other research findings oppose this evidence, especially systematic reviews and studies

done in advanced medical facilities. According to the recent meta-analysis conducted by Jaber et al., patient request (38.2%) and infection (24.6%) were found to be the two most prevalent reasons for plate extraction.¹⁶ Similarly, the study conducted by Widar et al. that analyzed elective or orthognathic surgery showed remarkably low prevalence rates of infection (approximately 10%) and higher removal due to discomfort and personal patient preferences.¹⁷

From biological and clinical perspectives, the high prevalence rate of infection is attributed to various factors. The metallic hardware serves as a foreign body that promotes the attachment of microorganisms and biofilm formation, thus interfering with host immunity and antibiotic effects.^{18,19} Anatomically, the mandible is predisposed to infections owing to its characteristics such as dense cortical bone, vascularity, and open nature.^{20,21} Additionally, patients' behavioral attributes contribute to infections through poor oral hygiene practices, smoking, and poor post-operative management.²² Moreover, poor nutrition and weak immune systems can lead to impaired wound healing, making patients prone to complications that necessitate plate removal.²³

From the clinical perspective, these results point to the significance of aseptic surgical procedures, proper use of antibiotics, and patients' education about post-operative care. Timely diagnosis and treatment of infection can possibly help avoid plate removal surgery. Low rates of mechanical failure show advancements in implant design and material strength, while high rates of plate removals requested by patients highlight the necessity for improvement in patient counseling about retaining implants.

This research has some limitations. First, it is a single-center study that limits the possibility of generalization. Secondly, as it is a cross-sectional study, it does not allow for drawing causal conclusions. Smoking status, other diseases, and oral hygiene practices have not been controlled for. Finally, there is information bias due to using medical records.

Nevertheless, these results have clinical implications. They clearly show that infections are the main

cause of plate removal, which underlines the need for improving perioperative care. In terms of health policy, improving infection control measures and follow-up programs post-surgery are vital for the management of tertiary care patients. Multicenter studies are required in the future to examine other risk factors and increase sample size. The role of longitudinal studies can help identify causality and allow creation of a framework of guidelines regarding management of plates in cases of maxillofacial trauma.

Surgical infection emerged as the most important cause of plate removal post surgery due to maxillofacial trauma, plate exposure came second, pain/discomfort third, and patient-related reasons were fourth. On the other hand, mechanical failure and reconstructive indications emerged as comparatively rare causes. There were no correlations found between the reasons for plate removal and demographic/clinical variables examined in the study.

CONCLUSION

The main causes of plate removal after maxillofacial trauma were surgical infection, plate exposure, pain/discomfort, and patient-related reasons, with reconstructive indications and mechanical failure being relatively infrequent causes. Demographic or clinical factors showed no association with the aforementioned causes of plate removal.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Maryam Jadoon: Conception of research, data collection.
2	Khurshid Alam: Write up of article, literature review.
3	Aqsa Munir: Data collection.
4	Muhammad Masood Khan: Data entry.
5	Anoosha Sajid: Data analysis.
6	Sidra Qadir: Revisions.