

Conservative Splint Therapy For Atrophic Edentulous Mandible Fracture In A Geriatric Patient

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Citation

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Abstract

Fractures of edentulous mandible are common in elderly persons. The advancing age, residual ridge resorption and decreased vascularity impairs the mandibular bone strength, predisposing it to fracture during traumatic event and even to spontaneous fracture. Gunning splint is a prosthetic aid designed to stabilize the reduced fractured mandibular segments. It is a viable treatment option for atrophic edentulous mandible fracture. The rationale of conservative treatment approach using Gunning splint in elderly patient with case report is discussed.

INTRODUCTION

The fractures of edentulous mandible represent a group of maxillofacial injuries that more commonly affect the geriatric patients. The loss of bone mass and decreased vascularity decreases the strength of mandible and makes it vulnerable to fracture. Several treatment modalities have been successfully used for clinical management of such injuries in patients with advanced age. However, the treatment options suitable for atrophic edentulous mandible fracture has been a matter of controversy. The bone atrophy and advanced age favors the conservative treatment due to higher incidence of complications associated with geriatric edentulous mandible. A case of conservative management of atrophic mandible fracture using Gunning splint with precise vertical dimensions is being presented.

CASE REPORT

A 60 years old male patient presented with pain on the right side of the lower jaw. There was history of trauma four days back. On extra-oral examination, there was right mandibular deviation on opening the mouth and tenderness over left TMJ.

Intra-oral examination revealed that the left mandibular canine was the only tooth present in the mandibular arch while the maxillary arch was edentulous. The lone standing tooth was mobile and had calculus deposits. (Fig 1) The mandibular ridge was atrophic. There was no laceration or hematoma on the mucosa. No other significant finding was observed in the oral cavity. Radiographic examination revealed left subcondylar fracture and right parasymphiseal

mandibular fracture.

Figure 1

Showing the lone standing tooth in mandibular arch



Considering the age of the patient and resorption level of mandibular alveolar ridge, closed reduction and stabilization was planned. There was no history of use of any removable dentures. When complete dentures do not exist, the stabilization of reduced fracture segments can be achieved by employing Gunning splint. It is an acrylic, single unit prosthesis with gap in the anterior region to allow food intake.

The permanent left mandibular canine was indicated for extraction because of poor periodontal status. However, it was planned to retain this tooth till jaw relation registration as it could be used as a reliable reference for establishing the occlusal vertical dimensions.

Prosthetic procedure

Impressions were made with irreversible hydrocolloid

impression material and casts were poured with Type III gypsum product. The mandibular cast was not sectioned as there was no gross disfigurement. Temporary record bases were prepared with self polymerizing acrylic resin and occlusal rims were fabricated on them accommodating the single natural tooth present.

Jaw relations were recorded with adequate freeway space and correct occlusal vertical dimension using mandibular left canine as reference. Occlusal rims were mounted at established vertical dimension. The mandibular canine was trimmed from the cast. The wax - up for the splint was done incorporating Ehrling's type arch bar bilaterally in the posterior segments (Fig 2) and Gunning splint was fabricated following conventional method. The splints were made of transparent acrylic to permit visualization of pressure spots, if any, underneath them. The single natural tooth indicated for extraction was removed with minimal intervention. (Fig 3)

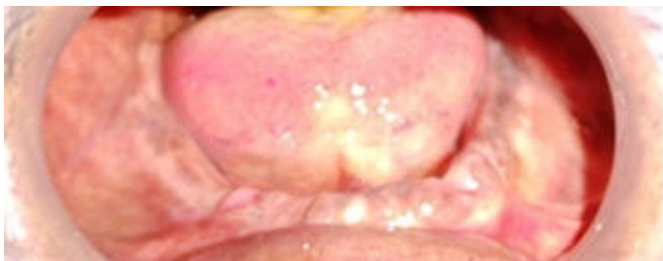
Figure 2

Showing Ehrling's type arch bar embedded in acrylic.



Figure 3

Showing the edentulous mandibular arch



The impingements visible as blenching under clear acrylic were removed. The splints were tried-in (Fig 4) and stabilized. Instructions were given regarding oral hygiene maintenance.

Figure 4

Showing Gunning splint in oral cavity.



DISCUSSION

Mandibular fracture is common.¹ It is the most commonly fractured bone in maxillofacial skeleton because of its prominence.² Fracture mandible is 1.5 times more common than fracture maxilla.¹ Fracture of edentulous mandible mainly affects geriatric persons, especially more in atrophic mandible.^{3, 4, 5, 6, 7} The weakened mandible in advanced age may get fractured even spontaneously. ^{8, 9, 10, 11, 12, 13} However, mandibular fracture has been mentioned as uncommon and edentulous mandible fracture as rare also.^{14, 15}

Hippocrates described treating the mandibular fracture by re-approximation and wiring the teeth with immobilizing the jaw using external bandaging. The basic principles of reduction of the fractured segments and immobilization during healing defined centuries ago stand true even today. Bean introduced customized oral splints for fixation. The Bean articulator splint restored occlusion and accelerated healing.¹⁶ Thomas Brian Gunning opined that reduction and fixation should be achieved immediately, whenever possible, to permit function. He designed splint with extraoral wings for treating fracture in edentulous cases. It had mental band of linen to hold the jaw up in the splint.

Treatment of atrophic edentulous mandible fracture is challenging due to the associated complications.¹⁷ The tension and compression zones are close so it is preferable to use screws over plates for the immobilization.¹⁵

Perioperative management is more complex. Morbidity and mortality are increased in geriatric patients after trauma.^{18, 19} Intercurrent chronic systemic diseases contribute to undesirable outcome to trauma. Long period of stabilization is required which further add to increased complications.²⁰ Various factors that weaken the mandible in old age predispose it to fracture include reduced vascularity in elderly and also loss of bone mass due to teeth loss at an early age. Edentulous mandibular ridge undergoes resorption as the teeth are lost. This coupled with reduced

central blood supply makes it vulnerable to fracture. Edentulousness and increased age has been important risk factor for mandible fracture.²¹ In senile skeleton there is increase in proportion of mineral salts to ground substance making the bone more brittle and susceptible to fracture. Loss of teeth decreases mass of bone which weakens it and susceptible to fracture.^{3, 4, 5, 6} There is atrophy of alveolar ridges with associated basal bones. Bony surface area and density are decreased.

The atrophic edentulous mandibular fracture may be treated either by open or closed reduction. Controversies exist regarding the treatment of atrophic edentulous mandible fracture.²² One school of thought is that under most circumstances, the fracture should be opened and fixed. The other school of thought believes that these fractures can be successfully treated with closed reduction. There is inadequate evidence to support the effectiveness of a single approach, whether open or closed reduction should be used as no eligible randomized controlled trial has been identified. Systematic review has revealed that single approach for managing fractured atrophic edentulous mandible may not be effective.¹ A number of factors determine the treatment option to be used. Atrophy of mandible is most important factor.²³ The relative amount of displacement of fracture segment is also a determining factor as to whether open or closed reduction is desired.²² Open reduction would potentially compromise the vascularity. The major blood supply of mandible, subperiosteal plexus, may severely impair the vascularity during open reduction resulting in nonunion of fracture treated by open reduction. Fracture treatment with open reduction have more post operative complications. Bruce and Strachan advocated that open reduction be reserved for fractures of large edentulous mandible and not for atrophic mandible fracture. However, it has also been reported that open reduction may be tolerated by elderly.²⁰

Concerns over compromised blood supply and risk of aggressive surgical interventions in patients with advanced age convinces to accept less than ideal jaw alignment achievable with closed reduction. Less precise alignment in edentulous patients may be acceptable as no opposing teeth and occlusion is involved. Conservative treatment has a distinct advantage as a treatment option.²⁰ Barber has supported conservative treatment approach as it requires less time.²² The operating time needed is less for closed reduction. The conservative treatment options for fracture mandible include use of existing dentures or Gunning splint to stabilize fracture, external fixation appliance (Joe Hall

Morris appliance) and even no treatment at all. Gunning Splint can be used for stabilization when complete dentures are not available. It may be useful for grossly displaced edentulous fracture.

Closed reduction with Gunning Splint is adequate when aggressive surgical approach is contraindicated. Short conservative procedure without general anesthesia involves less risk than open surgical procedure under general anesthesia. External fixation appliance or Joe Hall Morris appliance may be used for edentulous mandible fracture. Transmucosal fixation for edentulous mandible fracture using external fixation principle within oral cavity can be a conservative option. Wood reported healing with transmucosal fixation in 5 patients out of 8 patients included in the study.²⁴ However, use of external fixation appliance in atrophic mandible fracture is limited due to reduced quantity of available bone. Miniplates osteosynthesis is less invasive treatment and suitable for atrophic edentulous mandible except for comminuted defects.⁹

Gunning Splint as conservative treatment option is viable.²³ It has been used satisfactorily for century but one problem with this is that it is difficult to establish vertical dimension of face.²⁵ Proper reduction of fractures of the edentulous mandible and maxilla requires the incorporation of correctly determined freeway space into the Gunning Splint.⁵ It is advisable to ensure an adequate vertical opening of the jaws, as this lessens the likelihood of respiratory obstruction. In the present case report, the vertical dimension of occlusion for the splint was determined using the lone standing tooth as reference before its extraction, providing adequate interocclusal space.

CONCLUSION

Advanced age, vulnerability to perioperative complications and compromised bone mass contribute to favor conservative treatment as a practical option for management of atrophic edentulous mandible fracture. If fracture segments are not grossly displaced, clinical management with Gunning splint serves the purpose with less complications such as infection and nonunion.

References

1. Nasser M, Fedorowicz Z, Ebadifar A. Management of the fractured edentulous atrophic mandible. *Cochrane Database Syst Rev*. 2007 Jan 24; (1):CD006087.
2. Banks P. *Killey's fracture of mandible*. 4th ed. London: Wright; 1991: 01-133.
3. Bruce RA, Strachan DS. Fractures of the edentulous mandible: the Chalmers J Lyons Academy Study. *J Oral Surg*. 1976; 34: 973-9.
4. Friedman CD, Costantino PD. Facial fractures and bone healing in the geriatric patient. *Otolaryngol Clin North Am*.

- 1990; 23:1109-19.
5. Ellis E, Moos KF, El-Attar A. Ten years of mandibular fractures: An analysis of 2,137 cases. *Oral Surg* 1985; 59:120-9.
 6. Scott RF: Oral and maxillofacial trauma in the geriatric patient, in Fonseca RJ, Walker RV, Betts NJ, et al (eds): *Oral and Maxillofacial Trauma*, vol 2. Philadelphia, PA, Saunders, 1997, 1045-1072.
 7. Madsen MJ, Haug RH, Christensen BS, Aldridge E. Management of atrophic mandible fractures. *Oral Maxillofac Surg Clin North Am.* 2009; 21:175-83.
 8. Sidramesh M, Chaturvedi P, Chaukar D, D'Cruz AK. Spontaneous bilateral fracture of the mandible: a case report and review of literature. *J Cancer Res Ther.* 2010; 6: 324-6.
 9. Hiroshi M, Kunio I. Progressive systemic sclerosis with spontaneous fracture due to resorption of the mandible: A case report. *J Oral Maxillofac Surg* 2006; 64:1137-9.
 10. Fleming WE, Cook RM, Hueston JT. A case of spontaneous fracture of the mandible associated with infection of the right sub-lingual gland. *Aust Dent J* 1967; 12: 360-3.
 11. Kelly DE, Harrigan WF. An unusual bilateral pathological fracture. *J Oral Surg* 1977; 35: 48-50.
 12. de Silva BG. Spontaneous fracture of the mandible following third molar removal. *Br Dent J* 1984; 156: 19-20.
 13. Bramley P, Forbes A. A case of progressive hemiatrophy presenting with spontaneous fractures of the lower jaw. *Br Med J* 1960; 1: 1476-8.
 14. Shlomi B, Levy Y, Kahan A, Horowitz I. Fractures of the atrophic mandible--our experience at Tel-Aviv Medical Center. *Harefuah* 2002; 141: 242-6.
 15. Matias JG, Andrade MR, Fernandes VS. Edentulous mandible fractures osteosynthesis. *Acta Med Port.* 2004; 17: 145-8.
 16. Pollock RA. Management of Jaw Injuries in the American Civil War: The Diuturnity of Bean in the South, Gunning in the North. *Craniofac Trauma Reconstr.* 2011; 4: 85-90.
 17. Aziz SR, Najjar T. Management of the edentulous/atrophic mandibular fracture. *Atlas Oral Maxillofac Surg Clin North Am.* 2009; 17: 75-9.
 18. Watters JM, McClaran JC. *The Elderly Surgical Patient: Special Problems*, VII. New York, NY, Scientific American Inc, 1996.
 19. Smith OC: Advanced age as a contraindication to operation. *Medical Record (New York)* 1907; 72: 642-4.
 20. Marciani RD. Invasive Management of the Fractured Atrophic Edentulous Mandible. *J Oral Maxillofac Surg.* 2001; 59: 792-5.
 21. Cope MR. Spontaneous fracture of an atrophic edentulous mandible treated without fixation. *Br J Oral Surg* 1982; 20: 22-30.
 22. Barber HD. Conservative Management of the Fractured Atrophic Edentulous Mandible. *J Oral Maxillofac Surg.* 2001; 59: 789-91.
 23. Luhr HG, Reidick T, Merten HA. Results of treatment of fractures of the atrophic edentulous mandible by compression plating: a retrospective evaluation of 84 consecutive cases. *J Oral Maxillofac Surg.* 1996; 54: 250-5.
 24. Wood GA, Campbell DF, Greene LE. Transmucosal fixation of the fractured edentulous mandible. *Int J Oral Maxillofac Surg.* 2011; 40: 549-52.
 25. Goss AN, Brown RO. An improved Gunning Splint. *J Prosthet Dent.* 1975; 33:562-6.

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