Treatment of atrophic mandibular fracture related to implant placement in an oral bisphosphonate user: a case report

Tratamento de fratura em mandíbula atrófica com implantes em paciente usuário de bisfosfonato: um relato de caso

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ABSTRACT

Objectives: Atrophic mandibular fractures associated with placement of dental implants is an uncommon condition and to best of our knowledge this event in an oral bisphosphonate user was never described before. Case report: A 74-years-old woman presented a submandibular hematoma and mobility between two fragments on the right side of the body of the mandible after four implants placement. The patient reported the use of oral bisphosphonates for three years for treatment of osteoporosis. A titanium plate was placed at the base of the mandible to fix the fracture and the patient underwent a hyperbaric oxygen therapy for three months. Nine months after the surgery, the patient had no further complications and rehabilitation treatment was completed. Conclusions: The fracture fixation was effective in the treatment of atrophic mandibular fractures in an oral bisphosphonate user, with no occurrence of complications like osteonecrosis. In addition, the oral rehabilitation with prosthesis under the remaining implants showed a satisfactory outcome.

Keywords: Dental implants; Bisphosphonates; Mandibular Fracture.

INTRODUCTION

Life-expectancy has increased worldwide; therefore, the placement of dental implants in elderly patients has become more common[1] because of the higher amounts of tooth loss during their lives resulting in partial or full edentulism[2,3]. The loss of the tooth leads to resorption of the alveolar process, which can induce severe atrophy of the jaws that may impair the placement of dental implants[4].

The use of bone grafts to increase the bone disponibility in patients with atrophic mandibles is controversial[5-7]. The protocol of installing four implants for prosthetic treatment has often been applied in these cases without the use of bone grafts and has shown positive clinical outcomes[6]. Despite the uncommon occurrence[8], some case reports of patients with atrophic mandibular fractures associated with placement of dental implants have been described, especially during the osseointegration period[9,10]. The installation of dental implants in these cases produces zones of weakness in the mandible, which can predispose the patient to fractures during the dissipation of masticatory forces[11].

The treatment of atrophic mandibular fractures is quite complicated because of a higher degree of corticalization that reduces the blood supply provided by the central bone, the dependence of the blood supply from the periosteum, and the presence of potent muscle insertions that tend to destabilize the fragments of the mandible[8,9].

Another factor to be considered is that severe atrophy of the mandible is secondary to prolonged edentulism; therefore, it is expected that atrophic mandibular fractures occur more often in elderly individuals[1,12]. Fractures in these patients take a longer time to consolidate due to slower bone repair[1,13] and the high consumption of systemic medications that alter bone metabolism[14,15]. Bisphosphonates are a group of drugs that have been used in a substantial part of the world population to treat chronic diseases, such as metastatic cancer, Paget's disease and osteoporosis[15-17]. Bisphosphonates reduce bone turnover and have been linked to osteonecrosis of the jaw after procedures such as tooth extractions and dental implant placements[18] and can be an additional complicating factor for repair of atrophic mandibular fractures. To the best of our knowledge, there is no description in the literature regarding the treatment of atrophic mandibular fractures in an oral bisphosphonate user. This case report exposes the treatment of atrophic mandible fractures induced by implant placement in an oral bisphosphonates user.

CASE REPORT

A 74-year-old woman presented to our private clinic with lack of sensation in the lower lip on the right side of the mandible

after she felt a click while eating. The patient reported that she had undergone a surgery for placement of 4 implants in the mandible 45 days prior and that a load prosthesis had been installed immediately after the surgery. During the clinical examination, a submandibular hematoma and mobility between two fragments in the body of the mandible were noted on the right side; the prosthesis had previously been removed with one of the dental implants, which was in the fracture line. The patient reported the use of sodium alendronate (70 mg/1 time per week) for 3 years for treatment of osteoporosis. A cone beam CT scan was requested and showed that the mandible had a height of less than 10 mm. Additionally, a fracture in the region of the right mandibular body was observed (Figure 1a).

A surgical procedure to reduce and fix the fracture was performed in the hospital. The stability of the remaining implants was tested prior to the surgical approach, and it was decided to keep all the dental implants. An extra-oral access was obtained (Figures 1 b,c,d), the periosteum was detached, and the fracture was visualized (Figure 1e). Subsequently, a titanium plate was fixed to the base of the mandible (2.0 Synthes Locking) (Figure 1f). The incision was sutured in planes, and a penrose drain was kept in place for 24 hours (Figure 1g). The patient was hospitalized for two days and treated with cephalosporin (1 g 6/6 h intravenously), ketoprofen (100 mg 12/12 h intravenously), and dipyrone (2 cc of intravenous 6/6 h). The patient was discharged with amoxicillin (500 mg 8/8 h for 7 days orally) and dipyrone for pain (approximately 45 drops orally 6/6 h).

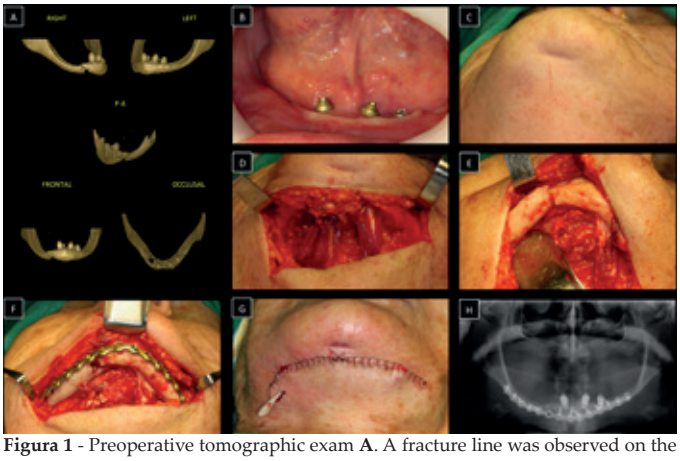

Figura 1 - Preoperative tomographic exam **A**. A fracture line was observed on the right side of the body of the mandible where the dental implant had been previously placed **B**. Preoperative intra-oral clinical aspect. We only noted three dental implants. The fourth implant was removed, along with the implant-supported prosthesis that had been placed previously **C**. Planning of the extra-oral access **D**. Extra-oral incision performed **E**. Detachment of the periosteum and exposure of bone fragments **F**. Fixation of bone fragments using a 2.0 titanium plate with a locking system **G**. Completion of the surgical procedure. A penrose drain was inserted after the surgery and was removed on the third postoperative day **H**. Panoramic radiograph three months after surgery. The titanium plate fixed the bone fragments appropriately.

A pressure curative was changed daily until suture removal, which occurred 7 days after the surgery. After this period, the patient underwent 20 30-minute sessions in a 100% hyperbaric chamber every 3 days (2 months). The use of sodium alendronate was suspended for 3 months after the surgery; however, after this period, the patient resumed her treatment for osteoporosis, which included sodium alendronate. It was noted by a panoramic radiography that the titanium plate fixed the bone fragments appropriately (Figure 1h). Nine months after the surgery, the patient had no further complications, and rehabilitation treatment was completed (Figure 2).

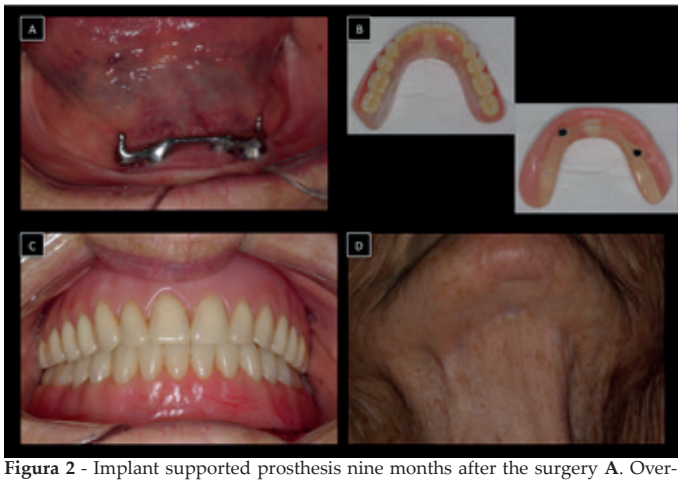

Figura 2 - Implant supported prosthesis nine months after the surgery **A**. Overdenture bar installed **B**. Superior and inferior aspect of the prosthesis **C**. Implant supported prosthesis in function **D**. Extra-oral incision appearance after one year of the surgery.

DISCUSSION

Despite the low incidence of atrophic mandibular fractures[8], these cases result in a high rate of nonunion consolidation and other complications[19]. In the case reported here, the complicating factor is that the patient is a bisphosphonate user, and this drug reduces bone turnover[15-18], thereby hindering fracture consolidation.

The dental implant placement predisposed the atrophic mandible fracture in this patient because the preparation of the surgical site for subsequent dental implant placement created a zone of weakness in the mandible that was susceptible to fracture while the osseointegration process occurred[8,11]. This phenomenon has been described in other case reports, which showed atrophic mandibular fractures associated with dental implants for periods of less than 4 months after the surgery for dental implant placement[10,11], as found in our clinical case.

We treated the atrophic mandibular fracture with rigid fixation using 2.0 titanium plates with a locking system that was inserted on the right side of the mandibular body after detachment of the periosteum by extra-oral access. Although there is no scientific evidence to support the superiority of any type of surgical access over the others[1], the intra-oral access is thought to be superior due to the absence of significant scar formation[19]. However, the extra-oral access was chosen to avoid contamination of the surgical site with the bacteria within the oral cavity, which could be an additional complication for the consolidation of the fracture[1]. Additionally the occurrence of scars was not seen in this case.

The consolidation of the atrophic mandibular fracture is highly dependent on the blood supply of the periosteum due to reduction of mandibular cancellous bone tissue under these conditions[20]. However, the installation of titanium plates for fixation of fractures without the detachment of the periosteum was difficult because of the visualization of the bone fragments and can complicate the stabilization of the fracture[1]. The detachment of the periosteum was not essential for the properly stabilization of the atrophic mandibular fracture in this case.

Regarding the titanium plate used for fixation of bone fragments, titanium plates with larger thickness and stiffness than the 2.0 that was used in this case report[12] have been recommended. However, the degree of the mandibular atrophy presented by the patient was so severe that it precluded the use of a thicker plate. The locking system was used as a default due to the presence of threads on the plate, which improved the hold of the screws in the titanium plate, resulting in increased stability of the fracture fixation[21] and enabling the use of a thinner titanium plate[1].

The patient was an oral bisphosphonate user; therefore, hyperbaric oxygen chamber therapy was indicated during the fracture consolidation period. This therapy was applied for the treatment of radiation or bisphosphonate-induced osteonecrosis of the jaws[22], and it was suggested that this therapy promotes a higher rate of oxygenation of the tissues and ameliorates the healing of poorly vascularized tissue[22,23]. Additionally, the use of sodium alendronate was stopped for 3 months, leading to improved bone healing[24], This treatment protocol was applied because an atrophic mandibular fracture has poorly vascularized tissues when associated with the use of bisphosphonates that reduce bone metabolism and induce necrosis of the jaws.

Some points should be taken into consideration when assessing the findings of this case report. Despite the association between atrophic mandibular fractures after dental implant placement and the use of bisphosphonates with osteonecrosis of the jaw has not been describe, we chose to use this treatment protocol to minimize the risk of mandibular necrosis, which could have catastrophic consequences for the patient. However, this patient had low risk of osteonecrosis since she was an oral bisphosphonate user for less than five years[24]. In addition, it is not possible to affirm that the hyperbaric oxygen chamber therapy and the interruption of the oral bisphosphonate consumption was the reasons of the good outcome showed in our case report.

Thus, we concluded that the fracture fixation was effective in the treatment of atrophic mandibular fractures in an oral bisphosphonate user, with no occurrence of complications like osteonecrosis. In addition, the oral rehabilitation with prosthesis under the remaining implants showed a satisfactory outcome.

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RESUMO

Objetivo: Fraturas de mandíbula atrófica associadas à inserção de implantes é uma condição de ocorrência incomum e o objetivo desse relato de caso é descrever o tratamento de fratura de mandíbula atrófica associada à instalação de implantes em uma paciente usuária de bisfosfonato oral. Relato de caso: Paciente do sexo feminino com 74 anos apresentava presença de um hematoma submandibular e mobilidade entre dois fragmentos no corpo da mandíbula no lado direito após a instalação de 4 implantes. A paciente reportou uso de bisfosfonato por via oral a 3 anos para tratamento de osteoporose. A fratura foi reduzida e fixada com uma placa de titânio na base da mandíbula e a paciente foi submetida a sessões de câmara hiperbárica por 3 meses. Após 9 meses do procedimento cirúrgico a paciente não apresentou complicações adicionais e o tratamento reabilitador foi finalizado. Conclusão: A fixação foi efetiva no tratamento da fratura em mandíbula atrófica em um paciente usuário de bisfosfonato oral e complicações com osteonecrose não foram detectadas. Adicionalmente, a reabilitação oral com próteses sobre implantes remanescente apresentaram um resultado satisfatório.

PALAVRAS-CHAVES: Bifosfonatos; Fraturas mandibulares; Implantes dentários.

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