ORIGINAL ARTICLE

Effectiveness of ORIF by Using one Titanium Plate and Archbar for Management of Mandibular Fractures in Parasymphyseal Region

SABIR HUSSAIN, SHER MOHAMMAD, RABIA KHAN

ABSTRACT

Background: Because of the limited safe space available for fixation of screws and plates in the mandible, especially in the mental foramen and apical region and evidences of metal deposits in the direct proximity of titanium osteosynthesis plates or even in peripheral organs, reduction in number / size of plates was desirable. The size and amount of osteosynthesis material used should therefore be kept minimum but without compromising desired stability.

Aim and objectives: This study aims to assess the effectiveness and evaluate the benefits of reduction of one plate in terms of morbidity and cost.

Material & Methods: A prospective study was carried out in sixty nine patients of mandibular fractures in parasymphyseal and body region in the Oral and Maxillofacial Surgery Department of a tertiary care teaching hospital during January 2006 to June 2008. Patients were treated by ORIF with one titanium plate and 0.75 ×1.25mm half round wire fixed with 0.45mm Soft Stainless Steel (SSS) wire to act as dental archbar / tension band. Antibiotics were started before surgery and continued for 5-7 days post- operatively. Follow-up was performed for 10 weeks and post-operative complications such as infection, wound dehiscence, neurosensory disturbances and malocclusion were recorded. Archbar was removed after six weeks of surgery. Data regarding age, gender, fracture side, and post operative complications were recorded on self designed performa and analyzed by SPSS-version13.0 to compare the results with the findings of similar studies in literature.

Results: A total of sixty nine patients were included in this study; amongst them 94.2% were male and 5.8% female, the ratio being 16.5:1 respectively. Age ranged from 13 to 60years, with a mean age of 25.96y and SD 10.7. Majority of these patients belong to age group of 21Y to 30Y. Highest number of fracture patients were victim of motor cycle accidents 88.4%, left sided fracture were more than right side. Optimal osteogenesis of fractures was observed in all patients with least morbidity and no subsequent surgery.

Conclusion: Results of the current study suggest that treatment of fractures in the parasymphyseal and body region by combination of one plate and archbar was highly effective in providing desired stability to fractured segments, required for early function and optimal osteogenesis of reparative bone with less morbidity and cost.

Key words: ORIF, mandibular fractures, titanium plate

INTRODUCTION

Surgical treatment of mandibular fractures has advanced significantly, rigid internal fixation and early return to function have replaced the use of wire osteosynthesis and prolonged use of maxillomandibular fixation (MMF)[1]. Clinical research studies for management of mandibular fractures were focused to achieve pre traumatic restoration of esthetics and function with minimum complications and cost. Some controversy still remains in the literature regarding the optimal treatment modality for mandibular fracture in parasymphyseal region[1].

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ORIF with titanium miniplates and screws has proven to be the most effective method, associated with minimal morbidity, early mobilization and return to work[1-3]. When planning a surgical strategy for these fractures, we need to have reliable stabilization of fractured segments during mastication for optimal and uneventful osteogenesis of reparative bone. During mastication relatively high tortional forces were generated in parasymphyseal region and required more secure stabilization of fracture segments. Champy et al did a series of experiments and recommended osteosynthesis of parasymphysial fractures by fixation of two miniplates, one at the inferior border of the mandible and the other below the apices of teeth to act as a tension band, to neutralize the torsional forces generated during

mastication and to allow optimal healing at fractured site[4,5,6].

This technique is commonly being practiced by maxillofacial surgeons, in the mean time cases have been reported with metal deposits in the close proximity or in peripheral organs following osteosynthesis with titanium plates. Size and amount of osteosynthesis material need to be reduced to minimize these deposits[7-9].

Mean while the efforts to find alternates of recommended procedure of double miniplate fixation were continued, one study used combination of miniplate and microplate, while in another study optimal results were achieved by using single miniplate and archbar. The main goal of both studies was to reduce the quantity of implanted material without compromising the required stability and optimal healing of bone. It was seen that one of the miniplate was completely replaced with archbar to act as tension band. Cost of the implants was increased in first study due to higher costs of microplate and micro screws while was reduced to half in the second technique respectively[10,12]. A few clinical studies were available in literature in which management of fractures in parasymphysis region had been focused in particular[10-13].

The purpose of this study was to assess the effectiveness of ORIF with one plate and archbar, in the management of mandibular fractures in the parasymphysis and body region.

MATERIALS AND METHODS

A prospective study was carried out in sixty nine patients with mandibular fractures in parasymphyseal and body region in the Oral and Maxillofacial Surgery Department of a tertiary care teaching hospital during January 2006 to June 2008. Patients were treated by ORIF by using one titanium miniplate fixed across the fracture line with minimum of two monocortical (2×6mm) screws on each side of the fracture line and 0.75 ×1.25mm half round wire adapted along the buccal side of teeth and fixed with 0.45mm Soft Stainless Steel (SSS) wire to act as dental archbar / tension band. Fracture site was approached by giving incision in buccal side of oral mucosa. Precise reduction of fractured segments under direct vision was established by manipulation of fractured segments and pre traumatic occlusion was maintained manually by trained assistant or by MMF. Plate was fixed and wound was closed by stitching with 3/o Vicryl sutures. MMF was opened, occlusion was verified and archbar was fixed with soft SS wire involving minimum of two teeth on either side of the fracture line.

Antibiotics were started before surgery and continued for 5-7 days post- operatively. Follow-up was performed for 6-10 weeks and post-operative complications such as infection, wound dehiscence, neurosensory disturbances and malocclusion were recorded. Archbar was removed after six weeks of surgery.

Data regarding age, gender, fracture site, and post operative complications were recorded on self designed performa and analyzed by SPSS-version13.0 to compare the results with the findings of similar studies in literature.

RESULTS

Among 69 patients treated by this method, 94.2% were male and 5.8% were female with ratio of 16.5:1 respectively as shown in Fig-1. Age ranged from 13 to 60years, with a mean of 25.96y and SD 10.7. Majority of patient belonged to age group of 21Y to 30Y details given in Fig-2. The commonest cause of the fracture were motor cycle accidents 88.4%, see details in Fig-3. Distribution of fractures according to side is given in Fig-4. Low complication rate of 2.9% infection related to soft tissue wound dehiscence was recorded and was managed by wound care and medication. Other complications in the form of malocclusion, bone infection, altered sensation, palpability of plates, non union, malunion and removal of plate were non existent.

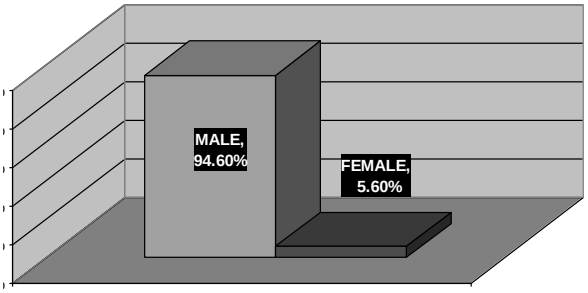

Fig-1 Distribution according to gender

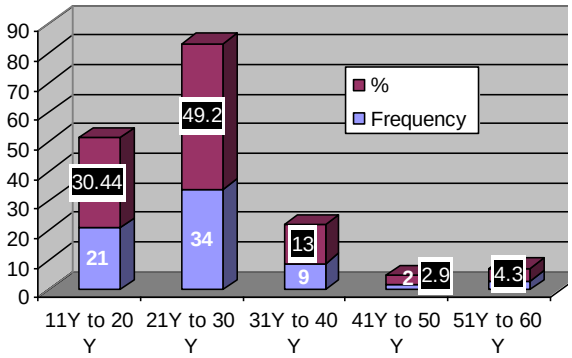

Fig-2 Distribution according to age groups

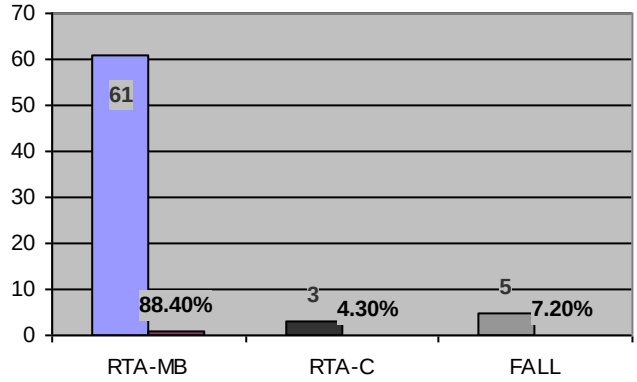

Fig-3 Distribution according to etiology

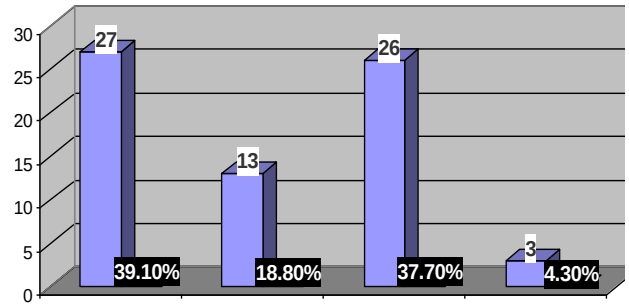

Fig-4 Distribution according to side of fracture

DISCUSSION

Mandibular fractures are the commonest fracture on the face usually caused by RTA and amongst them parasymphysis is the most frequent fractured site; therefore maxillofacial surgeons are exclusively involved with the management of fractures in this region[14-17].

Present study showed higher frequency of mandibular fractures in men as compared to women (ratio of 16.5:1respectively). This variation in frequency may be attributed to the fact that outdoor activities in general and particularly motor cycles are driven by male and RTA due to motor cycle's collisions is the commonest cause of these fractures during this study. Our findings are consistent with the findings of these studies[3,15-18]

Ultimate goal of open reduction and internal fixation of mandibular fractures had been to eliminate the need for intermaxillary fixation and facilitate stable anatomic reduction while reducing the risk of postoperative displacement of the fractured fragments and allowing immediate return to function[18-19].

Studies have shown that tortional forces generated during mastication were higher at parasymphyseal region and required double plate fixation for effective neutralization of the tortional stresses and providing optimal stabilization required for undisturbed healing of fractured bone[4-6].

Fracture healing is a dynamic process in which masticatory forces are slowly intensifying and increasingly carried by the healing bone. Since the combination of microplate and miniplate was tolerating the maximum forces relatively well, the stability achieved with this combination was sufficient for resuming masticatory function during the period of bone healing[12].

In present study, the use of one miniplate accompanied by a relatively strong SS half round wire as dental tension band, appeared to maximize the advantages of an ORIF technique and at the same time it has minimized implanted material, cost and post operative complications without affecting the stability of the fractured segments.

Adaptation and placement of one miniplate on a limited bone surface was easier, safe, least palpable and less likely to be removed even after healing of bone. There was no complication like infection related to plate, plate exposure or plate palpability as no plate was removed during this study. Archbar removal after healing period of six weeks increased the stresses transmitted to the healing bone leading to reduction in stress shielding effects and enhancing strength of bone during the remodeling phase. This technique not only used half of the recommended implanted material but also made it more reliable, cost effective and produced fewer complications.

It is difficult to calculate the extent to which a reduction of the total amount of titanium used will decrease deposition of metal ions in the peripheral organs. Nevertheless it should be the foremost aim to use as little osteosynthesis material as possible.

The disadvantage of this technique was that precise adaptation of stronger archbar was difficult and required bending pliers. Maintenance of oral hygiene and periodontal health was easier when compared to patients with MMF during the healing of soft tissues.

Complication rate of 3.2% to 29% was cited by many authors[3, 19] while during the present study it was low (2.9%) due to optimal stability of secured fracture segments provided by this technique in spite of using minimum implanted material.

Plate removal of 33.3% from the fracture osteosynthesis of mandible in the body region and 18.5% in parasymphyseal region have been reported in a recent study whereas there have been no case of plate removal during the current study.[21] There have been only two cases of vestibular wound dehiscences (2.9% rate) without evidence of plate exposure and managed by local wound care and oral antibiotics. Remaining patients were free of any complaint. Over all complication rate in current study was low when compared with results of other cited studies[1-4]. One has to keep in mind that results

depends much more on the characteristics of the fracture, behavior of the patient, absence of systemic disease, postoperative care, and adherence to partial postoperative functional restrictions.

CONCLUSION

Findings of the current study suggest that treatment of fractures in the parasymphyseal and body region with one miniplate and archbar was highly effective to provide stability, early mobilization and optimal osteogenesis at fracture site with additional benefits of decreasing the complications, cost and amount of titanium used.

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