Dental Anatomy and Pathology Encountered on Routine CT of the Head and Neck

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OBJECTIVE. Although dental CT is not routinely performed at hospital imaging centers, dental and periodontal disease can be recognized on standard high-resolution CT of the neck and face. These findings can have significant implications with regard to not only dental disease, but also diseases of the sinuses, jaw, and surrounding soft tissues. This article serves to review dental and periodontal anatomy and pathology as well as other regional entities with dental involvement and to discuss the imaging findings.

CONCLUSION. Recognition of dental and periodontal disease has the potential to affect management and preclude further complications, thereby preserving the smile, one of the most recognizable and attractive features of the human face and, unfortunately, often disease ridden. Although practicing good oral hygiene and visiting the dentist for regular examinations and cleanings are the most effective ways to prevent disease, some patients do not take these preventative measures. Thus, radiologists play a role in diagnosing dental disease and complications such as chronic periodontitis and abscesses, nonhealing fractures and osteomyelitis, oroantral fistulas, tumoral diseases, osteonecrosis of the jaw, and other conditions.

Keywords: dental, mandibular, maxillofacial, odontogenic, periodontal

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Dental health is an invaluable component of a person's quality of life. The teeth are an important component of a person's image and are vital in the basic functions of alimentation and speech. Dental care incurs a large economic burden, with $108 billion being spent in the United States in 2010. Carious disease affects approximately half of children by the ages of 12–15 years [1]. A recent meta-analysis has also linked periodontal disease to coronary artery disease (CAD), with an approximately 24–35% increased risk of CAD in patients with periodontal disease [2].

Dental anatomy and pathology are poorly understood by physicians and are not routinely taught or practiced in allopathic or osteopathic medical training. Therefore, the goal of this article is to highlight dental anatomy and heighten awareness about dental pathology. Odontogenic diseases and diseases of surrounding structures with involvement of the teeth are included in this educational article.

By incorporating careful inspection of the teeth, alveolar sockets, and surrounding structures into their search pattern on routine neck, sinus, maxillofacial, and mandibular CT, radiologists will improve their diagnostic capability, thus preventing further disease progression and perhaps avoiding the need for costly endodontic repairs including tooth extraction.

Technique

At our institution, helical CT images of the maxillofacial region are acquired and displayed using both bone and soft-tissue algorithms, and coronal and sagittal reformations are derived from 0.625-mm reconstructions to provide exquisite bony detail. CT examinations of the neck soft tissues are similarly performed with 0.625-mm retroreconstructions and reformations. The radiation dose of these examinations must be kept in mind. New dental scanning techniques and cone-beam CT are available with various dose reduction techniques, but a discussion of these techniques is beyond the scope of this article.

This article serves as a case-based collection of dental findings seen on facial and neck CT including carious, gingival, and periodontal disease; infections and abscesses resulting from an odontogenic cause, osteomyelitis, a fracture, or hardware failure; osteonecrosis-associated sinus disease; odontogenic tumors; malignancies invading the bony jaw and teeth; and a variety of incidental findings.

Anatomy

The teeth—densely mineralized extensions from the maxilla and mandible—are the hardest substances in the human body [3]. In an adult, there are up to 32 permanent teeth (Fig. 1A), which are divided into four quadrants. In each quadrant from the central to outer teeth, there are the following teeth, with the same nomenclature applying to both maxillary and mandibular teeth: a central incisor, a lateral incisor, a canine, first and second bicuspids, and first through third molars.

The V-shaped socket of the jaw that houses the tooth is called the alveolus and the contacting bone the lamina dura. The tooth erupted above the gum line is called the crown; the portion or portions of tooth within the alveolus are called the root or rootlets (Fig. 1B). The densely mineralized surface of the crown is called the enamel; beneath the enamel lies the dentin, which is the bulk of the tooth. The pulp is the central chamber of the tooth and houses small blood vessels and nerves that wind through the roots toward the root apices. The cementum, which is the intraalveolar extension of enamel, is bound to the lamina dura of the alveolus by a fibrous periodontal ligament and is a potential space for the spread of disease [3, 4].

Within the mandible, the inferior alveolar canal houses the inferior alveolar nerve, a branch of the third division of the fifth cranial nerve (Fig. 1B); radiologists should focus special attention on this area because invasive diseases of local and adjacent structures have the potential to violate the inferior alveolar canal, which may alter surgical planning.

Understanding dental anatomy is essential in the recognition of disease processes such as carious and periodontal disease, endodontic disease with apical abscesses and potential paranasal sinus involvement, and various diseases of the surrounding structures with secondary dental involvement [3, 5].

Carious Disease

Carious disease is one of the most common diseases of childhood, affecting 52% of children according to one study [6]. The oral cavity houses a multitude of bacteria, the most studied being the *Streptococcus mutans* species [7, 8]. Bacteria thrive in a sugar-rich environment, and it is well known that a sucrose-rich diet is linked to carious disease. The fermentation of sugar leads to an acidic environment, which promotes demineralization of the enamel [9].

Caries are noted as round defects in the enamel. Caries along the occlusive surface are best seen on sagittal and coronal views, whereas those along the nonocclusive (buccal, lingual, mesial, or distal) surfaces are noted best on axial and coronal views (Figs. 2A and 2B). Carious defects are a means of the spread of bacteria into the pulp chamber. As infection progresses into pulpitis, a root canal procedure is indicated to preserve the roots and avoid complete tooth extraction. Extension of infection to the root apices can lead to the formation of a periapical abscess within the supporting alveolus, and the increased pressure at the root apex can devitalize the tooth [3, 5].

Periodontal and Endodontic Disease

A mixture of bacteria and desquamated oral epithelium (so-called "plaque") can accumulate along the teeth, particularly along the neglected gingival surfaces. Over time, plaque may calcify [10] (Figs. 3A and 3B). Chronic gingivitis may expose the periodontium, creating another means for the spread of infection, this time along the periodontal ligament. A so-called periodontal "pocket" of subgingival infected debris first accumulates and may trigger the need for periodontal curettage and the placement of packing material, a temporary membrane device, and sometimes a bone graft [3, 5]. On imaging, periodontal disease is evident as an abnormal lucency and resorption of the lamina dura and cementum expanding the space between the lamina dura and the cementum [3–5] (Fig. 2C).

Unrecognized and untreated periodontal disease can lead to endodontic disease, with an acute process presenting as a periapical abscess (Fig. 4A). A periapical abscess may dangerously exert pressure on the root apex and supplying neurovasculature, which can lead to tooth devitalization. There is necrosis, and sclerosis of the surrounding alveolar marrow, termed "condensing osteitis," eventually develops [3, 5] (Fig. 4A). A healed periapical abscess results in a periapical granuloma, at which point the patient may be asymptomatic [3, 5]. Another periodontal infection is pericoronitis. Pericoronitis is a complication of an impacted molar tooth in which the impacted tooth exerts pressure on the adjacent teeth and periodontium and causes erosion that progresses to periodontal inflammation and then to an abscess (Figs. 4C and 4D).

Common dental procedures such as a root canal and placement of a crown and bridge are included in this article as well. When infection spreads to the pulp and roots, the treatment involves coronectomy and excavation of the pulp and roots followed by placement of endodontic anchor posts. After appropriate healing, an artificial crown is placed to protect and support the remaining tooth structure (Fig. 5A).

Bridges are prosthetic crowns that are secured to adjacent native teeth, essentially a partial denture. They can adhere to retained roots of missing teeth and to adjacent teeth (Fig. 5B). When bridge placement is not ideal, endodontic implants may be placed, which is discussed later in this article.

Odontogenic Abscesses and Osteomyelitis of the Jaw

Gingival spread of disease into the buccal, sublingual, and masticator spaces can lead to abscess formation (Figs. 6B and 6D). Odontogenic infection is the most common cause for suprahyoid neck infections. Involvement of the masticator space often presents as trismus [11, 12]. Another potential sequela is cellulitis of the floor of the mouth, which causes the oropharynx to narrow; this entity is named "Ludwig angina" and is a true emergency because there is a danger of asphyxiation [13].

Osteomyelitis of the jaw can develop from an untreated infectious cause involving the cancellous bone and may appear as aggressive lytic destruction with sclerosis of the adjacent marrow. Other potential sources of osteomyelitis are fractures, particularly nonrecognized or nonhealing fractures, that expose the medullary cavity to periodontal or oral cavity pathogens (Fig. 7B). Complicated mandibular fractures extend to involve the alveolar processes and teeth, thus disrupting periodontal integrity. In addition to potential surgical correction, these fractures require antibiotic therapy prophylaxis. Studies show an increased failure rate and increased rate of osteomyelitis in patients with complicated fractures that were not treated with antibiotics [14, 15] (Fig. 7B).

Osteomyelitis on CT often appears as lytic destruction, with low-attenuation areas representing areas of osteonecrosis and pus accumulation, surrounded by sclerotic marrow changes. Buccal or lingual cortical dehiscence can be seen accompanied by periosteal reaction (Fig. 7A). Inflammatory changes of the adjacent soft tissues can be quite extensive, sometimes mimicking a neoplasm [16, 17].

Osteomyelitis may become chronic if the initial infection is subclinical and unrecognized or a bony defect persists, allowing the accumulation of bacteria. Imaging findings are often peripheral sclerosis with a mixed pattern of trabecular osteolysis and sclerosis, bone fragmentation with a sequestrum, and expansion of the surrounding bone (Fig. 7C).

New bone formation along the periphery due to chronic periosteal new bone formation is called an involucrum.

Sinus Disease

Some authors have reported a twofold increase in maxillary sinus disease in patients with periodontal and endodontic disease [18]. The roots of the maxillary molars may abut the maxillary sinus floor and periapical infection may erode into the maxillary sinus and incite mucosal inflammation (Fig. 8A). In fact, a maxillary antrum polyp or retention cyst may be caused by endodontic disease, which should prompt radiologists to routinely inspect the dental root apices and periodontal integrity.

A frequently encountered complication of dental extraction is an abnormal connection between the maxillary sinus and the oral cavity termed an “oroantral fistula” [18]. Severe periodontal disease may also erode into the sinus cavity, creating a fistula. On imaging, these fistulas are recognized as a bony defect bridging the maxillary sinus with the oral cavity. Soft tissue separating the two cavities may represent granulation tissue, versus fluid and debris, and may be difficult to discern (Fig. 8B). Rootlets may also be fragmented and retained (Fig. 8C).

Osteonecrosis

The most common causes of jaw osteonecrosis are chronic osteomyelitis related to odontogenic infection followed by radiotherapy of the head and neck resulting in bony necrosis, the so-called “osteoradionecrosis of the jaw.”

Osteoradionecrosis of the jaw is a complication of radiation therapy for head and neck cancers [19, 20]. The usual clinical presentation is a nonhealing oral mucosal irritation with exposed bone. Radiation obliterates the small arterioles of the jaw, preferentially the mandible because it has less blood supply than the maxilla. CT findings include cortical disruption, disorganized trabeculation, and osseous fragmentation (Fig. 9B).

A relatively new entity is bisphosphonate-induced osteonecrosis of the jaw, first described as a diagnosis in 2002 [21–23], most often presenting as a nonhealing defect at least 8 weeks after tooth extraction [21, 23]. There is a strong link to the use of bisphosphonate therapy, with most cases occurring in patients who received IV preparations for the treatment of osseous metastatic disease as opposed to oral preparations for the treatment of osteoporosis or Paget disease.

Both forms of osteonecrosis manifest as lytic defects with extensive bony destruction and variable components of intermixed sclerosis (Figs. 9B and 9C). The exact cause and pathogenesis are debatable. The lesions are often infected with oral flora, but it is unclear if infection is the primary cause or if a noninfectious cause exists with bacterial superinfection [21, 22]. Other theories include a bony hypoxia from decreased angiogenesis resulting in poor bone turnover and healing [21].

Cysts and Tumors

Lesions of the bony jaw are a diagnostic conundrum for radiologists. The differential diagnosis is so broad that it is beyond the scope of this article. As a brief mention, benign lesions are slow growing and often expand cortex. On the other hand, malignancies are more destructive and erode cortex with sharp edges and radiating periosteal reaction [3].

One frequently encountered lesion is a dentigerous cyst, the most common variety of odontogenic cysts (Fig. 10A). This lesion arises from nonkeratinized epithelium lining the crown of an unerupted tooth. A dentigerous cyst is simply a developmental anomaly and is not a true neoplasm. Because it is epithelium lined, it has the potential to grow and cause thinning of the cortex, thus increasing the risk for pathologic fracture [3].

Other benign examples include the odontoma, the so-called “hamartoma of the jaw,” which is composed of enamel, cementum, and dentin. It is characterized on imaging as an ovoid, well-demarcated sclerotic lesion with globular and speckled calcifications (Fig. 10B). It is usually found when exploring the cause of an unerupted tooth [24].

More aggressive lesions typically destroy the cortex of the jaw. In a child, Langerhans cell histiocytosis (LCH) is a prime consideration, especially in patients with confluent lytic lesions surrounding the teeth roots. Bilateral mandibular lesions strongly support this diagnosis (Fig. 11A). LCH of the jaw is often treated with curettage and radiotherapy in aggressive or recurrent cases [25].

One aggressive tumor of odontogenic origin is an ameloblastoma, a histologically benign tumor with very aggressive, often deforming, features. The presentation is usually a painless, rapidly enlarging mass that may produce crepitus on examination as the cortex is expanded and thinned over time. Imaging findings may range from a well-demarcated soft-tissue mass (Fig. 11B) to a multilocular mass with a so-called “soap-bubble” appearance [26, 27].

Squamous cell carcinoma is the most frequently encountered head and neck malignancy. Cancers from either the lingual or buccal tissues invade and destroy the adjacent cortex and are often accompanied by periosteal reaction [3] (Fig. 11C). Using imaging to identify the anatomy that is involved helps guide presurgical planning: for example, using imaging to identify which teeth need to be extracted before radiation therapy and using imaging to detect invasion of the inferior alveolar canal, the treatment of which may entail radical hemimandibulectomy [3], and to detect perineural spread of disease (Fig. 11D).

Edentulism and Implant Planning

A lack of teeth has more than a cosmetic impact on a person because self-esteem, dietary intake, speech, and overall quality of life are affected [28, 29]. Some authors estimate that 30% of Americans over the age of 65 years are edentulous [28]. With edentulism and in combination with osteoporosis, there is lack of masticatory stress on the maxillary and mandibular alveolar ridges, resulting in bone absorption and thinning. Decreased alveolar height and reduced mineralization preclude adequate implant placement and the complication rate [28] (Fig. 12A). Bone augmentation procedures exist, such as the sinus lift procedure, whereby an osteotomy flap along the maxillary sinus floor is packed with bone graft material to increase the maxillary alveolar height (Fig. 12B). Another potential augmentation is bone grafting in which the donor portion, usually derived from the iliac crest, is grafted onto the mandible [3].

Radiologists currently maintain a role in the presurgical planning of endodontic implants. Dental CT provides the clinician with the most accurate and precise means of preprocedural planning. Performing imaging in the transverse plane through the alveolus avoids amalgam artifact. Specialized reconstruction software helps determine the ideal location for implant placement to ensure proper alveolar anchoring while avoiding deep neurovascular structures and violation of the maxillary sinus floor. A commonly seen complication encountered on facial CT is granuloma formation at the apex of an implant with or without maxillary sinus involvement. Other complications have been reported, such as infection, loosening, and fractures [28]. A complete discussion of the method, procedure, and complications of implants is beyond the scope of this article.

Incidental Findings

One role that the imager plays in dental CT is to guide the oral surgeon for optimal surgical planning. Two frequently encountered incidental bony findings are tori and exostoses [24, 30]. Maxillary and mandibular exostoses are corticated bony extensions at the lingual or buccal edge of the alveolar ridge (Fig. 13A). These exostoses may be problematic when performing periodontal surgery and may require surgical resection. A torus is a lobulated bony growth usually arising from the hard palate (torus palatinus) or lingual mandible (torus mandibularis) (Fig. 13B).

Both of these entities may become problematic if they are large and interfere with speech or alimentation and may contribute to periodontal disease. Additionally, these lesions may be noted by patients, who are then referred for dental imaging.

Conclusions

With a foundation of knowledge of the anatomy of the dental, periodontal, endodontic, and surrounding oral structures, one is able to better diagnose disease. Careful inspection of the bony jaw and teeth on maxillofacial, paranasal sinus, and soft-tissue neck CT is instrumental for radiologists to diagnose and help guide treatment of dental disease. Recognizing such pathology is supplemental in preserving a patient's smile, preventing chronic infectious processes, and avoiding costly endodontic repair.

References

1. Centers for Disease Control and Prevention website. Oral health: preventing cavities, gum disease, tooth loss, and oral cancers at a glance 2011. www.cdc.gov/chronicdisease/resources/publications/AAG/doh.htm. Accessed July 19, 2013
2. Humphrey L, Rongwei F, Buckley D, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. *J Gen Intern Med* 2008; 23:2079–2086
3. Abrahams JJ, Dental CT. Imaging: a look at the jaw. *Radiology* 2001; 219:334–345
4. Gahleitner A, Imhof H. Dental CT: imaging technique, anatomy, and pathologic conditions of the jaws. *Eur Radiol* 2003; 13:366–376
5. Abrahams JJ, Berger SB. Inflammatory disease of the jaw: appearance on reformatted CT scans. *AJR* 1998; 170:1085–1091
6. National Center for Biotechnology Information website. Bader JD, Rozier G, Harris R, Lohr KN. Dental caries prevention: the physician's role in child oral health. www.ncbi.nlm.nih.gov/books/NBK43253/. Accessed July 19, 2013
7. Tanzer JM, Livingston J, Thompson AM. The microbiology of primary dental caries in humans. *J Dent Educ* 2001; 65:1028–1037
8. Hardie JM. The microbiology of dental caries. *Dent Update* 1982; 9:199–208
9. Shaw JH. The role of sugar in the aetiology of dental caries. 6. Evidence from experimental animal research. *J Dent* 1983; 11:209–213
10. Molokhia A, Nixon GS. Studies on the composition of human dental calculus. *J Radioanalytical Nucl Chem* 1984; 83:273–281
11. Yonetsu K, Izumi M, Nakamura T. Deep facial infections of odontogenic origin: CT assessment of pathways of space involvement. *AJNR* 1998; 19:123–128
12. Schuknecht B, Stergiou G, Graetz K. Masticator space abscess derived from odontogenic infection: imaging manifestation and pathways of extension depicted by CT and MR in 30 patients. *Eur Radiol* 2008; 18:1972–1979
13. Huang TT, Lui TC, Chen PR, Tseng FY, Yeh TH, Chen YS. Deep neck infection: analysis of 185 cases. *Head Neck* 2004; 26:854–860
14. James RB, Fredrickson C, Kent JN. Prospective study of mandibular fractures. *J Oral Surg* 1981; 39:275–281
15. Abubaker AO, Rollert MK. Postoperative antibiotic prophylaxis in mandibular fractures: a preliminary randomized, double-blind, and placebo-controlled clinical study. *J Oral Maxillofac Surg* 2001; 59:1415–1419
16. Calhoun KH, Shapiro RD, Stiernberg CM, Calhoun JH, Mader JT. Osteomyelitis of the mandible. *Arch Otolaryngol Head Neck Surg* 1988; 114:1157–1162
17. Vezeau PJ, Koorbusch GF, Finkelstein M. Invasive squamous cell carcinoma of the mandible presenting as a chronic osteomyelitis: report of a case. *J Oral Maxillofac Surg* 1990; 48:1118–1122
18. Abrahams JJ, Glassberg RM. Dental disease: a frequently unrecognized cause of maxillary sinus abnormalities? *AJR* 1996; 166:1219–1223
19. Hermans R, Fossion E, Ioannides C, Van Den Bogaert W, Ghekiere J, Baert AL. CT findings in osteoradionecrosis of the mandible. *Skeletal Radiol* 1996; 25:31–36
20. Debnam JM. Imaging of the head and neck following radiation treatment. *Patholog Res Int* 2011; 2011:607820
21. Rizzoli R, Burlet N, Cahall D, et al. Osteonecrosis of the jaw and bisphosphonate treatment for osteoporosis. *Bone* 2008; 42:841–847
22. Marx RE, Stern D, eds. *Oral and maxillofacial pathology: a rationale for treatment*, 1st ed. Hanover Park, IL: Quintessence Publishing, 2002:36–38
23. Woo S, Hellstein J, Kalmar J. Narrative review: bisphosphonates and osteonecrosis of the jaws. *Ann Intern Med* 2006; 144:753–761
24. Yonetsu K, Nakamura T. CT of calcifying jaw bone diseases. *AJR* 2001; 177:937–943
25. Can IH, Kurt A, Özer E, Sari N, Samim E. Mandibular manifestations of Langerhans cell histiocytosis in children. *Oral Oncol Extra* 2005; 41:174–177
26. Weissman JL, Snyderman CH, Yousem SA, Curtin HD. Ameloblastoma of the maxilla: CT and MR appearance. *AJNR* 1993; 14:223–226
27. Reichart PA, Philipsen HP, Sonner S. Ameloblastoma: biological profile of 3677 cases. *Eur J Cancer B Oral Oncol* 1995; 31:86–99
28. Saavedra-Abril J, Balhen-Martin C, Zaragoza-Velasco K, Kimura-Hayama ET, Saavedra S, Stoopen ME. Dental multisection CT for the placement of oral implants: technique and applications. *RadioGraphics* 2010; 30:1975–1991
29. Marcus P, Joshi A. Complete edentulism and denture use for elders in New England. *J Prosthet Dent* 1996; 76:260–266
30. Al Quran F, Al-Dwairi Z. Torus palatinus and torus mandibularis in edentulous patients. *J Contemp Dent Pract* 2006; 7:112–119
31. eDoctor: Patient Centered Medical Blog by Online Doctors. www.edoctor.co.in/wp-content/uploads/2010/11/DSC00464.jpg. Accessed September 5, 2013

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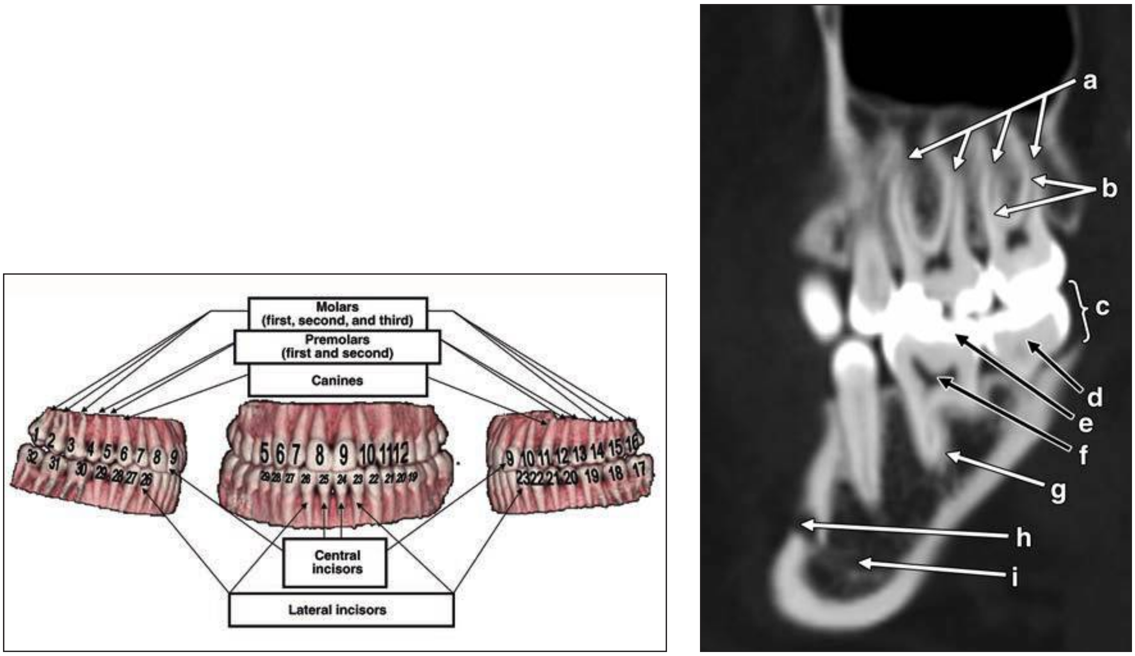

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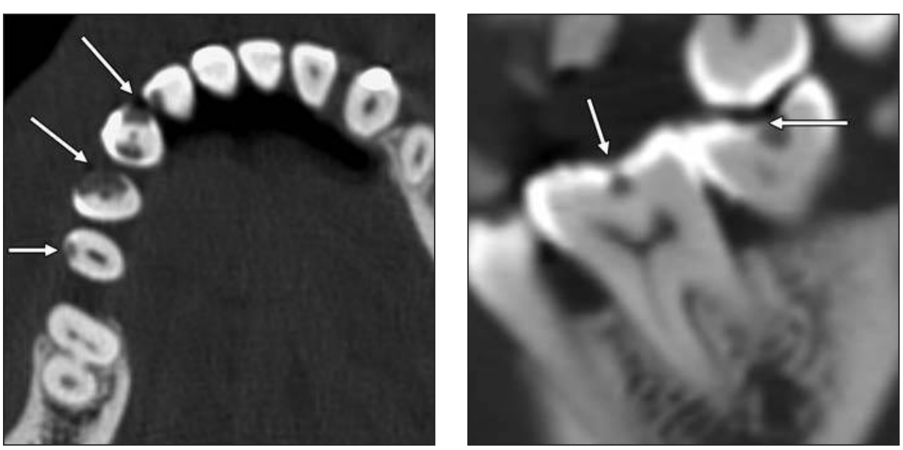
Fig. 1—Nomenclature.
A, Volume-rendered CT reformation image of teeth of 18-year-old man. There are up to 32 permanent teeth in human adult, which are enumerated as shown including paired bilateral maxillary and mandibular central and lateral incisors, canines, two premolars, and three molars.
B, Sagittal CT image through molar teeth shows dental anatomy. Roots (b) are planted into alveolar processes of maxilla and mandible. Crown (c) is erupted portion of tooth. Pulp chamber of tooth (f) contains neurovascular structures that exit root via apical foramina (a). Dentin (d) comprises bulk of tooth, which is covered by densely mineralized enamel (e). Periodontal ligament (g) is dense fibrous tissue that bonds tooth roots to alveolar bone. Inferior alveolar nerve, branch of third division of fifth cranial nerve, courses through mandible in inferior alveolar canal (i) and exits via mental foramen (h).

Fig. 2—Carious and periodontal disease.
A, Axial thin-section CT image through mandible shows multiple punched-out defects (*arrows*) in enamel mostly along buccal and mesial surfaces.
B, Sagittal CT reconstruction image shows additional defects (*arrows*) along occlusive surfaces.
C, CT image. Periodontal and periapical lucency (*arrow*) surrounding roots of second molar indicates endodontic spread of infection.



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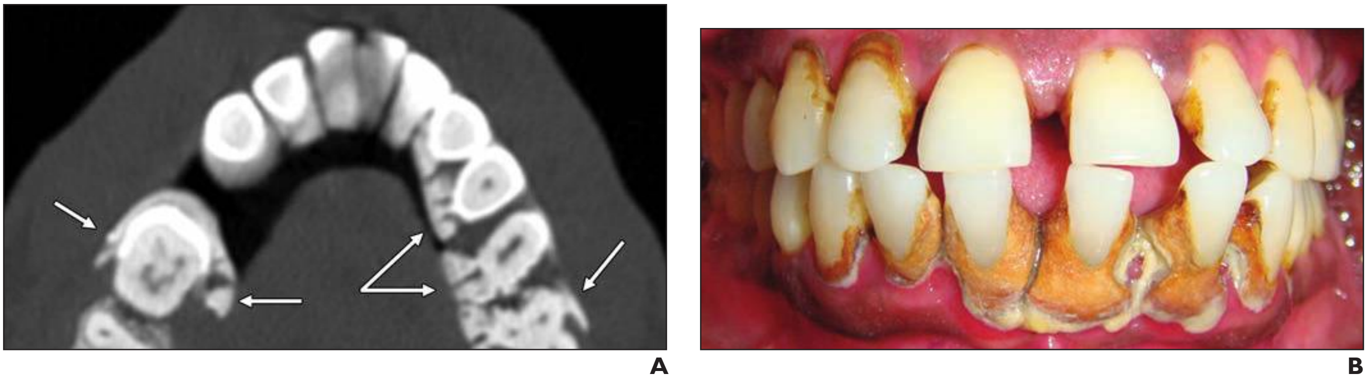


Fig. 3—Gingival disease and calculus.
A, Axial CT image shows chunky gingival calcifications (*arrows*) surrounding crowns of multiple teeth and along buccal and lingual surfaces.
B, Photograph shows dense calcified gingival disease and purulent debris. (reprinted with permission from www.edoctor.co.in/ [31])

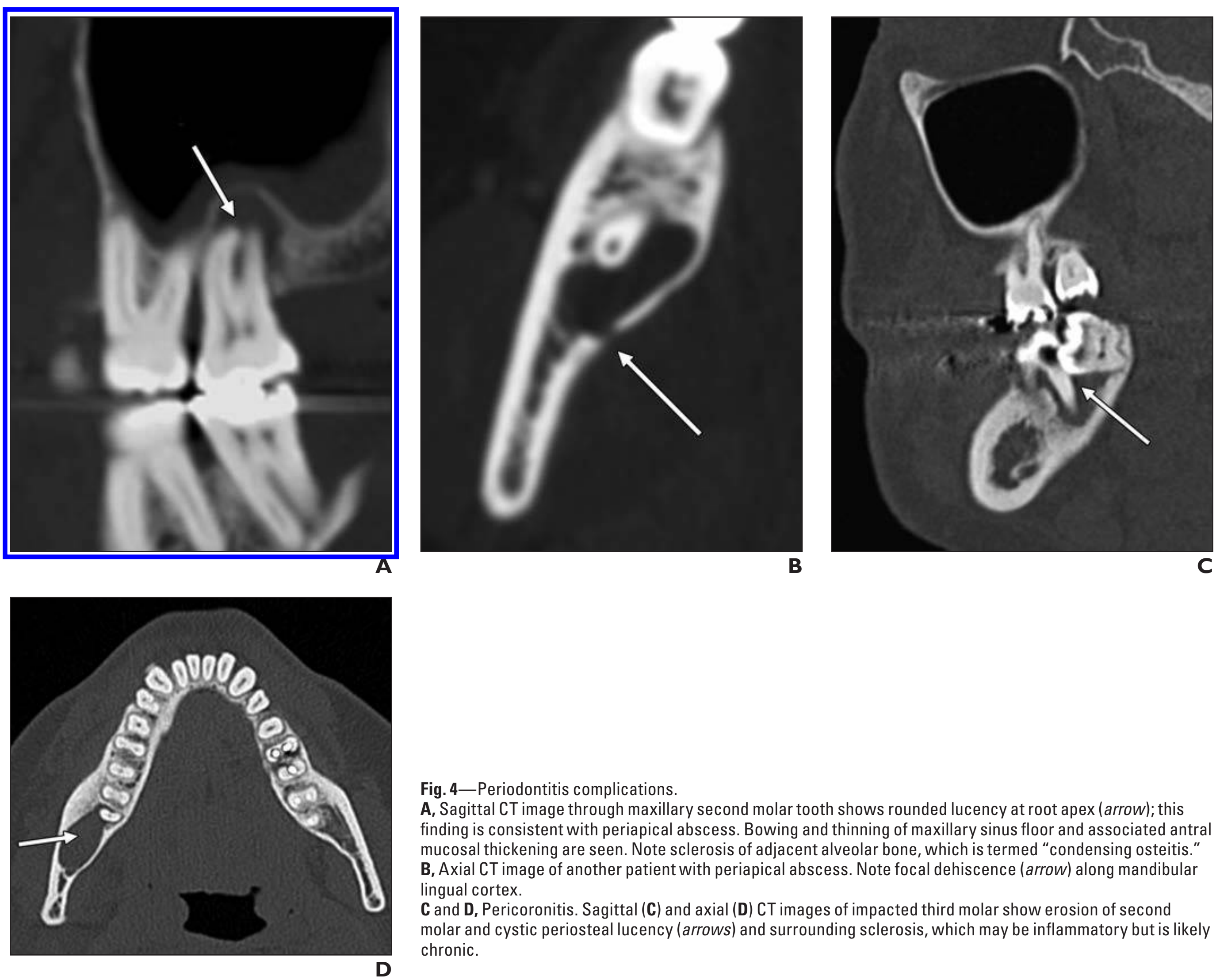


Fig. 4—Periodontitis complications.
A, Sagittal CT image through maxillary second molar tooth shows rounded lucency at root apex (*arrow*); this finding is consistent with periapical abscess. Bowing and thinning of maxillary sinus floor and associated antral mucosal thickening are seen. Note sclerosis of adjacent alveolar bone, which is termed "condensing osteitis."
B, Axial CT image of another patient with periapical abscess. Note focal dehiscence (*arrow*) along mandibular lingual cortex.
C and **D,** Pericoronitis. Sagittal (**C**) and axial (**D**) CT images of impacted third molar show erosion of second molar and cystic periosteal lucency (*arrows*) and surrounding sclerosis, which may be inflammatory but is likely chronic.

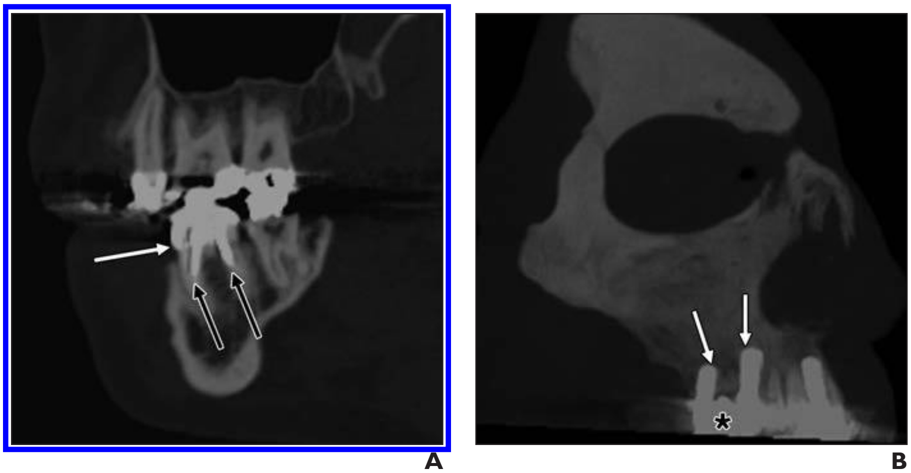


Fig. 5—Common prostheses.
A, Sagittal CT image of root canal of mandibular molar tooth. Endodontic anchors are placed into roots (*black arrows*). Crown or cap (*white arrow*) is placed over excavated crown.
B, Coronal CT reformation image shows multiple endodontic implants (*arrows*). Between implants, bridge (*asterisk*), which is supported by adjacent implants, was placed.

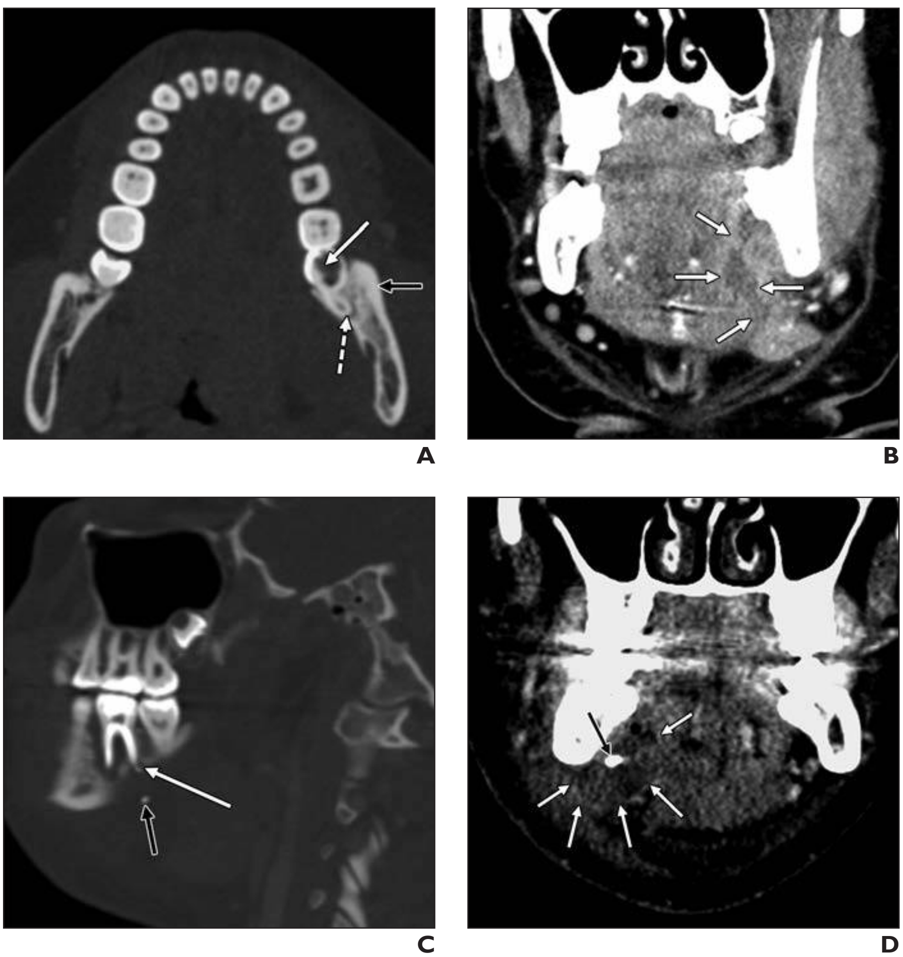


Fig. 6—Odontogenic abscesses.
A, Patient who presented with left jaw pain and swelling. Axial CT image through mandible shows large cavity of third molar (*solid white arrow*) and underlying periodontal disease (*dashed arrow*). Adjacent buccal cortex is thickened and marrow cavity appears sclerotic (*black arrow*).
B, Coronal contrast-enhanced CT image of same patient as in **A** shows associated odontogenic abscess in sublingual space (*arrows*) extends inferiorly to involve mylohyoid muscle.
C, Patient who presented with submandibular swelling 5 days after undergoing root canal. Root apex perforation is present with endodontic material extrusion (*black arrow*) through focal cortical dehiscence (*white arrow*).
D, Coronal CT image of same patient as in **C** shows submandibular space abscess (*white arrows*) has developed around extruded endodontic material (*black arrow*). Treatment will require specialized care from oral surgeon or endodontist.

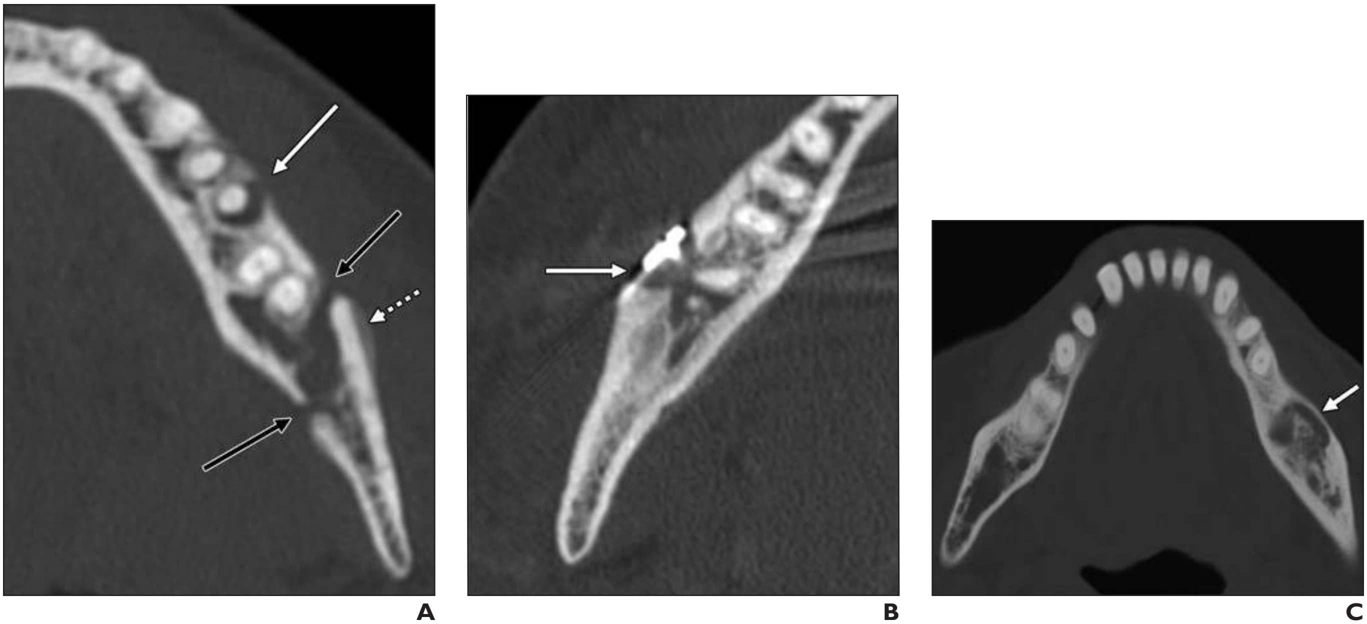


Fig. 7—Osteomyelitis.
A, Patient who presented with facial swelling. Axial thin-section CT image shows mandibular defects along lingual and buccal cortexes (*black arrows*) with lucency of underlying bone marrow. Patient had vague history of trauma; infected nonhealed fracture could have this appearance. Note additional periodontal disease of first molar (*solid white arrow*) with adjacent condensing osteitis. Periosteal reaction (*dashed arrow*) is seen along buccal cortex.
B, Patient who presented with facial swelling and dental pain and had history of mandibular fracture repair. Axial CT image shows microchain suture repair (*arrow*) with underlying lucency. Finding of lucency is suspicious for hardware failure due to infection.
C, Patient who underwent tooth extraction 1.5 years earlier. Axial thin-section CT image shows mixed sclerotic trabeculation and lucency in left mandibular angle. Note new ossification along periphery (*arrow*), which is termed "involucrum." These findings are suggestive of chronic osteomyelitis.

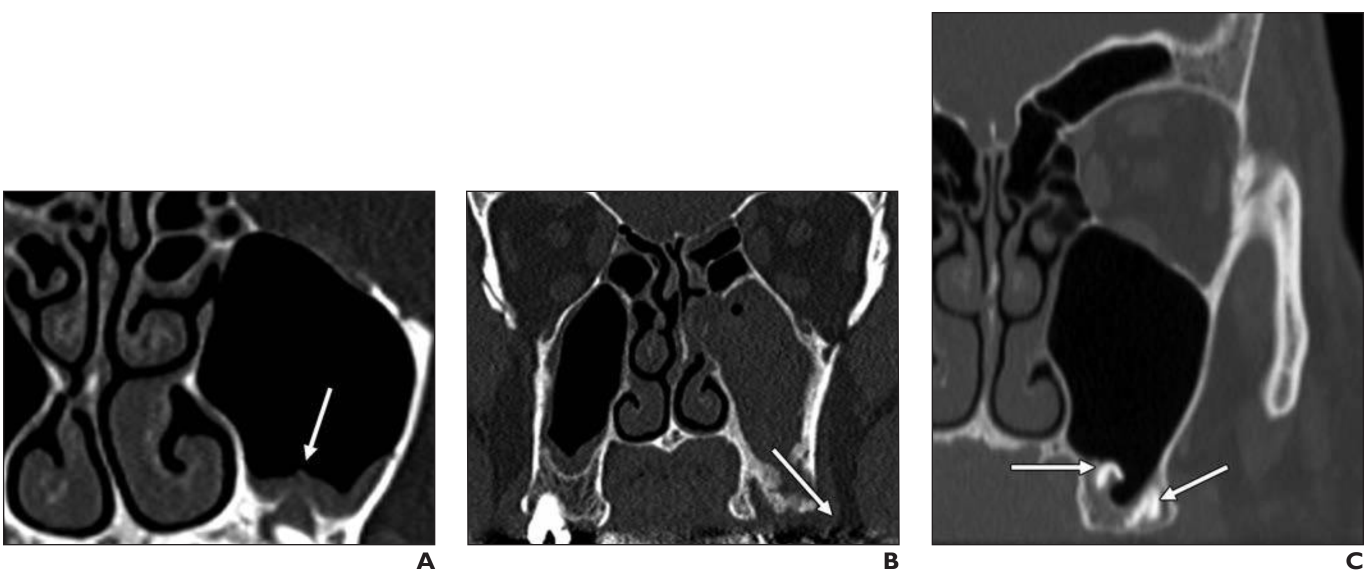


Fig. 8—Associated sinus disease.
A, Coronal image from sinus CT study shows mucosal thickening (*arrow*) along left maxillary sinus antrum. There is bulging periapical lucency of premolar tooth with sinus floor dehiscence. There is marked opacification of sinus with reactive sclerosing osteitis.
B, Patient who presented after undergoing molar extraction. Coronal CT image shows defect (*arrow*) in maxillary alveolus connecting sinus antrum to oral cavity. This defect is suggestive of oroantral fistula, complication of dental surgery that may be cause of visualized extensive maxillary sinus disease.
C, Retained rootlets (*arrows*) from tooth extraction are followed and imaged to evaluate for possible subclinical complications. In this case, lingual rootlet is dislodged into maxillary sinus alveolar recess without signs of mucosal disease.

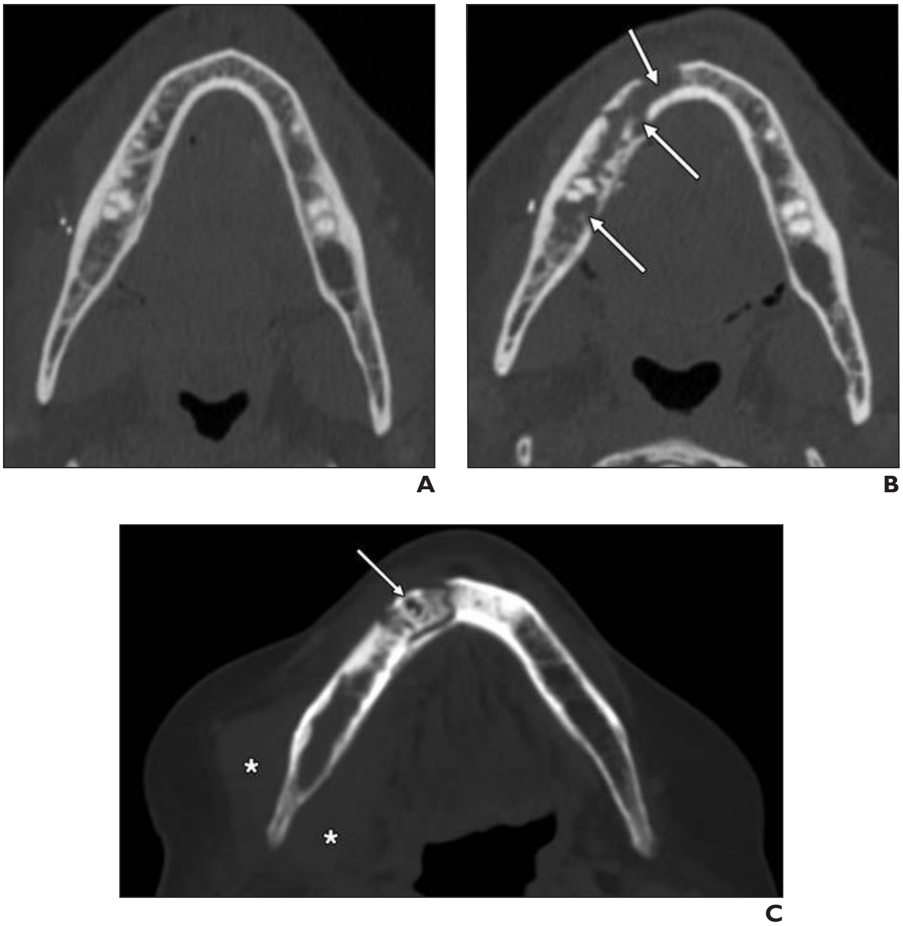


Fig. 9—Osteonecrosis.
A, Patient who presented for follow-up imaging after undergoing radiation for submandibular gland malignancy. CT image obtained 6 weeks after radiation shows no bony abnormality.
B, Same patient as shown in **A**. CT image obtained 1.5 years after radiation shows extensive osteoradionecrosis and multiple cortical disruptions (*arrows*).
C, Woman with multiple myeloma with jaw lesion treated with IV bisphosphonates and radiation. CT image shows posterior mandibular body osteolysis with associated perimandibular soft tissue (*asterisks)*, which is consistent with plasmacytoma. More anteriorly, there is necrosis with sequestrum (*arrow*) and surrounding involucrum that may represent bisphosphonate-related osteonecrosis or osteoradionecrosis related to radiation therapy.

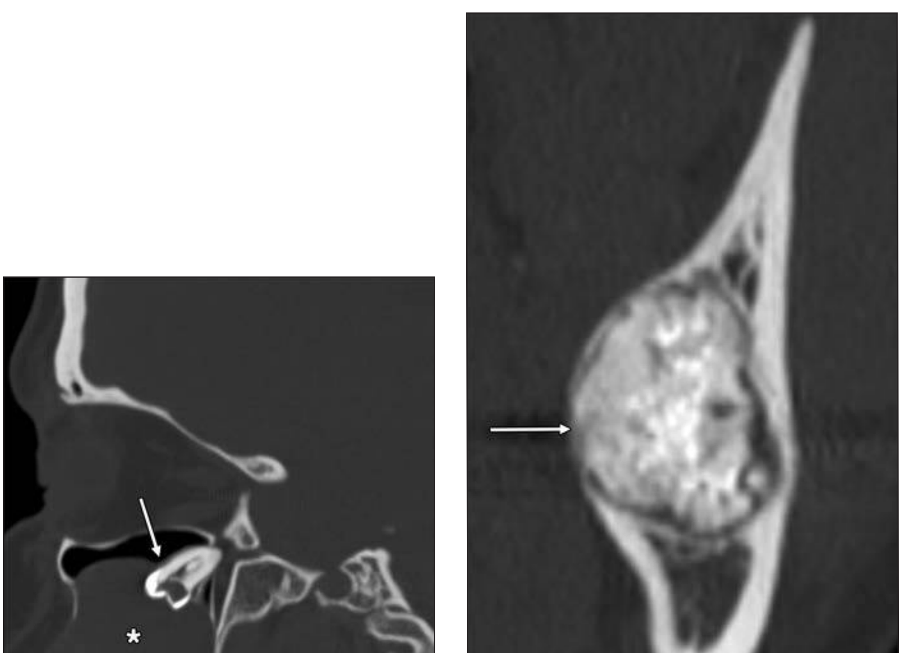


Fig. 10—Benign lesions.
A, Sagittal CT image through maxillary sinus shows large fluid-filled lesion (*asterisk*) occupying sinus. Unerupted tooth is noted at its superior aspect with posterior mass effect and encroachment on sphenopalatine foramen. Note that cyst attaches onto unerupted molar at its cervical region (*arrow*); this finding is diagnostic of dentigerous cyst. Thin line, which represents epithelial lining of cyst, is visible.
B, Coronal thin-section CT image of patient with unerupted third molar shows well-defined sclerotic mass (*arrow*) of mixed calcifications. This finding is consistent with odontoma.

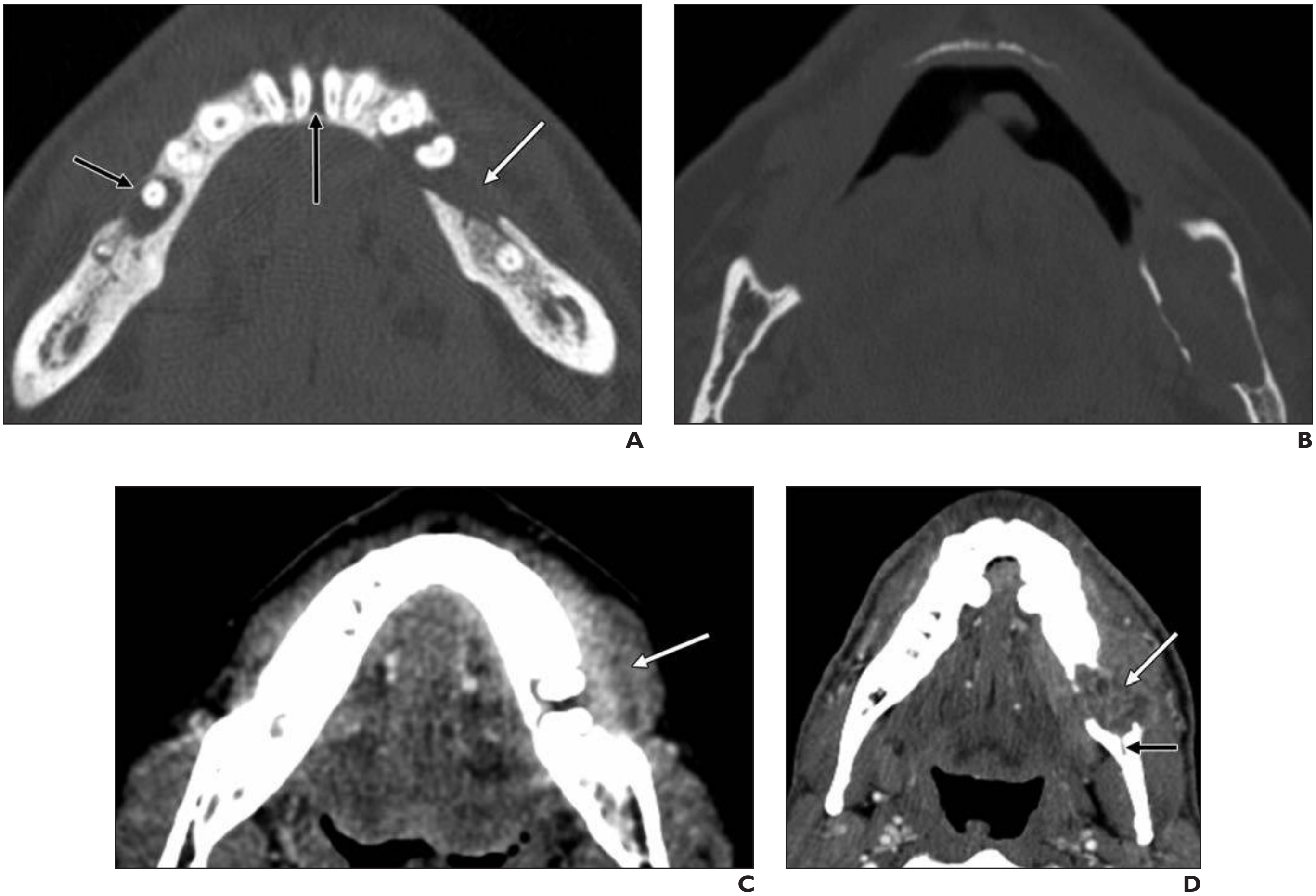


Fig. 11—Aggressive lesions.
A, Axial thin-section CT image through mandible of 11-year-old child with known Langerhans cell histiocytosis shows multiple lytic lesions (*white arrow*), especially affecting alveolar bone, with preservation of dental roots (*black arrows*).
B, Axial CT image through mandibular angles of 48-year-old patient shows expansible lytic lesion with thinning and dehiscence of cortex. This lesion is pathology-proven ameloblastoma.
C, Axial contrast-enhanced CT image of neck soft tissues shows soft-tissue lesion (*arrow*) invading buccal aspect of mandible. Note enhancing soft tissue spreading along mandibular surface. Underlying periodontal lucency extends between molars, likely heralding spread of disease. This lesion is pathology-proven oral squamous cell carcinoma.
D, CT image of another patient with squamous cell carcinoma shows soft-tissue destruction of mandible (*white arrow*). Note its apposition to inferior alveolar canal (*black arrow*).

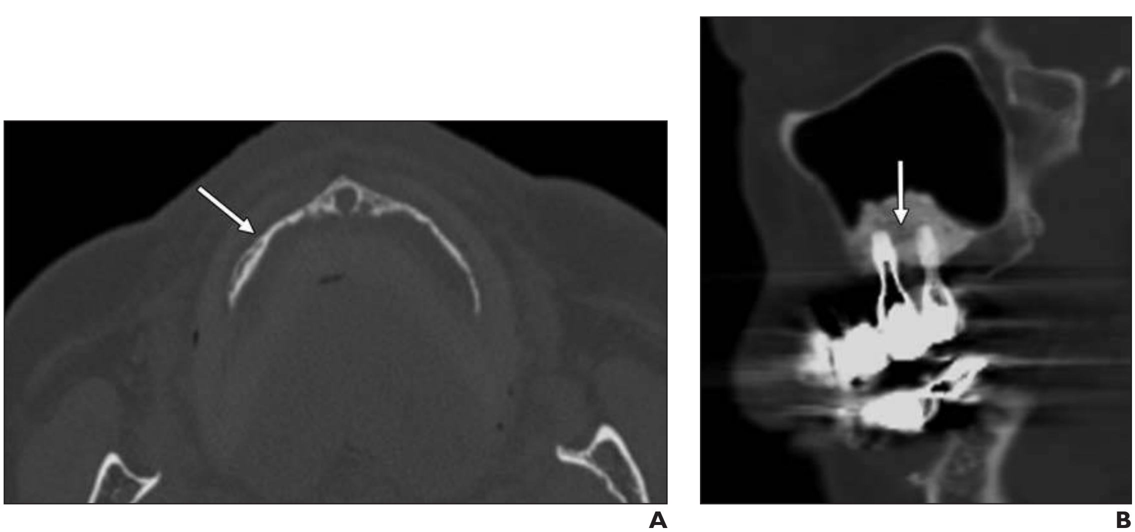
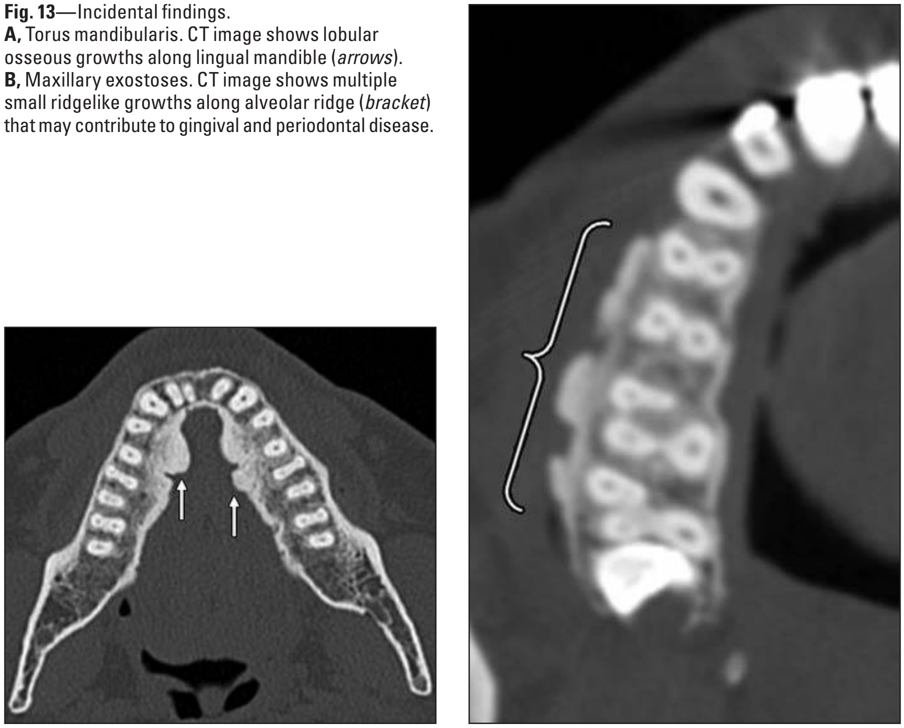


Fig. 12—Patient with edentulism.
A, Thin-section axial CT image shows marked thinning of alveolar maxilla (*arrow*).
B, Sagittal CT image shows maxillary molar implants are being supported by new bone formation (*arrow*); these findings are consistent with prior sinus lift procedure. Sinus lift procedure is surgical method of improving alveolar height.

Fig. 13—Incidental findings.
A, Torus mandibularis. CT image shows lobular osseous growths along lingual mandible (*arrows*).
B, Maxillary exostoses. CT image shows multiple small ridgelike growths along alveolar ridge (*bracket*) that may contribute to gingival and periodontal disease.



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