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Case Report

# Osteoradionecrosis of mandible with pathological fracture: A case report

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## Abstract

In head and neck cancers radiotherapy is used for therapeutic reasons but it results in a grave complication of Osteoradionecrosis (ORN) of the jaws, specially of the mandible. The incidence rate of ORN was up to 15% with the older radiation modalities. However, new treatment modalties like 3D conformal therapy and intensity modulated radiotherapy has resulted in lower incedence rate of up to 6% . The dentist needs to be aware of symptoms of ORN as they can be the first person to diagnose ORN. We here, report a case of mandibular ORN with pathlogical fracture, and its management.

**Keywords:** Mandible, Osteoradionecrosis, Radiotherapy

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## 1. Introduction

The term Osteoradionecrosis (ORN) was coined by Regaud in 1922 and is considered the most challenging complication after radiotherapy head and neck cancer.[1] The recent literature states that ORN of the jaw often presents as necrotic, exposed irradiated bone (dose greater than 50 Gy) that fails to heal over a period of 3 months without any evidence of persisting or recurrent tumour.[2-5] The pathogenesis of Osteoradionecrosis (ORN) is still not clear. However, the radiation arteritis is considered the most common reason for pathological outcome. The radiation arteritis leads to the development of a hypocellular, hypovascular and hypoxic environment in bone which results in the development of Osteoradionecrosis of jaw.[6] The two year incidence of exposed bone is 6.1%, with confirmed incidence of ORN of jaw is reported to be 3.1% as per study conducted by Treister et al. The poor oral health, including long term ORN, influences the survival along with cost of treatment in patients with HNC.[7,8]

The various risk factors associated with development of ORN of jaw are the stage, extent and location of the primary tumor, amount of radiation dose > 50 Gy, the extent of surgery on the primary tumor (mandibulectomies before radiation), dental extractions or bone trauma after radiotherapy (RT), poor oral hygiene, smoking or alcohol abuse, and immune dysfunction due to diabetes mellitus.[9] The high dose of Radiation (>70 gray) usually results in presentation of ORN within 2 years. On the other hand late presentation is seen in compromised tissue secondary to trauma and delayed wound healing.[10]

## 2. Case Report

A 54year old male patient reported to the OPD of department of dentistry with a chief complaint of pus discharge from open wound on left side of the mouth since 2 months. The patient gave a history of open bony wound since 6 months. The patient finds difficulty in mouth opening since 1 week. There was history of ulcer on floor of mouth, diagnosed as moderately differentiated squamous cell carcinoms 3 years back and had undergone surgery and external beam radiation therapy. Additionally he was treated for carcinoma of larynx 8 years back with radiation therapy. On extra oral examination, there was skin scar of a healed sinus on lower left side of mandible. Intraoral examination showed open wound with necrotic bone extending from left alveolus in relation to 36,37 region to left lower retromolar area (**Figure 1**). Provisional diagnosis of ORN was made and pus culture was sent. The orthopantomogram showed, alveolar bone loss in molar region with extension of radiolucency to left angle

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region resulting in pathological fracture of mandible (**Figure 2**). The CT scan confirmed the presence of lytic erosive changes on left side of alveolus (**Figure 3**) with pathological fracture of angle of mandible (**Figure 4**) The pus culture showed growth of MSSA and patient was prescribed cloxacillin 500mg 6 hourly for 14 days followed by the sequestrectomy later. The patient was referred to higher institution for further treatment with hyperbaric oxygen, external fixation and grafting.

**Figure 1:** Intraoral view show open wound with necrotic bone.

**Figure 2:** OPG showing pathological fracture of angle of mandible

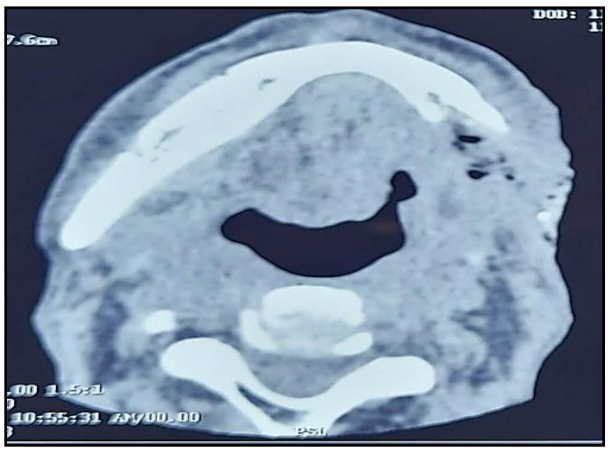

**Figure 3:** Ct scan confirmed the lytic erosive changes on left side in the angle of mandible

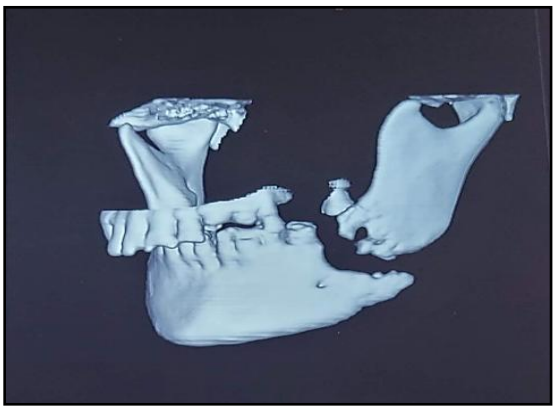

**Figure 4:** Ct scan confirmed the presence of pathological fracture of angle of mandible on left side

## 3. Discussion

The disease cancer is treated by combination of surgery, chemotherapy and radiation therapy. The types of radiation therapy are: curative or palliative. The radiation exposure was not given in a controlled manner in older techniques resulting in larger exposure of 60 to 65 Gy and was not sparing the normal tissues. But with newer technologies like intensity modulated radiation therapy and advanced intensity modulated radiation therapy also called as helical tomotherapy, we can target radiation according to the complex anatomical features of patient and changing size of the tumor without exposing the surrounding normal tissues and organs. This sort of radiation exposure along with the various risk factors can lead to the development of ORN.

The ORN can develop due to various factors like radiation dose >60 Gy, dose rate and fraction size, use of brachytherapy, primary site and size of the tumor, extent of mandible included in primary radiation field, state of dentition, poor oral hygiene, nutritional and immune status, concomitant chemoradiation, ill-fitting denture resulting in chronic trauma, extractions resulting in acute trauma from surgical procedures to the jaw, and advanced stage tumors.[11] The dentate patients has three times higher chance of developing ORN compared to edentulous patients because of trauma during extractions resulting in non-healing socket and also have more chances of developing periodontal diseases resulting in infection. The incidence of ORN after dental extraction is about 5%.

ORN is usually asymptomatic in early stages. It presents as exposed necrotic bone seen through ulcerated mucosa with anatomical site adjacent to previously radiated area, therapeutically due to head and neck cancer. Other symptoms include pain, halitosis, food impaction and fistulation from the oral mucosa or skin. Radiographically, it presents as sclerotic or lytic area and sometimes alongwith pathological fractures.[12]

The largest study that has examined dosimetry parameters for bone avoidance was a study of 1,259 patients with HNC treated with chemoradiation, which showed that limiting no more than 30% of the mandible to receive a dose of 35 Gy or more confers a <5% risk of ORN for patients undergoing pretreatment dental extractions. For patients without pretreatment dental extractions, limiting no more than 30% of the mandible to receive a dose of 42 Gy or more confers a <5% risk of ORN. This study and several others have shown that the volume of mandible receiving at least 50 Gy (V50Gy) is significantly associated with ORN risk.[13]

After the first description of ORN in 1922, several hypothetical pathophysiological models has been proposed, hypoxia being the most accepted one.[14] Recently, Delanian and Lefaix described the fibroatrophic theory which proposed that there is reduced cellular proliferation of fiberoblasts along with no ability to produce collagen in surrounding tissue after radiation expousure.[11]

This is important to understand that of referral to an appropriate dental specialist (including hospital-based dental oncologists) is mandatory before starting chemoradiation. The dental specialist needs to do complete dental prophylaxis which includes complete dental, periodontal, and radiographic examination. This helps to assess risk factors and detects teeth which if not removed, will place the patient at increased risk of ORN after radiotherapy. The dentist needs to educate patient about the lifelong risk of ORN and sways to reduce the risk. They should be educated on how to maintain good oral hygiene and also about importance of regular clinical and radiographic exams to detect any developing periodontal or carious lesion at an early stage, and the importance of avoiding extractions and dent alveolar surgeries post RT. In conditions which complicate dental treatment such as elderly patients with a limited prognosis, or with trismus, options may be limited but still time to time evaluation is necessary.[15]

The conservative measures for treatment of ORN includes use of long term antibiotics after culture sensitivity, local wound irrigation, debridement, sequestrectomy and hyperbaric oxygen therapy (HBO). Marx's classification system has three stages based on response to therapy, and how much ORN is resolved with treatment. Stage I ORN treatment involves primary hyperbaric oxygen (HBO) therapy, regardless of prior treatment. Stage II ORN treatment is a combination of transoral debridement or sequestrectomy, with a primary mucosal repair, followed by additional HBO therapy. Stage III involves a definitive surgical extirpation of all the diseased bone, primary wound closure, and external fixation followed by additional HBO therapy (20 dives). Ten weeks after resection of diseased bone, reconstruction is performed with autogenous cancellous bone packed into a freeze dried allogenic bone carrier. Additional postoperative HBO (10 dives) is then administered for completion of this protocol. Maxillomandibular fixation is maintained for 8 weeks. ORN with a pathologic fracture, orocutaneous fistula, or radiographic evidence of bony resorption of the lower border of the mandible are immediately classified as Stage III disease, bypassing the protocol for Stages I and II disease.[16] According to Marx's classification system, our case would fall under Stage III.

## 4. Conclusion

Osteoradionecrosis (ORN) of the mandible is still a serious and difficult consequence for patients receiving radiation therapy for head and neck malignancies. Although developments in radiation treatments, like as intensity-modulated radiation therapy, have reduced the prevalence of ORN, the disorder still poses significant hazards, particularly in patients with poor oral health, impaired immune systems, or a history of tooth trauma. Early diagnosis and intervention are critical, and dentists play an important role in recognising ORN symptoms, which are frequently the first indication of the disorder.

The treatment of ORN necessitates a multidisciplinary approach, which includes comprehensive dental examination and the use of conservative treatments such as antibiotics, debridement, and hyperbaric oxygen therapy. In more severe cases, such as the one described in this study, the condition advances to a pathological fracture, necessitating more intrusive treatments such as sequestrectomy, external fixation, and further HBO therapy. Marx's classification system can assist guide treatment and forecast results based on disease severity.

Preventive treatments, such as pre-treatment dental prophylaxis, regular oral care, and avoiding tooth extractions following radiation therapy, are critical in lowering the risk of ORN. Ongoing education for both patients and healthcare providers is essential for improving results and reducing the long-term burden of this severe condition.

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## 6. Conflict of Interest

None.

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