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Ultrasonic Management of Calcified Canal: A Case Report

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Abstract Calcification of the root canal system is a well-studied phenomenon. Calcification of the dental pulp may be discrete or diffuse in its form. Richman first introduced the concept of using ultrasonics (US) in endodontics. Dental traumatic injuries may be a cause for calcification of the pulp space. This case report demonstrates the use of US in the management of calcified canal having periapical pathology. US is considered an effective method in managing calcified canals in gaining access. With the use of US, access refinement and location of calcified canals have generated more predictable results.

Keywords: *root canal, calcification, ultrasonics, pulp, AH plus sealer*

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1. Introduction

Calcification of the root canal system is a well-studied phenomenon [1,2,3]. Calcification of the dental pulp may be discrete or diffuse in its form. Discrete calcification results in the formation of pulp stones, denticles, or nodules. Diffuse calcification results in a symmetric reduction in the size of the pulp chamber and the radicular pulp space, which is more commonly observed in older patients. Dental pulp calcification may occur in response to both local as well as systemic factors. Local factors include caries, cavity preparation, the presence of restorations, and excessive forces caused by clenching and trauma [4,5,6]. Systemic factors include hypercalcemia, gout, and end-stage renal diseases [7,8,9].

The concept of using US in endodontics was first introduced by Richman [10] in 1957. However, it was not until Martin et al. [11,12,13] demonstrated the ability of ultrasonically activated K-type files to cut dentin that this application found common use in the preparation of root canals before filling and obturation. The term endosonics was coined by Martin and Cunningham [14,15] and was defined as the ultrasonic and synergistic system of root canal instrumentation and disinfection.

The aim of this case report is to demonstrate the use of US in the management of calcified canal having a periapical lesion.

2. Case Report

A 24 years old male patient reported to Maratha Mandal's NGH Institute of Dental Sciences and Research Centre, Belgaum with chief complaint of persistent pus discharge from upper front teeth region since 6 months. He had suffered a dental traumatic injury 4 years back while playing football. It was a blunt type of trauma which had occurred. Patient had reported to a private clinician for the treatment and had undergone initial endodontic therapy two years back.

On examination 21 was discolored with slight alteration in the shade of 12. (Figure 1) An open access cavity was present with 11 and 21 and treatment was incomplete. A healing sinus tract was evident on the attached gingiva labially with respect to 21. No tenderness on percussion was noticed with 12, 11 and 21. On vitality testing (thermal and electrical) 12, 11 and 21 had a negative response (Figure 2).

Figure 1. Discolored 21 & a small healing sinus tract on labial gingiva with 21

Figure 2. An open access cavity was seen with 11 & 21

An intraoral periapical radiograph of maxillary anterior teeth revealed radiolucent lesion surrounded by radiopacity because of increased trabecular pattern, at apical third of 12 and 11. A near total calcification was present with the canal space of 12. The periodontal space widening and loss of lamina dura was present with 21 (Figure 3).

Figure 3. A preoperative radiograph of 12, 11 & 21

An access to 11 and 21 was gained and biomechanical preparation was carried with the help K type hand files and ProTaper rotary files up to F3. 3% Sodium hypochlorite and normal saline were used as irrigants. A metapex dressing was placed for duration of three weeks.

Gaining access through calcified canal of 12 seemed to be a challenge since a near total calcification was present. As periapical pathology was present a coronal access to canal of 12 was achieved with a small round bur (Mani). Since negotiation of canal was difficult 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 thin, long and pointed ultrasoinc tips (Endo Success, Satelec). Short vertical up and down strokes were performed up to the middle third of the root maintaining the US tip parallel to the long axis of the tooth. Small K 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 (iPex, NSK) and radiographically. ProTapr rotary files were introduced in the sequence up to F3. Metapex dressing was placed for a period of three weeks (Figure 4 and Figure 5).

Figure 4. A working length radiograph showing that the complete patency of the canal is achieved with 12

Figure 5. Metapex dressing placed in the canals of 12, 11& 21

Figure 6. Radiograph showing obturation with 11 & 21

Figure 7. Radiograph showing obturation with 12

Obturation of 12, 11 and 21 was done after duration of 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. After confirming that the canals are totally dry, master cones were tried and confirmed radiographically. Obturation was done by lateral condensation technique using AH Plus Sealer (Figure 6 and Figure 7).

3. Discussion

Uncovering the calcified canals is a challenge in dental practice. In the present case the canal of lateral incisor was almost totally calcified & only apical 1-2 mm of the canal patency was noticeable. A wise decision was to gain an access & negotiate the entire canal length.

In such a case when the canal is located, a small K file (#06, #08 & #10) coated with the chelating agent should be introduced in the canal to determine the patency. The file should not be removed until some canal enlargement has occurred. It should be used in short up & down movements. Selective circumferential filing motion should be performed [16].

In difficult-to-treat teeth, US has proven to be useful for access preparation, not only for finding canals, but also for reducing the time and the predictability of the treatment [17,18].

Microscopic visualization and ultrasonic instruments are a safe and effective combination to achieve optimal results.

There are numerous variations of rotary access burs available; however, one of the more important advantages of ultrasonic tips is that they do not rotate, thus enhancing safety and control, while maintaining a high cutting efficiency. This is especially important 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. US works well when breaking through the calcification that covers the canal orifice. A troughing tip is a good choice for this task. For these applications, bigger tips with a limited diamondcoated extension should be used during the initial phase of removing calcification, interferences, materials, and secondary dentin, as they offer maximum cutting efficiency and enhance control while working in the pulp chamber. The subsequent phase of finding canal orifices should be carried out with thinner and longer tips that facilitate working in deeper areas while maintaining clear vision [17,18].

Ultrasonic cutting seems to be significantly influenced by the power setting [19], as larger fragments of dentin are removed at higher power [20], and by the ultrasonic unit type used [19].

Therefore, care should be exercised while searching for canal orifices, as aggressive cutting may cause an undesired modification of the anatomy of the pulp chamber [21].

Although a wise clinician stops excavating dentin if a canal orifice cannot be found to avoid weakening the tooth structure. Root perforation can occur due to overzealous or inappropriate attempts to locate canals.

The microscope, access burs, and US [22] has greatly reduced these risks.

4. 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. US 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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