

Osteomyelitis of Maxilla

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ABSTRACT

Background: Because of its structure osteomyelitis of the maxilla is rare. The maxilla is composed almost entirely of spongy bone with a very thin cortex. The maxillary blood supply is more extensive than in the mandible. Any infectious process of this bone can either remain localized or spread into the soft tissues and result in a cellulitis, fistula or sinusitis. Osteomyelitis has a variety of clinical presentations depending on the virulence of the infecting organisms, the resistance of the host, and the reaction of the bone and periosteum to the inflammation. We describe our clinical experience of maxillary osteomyelitis treated at our center having different type of causes. Etiology as well as management of osteomyelitis is discussed in this article.

Keywords: Infection, Maxilla, Mucormycosis, Osteomyelitis, Osteonecrosis.

INTRODUCTION

Osteomyelitis is an inflammatory condition of the bone that begins as infection of the medullary cavity, rapidly involves the haversian system, and quickly extends to the periosteum of the affected area. The infection becomes established in the calcified portion of bone when pus in the medullary cavity and beneath the periosteum compromises or obstructs the blood supply. Following ischemia the infected bone becomes necrotic.¹

Osteomyelitis in maxilla is rare, as the maxilla has a significant collateral blood flow, thin cortical bones, and bone marrow with struts which make it less prone to infection.² Thin cortical plate and a relatively rare paucity of medullary tissue in the maxilla preclude confinement of infection within bone and permit the dissipation of edema and pus into the soft tissue and paranasal sinuses.³ Uncontrolled diabetes is the major cause of osteomyelitis along with bacterial infection, viral infection and fungal infection such as mucormycosis, aspergillosis etc.

CASE REPORT 1

History - A 60year old male patient reported with Pain and mobility in upper left back teeth region since 20 days. Patient was Diabetic and under medication for the same since 10 days. Patient gave a history of extraction of 24, 25 & 26; 1 month previously. Following the extraction, the socket had not healed completely. On Extraoral examination a single diffuse swelling of size 1*1 cm was seen at the left side of face. On intraoral examination unhealed extraction socket with exposed bone & Pus discharge present in relation to 24, 25 & 26. Draining sinus tract present in relation to 22, 23. Mobility of fragment of left side of maxilla.

Investigation - CT revealed erosion of bone on left alveolar process of maxilla. Histopathological report revealed chronic osteomyelitis. (Figure 1)

Management - Extraction of all left maxillary teeth along with sequestrectomy and debridement done under general anesthesia. Pre fabricated template was given after closure. (Figure 2)

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CASE REPORT 2

History - A 51 years old male patient reported for evaluation of pain in the right maxillary posterior region since 4 weeks previously. The patient had undergone extraction of 18, 5 weeks earlier. Following extractions the socket healed completely. Patient had persistent pain and discomfort for the last 1 month. He was on oral hypoglycaemic drugs for the last 3 weeks. Intraoral oral examination showed a necrotic bone of about 3x3 cm diameter in right maxillary molar region up to mid palate. (Figure 3) His teeth were periodontally compromised.

Investigations - CT scan was performed initially but no positive findings revealed. Paranasal sinus view showed haziness of right maxillary sinus with erosion of lateral sinus wall. (Figure 4) HBA1C test performed result was 13.99 and estimated average glucose 354.81. Hard & soft tissue specimen excised under local anesthesia and sent for histopathological examination. On examination H&E stain & Grocott's modified silver methanamine special staining technique readily identified non-septate mucormycotic hyphae at 90 degrees suggestive of Mucormycosis.

Management - The patient was administered Amphotericin-B 1mg/kg/day intravenously for four weeks. The necrotic bone along with 1 cm of adjacent bone excised under general anesthesia. (Figure 5) One week later the area started healing and subsequently after 10 days an obturator was made for the patient.

CASE REPORT 3

History - A 51 year old male patient reported with pain in upper right front teeth region since 1 month. He had history of extraction of 14 before 1 month & self-extraction of 13 before 1 week. On intra-oral examination, an infected socket with active pus discharge and exposed, mobile dentoalveolar segment seen in relation to 13 & 14. (Figure 6)

Investigations & Management - Intraoral radiographs reveal increased periapical radiolucency & bone loss from midline to 14 region. (Figure 7) Oral antibiotics Augmentin 625 mg (amoxicillin & clavulanic acid) & Metronidazole 400 mg 8 hourly were advised. Extraction of 12

with sequestrectomy and debridement done under local anesthesia. (Figure 8) Biopsy from the bone showed large areas of dead bone with empty osteocytic lacunae. PAS stained does not demonstrate any fungal elements. Soft tissue specimens showed large aggregate of pus with mixed inflammatory cells, suggestive of avascular necrosis. Patient was kept on Antibiotic for 1 week. Post-operative course of patient was uneventful with satisfactory intraoral healing.

DISCUSSION

The term osteomyelitis represents a wide spectrum of clinical conditions with a common pathology of inflammation and infection of the bone. It may result from hematogenous spread, contiguous spread from infectious focus, or direct bacterial inoculation into intact bone due to trauma.^{4, 5} The primary cause of osteomyelitis of the jaws is infection by odontogenic microorganisms. It may also arise as a complication of dental extractions and surgery, maxillofacial trauma and subsequent inadequate treatment of a fracture and/or irradiation.⁶

Pathophysiology:

Once bacterial inoculation occurs there is alterations in pH and capillary permeability that contribute to regional edema, cytokine release, tissue breakdown, leukocyte recruitment, decreased oxygen tension, increased local pressure, small-vessel thrombosis, and bone deterioration. As the infection spreads into the medullary cavity, increased pressure causes its extension into the cortex by Haversian and Volkmann canals with subsequent spread into the subperiosteal space causing periosteal stripping, leading to loss of periosteal blood supply and consequent bone resorption and necrosis.^{4, 7}

Osteomyelitis of maxilla is typically a polymicrobial infection that is caused by many types of odontogenic microbial flora. Both gram-positive and gram-negative microorganisms, including *Staphylococcus aureus*, *epidermidis*, *Streptococci*, *Peptococcus*, *Pepto streptococci*, *Hemolytic streptococci*, *Pneumococci*, *Escherichia coli* and *Bacteriodes* are seen. It is also been reported after

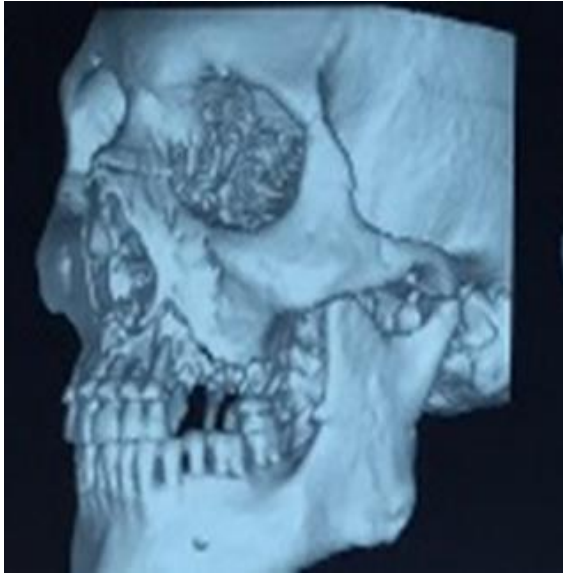


Fig 1: 3D reconstruction of the CT scan showing destruction of the left alveolar bone of maxilla.

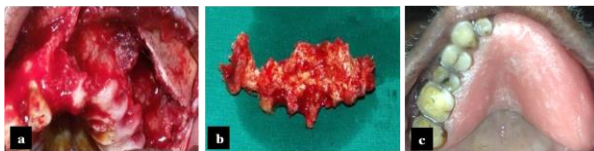


Fig 2: (a). Extraction of all left maxillary teeth along with sequestrectomy (b) Necrotic bone removed (c) Pre-fabricated template placed.



Fig 3: Clinical photograph showing exposed bone.



Fig 4: Initial CT scan showed no positive findings, Later Paranasal sinus view showed erosion of lateral sinus wall.



Fig 5: (a). Abnormal necrotic bone identified and removed (b). Exposed area packed with the betadine soaked roller gauze & retained with silk suture. (c). Post surgical defect.



Fig 6: Showing non healing extraction sockets & exposed bone.

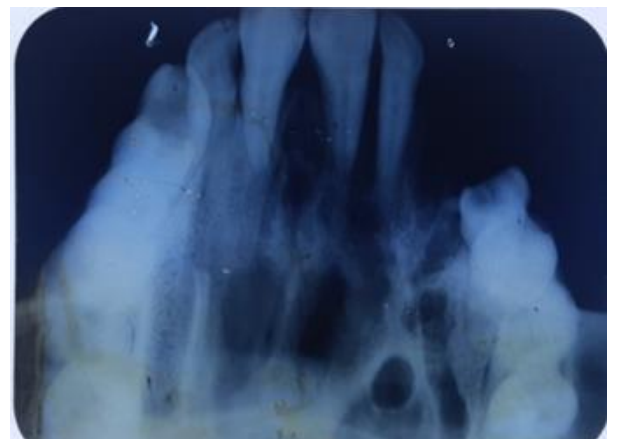


Fig 7: Maxillary occlusal view showing unhealed extraction sockets and interdenal bone loss.

maxillary necrosis secondary to invasive fungal infection like mucormycosis.^{4, 5} Factors which contribute to osteomyelitis are systemic diseases which compromise the immune system of an individual such as diabetes mellitus, HIV, malnutrition, and use of chemotherapeutic agents.²

Diagnosis is based on data collected from history, clinical and radiographic findings. Radiograph may reveal osteolysis, periosteal reaction or sequestra.

Cross sectional imaging modalities such as computed tomography (CT) scanning and magnetic resonance imaging (MRI) are now considered standard for diagnosing osteomyelitis.⁴ In our series of cases we came across exposed bone, clinically mimicking bacterial osteomyelitis, but leading to a different picture on microbiological and histopathological examination. Identification can be accurately done on histopathological sections itself and the culture will confirm the exact species.



Fig 8: Necrotic bone removal & debridement followed by suturing.

Uncontrolled diabetes mellitus can alter the normal immunologic response of patients to infections. Such patients have decreased granulocyte phagocytic ability with altered polymorphonuclear leukocyte response. Reports have suggested that the ability of serum of immunocompromised patients to inhibit *Rhizopus* in vitro is reduced, which makes them suitable hosts to opportunistic fungal infections.¹⁴

Mucormycosis (Zygomycosis, phycomycosis) is an acute opportunistic infection caused by a saprophytic fungus belongs to the class of phycomycetes.⁸ Once fungal hyphae enter into the blood stream they can disseminate to other organs such as cerebrum or lungs which can be fatal for the patient. Mucor hyphae form thrombi within the blood vessels that reduce vascularity to the tissues and cause necrosis.^{9, 10} The control of underlying predisposing illness and aggressive surgical debridement, along with prompt parenteral administration of amphotericin B remains the essential treatment today.¹¹ Recent studies have demonstrated that posaconazole, an extended-spectrum triazole agent, has in vitro activity against zygomycetes and may represent a therapeutic option for patients with serious invasive fungal infections.^{11, 12, 13}

Osteonecrosis of the maxilla occurs when the vascularity is compromised. Patients with

osteonecrosis present with painful exposed bone, often a result of dental extraction. Care should be taken while doing extraction. Sometimes Fracture of the dentoalveolar segment can occur during traumatic extraction and loss of osseous cellular elements as well as vascular damage leads to ischemia & avascular necrosis of bone.

Topazian et al recommended treatment mainly with Beta lactam, Clindamycin, and Metronidazole Depending on the type of chronic osteomyelitis. However, without adequate debridement, chronic osteomyelitis does not respond to most antibiotic regimens. Surgical debridement aimed at providing drainage to the area of infection, removal of sequestrum and other foreign bodies, and getting new blood supply to the area. It ranges from simple sequestrectomy to segmental resection and reconstruction in recalcitrant cases Hyperbaric oxygen therapy (HBOT) has been employed to accelerate wound healing as adjuvant treatment in complicated or refractory cases. HBOT along with antibiotic containing acrylic beads, micro vascular grafts has shown promising results in the management of patients with refractory osteomyelitis.⁴

Though the clinical symptom of the cases may sound similar but the treatment protocol changes vastly by radiographic and histopathological interpretation. Early resolution of such lesions is desirable to improve the quality of life of patients and to prevent possible life-threatening consequences. Aggressive medical management with adequate surgical intervention is the key to successful management.

CONCLUSION

The cases presented here emphasize the concept that simple procedures such as dental extractions can cause cataclysmic complications in susceptible patients. An immunocompromised or immunosuppressed patient having bone necrosis following tooth extraction should alert a clinician of possible mucormycotic infection. The line of treatment highly varies on all the investigations. Early diagnosis & Prompt, aggressive treatment is required to ensure favourable outcome.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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