



COMPARISON OF INTERMAXILLARY FIXATION VERSUS MANUAL METHOD OF REDUCTION IN THE MANAGEMENT OF MANDIBULAR FRACTURES

Dental Science

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| Dr. Rajdeep Singh* | MDS, Associate Professor, Department of Oral & Maxillofacial Surgery, Chhattisgarh Dental College & Research Institute, Rajnandgaon, Chhattisgarh India. *Corresponding Author |
| Dr. Mohan Alexander | MDS, MOMSRCPS, Professor, Department of Oral & Maxillofacial Surgery, MAHSA University, Saujana Putra, Malaysia. |
| Dr. Poonam Preet Bhandari | MDS, Professor & HOD, Department of Oral & Maxillofacial Surgery, PDM Dental College & Research Institute, Bahadurgarh-Haryana India. |
| Dr. Prashant B Tamgadge | MDS, Associate Professor, Department of Oral & Maxillofacial Surgery, Chhattisgarh Dental College & Research Institute, Rajnandgaon -Chhattisgarh India. |

ABSTRACT

A prospective study was conducted among patients who presented with isolated mandibular fracture which required active management over a 3-years period at the maxillofacial unit at D.J. College of Dental Sciences and Research Modinagar India. A total of 32 cases was included in the study & were divided in two groups: fracture reduction intra-operatively by manual method (non IMF group) & inter-maxillary fixation (IMF group). All the patients were postoperatively assessed clinically for occlusion and radio graphically (i.e. orthopantomographs) for anatomical reduction of fracture fragments. Patients were followed up for minimum of two weeks after surgery. The P value for operating time for IMF group & non IMF group ($p=0.000$), which is highly significant. Post-operative clinical as well as radiographic assessment for occlusion & fracture reduction in both the groups were similar. Our study suggests that the use of intra-operatively intermaxillary fixation is not routinely necessary for a favorable outcome of the treatment in isolated mandibular fractures.

KEYWORDS

Mandibular fracture, Intermaxillary fixation, Reduction.

INTRODUCTION

One of the first descriptions of managing the fractured mandible is from an Egyptian papyrus (circa 1650 BC). Circumferential wiring and external bandaging to achieve immobilization was described by Hippocrates. In 1888, Schede was the first to use a solid steel plate held by 4 screws for fixation. Arbeitsgemeinschaft für Osteosynthesefragen /Association for the Study of Internal Fixation (AO/ASIF) developed and popularized the concept of rigid internal fixation in Europe in the 1970s. Around the same time, Champy was skeptical of compression plates and instead proposed the use of monocortical miniplates, which revolutionized the treatment of mandibular fractures. This also meant that post-operative IMF was not mandatory.^{1,2}

The aim of mandibular fracture treatment is the restoration of anatomical form and function. Occlusion serves as the best guide for reduction of mandibular fractures. To achieve good occlusion, either intra-operative intermaxillary fixation (IMF) or manual method is available.

METHODS

A prospective study was conducted among patients who presented with isolated mandibular fractures to D.J. College of Dental Sciences and Research, Modinagar, Uttar Pradesh, India. Patients who satisfied the following criteria were included in the study: age more than 15 years and isolated mandibular fractures (single or multiple). Exclusion criteria consisted of other facial bone fractures which involved the occlusion, more than 10 teeth missing and concomitant condylar fractures that were treated with open reduction. A total of 32 cases that satisfied the criteria were included in the study.

The patients were divided into two groups according to whether IMF was used intraoperatively to aid in fracture reduction (IMF Group) or not (Non- IMF Group). The patients in each group were selected at random. All fractures in the study were treated by open reduction and internal fixation using miniplate osteosynthesis as described by Champy et al. 2mm, 4 to 6-holes miniplates and 2mm (6 to 10 mm) monocortical screws were used. All procedures were done under general anesthesia via nasoendotracheal intubation.

For the IMF group, either arch bars or eyelets were attached to the teeth of upper and lower jaws. The fracture site was surgically exposed &

intermaxillary fixation was done. Fracture fragments were fixed by miniplates & screws. The IMF was released and occlusion was checked before the wound was sutured.

For non-IMF group the fracture site was surgically exposed, reduction of fracture was then achieved by hand manipulation and placed into the appropriate occlusion by skilled assistant. Then miniplates were adapted and fixed across the fracture site by the operator.

In the study operating time was recorded. The starting time of operation was taken when incision was given by the surgeon at the fracture site. The finishing time was coincident with the placement of last suture. For IMF Group, the time taken for the IMF during surgery before incision was also added to the operative time.

All the patients were assessed both clinically (for presence of malocclusion) and radio logically (i.e. orthopantomographs) for satisfactory alignment of the fracture site using a score of 1-3 (1-displaced, 2- mild displacement and 3- undisplaced). Comfort in terms of adequate pain control and satisfactory dietary intake were also taken into account. All the patients were followed up for a minimum of two weeks after surgery.

A proforma was designed to extract the following information from the records: type of mandibular fracture (single or multiple, displaced or undisplaced), reduction technique used (IMF or manual), operating surgeon designation and experience, procedure time & occlusion. All the criteria were assessed clinically preoperatively, immediate postoperatively and two weeks postoperatively.

Need for the use of postoperative intermaxillary fixation, occlusal adjustment or second operation required to correct a malocclusion and complications of treatment including infection, wound dehiscence, sensory deficit, trismus, malunion or non-union were also recorded. The results were collected and statistically analyzed.

RESULTS

A total of 32 patients fulfilled the criteria and were included in the study --19 patients had intraoperative intermaxillary fixation to aid in fracture reduction, whereas 13 underwent manual reduction.

The age range for the IMF group was 16 to 49 years (mean age 28.68 years). The non-IMF group range was 17 to 40 years (mean age 26.08 years) -- $p = 0.323$. The IMF group had 14 (74%) males & 5 (26%) females and non-IMF group had 12 (92%) males & 1 female (8%) -- $p = 0.361$. [Table 1]

Table 1-Comparative data

| Parameter | IMF Group | Non-IMF Group | P value |
|---------------------------------------|-------------|---------------|---------|
| No. of patients | 19 | 13 | |
| Gender | 14 (74%) | 12 (92%) | 0.361 |
| Male | 5 (26%) | 1 (8%) | |
| Female | | | |
| Age (yrs) | 16-49 | 17-40 | 0.323 |
| Range | 28.68 | 26.08 | |
| Mean | 8.03 | 7.66 | |
| S.D | | | |
| Operating time (min) | 85-316 | 30-110 | 0.000 |
| Range | 158.05 | 73.62 | |
| Mean | 62.65 | 21.21 | |
| S.D | | | |
| Postreduction alignment Scores | 2 (10.5 %) | 0 (0%) | 0.473 |
| 1 (Displaced) | 1 (5.3%) | 1 (7.7%) | |
| 2 (Mild displacement) | 16 (84.2%) | 12 (92.3%) | |
| 3 (Undisplaced) | | | |
| Complications | 16 (84.2 %) | 12 (92.3 %) | 0.629 |
| Absent | 3 (15.8 %) | 1 (7.7 %) | |
| Present | | | |

The operating time for IMF group ranged from 85-316 minutes (mean operating time 158.05 minutes), whereas for the non-IMF group, the operating time ranged from 30-110 minutes (mean operating time 73.62 minutes) -- $p=0.000$. [Table 1]

Assessment of postoperative occlusion clinically and radiographically showed that non-IMF group (12 of 13 [92.3%]) had similar proportion of precise anatomic alignment of fractures (i.e. a score of 3) compared to those in the IMF group (16 of 19 [84.2%]) -- $p= 0.473$. [Table 1, Figure 1]

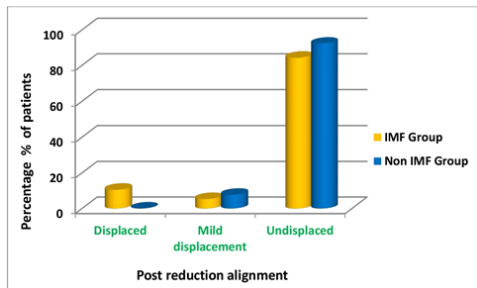


Figure 1: Post reduction alignment

There were problems of malocclusion recorded in 2(10.53%) patients in IMF group in the early postoperative phase, for which a short period of intermaxillary fixation was done. Minor occlusal adjustment was required in 1 patient (7.69%) in non IMF group and none in the IMF group, respectively. Reoperation was required in 1 (5.26%) patient in IMF group and 0(0%) in non IMF group $p=0.063$. [Figure 2]

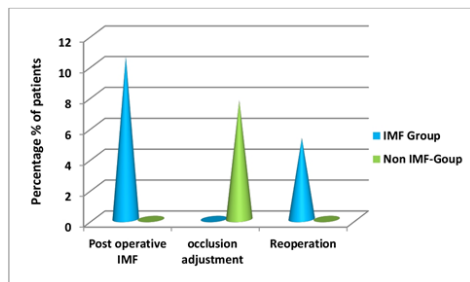


Figure 2: Management of early postoperative occlusion discrepancies

2 patients developed wound dehiscence at the incision site and another 2 developed minor wound infection, all of which were managed by local measures. There were no cases of malunion or non-union. The mean length of inpatient stay was 2 days, with most patients being discharged on first postoperative day. The mean duration of out-patient follow up was 2 weeks. The complications (displacements, etc) present were 3(15.8%) in IMF group and 1(7.7%) in non-IMF group -- $p= 0.629$. [Table 1]

DISCUSSION

The application of Erich arch bars to the maxillary and the mandibular dental arches remains the gold standard for re-establishing a stable occlusion before open reduction and internal fixation of facial fractures in general, and mandibular fractures in particular. However, the risk of inadvertent wire stick injury, disease transmission, adverse effect on surrounding tissue and time constraints make routine use of intermaxillary fixation unattractive for many clinicians.³

In 1973, Michelet *et al*⁴ described the treatment of mandibular fractures using small, easily bendable, non-compression miniplates placed transorally and anchored with monocortical screws. Champy⁵ later performed a series of experiments with miniplates that delineated "ideal lines of osteosynthesis" within the mandible.

Fordyce *et al*⁶ looked at a larger series of 115 fractured mandibles, of which 49 were reduced with intermaxillary fixation and 66 were reduced by hand without the use of intermaxillary fixation. Essentially the study found, that occlusal outcomes were similar in both groups after 2 weeks.

Dimitroulis¹ found similar results in mandibular angle fracture without the use of intermaxillary wire fixation and recommended the use of manual reduction. There was decrease in the operating time by one hour, an earlier discharge of the patient, and a satisfactory occlusal recovery.

Perioperative² intermaxillary fixation has a number of indications, which include: lack of trained assistant, unilateral or bilateral condylar fracture that may require postoperative intermaxillary fixation, and planned immobilization of mandible in comminuted fractures.

Our main aim was to discover if there is a difference in outcome between the two methods of treatment. Fracture reduction using intermaxillary fixation alone, using traction on the buccal aspects of the teeth, tends to approximate buccal surfaces of maxillary and mandibular teeth. This has the effect of establishing occlusion, but without anatomical reduction of the fracture in the parasymphysial region.

Whilst there are some definite indications for the use of intermaxillary fixation, there are obvious advantages to manual reduction and avoiding the need for intermaxillary fixation. Intermaxillary fixation used in this study, took at least 30-70 min to apply and there was a risk of injury to the surgeon and assistants from wires puncturing their gloves.³ The presence of circumdental wires mean that it is difficult for the patient to maintain a high standard of oral hygiene, may damage the periodontium and cause discomfort during removal. The cost of applying arch bars, increased length of general anaesthesia, personnel and outpatient time required in removing the metal work postoperatively, all militate against this method of fracture reduction.

Manual reduction is much more operator dependent than intermaxillary fixation and requires a greater degree of experience and skill. In the absence of a competent assistant, manual reduction is more difficult and intermaxillary fixation may be indicated in such circumstances.

The postreduction radiograph showed similar degrees of anatomic alignment between both groups. Therefore it was not surprising to find that there was no difference in the functional occlusal results between the 2 groups at 2 weeks post surgery. Similar findings were also reported by Fordyce *et al*⁶ and Dimitroulis¹.

The overall complication rates were favorably comparable with other studies. Overall early malocclusion rate was 12.5 % (15.8% IMF group & 7.69% non IMF group), with 6.25% requiring short duration postoperative IMF, 3.13% undergoing early reoperation for malreduction and 3.13% requiring minor occlusal adjustment. These figures were comparable with 17%, 0.5%, and 8%, respectively, in the review by Renton *et al*⁶.

Despite the advantages of safety, speed and low patient morbidity, the use of manual reduction of fractured mandible is only possible with the aid of a skilled assistant. In the absence of skilled assistance, it may be advisable to utilize intermaxillary fixation to reduce mandibular fractures.

The pivotal strength of this study is that both groups were closely matched for age, gender and site of the injury, making it possible to directly compare the two groups, with relatively small patient numbers being the obvious drawbacks.

CONCLUSION

Our study suggests that routine intraoperative use of intermaxillary fixation is not necessary for a favorable outcome in the treatment of isolated mandibular fractures. Avoidance of the use of intraoperative intermaxillary fixation is more economical in time and cost, is safer for the operator, and more comfortable for the patient.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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