OSTEORADIONECROSIS OF MANDIBLE: A CASE REPORT

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INTRODUCTION

ORN is a serious complication of radiotherapy for head and neck cancer. It was first described by Regaud in 19221. ORN can be defined as an irradiated bone that gets exposed through an ulcerated mucosa and fails to heal for over a period of three months without any presence of persisting or recurrent tumour2.The most common reason for its occurrence is radiation arteritis which induces 3H environment in an irradiated bone i.e., Hypocellular, Hypovascular and Hypoxic environment and results in this pathology3.

CASE REPORT:

A 34 year old female patient reported to the department of oral medicine and radiology with the chief complaint of pain in lower left back tooth region for past 10 days. Patient also gave history of exposed bony fragments. She also gave history of occurrence of adenoid cystic carcinoma of vallecula before 11 years and had undergone surgery and radiotherapy before 10 years with no evidence of recurrence.

On Intra-oral examination, inspection revealed an exposed necrotic bone of size approximately 1cm x 1cm in lower left alveolar ridge in relation to 36 region with mild vestibular obliteration. On palpation it was mildly tender and the obliteration was bony hard in consistency.

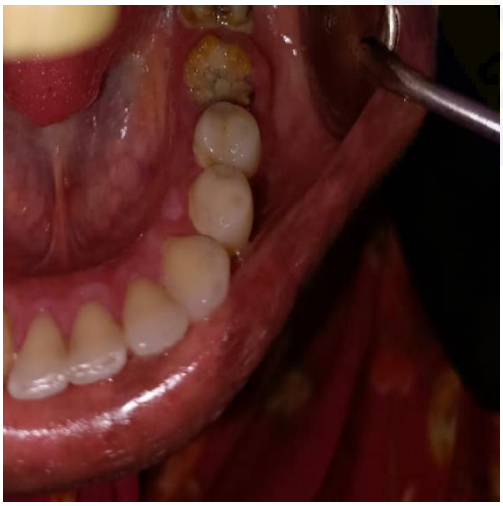


Fig.1-Exposed necrotic bone in 36 region

OPG reveals presence of root fragments in relation to 36 with an irregular radiolucency in its apical region extending to the cortex. CT reveals no periosteal reaction and cortical destruction was evident on buccal side in relation to mandibular alveolar process on left side. On PET/CT scan, spot of increased metabolic activity in mandibular alveolar process on left side was present. The spot type uptake of FDG probably reflects inflammation due to odontogenic foci that lead to the clinical presentation.

Fig.2.a:IOPA

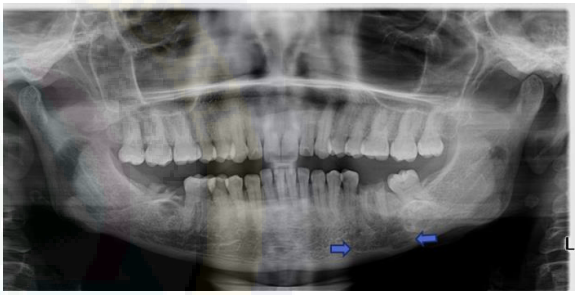
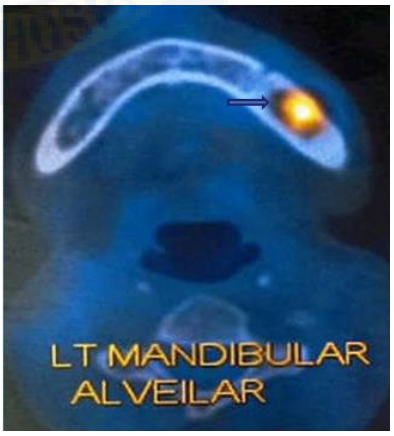


Fig.2.b:OPG



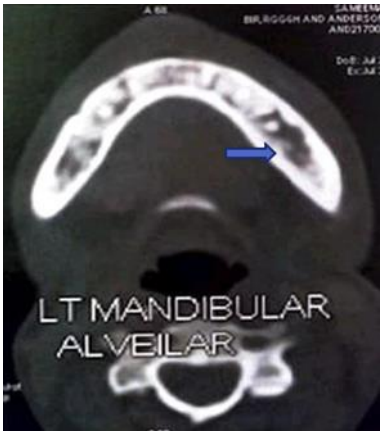


Fig.2.c: PET/CT

Fig.2:Radiographic Investigations

On correlating the clinical and radiographic features and based on staging by Schwartz et.al.4, diagnosis of Stage 1 Osteoradionecrosis of Mandible was made and was under conservative management. Advised Cap.Amoxycillin 500mg BD , Tab.Flagyl 400mg BD , Tab.Pan 20 BD (1/2 an hour before food) for 3 days and the patient is under follow-up.

DISCUSSION:

The effect of radiation in a cell and tissue may be either deterministic or stochastic. Deterministic effects have severity of response proportional to dose. At earlier stage of radiation exposure, extremely radiosensitive cells like basal cells of oral mucous membrane will be affected resulting in oral mucositis. Later upon chronic exposure, intermediately radiosensitive cells i.e., connective tissue cells such as fibroblasts, osteoblasts, osteoclasts, vascular endothelial cells and mesenchymal cells will be affected and forms the basis of pathophysiology of ORN 5. It has an incidence of around 2-22% with the most common bone affected being mandible particularly the posterior region compared to maxilla because of its relative hypovascular nature and increased bone density which results in increased absorption of radiation 6.

ORN is a type of late radiation toxicity whose occurrence is not only dependent on the radiation exposure but also on the oral health of the person being exposed to the radiation. It can be either spontaneous following high dose of radiation exposure i.e., between 6 months to 2 years or can be trauma induced (which may be iatrogenic trauma/inflammatory trauma/physical trauma) in those receiving low dose of radiation exposure where trauma is necessary to initiate ORN. Thus the risk of developing trauma induced ORN following radiotherapy remains lifelong7.

There have been various theories proposed to explain about the pathophysiology of ORN. Meyer in 1970 proposed radiation, trauma and infection theory. It suggested that trauma facilitated the invasion of micro-organisms in an irradiated bone and ORN is considered as the secondary infection after injury to devitalised bone. However there has been onset of ORN with no injury. Thus Marx in 1983 proposed hypoxic, hypovascular and hypocellular theory as a new way of understanding the pathophysiology behind ORN. He concluded that ORN is a complex metabolic and homeostatic deficiency of the tissue as a result of radiation-induced cellular injury where micro-organisms play

a contaminating role with or without trauma being the initiating factor. Due to both direct injury and indirect injury mediated by generation of free radicals following irradiation, there is development of hypoxic, hypovascular and hypocellular environment. It causes increased breakdown of tissue and chronic non-healing wound 8.

Radiation induced fibroatrophic theory in 2004 suggests that activation and dysregulation of fibroblastic activity is the key event in progression of ORN that leads to atrophic tissue in previously irradiated area. The bone remains paucicellular, fibrosed and poorly vascularised even decades after radiotherapy and these irradiated area remains fragile.After any physicochemical trauma, they may be subjected to late reactivated inflammation and may develop ORN 8,9.

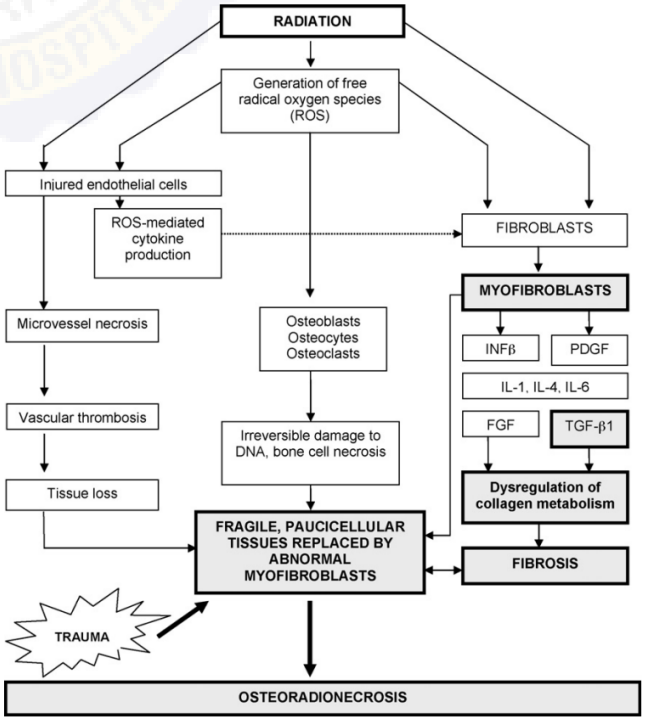


Fig.3:Radiation-Induced Fibroatrophic theory of ORN

In early stages, ORN can be asymptomatic. Exposed devitalised bone seen through an ulcerated mucosa is the main feature.Pain,dysesthesia,dysguesia,food impaction and halitosis can also be seen.In severe cases,fistula formation through skin / mucosa, complete devitalisation of bone with or without pathological fractures can be seen 6. Many authors had categorised ORN based on clinical and radiological features into various stages. One such staging by Schwartz et al4 is as follows:

Stage I	Minimal soft-tissue ulceration and limited exposed cortical bone. Patients are treated with conservative management
Stage II	Localised involvement of the mandibular cortex and underlying medullary bone
IIa	Minimal soft tissue ulceration
IIb	Presence of an oro-cutaneous fistula and mild soft-tissue necrosis
Stage III	Full-thickness involvement of the bone, including the inferior border. Pathological fractures may also be present

Table-1:Schwartz et al classification of ORN

The possible risk factors associated with development of ORN can be categorised as radiation associated risk factors, primary tumor associated risk factors and risk factors associated with dental health of the patient receiving radiation. The radiation associated risk factors irrespective of whether curative or adjunct therapy include total dose of more than 60Gy,conventional fractionation method, radiotherapy method followed being either external beam radiotherapy or brachytherapy. Primary tumor associated factors include Stage III / Stage IV primary tumor in tongue/ retromolar region/ floor of mouth have higher risk of developing ORN. Poor oral health with periodontally weak teeth, grossly decayed teeth in patients receiving radiation therapy have increased risk of ORN. Radiation therapy started within 2 weeks following dental extraction may also predispose ORN 10.

Kojima et al15 in 2017, conducted the study to determine the relationship between dental status of the patients and development of ORN. Out of 30 reported ORN cases, 14 were due to apical periodontitis , 2 were due to root stumps, 6 were spontaneous, 1 was due to extraction before RT, 2 were following surgery, 5 were due to extraction. The factors that would have aided in progression of ORN in this case may include conventional fractionation method, primary tumor in tongue(vallecula),presence of root stumps with periapical infection10.

Management depends on the clinical stage of the ORN. Superficial ORN can be treated following conservative therapy i.e., local irrigation using normal saline , NaHCO3 or chlorhexidine 0.2% , systemic antibiotics , avoidance of irritants such as denture , alcohol and tobacco usage with proper oral hygiene maintenance. Along with the above mentioned management, sequestrectomy, HBO (Hyperbaric Oxygen) therapy can be done in case of localised ORN11. Severe cases with pathological fractures may require vascularised tissue transfer. Pentoxifylline(potent vasodilator) 800mg along with tocopherol (antioxidant) 1000IU given orally for 6-24 months has also shown 89% recovery of ORN12.The protocol for patients requiring dental treatment following radiation therapy is shown in

Fig.4.

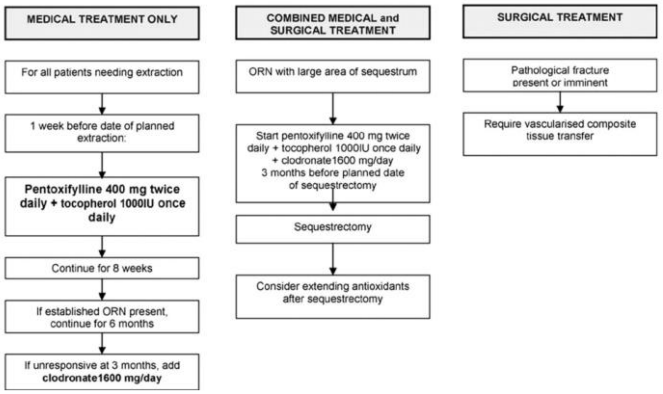


Fig.4:Protocol for patients requiring dental treatment following radiation therapy

CONCLUSION:

Prevention is always better than cure. Proper knowledge about ORN and its associated risk factors is essential so that ORN can be prevented by avoiding the risk factors associated with them while treating the primary tumor. Use of simple customised lead device covering maxilla and mandible can be done to avoid its exposure to radiation. Complete dental checkup must be done and dental treatment must be done if necessary prior to 21 days of initiation of radiation therapy13,14. Post radiation therapy, dental checkup must be done three months once to check for presence of any odontogenic infection in an irradiated bone and to treat them at the earliest to avoid in ORN occurrence16. Preventive measures against ORN development before, during and after radiation therapy is given in table-2.

Preradiation therapy
• Thorough assessment of dentition, periodontium, and oral hygiene (obtain radiographic information as needed) • Extraction of nonsalvageable teeth (allow 3-4 wk for wound healing) • Initiation of preventative measures (brushing teeth, topical fluoride application, oral rinses, trismus prevention exercises) • Nutritional consultation (optimization of nutritional status)
During radiation therapy
• Continue preventative measures (brushing teeth, topical fluoride application, oral rinses, trismus prevention exercises, avoiding denture use) • Appropriate follow-up with the dental team per institutional policy • Employ treatment measures as needed for mucositis, plaque removal, pain relief, oral dryness, and trismus
Postradiation therapy
• Close follow-up with the dental team • Continue preventative measures (brushing teeth, topical fluoride application, oral rinses, trismus prevention exercises, wait for 3 mo before denture use) • Ideally no extractions needed; however, if needed, it should be carried with appropriate measures taken

Table-2:Preventive measures against ORN development before, during and after radiation therapy

REFERENCES:

1. Regaud C. Sur la sensibilite du tissu osseux normal vis-a-vis des rayons X et gamma et sur la mecanisme de l'osteoradionecrose. CR Soc Biol (Paris). 1922;87:629-932.

2. Harris M. The conservative management of osteoradionecrosis of the mandible with ultrasound therapy. British Journal of Oral and Maxillofacial Surgery. 1992 Oct 1;30(5):313-8.

3. Marx RE. Osteoradionecrosis: a new concept of its pathophysiology. Journal of oral and maxillofacial surgery. 1983 May 1;41(5):283-8.

4. Schwartz HC, Kagan AR. Osteoradionecrosis of the mandible: scientific basis for clinical staging. American journal of clinical oncology. 2002 Apr 1;25(2):168-71.

5. Ongole R, Praveen BN, editors. Textbook of Oral Medicine, Oral Diagnosis and Oral Radiology E-Book. Elsevier Health Sciences; 2021 Apr 13.

6. Rathy R, Sunil S, Nivia M. Osteoradionecrosis of mandible: Case report with review of literature. Contemporary clinical dentistry. 2013 Apr;4(2):251.

7. Nabil S, Samman N. Risk factors for osteoradionecrosis after head and neck radiation: a systematic review. Oral surgery, oral medicine, oral pathology and oral radiology. 2012 Jan 1;113(1):54-69.

8. Lyons A, Ghazali N. Osteoradionecrosis of the jaws: current understanding of its pathophysiology and treatment. British Journal of oral and maxillofacial surgery. 2008 Dec 1;46(8):653-60.

9. Riley PA. Free radicals in biology: oxidative stress and the effects of ionizing radiation. International journal of radiation biology. 1994 Jan 1;65(1):27-33.

10. Curi MM, Lauria L. Osteoradionecrosis of the jaws: a retrospective study of the background factors and treatment in 104 cases. Journal of Oral and Maxillofacial Surgery. 1997 Jun 1;55(6):540-4.

11. Nadella KR, Kodali RM, Guttikonda LK, Jonnalagadda A. Osteoradionecrosis of the jaws: clinico-therapeutic management: a literature review and update. Journal of maxillofacial and oral surgery. 2015 Dec;14:891-901.

12. Delanian S, Depondt J, Lefaix JL. Major healing of refractory mandible osteoradionecrosis after treatment combining pentoxifylline and tocopherol: a phase II trial. Head & Neck: Journal for the Sciences and Specialties of the Head and Neck. 2005 Feb;27(2):114-23.

13. Levendag PC, Visch LL, Driver N. A simple device to protect against osteoradionecrosis induced by interstitial irradiation. The Journal of Prosthetic Dentistry. 1990 Jun 1;63(6):665-70.

14. Vahidi N, Lee TS, Daggumati S, Shokri T, Wang W, Ducic Y. Osteoradionecrosis of the midface and mandible: pathogenesis and management. InSeminars in Plastic Surgery 2020 Nov (Vol. 34, No. 04, pp. 232-244). Thieme Medical Publishers, Inc..

15. Kojima Y, Yanamoto S, Umeda M, Kawashita Y, Saito I, Hasegawa T, Komori T, Ueda N, Kirita T, Yamada SI, Kurita H. Relationship between dental status and development of osteoradionecrosis of the jaw: a multicenter retrospective study. Oral surgery, oral medicine, oral pathology and oral radiology. 2017 Aug 1;124(2):139-45.

16. Katsura K, Sasai K, Sato K, Saito M, Hoshina H, Hayashi T. Relationship between oral health status and development of osteoradionecrosis of the mandible: a retrospective longitudinal study. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2008 Jun 1;105(6):731-8.