



## Original Article

## Comparison between Repositioning Reduction Forceps and Intermaxillary Fixation with Eyelets in Anterior Mandibular Fracture Management

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## ABSTRACT

Road traffic mishaps, lack of organized health-care facilities, and inadequate referral and transportation, particularly in rural regions, are boosting anterior mandibular fracture incidence. **Objective:** To compare the outcome of repositioning reduction forceps and intermaxillary fixation (IMF) with eyelets in the anterior mandibular fracture management. **Methods:** Seventy consecutively sampled patients with isolated mandibular fractures were divided into two groups. IMF with eyelets was utilized to reduce mandibular fractures in group A and repositioning reduction forceps was used in group B. After mini plating, IMF was removed. Two observers assessed postoperative bony alignment, occlusion, lingual flaring and nonunion based on radiographs and findings. **Results:** Group A included 24 (68.6%) and 29 (82.9%) male patients, whereas group B had 11 (31.4%) and 6 (17.1%) female patients with mean ages of 27.9 ± 6.9 and 27.8 ± 8.9 years. In postoperative assessment, bony segments alignment (reduction) day-21 was present in all patients, lingual flaring at day-21, 1 (2.9%) and 2 (5.7%) patients, gap in fracture segments at day 21 was > 5mm in all subjects, malocclusion at day 21, 0 (0.0%) and 1 (2.9%) in group A and B respectively. Day 21 showed no non-union in any group. **Conclusions:** IMF with eyelets and repositioning reduction forceps improves bone segment alignment (reduction), lingual flare, fracture gap, and malocclusion.

## INTRODUCTION

The sole movable bone in the face is the mandible, making it susceptible to fracture [1]. After the nasal bone, it is the second most frequent facial bone to fracture. The mandible may be broken with a force between 44.6 to 74.4 kg/m [2]. Mental foramen, condyle, and mandibular angle are the mandible's weak points. 36% to 59% of all maxillofacial injuries is caused by mandibular fractures [3, 4]. Anterior mandible fractures include symphysis (midline) and parasymphysis (lateral to central incisor tooth and

medial to bicuspid). Anterior mandibular fractures make for around 17% of all mandibular fractures [5]. Road transportation incidents, falls, interpersonal aggression, sports accidents, damage from firearms, and occupational trauma are the most frequent causes of face fractures [6]. Since the mandible is so important for deglutition, speaking, swallowing, and appearance, mandibular breaks must be minimized and corrected. The method of treating anterior mandibular fractures has changed throughout

time, moving from closed reduction and external fixation to open reduction and internal fixation [7]. The goal of treatment is to effectively reduce the fracture pieces, securely immobilize them to reinstate pre-morbid occlusion, and support direct bone repair. Mandibular fractures are often reduced using manual reduction, repositioning forceps, and intermaxillary fixation (IMF). The realigned pieces are fixed using osteosynthesis materials after sufficient reduction [8]. IMF is utilized initially to minimize the fracture and subsequently to reestablish occlusion. IMF is typically performed by connecting the upper and lower jaws with arch bars, however there are a number of other methods available, such as IMF screws. The different IMF procedures have disadvantages while being effective, such as a higher likelihood of root damage, IMF screw failure, unintentional needle stick injury, and patient pain. Manual reduction and the employment of repositioning forceps are effective substitutes to IMF for the reduction and fixation of mandibular fractures [9-11]. When doing manual reduction, additional hands are required to decrease the fracture pieces, ideally with the help of a qualified assistant. Additionally, while manually fitting fracture segments, there isn't usually enough space to inject osteosynthesis materials using an intraoral technique owing to the fracture's restricted access [12]. In comparison to IMF or manual reduction, repositioning forceps may provide a better precise anatomical reduction and greater pre-compression. It is assumed that the improved aligning of the fragments would promote bone healing and reduce the likelihood of problems. All of the reduction procedures discussed above are effective alternatives for treating mandibular fractures. These approaches are commonly employed in conjunction with one another in clinical practice.

## METHODS

The Department of Oral and Maxillofacial Surgery at Liaquat University of Medical and Health Sciences in Jamshoro/Hyderabad carried out this comparative cross-sectional research using a non-probability sequential sampling approach from January 2022 to December 2022. Open Epi sample size calculator was used to determine the sample size. The sample size was 70, with 35 patients in each group. In group A (35 patients) fracture was reduced with the aid of repositioning forceps and in group B (35 Patients) fractures were reduced by IMF with eyelets. The research comprised patients with isolated mandibular fractures between the ages of 18 and 50, regardless of gender, who needed open reduction and internal fixation (ORIF) and had access to pre- and postoperative radiographs and data. Patient with other skeletal fractures, systemic diseases, smokers, alcoholics having

comminuted/infected fractures or 3 weeks older fracture at the time of treatment and requiring closed method of treatment were excluded from study. The Liaquat University of Medical and Health Sciences' ethics committee gave its clearance before this investigation could be carried out. The research recruited patients who met the inclusion criteria and those who expressed a willingness to contribute, and participants were briefed of the study's purpose and the benefits of participating. Before enrolling in the research, an informed written consent was obtained. Age and gender were determined and entered in a proforma along with other demographic and clinical characteristics. The primary researcher or supervisor evaluated the history, clinical examination, radiographs (as appropriate for each patient), occlusion, bone alignment, and lingual flaring and entered their findings on the Proforma. The selecting parameters were made using the port (chit) approach, in which there are two kinds of slips (slip-A = fractures reduced with repositioning forceps; slip-B = fractures reduced with IMF with eyelets) and each patient is instructed to accept only one slip. After the patient was assigned to one of the groups, the normal procedure for preparation and draping was followed, and all operations were carried out under general anesthesia under the observation of the supervisor. For group A, IMF with eyelets was done and repositioning reduction forceps were used than mini plating was done, after the plating IMF was released. For Group B, Reduction of mandibular fractures were achieved by IMF with eyelets than mini plating was done. Postoperative bony alignment, occlusion and lingual flaring and nonunion was evaluated by two observers based on postoperative results and radiographs, recoded on Proforma on day 1 day 7 and finally on day 21. Patients were discharged from oral and maxillofacial surgery (OMFS) ward on 2nd day postoperatively with standard antibiotics, analgesics and post-operative instructions. The Statistical Package for the Social Sciences (SPSS) version 22.0 registered statistical programme was used to analyze the data. Frequencies and percentages were calculated for categorical variables such as gender, occupation, method of reduction groups, fracture location, para symphysis, symphysis, gap in fracture segments, lingual flaring, malocclusion, bony segment alignment and non-union. Mean and standard deviation was calculated for continuous variables such as age. Chi square test was performed to assess the association between method reduction groups and pre-operative and post-operative parameters. The level of significance was set at  $p < 0.05$ .

## RESULTS

In this study 24 (68.6%) and 29 (82.9%) patients were male

and 11(31.4%) and 6(17.1%) patients were female in group A and group B respectively. Enrolled patients were grouped as; in group of 18-30 years there were 24 (68.6%) and 23 (65.7%) patients, in group of 31-40 years there were 9 (25.7%) and 8 (22.9%) patients and in group of 41-50 years there were 2 (5.7%) and 4 (11.4%) patients in group A and group B respectively (Table 1).

**Table 1:** Patients distribution According to Gender (n=70)

Gender	Group A	Group B	p-value
Male	24 (68.6%)	29 (82.9%)	0.163
Female	11 (31.4%)	6 (17.1%)	
Total	35 (100.0%)	35 (100.0%)	
Age group	Group A	Group B	p-value
18-30	24 (68.6%)	23 (65.7%)	0.688
31-40	9 (25.7%)	8 (22.9%)	
41-50	2 (5.7%)	4 (11.4%)	
Total	35 (100.0%)	35 (100.0%)	

In Table 2, patients' distribution according to preoperative assessment of patients in terms of fracture location, gap in fracture segment, lingual flaring and malocclusion in group A and group B is given.

**Table 2:** Patients Distribution according to Preoperative Assessment of Fracture Location (N=70)

Fracture Location	Group A	Group B	p-value
Para-Symphysis	5 (14.3%)	23 (65.7%)	<0.001*
Symphysis	30 (85.7%)	12 (34.3%)	
Gap in Fracture Segments	Group A	Group B	p-value
≤ 5 mm	32 (91.4%)	21 (60.0%)	0.002*
> 5 mm	3 (8.6%)	14 (40.0%)	
Lingual Flaring	Group A	Group B	p-value
Yes	6 (17.1%)	6 (17.1%)	1.0
No	29 (82.9%)	29 (82.9%)	
Malocclusion	Group A	Group B	p-value
Yes	31 (88.6%)	27 (77.1%)	0.205
No	4 (11.4%)	8 (22.9%)	

In Table 3 distribution of postoperative assessment of patients in terms of bony segments alignment, gap in fracture segment, lingual flaring and malocclusion in group A and group B is given which was done on day 1, 7 and 21.

**Table 3:** Patients distribution according to Postoperative Assessment of Bony Segments Alignment (Reduction), Lingual Flaring, Gap in Fracture Segment and Malocclusion (N=70)

Bony Segments Alignment	Group A	Group B	p-value
Day 1	Yes	35 (100.0%)	0.077
	No	0 (0.0%)	
Day 7	Yes	35 (100.0%)	0.077
	No	0 (0.0%)	
Day 21	Yes	35 (100.0%)	-
	No	0 (0.0%)	
Lingual Flaring	Group A	Group B	p-value
Day 1	Yes	0 (0.0%)	0.077
	No	35 (100.0%)	

Day 7	Yes	0 (0.0%)	3 (8.6%)	0.077
	No	35 (100.0%)	32 (91.4%)	
Day 21	Yes	1 (2.9%)	2 (5.7%)	0.555
	No	34 (97.1%)	33 (94.3%)	
Gap in Fracture Segments	Group A	Group B	p-value	
Day 1	≤ 5 mm	35 (100.0%)	33 (94.3%)	0.151
	> 5 mm	0 (0.0%)	2 (5.7%)	
Day 7	≤ 5 mm	35 (100.0%)	34 (97.1%)	0.314
	> 5 mm	0 (0.0%)	1 (2.9%)	
Day 21	≤ 5 mm	35 (100.0%)	35 (100.0%)	-
	> 5 mm	0 (0.0%)	0 (0.0%)	
Malocclusion	Group A	Group B	p-value	
Day 1	Yes	0 (0.0%)	2 (5.7%)	0.151
	No	35 (100.0%)	33 (94.3%)	
Day 7	Yes	1 (2.9%)	2 (5.7%)	0.555
	No	34 (97.1%)	33 (94.3%)	
Day 21	Yes	0 (0.0%)	1 (2.9%)	0.314
	No	35 (100.0%)	34 (97.1%)	

In this study non-union was absent in all 35 (100.0%) and 35 (100.0%) patients in group A and group B respectively. Chi-square test was not applicable (Table 4).

**Table 4:** Patients Distribution according to Postoperative Assessment of Non-Union at Day 21 (N=70)

Non-Union	Group A Frequency (%)	Group B Frequency (%)	p-value
Yes	0 (0.0)	0 (0.0)	-
No	35 (100.0)	35 (100.0)	
Total	35 (100.0)	35 (100.0)	

## DISCUSSION

There are various procedures mentioned in the literature for treatment of mandibular fractures. IMF screws, arch bars, eyelet wiring, direct interdental wiring, buccolingual stabilization, and loop-designed wire are often used in IMF. Each of these methods takes time and requires knowledge. Mandibular fractures are often treated with IMF and eyelet wire [13-16]. IMF with eyelet wiring is also associated with different problems such as disturb occlusion, malunion, nonunion, Temporomandibular Joint (TMJ) pain disorder syndrome, anterior open bite and palpable bony segments on each side. Hence this study was designed in tertiary care hospital to overcome the above problems in the management of anterior mandibular fractures by using reduction repositioning forceps or IMF with eyelets in anterior mandibular fractures. In this study 70 patients having isolated mandibular fractures were treated with IMF with eyelets and with aid of repositioning forceps. Most of the patients were male 24 (68.6%) and 29 (82.9%) and only 11 (31.4%) and 6 (17.1%) patients were female in both groups respectively. Mean of age was similar in both groups i.e., 27.9 ± 6.9 and 27.8 ± 8.9 years in group A and B respectively. Similar studies from Pakistan also reports the higher male prevalence with young age such as Ahmad et al., reported

the 81.0% male and mean age of 24.92 ±15.45 years [17]. Another Pakistani study by Mushtaq et al., also reported the 74.0% male and mean age of 29.71 ± 9.55 years [18]. A similar international study by Bohner et al., also reported the 73.5% male and approximately 46.7% patients were in age range of 18-40 years [19]. In our study, majority of the male patients were suffering from anterior mandibular fracture because our society is male dominant society where male are mostly involved in mobility and social engagements. Similar to young adults, those between the ages of 18 and 30 were affected by anterior mandibular fractures because in our culture, younger male adults are heavily engaged in the use of two-wheelers, early bikers, insufficient safeguarding strategies in the form of in this group are related to traffic accidents. In this study fracture location in most of the patients was symphysis reported in 30 (85.7%) and 12 (34.3%) patients followed by parasymphysis in 5 (14.3%) and 23 (65.7%) patients. A similar Pakistani study by Ahmad et al., reported the parasymphysis as most common fracture site (27.4 %) followed by angle (23.3%), body (22.2%), condyle (12.8%) and symphysis (11.1%) [17]. Barde et al., also found parasymphysis as the most common site in his study [20]. In contrast to our findings, Mushtaq et al., found body as most common fracture site (33.93%) followed by condylar (27.38%), angle (17.26%) and parasymphysis n=22(13.09%) [18]. Difference in our study was observed due to selection of patients. In our study patients with anterior mandibular fracture including symphysis and parasymphysis fractures were selected, whereas in other studies all mandibular fractures including parasymphysis, symphysis, condylar, angle, dentoalveolar, ramus, body and coronoid fractures were selected. In this study, postoperative assessment of bony segments alignment (reduction) at day-1 and day-7 was present in 35 (100.0%) and 32 (91.4%) patients (p-value=0.077) and at day-21 present in all patients, lingual flaring at day-1 and day-7, 0 (0.0%) and 3 (8.6%) patients (p-value=0.077) and at day-21, 1 (2.9%) and 2 (5.7%) patients (p-value=0.555), gap in fracture segments at day 1, ≤ 5 mm 35 (100.0%) and 33 (94.3%) patients and > 5 mm 0 (0.0%) and 2 (5.7%) patients (p-value=0.151), at day 7, ≤ 5 mm 35 (100.0%) and 34 (97.1%) patients and > 5 mm in 0 (0.0%) and 1 (2.9%) patients (p-value=0.314) and at day 21, ≤ 5 mm in all patients, malocclusion at day 1, 0 (0.0%) and 2 (5.7%) patients (p-value=0.151), at day 7, 1 (2.9%) and 2 (5.7%) patients (p-value=0.555) and at day 21, 0 (0.0%) and 1 (2.9%) patients (p-value=0.314) in group A and B respectively. Non-union was absent in all patients in both groups at day 21. Results shows that IMF with eyelets with aid of repositioning reduction forceps is better than IMF with eyelets without aid of repositioning reduction forceps in terms of bony segments alignment (reduction), lingual

flaring, gap in fracture segments and malocclusion. There were fewer complications and better alignment in the group of mandibular fractures treated with the use of repositioning forceps, according to a related research by Batbayar et al., who focused on the accuracy and outcomes of mandibular fracture reduction without and with the assistance of a repositioning forceps [8]. In this research, anterior (parasymphyseal and symphyseal) fractures were the ones most often treated using forceps-assisted reduction. There is a necessity for the creation of a reduction forceps intended for use in treating posterior mandibular fractures since this research has demonstrated the extra usefulness of a forceps in the treatment of anterior mandibular fractures [20].

## CONCLUSIONS

Both methods (i.e., IMF with eyelets with the aid of repositioning reduction forceps and IMF with eyelets) are safe and effective in management of anterior mandibular fracture. IMF with eyelets with the aid of repositioning reduction forceps is better than IMF with eyelets in terms of bony segments alignment (reduction), lingual flaring, gap in fracture segments and malocclusion.

## Authors Contribution

Conceptualization: Z, KAC

Methodology: Z, MUJ,

Formal analysis: OP

Writing-review and editing: SARS, OP, SKB

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

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