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Case Report

Management of Calcific Metamorphosis in Maxillary Central Incisor Using Newer Endodontic Aids: A Case Report

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Abstract

The calcified root canals cause many problems during endodontic treatment due to difficulty in canal orifice location, negotiation, preparation as well as consideration of operating time. This article describes endodontic management of a traumatized maxillary incisor with calcific metamorphosis, associated discoloration and periapical abscess using newer canal orifice locating devices, canal negotiating instruments and dental operating microscope. The non-surgical management of traumatized tooth #8 with calcific metamorphosis and periapical pathosis was carried out using newer endodontic aids including: Pulpout bur for access opening, C+ files for canal negotiation and dental operating microscope. For managing the present case, the newer techniques were carefully combined with basic and time-tested principles of managing cases with pulp obliteration. The calcified canal of tooth #8 was successfully located, negotiated, prepared and obturated till the apical terminus. There was radiographic evidence of periapical osseous healing and regression of clinical signs and symptoms.

Keywords: *Calcific metamorphosis; Pulpout bur; C+ files; Dental operating microscope*

Introduction

The successful outcome of root canal therapy is related to the ability to negotiate the canal to its apical terminus, allowing thorough debridement, disinfection and obturation of the prepared canal space. In situations, in which calcific deposits have blocked access to the canal, treatment efforts are often thwarted. Calcific metamorphosis commonly referred to as pulp canal obliteration [1] is defined as pulpal response to trauma that is characterized by deposition of hard tissues in root canal space. The tooth becomes darker in hue and appears yellow in color because of increased deposition of dentin under the enamel [2]. Holcomb and Gregory [3] suggested it to be the pathologic deviation of the normal pulp. The authors suggest that pulp of these teeth are potential source of infection and hence must always be removed [2]. The most accepted cause for its occurrence is destruction of blood supply of the pulp at the time of injury [4].

According to Endodontic Case Difficulty Assessment Form designed by American Association of Endodontists (AAE) teeth with Calcific Metamorphosis fall into the high difficulty category and achieving a predictable outcome will be challenging for even experienced practitioners [5].

Approximately 3.8-24% of traumatized teeth develop varying degrees of calcific metamorphosis. The incidence of pulp necrosis in these teeth varies between 1-16% [6]. Most of the literature doesn't support the endodontic intervention unless the periradicular pathoses develop or the involved tooth becomes symptomatic [7-9]. If the pulp tissue becomes necrotic and periradicular radiolucency develops, non-surgical root canal therapy has been shown to be successful 80% of the time [10].

The following is a case where in non-surgical endodontic intervention was successfully carried out in patient suffering from calcific

metamorphosis with periapical pathosis in her left maxillary central incisor. The case was managed using newer endodontic aids namely Pulpout Bur, C+ files and dental operating microscope.

Case Report

A 23 year-old female, was referred to the Department of Conservative Dentistry and Endodontics, Himachal Dental College and Hospital, with severe pain and swelling in her maxillary right central incisor, tooth #8.

The patient described recent severe pain over 3 days, but no previous history or any signs or symptoms. She gave a history of trauma about 10 years back and received no treatment for it, since the tooth was asymptomatic. The medical history was non-contributory.

On clinical examination yellowish discoloration of the concerned tooth was seen (Figure 1). The tooth was sensitive to percussion, but failed to respond to pulp sensitivity testing.

Figure 1: *Clinical View of Tooth #8 Showing the Yellowish Discoloration of the Tooth.*

The periapical area of the tooth was tender on palpation. A periapical radiograph revealed radiolucent area involving apex of central incisor with obliteration of the pulp chamber and root canal space (Figure 2A).

Based on the above findings, a clinical diagnosis of calcific metamorphosis with pulp necrosis and acute peri-apical abscess in right maxillary central incisor #8 was established.

A decision of carrying the root canal treatment for the tooth was made and the patient consent was taken. The tooth was anaesthetized and isolated with rubber dam. A standard access cavity of appropriate size and shape was prepared using a recently introduced, Pulpout bur (Essential Dental Systems NJ, USA) designed to aid in initial endodontic access-opening procedures of calcified teeth (Figure 3A). The bur is a friction-grip #4 round carbide bur with a plastic stop fixed at 7mm. The extra-long shank of these burs moves the head of the handpiece away from the tooth, improving the clinician's visibility during this delicate procedure. After access cavity was made, the canal was located using DG-16 endodontic explorer and dental operating microscope (PICO, OPMI, Carl Zeiss, Germany). A number 6 K-file was first introduced into the canal and obliteration was felt in the root canal space (Figure 2B). The K-file was teased in the canal several times but all the attempts were unsuccessful. Owing to the greater buckling resistance of C+ files (Denstply, Tulsa, OK, USA) (Figure 3B) as compared with K-files, a decision was made to use them for the present case. This increased buckling resistance of C+ files allows for easy negotiation of calcified canals and deeper penetration till the apical third of the tooth. The pyramidal shaped tip makes the insertion easier during the instrumentation. It has square cross-section that allows better resistance to distortion. The instrument shaft provides 300% increase in resistance to buckling.

A copious amount of 15% EDTA was introduced and number 6 C+ file was teased into the canal to establish a sense of patency. Use of EDTA ensured the softening of root canal dentin making it easily penetrated by the files. After few attempts, the number 6 C+ file pen-

etrated deeper in to canal. The periapical radiograph was taken to verify the position of the file in the canal. Following this number 8 C+ file was used in filing motion along with irrigation. When the instrument became loose then number 8 C+ file was inserted in stem winding motion with irrigants penetrating more apically as the coronal part enlarges. This method of alternate irrigation and advancement was followed until the file became loose in the canal. Frequent inspection of the files in between the instrumentation was done to identify any signs of fatigue, unwinding of flutes or any other defects.

With few more attempts the file was able to reach more apically upto the estimated working length. Working length was determined radiographically (Figure 2C). Once the working length was determined, the canal was prepared using hand K files and rotary twisted files upto number 25 tip. Normal saline alternated with 3% sodium hypochlorite was syringed into the canal for debridement. NaOCl enhances the dissolution of organic debris, lubricates the canal and keeps the dentin chips and pieces of calcified material in solution. The periapical radiograph with master cone in place was taken. The central incisor was obturated with guttapercha points and AH-Plus sealer using cold lateral compaction technique (Figures 2D and 2E). The access cavity was sealed with hybrid composite. The quality of the obturation was visualized on the periapical radiograph.

The meticulous follow up of the case was done for 2 years. The periapical radiographs were taken at 6, 9months and two years (Figure 2F). The periapical pathology had healed and patient was asymptomatic. On completion of treatment the tooth was restored with PFM crown (Figure 4).

Figure 2A: *Pre-Operative Radiograph of the Tooth #8 Showing the Obliteration of the Pulp Chamber and the Root Canal and the Radiolucency at the Peri-Apex.*

Figure 2B: *Radiograph Showing the Buckling of the K- File in the Calcified Canal.*

Figure 2C: *Working Length Radiograph, Showing No8 C+ File Reaching Till Apical Terminus.*

Figure 2D: *Master Cone Radiograph.*

Figure 2E: *Post-Obturation Radiograph.*

Figure 2F: *Follow-Up Radiographs at 9 Months; Revealing the Healing of Peri-Apical Radiolucency.*

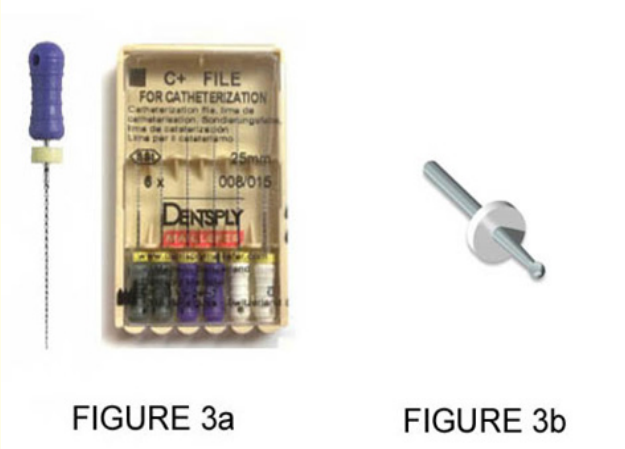

Figure 3A: *Pulp-Out Bur Design.*

Figure 3B: *C+ File Design.*

Figure 4: *Tooth Restored with PFM CROWN.*

Discussion

While dealing with the teeth having calcific metamorphosis, the first and the foremost step is rationally deciding about the treatment needs and options [11]. Teeth demonstrating pulpal obliteration but no periapical disease should be managed conservatively through clinical observation and periodic radiographic examination [12]. Periapical Index (PAI) scores can also be used to assess the tooth. PAI scores more than or equal to 3 should be indicated for root canal treatment [13]. It has been recommended that root canal treatment should be initiated in teeth that are tender to percussion and do not respond to electrical and thermal testing tests.

In the present case, the vitality tests confirmed that the tooth was non-vital and was associated with a pathological condition hence a root canal treatment was attempted. The patient was warned of the risk involved, especially the risk of perforation while gaining access to the root canal and possibility of instrument separation.

The clinician must use a rubber dam for isolation for ideal visualization, which would give a visual command over the canal. In a tooth with a calcified pulp chamber, the distance from the occlusal surface to the projected pulp chamber floor is measured from the preoperative radiograph [14]. The two dimensional radiographic image should be correlated with the three-dimensional morphology of the tooth.

However, the operating microscope has proven to be indispensable for the localization of calcified canals [15]. The microscope brings the practitioner right into the pulp chamber floor, with high-intensity light revealing intimate details in an area that was once under-illuminated and required guesswork and greater caution [16]. Subtle and minute differences in color and calcification patterns become immediately obvious, serving as a road map in removing the obstructions. Hence it was used for the present case and proved a great advantage for studying the anatomy of involved tooth.

In very deep access preparations, it is wise to take radiographic images at multiple angles to maintain alignment and direction. In certain situations, it may be beneficial to remove the rubber dam as this often lies over the area of interest at the level of the CEJ. In the present case also the rubber dam clamp interfered with the visualization of the canal on the radiograph, especially in the cervical region and hence was removed while taking working length radiographs.

Small files are required for initial path finding, however, these files lack the rigidity required to transverse restricted spaces and can often buckle or fracture when used with vertical watch-winding forces. One approach is to alternate between size 8 and 10 K files with a gentle watch-winding motion with minimal vertical pressure with regular replacement of the instruments before fatigue occurs [17].

A variety of "path finding" instruments have been introduced [18]. DG-16 explorer is a very useful instrument in the location of canal orifice. C+ Files (Denstply, Tulsa, OK, USA) are ideal for initial instrumentation of calcified root canals. They have a cutting tip that engages the dentin. A technique using K files with modified tips has also been developed for the penetration of constricted canals. The tip of a #10 K file was sliced diagonally to make it thinner. Because this modified K file has an especially fine tip and an appropriate stiffness, it followed constricted or sharply curved canals well and had a high penetration potential.

Fachin., *et al.* [19] described the "Modified-Tip Instrument" technique for removal of hard pastes from the root canal during retreatment and suggested its use to gain length in extremely calcified canals. The tip of a K-type file (quadrangular section), #30 and #35, is cut by 4 mm using an orthodontic wire cutter producing a sharp edge at the new working end. Used with an apical pressure and reaming motion this file now becomes an efficient and potent cutting instrument.

In this case liquid EDTA was used as chelating agent. Chelator preparations have been advocated frequently as adjuncts for root canal preparation, especially in narrow and calcified root canals. However, the degree to which these agents actually facilitate negotiation and preparation of such canals is unknown. This is not only because of the difficulty in providing a sufficient amount of chelating agent to this part of the root canal, but also reflects the differences in structure between the middle, coronal and apical dentin. Apical dentin is more frequently sclerosed, and is more mineralized. The authors recommend liquid EDTA solution is introduced into the pulp chamber (pipette, cotton pellet) to identify the entrance to calcified canal [20].

In the present case, once the canal was negotiated till full length, it was obturated and meticulously followed up for two years. The patient remained symptom free and radiographically there was evidence of periapical healing. There are limited numbers of studies on the outcome of root treatments on teeth with pulpal obliteration, but it is reasonable to conclude that teeth with pulpal obliteration in need of treatment have a reasonable outcome/prognosis once a technically adequate treatment has been carried out [21-23].

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