CASE REPORT

Osteoradionecrosis Complicating Mandibulotomy

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Abstract

Osteoradionecrosis (ORN) of the mandible is a well acknowledged entity following radiotherapy for oral cancers. Mandibular surgery prior to radiotherapy adds an additional risk factor for osteoradionecrosis. Management of these cases poses various hurdles including added morbidity, additional cost for treatment of ORN and suboptimal dose delivery to the tumor bed. This case reports elaborates the issues related to mandibular surgery in patients requiring adjuvant radiotherapy, precautions to be taken and the management of ORN in a postsurgical setting.

Keywords: Osteoradionecrosis, radiotherapy.

INTRODUCTION

Osteoradionecrosis (ORN) refers to a clinical condition resulting from a necrotic bone secondary to radiation injury. Traditionally, osteoradionecrosis has been defined as exposed irradiated bone that fails to heal over a period of 3 months.[1]

Mandible is by far the most common site affected in the treatment of cancers of the head and neck. The jaw bone is unique in that it is directly in contact with external conditions through the gingival attachment of the teeth, which poses greater potential for disease and infection. Osteoradionecrosis of the mandible can be a serious complication following radiotherapy for head and neck cancer, producing significant disability in patients who may be cured of their primary disease.

There are many factors that can contribute to the development of ORN. Though any patient having received 40 grays radiation administered to the mandible is at risk, it is more common in patients who have received more than 60 grays radiation therapy. Owing to the triad of hypoxia, hypocellularity and hypovascularity the tissues loose the reserve reparative capacity. ORN can be spontaneous, but it most commonly results from tissue injury. Even apparently, innocuous forms of trauma such as denture-related injury, ulcers, or tooth extraction can overwhelm the reparative capacity of the radiation-injured bone.

Although postoperative radiotherapy has proved effective in improving local control and survival in patients with head and neck cancers, its complications, especially mandibular osteoradionecrosis, reduce the quality of life. Mandibular surgery prior to radiotherapy adds an additional risk factor for osteoradionecrosis. Management of these cases poses various hurdles including added morbidity, additional cost for treatment of ORN and suboptimal dose delivery to the tumor bed. This case reports elaborates the issues related to mandibular surgery in patients requiring adjuvant radiotherapy, precautions to be taken and the management of ORN in a postsurgical setting.

CASE REPORT

A 46-year-old man presented to the head and neck services with a 2 months history of pain over the right side of tongue. Patient was consuming oral tobacco for more than 15 years and also revealed history of smoking. There was no history of dysphagia and his family history was noncontributory. Local examination of oral cavity and oropharynx revealed an ulcero-infiltrative lesion measuring around 3 × 2 cm over the right side of the base of tongue. The neck examination did not reveal any palpable lymph nodes. The patient was planned for a wide excision of lesion via a paramidline mandibulotomy approach along with ipsilateral neck dissection after histologic confirmation of squamous cell

carcinoma. The defect on the tongue base was primary closed. The mandibulotomy was fixed using miniplates and adequate closure achieved.

The final histopathology showed negative cut margins and no evidence of metastatic neck nodes. Postsurgery patient was planned for adjuvant radiotherapy to a total dose of 60 Gy. However, the patient only received a total dose of 5000 cGy in 25 fractions for duration of 6 weeks, owing to persistent pus discharge from the submental region (Fig. 1). The patient did not respond to conservative treatment, which included oral antibiotics, oral hygiene improvement, and dressings.

The diagnosis of the osteoradionecrosis of the mandible near the submental region was done after ruling out second primary. The diagnosis was based on the criteria of the ulceration of the skin with exposed necrotic bone, and discharging fistula over the necrotic bone for more than 2 months. Limited sequestrectomy was carried out by drilling superficial cortical bone until fresh bleeding was observed and the overlying soft tissue was freshened (Fig. 2). Reconstruction of the defect was done by rotation of the local submental flap (Fig. 3).

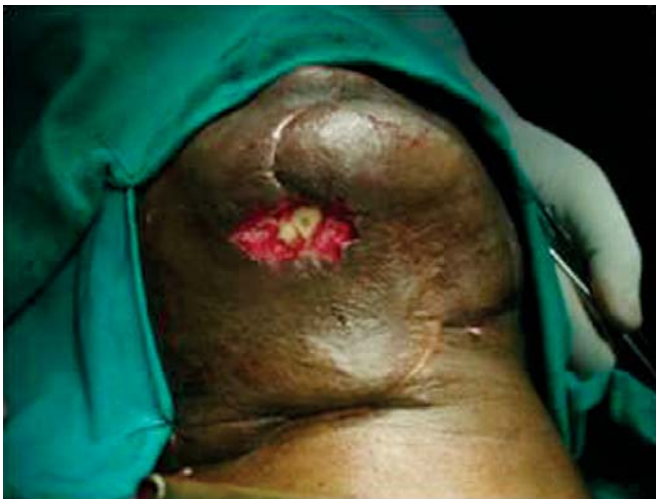

Fig. 1: Osteonecrosis of mandible

Fig. 2: Drilling of the cortical bone

Fig. 3: Submental flap

DISCUSSION

According to Howland et al,[1] atrophy is the first uncomplicated post-radiation bone changes. This may subsequently be complicated by fracture, true necrosis or true osteitis. Irradiation produces both acute and chronic effects on the soft tissue and bone in the head and neck area. Although radiotherapy techniques have been improving through the years, the reported incidence of osteo-radionecrosis remains as high as 10 to 15%.[2,3]

The common predisposing factors for osteoradionecrosis include surgical trauma, tooth extraction, and poor oral hygiene.[4] In Marx' s landmark study on the pathophysiology of osteoradionecrosis, as high as 35% of the cases studied were not associated with an inciting event. However, it is important to remember that, as described by Marx, that radiation causes an endarteritis that results in tissue hypoxia, hypocellularity, and hypovascularity, which in turn causes tissue breakdown and chronic nonhealing wounds.[5] Hence, ORN is not a primary bone infection but a complex tissue injury secondary to metabolic and homeostatic derangement.

Growing body of evidence is now thought to believe that osteoclasts suffer radiation therapy-related effects earlier

than vascular alterations, and that suppression of bone turnover via osteoclasia is the true etiologic crux of osteoradionecrosis. A loss of vitality of osteocytes has been observed both in osteoradionecrotic bone and in bone that was only a few weeks into radiation therapy (36 Gy), from histologic human specimens.[6] At the earlier stages, vascular abnormalities were absent. To further corroborate this theory, several authors have noticed an alarmingly high incidence of osteoradionecrosis like mandibular bone disease in patients receiving bisphosphonate therapy for cancer-associated hypercalcemia or metastatic osteolytic lesions.[7] In addition, vascular dysfunctions are proposed to help and generate the initial prefibrotic phase.[8]

Mandibulotomy can be performed via anterior to mental foramen, median mandibulotomy, or posterior to mental foramen, lateral mandibulotomy. Lateral mandibulotomy has distinct disadvantages and has been widely abandoned.[9,10] Median mandibulotomy can be further classified into midline mandibulotomy, which goes between the 2 central incisors, and paramidline mandibulotomy, which goes between the lateral incisor and canine tooth.[9] Dai et al showed that there was no difference in the complication rate between midline and paramidline mandibulotomy which was about 26%.[11]

The treatment of osteoradionecrosis begins with prevention, conservative measures (antibiotics, debridement, and irrigation) and surgical resection (sequestrectomy, marginal mandibulectomy, or segmental mandibulectomy with or without reconstruction). Roughly half of patients ultimately require surgical resection of the mandible. All devascularized bone must be resected, and ideally, blood supply to the tissue must be optimized. It has been proposed that the time interval between the completion of radiation therapy and the onset of osteoradionecrosis helps to dictate aggressiveness of surgical management,[12] but the amount of bone to be resected is strictly a clinical decision and is based on the presence of brightly bleeding edges of the remaining bone.

Patients with exposed bone and a lack of soft tissue coverage who undergo irradiation are certain to develop osteoradionecrosis. During surgery, undue soft tissue tension over the bone should be avoided. This kind of poorly healing wound will directly expose the irradiated bone to contamination in the oral cavity or external environment. After irradiation, soft tissue becomes fibrotic and fragile, and should be handled with extreme care. Meticulous closure of the oral mucosa is crucial. However, despite the most skillful technique, some patients will still develop osteoradionecrosis.

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