

Imaging of Odontogenic Infections

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KEYWORDS

- Odontogenic infection • Osteomyelitis • Head and neck spaces • Cross-sectional imaging
- Panoramic radiography

KEY POINTS

- Odontogenic infections represent a common clinical problem in patients of all ages.
- The presence of teeth enables the direct spread of inflammatory products from dental caries, trauma, and/or periodontal disease into the maxilla and mandible.
- The radiographic changes seen depend on the type and duration of the inflammatory process and host body response.
- Imaging plays a central role in identifying the source of infection and the extent of the disease spread, and in detecting any complications.
- The imaging modalities used can range from conventional radiography, cone-beam computed tomography, contrast-enhanced computed tomography, MR imaging, and nuclear medicine studies.

INTRODUCTION

Infections in the jaws have diverse clinical courses and outcomes, as the origin and the spread of these infections involve various tissues and anatomic spaces. Infection in the jaws and surrounding structures may be odontogenic or nonodontogenic in origin. Odontogenic infection is that which arises from the tooth or structures closely surrounding the tooth. Inflammatory lesions are the most common pathology condition of the jaws.¹ Infections from the teeth can directly spread into adjacent osseous and soft tissues. Imaging plays a key role in identifying the source of infections, the extent of the disease process, and detecting any complications.² This article explores the various odontogenic infections, including dental caries, periodontal disease, pulpal disease, pericoronitis, osteomyelitis, and the appropriate imaging for their diagnoses, as well as the

extension of these infections into the surrounding maxillofacial spaces.

The role of diagnostic imaging is to define the location of the infection and to explore for possible spread of the disease beyond the site of origin.³ Plain radiography still is an important component of diagnosing dental caries and periodontal disease. Computed tomography (CT), including cone-beam CT (CBCT) plays an important role in detecting bony changes and periosteal reactions. However, CT is superior to CBCT in the assessment of soft tissue spread of infections. Magnetic resonance (MR) imaging is the ideal imaging protocol to diagnose soft tissue infections due to the high spatial and contrast resolution provided in these images. T1-weighted images are ideal for evaluating anatomy and short-T inversion recovery (STIR) or T2-weighted images provide information about soft tissue edema.⁴

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CARIES

Definition

Dental caries occurs when there is loss of mineral in the tooth structure caused by bacterial by-products. Dental caries is a highly prevalent disease affecting up to 92% of adults.⁵

Etiology

The cariogenic bacteria that initially are at the tooth surface create a demineralization of the outer tooth structure and through that damaged surface can enter the tooth. Caries is a dynamic process with alternative phases of demineralization and remineralization.⁶ The surface lesion may then progress to a larger lesion below the surface. Root caries that do not occur as a spread from coronal tooth caries may be the result of an oral environment lacking saliva to wash away the plaque and organisms; that is, drug-induced or radiation-induced xerostomia. Caries affecting the pulp chamber of the tooth will compromise the pulpal tissues and will progress to an inflammatory process within the root canal system and eventually lead to the death of the pulpal tissues. Caries may also recur after dental restorations have been placed where the margins are maladapted to the tooth surface and bacteria have a path to enter.

Radiographic Findings

Initial demineralization of the tooth surface occurs within the enamel as a cavitation or lucent zone commonly on the interproximal surfaces of the teeth. Caries that progresses below the surface appears as a triangle shape showing the spread from a larger base near the enamel surface and narrowing to a point toward the tooth center. The dentinoenamel junction (DEJ) is an important radiographic landmark, as it marks where the caries enters the dentin and then changes radiographic shape. If caries is limited to the enamel and has not reached the DEJ, it is called "incipient caries." As the caries encroaches on the dentin, it spreads along the DEJ to create another wide base that tapers to a point at the pulp. Larger carious lesions may then spread in multiple directions, into the pulp and further into the root, and are called "severe caries." **Fig. 1** shows the stages of caries from simple demineralization of the enamel surface to the larger caries extending into the pulp. The pattern for root caries is an isolated radiographic lucency on the root of the tooth superior to the crestal bone (**Fig. 2**). Recurrent dental caries is common and will appear as a lucent area at the edge of the dental restoration (**Fig. 3**).

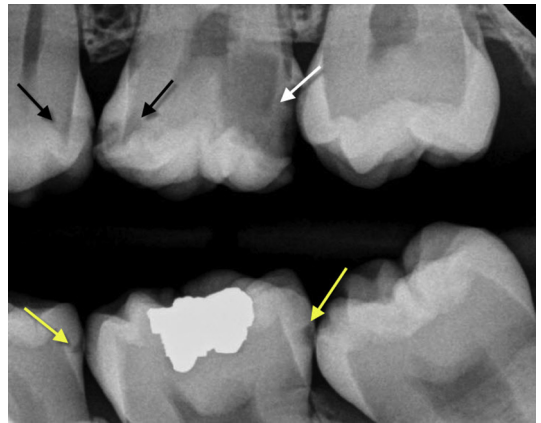


Fig. 1. Bitewing intraoral radiograph shows examples of carious lesions. The yellow arrows indicate incipient lesions that are limited to the enamel. The black arrows indicate caries into the DEJ and the white arrow indicates severe caries that has reached the pulp.

Intraoral dental radiography is the most appropriate imaging modality for diagnosis of caries. This includes periapical and bitewing radiographs. The resolution of these radiographs allows for detailed analysis of caries progression as well as analysis of the bone surrounding the tooth. One of the drawbacks of bitewing radiography is that it cannot differentiate between the clinical state of the surface; whether it is intact or cavitated.⁷



Fig. 2. CBCT sagittal cross section shows root caries in the mandibular left premolars. These lesions appear scooped out and are located at or below the CEJ and are usually associated with periodontal bone loss.

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