

# Management of Osteonecrosis Following Radiotherapy for Oropharyngeal Cancer

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**Chief Complaint:** Osteoradionecrosis (ORN) of the jaw

**History of Present Illness:** 70-year-old male with history of cT4aN2bM0 SCC of the oropharynx s/p definitive chemoradiation (9/2018) and ORN of the mandible presents for follow-up debridement of the mandible complaining of 1 month of persistent jaw pain. He first complained of the jaw pain 3 months ago when he initially presented with an area of exposed mandibular bone present in the right and left alveolar ridges. He was diagnosed with ORN and given pentoxifylline and vitamin E. After 2 months, the amount of exposed bone had decreased, but patient reported persistence of pain and was not able to wear his dentures due to the exposed bone despite medical therapy. The patient received debridement and curettage of the mandible 1 month ago, but the jaw pain persists. Patient denies fevers, chills.

**Past Medical History:**  
Oropharyngeal squamous cell carcinoma of the retromolar trigone s/p CRT 9/2018

**Past Surgical History:**  
Debridement of mandible 1.5cm in size, 01/2020  
Direct laryngoscopy with biopsy, 2018  
Tracheostomy  
Herniorrhaphy, 1996

**Medications:** (selected)  
chlorhexidine 0.12%, 15mL  
pentoxifylline, 400 mg oral  
Vitamin E supplement

**Allergies:** NDKA

**Social History:** Former smoker: 10 cigarettes per day, 27 pack-years; denies illicit  
Former drinker: Daily liquor, beer, wine; started age 16, ended age 67  
Unemployed, lives with cousin

**Vital Signs:** 35.4°C, 76 HR, 17 RR, 116/71 mmHg, 9/10 pain

**Physical Exam:**  
General: Well-appearing, no acute distress  
Head/Face: Normocephalic, non-traumatic, House-Brackmann score 1 bilaterally (normal facial movement)  
Oral Cavity: Edentulous. No lesions of the tongue, buccal mucosa, floor of mouth, hard or soft palate. Trismus to 3 cm – stable since last visit. Bilateral alveolar ridge with areas of postsurgical mucosal flaps, some areas of persistent exposed mandible at surgical sites, certain areas healing well, others with exposed bone with fibrous tissue  
Neck: Neck with post radiation edema/firmness, stable. Tracheostomy site well healed without fistula or drainage  
Resp: Non-labored on RA.

- Diagnosis, Assessment, Plan**
- ❖ No evidence of SCC recurrence on exam.
  - ❖ Early stage ORN of mandible with exposed bone due to CRT, now s/p surgical debridement and curettage 1.5cm in size
  - ❖ Continue taking vitamin E and pentoxifylline
  - ❖ Do not recommend antibiotic treatment for pathology and culture results with various species of bacteria.
  - ❖ Recommend hyperbaric oxygen therapy (HBOT) due to areas of persistent exposed bone.
  - ❖ Will consider further surgery in the future pending response to HBOT. Follow up in 2 months.

- Discussion of Disease Process/Clinical Correlations**
- Oropharyngeal cancer**
- ❖ Malignant transformation of the tissue of the oropharynx - can include the includes the base of the tongue, the tonsils, the soft palate, and the walls of the pharynx.<sup>1</sup>
  - ❖ 95% are squamous cell carcinomas
  - ❖ Risk factors: cigarette smoke exposure, HPV-16 infection
  - ❖ Vast majority are sporadic cancers, not associated with inheritance patterns.<sup>2</sup>
  - ❖ Molecular: cigarette smoke shifts cancer stroma toward glycolysis and induces head and neck cancer aggressiveness by upregulating metabolism.<sup>3</sup>

- Osteoradionecrosis (ORN)**
- ❖ Epidemiology: A complication of radiation that occurs in 3-10% of patients who receive more than 7000 cGy of ionizing radiation to treat a head or neck malignancy.
  - ❖ Clinical presentation: infection, tooth loss, pathologic fracture of the jaw (Fig. 1).<sup>4</sup>  
Stage 1: Only exposed cortical bone is necrotic  
Stage 2: Both exposed cortical bone and underlying medullary bone are necrotic  
Stage 3: Full diffuse involvement of mandible
  - ❖ Pathophysiology: defective osteogenesis in favor of radiation-induced fibrotic scar tissue (Fig 2).<sup>5</sup>



Figure 1. Mandibular osteonecrosis with fracture. <https://pubmed.ncbi.nlm.nih.gov/20604004/fig1/fig1a>

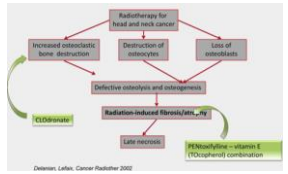


Figure 2. Pathophysiology of osteoradionecrosis.

- Current Research and New Treatments**
- ❖ A combination of pentoxifylline and vitamin E have been shown to reduce the radiation induced fibrosis in ORN that leads to bone damage.<sup>6</sup>
  - ❖ Debridement and antibiotics can be used to treat mild ORN; mandible resection (hemimandibulectomy) and microvascular reconstruction with myocutaneous flaps may be preferable in the case of extensive necrosis.<sup>7</sup>
  - ❖ Hyperbaric Oxygen Therapy (HBOT) is commonly used for ORN treatment. (Fig. 3)
    - Stimulates fibroblasts and monocytes, which can lead to angiogenesis and improved circulation of the affected tissues
    - Allows for better wound healing and control of infection
    - Has been shown to have better effects than penicillin
    - Should be done along with appropriate debridement
    - Can also be used as a preventative measure for ORN



Figure 3. Mechanism of hyperbaric oxygen therapy.

- Conclusions**
- ❖ ORN is a significant side effect of radiation therapy that occurs in 3-10% of patients.<sup>4</sup>
  - ❖ Treatment for ORN may include medications, debridement & curettage, HBOT, and possible surgical intervention depending on severity of the lesion.
  - ❖ HBOT is useful for stimulating healing of persistent exposed areas of bone as it allows delivery of high-pressure oxygen to oxygen- & nutrient-deprived tissues.

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