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Frequency and Reasons for Removal of Bone Plate Following Maxillofacial Surgery

Mushahid Hussain[1], Asma Uppal[1], Yahya Khan[1], Siddique Ullah[1], Muhammad Ammar[1], Muhammad Bilal[1]

[1]Department of Oral and Maxillofacial Surgery, Bolan Medical College/Hospital, Quetta, Pakistan.

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Corresponding Author: Mushahid Hussain,
Department of Oral and Maxillofacial Surgery, Bolan Medical College/Hospital, Quetta, Pakistan.
Email: mushaidhussain344@gmail.com

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ABSTRACT

Background: In maxillofacial procedures, bone plates are frequently utilized for internal fixation. However, if they are there for an extended period of time, they may cause problems that require removal. Routine removal is still up for discussion despite improvements in materials and processes. **Objective:** to ascertain the clinical justifications and frequency of bone plate removal in a tertiary care context after maxillofacial surgery. **Methods:** In a tertiary care hospital Quetta, a six-month qualitative study was carried out from October 2024 to March 2025. A total of 120 patients who had bone plate fixation and removal were included in the study using random selection. Semi-structured interviews with an emphasis on patient experiences and clinical grounds for removal were used to gather data. **Results:** The majority of patients (65%) were between the ages of 31 and 45. The most often fractured location (53.3%) and plate-removal site (60%), respectively, was the mandible. Most of the plates were taken out between six and twelve months after they were first fixed. Infection (31.7%), plate exposure (21.7%), and pain/discomfort (18.3%) were the main causes of removal. Less often reported causes included mechanical failure and psychosocial problems. **Conclusion:** After maxillofacial surgery, infection, exposure, and discomfort frequently make bone plate removal necessary. The results highlight how crucial appropriate surgical technique, patient education, and customized postoperative care are. To lessen long-term issues, more investigation into bioresorbable materials and better fixation techniques is advised.

INTRODUCTION

Since the late 19th century, internal fixation in the facial region has reportedly been accomplished with bone plates (BPs) and screws. [1] Since Champy modified techniques from Michelet et al. in 1978, modern internal fixation devices have become more popular in the maxillofacial region. These devices now play a significant role in the treatment of facial bone trauma as well as orthognathic and maxillofacial reconstructive surgery. [2–5]

The long-term management of internal fixation devices is still somewhat debatable, nevertheless, because there is a lot of disagreement but little evidence in the literature on oral and maxillofacial surgery. [1, 2, 6, 7] It was recommended that these fixation devices be removed once they stopped working as part of the overall treatment plan for the early systems, which were often big, heavy, and made of cobalt chrome or stainless steel. [3, 7, 8] Trauma patients frequently suffer maxillofacial fractures, and since their introduction in the late 1970s, miniplates have gained popularity as a fixation technique [9]. Early mobilization and quicker recovery are made possible by miniplates' low-profile design, improved visibility, stability, and strength; they have also shown excellent levels of biocompatibility and a low incidence of hardware-related issues [10].

Mandibular, zygomatic, and maxillary fractures, as well as orbital, frontal, and nasal bone fractures, are frequently treated using miniplates [10]. Miniplates also have the benefit of giving the fracture site strength and stability. Miniplates also make it simpler to remove the fixation device, which lowers the possibility of problems and the necessity for follow-up procedures. Miniplates have shown promise, but it's important to take into account their drawbacks. Alternative fixing techniques can be needed for patients with complex fractures or low bone quality [11]. Prior to selecting miniplates, metal sensitivity or allergies must also be considered [12,13].

There is continuous discussion on whether miniplates should be removed or kept in place following jaw surgery. Removal is frequently necessary due to complications like infection, plate exposure, and plate loosening [14,15]. Serious infections may need to be removed in order to stop more problems [16, 17].

Stability may be jeopardized, and pain or discomfort may result from loosening and plate exposure. However, there are dangers associated with removal itself, including discomfort, a higher chance of infection, and decreased stability [14]. Other problems with miniplates, like the development of foreign body granulomas or the trapping of facial nerve branches, have been documented in a few trials [18].

In order to give shattered bones stability and support, miniplates and screws are commonly used. However, their existence in the body can have a variety of effects, both good and bad. The good news is that these miniplates are essential for maintaining bone alignment, speeding up the healing process, and regaining normal function. Compared to more conventional techniques like casts or immobilization, they efficiently offset the stresses applied to the fractured bone, enabling patients to regain mobility sooner. [19]

A number Nearly all factors, implant-related and patient related, influence the decision to remove bone plates. Indications of common are infection, plate selectivity, hardware failure, patient discomfort, temperature sensitivity and patient preference, as cited by Mosbah et al. (2003) [20] and Rai & Datarkar (2011) [21]. Infection is the most common cause of hardware removal among these and often results from the colonization of microbes surrounding the implant and resistance to antibiotics [22]. In addition, removal may also be necessary because of the frequently occurring to plate exposure often due to insufficient soft tissue coverage and impaired vascularity, for example, in the low magnolol thickness in areas such as the mandible [23].

Knowing frequency and some reasons of when bone plate removal is required is very important in planning a surgery for the patient or advising the patient, and with the effective postoperative care. This helps to develop preventive measures like antibiotic prophylaxis, controlled surgery technique and the patient information, anticipation possible consequences. In addition, the investigation of surface modified plates or bioresorbable implants may become substitutes which help eliminate the requirement of removal in the future.

The intent of this study is to find out the bone plate removal prevalence and the underlying causes for the bone plate removal in a tertiary care facility following maxillofacial surgery. The study had the goal to identify contributing factors contributing most to long term patient outcomes in maxillofacial trauma and reconstructive surgery.

LITERATURE REVIEW

External fixation with bone plates is usually used to encourage internal fixation and recreate anatomic form and function after maxillofacial trauma. Titanium plates and screws are the most widely used variant of materials for maxillofacial surgery, the rest stronger and less susceptible to corrosion, is thus due to the reason of their strong biocompatibility. However, the question has not been answered whether these plates should be taken out after the bone is healed when they need to come out. Knowledge of both frequency and reason for bone plate removal after maxillofacial surgery is also necessary for guidance of postoperative care and surgical decision making.

ORIF using titanium plates has been utilized extensively by Oral and Maxillofacial Surgery, and this has lead to a great deal of advancement in Oral and Maxillofacial Surgery. It is preferred because it is low allergy propensity and properly biocompatible. Although, removal (24) may be necessary as the infection, plate exposure, discomfort, or palpability, or hypersensitivity, are issues. It is well known that titanium usually has good tolerance to removal, and indeed rates are quite noteworthy in some studies. In the patient group with craniofacial abnormalities, the reported frequency of hardware removal ranges from 5% to 40% (25) and depends on patient population, position of the plate and length of recovery following surgery.

In fact, infection is one of the most frequently mentioned causes of want. Infection after surgery may be caused by poor dental hygiene, local systemic disorders, their debilitate immunity or contamination at the time of injury or operation. Hardware assisted maxillofacial surgery carries up to 15% infection rates and hardware removal is required to treat (26). A nearly 42% Chen at al. of a retrospective research reveals that infection was a cause for almost 42% of patients who had a plate removed after mandibular fracture repair.

The second common cause of removal is when the plate is exposed to the outside by the removal of the skin or the mucosa. Wound strain or loss of soft tissue cover to zygomatic or mandibular region is usually the common cause. This may cause soft tissue dehiscence over the plate resulting in the exposure and maceration of developing soft tissue with the risk of contamination. In some series of patients this exposure was reported in up to 20% and if untreated is frequently infected (28).

In the other reason, removal is done because of pains or discomfort in the plate. Depending on the cooler climates where titanium's thermal conductivity or that of some metal which it is used in its shape, the discomfort may persist in the patient. This was confirmed by Bither et al who found 12% of 78 patients who were treated for mandibular fracture with removal because the pain persisted (29).

Other noninfectious causes include plate palpability and patient request. The patient can be uncomfortable when the plate is not placed where it is supposed to be and it may be misplaced for example in the frontal bone or infraorbital rim area which are aesthetically sensitive. Additionally, even if there is no clinical disease, a patient may choose removal even because he has a fear of a

foreign body. Moreover, in some cultures or places, the bone removal is also preferred even if there are no symptoms after its healing as per Rai and Pradhan's study from India (30).

Occasionally, it will require fixation removal or revision if delayed or unsuccessful bone healing occurs as well. Prevent them from healing especially as they may have metabolic diseases, poor nutritional health or the habit of smoking. Additionally, the hardware will break loose, cease to function (31), and mechanical instability will occur in which it will need to be removed.

The reason for that is that plates should be taken out periodically. Besides that, supporters say it also keeps people from undergoing unnecessary removal and the complications such procedures could lead to. The opponents claim that removal should be taken into account to avoid late issues like stress shielding, chronic infection and metal sensitivity reactions. At the moment most believe plates should only be removed if they have symptoms or if they are complex (32).

Despite advances in the technology through better surgical methods and plate designs, complications remain. Due to the long period of time that these pupates Maxillofacial patients should be followed to recognize later problems, open questions in maxillofacial surgery are caused. Early hardware related problems can be identified after postoperative follow up.

In brief, bone plate present in the field of maxillofacial surgery can be in suction rate depending on anatomical location, patient traits, execution and levitate material employed. The main reasons for removal that still serve as the reason for removal are infection, exposure, discomfort, and patient preference. Nevertheless, even in the asymptomatic population, usual removal is not recommended but individualized examination is required. Nevertheless, further research is needed in order to improve results and to revise the guidelines mainly in the subject or context of high risk.

Research Objective

The purpose of this study is to find the rate of bone plate removal after maxillofacial surgery. Their aim is to determine the major clinical reasons for this plate removal. Infection, plate exposure, chronic pain or patient discomfort are some of these. Knowledge of such factors can contribute to surgical planning improvement as well as the care of the patients postoperatively. Additionally, time frame between fixation and removal is also evaluated in the study. By doing this we will have better patient outcome and evidence-based surgical practice.

METHODOLOGY

The aim of this study was a qualitative one to determine the prevalence and causes of bone plate removal following maxillofacial surgery. The study was conducted in the Department of the Oral and Maxillofacial Surgery of a tertiary care hospital during six months period from October 2024 to March 2025. It was a study of 120 patients who had prior bone plate fixation during a craniofacial surgery that later required plate removal. To reduce the selection bias and have a random sample of participation of patients, a random sampling process was made.

Patients, aged at least 18, who had had at least six months between maxillofacial plate fixation and presentation, for whom participation was approved, were enrolled. Only patients who did not want to participate and those with insufficient medical information were removed. Data was gathered by means of semi structured interviews. The core topics of the interviews were patients' experience, opinion and clinical aspects related to plate removal. Informed consent was obtained from all the participants and ethically approval obtained from the institutional review board.

RESULTS

A total of 120 patients who underwent bone plate fixation followed by plate removal were included in the study. The demographic analysis showed a predominance of male participants. The most commonly affected fracture site requiring plate fixation was the mandible. The majority of the patients underwent plate removal between 6 and 12 months after the initial surgery. Clinical reasons for bone plate removal varied, with surgical site infection being the most frequently cited cause. The anatomical location analysis revealed that the mandible was the most common site for plate removal.

Table 1

Demographic Distribution of Study Participants (n=120)

Demographic Variable		Frequency (n)	Percentage (%)
Gender	Male	78	65.0%
	Female	42	35.0%
Age Group (years)	18–30	28	23.3%
	31–45	46	38.3%
	46–60	30	25.0%
	>60	16	13.4%

Table 1 presents the demographic distribution of the study participants. Out of 120 patients, 65% were male and 35% were female. The majority of the participants (38.3%) belonged to the 31–45 years age group, followed by 25% in the 46–60 years age group.

Table 2

Distribution of Initial Fracture Site Requiring Plate Fixation

Fracture Site	Frequency (n)	Percentage
Mandibular Fracture	64	53.3%
Zygomaticomaxillary Complex (ZMC) Fracture	26	21.7%
Le Fort Fracture	14	11.7%
Orbital/Frontal/Nasal Bone Fractures	16	13.3%

Table 2 shows the initial fracture sites where bone plate fixation was required. Mandibular fractures were the most common, accounting for 53.3% of cases, followed by Zygomaticomaxillary Complex (ZMC) fractures at 21.7%.

Table 3

Time Interval Between Plate Fixation and Plate Removal

Time Interval Between Surgeries	Frequency (n)	Percentage (%)
6–12 months	54	45.0%
13–24 months	38	31.7%
>24 months	28	23.3%

Table 3 outlines the time intervals between initial plate fixation and subsequent removal. Most patients (45%) underwent plate removal between 6 and 12 months, while 31.7% had removal between 13 and 24 months.

Table 4

Clinical Reasons for Bone Plate Removal

Reason for Removal	Frequency (n)
Surgical Site Infection	38
Plate Exposure	26
Pain/Discomfort	22
Patient Request (Psychosocial)	14
Mechanical Plate Failure	12
Reconstructive Indication	8

Table 4 lists the clinical reasons necessitating bone plate removal. Surgical site infection was the leading cause (38 cases), followed by plate exposure (26 cases) and pain or discomfort (22 cases). Psychosocial patient requests and mechanical plate failure were less common reasons.

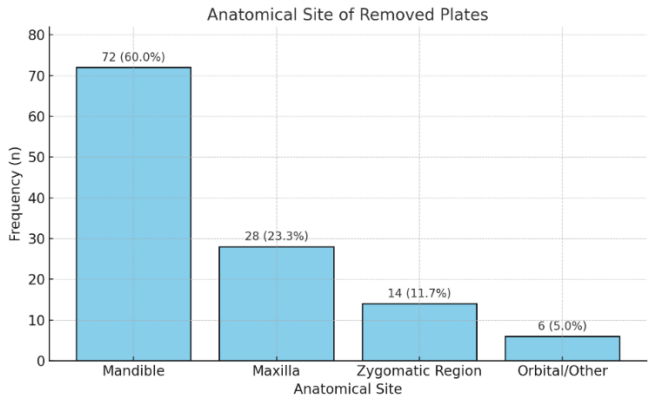
Table 5

Anatomical Location of Removed Plates

Anatomical Site	Frequency (n)	Percentage (%)
Mandible	72	60.0%
Maxilla	28	23.3%
Zygomatic Region	14	11.7%
Orbital/Other	6	5.0%

Table 5 details the anatomical sites from which plates were removed. The mandible was the most common site (60%), followed by the maxilla (23.3%) and zygomatic region (11.7%).

Figure 1



DISCUSSION

The aim of this qualitative study was to report the incidence and the reasons for removing the bone plates from the maxillofacial surgery. And the results help explain what variables related to the clinical and patient sort of things would make you need hardware removal.

Table 1 shows the distribution of the participants in their demographic. Namely, there were 65% men among the majority of patients as it was in line with the fact that men are more prone to sustain facial injury due to high risk and occupational activities compared to women. Most of the patients (38.3%) were in the ages of 31 to 45 and have the potential of higher level of physical activity and higher possibility of the occurrence of a face fracture.

Table 2 also gives the reasons for the initial plate fixation with mandibular fractures representing the bulk (53.3%) and followed by zygomaticomaxillary complex (ZMC) fractures (21.7%). Since mandible is so extensively fractured, it is in keeping with clinical pattern. ZMC and Le Fort fractures involve the anatomical and functional midface anatomy and therefore internal fixation is also necessary.

Table 3 shows the time interval from first fixation to subsequent plate removal. That most patients (45%) have gotten their plates removed between six and 12 months after the fact means that most problems or discomfort occur in the first year after surgery. One third of a sizable portion (31.7%) between 13 and 24 months had plates removed, suggesting that some problems can arise or continue over time.

In Table 4 it can be seen that surgical site infection (31.7%) is the most common cause of plate removal. The fact that the research now in publication corroborates it, research on implant associated infections is a very widespread complication using maxillofacial hardware. Plate exposure through the skin or mucosa, primarily in areas such as the mandible surrounded by extremely little soft tissue, represented another common cause (21.7%). Thereby, 11.7% of patients requested removal of the stent for psychological and 18.3% due to pain and discomfort, even if without clinical issues. Less of these were removed accounting for mechanical plate failure or as part of reconstructive treatments.

Focusing on Table 5, the most commonly plate removed anatomical site is the maxilla (23.3%) followed by the mandible (60%). Probably reasons for the pseudarthrosis of the mandible are its mechanical role in speech and mastication, that is, it may subject the soft tissues and plate to stress.

CONCLUSION

This qualitative analysis highlights the prevalence and causes for bone plate removal after maxillofacial surgery in a tertiary care context. The removal was most often a consequence of infection, plate exposure, and ongoing

discomfort. The most anatomical region impacted by removal was the mandible and most removals occurred between 6- and 12-months post-surgery. These results highlight the important role of careful surgical technique, patient education and postoperative follow up in order to reduce problems. Miniplates are a safe and effective means of achieving hemostasis, but if there are infection and/or mechanical failure, miniplates may need to be removed. Patient centered criteria, such as the aesthetic and psychological concerns are often involved in removal decisions. Comprehension of clinical and patient driven aspects is necessary to enable improvement of surgical outcomes and subsequent postoperative care. The findings recommend further research in other materials and fixation methods to minimize long term difficulties and support decision making or removal of the plates with individualized approaches.

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