Reporte de Caso/Case Report

Eficacia del sistema portante en el tratamiento de la fractura atrófica mandibular bilateral - Reporte de caso

Efficacy of the load-bearing system in the treatment of bilateral atrophic mandible fracture - case report

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Rev Fac Odont (UNC). 2022; 32 (2): 27-31
doi: 10.25014/revfacodont271.2020.32.2.27
revistas.unc.edu.ar/index.php/RevFacOdonto
Received 12 november 2021; Accepted 15 March 2022

Abstract

Atrophic mandible fractures represent a clinical challenge due to both the peculiarities of the population involved and the management of a limited bone remnant. The choice of the type of osteosynthesis is guided by some criteria, including the degree of fracture comminution and the height of the bone remnant, where residual mandibular bone height <10 mm represents an important clinical challenge and is related to major postoperative complications. The aim of this study is to report the efficacy of the load-bearing osteosynthesis in a bilateral atrophic mandible fracture. An 86-year-old male patient, victim of a fall from his own height, evolving with a bilateral body fracture in the atrophic lower jaw. This fracture occurred adjacent to the end of a reconstruction locking plate installed 18 months ago to treat a fracture in the mandibular parasymphysis, requiring a surgical approach to removal the previous fixation and installation of two locking reconstruction plates in each fractured segment. In the six months of follow-up, no complication was observed. The uniqueness of this case reinforces the therapy with load-bearing plates and its clinical efficiency.

Keywords: Mandibular fractures; Mandibular Injuries; Fracture Fixation, Internal

Resumen

Las fracturas atróficas de la mandíbula representan un desafío clínico debido tanto a las peculiaridades de la población involucrada como al manejo de un remanente óseo limitado. La elección del tipo de osteosíntesis está guiada por algunos criterios, incluido el grado de conminución de la fractura y la altura del remanente óseo, donde la altura del hueso mandibular residual <10 mm representa un desafío clínico importante y se relaciona con complicaciones posoperatorias importantes. El objetivo de este estudio es informar sobre la eficacia de la osteosíntesis de carga en una fractura atrófica mandibular bilateral. Paciente masculino de 86 años, víctima de una caída desde su propia altura, que evoluciona con una fractura corporal bilateral en la mandíbula inferior atrófica. Esta fractura ocurrió adyacente al extremo de una placa de reconstrucción con bloqueo instalada hace 18 meses para tratar una fractura en la parainfisis mandibular, requiriendo un abordaje quirúrgico para retirar la

fijación previa e instalación de dos placas de reconstrucción con bloqueo en cada segmento fracturado. En los seis meses de seguimiento no se observó ninguna complicación. La singularidad de este caso refuerza la terapia con placas portantes y su eficacia clínica.

Palabras Clave: Fracturas Mandibulares, Traumatismos Mandibulares; Fijación Interna de Fracturas.

Introduction

The management of atrophic mandibular fractures has been a challenge for Oral and Maxillofacial Surgeons for decades[1,2]. They represent 1 to 5% of all mandibular fractures, with the main etiological factors being fall from height and traffic accidents, affecting most commonly the mandibular body[2,3]. In addition, the lower bone volume and quality associated with systemic conditions found in the geriatric population play an important role in bone healing and complications[4].

Treatment should be based on the type and location of the fracture, residual alveolar height according to Luhr's classification, and the patient's health condition, evaluating whether the increased risk of general anesthesia and the reduced vascular supply of the atrophic mandible support the chosen type of treatment[2,5].

Load-bearing reconstruction plates support the entire functional load until healing occurs[6], and when associated with the locking system, they increase primary stability without the need for compression of the adjacent bone, facilitate the plate adaptation, and decrease the incidence of screw loosening[4]. The case of a recurrent fracture in an atrophic mandible previously treated by a 2.4mm locking load-bearing fixation system is reported below. After a new fall of height, the patient developed a bilateral fracture of the mandible adjacent to a previously installed reconstruction plate, showing in addition to its effectiveness in the bone repair of the previous fracture, an area of mandibular reinforcement.

Case report

An 86-year-old male patient was referred for evaluation by the Oral and Maxillofacial Surgery team due to facial trauma after a fall of height. In the review of the medical history, arterial hypertension, diabetes and hypothyroidism were reported. The patient was also, under investigation for Parkinson's disease, being classified as ASA III. The patient reported a previous history of a fall 18 months ago, whose radiograph showed bilateral condylar resorption and a fracture of the left parasymphysis, which was surgically treated with reduction and fixation with a 2.4mm locking reconstruction plate by general anesthesia (Figure 1).

In the initial evaluation, intra and extra-oral ecchymosis and edema associated with a laceration in the submental region were observed. The patient had pain complaints associated with bilateral mandibular mobility and crepitation upon manipulation. The CT scan revealed a bilateral fracture of the mandibular atrophic body and osteosynthesis material in the left parasymphysis region, in which the fracture on the left side was distal to it (Figure 2 A-C).

After medical clearance by the cardiology and anesthesiology teams, it was planned the removal of the existing osteosynthesis material followed by bilateral fixation of the fractures in the mandibular body under general anesthesia. A bilateral extra-oral incision in the body region connected in the midline following the scar of the previous access was used to fully expose the mandible and access the fractures (Figure 3A). The existing reconstruction plate was removed, followed by bilateral anatomical reduction and fracture stabilization with a 2.0 mm plate with monocortical screws at the mandibular base (Figure 3B). Then, a locking reconstruction plate in each mandibular body was bended and fixated with six bicortical locking screws, three screws on each side of the fracture (Figure 3C). Suture by planes with resorbable thread and skin with non-resorbable thread were performed (Figure 3D). For better care, the patient remained hospitalized for 72 hours, where he presented stable clinical signs, being discharged with a home prescription for analgesics, anti-inflammatory and antibiotics. In immediate postoperative imaging, an adequate mandibular contour was observed. Weekly returns were performed and in a 90-day radiographic examination, stability of the fixed fractures and

synthesis material, absence of signs of bone resorption, and maintenance of mandibular function were observed. No postoperative complications have been observed so far (Figure 4).

Discussion

The atrophic mandible has morphological and metabolic peculiarities such as more cortical and dense bone and smaller volume. Thus, there is reduced blood supply due to less local endosteal and periosteal irrigation due to the smaller residual bone area and arteriosclerosis of the inferior alveolar artery. These local factors associated with the higher prevalence of systemic changes in the elderly population increase the complexity of cases, surgical risks and postoperative complications such as infection, malunion, non-union and failure of the fixation system[6–8]. Based on these factors, besides the patient's comorbidities and ASA III classification, the treatment choice considered the impossibility of retreatment in case of failure in the osteosynthesis system due to the patient's systemic conditions.

The basic principles for atrophic jaw treatment are the same as other facial fractures, with the restoration of the form and function the gold objectives to achieve[6,9]. However, due to its low incidence, there is a lack of randomized clinical trials to establish protocol management for these fractures[7,10]. A variety of treatments are found in the literature, and the choice of the bone fixation system is a frequent topic of study and discussion. Through the classification of the residual alveolar height of atrophic mandibles made by Luhr in 1996 into Class I (16–20 mm), Class II (11–15 mm), Class III (≤10 mm), the choice of osteosynthesis material have been performed: for class I most suitable mini-plates[8,11]; for classes II/III and defects with loss of continuity, reconstruction plates [3,7,8,11] or 2.0mm system with locking screws[12]. Due to the lower residual height and bone quality, the postoperative complication rate and the need for a fixation system that supports the functional load increase. The load-sharing system becomes fragile for this application[10]. Although mini-plates have advantages such as less tissue manipulation, easier handling and adaptation, they are related to greater susceptibility to plate fractures and screw loosening due to the material fatigue occasioned by traction of the facial muscles, overloading the osteosynthesis system[2,6,8,9]. However, its use to aid in the simplification of comminuted fractures, helping to reestablish the mandibular anatomical contour and better adaptation of load-bearing reconstruction plates is well described in the literature[4,5,10], technique corroborated by the cases of Franciosi et al. (2014)[10], Minucci et al. (2018)[13] and Meneses-Santos et al. (2020)[14].

Reconstruction plates overcome functional forces opposing muscle traction having a higher risk of intra- or extra-oral exposure and suture dehiscence due to their greater volume[10] and interference for prosthetic rehabilitation[12]. In addition, they can lead a bone weakening in very atrophic ridges due to the potential for necrosis when bicortical screws are applied[2]. In a randomized study by Sarkar et al. (2021), the evaluation of postoperative complications when using the locking and non-locking 2.0 systems, the locking system promoted better stability of the fractures, with a similar complication rate[9]. The unfavorable fractures of atrophic mandibles, where typically the higher degree of atrophy is located in the region of the mandibular body, the treatment aims to increase local bone strength, achieved by the use of more rigid plates that supports masticatory forces due to poor bone quantity and quality[4,8]. We observe that even after high impact trauma, the previously plate load-bearing contributed to local bone reinforcement, dissipating the forces received in the impact to the distal regions of the osteosynthesis material, resulting in the fracture of the atrophic bone with lesser local resistance[9].

In this report, the open surgical treatment allowed direct visualization of the bone fragments, providing excellent reduction and fixation of the fracture, facts corroborated by the studies of Emam et al. (2017),[2] Novelli et al. (2012)[11], Minucci et al. (2018)[13] and Meneses-Santos et al. (2020)[14]. The choice of the reconstruction plate in this report is justified by the residual bone height <10mm bilaterally, being able to support the functional loads on the mandible during the repair process, where the insertion of three screws at each side of the fracture promote higher stability, as observed in the studies of Pereira-Filho et al. (2013),[6] Gerbino et al. (2018)[7] e Franciosi et al. (2014)[10]. Santos et al. (2013) demonstrated the failure of the mini-plates as treatment of fractures in atrophic mandible, requiring replacement of the material for a reconstruction

plate[1]. Concurrently graft was not used with the installation of the plate due to the need for a second surgical site for bone removal, associated with increased surgical time and impairment of the patient's early mobility, reducing postoperative medical complications.
This case demonstrates that the load-bearing system associated with locking screws is a reliable method to withstand the forces on the mandible. Even after a second high-impact trauma, the fracture occurs adjacent to the previously reconstructive plate with no crack or fracture in the segment below it, corroborating its clinical efficacy as a predictable protocol in the literature.

Ethics Committee

This study followed all the ethical principles of Declaration of Helsinki and written informed consent of the patient to register and publish the case was performed. In this article, photographs are not shown in any type of data that allow the identification of persons. This work does not constitute a clinical trial on experimentation with living beings.

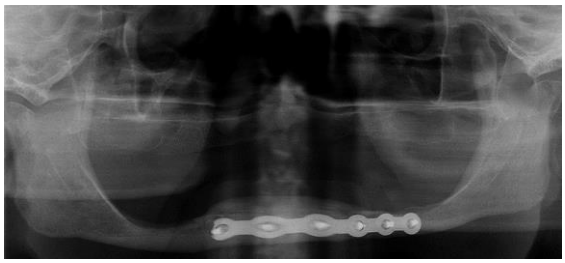

Figure 1. Postoperative radiographic evaluation of the parasymphysis fracture approach, 18 months before the bilateral fracture on the mandibular body region.

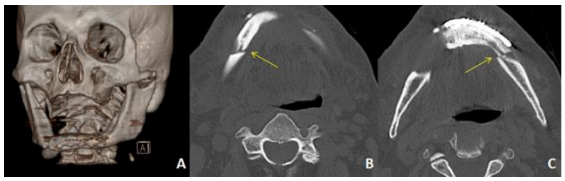

Figure 2. Preoperative tomographic evaluation. Suggestive images of bilateral mandibular fracture in the body region in 3D reconstruction (A) and axial sections (B-C).

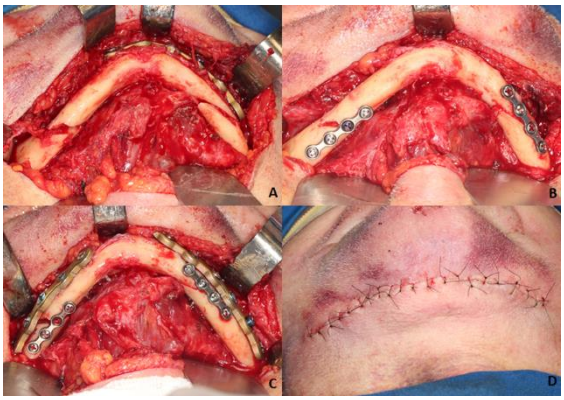

Figure 3. Transoperative. (A) Exposure of fractures and visualization of previous load-bearing locking system through extra-oral access. (B) Removal of the osteosynthesis system and installation of 2.0 mini-plates with monocortical screws for temporary stabilization and reestablishment of the mandibular perimeter. (C) Final stabilization of the fractures with a load-bearing locking reconstruction plate in each fractured mandibular body. (D) Immediate extra-oral postoperative appearance.

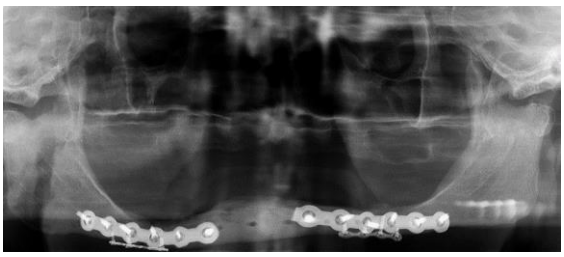

Figure 4. Panoramic x-ray 90 days after surgery. Evidence of adequate fracture reduction and osteosynthesis material with good adaptation and no evidence of failures.

Conflicto de intereses/Conflict of interest

Todos los autores declaran que no existen conflictos potenciales de interés con respecto a la autoría y / o publicación de este artículo.
All authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

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