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ORIGINAL ARTICLE

Three Different Treatment Modalities for Anterior Mandibular Fractures: A Comparative Study

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ABSTRACT:

Background: Mandible fracture is the commonly occurring fractures in the facial skeleton. The present study aimed to evaluate and compare three different treatment modalities for treating isolated anterior mandibular fractures. **Materials & Methods:** The present study was conducted on fifteen patients. All patients were divided into three major groups. Group I: Five patients were treated with two mini plates placed across the fracture site along with upper & lower Erich arch bar for six weeks. Group II: Five patients were treated with two mini plates without Erich arch bar. Group III: Five patients were treated with one mini plate placed along with the lower Erich arch bar for six weeks. Epidemiology of mandibular fractures, status of occlusion, site of fracture, operating time, stability of occlusion & fractured fragments in reduced position during manual reduction was recorded. Complication such as infection, wound dehiscence, exposure/loosening of implants, malunion, non-union and hardware failure etc. was recorded. **Results:** Maximum patients were seen in age group 31-40 years (males- 4, females- 3) followed by 41-50 years (males- 2, females- 2). 1 patient in group I had anesthesia/paraesthesia reported at immediate postoperative period, 15 days, 1 month, 3 months and 6 months. In group II, 1 patient had immediate postoperative period and at 1 month. Improper reduction of fractured segments was being noticed only in immediate post-operative phase, 1 month and 6-month post-operative phases of group II patients. In group III patients, improper reduction of fractured segments was noticed in each of the examined post-operative visits. 1 patient of group I in examined post-operative phases (of 1 month and 6 month) showed clinical signs/symptoms of infection/wound dehiscence. Group II & III patients showed signs of loosening/fracture of screws/plates. **Conclusion:** Single miniplate at the inferior border with utilization of 6 weeks arch bar system can be reliably and judiciously used for surgical management of such clinical circumstance.

Key words: Mandibular, Miniplate, Screws.

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INTRODUCTION

Of the facial bones, mandible being prominent and mobile gets fractured commonly. Mandible fracture is the commonly occurring fractures in the facial skeleton which in turn causes functional and esthetic disfigurement which needs early intervention for better post treatment results.¹ Mandible fractures may be simple, compound or complex fractures. Using different methods of direct or indirect

interdental wiring, the teeth are placed into normal occlusion and immobilized in that position by IMF, the bone fragments being indirectly reduced. Mandible fractures are one of the most common types of craniofacial fractures undergoing surgical intervention comprising 55.9% of facial fractures treated with surgical reduction in nationwide sample data. Methods of open reduction and internal fixation have changed and diversified enormously

in the past few years. Through the decades various plate and screw osteosynthesis have been introduced like AO bicortical plating system; mono cortical miniplating system, resorbable plates and screws, locking miniplates and 3-dimensional miniplating system. The primary objectives of any treatment are rapid recovery and function.²

The principle of osteosynthesis, according to Champy, is to re-establish the mechanical qualities of the mandible. Champy advised the use of two miniplates in the anterior region, one at the inferior border and the second 5 mm above the lower plate. Though Champy did not use arch bars for intra-operative inter-maxillary fixation, most surgeons use arch bars either for intra-operative or postoperative inter-maxillary fixation. The lower arch bar placed for intra-operative or postoperative inter-maxillary fixation itself acts as a tension band and the sub-apical plate (tension band plate) can be eliminated.³The present study aimed to evaluate and compare three different treatment modalities for treating isolated anterior mandibular fractures.

MATERIALS & METHODS

The present study was conducted in the department of Oral & Maxillofacial Surgery, Institute of Dental Sciences, Bareilly, U.P. India. Total fifteen patients were randomly selected from the patients reporting to the outpatient department of the Oral & Maxillofacial Surgery, Institute of Dental Sciences & emergency department of Rohilkhand Medical College, Bareilly. Patients reporting to the department with a history of trauma having isolated anterior mandibular fractures were included in the study. Written consent was obtained.

All patients were divided into three major groups: -

Group A: Five patients were treated with two miniplates placed across the fracture site along with upper & lower Erich arch bar for six weeks.

Group B: Five patients were treated with two miniplates without Erich arch bar.

Group C: Five patients were treated with one miniplate placed along with the lower Erich arch bar for six weeks.

In the first group, two titanium miniplates were placed across the fracture site along with lower Erich’s arch bar for 6 weeks (Fig. 1-2). In the second group, two titanium miniplates were used for osteosynthesis without Erich’s arch bar (Fig. 3-4). In the third group, one titanium miniplate was placed along with the lower Erich’s arch bar for 6 weeks (Fig. 5-6). In all 3 groups, 2.0 mm plates were used. After ruling out head injury and cervical spine injury in the patients and ensuring their complete stabilization, surgery was undertaken. All routine investigations were carried out preoperatively. Preoperatively, an orthopantomogram (OPG) was taken for all the patients for radiographic interpretation of the fracture site.

All patients were followed up to 3 months (once weekly during 1st month, End of 2nd month, end of 3rd month) and were assessed clinically and radio-graphically by taking OPGs at each follow-up visit. Epidemiology of mandibular fractures, status of occlusion, site of fracture, operating time, stability of occlusion & fractured fragments in reduced position during manual reduction was recorded. Complication such as infection, wound dehiscence, exposure/loosening of implants, malunion, non-union and hardware failure etc. was recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I: Age & gender wise distribution

Age groups (Years)	Male	Female
21-30	1	1
31-40	4	3
41-50	2	2
>50	1	1

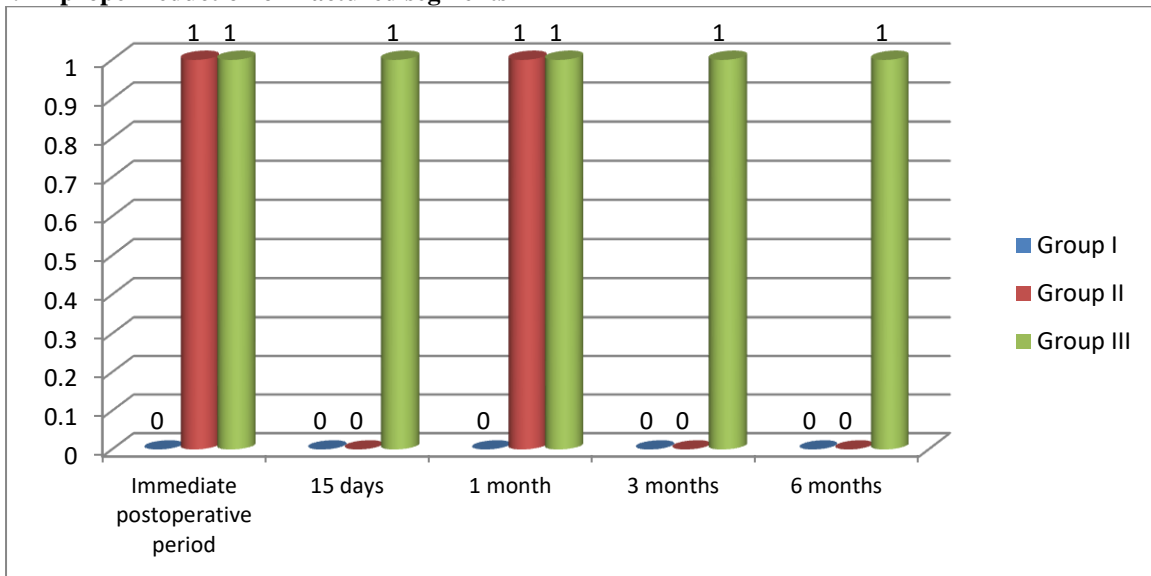
Table I shows that maximum patients were seen in age group 31-40 years (males- 4, females- 3) followed by 41-50 years (males- 2, females- 2).

Table II: Signs/symptoms of anesthesia/paraesthesia

Time period	Group I	Group II	Group III
Immediate postoperative period	1	1	-
15 days	1	-	-
1 month	1	1	-
3 months	1	-	-
6 months	1	-	-
P value	0.24		

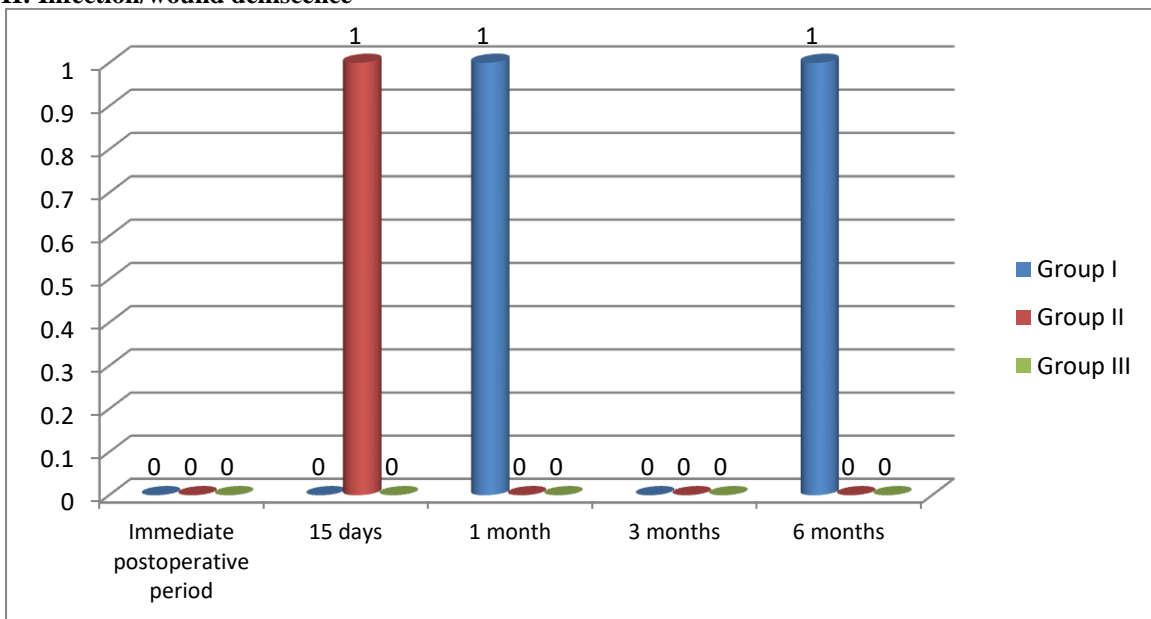
Table II shows that 1 patient in group I had anesthesia/paraesthesia reported at immediate postoperative period, 15 days, 1 month, 3 months and 6 months. In group II, 1 patient had immediate postoperative period and at 1 month whereas no patient in group III had anesthesia/ paraesthesia. The difference was non- significant ($P > 0.05$).

Graph I: Improper reduction of fractured segments



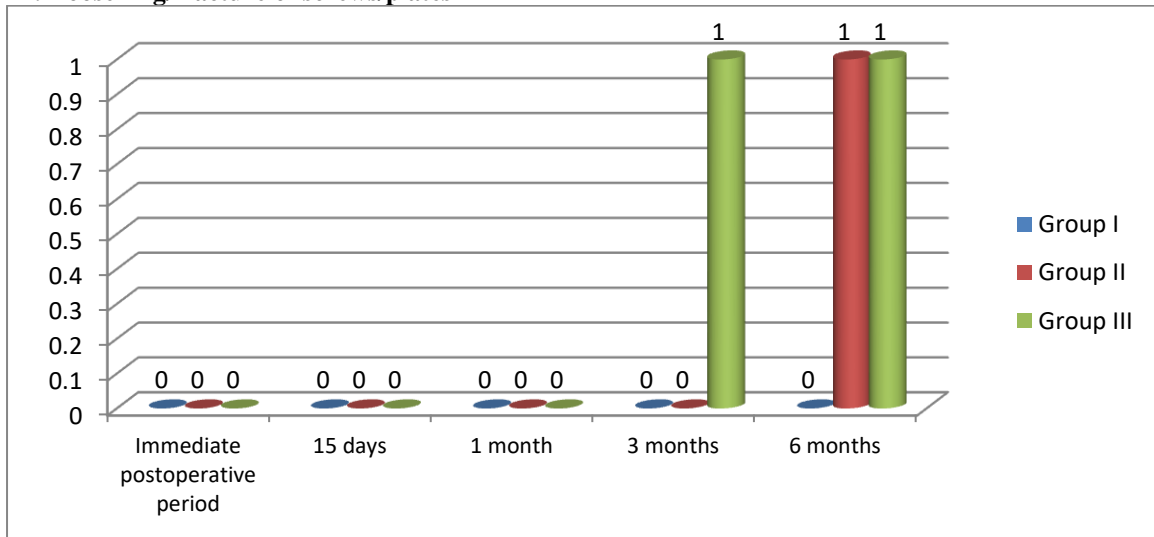
Graph I shows that group I patients did not show any signs of improper reduction of fractured segments. It was being noticed only in immediate post-operative phase, 1 month and 6-month post-operative phases of group II patients. In group III patients, improper reduction of fractured segments was noticed in each of the examined post-operative visits. The difference was non- significant ($P > 0.05$).

Graph II: Infection/wound dehiscence



Graph II shows that one patient of group I in examined post-operative phases (of 1 month and 6 month) showed clinical signs/symptoms of Infection/wound dehiscence. However, it was not noticed in only one patient in group II. It was not observed at all in group III patients.

Graph III: Loosening/fracture of screws/plates



Graph III shows that group I patients did not exhibit any signs of loosening/fracture of screws/plates. It was being noticed only in three months and six months post-operative periods of group II and group III. The difference was significant ($P < 0.05$).

Fig- 1 Preoperative OPG confirming fracture site of Group I patient



Fig- 2 Postoperative OPG of Group I patient



Fig- 3 Preoperative OPG of Group B patient (Fracture line)

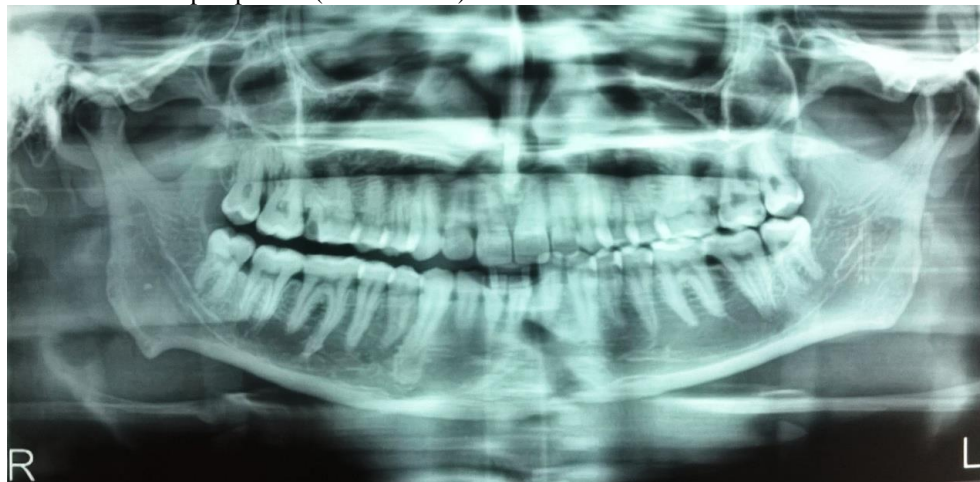


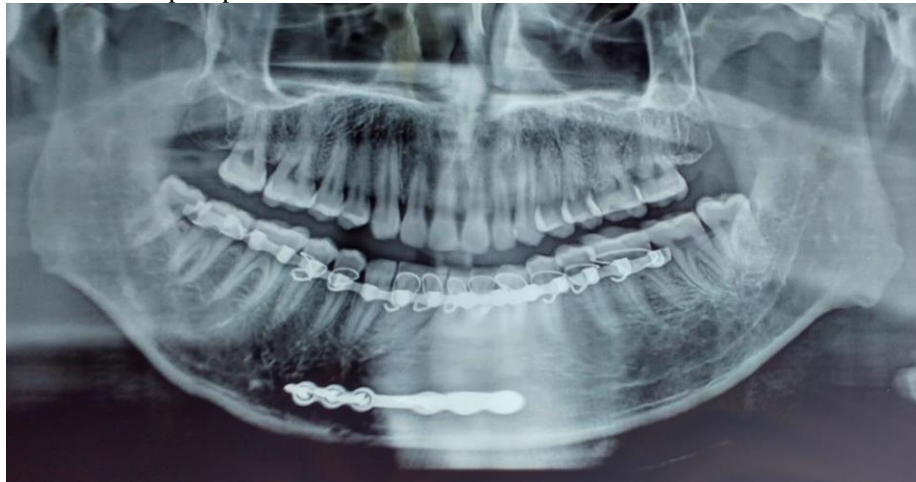
Fig- 4 Postoperative OPG of Group II patient



Fig- 5 Preoperative OPG confirming fracture site of Group III patient



Fig- 6 Postoperative OPG of Group III patient



DISCUSSION

Mandibular fractures are extremely common type of head and neck injuries. The key to successful management of these fractures is to understand the principles of accurate fracture reduction, reestablishment of occlusion, and stable internal fixation. As we all are aware that mandibular reconstruction has always been challenging and demanding task in the field of surgery. It is like that since the mandible is actively involved in phonation, chewing, swallowing, and facial esthetics.⁴Therefore, even slight mandibular disfigurement can cause serious discomfort and problem to the patient. However, with the advent of modern reconstruction plating systems, mandibular form and function can be received effectively. Thus, majority of mandibular reconstruction surgeries are chiefly aimed to restoring and rehabilitating form, phonation, function and esthetics.⁵The present study aimed to evaluate and compare three different treatment modalities for treating isolated anterior mandibular fractures.

In the present study, the results were similar for both groups following and ignoring Champy's principle. In three in vitro three-dimensional studies of loads across the fracture site, authors found high torsion movements for symphysis fracture.

Literature has shown many of the pioneer researchers those who significantly worked and drawn few concrete norms. Blackwell and associated were among then who evaluated the response of patients who are undergoing reconstruction of mandible by using mandibular low-profile reconstruction plates.⁶ They studied total 15 patients wherein they showed that plate exposure and its sensibility can be reduced by using low profile mandibular reconstruction plate. The basic requirement of rigid fixation is to provide adequate stability to prevent inter-fragmentary motion even with active mandibular movements. This can be achieved by accurate close approximation of fracture fragments and ensuring larger contact areas in regions that are under compressive forces. Many modalities like bone

reconstruction plates, lag screws, geometric bone plates and miniplates are available to achieve internal fixation of body/symphysis fractures. Literature has shown that the two fundamental principles are usually required to obtain adequate rigid internal fixation.⁷

We believe that placement of a sturdy stable lower arch bar could eliminate the need for two miniplates in the parasymphysis region. Rix et al.⁸ followed Champy's principle, but used a modification for parasymphysis fractures in close proximity to the mental nerve.³⁷ Instead of two miniplates, only one was placed above the foramen and supplemented with loop wiring which included two or more teeth on either side of the fracture line with satisfactory results. In the 1970s, miniplates were introduced to maxillofacial trauma surgery. The use of miniplates was initiated by Laurentjoye et al⁹ in 1973 for mid-face fractures 10 and was applied to the mandible by Champy et al. They described the concept of mandibular osteosynthesis by using monocortical juxtaalveolar and sub-apical osteosynthesis without compression and inter-maxillary fixation. The article by Champy et al. revolutionized the open treatment of mandibular fractures. Since then, mandibular osteosynthesis using a miniplate has been done according to Champy's principle. Champy et al. introduced the concept of ideal osteosynthesis lines by using a multi-disciplinary approach considering anatomical, biochemical and clinical factors. According to them, the osteosynthesis plates should be fixed according to these ideal lines to get the best results. In one study, comparing the technique of mandibular osteosynthesis following and ignoring Champy's principle, it was concluded that the use of titanium miniplates was an effective method of treatment for mandibular fracture especially following Champy's principle. In the present study, the results were similar for both groups following and ignoring Champy's principle. In three in vitro three-dimensional studies of loads across the fracture site, authors found high torsion movements for symphysis fracture.

According to these studies, the anterior body and canine fracture have similar maximum torsion movements. These values indicate that for a symphyseal fracture and for the body fracture, treatment with one bone plate should be sufficient. This was used in group III with an arch bar as a tension band for 6 weeks. Al-Belasy¹⁰ studied whether a short period of maxillo-mandibular fixation followed by an arch bar splinted to the lower jaw is a suitable alternative to conventional maxillo-mandibular fixation for treatment of fractures of the mandibular tooth bearing area. These results were quite comparable with the study results of ours. Conventional 6-week maxillo-mandibular fixation was compared with another group who had maxilla mandibular fixation for 2 weeks followed by an arch bar wired to the lower jaw. Al-Belasy found this method effective and in the present study, group III included patients with a lower arch bar along with a single miniplate, which gave satisfactory results.

CONCLUSION

Author suggested that a single miniplate at the inferior border with utilization of 6 weeks arch bar system can be reliably and judiciously used for surgical management of such clinical circumstance. Nevertheless, we expect some other large scale studies to be conducted that could further establish certain standard norms in these prospects.

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