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THE VARIANCE OF RADIOPAQUE IMAGES COMMONLY FOUND IN PERIAPICAL LESION USING PERIAPICAL RADIOGRAPHIC TECHNIQUE (Review article)

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ABSTRACT
***Background**: Two pathological views are presented in radiographic imaging: radiolucency and radiopacity. In radiographic examination, radiopaque lesions are reported as the most common manifestation to be found. Opaque lesions are displayed into various depictions thus more specific examination is required to distinguish respective lesions. **Objectives**: Investigate radiopacity aspect of periapical lesions using literature review to aid dental practitioners obtain final diagnosis, differential diagnosis, and identification of each periapical opaque lesion. **Discussion**: Assessing respective matter about lucent and opaque lesion images in periapical tissue, this review resulted in the identification of elusive characterization in each opaque lesion. **Conclucion**: Radiographically, each diagnosis possesses particular characteristic which differ each periapical opaque lesion from another.*

***Keyword**: Opaque lesion characteristic, periapical opaque lesion, periapical radiograph*

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INTRODUCTION

Inflammatory lesion in periapical region is a local response of bone surrounding dental apex to periapical tissue destruction which induced by the expansion of periodontal disease. Infectious agents from necrotized pulp spread via root apex to promote inflammatory reaction in surrounding bone.[1] This frequently affects alveolar bone in periapical region or surrounding teeth.[2] This periapical lesion is identified as an abnormality around root apex, periodontal membrane and alveolar bone.[2,3,4] Commonly began with inflammation or necrosis of the pulp, this condition then progressively circulate inflammatory mediators through apical foramen to initiate the development of periapical lesion.[2,5] Traditionally, periapical radiograph has been clinically used to diagnose periapical pathology.[18]

For many radiologists, radiopaque lesion of jaw bone is known as *terra incognita*, the Latin term for "unknown land". Jaw lesions mostly depict radiolucent appearance, such as periapical (radicular) cyst, folicular (dentigerous) cyst, ceratocyst odontogenic tumor (previously known as odontogenic keratocyst), and ameloblastoma; which are well-explained in radiological literatures. Yet radiopaque presentations of jaw lesion are continuously gained less attention. Radiological diagnosis of periapical and jaw lesions are obtained through several imaging aspects such as attenuation, margination (narrow or wide transition zone) and the interrelation with adjacent teeth.[6]

Causing resorption in periapical bone structure, progressive phase of inflammatory condition can be identified by radiolucent lesion in

radiographic examination.[19] Radiopaque lesion may also be identified near dental apices and should be discerned, as it is possibly progressed from endodontic and non-endodontic problem.[20]

The purpose of this review is to discuss about radiopacity aspect of periapical lesion through literature review and assist dental practitioner obtain final diagnosis, differential diagnosis, and identification of each periapical opaque lesion.

This article elucidates four common lesions frequently found in dental practice, comprised of: cementoblastoma, cemento-osseus dysplasia, condensing osteitis/periapical sclerosing osteitis and hypercementosis. These lesions are reported as the most common lesion to be found in periapical region.[6]

Cementoblastoma

Cementoblastoma frequently occurs among adolescent and children under age 20 (50%) and under 30 (75%). The incident varies from less than 1% to 6.2% among other odontogenic tumors. More than 75% cementoblastomas are developed in mandibula where 90% progressed in mandibular first molar or second premolar area. Radiographically, cementoblastoma appeared as sclerotic periapical lesion with clear and sharp border surrounded by round radiolucency which attached closely to dental root.[6]

Figure 1. Round sclerosing and opaque lesion in dental periapical region with clear and sharp border surrounded by round radiolucent area.

Cemento-osseus dysplasia

Cemento-osseus dysplasia is hamartomatosed process which frequently related with dental apex. Presented in many clinical variations, respective terminology becomes quite confusing. Cemento-osseus dysplasia usually progresses in the anterior of mandibula and merely includes one or several teeth. Other restricted manifestation occured in posterior region of the jaw, commonly affects molar tooth, is entitled as focal cemento-osseus dysplasia. Cemento-osseus dysplasia itself typically involves two or more jaw quadrants.

In radiographic presentation, initial lesion manifests as a lucent area which developed into a combination of lucent and opaque lesion and frequently with central calcified area. Initial lesion (lucent) may be confounded by periapical inflammatory lesions like cyst, granuloma, and abscess. Differ from other inflammatory lesions, cemento-osseus dysplasia/cementoma is usually associated with unrestored vital teeth, intact periodontal ligament and lamina dura, and visible calcified epicenter.[8]

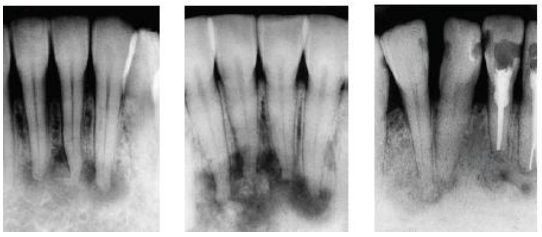

Figure 2. Progression of cemento-osseus dysplasia (left to right)

Lesion progression is comprised of three phases, where initial phase presented as radiolucency, followed by radiolucent image with patchy opacity inside radiolucent structure. The last stage is depicted by compact radiopaque lesion surrounded by thin radiolucent line.[9]

Cemento-osseus dysplasia possesses a strong tendency in race and sexes, where most lesions occur among Black and Asian females in fourth or five decade of life. Only focal variant frequently reported in White female. Cemento-osseus dysplasia often manifests with no noticeable symptoms yet it manifests with blunt pain. This lesion can also be mystified by osteomyelitis and drainage of necrotic bone debris in oral cavity or skin surface through osteocutan sinus.[6]

Condensing osteitis/periapical condensing osteitis

Condensing osteitis (CO), known as focal sclerosing osteomyelitis, is a persistent, asymptomatic, pathological change in bone structure which considered as a response upon long-term inflammatory stimulus and low-grade stage of inflamed or necrotized pulp.[10]

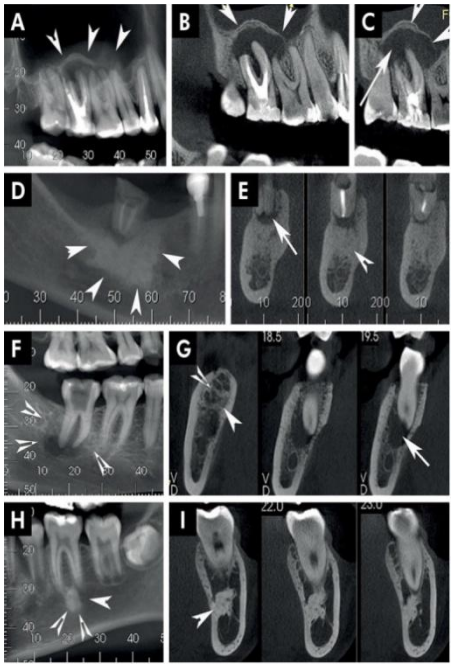

Figure 3. Condensing osteitis (CO): CBCT exposed a diffuse radiopaque lesion in the apex of mandibular molar (arrow) (D), adjacent to inflammatory periapical lesion (arrow) (E).

Figure 4. Presentation of ill-defined border with progressive transition from condensed (short arrow) to normal trabecula near alveolar crest (long arrow)

Condensing osteitis/periapical sclerosing osteitis occurs in child and adolescent, frequently in mandibular premolar and molar. This is a localized form of osteitis and reactive sclerosis which surrounds dental apex persisted with pulpitis or pulp necrosis. Adjacent tooth commonly present the widening in periodontal ligament or the presence of periapical inflammatory lesion (like granuloma, cyst or abscess). In radiographic image, condensing osteitis/periapical sclerosing osteitis appears as non-expansive, uni or multifocal periapical sclerotic lesion, with ill-defined margin related to dental caries.[6]

Biopsy is not required to diagnose CO. It is assessed based on clinical manifestations and radiographic image where root canal treatment is considered as selected treatment.[11]

Hypercementosis

Hypercementosis is an excessive non-neoplastic cementum deposition blend with normal root cementum.[12] In most cases, etiologic factor remains unknown. The lesion progressed in supra-erupted teeth as the consequence of antagonist tooth loss. Another cause of hypercementosis is inflammation, which commonly induced by scleroting ostetitis. This lesion is sometimes associated with hyper-occlusion or tooth fracture .[1]

Hypercementosis generally requires no treatment. Any dental intervention therapy, be it tooth extraction, endodontic or orthodontic therapy, will demand adequate preventive measure to avoid further complication generated from this condition.[21]

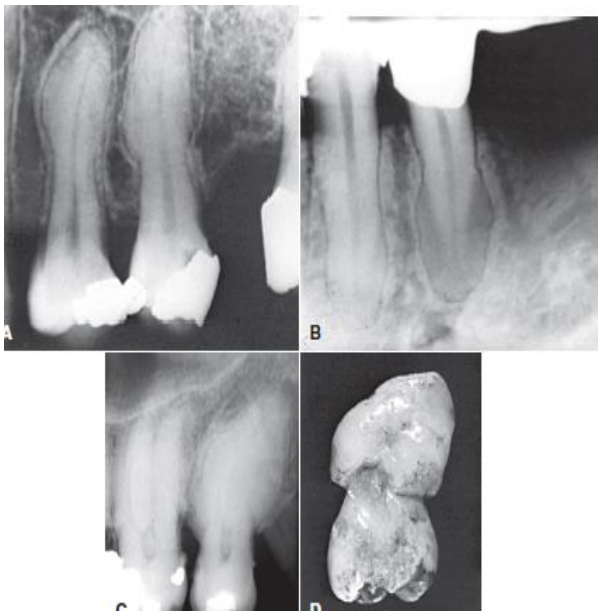

Figure 5. Enlarged root surrounded by radiolucent in PDL space and adjoining intact lamina dura. This enlargement may possibly progressed as cementoblastoma

DISCUSSION

Tooth-associated lesion can be found in periapical (around dental apex), interapical (between apex of two adjacent teeth), or pericoronal (around dental crown) area. Pericoronal lesions are originated from ectoderm-derived component of enamel organ (ameloblast). Periapical lesions generally progress from endodontal or periodontal or ectodermal of dental papilla (odontoblast) or follicle (cementoblast, fibroblast and osteoblast) of inflammatory disease area.[6,13]

Inflammatory changes in periapical bone structure are the consequence of root canal system infection and the result of osteoclastic or osteoblastic activity. These changes are identified by radiographic examination in the presence of radiolucent or radiopaque image.[14] Changes in bone structure may be presented in inflammatory, neoplastic, displastic, and metabolic lesions.[15-17] Radiolucent area is frequently identified with root canal infection yet radiopaque lesion may also be induced by similar causation hence equal concern should be given to prevent misdiagnosis.

Cementoblastoma commonly resembles a golf ball attached on the root of vital tooth which varied in size, 2-3 mm in diameter. Internal structure presents radiopaque image surrounded by thin radiolucent. It is located in the apical of mandibular first permanent molar and sometimes in the premolar. Large attachment in dental root may cause localized extension of cortical plate. The incident occurs between age 8 and 44 with average age of 20.

Cemento-osseus dysplasia is presented as round, small-sized unilocular lesion in vital teeth, around 5-6 mm. Internal structure is divided into 3 stages: radiolucent, patchy opacity in radiolucent, and radiopaque surrounded with radiolucent. Common location is in the apical of vital lower incisiv. It does not generate reposition of adjacent tissue. The incidence commonly found in middle-aged adult.

Scleroting/condensing osteitis occurs in non-vital teeth (large caries) in irregular form. Internal structure expresses irregular and diffuse radiopaque, located commonly in mandibula premolar and molar. It is typically found in adult in three to seven decade without any difference in sex predilection.

Hypercementosis demonstrates an enlargement image around affected root. The tooth may be vital or non-vital with different size and form adjusting the root shape. Internal structure presents radiopaque area with well-defined border located in affected root cementum. Hypercementosis are mostly found in Indian population and usually related with one or more local and systemic factors. The incident of hypercementosis based on race and population are not yet able to determine. Mandibular molar is the most frequent tooth to be affected, followed by mandibular second premolar, upper first premolar and lower first premolar.[22] Clinical aspect like pulp sensibility and vitality test mostly assist the assessment of periapical change originated from inflammatory or non-inflammatory causes.[23]

There are several variances used to guide the assessment of clinical and radiological findings which is remarkably convenient in daily practice as a dentist. Cone-Beam Computed Tomography (CBCT) is also a significant tool for diagnosis in dentistry,[24] which enable the detection of periapical lesion with high accuracy compared to periapical and panoramic technique. CBCT characteristics and overall

interpretation strategy enhance a comprehensive multi-dimensional examination thus clarify accurate location of periapical lesion, bone resoprtion or bone formation characteristic and accurate detection of any regressive lesion.[25] From this review, it can be concluded that each radiographic image expressed particular characteristic which distinguish one periapical opaque lesion from the others.

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