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Case Report

Management of Calcified canals using Magnifying Loups, LN bur, C+ files and ultrasonics: A case series

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ABSTRACT:

Root calcifications are a potent challenge to endodontics. It is a process of hard tissue formation, by vital pulp cells leading to reduction in size of the intradermal cavities. Our case report is hereby enlightening the causes of canal calcifications, incidence of canal calcification, types of canal calcification, managing calcified canal and success rate of root canal treatment of calcified canals.

Keywords: Root canal calcifications, calcific metamorphosis, Patency of root canal, management of calcified canals prognosis

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INTRODUCTION

Calcifications of dental pulp are well classified as discrete or diffuse in its form. Discrete calcifications lead to formation of pulp stones or denticles. These can be free or embedded with the root dentin. Diffuse calcifications result in symmetric reduction in pulp chamber size and radicular space and is more commonly observed in older age.^[1,2]

Dental pulp calcification may occur due to both local as well as systemic factors. Local factors may include caries, the presence of restorations, excessive forces caused by clenching and trauma, and cavity preparation^[1,2,3]. Systemic factors may include hypercalcemia, end-stage renal diseases and gout. Some miscellaneous etiology like orthodontic treatment, endodontic regenerative procedures^[2], surgeries, auto-transplantations and any iatrogenic dental treatment may also lead to such pulpal calcifications.^[3,4]

The American Association of Endodontics (AAE) classifies the root canal treatment in pulpal calcifications as a high difficulty procedure, owing to the risk of complications, or even failures^[5]. It is not

essential every chance to treat root canal calcifications, indicated only in cases of irreversible pulpitis or periapical periodontitis^[6].

Ultrasonics were first introduced as a management by Richman in 1957^[7]. However, its mechanism and technique of use was explained by Martin et al.^[8,9,10]. He also explained ultrasonically activated k-type file to cut the dentin, which later popularized its application in preparation of calcified and fine canals. The term endosonics was coined by Martin and Cunningham^[11,12] and was defined as the ultrasonic and synergistic system of root canal instrumentation and disinfection.

CASE REPORT 1

A 24-years old male patient reported to outpatient department of Endodontics with a chief complaint of yellowish discoloration of upper right front tooth. Patient's medical history was insignificant, but dental history revealed that patient has undergone orthodontic treatment 3 years back. Patient gave negative history to any sensitivity or pain. On intraoral examination, tooth presented with yellowish

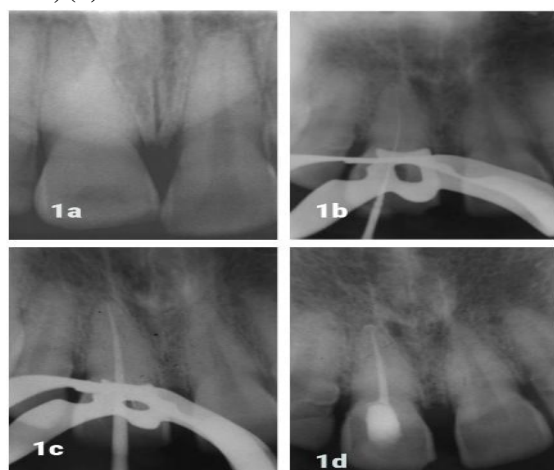
discoloration and dull sound on percussion with respect to 11,21. IOPA revealed complete calcification in 11 root canal with small irregular radiolucency around the apical area of 11 (Fig 1a). Diagnosis of Chronic periapical abscess with canal calcification was made and treatment plan of root canal treatment of 11 was formulated.

Treatment plan was well explained to the patient and informed consent was taken for the same.

Gaining access through calcified canal was a bit challenging due to presence near total obliteration in pulp chamber and canal. A coronal access to canal of 12 was achieved with a small round bur and LN bur (Maillefer ,Dentsply). Since negotiation of canal was challenging with small K type files, a chelating agent (Glyde File Prep) was placed in the pulp chamber for a period of 1 week. In the next appointment, radicular access was tried with the help of C+ files (VDW, Dentsply) and thin, long and pointed ultrasonic tips (Endo Success, Satelec). Short vertical up and down strokes were performed upto the middle third of the root maintaining the Ultrasonic tip parallel to the long axis of the tooth. Small c+ type files (#06, #08 and #10) were used in up and down filing motion to reach up to the apex. Working length was determined and confirmed with the help of electronic apex locator (Root ZX, J Morita) and confirmed radiographically (Fig 1b). Biomechanical preparation was done using ProTaper rotary files in the sequence up to F3, canals were thoroughly irrigated throughout the procedure using normal saline and 3% sodium Hypochlorite. Metapex dressing was placed for a period of three weeks.

After three weeks, canals were again debrided and irrigated before obturation with the help of 3% Sodium hypochlorite, Normal saline and Chlorehexidine as a final rinse. Canals were dried using paper points and master cone IOPA was taken to confirm working length radiographically (Fig 1c). Obturation was done by lateral condensation technique using AH Plus Sealer (Fig 1d).

Figure 1. (a) complete calcification observed wrt 11, (b) Working length IOPA, (c) Mastercone IOPA, (d) Post obturation IOPA



CASE REPORT 2

A 36-years old female patient reported to outpatient department of Endodontics with a chief complaint of pain in upper right front tooth.

Patient's medical and dental history was insignificant. Patient gave history of sharp shooting and localised pain to hot stimuli that lingers several minutes following exposure. Pain is aggravated on biting or even touching the opposite tooth. Pain was relieved by taking cold beverages and medicine revealing that it's continuous nature. There was no history of swelling and sinus opening .

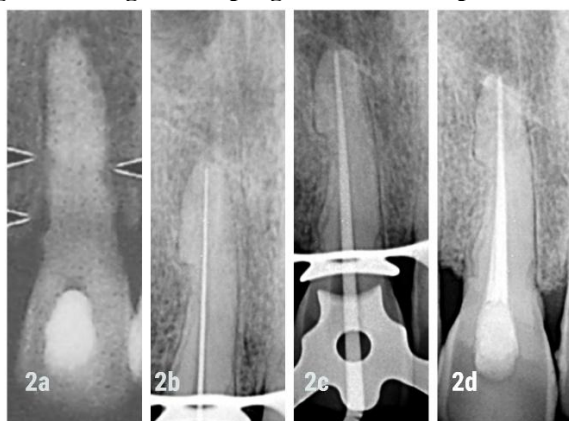
Intraoral examination revealed, 11 gave positive response to vertical percussion and palpation. IOPA revealed complete calcification in 11 root canal with small irregular radiolucency around the apical area of 11 (Fig 2a). Diagnosis of Acute periapical abscess with canal calcification was made and treatment plan of root canal treatment of 11 was formulated.

Treatment plan was well explained to the patient and informed consent was taken for the same.

Due to complete calcification in pulpal chamber of 11, it was a challenging task to locate the orifice. A coronal access to canal of 11 was achieved with a LN bur (Maillefer ,Dentsply). Chamber was filled with hypochloride and laser activation was done to remove all calcifications present over the orifice. Since negotiation of canal was challenging with small K type files, C+ files (VDW, Dentsply) and thin, long and pointed ultrasonic tips (Ultra X, Orikam) were used. Short vertical up and down strokes were performed upto the middle third of the root maintaining the Ultrasonic tip parallel to the long axis of the tooth. Small c+ type files (#06, #08 and #10) were used in up and down filing motion to reach up to the apex. Working length was determined and confirmed with the help of electronic apex locator (Root ZX, J Morita) and confirmed radiographically (Fig 2b). Biomechanical preparation was done using ProTaper rotary files in the sequence up to F3, canals were thoroughly irrigated throughout the procedure using normal saline and 3% sodium Hypochlorite. Metapex dressing was placed for a period of three weeks.

After three weeks, canals were again debrided and irrigated before obturation with the help of 3% Sodium hypochlorite, Normal saline and Chlorehexidine as a final rinse. Canals were dried using paper points and master cone IOPA was taken to confirm working length radiographically (Fig 2c). Obturation was done by lateral condensation technique using AH Plus Sealer (Fig 2d).

Figure 2. (a) Calcification with root resorption in 11, (b) working Length IOPA, (c) Mastercone IOPA, (d) Post obturation 6 months IOPA with no good healing and no progression of resorption.



DISCUSSION

Negotiating the calcified canals is the most challenging task in dental practice. In the presented cases, the canals were almost totally calcified and only apical 1-2 mm of the canal patency was noticeable.

Proper assessment of pre-operative radiograph is the key in cases with sclerosis. Preoperative IOPA at different angulations generally lends us with an idea of the extent of calcification or presence of any extra canals. IOPA if studied properly may give us an idea about the location of canal orifice with the help of depth gauge, which can help one to guide the way through the depth of crown to the pulp chamber, or in cases where the calcifications are deep into the root.^[13] The main problem with cases with severe calcification of the pulp chamber is that one has to be more accurate to the orifice location, rather than locating pulp chamber with is non-existent. This unfortunately generally leads to more tooth structure loss in pursuit of searching the canal. These gauging may lead to consequences like perforations, which can render weak tooth structure, prone to fracture post treatment. Fortunately, there are different methods and equipment that may help us to locate the root canals.

One of the Krasner and Rankow rules, “the colour of the pulp chamber” is the key in negotiation of canals in sclerosis. The pulpal floor is always darker than the walls of tooth. The use of magnification here is very important to observe any slight changes in dentine colour.^[14]

Therefore, in our cases, we have employed 3.5X dental loupes, with illumination that helped us observe the colour changes.^[15] One should make sure that the canal is dry while troughing for canals because generally orifices are covered with ‘white chips’.^[16] These chips can be removed using long shank burs and ultrasonics. Sometimes, in the backdrop of dark dentine of pulp chamber, orifice may appear as white spots.

Both LN bur (Maillefer, Dentsply) and ultrasonics (Ultra X, Orikam) allow careful, selective, controlled removal of dentine. These can be used along with endodontic DG16 (Dentsply Sirona) probe or micro-orifice openers, which are excellent for initial penetration and exploration of canal orifices.

In cases of multirooted tooth calcification, one can also use dyes, that can be beneficial in locating canal orifices. Dyes like CerKameds ‘Canal Detector’, works by one of its components, a dye that invades into the root canal orifices and dyes them blue, thus enabling easier detection.^[15,16]

Finding patency in cases of calcified canals is a bigger challenge than location of orifices. For this work C+ files (VDW, Dentsply) are the best because these files are made from a special steel alloy with a uniform structure, which offers maximum resistance to fracture, but with no limitations with flexibility.^[17] These files have an inactive tip, which allows the instrument to follow the canal rather than cutting its own pathway, thus decreasing the risk of perforation of the root canal system. The small hand files are important in creating a ‘glide path’.^[17,18] The use of pre-curved smaller C+ hand files such as .06 and .08 is often the first step in initial exploration of calcified canals. This is effectively an initial preparation of the root canal structure from orifice to apex, which precede rotary/reciprocating files. Whereas one must carefully use stainless steel files as they may lead to transportation or separation of the instruments in such cases

In such cases when the canal is located, a small C+ file (#06, #08 & #10) coated with the chelating agent should be introduced in the canal to determine the patency. The file should not be retrieved until canal enlargement has occurred. It should be used in short filing movements. Selective circumferential filing motion should be performed.^[13]

In difficult-to-treat teeth, Ultrasonics has proven to be useful for access preparation, not only for finding canals, but also for reducing the time and the increasing the predictability of the treatment.^[9,10] Microscopic visualization and ultrasonic instruments are a safe and effective combination to achieve optimal results. The most important advantages of ultrasonic tips is that they do not rotate, but helps in enhancing safety and control, while maintaining a highly efficient cutting. This is especially essential when the risk of perforation is high.

The visual access and superior control that ultrasonic cutting tips provide during access procedures make them a most convenient tool. Ultrasonics works well when one has to break through the calcification that covers the canal orifice. A troughing tip is a good choice for this task. Bigger tips with a limited diamond coated extension should be used during the initial phase of removing calcification, interferences, materials, and secondary dentin, as it can provide us with maximum cutting efficiency and enhanced control while working in the pulp chamber. The

subsequent phase of finding canal orifice must be carried out with thinner and longer tips that facilitate working in deeper areas while maintaining clear vision [8,9,10].

Therefore, care should be taken while searching for canal orifices, as aggressive cutting may cause an undesired alterations in the anatomy of the pulp chamber. [17] Although a wise clinician must stop excavating dentin when a canal orifice cannot be found to avoid weakening the tooth structure. Root perforation can occur due to inappropriate attempts to locate canals.

The magnification, LN burs, and Ultrasonics [18] has greatly reduced the risks in management of calcified canals.

CONCLUSION

US offers many applications and advantages in clinical endodontics. Improved visualization combined with a more conservative approach can be used to selectively remove the tooth structure. Ultrasonics can be considered an effective method in managing difficult situations like calcified canals to achieve access. As a result, access refinement and location of calcified canals have generated more predictable results.

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