Bilateral Osteoradionecrosis of Edentulous Jaw: A Case Report with Review of Literature

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ABSTRACT

Osteoradionecrosis (ORN) of the jaws, particularly of the mandible is a long term and serious complication of therapeutic radiotherapy of head and neck cancer. The mandible is affected more commonly than any other bones of the head and neck region. This condition presents with a non-healing wound persistent for 3 months or more characterized by the irradiated bone getting exposed and devitalized with the loss of the overlying skin or mucosa. We here report a case of mandibular osteoradionecrosis with the discussion of etiology, pathogenesis, clinical features, preventive measures and management of ORN.

KEYWORDS: Mandible, Osteoradionecrosis, Radiotherapy

INTRODUCTION

One of the most serious and severe complications of management of head and neck radiotherapy is osteoradionecrosis (ORN).[1] ORN describes the process where irradiated bone undergoes necrosis and becomes exposed through soft tissue. The first report of ORN of the jaws after radiation therapy was published in 1992 by Regaurd. Ewing in 1926 first recognized and reported the bone changes associated with radiotherapy (RT) and described this state as radiation osteitis.[2] The total incidence of ORN after tooth extraction among irradiated patients as found in a study was 7%. [3] ORN is rare after radiation of less than 60gy. With the older radiation techniques, the rate of ORN was reported to be between 5% and 15%, while with newer techniques such as IMRT, brachytherapy, 3D conformal RT, stereotactic RT, radiofrequency ablation, radioimmunotherapy have decreased rate to 6% or less.[2]

CASE REPORT

A 56 years old male reported to the dental outpatient department with the complaint of pain on the lower jaw since 2 years and also pus discharge below the left lower chin since 4 months (Figure 1). History reveals that pain was of gradual onset, moderate, continuous type. The pus discharge was tinged with blood which was active discharge while consuming food. Medical history revealed that he is known diabetes mellitus for the past 6years and treated for cancer on the left side of the tongue 4 years ago with chemotherapy and radiotherapy.

Extra orally, facial asymmetry noticed on the left side due to the single diffuse swelling in the left lower part of the face approximately measuring about 6 cms in diameter. The superior extends to an imaginary line drawn from the commissures of the mouth to the area in front of the tragus of the ear, inferiorly 2.5 cms below the lower border of the mandible, medially crosses the midline approximately 3 cms and laterally till the angle of the mandible. A sinus opening was prominently seen surrounded by reddish crestations. . On palpation, the swelling was firm in consistency, tender, local rise in temperature elicited and fixed to the underlying structure (Figure 2) .

Figure 1 :Patient profile

Intra orally, a prominent bone exposure was appreciated in the alveolar ridge of 36 and 46 regions resulting in a crater like a defect. On palpation ,the loss of continuity of the alveolar ridge was evident, tenderness elicited with the discharge of pus, paresthesia was absent (Figure 3).

Correlating history and clinical findings, we provisionally considered osteomyelitis in edentulous 35,36,45,46 region. Clinical differential diagnosis includes action-mycosis, tuberculous infection, intraosseous carcinoma. The patient was subjected to radiological investigation.

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Figure 2: Swelling in the left lower chin with sinus opening surrounded by reddish crestration

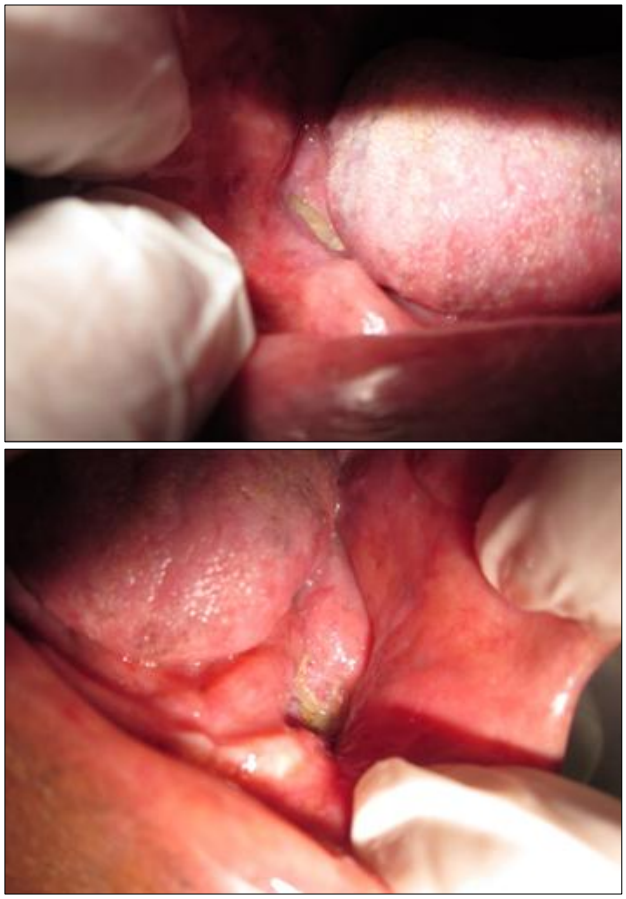


Figure 3: Bony exposure with loss of continuity of alveolar ridge in 36 and 46 teeth

OPG reveals, gross pathological changes were seen in the mandible bilaterally. A large diffused mixed lesion was evident in the left body of the mandible approximately measuring about 5cm X 3cm with a break in the continuity of the lower border of the mandible suggestive of the pathological fracture. There was destruction of the path of the inferior alveolar canal was destructed within the pathological area (Figure 4) CT reveals, an ill - defined enhancing soft tissue thickening lower alveolus on both sides extending anteriorly up to the subcutaneous plane with adjacent cortical break with lysis in the body of the mandible on both sides giving an impression of post- radiotherapy changes (Figure 5).

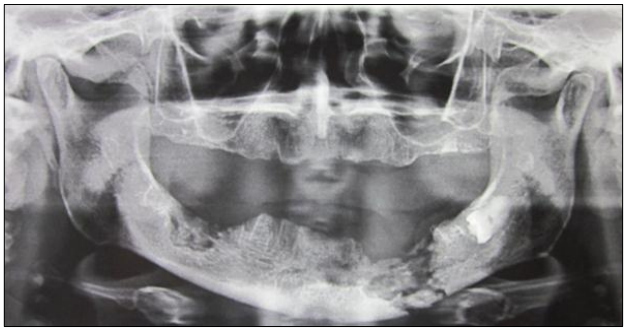


Figure 4: OPG reveals, diffuse mixed lesion were evident in the mandible bilaterally with pathological fracture on the left lower border of mandible.

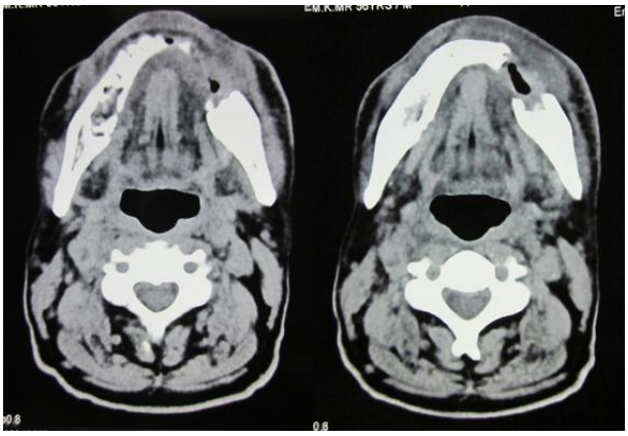


Figure 5: CT axial section reveals, ill defined enhancing soft tissue thickening with cortical break and lysis in the alveolus of mandible bilaterally.

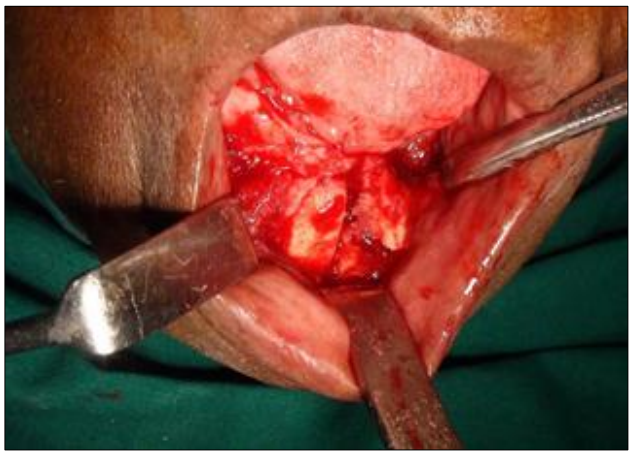
Following the radiological investigations, a swab test was performed on the left side of the exposed alveolus where there was evident pus discharge and most prominent organisms grown out from the culture to suggest E.Coli (Figure 6).

The patient was submitted to surgical management. The pathological site was surgically opened under GA and fragments removed (Figure 7). Impregnated beads of gentamycin were placed in the surgical bed .

Histological examination reveals, decalcified bone, shows irregular bony trabacule with empty lacunae associated with an absence of osteocytes. Reversal lines are also evident with bone marrow spaces and RBC's (Figure 8). Based on the history, clinical, radiological, laboratory and

histopathological investigations a final diagnosis of Osteoradionecrosis in the edentulous 34,35,36,46,47 teeth region was made.

Figure 6 : Swab test shows active collection of pus



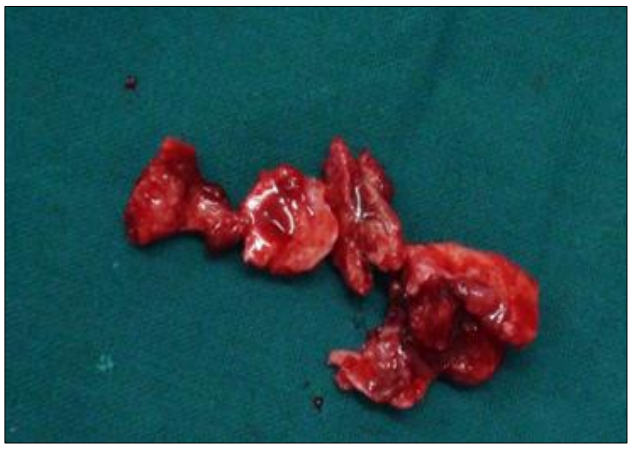


Figure 7 : Surgically excised sequestrum

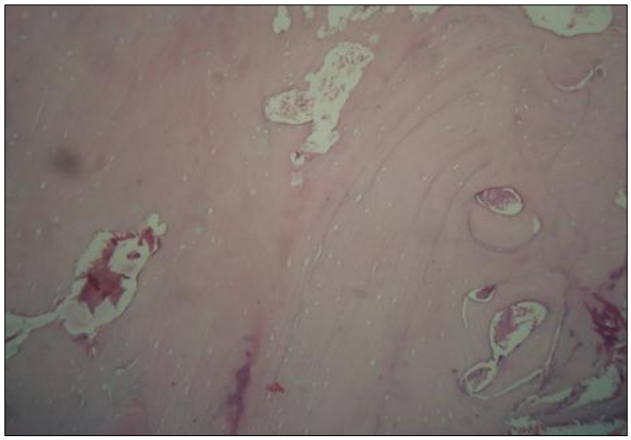


Figure 8 : H & E stained 40X magnification reveals, decalcified bone shows irregular bony trabaculae, empty lacunae with absence of osteocytes.

A close post operative follows up was made. The patient responded to treatment effectively with good healing evident bilaterally. However, a surgical reconstruction was yet to be performed (Figure 9).

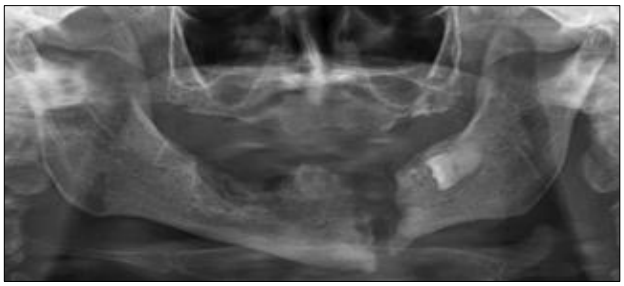
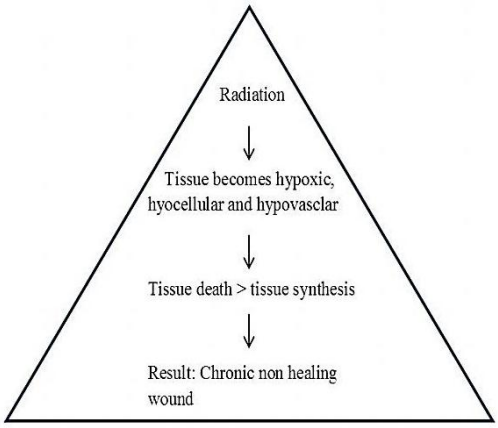


Figure 9 : Patient followup of one year

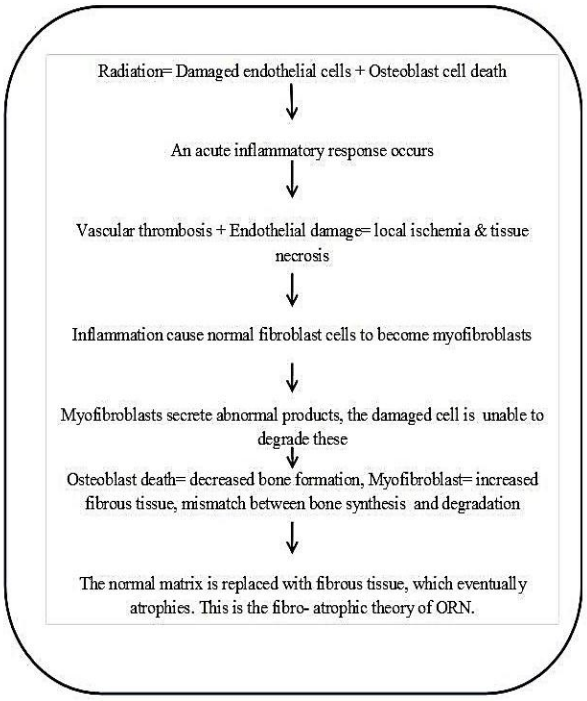
DISCUSSION

" Osteoradionecrosis (ORN) is defined as exposed bone tissue that had previous irradiation and which fails to heal over a period of 3 months in the absence of a residual or recurrent tumour".[4] The risk factors for the development of ORN include size and site of the tumour, radiation dose > 60gy, use of brachytherapy, injury or dental extraction, infection, immune deficiencies and malnutrition.[5,6] ORN pathophysiology remains controversial with various theories put forward. There is classic triad described by Meyer in the pathophysiology of ORN includes radiation, trauma, and infections. The above theory was improvised by Marx postulating it as the hypoxic-hypocellular, hypo vascular theory. It occurs in 4 steps sequence in which after radiation exposure there is a formation of hypoxic-hypocellular-hypovascular tissue leads to excess collagen lysis and cellular death which eventually leads to chronic non-healing wound[7] (Graph 1).[9] The most recent theory is the radiation fibro atropic theory described by Delanian&Lefaixsuggesting activation and dysregulation of fibroblastic activity of the previously radiated area which leads to progression of ORN[8] (Graph 2).[9]

When ORN develops, it starts as a small area of mucosal breakdown with exposure of the underlying bone, and progressively patient starts developing trismus, neuropathic pain, and chronic drainage. Additionally, patients also experience collateral damage from radiation therapy (i.e. xerostomia, chronic trismus, dysgeusia,



Graph 1:Marxs' theory of 'Three H's'



Graph 2 : The fibro-atrophic cascade involved in ORN

dysphagia, and decreased tongue mobility). These problems, in combination with symptoms from ORN, often leave patients functionally and emotionally disabled.[8] The mandible is affected more than any other bones of head and neck region. The mandible receives blood supply comparatively less than other facial bones.The Posterior mandible has a denser bone with higher mineral content and thus higher absorbed radiation dose. Also, mandible is more likely in the field of radiation for oropharyngeal cancers.[2,10]

There are several classification systems which determine the severity of ORN to guide its management . More recently, Kagan and Schwartz (2002) described a three - stage clinical staging system based on clinical and radiologic findings and treatment is determined based on the stage (table 1).[8]

Stage	Description	Treatment
I	Superficial involvement,only cortical bone exposed & minimal soft tissue ulceration	Majority improve with conservative management
II A.Minimal soft tissue ulceration B. Soft tissue necrosis	Localised involvement of mandible, ex posed cortical and medullary bone are necrotic & possible orocutaneous fistula	Majority improve with conservative management, surgical procedures, or hyperbaric oxygen therapy
III A.Minimal soft tissue ulceration B. Soft tissue necrosis	Diffuse involvement of the mandible, including the lower border. Pathologic fracture may occur	

Table 1 : Clinical staging of ORN

Diagnosis is primarily from history and examination. One criterion states: "The presence of persistent exposed bone after 6 months of conservative management is diagnostic". Diagnosis is aided by an orthopantomogram (OPT) to observe the different densities of bone and soft tissue. Histological can also be used to show necrosis of the bone.[9]

Prevention of ORN is an extremely important part of the comprehensive management of patients who undergo external beam radiation therapy to the head and neck. All diseased teeth should be extracted 21 days before initiation of radiation therapy. All patients should be instructed on meticulous oral hygiene and fluoride should be applied to the dentition daily via custom moulded trays. Patients should undergo weekly check up during RT and monthly follow- ups for the first six months. Following early post- treatment patient should visit their dentists for every four months.[11]

There are a number of treatment options available for ORN depending on the severity of the disease and individual patient factors.[12] Conventionally consists of various conservative measures, including the use of long-term antibiotics, local wound irrigation, debridement, sequestrectomy and hyperbaric oxygen therapy.[13,14] Recently, reported treatment regimen for established ORN has focused on vascular directed therapy using the pentoxifylline (PTX, PENTO) 1200mg/day for 6 months works by counteracting tumour necrosis factor alpha (TNG-α) and antioxidant therapy alpha-tocopherol (Vitamin E) which removes free radicals generated during oxidative stress.[13,14] Kahenasa et al., suggested that further controlled and randomized clinical trails using the PENTO are necessary to confirm the effectiveness of PENTO regimen in the treatment of ORN.[15,16]

CONCLUSION

Osteoradionecrosis is a significant complication of radiation therapy to the head and neck. As part of the health care team, it is essential that dental practitioners establish a previous history of radiotherapy to the jaws and chalk out a proper dental treatment plan in

conjunction with the oncology team to prevent any such complications.With the ever increasing burden of cancer on society, side effects associated with its treatment only add to the distress of the patients. Recent advances in the understanding of ORN pathogenesis have opened new perspectives in its management.

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