International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

# Management of Mandibular Fractures in Completely Edentulous Patients

**Divyadharsini V[1], Dr. Dhanraj[2]**

[1]Bachelor of Dental Surgery, Saveetha Dental College & Hospitals, Chennai, Tamil Nadu

[2]Department of Prosthodontics, Saveetha Dental College & Hospitals, Chennai, Tamil Nadu

**Abstract:** ***This review aims to discuss various methods for the management of mandibular fractures in completely edentulous patients. In severely atrophic mandible, even very minor trauma can cause fracture. Additionally, pathologic fracture during mastication can occur. The reduction and fixation techniques for treatment of fractures of the edentulous mandible are based on the fundamental principles of adequate bone fragment apposition and immobilization.***

**Keywords:** Mandibular, Fractures, Edentulous, Open reduction, Bone plating

## 1. Introduction

A fracture is defined as a sudden break in the continuity of bone. Fractures in completely edentulous is rare. Mugino et al.[1] reported that only 11 out of 335 mandibular fracture patients (3%) treated had edentulous mandibular fracture, and that only 8 (2.3%) had atrophic mandible. The most common site of fracture in mandible is said to be the body of the mandible. Atrophy is progressively caused by resorption of alveolar bone consequent to teeth loss[2], and the use of dentures in these patients accelerates mandibular atrophy[3,4]. In the severely atrophic mandible, even very minor trauma can cause fracture. Additionally, pathologic fracture during mastication can occur. Very often, due to the fragile nature of the jaw, these fractures occur bilaterally. Luhr et al[5]created the mandibular atrophy classification used nowadays, according to mandibular height: Class I, 16 to 20 mm; Class II, 11 to 15 mm; Class III, < 10 mm. It has been proven that complications related to fracture consolidation are higher in patients with greater decrease in mandibular height[6]. One of the factors that supports this is the reduced cross section and smaller contact area of fractured ends in atrophic bone. Furthermore, bone quality is diminished, it may be sclerotic, and suffers blood flow decrease[2].

## 2. Clinical Examination and Investigation

The patient clinically presents with an extraoral ecchymosis associated with an atrophic edentulous mandible fracture and is associated with pain and mobility in the anterior region of the mandible. Patient also presents with an intraoral ecchymosis in the floor of the mouth associated with an atrophic edentulous mandible fracture. Edentulous patients often have greater displacement of bone fragments due to the lack of the structural stability of the mandibular alveolus and dentition. The investigations would include x-rays of the skull with acquisition of posteroanterior view (PA view), anteroposterior view (Townes view) and bilateral oblique views. A panoramic tomographic view shows the entire mandible in single plane. Furthermore specific views can be obtained with the help of lateral, Waters (occipitomental view), periapical, or basal (submentovertex view). The most specific investigation for the diagnosis of fracture in edentulous mandible is CT scan. A retrospective study of 42 patients showed that initial helical CT scans depicted 100% of mandibular fractures, whereas the initial panoramic imaging showed only 86% of such fractures that were eventually demonstrated[7]. However, results from the same study also suggested that the bony detail of alveolar-ridge tooth-root fractures were better evaluated by using panoramic imaging. For the CT scan examination, direct coronal and axial imaging should be attempted, depending on the patient's mobility. The disadvantage of direct coronal (or reverse coronal) series is that patient's neck to be hyperextended, which is not possible for patients with spinal fixation collar. In that case, thinner axial sections (< 3 mm) in which the patient's mobility will be less of an issue, as motion artifact will be greatly reduced is used. Despite being visually impressive, 3-dimensional (3-D) reconstructed CT scan images are of questionable value in detecting fractures when compared with planar images. However, once a fracture is identified, 3-D images may be helpful in depicting the spatial relationships among fragments when planning for surgery and/or other treatment[8,9,10,11].

## 3. Treatment Protocol

The atrophic edentulous mandible fracture presents with several factors which make treatment very difficult. There is a lack of bone which is generally cortical in nature with lower healing potential. There are no teeth present to aid in reducing the fractures. Often the patients are elderly and medically compromised. Fragment reduction and fracture consolidation are difficult, due to bone atrophy, diminished capacity of bone regeneration, and the lack of anatomic landmarks to guide the alignment of fragments. Therefore, poor union or asymmetry may be observed. As a matter of fact, the selection of the correct type of osteosynthesis is essential to achieve fracture stability. Atrophic mandible fractures require transfacial open reduction, load-bearing internal fixation, and often immediate bone grafting.

The reduction and fixation techniques for treatment of fractures of the edentulous mandible are based on the fundamental principles of adequate bone fragment apposition and immobilization. The techniques include the following: (1) analgesia and soft diet, (2) closed reduction with splint fixation, (3) open reduction (intraoral or

extraoral) with transosseous wire ligation, (4) percutaneous intramedullary pinning, (5) intraoral open reduction with bone graft and maxillomandibular fixation, (6) external splint fixation appliance, (7) extraoral open reduction and fixation with malleable mesh, and (8) extraoral open reduction and fixation with bone plating

## 4. Management of Edentulous Mandible Fractures

Surgical treatment under general anesthesia is often conditioned by the poor general condition of an ancient patient. Consequently, it is mandatory to correctly decide the treatment from the beginning. At present, advances in trauma management and elder patient anesthesia have reduced the surgical risk for this population[12].

**a) Analgesia and soft diet:**
Observation is indicated for patients medically unfit for general anesthesia. Atrophic edentulous mandible fracture patients are often elderly with medical problems presenting severe anesthetic risks. One major complication of observation and soft diet would be nonunion of the mandibular fracture.

**b) Closed reduction with splint fixation:**
Historically, atrophic edentulous fractures were treated closed by wiring in the patients dentures or fabricating Gunning style splints with postoperative mandibulomaxillary fixation. Standard treatment with closed reduction often resulted in prolonged periods of mandibulomaxillary fixation which was difficult for these patients and the fractures were often poorly aligned with postoperative malunions and nonunions. Closed reduction also causes deterioration of respiratory function and temperomandibular joint problems.

**c) Open reduction**
Open reduction has been criticized since it is hard to put old patients under general anaesthesia and blood flow may be diminished due to subperiosteal dissection caused by surgery[13].

**d) External fixation**
External fixation gives temporary stabilization of a fracture while the patient is treated medically, or if soft-tissue maturation around the fracture site is required. Complications such as malunion and nonunion are significant when external fixators are used as they do not provide absolute stability at the fracture site.

**e) Bone plating**
Despite some authors recommend miniplates for edentulous mandibular fractures[1,14], nowadays most of maxillofacial surgeons prefer stronger plates for fixation[15,16]. Some studies report many complications related with the use of reconstruction plates, seldom requiring osteosynthesis material removal[17]. Moreover, some authors describe a higher rate of wound dehiscence due to fixation with large plates[18]. One of the largest series of edentulous mandibular fractures found in literature, described by Bruce and Ellis, concluded that the optimal treatment for this kind of fractures is open reduction accompanied by stable fixation with large osteosynthesis plates[19]. The fact that there is no need to preserve a dental occlusion in an edentulous patient probably explains why most of condylar fractures do not require surgical treatment.

There are different types of techniques used to guide fragment's reduction in edentulous mandibles. One of them, is fixing the jaws in occlusion with the patient's dentures held with screws to the bone. It can also be very useful to temporarily maintain the mandibular alignment with miniplates fixated to the inferior border, before applying a larger plate to vestibular cortical bone.

Furthermore, some authors use inferior border fixation with miniplates as the definitive treatment of the fracture[20]. The latter technique presents the advantage that future denture adaptation is easier without the stronger osteosynthesis plate which is frequently larger than the mandible's height. This author affirms that some of these patients are able to continue using the previous dentures[20].

Madsen and Haug[19] have studied reconstruction locking plate's biomechanical behavior when fixated to mandibular replicas, divided into one group with osteosynthesis fixation to the buccal mandibular surface and a second group with fixation to the inferior border. This study could not demonstrate significant differences in mechanical behavior between the two specific experimental groups. It has not been demonstrated that bicortical screws represent a higher risk for inferior alveolar nerve injury. Several times, the nerve is exposed due to mandibular atrophy and it can be separated from the mandible to prevent its laceration.

The relationship between the extent of mandibular atrophy and the incidence of fibrous unions or nonunions has been studied by many authors[20,21,22]. As we mentioned before, the greater the mandibular atrophy, the stronger the osteosynthesis plate recommended for fixation[20,21,22]. The principle of load-bearing osteosynthesis provides an optimal stability.

## 5. Post Operative Follow Up

If MMF screws are used intraoperatively in conjunction with the patient’s prostheses, they are usually removed at the conclusion of surgery if proper anatomic fracture reduction and fixation have been achieved.

Postoperative x-rays are taken within the first days after surgery. In an uneventful course, follow-up x-rays are taken after 4–6 weeks.

The patient is examined approximately 1 week postoperatively and periodically thereafter to assess the stability of the fracture and to check for infection of the surgical wound. During each visit, the surgeon must evaluate the patients ability to perform adequate oral hygiene and wound care, and provide additional instructions if necessary.

Follow-up appointments are at the discretion of the surgeon, and depend on the stability of the mandible on the first visit. Weekly appointments are recommended for the first 4

postoperative weeks. Postoperatively, patients will have to follow three basic instructions:

**1) Diet**

Depending upon the stability of the internal fixation, the diet can vary between liquid and semi-liquid to "as tolerated", at the discretion of the surgeon.

**2) Oral hygiene**

Patients having only extraoral approaches are not compromised in their routine oral hygiene measures and should continue with their daily schedule. Patients with intraoral wounds must be instructed in appropriate oral hygiene procedures. A soft toothbrush (dipping in warm water makes it softer) should be used to clean the oral cavity. Chlorhexidine oral rinses should be prescribed and used at least three times each day to help sanitize the mouth. For larger debris, a 1:1 mixture of hydrogen peroxide/chlorhexidine can be used. The bubbling action of the hydrogen peroxide helps remove debris.

**3) Physiotherapy**

Physiotherapy can be prescribed at the first visit and opening and excursive exercises begun as soon as possible. Goals should be set, and, typically, 40 mm of maximum interincisal jaw opening should be attained by 4 weeks postoperatively. If the patient cannot fully open his mouth, additional passive physical therapy may be required such as Therabite or tongue-blade training.

## 6. Conclusion

Open reduction and RIF is considered to be a reliable treatment for edentulous mandibular fractures, supported by the high rate of fracture consolidation and low incidence of complications demonstrated, as well as an immediate recovery of the masticatory function.

## References

[1] Mugino H. Takagi S, Oya R, Nakamura S, Ikemura K, Miniplate osteosynthesis of fractures of the edentulous mandible. Clin oral Investig 2005;266-70.
[2] Ellis E III, Price C. Treatment protocol for fractures of the atrophic mandible. J Oral Maxillofac Surg.2008;66(3):421–435. [PubMed]
[3] Campbell R L. A comparative study of the resorption of the alveolar ridges in denture-wearers and non-denture-wearers. J Am Dent Assoc. 1960;60:143–153. [PubMed]
[4] Józefowicz W. The influence of wearing dentures on residual ridges: a comparative study. J Prosthet Dent.1970;24(2):137–144. [PubMed]
[5] Luhr H G Reidick T Merten H A Results of treatment of fractures of the atrophic edentulous mandible by compression plating: a retrospective evaluation of 84 consecutive cases J Oral Maxillofac Surg 1996543250–254.254, discussion 254–255 [PubMed]
[6] Wittwer G, Adeyemo W L, Turhani D, Ploder O. Treatment of atrophic mandibular fractures based on the degree of atrophy—experience with different plating systems: a retrospective study. J Oral Maxillofac Surg. 2006;64(2):230–234. [PubMed]
[7] Wilson IF, Lokeh A, Benjamin CI, et al. Prospective comparison of panoramic tomography (zonography) and helical computed tomography in the diagnosis and operative management of mandibular fractures. *Plast Reconstr Surg*. 2001 May. 107(6):1369-75. [Medline].
[8] Cevidanes LH, Bailey LJ, Tucker SF, et al. Three-dimensional cone-beam computed tomography for assessment of mandibular changes after orthognathic surgery. *Am J Orthod Dentofacial Orthop*. 2007 Jan. 131(1):44-50. [Medline].
[9] 9.Rodt T, Bartling SO, Zajaczek JE, et al. Evaluation of surface and volume rendering in 3D-CT of facial fractures. *Dentomaxillofac Radiol*. 2006 Jul. 35(4):227-31. [Medline].
[10] Huh KH, Yi WJ, Jeon IS, et al. Relationship between two-dimensional and three-dimensional bone architecture in predicting the mechanical strength of the pig mandible. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2006 Mar. 101(3):363-73. [Medline].
[11] Kaeppler G, Cornelius CP, Ehrenfeld M, Mast G. Diagnostic efficacy of cone-beam computed tomography for mandibular fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013 Jul. 116(1):98-104. [Medline].
[12] Marciani R D. Invasive management of the fractured atrophic edentulous mandible. J Oral Maxillofac Surg. 2001;59(7):792–795. [PubMed]
[13] Ellis E 3rd Price C. Treatment protocolfor fractures of the atrophic mandible. J Oral Maxillofac Surg 2008;66:421-35.
[14] Sugiura T, Yamamoto K, Murakami K. et al. Biomechanical analysis of miniplate osteosynthesis for fractures of the atrophic mandible. J Oral Maxillofac Surg. 2009;67(11):2397–2403. [PubMed]
[15] Müller S, Bürgers R, Ehrenfeld M, Gosau M. Macroplate fixation of fractures of the edentulous atrophic mandible: immediate function and masticatory rehabilitation. Clin Oral Investig. 2011;15(2):151–156.[PubMed]
[16] Van Sickels J E, Cunningham L L. Management of atrophic mandible fractures: are bone grafts necessary? J Oral Maxillofac Surg. 2010;68(6):1392–1395. [PubMed]
[17] Melo A R, de Aguiar Soares Carneiro S C, Leal J L, Vasconcelos B C. Fracture of the atrophic mandible: case series and critical review. J Oral Maxillofac Surg. 2011;69(5):1430–1435. [PubMed]
[18] Madsen M J, Haug R H. A biomechanical comparison of 2 techniques for reconstructing atrophic edentulous mandible fractures. J Oral Maxillofac Surg. 2006;64(3):457–465. [PubMed]
[19] Bruce R A, Ellis E III. The second Chalmers J. Lyons Academy study of fractures of the edentulous mandible. J Oral Maxillofac Surg. 1993;51(8):904–911. [PubMed]
[20] Clayman L, Rossi E. Fixation of atrophic edentulous mandible fractures by bone plating at the inferior border. J Oral Maxillofac Surg. 2012;70(4):883–889. [PubMed]
[21] Sikes J W Jr Smith B R Mukherjee D P An in vitro study of the effect of bony buttressing on fixation strength of a fractured atrophic edentulous mandible

model J Oral Maxillofac Surg 200058156–61.61, discussion 62 [PubMed]

[22] Pereira F L, Gealh W C, Barbosa C E, Filho L I. Different surgical approaches for multiple fractured atrophic mandibles. Craniomaxillofac Trauma Reconstr. 2011;4(1):19–24. [PMC free article] [PubMed]