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Letter to the editor

Management of calcified root canal during root canal therapy

The successful result of root canal therapy depends on appropriate access cavity, cleaning, shaping, and root-filling techniques. Pulp canal calcification occurs due to the deposition of calcified tissue in the canal walls because of trauma and other factors. The root canal space can be partially or completely obliterated. In this context, endodontic treatments of severely calcified teeth are considered incredibly difficult and complex. Therefore, assessment of the anatomy pulp chamber and root complex is a priority for negotiating calcified canals. Locating, establishing, and securing the glide path is the most challenging part of instrumentation in calcified root canals.[1–3] This brief letter focuses on calcified root canals during endodontic procedures.

To locate the calcified canal, Dianat et al. evaluated 60 extracted single-rooted teeth with canal obliteration. The samples were divided into two groups (n = 30) and mounted in cadaver jaws. A dynamic navigation system (DNS) and freehand methods were used to locate the canals. Based on cone beam computed tomography (CBCT) scans, the drilling entry point, angle pathway, and drill depth were virtually planned with X-Guide software for DNS group. The freehand group was treated only using the CBCT images with the same drilling (as the DNS group) and a dental operating microscope without navigation. The results showed that DNS was more accurate and effective in locating calcified canals, and less tooth structure was removed. Besides, applying DNS can prevent misshape during the preparation of calcified canals.[4]

Dental trauma is a major factor associated with pulp canal obliteration. In this regard, Llaquet Pujol et al. described seven case reports (with histories of dental trauma ranging from 27 to 53 years) with severely calcified canals in the anterior area. In this research, the teeth canal was located by performing the following procedures: 1) evaluating teeth via CBCT scan, 2) applying intra-oral scan, 3) using three varied materials and computer-aided design-computer-aided manufacturing (CAD-CAM) techniques for manufacturing 3D guides, and 4) customizing a 1-mm-diameter cylindrical bur for preparing access cavity. The study highlighted satisfactory results of using a 3D model as a guideline for a safe access cavity. Hence, 3D printing technology is recommended for localizing calcified canals.[2]

Canal obliteration can also be associated with orthodontic treatment as an interfering factor, and it may initiate the formation of secondary dentin deposition. In a relevant study, the authors described a 23-year-old patient with crown discoloration and periapical radiolucency. This case had a calcified canal in tooth 11 that was treated two years ago under orthodontic procedures. The treatment steps applied in this study are as follows: 1) evaluating the tooth via digital periapical radiography, 2) creating preliminary access cavity through round bur No. 2, 3) removing calcification and locating canal orifice using an ultrasonic tip and endodontic explorer (DG-17), 4) negotiating of the canal with K-File No. 8, 5) using Hyflex rotary system, i.e., 30/0.04 (Coltene, Altstaetten, Switzerland), for preparing the canal, 6) filling the canal and internal bleaching (i.e., three times at the interval of five days), and 7) final dental restoration. Since the treatment result was satisfactory, using an ultrasonic tip and DG-17 is suggested. Although canal calcification in the orthodontic population is a debatable issue, the clinician's attention is of the utmost importance for an early diagnosis of the narrowing canal space that needs to be closely monitored in patients undergoing treatment.[3]

To assess the drilling path and dentin wear in calcified canals, Pires et al. examined two different burs, i.e., a 1.0 mm diameter bur (DSP, Biomedical, Campo Largo, Brazil) and a 0.8 mm diameter bur (Munce, CJM, Santa Barbara, USA), in 20 extracted mandibular incisor teeth. To improve the accuracy of clinical procedures, 3D printing models and virtual reality simulations were employed. Samples were divided into two groups (n = 10), and the access cavity was created with DSP and Munce burs. Although there was no significant difference between the two burs in the drilling

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path, the Munce bur showed higher dentin wear than the DSP bur. As a result, a DSP bur can be regarded as a superior choice in a calcified canal.[5]

Another relevant study evaluated the efficacy of using EDTA combined with C-Pilot files (VDW, Munich, Germany) and ultrasonic tips, i.e., ET20 or ET40 (Acteon, Norwich, UK), in the calcified root canals. To accomplish this goal, 132 patients with calcified root canal teeth were included in the study. The location and thickness of the calcified canals were determined through CBCT. The patients were divided into two groups: 1) a research group including 64 patients whose calcified canals were instrumented with EDTA + C-Pilot files and ultrasonic tips and 2) a control group with 68 patients were prepared only with C-Pilot files and ultrasonic tips without EDTA. The clinical success rate was evaluated 6 months after the treatment, which was 92.19% in the research group. Based on the obtained results, using EDTA in combination with C-Pilot files and micro-ultrasound is recommended for a calcified canal.[6]

Posterior regions pose another challenge in the treatment of calcified root canals. In a case report, guided endodontics was applied to treat calcified MB and ML canals. Tooth 46 was assessed and prepared for therapy using CBCT and intraoral scans, CAD-CAM workflows, and 3D printing. Using the guided endodontic sleeve as half-cylinder was recommended for positioning instruments into tooth 46 since it facilitated this process. Consequently, the treatment of calcified canals should be prepared individually for each case according to the restricted mouth opening and lack of visibility.[7]

Cold ceramic (SJM, Yazd, Iran) is a bioceramic material like mineral trioxide aggregate (MTA) used for endodontic treatment. In this regard, a case report described the successful application of cold ceramic in the calcified canal of tooth 21. The periapical lesion, bone loss, and calcified canal were observed in the radiographic examination. The tooth was diagnosed with necrosis. Although the access cavity was prepared at the full length of the dental bur, the canal pathway was not recognized. Hence, it was decided to fill the pulp chamber with cold ceramic. Contrary to the prognosis being hopeless, the treatment result was highly satisfactory. The post-operative radiograph after 6 years showed relative healing and bone regeneration. Despite the need for further investigation, cold ceramic can be used in the case of a complicated calcified canal.[8]

In another research, chamberless endodontic access (i.e., retrograde instrumentation of canal with ultrasonic activated U-files and filling with warm vertical condensation technique followed by apical seal) demonstrated reliable therapy in treated calcified incisor tooth with chronic apical abscess.[9] Regarding the information in this brief letter, the management of the calcified canal can be realized through the following methods: 1) using guided endodontics (in the form of a cylinder or half-cylinder sleeves), 2) using DSP bur, 3) preparing the calcified canal with EDTA + C-Pilot files, 4) filling pulp chamber with cold ceramic, and 5) applying chamberless endodontic access technique. Hence, clinicians' ability to select an appropriate treatment plan and incorporate technological resources and digital planning is indispensable to treating calcified canals.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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Kaveh Nasiri*
Independent Researcher, Essen, Germany

Karl-Thomas Wrbas
Department of Operative Dentistry and Periodontology, Center for Dental Medicine, Oral and Maxillofacial Surgery, Medical Center, University of Freiburg, Freiburg i.Br., Germany
Division of Endodontics, Department of Dentistry, Faculty of Medicine and Dentistry, Danube Private University, Krems, Austria

*Corresponding author. Independent Researcher, Koenigraetzstrasse, Essen 45138, Germany.
E-mail address: DDS.Nasiri@web.de (K. Nasiri)

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