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Case report

Osteoradionecrosis of the jaw caused by periapical periodontitis: A case report

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ABSTRACT

Osteoradionecrosis of the jaws (ORNJ) is a well-known complication of head and neck radiotherapy that may severely impair patient quality of life. Not only dentoalveolar surgery but also root canal treatment may also damage the alveolar bone. This report describes a case of ORNJ in the maxilla following treatment for periapical periodontitis. The patient was treated with chemotherapy and radiotherapy consisting of the course of cisplatin and etoposide, and a total dose of 60 Gy/30Fr for small cell carcinoma of the right-maxillary gingiva. In April 2015, after irradiation therapy, he received root canal treatment in the right-maxillary first premolar because of periapical periodontitis. Six months after root canal treatment, he had developed ORNJ in the right maxilla with acute inflammation, and was thus treated with antibiotics. In April 2016, after treatment of ORNJ, T1- and T2-weighted magnetic resonance images showed a hypointense area surrounding the right-maxillary first premolar. These findings suggest that root canal treatment for dental pulp necrosis may be triggered to cause the ORNJ.

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1. Introduction

Radiotherapy (RT), alone or in combination with surgery, is an established form of therapy for the treatment or palliative care of cancer patients. However, this treatment shows acute and late toxicity. Examples of late toxicity include radiation caries, trismus, xerostomia, myelitis, skin fibrosis, and osteoradionecrosis of the jaw (ORNJ). Among these side effects, ORNJ is the most dreaded complication because there is no established treatment method for it. The mechanism of ORNJ is direct damage to all existing bone cells, marrow stem cells, blood vessels, and all other tissues in the field of the radiation. As a result of this damage, viable cells are lost in the cortical bone and the bone marrow becomes fibrotic over

time in a dose-dependent manner [1]. Clinical diagnosis of ORNJ is defined by the existence of necrotic bone and bone exposure in the head and neck region. Previous reports have shown that dentoalveolar surgeries such as tooth extraction and dental implant treatment can cause ORNJ [2,3]. Following dentoalveolar surgery, secondary infection caused by oral bacteria from the wounded area is frequently seen in ORNJ. Along with the surgically wounded area, pulp necrosis has also been found to be a source of infection [4]. Dental pulp necrosis is caused by acute and chronic stimuli such as dental caries, crown preparation [5], trauma [6], and occlusal force [7]. Dental pulp necrosis can cause periapical periodontitis and inflammatory diseases in the head and neck region, including external dental sinus tract [8] and facial cellulitis [9]. Furthermore, the previous report suggested that periapical periodontitis derived from dental pulp necrosis causing acute inflammation in ORNJ [10]. This report describes the onset and treatment of a case of ORNJ that was found to be caused by dental pulp necrosis.

2. Case report

A 46-year-old man with spontaneous pain and swelling in the right-maxillary region consulted his family dentist. He was referred to the Department of Otorhinology at Nagoya University Hospital.

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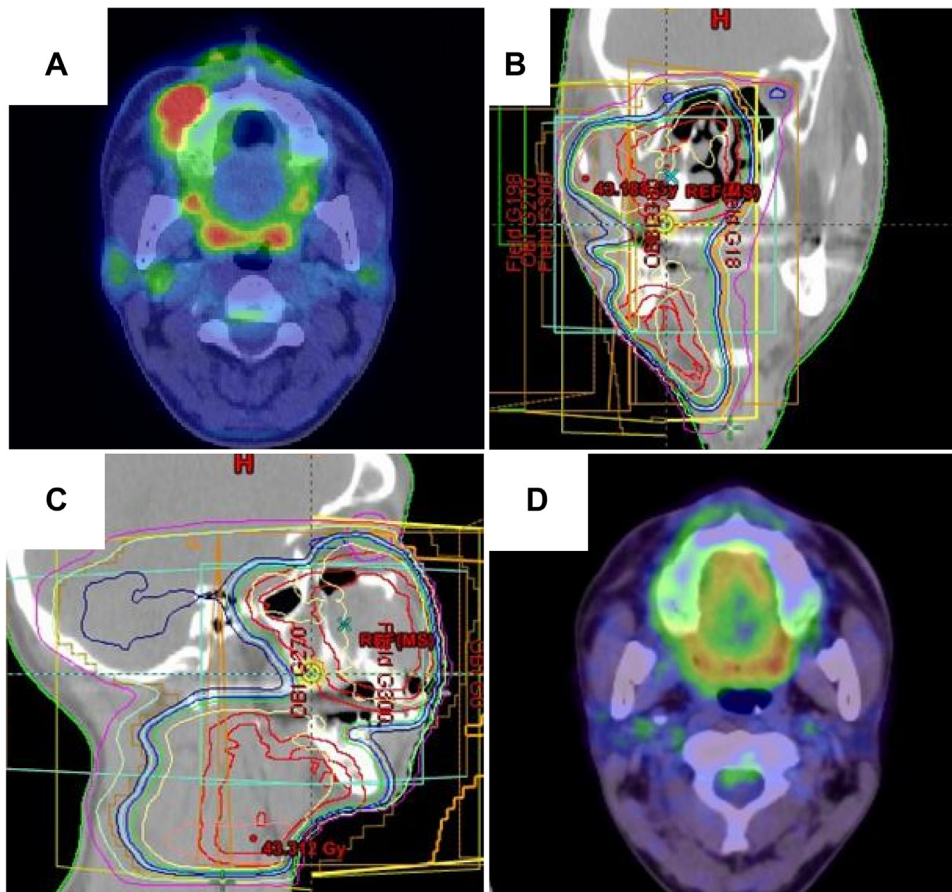


Fig. 1. (A) PET-CT image before chemoradiotherapy (B)(C) CT images of irradiation field. The right upper first premolar was included in the radiation field and irradiated with 43 Gy. (D) PET-CT image after chemoradiotherapy in September 2014.

He was diagnosed with small cell carcinoma of the right gingiva by magnetic resonance imaging (MRI), positron emission tomography – computed tomography (PET-CT), and pathological examination in April 2014. PET-CT imaging showed an abnormally high uptake in the right maxilla (Fig. 1A). MRI of the head showed a giant mass lesion in the maxilla extending to the subcutaneous tissue laterally. The patient refused operation and accepted chemoradiotherapy. He was treated with one course of induction chemotherapy consisting that cisplatin at 80 mg/m² was intravenously administered on day 1 and etoposide at 100 mg/m² was intravenously administered on days 1, 2, and 3 of a 28-day cycle. The patient was subsequently started on concurrent chemoradiotherapy consisting of four course of cisplatin and etoposide similar to the induction chemotherapy, and a total dose of 60 Gy/30Fr of intensity-modulated radiation therapy. The irradiation field included the right-maxilla, mandible, and submandibular lymph nodes (Fig. 1B and C). In September 2014, after chemoradiation therapy, PET-CT and MRI of the head showed a partial response of the predominantly expansive cheek tumor. PET-CT and MRI of the head after completion of chemoradiation therapy showed a significant decrease in tumor size, including complete resolution of the mass in the right maxilla (Fig. 1D). In February 2015, computed tomography (CT) image did not show destruction of alveolar bone and osteosclerosis on the buccal site (Fig. 2A). MRI of the head was performed to check for local recurrence and showed no mass in the maxillary region. T1- and T2-weighted images revealed a hypointense area in the right maxilla compared with the left maxilla around the first and second premolar (Fig. 2B and C arrow). Diffusion weighted image revealed that the hyperintense region in the right maxilla had reduced compared with that was performed in April 2014 (Fig. 2D arrow).

In April 2015, the patient experienced occlusal pain in the first premolar at right maxilla and sought treatment from his family dentist. Radiographic examination showed radiolucent area in the apical area of the right-maxillary first premolar was detected (Fig. 3 arrows). However, a radiolucent area of the crown area of the premolar was not detected (Fig. 3). The family dentist examined the electric pulp test before he underwent root canal treatment. The result of the electric pulp test was negative.

The patient was diagnosed with periapical periodontitis derived from pulp necrosis. He underwent root canal treatment without local anesthesia. Pus discharge from the root canal was not observed during root canal treatment. Root canal filling occurred on the same day. Cefcapene pivoxil hydrochloride 300 mg, taken orally once per day for three days, was prescribed. However, occlusal pain in the right maxilla did not improve. The patient was introduced to the Department of Oral and Maxillofacial Surgery in Nagoya University Hospital in October 2015. The swelling, redness, and tenderness had spread to the surrounding right-maxilla region (Fig. 4A). Hypoesthesia in the right-maxillary region was observed. Additionally, the gingiva on the periapical region of the premolar was swollen but neither an intraoral sinus tract nor a bone exposure was observed (Fig. 4B). Percussion pain was observed in the right-maxillary first premolar but not in the second premolar. Tooth mobility was observed in the right-maxillary first and second premolar. The depth of periodontal pocket on the first and second premolar was 3 mm. Swelling, redness, pus discharge from periodontal pocket was not observed. The blood test results indicated an inflammatory reaction (CRP: 10.67; WBC: 8100). Axial CT revealed that the buccal cortical bone on the right premolar region of the maxilla was ruptured (Fig. 4C). A coronal CT image

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