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Original Article

Frequency of Postoperative Maxillomandibular Fixation Following Open Reduction and Internal Fixation in Maxillofacial Fractures

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Abstract

Objective: To determine the frequency of postoperative maxillomandibular fixation (MMF) required after open reduction and internal fixation (ORIF) for restoring premorbid occlusion in patients with maxillary and mandibular fractures.

Methodology: This cross-sectional analytical study was conducted in Department of Oral & Maxillofacial Surgery, Ghurki Trust Teaching Hospital, Lahore. Patients aged 12 to 60 years of either gender presenting with maxillary or mandibular fractures were included in the study. ORIF procedure was performed under General Anesthesia with nasal intubation in all cases of maxillary and mandibular fractures under inclusive criteria. Then patients were followed-up in OPD for 2 weeks and evaluated for postoperative malocclusion, and MMF was done for 4 weeks under local anesthesia to restore premorbid occlusion

Results: A total of 382 patients that met the study criteria were included in this study. Out of these, 240 (62.8%) were men and 142 were women. Mean age of the patients was 30.34±9.40 years. The maxilla was the site of fracture in 180 cases (47.1%), while among mandibular fractures, the parasymphyseal region was involved in 172 cases (45.3%) and the angle in 29 cases (7.6%). The overall frequency of postoperative MMF was 53.9%. Among the complications observed, wound dehiscence occurred in 4.5% of cases with MMF and 2.6% without it; infection rates were 6.3% with MMF and 3.9% without. Malocclusion was reported in 0% of cases with MMF compared to 0.8% without MMF.

Conclusion: The findings of this study support the use of post-operative MMF after ORIF of patients with malocclusion in maxillary and mandibular fractures. This treatment modality may offer a safe, effective, and reliable means of achieving optimal occlusal outcomes and improving patient satisfaction; however, further controlled studies are needed to establish its role in standard care.

Keywords: Maxillomandibular Fixation, Maxillofacial Fractures. Open Reduction Internal Fixation.

Introduction

Mandibular fractures are among the most frequent face wounds that necessitate surgical treatment.[1] Maxillofacial trauma accounts for approximately 15% to 58% of all injuries globally.[2] About 38% of all maxillofacial fractures are mandibular fractures.[3] Because of the teeth, mandibular fractures are treated differently from those involving long bones.[3] The procedure, which can be either closed or open reduction and internal fixation (ORIF), is often carried out in a hospital environment by oral and maxillofacial surgeons or other pertinent surgical specialities.[4] In general, ORIF is regarded as a safe and successful technique. However, a number of perioperative complications might arise, including bleeding, surgical site infection, non-union of the osseous segments, bone necrosis, soft tissue damage, malocclusion, abscess, hardware exposure, temporomandibular joint abnormalities, and inferior alveolar nerve injury.[5]

For many years, MMF has been utilized to treat mandibular fractures in order to maximize surgical results in terms of normal anatomical shape, occlusion, function, and aesthetics.[6] The majority of surgeons who repair mandibular fractures put their patients in postoperative MMF to guarantee that the restored occlusion is maintained and that occlusal pressures do not interfere with the restoration. Arch bars, eyelet wiring, self-drilling MMF screws, cast metal splints, and self-tapping MMF screws are some methods for achieving MMF.[7] Following maxillofacial fracture surgery, a number of problems may arise. These usually consist of issues with the teeth, soft tissues, temporomandibular joints, nonunion, malunion, malocclusions, facial asymmetry, nerve damage, osteonecrosis, and infection.[8, 9]

The purpose of this study is to determine the frequency of post-operative MMF to correct malocclusion after treating maxillary and mandibular fractures by open reduction and internal fixation using titanium miniplates. Results of this study will guide to modulate treatment plan for future surgical procedures, there by decreasing overall patient morbidity.

Methodology

This cross-sectional analytical study was conducted in the Department of Oral & Maxillofacial Surgery, Ghurki Trust Teaching Hospital, Lahore in 6 months duration.A total of 382 patients, aged 12-60 years of either gender who presented with displaced, unfavorable fractures on clinical and radiographic examinations of Maxilla or Mandible, were included in study. Sample size calculated by WHO calculator at 95% confidence level, anticipated proportion of MMF as 54.24% at 5% margin of error.[10] Edentulous patients, condylar fractures, dentoalveolar fractures, infected fractures, pathological fractures, gunshot injuries and medically unfit for surgery were excluded. After taking approval for study protocol from ethical committee at Lahore Medical and Dental College (FD/2676/24) patients presenting in OPD of Oral & Maxillofacial Surgery Department were included in the study. All patients underwent a standardized clinical protocol beginning with a comprehensive clinical examination and the collection of demographic data, including age and gender, via a brief questionnaire. ORIF was performed under general anesthesia with nasal intubation in all cases that met the inclusion criteria for maxillary and mandibular fractures. For intraoral surgical access, local anesthesia was administered in the vestibular region, and the fracture sites were exposed through intraoral incisions. Eyelets were placed on the teeth to facilitate MMF, and stainless-steel tie wires were threaded through the eyelets to achieve proper occlusion. Fracture stabilization was accomplished using titanium miniplates, and a layered closure was performed using 3-0 vicryl sutures. Patients with disordered occlusion underwent four weeks of MMF under local anesthesia, which was administered at the time of appliance placement. During these four weeks, patients were scheduled for regular follow-up visits (typically once per week) to monitor healing and ensure appliance stability; additional local anesthesia was administered only if required. Medications were provided, and detailed postoperative instructions were given. After the MMF was removed and tie wires taken out, patients continued follow-up for at least one week, during which they were assessed both clinically and radiographically for any signs of surgical malocclusion. Since the patient was unable to chew following MMF, a blended diet and medicine syrups were recommended. Clinical assessment for occlusion was one of the patient follow-up measures.

After entering data in SPSS version 25.0, analysis was done. As descriptive analysis, frequencies and percentages were calculated for gender, fracture site and MMF. Mean and standard deviation was calculated for age and duration of fracture. Chi-square test was applied for assessment post-operative MMF after ORIF. Effect modifiers such as age, gender, fracture stie, fracture duration was controlled by stratification.

Results

A total of 382 patients that met the study criteria were included in study. Of the total patients, 240 (62.8%) were men and 142 were women. Mean age of the patients was 30.34±9.40 years with minimum age of 12 and maximum age 58 years. Mean age in males was 31.50±9.60 years and 28.37±8.72 years. Maxillary fractures were found in 180 (47.1%); Para symphyseal in 172 (45.3%); and angle in 29(7.6%) of all fractures

Table 1: Basic Demographic and Clinical Features

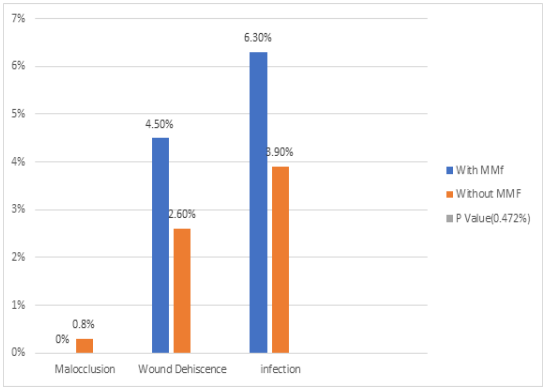
		Frequency	Percentage
Gender	Male	240	62.8
	Female	142	37.2
Maxillary	Lefort (1/2/3)	180	47.1
Mandibular	Para-symphyseal	172	45.3
	Angle	29	7.6
Total		382	100.0

The overall frequency of postoperative MMF was 206 cases (53.9%). Among the 206 patients who underwent ORIF, MMF was performed in 93 patients (51.7%) with maxillary fractures (LeFort I/II/III). In cases of mandibular fractures, postoperative MMF was applied in 58.4% of para-symphyseal fractures, compared to 41.6% in patients who did not require MMF. For angle fractures, MMF was performed in 41.4% of patients, while 58.6% did not undergo MMF (Table 2).

Table 2: Location of Fracture according to Post Operative MMF status

	MMF		P value
	Yes n=206 (%)	No n=176 (%)	
Maxillary (Lefort I/II/III)	93 (51.7)	87 (48.3)	
Mandibular Para-symphyseal	101 (58.4)	72 (41.6)	0.166
Angle	12 (41.4)	17 (58.6)	

Among the complications studied, wound dehiscence occurred in 4.5% of patients with MMF and 2.6% of those without MMF. The incidence of infection was 6.3% in the MMF group compared to 3.9% in the non-MMF group. Malocclusion was observed in 0% of patients with MMF and 0.8% of those without MMF, as detailed in Graph 1 below.



Comparison of Complications of Patient with MMF And Without MMF

Discussion

This study investigated the frequency and outcomes of postoperative MMF following open reduction and internal fixation in patients with maxillary and mandibular fractures. In case of displaced maxillary and mandibular fractures open reduction and internal fixation is done but due to semi rigid fixation of miniplates there is some movement when patient bite and occlusal forces generate that leads to malocclusion. To overcome this issue maxillomandibular fixation play vital role in stabilizing occlusion and potential healing. Among 382 patients, more than half (53.9%) required MMF to restore premorbid occlusion (Table 1).The findings revealed that MMF was associated with a lower rate of postoperative malocclusion and only a slight increase in minor complications such as wound dehiscence and infection. These results suggest that postoperative MMF can be a beneficial adjunct to ORIF in ensuring optimal occlusal alignment and improving overall treatment outcomes in maxillofacial trauma cases.

The prevalence of maxillofacial injuries is rising as a result of increased socioeconomic activity and reliance on road transportation. The maxillofacial region comprises both soft and hard tissues, extending from the mandible inferiorly to the frontal bone superiorly.[12,13] Facial trauma results in damage to the face's soft tissues, teeth, and skeletal components.[9] Many surgeons prefer postoperative MMF for varying periods of time depending upon the type of fractures. Prior to the development of inflexible titanium plating methods, bone fragments were internally fixed via interosseous wire fixation.[14,15] Considering the high incidence of infection and malunion following surgery, which is most likely caused by the interosseous wires inadequate stiffness of interosseous wires, MMF played a critical role in enhancing stabilization and ensuring the success of the repair.[16] This study's goal was to ascertain how frequently post-operative MMF is used to address malocclusion following ORIF repair of maxillary and mandibular fractures using titanium miniplates.

To evaluate the postoperative efficacy of MMF after ORIF, Saman et al. in 2014 carried out research in USA, in which a total of 224 (54.24%) among 413 patients had MMF to restore premorbid occlusion.[10] In another literature review of Maxillary Lefort-I fracture with Zygomaticomaxillary Complex, it was noted that the patient had anterior crossbite at the first follow-up visit after 15 days after ORIF Post op MMF was completed and the patient was placed on guiding elastics.[11] Rigid MMF was performed using 26-gauge stainless steel wire to guide the patient into proper occlusion. After a month, the maxillary segment was immobile and the appropriate occlusion was preserved.[11]

Most surgeons put patients in postoperative MMF while repairing mandibular fractures in order to preserve the restored occlusion and prevent occlusal pressures from interfering with the repair, this study was conducted in minneisotta USA.[17]However, there are dangers and issues associated with postoperative MMF.[18] This study investigates the utility and safety of continuing postoperative MMF in patients who have undergone ORIF for symphyseal, parasymphyseal, or angle fractures. The fractured region location was maxillary fracture in 180 (47.1%) and in mandibular, parasymphyseal in 172 (45.3%); and angle in 29 (7.6%) of all fractures.

Of the complications studied, wound dehiscence was found in 4.5% with MMF and 2.6% without MMF, infection was 6.3% versus 3.9%, Malocclusion 0% and 0.8% in the group with and without postoperative MMF respectively.(Graph 1). Our findings align with a prior retrospective study conducted by Valentino and Marentette, which similarly reported no significant difference in complication rates between patients who underwent postoperative MMF and those who did not.[19]

A recent retrospective study conducted by Kumar et al. examined the outcomes of patients who underwent postoperative treatment with MMF compared to those who did not. The findings indicated that there was no statistically significant difference between the two groups.[20] The drawbacks of postoperative MMF are numerous.[21] It is important to address potential drawbacks related to patient discomfort, gingival trauma, weight loss, and oral hygiene during the course of treatment. Furthermore, TMJ ankylosis may become more common if TMJ mobility is delayed. Osteopenia and variations in local venous pH can also lead to complications with bone repair. Additionally, the masseter and temporalis may weaken and atrophy as a result of prolonged fixation.[18]

Limitations

This study is limited by its single-center design and relatively small sample size. The study did not include long-term follow-up beyond the immediate postoperative period, limiting insight into the durability of occlusal outcomes and late complications.

Conclusion

The findings of this study support the use of post-operative MMF after ORIF of patients with malocclusion in maxillary and mandibular fractures. This treatment modality should be considered a standard of care for these patients, as it offers a safe, effective, and reliable means of achieving optimal occlusal outcomes and improving patient satisfaction.

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