

Case Report

Osteoradionecrosis of Mandible: A Case Report with Literature Review

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ABSTRACT

Osteoradionecrosis (ORN) of the jaws is a longterm and serious complication of therapeutic radiotherapy for head and neck cancer. It is also known as the effect of radiation on tissues, especially bone, which causes a severe reduction in blood flow, increasing the risk of infection, and inability to recover normally. The mandible is more frequently affected. This article describes a clinical example of ORN of the mandible that developed 4 years after oral cancer therapy and had exposed bone and a necrotic process that covered the entire mandible.

Key words: Mandible, necrosis of bone, osteoradionecrosis, radiotherapy

INTRODUCTION

Marx first described osteoradionecrosis (ORN) as hypovascularity and hypocellularity in 1983. It is also known as ionizing radiation-induced osteonecrosis. It is a very serious side effect of radiotherapy to the jaws that can be caused by tooth extraction, biopsies, cancer surgery, and periodontal procedures. The pathogenesis mechanism is unknown. The prevalence of ORN of the mandible has been reported to range between 2% and 22%. After conventional radiotherapy, the prevalence of ORN in patients with head and neck cancer is around 7.4%, 5.1% after intensity-modulated radiotherapy, and 6.8% after chemoradiotherapy.^[1]

The buccal cortices of the premolar and retromolar regions supplied by the inferior alveolar artery are particularly vulnerable. There is a 20% chance of mandibular osteonecrosis after radiation therapy for head and neck cancer. Radiotherapy can cause ORN.^[2] Surgical trauma, most commonly a dental extraction, is the most common inducing factor reported. Other trauma, mechanical injuries, poor dental status, and so on can also cause necrosis.^[3] ORN can occur spontaneously in <10% of cases.^[4] Pain, swelling, bone exposure, secondary infection, fistula formation, and bone loss are the most typical clinical signs and symptoms of ORN. Without treatment, the problem typically gets worse.^[5,6]

To evaluate the clinical characteristics of ORN causing and risk factors, and care choices, this article discusses a patient who developed ORN 4 years after receiving radiotherapy for tongue cancer.

CASE REPORT

A male patient aged 48 year visited the department of oral medicine and radiology in the Institute of Dental Science with the chief complain of pain in the left lower back region since 4–5 days. On examination, the patient gave the history of squamous cell carcinoma of the tongue, followed by chemotherapy and radiotherapy in 2018, with associated no systemic disease or chronic conditions which were present.

The patient was diagnosed with squamous cell carcinoma of the right lateral border of the tongue 4 years prior in a private hospital. He underwent chemotherapy and radiotherapy for 4 years; later, after radiotherapy, he began to experience pain in the right side of his mandible since 4–5 days, along with discharge or swelling. On a general examination, the patient was well-built, free of abnormalities, and attentive to time, place, and people. All vital signs are in a normal range. On the extraoral clinical examination, it showed bone exposure and necrotic bone in the right lower side of the body of mandible [Figure 1]. A diagnose of ORN of the mandible was made. Panoramic X-ray reports missing 34, 35, 36, 37, 46, 47, and 48 tooth, with generalized horizontal bone loss and showed mixed radiolucency and radio-opaque lesion

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with sequestration which indicated lysis and necrosis of the bone, sequestra formation that involves the mandibular canal and lower mandibular edge, with a pathological fracture [Figure 2].

CT scan [Figures 3 and 4] reveals mixed radio-opaque radiolucent lesion with heterogenous intensity, and sclerotic changes within the bone, the necrosed area, and sequestra formation, we noticed bilaterally on the body of the mandible indicating the pathological fracture, whereas 3DCT image showed necrotic bone, and sequestra formation causing a pathological fracture in the lower border of the mandible. The patient was referred to the department of oral surgery for the needful treatment.



Figure 1: Clinical photograph showing exposed necrotic bone RT mandible



Figure 2: Extensive radiolucency and bone sequestration in right mandibular area that involve the mandibular canal and lower mandibular edge, with a pathological fracture can be seen

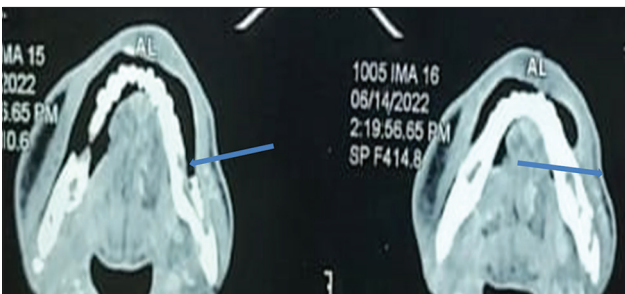


Figure 3: Axial view CT scan showing necrosed bone bilaterally and sequestration in the mandibular region

DISCUSSION

ORN necessitates close monitoring and multidisciplinary collaboration. According to recent studies, better dental preventive care and more advanced radiation treatments like 3-dimensional conformal RT and intensity-modulated radiation (IMRT) are to blame for the ORN incidence's drop to <5%.^[7] The mandible is a frequent location for ORN formation due to its anatomy and vascularization pattern. Compared to the upper jaw, it has a substantially higher density. It absorbs more photons as a result during radiation, which causes pathological vascular alterations. The mandible is more susceptible to ORN than the maxilla, and this is the most logical explanation for this. If necrosis is not treated, it gets worse over time. Although microorganisms have a minor part, secondary infection is a frequent consequence that can result in severe osteomyelitis.^[8]

In a study by Dakir *et al.*, a 71-year-old male patient reported 15 days of facial pain and pus discharge coming from the right side of his face. His medical history reveals the presence of ORN and squamous cell carcinoma, for which he underwent resection and external beam irradiation in another hospital, where he also underwent one round of chemotherapy.^[9]

Our case was diagnosed as of ORN in the right and left mandibular area showing that bone was extensively necrotic, causing a pathological fracture. Although mentioned earlier, the patient had a carcinoma of the right tongue and undergone chemotherapy and radiotherapy in 2018.

Later, he experienced the pain and reduced mouth opening in the right side of the tooth region after complete clinical and radiographic examination radionecrosis of the mandible was diagnosed. The patient was referred to the department of oral surgery for the needful treatment.

A new theory for the pathogenesis of ORN has proposed that damage to bone is caused by radiation-induced fibrosis. Cells in bone are damaged as a result of acute inflammation, free radicals, and the chronic activation of fibroblasts by a series of growth factors.^[10]

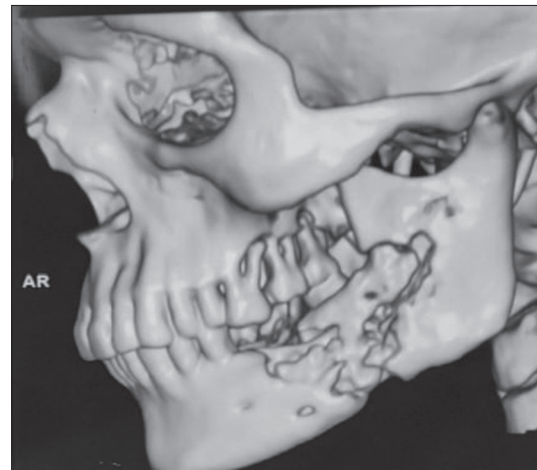


Figure 4: 3D CT scan showing necrotic bone, causing a pathological fracture

This condition also occurs with odontogenic origin, tumor recurrence, and metastatic tumors. Therefore, symptomatic patients require careful examination using a combination of PET, SPECT, and biopsy in addition to CT and MR.

Kubota *et al.*^[11] evaluate factors associated with ORN of the jaw (ORNJ) in patients with head and neck squamous cell carcinoma that 46 patients (7.5%) developed ORNJ. The median follow-up duration was 40 (3–145) months. The median time to ORNJ development was 27 (2–127) months.^[11]

The other 108 patients were managed surgically in the following ways: 18 (15.0%) patients underwent minor surgical operations such as sequestrectomy or debridement, and 90 (75.0%) patients underwent radical resection (four patients were not healed) (one patient unhealed). Of the 90 patients who underwent radical resection, 58 underwent the procedure along with immediate microvascular flap reconstruction (19 bone flaps and 39 soft flaps), and 32 patients underwent the procedure alone (five patients received second-stage reconstruction). Follow-up data showed that 55 patients were disease-free.^[12]

IMRT and 3D-conformal radiotherapy have both been utilized in recent years to lessen RT's unfavorable side effects, with encouraging results.^[13]

CONCLUSION

Although its occurrence has decreased as a result of improvements in head and neck radiation treatment methods, ORN is still a serious oral consequence in this region. The management of ORN should emphasize risk reduction or prevention. Unfortunately, the research lacks defined preventive strategies, which may be the most effective strategy to lower the risk for ORN. The oral and dental care of patients undergoing radiation therapy of the head and neck region involving the jaws are at risk of developing ORN. It begins before and continues during the radiation therapy, followed by life-long regular dental reviews on completion of radiation treatment. Proper and carefully planned pre- and post-radiation therapy, counseling program can reduce the risk of ORN and improve the quality of cancer patient.

REFERENCES

1. Bras J, De Jonge HK, van Meresteyn JP. Osteoradionecrosis of the mandible: Pathogenesis. *Am J Otolaryngol* 1990;11:244-50.
2. Kahenasa N, Sung EC, Nabili V, Kelly J, Garrett N, Nishimura I. Resolution of pain and complete healing of mandibular osteoradionecrosis using pentoxifylline and tocopherol: A case report. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2012;113:18-23.
3. Oh HK, Chambers MS, Martin JW, Lim HJ, Park HJ. Osteoradionecrosis of the mandible: Treatment outcomes and factors influencing the progress of osteoradionecrosis. *J Oral Maxillofac Surg* 2009;67:1378-86.
4. Vanderpuye V, Goldson A. Osteoradionecrosis of the mandible. A case report. *J Natl Med Assoc* 2009;92:579-84.
5. Marx RE. Osteoradionecrosis: A new concept of its pathophysiology. *J Oral Maxillofac Surg* 1983;41:283-8.
6. Peterson DE, Doerr W, Hovan A, Pinto A, Saunders D, Elting LS, *et al.* Osteoradionecrosis in cancer patients: The evidence base for treatment-dependent frequency, current management strategies, and future studies. *Support Care Cancer* 2010;18:1089-98.
7. Jerezek-Fossa BA, Orecchia R. Radiotherapy-induced mandibular bone complications. *Cancer Treat Rev* 2002;28:65-74.
8. Beech NM, Porceddu S, Batstone MD. Radiotherapy-associated dental extractions and osteoradionecrosis. *Head Neck* 2017;39:128-32.
9. Dakir A, Balakrishna R, Dhanavelu P, Kumar S, Priyan S, Muthumani. Osteoradionecrosis-a case report. *Biomed Pharmacol J* 2014;7:687-9.
10. Lyson A, Ghazali N. Osteoradionecrosis of the jaws: Current understanding of its pathophysiology and treatment. *Br J Oral Maxillofac Surg* 2008;46:653-60.
11. Kubota H, Miyawaki D, Mukumoto N, Ishihara T, Matsumura M, Hasegawa T, *et al.* Risk factors for osteoradionecrosis of the jaw in patients with head and neck squamous cell carcinoma. *Radiat Oncol* 2021;16(1):1
12. Dai T, Tian Z, Wang Z, Qiu W, Zhang Z, He Y. Surgical management of osteoradionecrosis of the jaws. *J Craniofac Surg* 2015;26:175-9.
13. Chambers MS, Garden AS, Kies MS, Martin JW. Radiation-induced xerostomia in patients with head and neck cancer: Pathogenesis, impact on quality of life, and management. *Head Neck* 2004;26:796-807.