Case Report

A rare case report on endodontic management of calcified structures within large periapical pathology: An 8-year follow-up outcome

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Abstract

Periapical lesions with mixed radiographic appearance can have odontogenic or nonodontogenic origin. A number of neoplastic lesions either benign or malignant can present as radiolucent, radiopaque, or mixed in jaws and if present near the root apices can be misdiagnosed as odontogenic infection/etiology. The present case report describes a rare case of two elongated radiopaque structures within periapical pathology located beneath the apices of mandibular central incisors in a 26-year-old male. Further, it describes its nonsurgical and surgical endodontic management along with histological confirmation and long-term radiographic healing outcome using cone-beam computed tomography. Microscopic examination revealed the presence of dentin and cementum with fringes of periodontal ligament suggestive of tooth-like structures. No case report has yet reported tooth-like calcifications within the large periapical lesion. Biopsy of such lesions is deemed necessary to differentiate from nonodontogenic lesions which could be benign or malignant in nature.

Keywords: Apicoectomy; bacteria; calcification; cone beam computed tomography; foreign bodies; periapical granuloma

INTRODUCTION

Periapical pathology, the most common odontogenic infection, develops in necrotic teeth after caries or trauma.[1,2] With bacterial ingress involving pulp chamber and root canals, there is an increased inflammatory response which spreads to periapical tissues.[2] It may be symptomatic or asymptomatic depending on the inflammatory response. This initiates an array of defense mechanisms with the recruitment of osteoclastic cells in response to inflammatory mediators leading to bone resorption.[3] This leads to the chronicity of periapical lesions (abscesses, granulomas, or cysts) which gradually increase in size.[2,4] The incidence of periapical cysts, granulomas, and abscesses ranges 6%–55%, 9.3%–87.1%, and 28.7%–70.07%, respectively.[5]

Mixed periapical lesions can also be seen surrounding the root apices of teeth which may be of endodontic origin or nonendodontic origin. Nonendodontic lesions such as cysts, tumors, or anatomic variations can impose a diagnostic dilemma, especially when seen along the necrotic tooth.[4,6] Their reported incidence is 0.65%–6.7%.[1] Dystrophic calcification can also occur at the site of long-standing chronic apical lesions such as granuloma or cyst. Their reported incidence is 21.9% in periapical granulomas and 16.2% in radicular cysts.[7] Hence, detailed clinical, radiographic, and histological investigations are deemed for appropriate diagnosis.[1,3,4]

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Periapical lesions diagnosed on two-dimensional (2D) radiography may not reveal the true extent of the lesion image. Furthermore, it is affected by anatomical noise and geometric distortion.[2,8] Cone-beam computed tomography (CBCT) overcomes this limitation with better visualization of adjacent anatomical structures in three dimensions.[9,10] However, there is also scientific agreement that histological report is considered gold standard for diagnosis.[11] Traditional periapical healing criteria may not be relevant for healing evaluation under three dimensions; hence, newer criteria are now adapted for postoperative healing evaluation.[9,12] In recent years, endodontic microsurgery aided under microscope, CBCT-based diagnosis and treatment planning, use of microsurgical instruments, ultrasonic root-end preparation, and use of bioceramic root-end filling materials have improved its success.[13] Thus, the present case report describes a rare case of periapical pathological rarefaction associated with two unusual, fingernail-like radiopaque calcified structures beneath the apex of nonvital mandibular central incisors of a 26-year-old male. Further, it describes its management and three-dimensional healing of the lesion using newer criteria with 8-year postoperative follow-up.

CASE REPORT

A 26-year-old male patient with a history of repeated swelling and pus discharge along mandibular anterior teeth for the past 1 year was referred to the conservative and endodontics department during January 2016. The patient gave a history of blunt trauma on the chin from a cricket bat 7–8 years back, for which he had received anti-inflammatory medication for pain relief from the general physician.

Preoperative clinical and radiographic examination

Extraoral examination revealed no facial disfigurement, swelling, or enlarged lymph nodes. Intraorally, yellowish-white fluctuant mucosal swelling was present along the apices of teeth 41 and 42 (FDI). Miller's Class 1 gingival recession was seen along teeth 31 and 41 and periodontal pocket depth of 4 mm along the distal aspect of tooth 41 [Figure 1a]. Teeth were immobile and gave negative responses to pulp sensibility tests (EPT and cold).

Digital 2D radiography (Kodak RVG 5200, Carestream Dental) showed a well-circumscribed periapical radiolucency extending between root apices of teeth 32–42 and measuring 1.11 cm × 1.08 cm in size. Interestingly, two elongated nail-like radiopaque structures measuring about 4–5 mm in size were observed within the circumscribed pathology [Figure 1b]. CBCT imaging was done with CS 9300 3D machine (Carestream Dental LLC, Atlanta, GA, USA) having parameters of 84 KV, 8 mA, 0.09 mm^3 voxel size, and exposure time of 19.88 s. The size of the pathology as measured on CS 3D imaging software was 10 mm × 6.5 mm × 7.5 mm in coronal, axial, and sagittal views. The coronal slice displayed two elongated calcified structures of 3.4 mm and 3.9 mm beneath apices of 31 and 41, respectively. The axial section showed structures present close to the lingual cortex of the mandible. The sagittal section presented with calcified structures beneath the apices of 31 and 41, however they were unattached to the tooth structure and the same was confirmed after surgical exposure [Figure 1d-f].

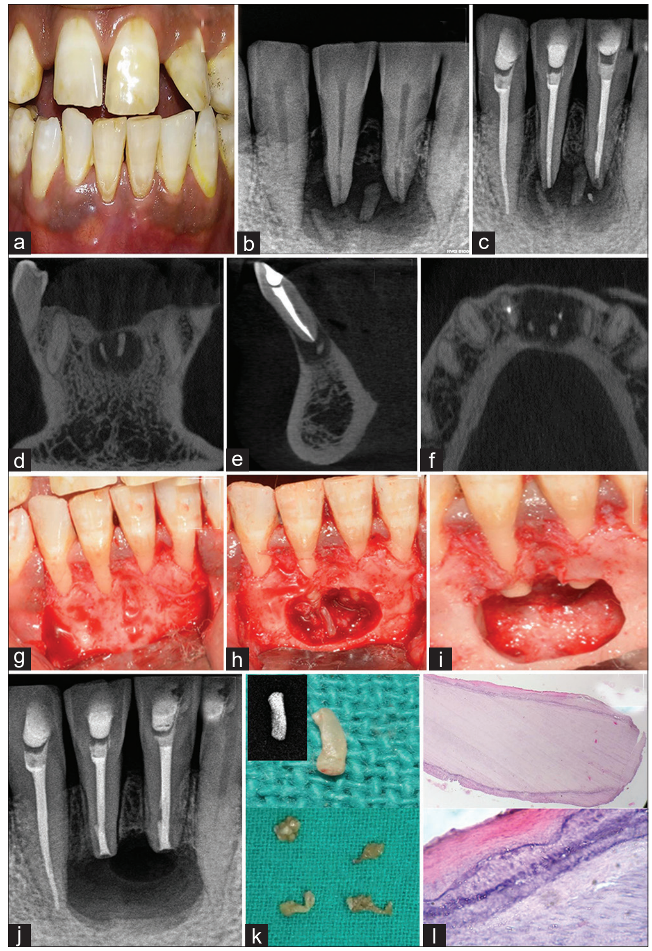

Figure 1: (a and b) Preoperative clinical and radiographic images (c) Nonsurgical endodontic treatment for teeth 31, 41, and 42 (d-f) Coronal, sagittal, and axial cone beam computed tomography views showing pathology along with calcified structures in three dimensions (g-j) Intraoperative surgical images showing apicoectomy with retrograde filling (k) Macroscopic image of hard (inset radiograph) and soft tissue, (l) Microscopic image of hard tissue at low and high-end magnification showing dentin and cementum

Diagnosis and treatment planning

A provisional diagnosis of large periapical pathology with radiopaque calcified structures was made, and a combined nonsurgical and surgical treatment plan was discussed with the patient and informed consent was taken.

Treatment procedure

Teeth #31, #41, and #42 were anesthetized (2% lignocaine with 1:80,000 epinephrine), isolated under a rubber dam, and accessed using high-speed diamond burs and coolant. Working length was determined using hand k files (Mani, Inc. Japan). Biomechanical preparation was done using rotary instrumentation (ProTaper Gold, DENTSPLY, Maillefer, Switzerland) in crown down technique and copious irrigation with 3% sodium hypochlorite (NaOCl, PrevestDenpro Ltd., Jammu, India). Pus discharge was drained; canals were irrigated and packed with calcium hydroxide for 1 week and temporized. At recall, medicament was flushed out using saline and 3% NaOCl alternatively. Five milliliters of 17% liquid EDTA (Prevest Denpro Ltd., Jammu, India) irrigation was delivered, followed by final irrigation with 3% NaOCl. Irrigants were activated using passive ultrasonic irrigation, and calcium hydroxide dressing was repeated for another 2 weeks. At recall with the absence of discharge from canals, obturation was done using gutta-percha and zinc oxide-based sealer in lateral condensation technique. Finally, access cavities were restored with composite [3M, ESPE, Figure 1c].

Two weeks later, apicoectomy in relation to 31, 41, and 42 was planned. The surgical site was disinfected using 0.2% chlorhexidine and anesthetized. All intraoral surgical procedures except for incisions, elevation of the flap, and suturing were performed under an operating microscope (OPMI PICO; Carl Zeiss, Göttingen, Germany) [Figure 2]. The papilla base incision was given and joined by an intrasulcular incision along the buccal surfaces of the teeth. Two vertical releasing incisions extended from the distal margin of #32 and #42 till the alveolar mucosa and mucoperiosteal flap were detached. Osteotomy was done using curettes (HuFriedy, Leimen, Germany) and surgical carbide bur with copious saline irrigation. Calcified structures were seen alongside the pathology. Curettage of the lesion was done, and hemostasis was achieved using 0.1% epinephrine-soaked cotton pellets. Root ends were resected, retrograde preparation was done using ultrasonics (Satelec Corp, Bordeaux, France), and freshly mixed mineral trioxide aggregate (MTA Angelus, Brazil) was condensed. The bony cavity was cleansed; the mucosal flap was reattached and sutured [Figure 1g-j]. Postoperative instructions were given and recalled for suture removal after 5 days. Clinical and radiographic follow-up was done after every 3 months till 1 year [Figure 2a-c] and thereafter every year till 8 years [Figure 2].

Histopathological examination revealed connective tissue stroma infiltrated by chronic inflammatory cells. Dilated blood vessels and dense collagen bundles suggested periapical granulomatous lesions. Hard tissue examination revealed dentin and cementum at the periphery. Dentin and cementum showed zone of dentinal tubules and acellular cementum, cellular cementum (Tome's granular layer) with peripheral fibrous fringes of periodontal ligament respectively. These finding suggested diagnosis of tooth-like hard calcified structure [Figure 1k and l].

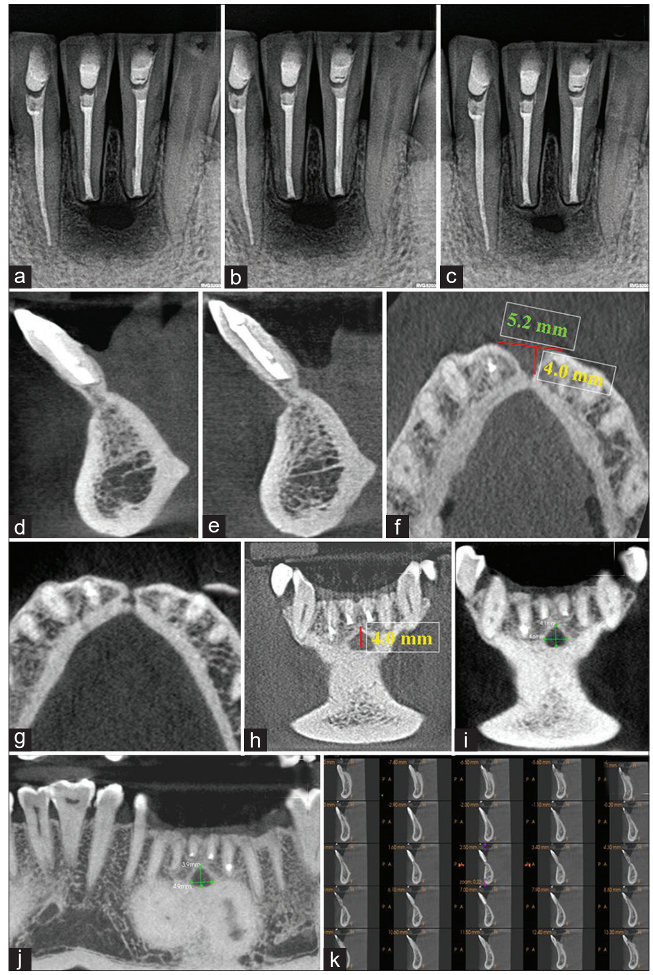

Figure 2: Postoperative radiographic images (a-c) Three-month, 6-month, and 1-year postoperative RVG showing healing of the surgical site. Postoperative 5 years and 8 years cone beam computed tomography scan in sagittal (d, e) Axial (f, g) and coronal planes (h, i), respectively, showing complete reformation of periodontal ligament space and apical bone formation. An isolated hypodense area of incomplete bone formation (5 mm × 4 mm × 5 mm) is seen along the labial corte × 2 mm from apices of 31 and 41 representing apical scar formation (j) Reconstructed buccal and lingual cortices showing dimensions of periapical scar at 8 years (k) 5 × 5 grid view of sagittal sections of teeth

Clinical and radiographic follow-up

The patient was clinically asymptomatic with the absence of pain, pocket, swelling, and mobility after 7 days and throughout the follow-up period. Radiographic healing (2D) showed bone filling and reorganization of PDL along the resected root ends after 1 year [Figure 2k]. However, an area of incomplete bone formation was observed at a distance of 2–3 mm from the apices of 31 and 41. Five-year CBCT evaluation (3D) showed a hypodense area measuring

5 mm × 4 mm × 4 mm mesiodistally, superoinferiorly, and buccolingually [Figure 2d-f]. Three-dimensional healing criteria gave a scoring of 2 for R (resection plane) and A (apical area) indices while the C index scoring was 1, suggesting complete healing along the resected plane and apical area while the cortical plate is reestablished but is concave.[8,9] An isolated area of the labial cortical plate was not continuous, which suggested limited healing as per modified PENN 3D criteria.[9,13] CBCT comparison at 5 years and 8 years displayed similar size of the periapical scar [Figure 2g-j].

DISCUSSION

Periapical granulomas, cysts, and abscesses are the common pathologies of odontogenic origin with periapical granuloma being the most common among them.[13,14] Many nonendodontic lesions can mask the true diagnosis with the impression of periapical lesion.[6] Recently, CBCT helps to provide deep insight regarding lesion and adjacent teeth, the internal content of the lesion-like calcified deposits, foreign bodies, tooth-like material, and any dysplastic or neoplastic periapical diseases.[15,16] The primary reasons for CBCT acquisition in our case were the assessment of inconclusive healing, complexity of the structures, and treatment planning for surgery.

Dystrophic calcification occurs at the site of dead, diseased, and degenerating tissues and is usually associated with increased phosphate concentration, increased alkalinity, and absence of oxygenation.[7] Furthermore, calcification can occur in slowly progressive benign and malignant lesions, giving alarm for biopsy of the lesion. Benign lesions include compound odontoma (more common in the anterior maxilla), ossifying fibroma, adenomatoid odontogenic tumor, and calcifying cystic odontogenic tumor.[17] Malignant lesions may also have secondaries surrounding the apices of teeth resembling odontogenic infection.[18] However, in our case, after histopathology of hard tissue, dentin was seen surrounded by cementum at the periphery. Bueno MR reported a case of mesenchymal chondrosarcoma beneath tooth #37, initially misdiagnosed as apical periodontitis and treated by endodontic treatment.[17] When symptoms reappeared with furcation involvement after 45 days, the tooth was extracted, following which increase in the growth of gingival tissue was observed, and the sample was sent for biopsy. Sirotheau Corrêa Pontes *et al*. mentioned that the mean age of the patients who have cysts, benign neoplasms, and fibro-osseous lesions was 29, 30.2, and 37.5 years, respectively.[4] The patient's age in our case report was 26 years. However, in the same study, 56.5% of teeth responded positively while 43.5% negatively. This creates a challenge as the tooth may be necrotic while the periapical lesion could be of nonendodontic origin. Therefore, dentists cannot formulate the diagnosis by relying solely on pulp vitality tests but should acknowledge the clinical history and thorough clinical examination to look for the local cause of pulp infection such as caries, fractured restorations, or failed root canal treatment.

Healing along the resected root ends poses a challenge in the reestablishment of periodontium of normal width. The present case attained positive results in this respect with a bacterial tight seal along the root end filling.[9] The percentage of healing was lowest for the C index as healing across the cortical plate may require a longer duration as it was distant from the concentric growth pattern and resulted in periapical scar.[15] Periapical scar, an unsolicited finding, has a prevalence between 6.6% and 12.1%.[19] As per Kim and Kratchman, 26% of periapical osseous defects radiographically larger than 10 mm can result in scar formation after apical surgery.[20] As per modified PENN 3D criteria, the healing was described to be limited as only an isolated area of incomplete bone formation was seen along the buccal cortex while healing along the resected root ends was complete.[16] No guided tissue regeneration membrane was used which may be one of the reasons for periapical scar tissue formation.

CONCLUSION

To the best of our knowledge, the present case is a rare case of calcified tooth-like structures within the large periapical pathology beneath the nonvital mandibular incisors. Such lesions should be diligently analyzed from clinical, radiological, and histological aspects to rule out any nonodotogenic lesions. Limited healing (periapical scar) is the limitation of the present case report; however, no change in scar size with complete periodontal regeneration at 5-year and 8-year follow-up CBCTs with the absence of symptoms suggest satisfactory outcome.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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