

# Importance of ultrasound use in endodontic access of teeth with pulp calcification

José Edgar **VALDIVIA**<sup>1</sup>

Marcia Morante Porto **PIRES**<sup>1</sup>

Hair Salas **BELTRAN**<sup>2</sup>

Manoel Eduardo de Lima **MACHADO**<sup>3</sup>

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## ABSTRACT

One of the challenges of Endodontics is the location of root canals, so that they can be cleaned, reshaped and filled properly. The use of ultrasound and visualization of the operative field under magnification has increased safety in certain endodontic treatments, ensuring optimal results. The objective of this study was to show a clinical approach of treating a tooth with calcification at the opening of canals where access to the pulp chamber

was performed, followed by removal of calcification and location of canals under magnification using ultrasonic inserts. The case was finished with definitive crown-root sealing in a single session. It can be concluded that the associated use of ultrasound under magnification is a feasible clinical strategy to access areas of calcification.

**Keywords:** Endodontics. Ultrasound. Dental pulp calcification.

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<sup>1</sup>Professor of Endodontics, Associação Paulista de Cirurgiões-Dentistas (APCD), São Paulo, São Paulo, Brazil.

<sup>2</sup>Professor of Endodontics, Universidade Católica de Santa Maria (FO-UCSM), Peru.

<sup>3</sup>Full professor of Endodontics, Universidade de São Paulo (USP), São Paulo, São Paulo, Brazil. Professor and Chairman of Endodontics, Associação Paulista de Cirurgiões-Dentistas (APCD), São Paulo, São Paulo, Brazil.

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Contact address: José Edgar Valdivia Cardenas  
Rua Antonio Tavares, 300 - São Paulo/SP, Brazil – CEP: 01.542-010  
[j.edgar\\_30@hotmail.com](mailto:j.edgar_30@hotmail.com)

## Introduction

The goal of endodontic treatment is cleaning, shaping and filling the root canal system. A fundamental prerequisite for the success of endodontic treatment is the proper preparation for access surgery, location and identification of the root canal opening. In order to do so, it is important that the clinician have a detailed knowledge of root canal system morphology.<sup>1</sup> One of the challenges of Endodontics refers to the location of root canals, particularly in cases in which the opening of the canal is obstructed by secondary dentin or deposition of secondary dentin calcified by restorative material inserted near the pulp or by pulpotomy. The use of ultrasound and an enlarged field of view by a surgical microscope (SM) have increased safety in controlled root dentin abrasion, ensuring optimal clinical results.<sup>2,3</sup> The SM extends the field of view and therefore aids locating and performing instrumentation of the calcified canals. Changes in dentin color (whitish) and the appearance of the calcified canal<sup>4,5</sup> is something that must be considered when dealing with such cases.

Ultrasonic inserts are useful for refining access surgery, locating calcified root canals, removing pulp stones, locating accessories canals, and activating irrigation; thus, enhancing its properties.<sup>7-10</sup> It must be said that, in the past, ultrasound was used erroneously for instrumentation of root canals.<sup>6</sup>

Thus, aware of the difficulties faced in locating some root canals, so as to achieve an endodontic treatment of satisfactory quality, this clinical case report highlights the importance of combining the use of ultrasound with surgical microscope (Microsonics concept) in order to safely treat calcification located at the opening of a mandibular molar root canal.

## Case report

A 26-year-old male patient was referred for endodontic treatment of a left mandibular first molar at the Associação Paulista de Cirurgiões-Dentistas (APCD-central). The clinician who referred the patient for treatment claimed not being able to find the canals due to calcification on the pulp chamber floor.

Clinically, the tooth was asymptomatic and negative to vertical percussion and apical palpation. The initial radiograph (Fig 1) revealed the presence of a radiolucent area in the pulp chamber suggestive of calcification on its floor.

Under rubber dam isolation, the dressing was removed. When performing access surgery, it was possible

to observe dentin obstruction on the pulp chamber floor at the opening of the mesial canals (Fig 2). The pulp chamber was flooded with Canal Plus (Specialities Sep-todont Pty Ltd.) and 2.5% sodium hypochlorite (Biodinâmica Química e Farmacêutica Ltda., Ibitiporã/PR, Brazil). With the aid of the surgical microscope (Alliance, São Paulo, SP, Brazil), E4D and E7D ultrasonic inserts (Figs 3, 4) (Helse, São Paulo, SP, Brazil), attached to an ultrasound device (Gnatus, Ribeirão Preto, SP, Brazil), were used by alternating one after the other, thus removing the calcified dentin from the area.

Subsequently, the accessed canals were explored with a K-file #15 (Dentsply Maillefer, Ballaigues, Switzerland). The openings of the canals were prepared by alternating a rotatory SX file (Protaper Universal - Dentsply Maillefer, Ballaigues, Switzerland) with Gates-Glidden drills 2 and 3 (Dentsply Maillefer, Ballaigues, Switzerland). After preparation of root canal openings, odontometry was carried out with an electronic foramen locator (Root ZX II, J. Morita, Suita City, Osaka, Japan).

Chemical-surgical preparation was performed with Wave One Primary single-file reciprocating system in the mesial canals (Dentsply Maillefer, Ballaigues, Switzerland) and Wave One Large in the distal canal (Fig 5). To prepare the distal canal, a DC 1 drill (White Post, FGM, Joinville/SC, Brazil) (Fig 6) was used, alternating it with Wave One Large for simultaneous preparation for the glass fiber post.

During the entire procedure, copious irrigation was carried out with 2.5% sodium hypochlorite (Biodinâmica Química e Farmacêutica Ltda., Ibitiporã/PR, Brazil). After preparation, final ultrasonic irrigation was performed by alternating 2.5% NaOCl and EDTA (Fórmula & Ação, São Paulo/SP, Brazil), with Irrisonic inserts (Helse, São Paulo/SP, Brazil), for 30 seconds, and in three cycles, within the canal.

Filling of mesial canals was performed by means of the single-cone technique, with Wave One Primary gutta-percha cones (Dentsply-Maillefer). In the distal canal, filling was performed by the continuous-wave vertical condensation technique, with Wave One Large gutta-percha cones (Dentsply-Maillefer). AH PLUS was the endodontic sealer of choice (Dentsply-Maillefer). Subsequently, the distal canal was filled in the apical third, only (Fig 7); thus leaving the middle third and coronal thirds unfilled, so as to allow cementation with the glass fiber post. In this case, a White Post DC 1 fiber post (White Post,



**Figure 1.** Initial radiograph: mandibular first molar, absence of pulp chamber due to calcification.



**Figure 2.** Calcified pulp chamber floor.



**Figures 3, 4.** E7D and E4D ultrasonic inserts, respectively (Helse, São Paulo, SP, Brazil).



**Figures 5, 6.** Wave One Large/DC 1 drill (White Post DC, FGM, Joinville/SC, Brazil).



FGM, Joinville/SC, Brazil) was used. The middle and coronal thirds, as well as the entire pulp chamber, were conditioned in 37% phosphoric acid. The adhesive system was then applied (Ambar, FGM, Joinville/SC, Brazil). The post was cemented with resin cement (Allcem Core, FGM, Joinville/SC, Brazil) (Fig 8).

Thereafter, the composite core was manufactured with AllCem Core resin cement (FGM, Joinville/SC, Brazil) and a thin layer of Llis composite resin (FGM, Joinville/SC, Brazil). Finishing was performed with occlusion adjustment. The case was referred to the prosthetist for future manufacture of the prosthetic crown (Fig 9).

By the end of the procedure, a periapical radiograph was obtained, revealing adequate endodontic treatment,

with the post and the restoration in composite resin well adapted inside the distal canal (Fig 10). The patient was informed about the need for prosthetic restoration.

Twelve months after completion of the case, the patient was required to have routine control performed. The tooth was asymptomatic, properly prosthetically restored and in normal occlusion (Fig 11).

## Discussion

Locating the root canals is one of the major difficulties in Endodontics. The second mesiobuccal canals can not be found in 13% of teeth due to calcification of the root canal or furcations more apically located.<sup>11</sup> Thus, the endodontist can make use of devices, such as



**Figure 7.** Endodontic filling.



**Figure 8.** Cemented glass fiber post.



**Figure 9.** Onlay crown cemented after crown-root sealing.



**Figure 10.** Final radiograph: note perfect crown-root sealing.



**Figure 11.** Radiographic control after 12 months: note the intact tooth and absence of pathological symptoms.



ultrasound, to assist with this process, which simplifies the location of root canals difficult to access as well as calcified root canals.<sup>12,13</sup> In the case presented herein, the difficulty accessing the root canal system is clear due to calcification present on the floor of the pulp chamber, the reason for referral to the specialist.

The use of ultrasound in Endodontics has improved the quality of care and accounts for an important adjunct to treat difficult cases. Since its introduction, ultrasound has proven increasingly useful in applications such as: location of root canal openings, cleaning, shaping, filling, removal of material and obstructions from inside the root canal, and periapical surgery. In more complicated cases, the use of ultrasound has significantly reduced risks, for example, of perforations. There is a variety of drills available for endodontic access; however, there are no means to access calcified areas. One of the most important advantages of ultrasonic inserts is selective wear. Additionally, they do not rotate, ensuring greater safety and control, while maintaining a high cutting efficiency.<sup>14</sup> When used for the location of second mesiobuccal canals, ultrasound is excellent for removing secondary dentine from the mesial wall.<sup>7</sup> It is important to note that high-quality ultrasonic inserts are available in the domestic market within the reach of the clinician, that is, an affordable technological reality.

The first clinical situation in which major advantages can be achieved with the use of ultrasonic inserts is the preparation of the access cavity and location of the root canal. This first phase of endodontic treatment is often hampered by the presence of calcifications and deposit of secondary dentine in the pulp chamber, thus obliterating partially or totally the root anatomy. We know how complex it is, in these situations, to make a correct access cavity, respecting the original tooth anatomy, not changing the pulp chamber floor and, above all, locating all root canal openings. Control provided by ultrasonic inserts is far better than that offered by any other rotary device, not only due to the ease of guiding an instrument that is not rotating, but also due to the size of the insert, definitely smaller, which provides an excellent cut and a better view.<sup>13</sup>

Magnification enters our specialty as a supplementary ally of ultrasound in various clinical procedures, allowing for great lighting and better visualization of the operative

field. High magnification is required to assist the location of calcified root canals, detect microfractures, identify isthmuses, interpret the complexities of the root canal system, assist the removal of intracoronary cores and fractured instruments, as well as allow coronary access.

A potential cause of persistent pain after endodontic therapy might be the nonlocalization and hence no treatment of an additional canal. In a second intervention, while examining the pulp chamber floor with a SM under high magnification, it is possible to locate this canal; for instance, the presence of a fourth root canal in a maxillary first molar. The SM immensely aid locating and instrumenting calcified root canals. Changes in the color of the dentin and the appearance of a calcified root canal can be viewed with the device.<sup>3,15</sup> It is possible to claim that both technological resources, associated with the technical skill of the operator, were key for the clinical resolution of the case presented herein. By the end of treatment, the option was to definitely restore the tooth and refer the patient to the specialist performing the prosthetic piece.

The new standpoint of Endodontics regarding the restoration of endodontically treated teeth includes performing crown-root sealing whenever possible, assuming that Dentistry has sought an ideal approach to reconstruct endodontically treated teeth in a way that provides protection for the remaining tooth, thus preventing contamination of endodontic treatment.<sup>16,17</sup> It is the Endodontics dentist's role to establish a good relationship between Endodontics and Prosthetic Dentistry, so as to provide the tooth with better rehabilitation, both functional and esthetic. In the case presented herein, after questioning about the best restorative treatment, and after careful evaluation of the case, consensus was reached on immediate crown-root sealing, followed by referral to prosthetic rehabilitation.

## Conclusion

The use and combination of new endodontic resources, such as ultrasonic inserts under magnification, provides the clinician with greater operational ease and safety in complex cases, as presented herein; thus increasing the chances of success. Visual magnification allowed better visualization of the operative field, and ultrasonic inserts allowed improvements in the access surgery with great effectiveness, selective wear and minor wear of dentin structures.

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