Management of Mandibular Nonunion Fracture with Single-Piece Implant - A Case Report

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Abstract

Rationale: This paper presents the treatment of noninfected hypertrophic, horse hoof nonunion edentulous mandible accompanied with a Luhr class fracture. **Patient Concerns:** The patient reported with complaints of pain and an unstable lower denture at the right side of the lower jaw post mandibular fracture. **Diagnosis:** Upon inspection and post cone-beam computed tomography, it was determined that it was a case of a noninfected hypertrophic, horse hoof nonunion edentulous mandible with Luhr class 1 fracture. **Treatment:** The clinicians in this study treated the fracture with single-piece corticobasal jaw implants successfully with 10 BECES® corticobasal single-piece jaw implants in the maxilla by engaging double pterygoids bilaterally and eight implants in the mandible. **Outcomes:** After two years, complete unification of the fracture line and callus adaptation was observed on a panoramic radiograph. **Take-away Lessons:** The authors propose a new treatment option for the correction of nonunion mandibular fracture.

Keywords: Callus, immediate loading, implants, mandibular fracture, nonunion

Introduction

Treating fractures often poses a challenge for the surgeon. If the fracture is not reduced properly during the healing, then a hyperplastic callus is formed (callus adaptation), which undergoes a steady remodeling process until functional adaptation to stresses takes place. Luhr *et al*.[1] developed a classification with regard to the difficulty of treating fractures of the mandible with different degrees of atrophy. Mandibles of 16–20 mm height are classified as Class 1 atrophy, those of 11–15 mm as Class 2, and those with a height of 10 mm or less as extremely atrophic mandible or Class 3 atrophy. A fracture in a mandible with <10 mm of height is probably a contraindication for plating, but the supraperiosteal placement of plates and screws was recommended by Luhr *et al*.[1] Nonunion of long bone or tubular bone fracture is classified as noninfected and infected. Noninfected nonunions are categorised into hypertrophic or hypervascular nonunion and atrophic or avascular nonunion. The treatment options for nonunion can be divided into nonsurgical and surgical. Nonsurgical options consist of functional bracing with weight-bearing and exercise, external bone graft, and injection of bone marrow or other biological modifiers such as growth factors. Surgical options consists of internal fixation via compression plating or locked reamed intramedullary nailing or distraction osteogenesis.At times, it can also be fixed via bone compression with external fixators such as Ilizarov apparatus with the addition of bone grafts- autografts, allogenic or bone substitutes.

This case presents the treatment of a noninfected hypertrophic, horse hoof nonunion edentulous mandible with Luhr *et al*. class 1 fracture.[1] The author proposes a new treatment option for the correction of nonunion mandibular fracture.

Case Report

A 55-year-old completely edentulous male patient, admitted in the Department of Oromaxillofacial Surgery, reported

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with a fracture of the right side body of the mandible due to trauma [Figure 1]. Mobility of the fractured segment was minimal, but he complained of pain while attempting to keep his mouth wide open. On panorama, a nonunion of the fracture on the right side of the body of the mandible was observed [Figure 2]. On intraoral examination, it was observed that interarch space was less on the right side distally as compared to the left side because of the shift of the mandible toward the left due to nonunion of the fracture. Extraorally deviation on mouth opening toward the left side of the patient was observed. Step deformity was palpable on the extraoral aspect of the mandible at the inferior border of the fracture site. The patient was advised a unique treatment option to have a functional fixed immediate restoration supported by single-piece implants that would aim to replace his missing teeth and simultaneously correct the existing nonunion of the fracture. After routine blood examination, written consent was obtained and the patient was operated in a routine dental operatory under local anaesthesia. Lignox® 2% A (lignocaine with adrenaline 1:80000) was infiltrated in both jaws. Nerve block, especially for the lower jaw, was avoided. Following manufacturer instructions, 10 BECES® (SIMPLADENT, GmbH, Switzerland) corticobasal single-piece jaw implants were placed without raising a flap in the maxilla with 1:1 reduction Kavo® straight handpiece with external irrigation using 0.9% w/v normal saline, engaging double pterygoids bilaterally, six implants in anterior with nasal cortical anchorage and one at nasal spine [Figure 3] following strategic principles. For lower jaw, eight BECES® (SIMPLADENT GmbH, Switzerland) corticobasal single-piece jaw implants were placed without raising a flap with a 1:1 reduction Kavo® contra-angle handpiece having external irrigation using 0.9% w/v normal saline [Figure 4], two implants were placed on right side distal to fracture line engaging lingual cortical plate, two implants at left side engaging lingual cortical plate, and rest four implants were placed between inter-mental foramen.[28] A postoperative panorama was taken to check the implant placement [Figure 5]. Following that, impression was made with stock metal trays on pickup impression caps supplied along with implants by polyvinyl additional silicon putty impression material (Aquasil®-Dentsply), the same day after the implant placement. Interarch jaw relationship was made with aluminium reinforced bite registration wax and facebow transfer done. The next day, metal framework fit was checked over the implant abutment intraorally, teeth shade and form were checked with the patient. The next day, a semipermanent metal to acrylic material hybrid prosthesis was cemented over the implant abutment by resin-modified glass ionomer permanent cement (Fuji Plus®). The prosthesis of both jaws was fabricated sanitary at intaglio surface posteriorly and anteriorly modified ridge lap [Figure 6]. Postoperative instructions were given and follow-up schedule was explained. After two years, a panorama was taken, and complete unification of the fracture line and callus adaptation was observed [Figure 7]. The patient's lower jaw was shifted back to its original position, i.e., toward the right, maintaining the facial midline. Increased mouth opening without any pain was observed [Figure 8].

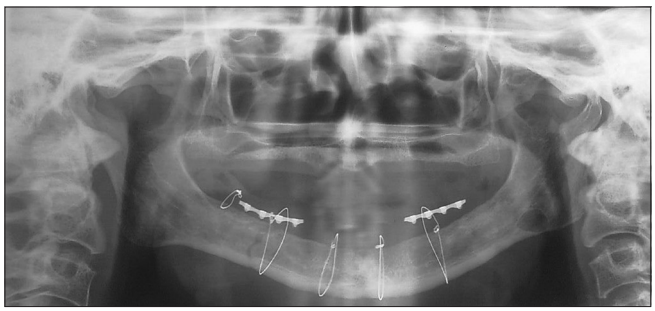

Figure 1: Intraoral panorama demonstrating the fracture stabilisation using circumferential wiring

Figure 3: Intraoral view demonstrating the placement of the maxillary single-piece implants

Figure 2: Preoperative panorama with right lower nonunion fracture

Figure 4: Intraoral view demonstrating the placement of the mandibular single-piece implants

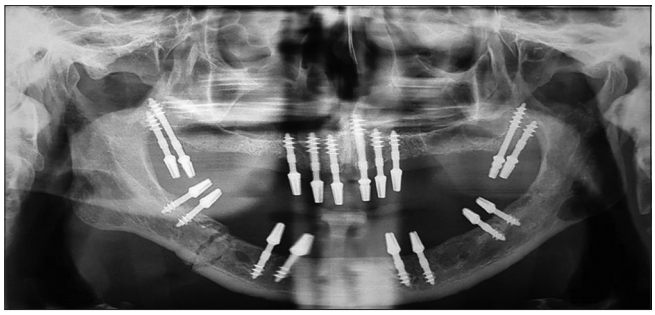

Figure 5: Postoperative immediate panorama showing the placement of the maxillary and mandibular single-piece implants and hyperplastic callus

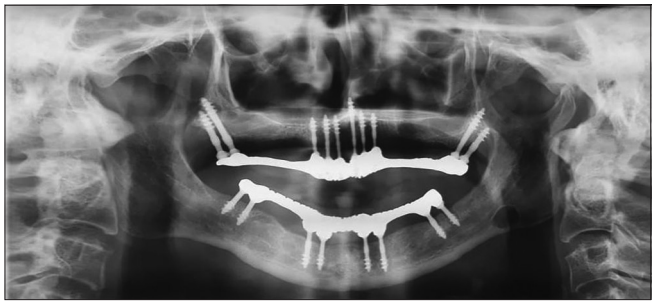

Figure 7: Panorama representing the 2-year follow-up of the placement of the maxillary and mandibular single-piece implants

Discussion

Single-piece bicortical implants have been in function for quite a long period.[2-6] Single-piece implants were preferred so as to avoid loose connections/mobility at the abutment level that would eventually result in the failure of cross-arch rigid connection, thus compromising the desired result, which is the treatment of a nonunion fracture.[2,7] Implants, when placed surgically, create trauma, resulting in an increase in microcracks leading to a spurt in remodeling at the site, which progresses over the jaw and of hyperplastic callus leading to ossification and maturation of callus. This happens because the functional and mechanical stimulus was provided, cortical bone remodeling is through cutting/filling cone bone multicellular units and trabecular remodeling is accomplished by hemicutting/filling cones. Immediate implant loading by external splinting is helpful in the appliance of Wolff's law for force-guided remodeling. Osteocytes are aligned as of Frost's mechanostat theory in direction of the functional stimulus generated leading toward remodeling-based realignment leading to callus adaptation. Our procedure is comparable to previous studies where they incorporated the use of miniplates to fix mandibular nonunion fractures. These procedures, like ours, are very reliable with minor complications such as malocclusion that can be easily treated post union.[8,9]

Conclusion

For the first time ever, a nonunion fracture has been treated successfully by implants following an immediate functional loading protocol. Furthermore, the complaint of discomfort and pain was addressed and treated with success.

Figure 6: Intraoral view showing the hybrid fixed metal to acrylic prosthesis

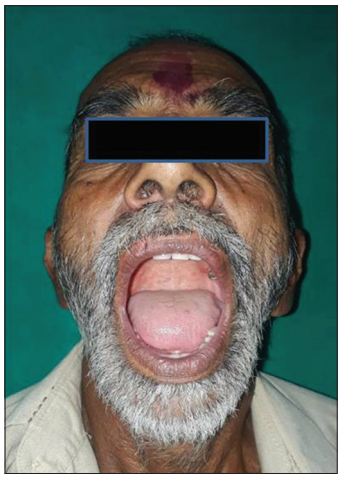

Figure 8: Facial view demonstrating an increased mouth opening as compared to the preoperative

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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