Original Article

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IMF after ORIF of Isolated Mandibular Fractures: Is A Necessity?

Pradeep P.S.[1], Sunil Sathigrama Malegowda[2], Muhsina K.[3], Asal Irfan P.[4]

Abstract

Background: The surgical dictum of keeping patient under inter maxillary fixation after open reduction and internal fixation has been reported, no advantage over without inter maxillary fixation. This study attempts to identify and discuss requirement of inter maxillary fixation after open reduction and internal fixation in isolated mandibular fractures. *Methodology*: Total of 42 dentate, medically fit adult patients devided in to two groups irrespective of age and gender. Group I consisted of 24 patients kept under inter maxillary fixation after open reduction and internal fixation for 7 days postoperatively. 18 patients were allowed to do early mandibular mobilization alloted in group II. Occlusal discrepancies, surgical site infection, malunion/nonunion, plate/screw infection and removal recorded in both the groups and compared. *Results*: Statistical analysis showed group I patients had better outcome in-terms of occlusion and no other statistical difference noted between two groups. *Conclusion*: This study favors 7 days post operative inter maxillary fixation after open reduction and internal fixation for isolated mandibular fractures for the better occlusal outcome.

Keywords: Mandibular Fracture; Intermaxillary Fixation; Open Reduction and Internal Fixation; Occlusion.

Introduction

Mandible is the second most common fracture of the face following nasal bone as reported in literature [1]. Documented data on incidence of mandibular fractures in India as a whole, is not available because of poorly organized health care structure. Even though said to be Second common in incidence, open reduction with internal fixation of the mandible considered as regular in Maxillo facial departments. Inter maxillary fixation and open reduction with internal fixation using mini plates and screws are the treatment modalities practiced today. First documentation on importance of Intermaxillary fixation (IMF) or Maxillomandibular fixation (MMF) was reportedly by Guglielmo Salicetti in 1492 were they used to "tie the teeth of uninjured jaw to the teeth of the injured jaw" [2]. Even though lot of evolution occured in the treatment of mandibular fractures from the writings of ancient Egypt till date, concept remained the the same in immobilisation of the jaw bone. Thanks to Champy et al., who gave better understanding of biomechanics of the fracture and ideal osteosynthetic lines [3], which is followed by every surgeon today for open reduction and internal fixation (ORIF).

Miniplate osteosynthesis, modality practiced today known to withstand masticatory forces, in other terms it is functionally rigid [4]. Intermaxillary fixation using Erich arch bar has become part of surgery for obtaining closed reduction and to assist in immobilization while performing ORIF. IMF/MMF alone be sufficient to treating condylar or subcondylar fractures etc, achieving the occlusion, while having many disadvantages. Surgical exposure of condylar fractures posing the risk of facial nerve injury, other systemic conditions contraindicating exposure to anesthesia, comminuted fractures of the jaw bones, panfacial trauma, socioeconomic factors of the patient may limit the treatment only to closed reduction with the help of intermaxillary fixation. Disadvantages

Author's Affiliation: [1]Associate Professor [3,4]Junior Resident, Department of Dentistry, DM Wayanad Institute of Medical Sciences Meppadi, Wayanad, Kerala 673577, India. [2]Reader, Dept of Oral and Maxillofacial Surgery, Coorg Institute of Dental Sciences, Virajpet, Coorg, Karnataka 571218, India.

Corresponding Author: Sunil Sathigrama Malegowda, Reader, Department of Oral and Maxillofacial Surgery, Coorg Institute of Dental Sciences, Virajpet, Coorg, Karnataka 571218, India.

E-mail: sunilsmomfs@gmail.com

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associated with intermaxillary fixation is vast. Discomfort, poor aesthetics, difficult to maintain hygiene, risk of aspiration, delayed temperomandibular joint movements having the risk of ankylosis, Injury to gums, Periodontitis, forced liquid diet are the few which can be listed. Many surgeons continue IMF after ORIF for days to few weeks. In a study conducted by Nithin A Shenoy et al., found 72% of surgeons still prefer IMF post ORIF for varying period of time [5].

Contrary being reported by multiple authors suggesting no advantage of IMF postoperatively after open reduction and fixation. Mohammad Waheed El-Anwar and others in a study of 80 patients with isolated mandibular fractures, ORIF was performed only with temporarily intra operatively had no statistical difference in outcome when compared patients with IMF [6]. Intension of this study is to evaluate the requirement of IMF post operatively after ORIF of isolated mandibular fractures.

Materials and Methods

Total number of 42 medically fit dentate patients with isolated symphyseal, parasymphyseal, body fractures of mandible between November 2015 till December 2017 studied prospectively. Last case follow up done till march 2018. Condylar, Coronoid and Ramus fractures (including angle) of any nature were not included. Comminuted fractures, pathological fractures, medically compromised patients, edentulous patients were excluded. Occlusion, Infection, number of days of hospitalization, Malunion/Nonunion, plate removal, were the parameters studied.

Group I: 24 Dentate patients were in this group irrespective of age and sex. These patients kept under IMF till 7th post operative day. IMF was done using red elastics.

Group II: 18 Dentate patients in this group irrespective of age and sex were allowed early temporomandibular mobilisation from first post operative day.

Technique: All cases were operated under GA (General Anesthesia) with Nasotracheal intubation. Under standard aseptic conditions Erich arch bar fixation done. IMF done to achieve occlusion using SS wire. Standard intra oral incisions was used for surgical approach. Reduction and fixation done using titanium mini plates and screws on par with champy's osteosynthetic lines. Closure was done using nonresorbable suture material. Post closure, IMF was released in all cases to facilitate extubation by anesthetist. All patients were hospitalized till primary healing of the surgical site happens, and same being recorded. Treated with appropriate antibiotics and other medication during this period. Utmost care was provided to avoid infections across both the groups. Group I patients were kept under IMF using red elastics till 7th post operative day. Patients from Group I are fed only liquid diet till IMF removal. Group II patients asked to start with temporomandibular movements. Semisolid diet started for group II from first post operative day onwards. Group II patients were allowed to open the mouth but arch bar removed only on 7th post operative day. Patients were reviewed on 7th day, 45th day and 3 months respectively after discharge. Occlusion and infection was monitored closely till the day of discharge and recorded. Radiographic examination done on 1st day, 7th day and at 3 months post operatively for evaluating reduction, plate/screw infection and for non union/Mal union. All encountered complications treated accordingly and recorded. Comparison of above mentioned criteria done between two groups using statistical analysis.

Informed and written consent for the procedure obtained from the patient and patient party before surgical procedure as per hospital policy. Patients left to choose between two treatment modalities based on their wish after explaining in detail about both merits and demerits, and then alloted in groups accordingly. Internal ethical committee of institution had approved this study.

Results

This study had two groups. Group I consisted of 24 patients. Age of these patients varied from 24 years to 47 years with 14 male patients and 10 female patients. Group II consisted of 18 patients. Age of these patients varied from 24 years to 52 years with 12 male patients and 6 female patients. Mean age was 36.25 and 38.77 respectively (Table 1).

Malocclusion was the major factor analysed in this study. 8 patients had malocclusion in group II. Group I noted no malocclusion in patients. This was statistically highly significant (Table 2).

Infection was noted only in one patient each of both the groups. This finding was statistically insignificant (Table 3). Mal-union / Nonunion and Incidence of plate removal was non computable

Table 1: Distribution of study subjects according to age

Groups	N	Mean	Std. Deviation	Std. Error Mean
Group I	24	36.2500	6.15912	1.25723
Group II	18	38.7778	6.70869	1.58125

Table 2: Statistical analysis of Malocclusion

		Malocclusion		Total
		Present	Absent	
Groups	Group I	0 .0%	24 100%	24 100%
	Group II	8 44.4%	10 55.6%	18 100%

$\chi^2 = 13.176$, $p < 0.001$ Highly Significant

Table 3: Statistical analysis for Incidence of infection

		Infection		Total
		Present	Absent	
Groups	Group I	1 4.2%	23 95.8%	24 100%
	Group II	1 5.6%	17 94.4%	18 100%

$\chi^2 = 0.044$, $p = 0.834$ Non Significant

Table 4: Statistical analysis for Incidence of Mal union/Nonunion

		Mal/nonunion		Total
		Present	Absent	
Groups	Group I	0 0%	24 100%	24 100%
	Group II	0 0%	18 100%	18 100%

χ^2 - Not Computable

Table 5: Statistical analysis for Incidence of Plate removal

		Plate removal		Total
		Present	Absent	
Groups	Group I	0 0%	24 100%	24 100%
	Group II	0 0%	18 100%	18 100%

χ^2 - Not Computable

because of no incidence in our study (Table 4, Table 5).

Discussion

Many surgeons prefer IMF post operatively after ORIF for varying period of time. Other than listed disadvantages multiple hospital visits, weight loss (nutritional factors), social factors and another intervention to remove arch bar are the major concerns both for the patient and the surgeon. On the other hand lMF after ORIF is a popular

practice for undeniable advantages of minor occlusal corrections post operatively. The famous "soft tissue rest" post operatively, also plays important role in surgeons decision making. Our study dealt with most common factors pertaining to mandibular fractures other than incidence and aetiology, over a debatable topic.

Occlusion (functional restoration) is "the reason" for intervention of mandibular fractures (any fracture). Functionally stable rigid fixation or mini plate osteosynthesis is capable of withstanding adverse masticatory forces as proven in literature. However small correctable occlusal discrepancies are noticed immediate post operatively, even by trained surgeons. It's not uncommon to note malocclusion after internal fixation of undisplaced fractures too. Even though open reduction and internal fixation revolutionized fracture management, IMF still used maintain occlusion until internal fixation is performed [6,7,8]. Our study had 8 patients who presented with minimal open bite. All of these patients are from group II. Severe masticatory pull, loosening of IMF while placing the screws, TMJ positioning are the commonly blamed factors for malocclusion post internal fixation. Authors of this study believe improper placement of IMF and inability to assess proper occlusion due to partial edentulousness, premorbid malocclusion were the primary reason for complication in this study group. IMF using elastics had to be placed for these 6 patients for achieving occlusion, whom eventually improved within a week. 2mm locking transoral locking miniplate fixation of mandible and one week of intermaxillary fixation also yielded better results in a prospective study by Chritah A et al. [9]. Sunil K Raut et al. clearly concluded that supplemental IMF for 2 weeks following miniplate fixation along the Champy's lines of osteosynthesis yields better outcome in cases of fracture mandible [10]. These studies clearly indicates requirement of IMF either rigid or elastic IMF for some period after ORIF. This concern is for the reason of achieving the occlusion and aiding to the soft tissue healing. In contradiction multiple studies also shows no difference of outcome even if no IMF secured postoperatively. Dimitroulis G in 2002 found that the use of IMF for the management of angle fractures of the mandible is unnecessary provided there is skilled assistant present to help manually reduce the fracture site for plating [11]. Same study also proved that this not only improves patient comfort but also reduces the operating time by up to 1 hour and discharge time up to half day. Cousin GC treated 150 patient for ORIF, out of which 98 were hand held occlusion, and 52 were using Rapid IMF. He noted only fewer complications when compared to large sample size [12]. Another Original Investigation by Masoud Saman et al clearly states the surgical dictum of maintaining postoperative MMF for all trauma patients after ORIF of the mandible may not be of any advantage [13]. Argument can be made on basis of question on when surgeon is removing the hardware used for IMF. Even though moving towards no IMF is the requirement of the present day, many surgeons believe maintaining IMF postoperatively is unavoidable due to risk of malocclusion. If decision of no IMF has to be made, hardware to be removed intra operatively which may leave surgeon with no options for correction of possible minor malocclusion other than placing it again. Advocation for closed reduction over open reduction also exists. Rahul Gupta, while treating thirty three patients for isolated mandibular fractures only with closed reduction using arch bar concluded that 97% of patients give good results in terms of occlusion, mouth opening and cosmesis [14]. Some compare the cost involved for ORIF and closed reduction. Obvious low cost involving closed reduction may sound beneficial above open reduction. Surprisingly In a study conducted by Omar Abubaker, Gregg. T. Lyman in 1998 found actual cost of ORIF throughout the study period was higher than that of closed reduction, when the cost of treating postoperative complications, the use of the ICU and the number of postoperative follow up visits was considered the use of ORIF was found to be more cost effective than closed reduction and MMF [15]. In an another study by Brian L. Schmidt et al comparing the cost effectiveness of mandibular fracture treatment found that even though the initial cost of ORIF is more than double of closed reduction, the over all cost of treating patients by ORIF was much lesser than that of closed reduction [16]. Recent literature available clearly leans towards wireless open reduction and internal fixation for undeniable advantages. This again emphasized by Kumar et al. in a retrospective study which showed no significant differences in treating isolated mandible fractures with open reduction and internal fixation and immediate release versus open reduction and internal fixation with 5-7 days of MMF [17]. In our study its statistically proven that significant number of patients had occlusal discrepancies which couldn't have been corrected in case of no arch bar in place.

Newer techniques of Intermaxillary fixation are also widely advocated in literature. IMF screws found to be ideal method for intermaxillary fixation in cases underwent ORIF and required

IMF for less than a week in a study by N.K. Sahoo and Ritu Mohan [18]. Mohammad Waheed EL–Anwar in 2018 study clearly records IMF screws as similarly effective as arch bar in cases requiring post operative rigid intermaxillary fixation [19]. Orthodontic brackets are also used effectively while treating the mandibular fractures in pediatric patients [20]. Use of titanium minipltes, Y plates and bilayer thermoforming plates are also advocated alternative to conventional wire or arch bar intermaxillary fixation [21,22,23]. Which ever technique is being followed the purpose and outcome of intermaxillary fixation remains the same.

Infection was noted in only 1 patient in group I and 1 patient in group II. 0-25% incidence of the infection post operatively reported in literature for mandibular fixation [24].

Contamination of the wound while starting with early oral feeds still a problem, irrespective of the diet. Hardware in oral cavity, debilitated patient, psychological issues following incidence may be the major factor for a patient to maintain hygiene. Sterile instruments, implants and aseptic surgical condition is practiced by every surgeon, hence can only be a minor contributory to the incidence. Virulence of microorganism, Host resistance plays role in determining the infection. However our study group had only medically fit individuals. Intrestingly Austin Gaal in 2016 concluded that Limiting antibiotic exposure to only intraoperative antibiotic prophylaxis in patients undergoing transoral operative treatment of isolated open mandibular fractures was not associated with an increased risk of surgical site infection [25].

Adherence to the Scottish Intercollegiate Guidelines Network (SIGN) on antibiotic prophylaxis in surgery which provided evidence-based recommendations that suggest not giving more than 24 hours of antibiotic prophylaxis in ORIF of mandible fractures strongly recommended in a study [26]. Surgical wound infection and wound dehiscence was handled with proper wound care and antimicrobials in our study. Hospitalization of these patients prolonged for few days due to requirement of parenteral drug administration, wound care till healing is complete. Values of these finding is statistically insignificant. Nonunion and malunion was not encountered in this study across both the groups. Plate/screw infection also not recorded in both the groups. Drawing conclusions on these findings may not be appropriate because of smaller sample size, moreover only medically fit patients were included in the study group.

Conclusion

Objectives of this study is to determine the requirement of the intermaxillary fixation after open reduction and internal fixation of mandibular fractures. By statistical analysis of the data it is safe to conclude that post operative intermaxillary fixation for a period of seven days yielded less occlusal discrepancies when compared to study group with early mandibular mobilization. Other findings had no statistical difference what so ever but difficult to draw conclusions due to smaller sample size and sample included only medically fit patients. Even though our findings in par with surgical dictum of maintaining IMF after ORIF, is against the recent studies showing no difference in outcome of hand-held reduction intra operatively. Authors of this study believe moving towards no wire fixation is requirement of this hour, but it is also true that surgeons are left with no other option than placing intermaxillary fixation if occlusal dependencies noted post opearatively in cases of hand held reduction. At the same time if IMF is placed to achieve reduction intra operatively, then timing of removal of that hardware (Arch bar, eyelet loop etc.) also debatable. Second intervention to remove hardware exposes both the patient and surgeon to the risk of hazards. Identification of newer technique required which enables both occlusal corrections post operatively (if any) and simple application and removal without exposing the surgeon and patient to higher risk of injury.

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