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OSTEORADIONECROSIS AND MASTOIDITIS AFTER RADIOTHERAPY FOR LEFT CARCINOMA TONSIL

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ABSTRACT

Osteoradionecrosis (ORN) is a condition of non-vital bone in a site of radiation injury due to hypovascularity, hypocellularity, and local tissue hypoxia. In course of Radiotherapy for carcinoma tonsil, the middle and inner ear too receive high doses of radiotherapy.

Here we present a patient administered with Concurrent CTRT for Carcinoma of left Tonsil and complained of ear discharge and pain after 3 years of CTRT. The HR CT scan of Temporal bones showed features like Left sided Cholesteatoma with erosion of the Ossicular chain, lateral wall of Semicircular canal and associated erosive mastoiditis, but clinically we diagnosed it as diffuse variant of osteo radionecrosis of the temporal bone. Intra – operative findings included necrosis of posterior and inferior exterior auditory canal. Mucupurulent discharge and debris seen in middle ear extending to antrum. Post op HPE report showed necrotic bony spicules and few foci of new osteoid formation consistent with findings of chronic active osteomyelitis.

Treatment can be tailored according to local or widespread involvement. Surgical debridement is preferred for widespread disease and severe pain. Medical therapy includes Pentoxifylline, Tocopherol, Clondronate. Pentoxifylline. Sometimes HBOT can also be used, as HBOT promotes angiogenesis in irradiated tissues.

KEYWORDS

Osteoradionecrosis, Mastoiditis, Radiotherapy, Carcinoma Tonsil

INTRODUCTION:

Osteoradionecrosis (ORN) is a condition of non-vital bone in a site of radiation injury that was first described by Marx [1] in 1983 as hypovascularity, hypocellularity, and local tissue hypoxia. While more common in the mandible, ORN is rare in the temporal bone [2]. The first case of osteoradionecrosis involving the temporal bone was reported in 1952 by Block [3] in a patient with syringobulbia. Sometimes osteoradionecrosis can be spontaneous, but exposure to radiation damages the reparative capacity of bone.

In course of Radiotherapy for carcinoma tonsil, the middle and inner ear too receive high doses of radiotherapy. Eustachian tube dysfunction following RT for head and neck cancer has been reported [4]. This causes widening of ET lumen and atrophy of Ostmann's fat pad 5-10 yrs, after radiotherapy leading to patent patulous eustachian tube. It can also result in the development of negative pressure in the middle ear (ME) and transudation of serous fluid into the mastoid [5]. Because the initial symptomatology of crust, otorrhea, and otalgia is misdiagnosed as chronic otitis media, the disease may be overlooked [6].

The incidence of Squamous cell Carcinoma of Oropharynx has increased in the lastly 20 years [7]. The etiology has changed from smoking and alcohol to Human Papilloma Virus (HPV) related. Around 70% of Oropharyngeal cancers are due to HPV [8].In the last 15 years, there have been lot of improvements in Chemoradiation and thus the Disease survival rates are comparable to those reported for traditional surgery [9].

Here we present a patient administered with Concurrent CTRT for Carcinoma of left Tonsil and complained of ear discharge and pain after 3 years of CTRT.

CASE REPORT:

In 2016, a 62 year old male patient was diagnosed with Moderately Differentiated Squamous Cell Carcinoma of Left Tonsil T2N0M0. Patient is a known case of Diabetes Mellitus. On examination, ulcerated lesion in left tonsil involving palatoglossal fold and vallecula. CT scan showed heterogeneous soft tissue mass in left tonsil involving posterolateral margin of tongue extending to vallecula. Biopsy showed Grade II SCC.

Treatment course – Concurrent chemo-radiotherapy was delivered to a 3dCRT plan for a dose of 65Gy in 30 fractions to the primary tumour + level I and II nodes with 6, 15 MV photons over 6 weeks along with 4 cycles of weekly concurrent Cisplatin. Patient tolerated the treatment well. No signs of any loco-regional recurrence or distant metastases were found for 3 years.

After 3 years, patient developed left ear pain with purulent ear discharge. Which persisted for 6 months despite local medical treatment. On otoscopic examination, small central perforation in TM with a pale EAC mucosa, Right ear was normal.

Audiometric examination included evaluating the air and bone conduction thresholds which showed a moderate mixed hearing loss on left side and normal hearing on right side. Diagnostic Nasal Endoscopy done and was normal.

The HR CT scan of Temporal bones showed Left sided Cholesteatoma with erosion of the Ossicular chain, lateral wall of Semicircular canal and associated erosive mastoiditis, but clinically we diagnosed it as diffuse variant of osteo radionecrosis of the temporal bone in view of the examination findings and the history. Hence we proceeded towards surgical management.

Intra – operative findings included necrosis of posterior and inferior exterior auditory canal. Mucupurulent discharge and debris seen in middle ear extending to antrum. Malleus and incus partially necrosed, were removed. Only stapes left. Facial nerve was exposed. Temporalis fascia placed over stapes. Posteriorly based vascularized flap place in cavity. Covered it with gentamycin soaked gel foam.

Post op HPE report showed necrotic bony spicules and few foci of new osteoid formation consistent with findings of chronic active osteomyelitis.

Further the patient is receiving Hyperbaric Oxygen as a part of treatment.

DISCUSSION:

Earlier the main treatment plan for Carcinoma of Tonsil was Radiation therapy following Surgery, with 5 year Disease specific survival (DSS) of 61-75% [10]. Due to improvements in chemoradiation, the current organ preserving protocols involve concurrent chemoradiation therapy. Of late there is again an interest among surgeons for surgery due to advanced in robotic surgery and transoral laser surgery. Also there is a plan for reducing the chemoradiation for HPV positive SCC to reduce the acute and long term toxicities of chemoradiation therapy [11].

ORN is defined as a bone which is exposed through an opening in the overlying skin or mucosa, which persists as a non-healing wound for 3 months or more [12].ORN was described originally by Ewing in 1926 as a bony osteitis and Schuknecht described the HPE findings as "Aseptic bone fibrosis with compensatory reparative fibrosis" [13].

There are various effects of radiation on structure of ear. The external ear develops ulceration, fibrosis, and cholesteatoma [1]. Middle ear loses ciliary function, and also develops ossicular necrosis and Eustachian Tube obstruction causing TM atelectasis, SOM, Cholesteatoma [15]. Inner ear shows SNHL, Damage to stria vascularis and cells of Organ of Corti.

Osteo Radio Necrosis (ORN) of Temporal bone is a serious delayed combination that may arise following Radiotherapy to surrounding structures. Symptoms of ORN may present as early as 3 months [16] or may be delayed up to 40 years [16].

The pathophysiology is believed to be due to radiation damage to blood vessels, causing osteocyte loss, fibrosis hypocellularity and fatty degeneration of bone[1]. The temporal bone is relatively superficial, has a scanty blood supply and is also exposed to pathogens via eustachian tube [17].

Patients most commonly present with otalgia, otorrhea, crusts but may also present with facial nerve paralysis, hearing loss, or meningitis. Sometimes the presentation look like that of a malignancy like an unhealed ulcer, exposed bone, granuloma and in such cases differentiation becomes difficult. In mild cases CT scan shows EAC bony erosion and mastoid opacification. Moderate cases show enhancing soft tissue, soft tissue gas and involvement of TMJ.

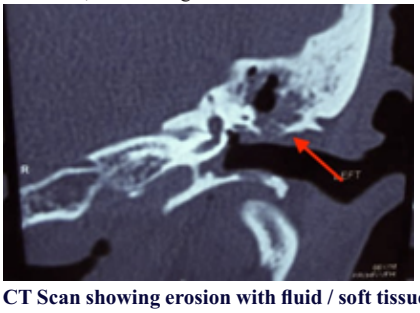

Figure 1 : CT Scan showing erosion with fluid / soft tissue of bone on

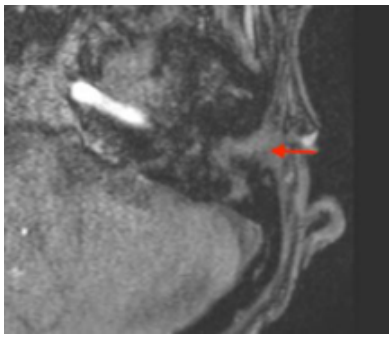

Figure 2 : MRI Scan showing erosion of mastoid segment of left temporal

Ramsden et al., provided a classification for osteoradionecrosis of the temporal bone; local and diffuse types [18]. The local type in limited to EAC and the diffuse type may involve skull base and adjacent structures. Diffuse type seen in patients getting Radio therapy after prior mastoidectomy or temporal bone resection and also this type is associated with complications like meningitis, CSF leakage and suppurative labyrinthitis.

The management of ORN is a controversy, without much support from randomized, controlled studies. Few systems used are Marx's classification system[1] (based on response to therapy), Kagan and Schwartz"s system (based on clinical and radiological findings) [19].

Certain predisposing factors for developing ORN are Diabetes, Smoking, Male sex. Concurrent chemotherapy as Cisplain derivatives generate a lot of free radicals which inhibit the DNA repair capacity of the bone cells in the normal tissues [20]. According to the theory of Delanian and Lefaix, this might have a major initial impact on the pathomechanism of ORN development [21]. Among the various modes of Radiotherapy 3dCRT has higher chances of resulting in ORN than IMRT and IGRT due to wider area of exposure. Our patient had Diabetes, History of smoking, is male and received Platinum based concurrent chemotherapy and also 3dCRT.

Hence to diagnose early, we must see if the patient has any of the above predisposing factors. ORN is a clinical diagnosis, with pain, exposed bone and no recurrence. CT imaging may allow for the diagnosis of ORN, but there are known limitations of CT in differentiating viable tumour from post-radiotherapy changes. Bone Scan has a limitation in terms of specificity, because RT-induced bone complications like ORN, chronic osteomyelitis and metastases may all result in increased uptake. MRI has been proven to be valuable for distinguishing ORN and Malignancy. Our patient was diagnosed clinically and based on CT and MRI findings.

Treatment is a controversy. For minor symptoms or if the disease is localized treatment is conservative therapy. Surgical therapy is needed for widespread disease or with severe pain. Conservative therapy should include topical anti microbials and local debridement. There have been studies indicating presence of bio films in ORN of temporal bone, and in such cases Gentian violet may be used to disrupt them. If mastoidectomy has to be performed, posterior canal wall should be removed and the cavity should be obliterated using a muscle flap for faster healing. Resection of necrotic bone can be reconstructed with local rotational or free flaps.

Medical therapy includes Pentoxifylline, Tocopherol, Clondronate. Pentoxifylline and its metabolites improve blood flow by decreasing its viscosity. Tissue oxygen levels have also been shown to increase significantly. It is given with tocopherol, which reduces fibrosis by scavenging the reactive oxygen species that were generated during oxidative stress, protecting cell membranes against the peroxidation of lipids, and partially inhibiting TGF- β1 and the expression of procollagen genes. Clodronate is a new generation bisphosphonate that inhibits bone resorption by reducing the number and activity of osteoclasts. clodronate has been shown to act directly on osteoblastic cells by increasing the formation of bone and reducing the proliferation of fibroblasts [22].

HBOT (Hyperbaric Oxygen Therapy)
HBOT promotes angiogenesis in irradiated tissues. It increases oxygen supply thereby causing fibroblastic proliferation and capillary formation. It also increases tissue vascularity, viability and healing capacity [22]. It improves tissue swelling through osmotic effect of oxygen and a steep oxygen gradient across an irradiated tissue margin which leads to growth of new blood vessels. Also wound healing is enhanced by improving white blood cell and fibroblast function due to increase in oxygen levels [23].

HBOT is associated with many adverse effects including pressure-induced damage to the ears, sinuses and lungs, a temporary worsening of short sightedness (myopia), claustrophobia and oxygen poisoning. Thus, the use of HBOT in treating established ORN has not been convincing and is still controversial.

CONCLUSION :

Osteoradionecrosis should be thought as a differential diagnosis when there is a history of Radiotherapy and Chemotherapy with High risk factors. Combining clinical and radiological findings one can diagnose the disease and the appropriate treatment can be administered.

CONFLICT OF INTEREST :

The authors declare no conflict of interest.

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