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Management of large radicular cyst associated with amalgam particles in cystic lining

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Abstract

The failure of amalgam retrofilling and presence of an associated cystic lesion makes surgical endodontic intervention inevitable. Amalgam retrofilling can also give rise to mucoperiosteal tattoo formation and allow incorporation of amalgam particles in the cystic lining. Such a finding has not yet been reported in the endodontic literature. This case report describes the successful endodontic management of a large radicular cyst associated with failed amalgam retrofilling, mucoperiosteal tattoo and amalgam particles dispersed in the epithelial cystic lining. All four mandibular incisors associated with the lesion presented with Weine Type II canal anatomy. The follow-up revealed clinical and radiographic signs of healing.

Keywords: Amalgam particles, cystic lining, mandibular incisors, radicular cyst, Weine type II anatomy

INTRODUCTION

Although nonsurgical endodontic treatment is always the first choice for failed endodontic treatment, many clinical situations make periapical surgery inevitable. One such circumstance is when the patient presents with failed root end filling associated with a periapical lesion. In these cases, periradicular surgery aims at removal of diseased periapical tissues, sealing of the root apex to facilitate the regeneration of hard and soft tissues, and allow the formation of new attachment cells.

Amalgam has historically been used as the retrofilling material until many investigators reported its demerits such as (a) effect of free mercury in direct contact with the periapical tissues (b) associated microleakage and electrochemical reactions and (c) occurrence of voids and gaps between the prepared root surface and amalgam.

Tronstad and Wennberg have demonstrated that freshly mixed conventional silver amalgams are very cytotoxic as a result of the unreacted mercury although the cytotoxicity decreases rapidly as the material sets.[1,2]

Amalgam has been largely replaced by materials like mineral trioxide aggregate (MTA) as retrofilling material of choice due to superior biocompatibility and superior sealing ability. Amalgam tattoo is an iatrogenic lesion caused by traumatic implantation of dental amalgam into soft tissue.[3] Amalgam tattoo presents as a dark gray or blue, flat macule located adjacent to a restored tooth, on the gingiva, alveolar mucosa, buccal mucosa, or floor of the mouth.[4]

To the best of our knowledge, the occurrence of amalgam particles in cystic lining and presence of amalgam tattoo with associated mucoperiosteum has not been reported in literature till date.

We present a case report of a successful management of an infected radicular cyst which showed a distinct incorporation of amalgam particles in the cystic lining and presence amalgam tattoo in the associated mucoperiosteum. The patient also had a Weine type II anatomy in all 4 mandibular anterior teeth.

CASE REPORT

A 38-year-old male patient was referred to our department by a private dentist for consultation of a large periapical lesion in his mandibular anterior region. The dental history indicated that the lower left canine was endodontically treated 10 years ago followed by periapical surgery in a private hospital in Mumbai, India [Figure 1a and b].

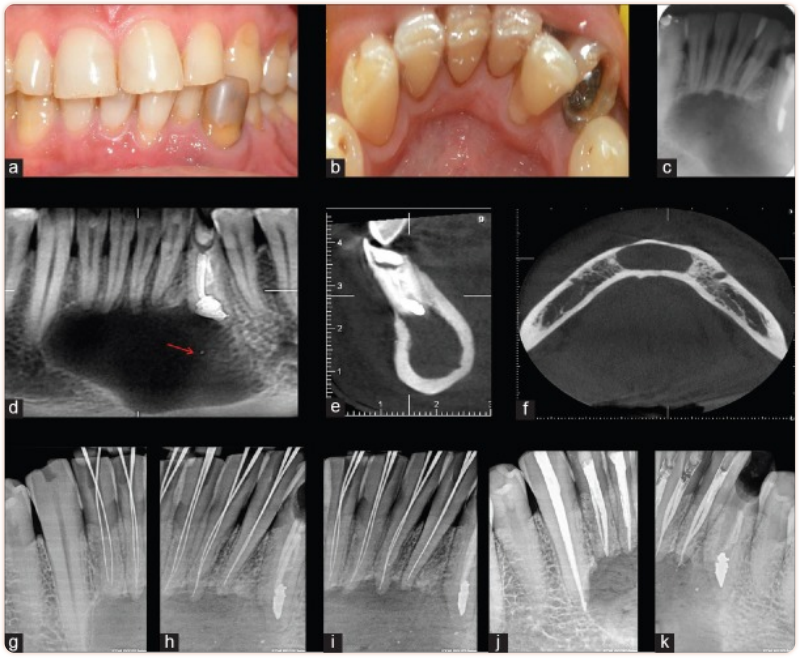

Figure 1

(a) Pretreatment front view and (b) pretreatment occlusal view (c) pretreatment periapical radiograph (d) panoramic radiograph: Dislodged amalgam particle seen (red arrow). (e) Cone beam computed tomography images sagittal view through the mandibular left canine (f) transverse view of the cystic cavity (g-i) periapical radiographs showing the presence of two canals in lower incisors with Weine type II anatomy (j and k) obturation radiographs

The patient's medical history was noncontributory. Clinical examination showed tenderness to palpation in the lower anterior region in from the lower right canine to left canine and tenderness to percussion was present in 33. Periodontal examination revealed Grade II mobility in 33 while other teeth had normal tooth mobility. Pulp sensibility testing was done in all mandibular anterior teeth using cold test (carbon dioxide snow), electric pulp test. Mandibular right and left incisors were non vital, while mandibular right canine was vital. Radiographic examination revealed the presence of a large periapical lesion in mandibular anterior region overlapping the apices of mandibular incisors having well-defined radiopaque border [Figure 1c].

A cone-beam computed tomography (CBCT) examination of the mandible was advised to determine the three-dimensional extent of the periapical lesion. The CBCT revealed the presence of a large radiolucency in the mandibular anterior region extending from the mesial aspect of root of the lower right canine to the distal aspect of the root of the lower left canine and from the apices of lower anterior incisors to the inferior border of the mandible involving the border of mandible on the right half of the lesion [Figure 1d–f]. The lower left canine appeared resected and filled with a radio-opaque retrofilling material. The CBCT revealed the presence of two canals in 31, 32, 41, and 42. All four teeth had Weine type II anatomy. Both mandibular canines had Weine type I canal anatomy. The quality of the root canal filling in 33 was inadequate, and a small radio-opaque fragment of the retrofilling material had dislodged and moved inside the radiolucent cavity. Although the apices of mandibular incisors appeared to overlap the periapical lesion, the clinical appearance of the teeth was seemingly normal.

Based on the clinical and radiographic examination, a diagnosis of pulp necrosis in 31, 32, 41, and 42 was made. The large periapical lesion was provisionally diagnosed as a radicular cyst. Mandibular left canine was diagnosed to be inadequately endodontically treated with a faulty retrofilling. An excisional biopsy of the lesion and biochemical examination of cystic fluid was performed later which confirmed the diagnosis to be a radicular cyst.

Treatment plan consisted of endodontic treatment of involved mandibular anterior teeth, periapical surgery for cyst enucleation and replacement of the retrofilling material. Lower left canine tested positive to heat and cold test, so endodontic treatment was deferred based on its involvement during surgery.

Nonsurgical endodontic treatment

The mandibular anterior teeth were isolated using rubber dam. Test cavity was prepared in 31, 32, 41, and 42. The teeth were nonvital. Further access cavity was prepared using a long, slender tapered fissure bur (EX 24, nonend cutting tapered fissure; Mani, Tochigi, Japan). TC-11 bur (Mani, Tochigi, Japan) was used for initial penetration into the pulp chamber and final refining of the access cavity. Labial canal was located below the incisal edge in 31, 32, 41, and 42 [Figure 1g–i].

The access opening was extended in the lingual direction, and a second lingual canal was also located in 31, 32, 41, and 42 below the cingulum area. Use of endodontic files with tapers more than 4% may cause the excess removal of tooth structure weakening the tooth at the coronal third of the root. Hence, use of orifice openers with higher tapers was avoided. Instead, the canals were negotiated with 2% taper K files starting with 10 K file, followed by No. 15 and 20 (Mani Inc., Japan).

The canals were prepared using a crown-down technique using K3 Rotary NiTi files (Sybron Endo, Orange, California), to a master apical file of size 25/0.04 taper using Ethylene diamine tetra acetate gel (Glide, Dentsply Maillefer, 1338 Ballaigues, Switzerland) as a lubricant and 5% sodium hypochlorite as irrigant. Pus filled exudates was found seeping through the root canals of 31, 32, 41, and 42. Fluid was aspirated using a 22 gauge needle and sent for protein estimation. Protein content was found to be 6.6 g/dl. The canals were irrigated with 5.25% sodium hypochlorite solution, rinsed with 17% EDTA solution, dried with paper points, and obturated with Gutta-percha using cold lateral condensation technique [Figure 1j and k].

Gutta-percha was removed from mandibular left canine using H files (Mani Inc., Japan). Further canal preparation was performed by circumferential hand filing with H files using 2% chlorhexidine gel followed by irrigation with sterile physiological saline. 0.5% sodium hypochlorite was passively placed in the canal and allowed to remain for 3 min. It was agitated using sonic vibrations using Endoactivator (Dentsply, Maillefer, 1338 Ballaigues, Switzerland). Final irrigation was carried out using distilled water. Canal obturation in 31,32,41 and 42 was done using a cold lateral condensation technique with AH Plus sealer (Dentsply, DeTrey) and restored with Cavit G (3M ESPE, Germany) [Figure 2h and i].

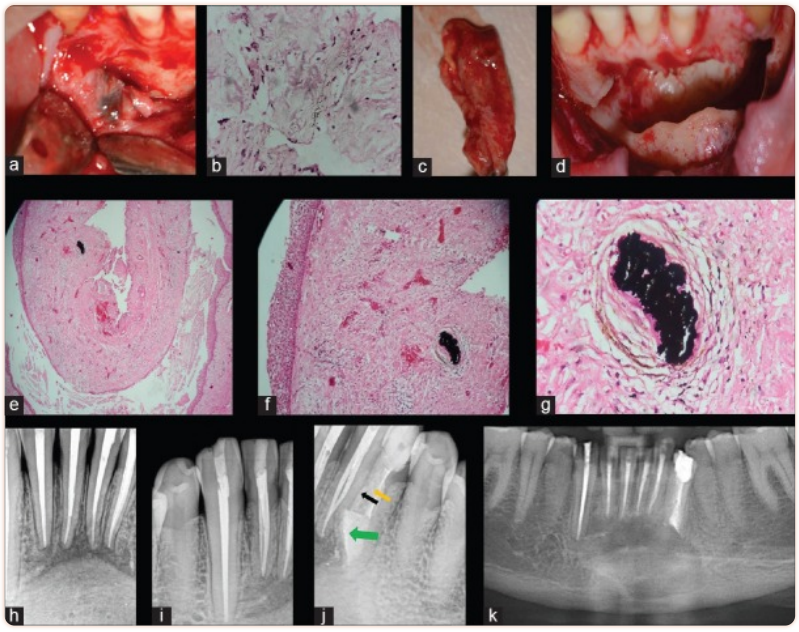

Figure 2

(a) Mucoperiosteal amalgam tattoo (b) H and E stained section of amalgam tattoo (c) cystic lining (d) large cystic cavity (e) H and E stained section of cystic lining (f) ×10 magnification of the same specimen: Stratified squamous nonkeratinized epithelium (g) ×40 magnification-amalgam particles surrounded by swirling collagen fibers (h and i) postsurgical radiographs (j) posttreatment radiograph of 33: MTA retrofilling (green arrow), fiber reinforced composite (yellow arrow), and fiber post (black arrow). (k) Recall panoramic radiograph after 18 months

Periradicular surgery

General anesthesia was the anesthesia of choice for the surgical enucleation due to the following factors (a) the patient was highly apprehensive of the surgery (b) the previous retrosurgery was performed under local anesthesia and had proved to be a traumatic memory for the patient (c) CBCT revealed a large size of the lesion (d) the patient was healthy and had no contributory medical history of any disease or systemic disorder.

The patient was taken under general anesthesia in the operation theater for the cyst enucleation. The patient was induced, and endotracheal intubation was done nasally, and the throat was packed. The patient was then scrubbed and draped in the usual manner.

Before the start of the procedure, the oral cavity was thoroughly irrigated with Betadine solution. An incision was made in the lower vestibule, 5 mm below the mucogingival junction extending from 33 to 43 regions. A full thickness mucoperiosteal flap was then raised. An amalgam tattoo observed on the mucoperiosteum in relation to the labial surface of the mandibular left canine was surgically excised completely, and the tissue was sent for histopathologic examination [Figure 2a and b].

Window was made over the overlying bone using a round bur (No. 8 round carbide bur) under continuous irrigation with normal saline. The window was enlarged using a ronguer and cystic cavity was exposed. With the help of a curette, the cyst was enucleated carefully, the lining was sent for histopathologic examination [Figure 2c and d].

The cystic cavity was completely filled with absorbable gelatin sponge (ABGEL, Shri Gopal Krishna Labs Pvt. Ltd., Mumbai, India) allowing only the root of the canine to be exposed. The amalgam retrofilling was removed with a Proultra Endo Surgical tip No. 1 (DENTSPLY, Tulsa, OK, USA) carefully moving around the filling to remove it in Toto. The high vacuum suction was also used to rapidly evacuate the amalgam dust. After discarding the gelatin foam, the retrocavity cavity was irrigated with saline and inspected under magnification for amalgam remnants. The retrocavity was filled with MTA (MTA Angelus, Londrina, PR, Brazil).

Syringeable bone graft material Novabone (NovaBone Products, Alachua, FL 32615, USA) was used for filling the cystic bony cavity. The flap was repositioned using 6 silk sutures. The patient received postoperative instructions. Additional antibiotics and analgesics were provided to the patient (amoxicillin 500 mg, 3 times a day for 5 days, and ibuprofen 600 mg for pain, 2 times a day as needed). The patient returned 1 week later for suture removal and reported slight postoperative pain. Healing after the surgery was uneventful.

Postsurgical treatment. During the removal of cystic lining, the apex of the mandibular right canine was involved, due to which the tooth lost its vitality. The endodontic treatment of the mandibular right canine was carried out immediately after the cyst enucleation on the 2nd day. The mandibular left canine was reinforced using a Fiber reinforced composite resin (everX Posterior, Unitip, Stick Teck Ltd., member of GC, Turku, Finland) and placement of a glass fiber post (Radix Fiber Post, Dentsply, Caulk, USA). Occlusal surface was sealed with a composite resin restoration. Since the tooth was out of occlusion, further crown placement seemed unnecessary as the esthetics were adequately restored [Figure 2j].

Histopathologic examination of the specimens

The histopathologic investigation revealed stratified squamous nonkeratinized epithelial lining, with the underlying connective tissue stroma showing collagen fibers, fibroblasts and budding capillaries, thick walled blood vessels, extravasated blood, and diffuse chronic inflammatory infiltrate. It confirmed the diagnosis of an infected radicular cyst. Within the fibrovascular stroma, amalgam particles were seen as the focus of foreign amorphous and pigmented bluish-black material surrounded by collagen fibers arranged in a swirling pattern [Figure 2e–g]. The histopathologic analysis of the amalgam tattoo of the mucoperiosteal tissue revealed mature collagen fibers in wavy bundles, active fibroblasts, and scattered pigmented black deposits of amalgam particles.

Follow-up

The patient was regularly followed up after 3 weeks, 1 month, 3 months, 6 months, and 1 year. All the mandibular incisors were asymptomatic at the 1-year recall visit. Follow-up radiograph at the end of 1 year shows a good healing on the lesion [Figure 2k].

DISCUSSION

Nonsurgical retreatment is the treatment of choice in persistent apical periodontitis.[5]

Surgical intervention becomes necessary when (a) when the infection prevails in the inaccessible areas, (b) extraradicular infection, (c) true radicular cysts, and (d) foreign body reactions.[6] The surgical approach to cystic lesions of the jaws is either marsupialization or enucleation. The choice of treatment is dependent on the size and localization of the lesion, the bone integrity of the cystic wall and its proximity to vital structures.[7]

In the current case, the following features made conservative surgical access of the lesion necessary: (a) The existing amalgam retrofilling was improper and had resulted in leaching of amalgam particles in the cystic lesion and (b) large size of the lesion.[8]

In the current case, CBCT served a 2-fold purpose: (a) Providing a detailed view of the internal anatomy and canal configuration of all involved teeth (b) determining the exact location of the radicular cyst and its vicinity to adjacent structures.

Various authors have studied the root canal morphology of extracted mandibular incisors and have reported a prevalence of two canals in 11-68% of the cases.[9,10,11] Electronic database search (PubMed, Scopus, Google Scholar) revealed only 3 references reporting the presence of two canals in all four mandibular incisors of the same patient.[12,13,14] This fact emphasizes the uncommon occurrence of the unusual root canal anatomy discussed in the current case report.

MTA has a good track record of apical sealing ability compared to various other materials. Its favorable properties include the following: (a) Causes increased levels of alkaline phosphatase and osteocalcin, (b) production of interleukin (IL-6, IL-8), (c) allows periodontal ligament attachment, cementum growth, (d) favorable periapical tissue response due to minimal inflammation. (e) Allows cell adherence and growth. (f) Is nonmutagenic.[4] Due to its superior biocompatibility and sealing ability, MTA was the material of choice for the apical sealing of the large root end opening in the current case.

CONCLUSION

Retreatment of teeth with amalgam retrofillings and large periapical lesions will necessitate a surgical approach. Amalgam should be avoided as a retrofilling material, instead, contemporary biomaterials such as MTA should be chosen. This case highlights the occurrence of 2 canals in mandibular incisors. A careful clinical and radiographic examination using radiographic adjuncts like CBCT will enable the clinician to identify anatomic variations in teeth with certainty.

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Nil.

Conflicts of interest

There are no conflicts of interest

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