

Pathological Fracture of the Mandible Associated to Osteoradionecrosis with Necrotic Bone and Reconstruction Plate Exposure: Case Report

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Abstract

Osteoradionecrosis is a severe and devastating late complication of radiotherapy in patients with head and neck cancer. The diagnosis of Osteoradionecrosis is established by clinical and radiographic evidence of bone necrosis after irradiation. The current article reports a case of osteoradionecrosis in an irradiated patient (male; 62-year-old), which evolved into pathological fracture of the jaw, 2 years after the end of radiotherapy for oral cancer treatment. The patient was rehabilitated in other service, with reconstruction plates, without adjuvant hyperbaric oxygen therapy, progressing to a fistula formation and bone exposure. The patient was referred to our service, with an extensive bone and plate exposure, with signs of severe osteoradionecrosis. After the adequacy of the oral environment, the patient underwent surgery for necrotic bone and reconstruction plate resection, with a primary closure of the skin and intraoral mucosa. The post-operative clinical and radiographic examinations performed after 12 month showed no signal of recurrence. Pathologic fracture in conjunction with osteoradionecrosis has a relatively high treatment complication rate. The incorrect diagnosis of mandibular fracture associated with osteoradionecrosis leads to inadequate treatment, with irreversible consequences to the patient, as described in the related case.

Keywords: Head and neck cancer; Mandible; Osteoradionecrosis; Radiotherapy; Pathologic fracture

Introduction

Osteoradionecrosis (ORN) is a severe and devastating late complication of radiotherapy in patients with head and neck cancer, especially in the mandible, since it has high density and low blood vasculature [1,2]. Typically it is defined as osteonecrosis caused by ionizing radiation [3]. Clinically it is the loss of skin or mucosal tissue and exposure of necrotic bone tissue for at least three months in a previously irradiated area without evidence of residual or recurrent tumor [4]. Progression of the condition may lead to pathologic fracture, intraoral and/or extraoral fistula formation, bone sequestration, trismus, pain, local or systemic infection and sometimes permanent deformity. Other symptoms include dysesthesia, halitosis, dysgeusia and food impaction [5]. The diagnosis of ORN is established by clinical and radiographic evidence of bone necrosis after irradiation, which is not related to tumor recurrence [6]. Most cases of ORN occur in the first years after radiotherapy, and they include almost all cases that developed spontaneously; however, the trauma-induced ORN may develop years after initial therapy [4].

The ORN treatment can range from a conservative treatment or minimal surgical intervention to a radical intervention by complete excision of the affected area, with or without reconstruction, hyperbaric oxygen therapy and more recently, drug therapy with pentoxifylline and tocopherol was added [7,8]. Prevention of ORN is most important management, as the condition may be chronic, progressive and lead to pathologic fracture.

Case Report

The current article reports a case of ORN in an irradiated patient (male; 62-year-old), which evolved into pathological fracture of the jaw, 2 years after the end of radiotherapy for oral cancer treatment. The patient was rehabilitated in other service, with reconstruction plates, without adjuvant hyperbaric oxygen therapy, progressing to a fistula formation and bone exposure (Figure 1). The patient was referred to our service, with an extensive bone and plate exposure, with signs of severe ORN, trismus, teeth in a state of residual root and generalized gingivitis (Figure 2). After the adequacy of the oral environment, the patient underwent surgery for necrotic bone and reconstruction plate

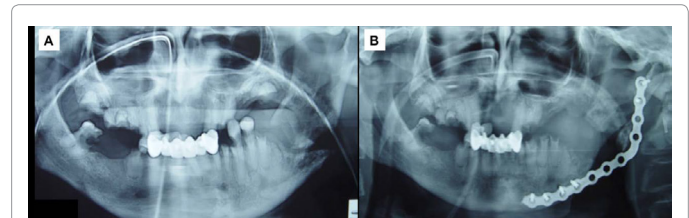


Figure 1: Panoramic radiograph showing extensive osteoradionecrosis and bone fracture (A) and the presence of titanium plate reconstruction (B).

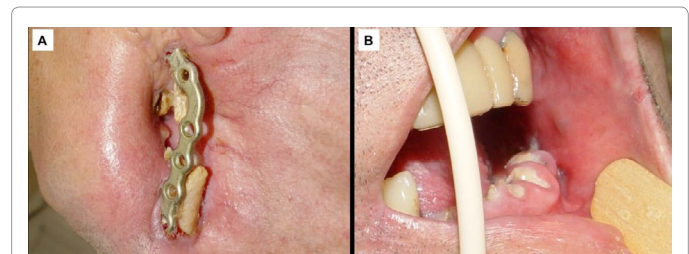


Figure 2: Initial clinical features: plate and bone exposure (A) and intra-oral condition (B).

resection, with a primary closure of the skin and intraoral mucosa. The histological analysis showed a non-viable bone demonstrated by lack of nucleoli in bone lacunae and necrosis of bone marrow, confirming

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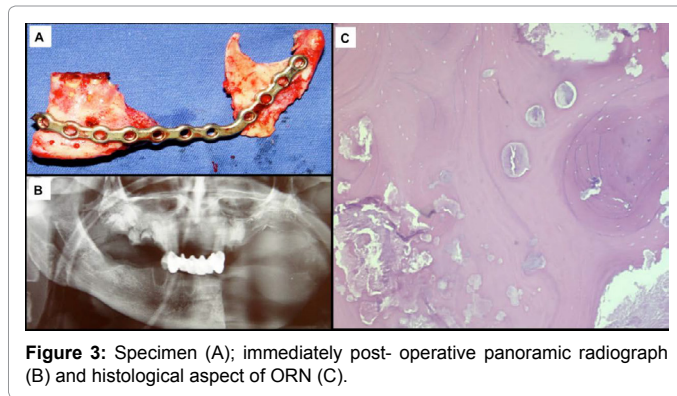


Figure 3: Specimen (A); immediately post-operative panoramic radiograph (B) and histological aspect of ORN (C).

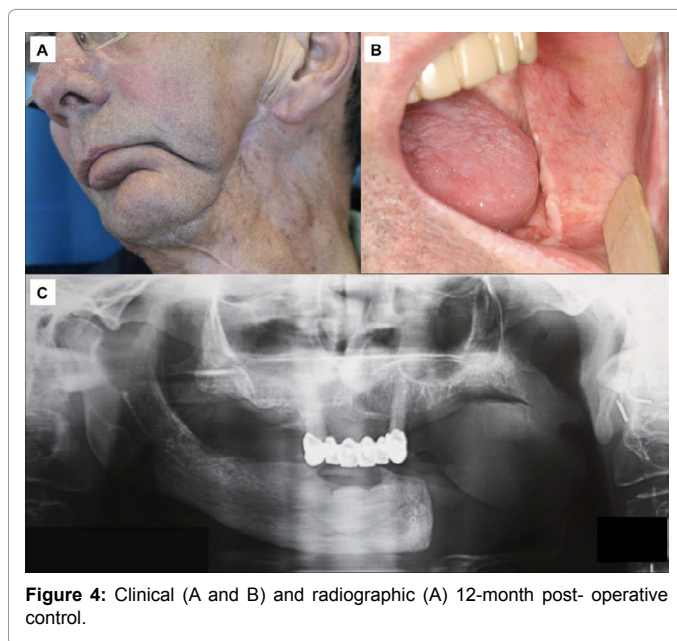


Figure 4: Clinical (A and B) and radiographic (A) 12-month post-operative control.

the diagnostic of ORN (Figure 3). The post-operative clinical and radiographic examinations performed after 12 month showed no signal of ORN recurrence (Figure 4).

Discussion

The incidence of ORN of mandible varies widely in the literature. The most representative study, however, with a retrospective review of 830 patients showed an incidence of 8.2% [9]. Comparison of different incidences published is very difficult due to the variation of risk factors such as tumor location and size, type of tumor resection, radiation techniques and doses applied teeth status before radiotherapy, dental treatment, among others. With the conventional radiation techniques, the rate of ORN was reported to be between 5% and 15%, whereas with newer techniques such as 3D conformal therapy and intensity modulated radiotherapy the rate of ORN has decreased to 6% or less [10].

A review of 1,000 patients irradiated in the head and neck region showed that 2.6% patients developed ORN and 23% of them progressed to pathological fractures. Patients are often elderly, patients with comorbidities such as malnutrition, difficulty swallowing due to surgery and radiotherapy, and possess long-standing habits of tobacco and alcohol [11,12].

Pathological mandibular fractures are rare, accounting for fewer than 2% of all fractures of the mandible. They usually may follow surgical interventions such as third molar removal or implant placement, result from regions of osteomyelitis, osteoradionecrosis, and bisphosphonate-related osteonecrosis of the jaw, idiopathic reasons or be facilitated by cystic lesions, benign, malignant, or metastatic tumors [13].

Patients with pathologic mandibular fractures related to ORN are classified as advanced ORN. In these cases, conservative treatment, including just hyperbaric oxygen therapy is inadequate, since this therapy does not revive or resurrect dead bone. Pathologic fracture in patients with ORN requires advanced therapies, with resection of the necrotic bone [13,14]. The most appropriate treatment for this pathology constitutes radical intervention, removing the necrotic bone until healthy bone, with or without reconstruction. The options for reconstruction include the use of reconstruction plate alone, reconstruction plate with free primary bone graft, reconstruction plate with secondary bone graft or reconstruction with microvascular graft associated with hyperbaric oxygenation therapy prior to surgery and afterwards [11,15]. The microvascular reconstruction allows extensive excision of all necrotic and scarred tissue, and improves the chances of healing and achievement of healthy tissue. It also introduces tissue with a blood supply that has not been irradiated [6]. In the case reported, all necrotic bone of the left side was removed and the adjuvant hyperbaric oxygen therapy was not necessary.

Complementary therapies previously and subsequently used for surgical treatment in irradiated patients minimize complications and promote an optimal outcome for these lesions. The hyperbaric oxygen therapy may be beneficial as an adjuvant treatment for patients with ulcerate ORN and for prophylactic use before dental extractions in high risk patients [3], although this therapy remains controversial and limited due to the high cost of treatment prevents adhesion of many patients. The use of pentoxifylline and tocopherol protocol in patients with osteoradionecrosis is still recent [10]. New technique was presented combining pentoxifylline and tocopherol to antibiotic therapy and removal of bone debris shows the positives for the treatment of ORN results, but needs further research [16]. Despite several existing techniques, the ORN is extremely complex in its treatment, which makes it very important for prevention efforts. It is vital that there is collaboration of the surgical team, the radiotherapist and the patient, so that the main objective is reached.

Conclusion

Pathologic fracture in conjunction with ORN has a relatively high treatment complication rate. The incorrect diagnosis of mandibular fracture associated with ORN leads to inadequate treatment, with irreversible consequences to the patient, as described in the related case.

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