

CHAPTER 13

OSTEOMYELITIS

Suppurative osteomyelitis

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SUPPURATIVE OSTEOMYELITIS

Osteomyelitis is an inflammatory reaction of bone to infection which originates from either a tooth, fracture site, soft tissue wound or surgery site. The dental infection may be from a root canal, a periodontal ligament or an extraction site. Suppurative osteomyelitis can involve all three components of bone: periosteum, cortex, and marrow. Usually there is an underlying predisposing factor like malnutrition, alcoholism, diabetes, leukemia or anemia. Other predisposing factors are those that are characterized by the formation of avascular bone for example, therapeutically irradiated bone, osteopetrosis, Paget's disease, and florid osseous dysplasia. Osteomyelitis is more commonly observed in the mandible because of its poor blood supply as compared to the maxilla, and also because the dense mandibular cortical bone is more prone to damage and, therefore, to infection at the time of tooth extraction.

Acute osteomyelitis is similar to an acute primary abscess in that the onset and course may be so rapid that bone resorption does not occur and, thus, a radiolucency may not be present on a radiograph. Clinical features include pain, pyrexia, painful lymphadenopathy, leukocytosis, and other signs and symptoms of acute infection. Later, after approximately two weeks, as the lesion progresses into the chronic stage, enough bone resorption takes place to show radiographic mottling and blurring of bone. A sclerosed border called an involucrum forms around the affected area. The involucrum prevents blood supply from reaching the affected part. This results in the formation of pieces of sequestra or necrotic bone surrounded by pus. A fistulous tract may develop by the suppuration perforating the

cortical bone and periosteum. The fistulous tract discharges pus onto the overlying skin or mucosa.

The radiopacity of the sequestra and the radiolucency of the pus give rise to the characteristic "worm-eaten" radiographic appearance. Radiographs also aid in locating the original site of infection such as an infected tooth, a fracture, or infected sinus.

Fig. 13-1 Chronic suppurative osteomyelitis of dental origin. The lesion discharged pus into the oral cavity. Note the radiopaque sequestra (arrow) surrounded by the radiolucent suppuration.

Fig. 13-2 Chronic suppurative osteomyelitis demonstrating a worm-eaten appearance of the body of the mandible. Note the radiopaque sequestra surrounded by the radiolucent suppuration and a radiopaque involucrum. The patient had fetid breath.

Fig. 13-3 Chronic suppurative osteomyelitis of dental origin. The radiopaque sequestrum (arrow) is surrounded by the radiolucent suppuration. (Courtesy, Dr. A. Wuehrmann and Dr. L. Manson-Hing).

Fig. 13-4 Sequestrum that has floated into the soft tissues. Patient gave a history of a problematic tooth extraction several years ago which resulted in clinical complications.

GARRÉS OSTEOMYELITIS (Periostitis ossificans, Osteomyelitis with proliferative periostitis)

Garrés osteomyelitis or proliferative periostitis is a type of chronic osteomyelitis which is nonsuppurative. It occurs almost exclusively in children and young adults who present symptoms related to a carious tooth. The process arises secondary to a low-grade chronic infection, usually from the apex of a carious mandibular first molar. The infection spreads towards the surface of the bone, resulting in inflammation of the periosteum and deposition of new bone underneath the periosteum. This peripheral formation of reactive bone results in localized periosteal thickening. The inferior border of the mandible below the carious first molar is the most frequent site for the hard nontender expansion of cortical bone. On an occlusal view radiograph, the deposition of new bone produces an "onion-skin" appearance.

Fig. 13-5 Garrés osteomyelitis (proliferative periostitis) demonstrating an expansion of the inferior border of the mandible (onion-skin appearance) caused by the periapical infection of the mandibular first molar.

Fig. 13-6 An occlusal radiograph of Garrés osteomyelitis showing the buccal expansion of the mandible caused by infection around the root tip of the extracted first molar.

Fig. 13-7 Garrés osteomyelitis (periostitis ossificans) exhibiting localized periosteal thickening. The source of infection is not known; it could have been from an exfoliated deciduous molar tooth.

TUBERCULOSIS OSTEOMYELITIS

Tuberculosis is a chronic granulomatous disease which may affect any organ, although in man the lung is the major seat of the disease and is the usual portal through which infection reaches other organs. The microorganisms may spread by either the bloodstream or the lymphatics. Oral manifestations of tuberculosis are extremely rare and are usually secondary to primary lesions in other parts of the body. Infection of the socket after tooth extraction can also be the mode of entry into the bone by *Mycobacterium tuberculosis*. Mandible and maxilla are less commonly affected than long bones and vertebrae. On a radiograph, the appearance of bony lesions is similar to that of chronic suppurative osteomyelitis ("worm-eaten" appearance) with fistulae formation through which small sequestra are exuded. Periostitis ossificans (proliferative periostitis) can also occur and change the contour of bone. Calcification of lymph nodes is a characteristic sign of tuberculosis.

Fig. 13-8 Tuberculous osteomyelitis showing the "worm-eaten" appearance similar to that of a chronic suppurative osteomyelitis (Courtesy, Dr. A. Wuehrmann and Dr. L. Manson-Hing).

Fig. 13-9 Calcified tuberculous lymph nodes (Courtesy, Dr. L. Manson- Hing).

SYPHILITIC OSTEOMYELITIS

Syphilis is a chronic granulomatous disease which is caused by the spirochete *Treponema pallidum*. It is a contagious venereal disease which leads to many structural and cutaneous lesions. Acquired syphilis is transmitted by direct contact whereas congenital syphilis is transmitted in utero. In congenital syphilis, the teeth are hypoplastic, that is, the maxillary incisors have screwdriver-shaped crowns with notched incisal edges (Hutchinson's teeth) and the molars have irregular mass of globules instead of well-formed cusps ("mulberry molars"). Also, a depressed nasal bridge or saddleback nose occurs because of gummatous destruction of the nasal bones.

Acquired syphilis, if untreated, has three distinct stages. The primary stage develops after a couple of weeks of exposure and consists of chancres on the lips, tongue, palate, oral mucosa, penis, vagina, cervix or anus. These chancres are contagious on direct contact with them. The secondary stage begins 5 to 10 weeks after the occurrence of chancres and consists of diffuse eruptions on skin and mucous membrane. This rash may be accompanied by swollen lymph nodes throughout the body, a sore throat, weight loss, malaise, headache and loss of hair. The secondary stage can also damage the eyes, liver, kidneys and other organs. The tertiary-stage lesions may not appear for several years to decades after the onset of the disease. In this stage of osteomyelitis, the bone, skin, mucous membrane, and liver show gummatous destruction which is a soft, gummy tumor that resembles granulation tissue. Paralysis and dementia can also occur. In the oral cavity, the hard palate is frequently involved resulting in its perforation. The gummatous

destruction is painless. Syphilitic osteomyelitis of the jaws is difficult to distinguish from chronic suppurative osteomyelitis since their radiographic appearances are similar.

Fig.13-10 Syphilitic osteomyelitis of the palate. The gummatous destruction has produced a palatal perforation.

Fig.13-11 Radiograph of syphilitic osteomyelitis of the palate. The perforation which is the site of gumma of the hard palate produces a radiolucency which may be mistaken for a median palatine cyst.

ACTINOMYCOTIC OSTEOMYELITIS

Like tuberculosis and syphilis, actinomycosis is a chronic granulomatous disease. It can occur anywhere in the body, but two-thirds of all cases occur in the cervicofacial region. The disease is caused by bacteria-like fungus called *Actinomyces israeli*. These microorganisms occur as normal flora of the oral cavity, and appear to become pathogenic only after entrance through previously seated defects. The portal of entry for the microorganisms is either through the socket of an extracted tooth, a traumatized mucous membrane, a periodontal pocket, the pulp of a carious tooth or a fracture. In cervicofacial actinomycosis, the patient exhibits swelling, pain, fever and trismus. The lesion may remain localized in the soft tissues or invade the jaw bones. If the lesion progresses slowly, little suppuration takes place; however, if it breaks down, abscesses are formed that discharge pus containing yellow granules ((nicknamed sulfur granules) through multiple sinuses.

There is no characteristic radiographic appearance. In some cases the lesion resembles a periapical radiolucent lesion. The more aggressive lesion resembles chronic suppurative osteomyelitis. In chronic suppurative osteomyelitis there is usually a single sinus through which pus exudes; however, in actinomycotic osteomyelitis there are many sinuses through which pus and "sulfur granules" exude.

Fig.13-12 Actinomycotic lesion similar to radicular cyst. This is not a typical appearance. (Courtesy, Dr. J. Weir).

OSTEORADIONECROSIS (and effects of irradiation on developing teeth)

In therapeutic radiation for carcinomas of the head and neck, the jaws are subjected to high exposure doses of ionizing radiation (average of 5000 R). This results in decreased vascularity of bone and makes them susceptible to infection and traumatic injury. Infection may occur in irradiated bone from poor oral hygiene, extraction wound, periodontitis, denture sores, pulpal infection or dental treatment. It is therefore advisable that a patient scheduled to undergo therapeutic radiation be given dental treatment prior to radiation therapy and that after radiation therapy the patient be taught to maintain good oral hygiene.

When infection occurs in irradiated bone, it results in a condition called osteoradionecrosis which is similar to chronic suppurative osteomyelitis. The mandible is affected more commonly than the more vascular maxilla. Therapeutic radiation may affect the salivary glands, producing decreased salivation. The resulting temporary or permanent xerostomia is responsible for radiation caries of teeth and erythema of the mucosa.

A radiograph of osteoradionecrosis, shows radiopaque sequestra and surrounding radiolucent purulency similar to that of chronic suppurative osteomyelitis. The two cannot be differentiated radiographically except by the history of therapeutic radiation.

Effects of irradiation on developing teeth depends on the stage of development when irradiation occurs and on the dosage administered. The injured tooth germs may either fail to form teeth (anodontia), exhibit dwarf-teeth, produce agenesis of roots, shortening and tapering of roots, or develop into hypoplastic teeth. The eruption of teeth may be retarded

and their sequencing may be disturbed. Other radiation induced effect may include maxillary and/or mandibular hypoplasia.

Fig.13-13 Occlusal projection of anterior region of mandible showing osteoradionecrosis. Notice the destruction of the trabecular pattern of bone.

Fig.13-14 Osteoradionecrosis of left mandible showing the radiopaque sequestra.

Fig.13-15 Osteoradionecrosis of left mandible has resulted in a pathologic fracture.

Fig.13-16 Dwarfing of teeth as a consequence of radiation therapy (Courtesy, Dr. L. Guerra)