Pulp Calcification and External Reabsortion Resulting from Dental Trauma in Childhood, Associated with the Applicability of Guided Endodontic Treatment – Endoguide: Case Report

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Abstract: *Introduction:* Pulp canal calcification is characterized by the deposition of calcified tissue along the canal walls. As a result, the root canal can become completely obliterated, making endodontic treatment and its chemical-mechanical preparation difficult and contributing to accidents and complications. The objective of this case report is to understand that digital dentistry has added value in several dental situations. Endoguide provides safety, precision, efficiency, minimizes operative time, and reduces the chances of root canal deviation and damage to surrounding tissues.

Methodology: The literature review was carried out through a bibliographic survey on guided endodontic treatment in obliterated canals. The clinical case reported here was treated at the dentistry clinic of the Euro-American University Center (UNIEURO).

Case report: A 23-year-old female patient with a history of trauma in the anterior region of the maxilla at least 10 years ago reported that there was no intervention at the time of the incident and detailed how the trauma occurred. The patient presented to the UNIEURO dental clinic complaining of darkening of the crown of tooth 21. Radiographically, significant external resorption was observed and the clinical examination showed marked vestibularization. When performing sensitivity tests on tooth 21, negative responses were obtained. The lower teeth were also the focus of observation for analysis of possible impairment during the trauma that occurred. It was observed that all were vital, except for tooth 21, thus confirming the diagnostic hypothesis of Pulp Calcification. The patient was referred to the radiology clinic with a request for an imaging exam: Computed Tomography on a Prexion device; known for allowing a more detailed view of the root canal system and the periapical region. Subsequently, intraoral scanning was performed at the Voxells clinic, where the Stereo lithography (STL) file was acquired and combined with images in the DICOM (Digital Imaging and Communications in Medicine) file. Subsequently, Trion was responsible for developing the 3D model and printing it to guide the endodontic access surgery in the appropriate position and angle.

Conclusion: The guided endodontic technique is safe, effective and faster. It increases predictability, minimizes the risk of deviations and perforations, and promotes greater comfort for the patient and dentist. It is important for the professional to be familiar with this cutting- edge technology and its benefits in the dental world.

Keywords: Dental pulp calcifications, Root canal preparation, Computer-aided design, Cone beam computed tomography, Dental trauma, Tooth resorption.

1. INTRODUCTION

Pulp canal obliteration (PCO) is defined as the deposition of mineralized tissue inside the coronary pulp and root canals. The potential causes of its etiology include pulp aging, traumatic environmental factors, cavities, orthodontic treatment, and parafunctional habits. The calcification of the root canal system (RCS) exhibits a direct correlation with traumatic dental injuries. Research findings indicate that approximately 4 to 24% of traumatized teeth develop different degrees of pulp obliteration [1]. The main radiographic feature is the apparent loss of the "canal lumen", visually, there is discoloration of the clinical crown, which has a yellowish appearance. Although such cases are prevalent in dental practices, they still constitute a challenge for endodontic treatment [2].

The explanation regarding why dental trauma causes the deposition of mineralized pulp tissue is as follows: once there is an interruption in the vascular and nerve supply to the apical pulp, there may also be clot formation and stimulation of the deposition of calcified tissue by odontoblasts. Clinical cases of this nature are associated with dislocation or avulsion injuries and a significant decrease in blood supply, which generally lead to calcification of the RCS. During time, pulp obliteration can be seen radiographically, presenting a

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common diagnosis of this type of traumatic aggression [3].

Pulpal calcification is undeniably a clinical challenge for endodontists. However, digital dentistry has been an indispensable ally in this area. It has brought functionality and predictability to professionals. The cone-beam computerized tomography scan is the gold standard radiographic examination for providing greater safety for the dental surgeon and the patient, since the tomographic sections allow a greater wealth of detail to be visualized, which is imperceptible in a panoramic or periapical X-ray [4]. In addition, guided or endoguide endodontics is an alternative on the market that consists of a combination of intraoral digital scanning, cone beam tomography and endodontic treatment, with the primary objective of simplifying root canal access procedures for teeth that cannot be treated using conventional techniques [1].

In order to achieve success in endodontic therapy, it is necessary to follow steps and fulfill basic requirements, such as internal and external dental morphological knowledge, detailed interpretation of imaging tests, adequate access surgery, and perfect exploration and instrumentation inside the root canals to ensure that they can be effectively disinfected, reshaped and filled [5].

It is essential to have a detailed anamnesis to understand what has actually happened. When pulp obliteration is detected, the clinical approach must be rigorous. There is a need for follow-up and if there are any concerning signs, immediate intervention is necessary [3]. In this context, it has become clear that there is a demand to elucidate the advantages and benefits of using the endoguide in the endodontic treatment of calcified canals. As specificizing how this procedure can be an alternative to increase precision in locating and guiding endodontic instruments in calcified canals, providing safety, precision, and effectiveness, which minimizes operative time and minimizes the chance of complications, such as root canal deviation and damage to surrounding tissues.

2. METHODOLOGY

This work is characterized as an exploratory research, with a case report and a qualitative-quantitative approach of a basic nature. This article discusses pulp calcification and external resorption resulting from dental trauma in childhood, associated with the applicability of guided endodontic treatment - *endoguide*. This study aims to analyze the factors that influence the efficacy of endodontic treatment in a tooth with a calcified canal by utilizing digital dentistry.

A literature review was conducted in the Virtual Health Library (VHL), *PubMed* and *Scientific Electronic Library Online* (SciELO) databases in order to identify scientific articles published between 2014 and 2024. The research in the aforementioned sources was conducted using the Boolean signs "Calcificações da polpa dentária" AND “Preparo de Canal Radicular” AND "Desenho Assistido por Computador" AND/OR “Tomografia Computadorizada de Feixe Cônico” AND “Traumatismos dentários” AND “Reabsorção de dente”. In addition, its English counterpart to present as methodology the description, application and/or evaluation of the success of the guided endodontic treatment technique in calcified canals: "Dental Pulp Calcifications" AND “Root Canal Preparation” AND "Computer Aided Design" AND/OR “Cone Beam Computed Tomography” AND “Dental Trauma” AND “Tooth Resorption”. A total of 310 articles were found by combining the descriptors cited. Articles published before 2014 were then excluded. This resulted in the total of 248 papers. Afterwards, articles that were duplicated in the different databases used in the search were automatically and manually excluded. A total of 173 articles remained. The publications were pre-selected based on their titles, with the first criterion being the full term and/or references to guided endodontic treatment of a tooth with a calcified canal, which resulted in thesuccessful treatment and rehabilitation of the patient. Based on this, 41 papers were chosen. After reading the available abstracts of the selected scientific articles, 27 articles remained. The final method of selection was to read the full article, which resulted in 25 articles for the literature review.

The analysis of the selected material was conducted by categorizing the studies based on the type of study, its objectives, the location where the research was conducted, the year of publication, the journals in which they were published, the methodologies employed, and the primary findings discovered.

3. LITERATURE REVIEW

3.1. External Inflammatory Resorption

External inflammatory resorption is caused by two relevant factors: firstly, infection of the root canal system with bacteria; secondly, when there is mechanical damage to the cementum during the trauma, or the cementum is damaged in reaction to resorption of the external surface, exposing the dentinal tubules to the periodontal ligament and the surrounding bone. This form of resorption can manifest itself immediately after a traumatic incident or arise later. It is identified radiographically by the evident loss of tooth structure and its replacement by bone [6].

The occurrence of severe trauma anywhere on the root surface may result in external apical resorption [3]. This procedure involves the presence of microorganisms in the root canal and dentinal tubules, releasing lipopolysaccharides and peptidoglycans into the periodontium. As a result, macrophages, neutrophils, complement proteins and antibodies from B lymphocytes are secreted into the surrounding tissues. The leukocytes promote the secretion of cytokines such as IL-1, IL-6 and TNF-α, which increase the secretion of RANK ligand (RankL), thus inducing the monocyte differentiation into osteoclasts/odontoclasts that resorb bone and dentin, causing resorption [7].

In the management of external inflammatory resorption, the main objectives are to prevent infection of the root canal system or, if it is already infected, to eradicate the bacteria present and encourage periodontal ligament healing and repair. These objectives may be accomplished through endodontic treatment, which adheres to the fundamental principles ofthis approach, with a particular emphasis on the utilization of specific intracanal drugs that could affect bacteria and influence the tissue response in the periodontal ligament [6].

3.2. Pulp Calcification Related to Dental Trauma

Pulpal calcification is a challenge in the endodontic treatment of certain teeth. According to the American Association of Endodontics, a pulp response to trauma is characterized by a rapid deposition of hard tissue in the root canal space, which results in a reduction in the volume of the pulp space and the diameter of the root canal [8]. The entire root canal space may appear obliterated on radiographs due to extensive deposition; however, histological examination may reveal some empty portions of the pulp space [9]. The pulp canal obliteration is a typical late sequela of dental trauma. It occurs in 15% to 40% of cases after luxation lesions [10].

Tooth injuries, whether they are low-grade and sustained over a period of time or a single force that causes catastrophic changes in the homeostasis of the tooth and its environment, lead to the activation of the nuclear factor kappa B receptor activator, (NF-κB)-linker (RANKL), the activator of the NF-κB receptor (RANK) and the osteoprotegerin receptor (OPG). This results in the formation or resorption of hard tissue. This tertiary dentin formation caused by trauma leads to calcification and closure of the pulp space, which is often referred to as pulp canal calcification or pulp canal obliteration and is observed in traumatic tooth injuries [11].

Pulp tissue may be calcified (obliterated) as a result of trauma, surgical interventions or damage caused by cavities. This is primarily manifested by the apparent reduction of pulp space and yellowish discoloration in the clinical crown, which may complicate root canal treatment, rendering disinfection more challenging [12].

Affected teeth generally have a darker shade compared to adjacent teeth, with a yellowish color [13]. The clinical crown often loses its translucency because of the increase in thickness. The progression of discoloration and calcification increases with time. Pulp obliteration commonly occurs due to trauma and often affects anterior teeth in young adults. The literature has also proposed other etiologies, such as pulp response to cavities, occlusal interference, vital pulp therapy and orthodontic treatment [9].

In certain cases of the dental pulp calcification, intervention is not necessary; however, the presence of inflammation of the pulp tissue, microbial contamination of the SCR or the development of periapical pathology require endodontic treatment. The American Association of Endodontics (AAE) recognizes that the procedure for treating calcified canals is highly challenging and complex, given that the location and biomechanical preparation of the canal orifices represent a significant clinical challenge [14].

Partial or complete obliteration of the root canal could prevent complete instrumentation and disinfection of the RCS and may also increase the risk of iatrogenic procedural errors such as perforation, trepanning, weakening of the remaining tooth structure and file fractures [15]. In patients with pulp obliteration, it can be challenging to prepare the access cavity and negotiate the root canal orifices, which can increase the risk of fracture [9, 16]. The Guided Endodontics Technique allows adequate endodontic treatment without significant removal of coronal or root tooth structure [5]. Therefore, pre-operative planning using the three- dimensional (3D) imaging modality is highly recommended [9].

3.3. Computerized Tomography and Intraoral Scanning

Obtaining adequate access to the root canals is a significant and intricate aspect of endodontic treatment, as it has a direct impact on the location, preparation, and filling of the root canal system [17]. For this reason, new instruments and operative techniques have been developed to increase the success rates of endodontic therapy, especially in more complex cases such as PCO [18].

The success achieved in treating patients with pulp calcification through the utilization of guided endodontics as a facilitating technique is already a reality in contemporary dentistry. Dentistry is constantly benefiting from new technologies that enhance diagnosis, planning and therapeutic intervention. Complementary imaging techniques have undergone significant advancements in a brief span of time, particularly with the advent of cone beam computed tomography (CBCT). It has improved its spatial resolution, image quality and contrast, enabling detailed visualization of small structures relevant to endodontic diagnosis [19-21].

In guided endodontics, a digital impression is taken and superimposed onto the CT scan images. The drilling path is planned, and a guide is fabricated using computer-aided design software to facilitate access to the root canal. Finally, a 3D printer is used to produce the guide [9]. The reduction in the number of radiographs with this approach is also a benefit and compensates for the radiation received by the patient in CBCT, as the latter would be considered a possible disadvantage of this technique [18].

Guided endodontics was developed based on the surgical guides utilized in implant dentistry. These guides provide a precise outline of drill paths for inserting implants and can now be adapted for endodontic procedures. Before the guide is made, a cone-beam computed tomography scan (CBCT) and an intraoral digital scan of the dental region are conducted, covering the tooth to be subjected to endodontic treatment. The guide is digitally designed using software that integrates the data obtained from CBCT and intraoral scanning. Subsequently, a 3D guide made of rigid material is produced, which will adjust to the surface of the tooth, providing more precise access to the root canal with less chance of deviations [16-18].

Intraoral scanning provides accurate reproduction of dental crowns and gingival tissues. This ensures a complete digital record of the patient's arch. The development of oral scanners has improved model accuracy. Direct oral scanning provides a quicker and more reliable copy of the teeth, which is essential for success in cases that require high sensitivity [1].

In addition, stereolithography 3D printers are becoming increasingly accessible and integrated into dental practices. There have also been significant advances in navigation and virtual planning software, which allows imaging exams to be integrated to make more efficient use of their benefits. These methods make it easier to implement proper instrumentation and disinfection of the root canal system [19].

Although the planning of guided endodontics may appear time-consuming, the time taken for the treatment itself is minimal. Additional costs associated with computed tomography, intraoral scanning, and endodontic guidance can be justified by reducing the likelihood of iatrogenesis and increasing the chance of tooth retention. For instance, the expenses associated with implants would be significantly higher if unsuccessful conventional treatment resulted in tooth extraction [5].

3.4. The Guide

A guide supported by the teeth provides adequate stabilization, prevents trauma to the gums, and allows the dental surgeon to use a rubber dam during the procedure. After aligning the DICOM and STL images, a tooth-supported model is projected. The guide should cover the labial and palatal surfaces of the three adjacent teeth to ensure correct intraoral stabilization [8, 21].

Digital planning guarantees predictable application of guided endodontic access. This approach is safer, since it prevents accidents such as lateral root perforations. The guide that supports teeth 25 to 35, previously planned and 3D printed, provides stability for the guided access without the need for any bone support or fixation. Periapical radiographs can be used to monitor centralized access with satisfactory remaining tissue and no proximal deviations [22].

From a clinical perspective, guided access provides the operator with a more predictable and reliable technique that improves short- and long-term results. It also allows for more conservative access, which preserves tooth structure [13, 23].

4. CASE REPORT

4.1. Patient Informations

Female patient, 23 years old, referred for clinical evaluation at the Centro Universitário Euro-Americano, *Campus* Águas Claras. She complained of darkening on the 21st tooth. During the anamnesis, there was a clinical history in which she reported having suffered dental trauma when she was eight years old and not having sought a professional dental surgeon for prevention/preservation.

4.2. Diagnostic Evaluation

Clinical examinations have revealed significant vestibularization in the region of tooth 21 and a darkening of the dental crown. The probing depth varied from 1mm to 2mm in the sites explored (mesiobuccal, midbuccal, distobuccal, distopalatal, midpalatal and mesiopalatal). Cold and hot pulp vitality tests were conducted on elements 12, 11, 22, 31, 32, 41, and 42 to evaluate the possibility of whipping on these dental elements. This possibility was ruled out.

A cold pulp vitality test using refrigerant gas (Endo Ice®, Maquira Dental Products Industry LTDA, BRAZIL) and a hot pulp vitality test utilizing a gutta-percha stick and a lamp were conducted on the darkened tooth element 21. Both tests yielded negative results, thereby confirming the presence of pulp calcification. The digital palpation and the perpendicular percussion of tooth 21 were negative. Periapical radiography confirmed the absence of a periapical lesion—as previously verified by palpation and percussion tests—and the presence of an external apical inflammatory resorption, which was resorbing the tooth, exhibiting a shortening of the root perpendicular to the root axis.

4.3. Treatment Planning and Implementation

This research was granted authorization by the Research Committee of the Ethics Committee Involving Human Beings of the Euro-American Institute of Education, Science and Technology S.A (UNIEURO). The patient also signed a written informed consent.

Initially, after anamnesis and clinical examination, and having realized the complexity of the location of the root canal due to pulp obliteration with a high risk of perforation, the patient was referred for a Prexion cone beam computed tomography scan of tooth 21. A DICOM (Digital Imaging and Communications in Medicine) file was obtained. These files allow for improved case planning, as they provide a more detailed view of the root canal system and periapical extension.

The patient was then referred to the Voxells clinic, where she was scanned using the iTero Element **2** Intraoral Scanner® (Align Technology, California, USA) and the Stereolithography (STL) file was acquired. In the TRION 3D clinic, the two files (STL and DICOM) were combined to facilitate the development of a composite skull and the printing of a 3D surgical guide to guide endodontic access in the appropriate position and angulation. This was designed to allow the 1.3 diameter, 20mm high implant cutter® (Neodent SA, Curitiba, Brazil) to reach a drilling depth of 21mm with an angulation of 15.54º, until it reached the canal lumen.

The second session was conducted in an area known as the aquarium, at the Águas Claras *Campus,* where some students were able to observe the procedure. It began with antisepsis by rinsing the patient with chlorhexidine diglyconate 0.12%®

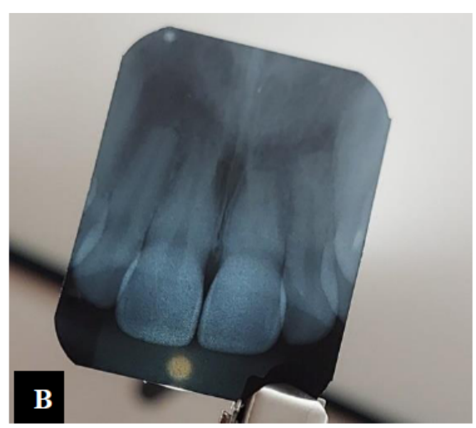

Figura 1: A) Intraoral clinical examination, element 21 darkened. **B**) Initial radiograph, without canal lumen visualization.
Source: Authors' records.

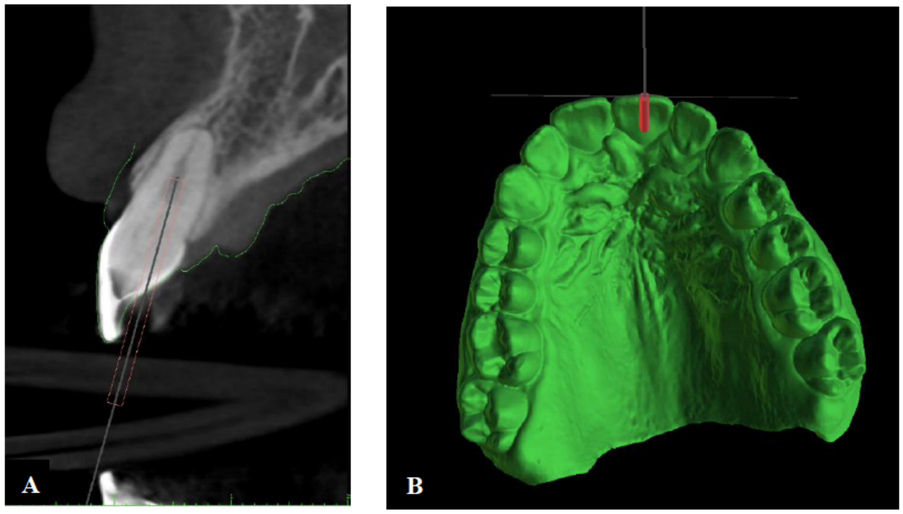

Figura 2: A) Computerized Cone Beam Tomography. **B**) 3D Model.
Source: Authors' records.

(Rioquímica S/A, São Paulo, Brazil) and asepsis of the 3D guide with chlorhexidine diglyconate 2% (Rioquímica S/A, São Paulo, Brazil). Afterwards, enamel access was initiated with a caneta de alta roatação® [high-speed dental handpiece] (Dabi Atlante, Ribeirão Preto, São Paulo, Brazil) and Ponta Diamantada [Diamond Tip] 1014HL® (American Burrs, Santa Catarina, Brazil) and a guided endodontic model was positioned with stability through the dental arch.

The penetration of the obliterated root canal was achieved using a VDW.SILVER RECIPROC® endodontic motor (VDW, Munich, Germany) using a low-speed pen with a 1.3 diameter implant cutter and a rotary pumping movement relative to the speed (1200 rpm) and a torque of 4 N with continuous irrigation of 0.9% saline solution. A periapical radiograph was taken using the bisector method to verify the successful canal path, and this was confirmed. Next, a rubber dam was installed for absolute isolation using the 211® clamps (Golgran, São Paulo, Brazil).

The Exploratory Working Length (EWL) was determined to be 19mm. Therefore, the root canal was explored using C-Pilot k#10 and k#15® files (VDW, Munich, Germany). The k#20, k#25 and k#30 files were used to prepare the cervical third and the protaper ultimate SX® rotary file (Dentsply Sirona, North Carolina, USA) was handled 2mm below the Ctex (17mm). The Working Length (WL) was determined using the iRoot Ipex® apex locator (Easy Bassi, Belo Horizonte, Brazil), and the result was 20mm.

Figura 3: Endoguide positioned for adaptation assessment.
Source: Authors' records.

The apical third was prepared with manual files k#15, k#20, k#25 and k#30 and 25mm protaper next rotary files X1 (17.04), X2 (25.06), X3 (30.07), X4 (40.06) and X5 (50.06)® (Dentsply Sirona, North Carolina, USA), irrigated with Milton's Solution 1.0%® Solution (Asfer Indústria Química, São Caetano do Sul, São Paulo, Brazil) (sodium hypochlorite) and suction, as well as recapitulation of k#10 at each file exchange. The k#15 was used to perform foraminal patency at CT+1mm (21mm) and the final irrigation protocol was implemented using easy clean® (Easy Dental Equipment, Belo Horizonte, Brazil) 3x20 seconds of Milton's solution, 3X20 seconds of EDTA 17%® (Inodon, Porto Alegre, RS, Brazil), 3x20 seconds of Milton's solution and 30 seconds of 0.9% saline solution. Aspiration of the inside of the root canal with Capilary Tip® (Ultradent Produtos Odontológicos, São Paulo, Brazil), and drying with an absorbent paper cone.

Ultracal Xs® (Ultradent, São Paulo, Brazil) was selected as the Intracanal Medication owing to its efficacy in combating microorganisms, solubility of organic matter, and stabilization of external inflammatory resorption. The canal was then sealed with a triple provisional restoration made of absorbent cotton, coltosol and Restorative Glass Ionomer® (Riva Light Cure, SDI, Australia).

The third session was carried out to change the intracanal medication to ensure continued stabilization of the external inflammatory replacement resorption. Ultracal Xs was placed again, and a triple seal was achieved.

The fourth session comprised of obturation, wherein the root canal of tooth 21 was successfully sealed in its entirety. An X3® gutta-percha cone (TDK Corporation, Tokyo, Japan) was used, which was cut at the apex with a scalpel blade until the cone was tactilely and radiographically locked at the working length, and MTA Fillapex® (Angelus, Londrina, Paraná, Brazil) filling cement with a lateral and vertical condensation technique using paiva® presses (6b Invent Germany, Germany).

5. DISCUSSION

Pulp obliteration has various etiologies, but the most common and recurrent is a traumatic dental injury in which mineralized tissue is deposited in the coronary portion and root canals. The endodontic treatment of a calcified tooth is intricate owing to the substantial likelihood of accidents and complications, such as instrument fractures, deviations, and perforations of the root canal [1]. The endodontic guide is based on the combination of intraoral digital scanning and cone

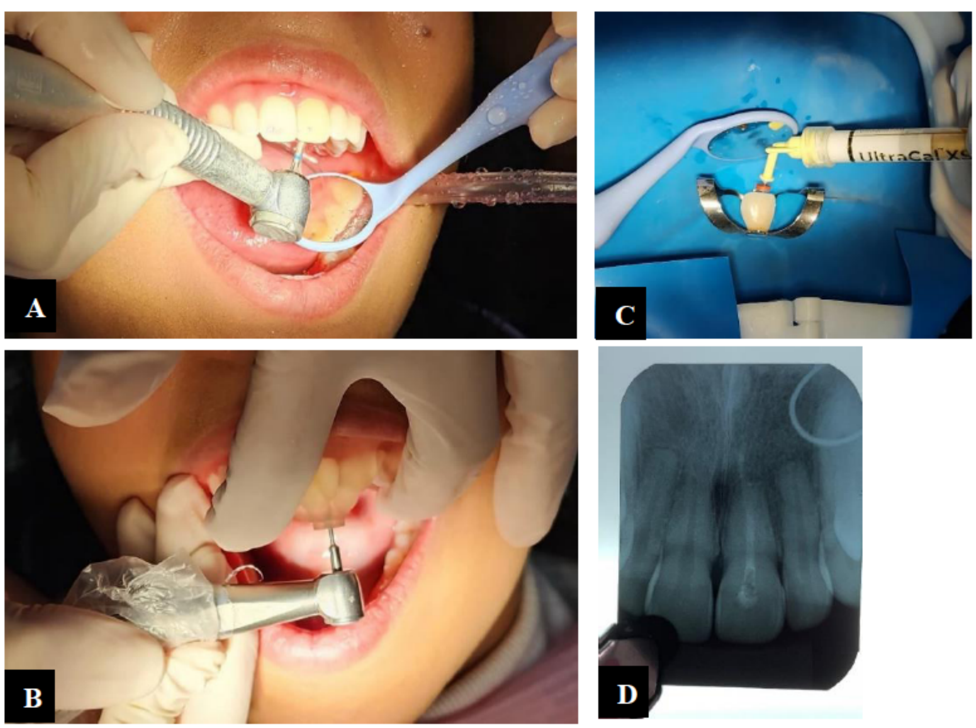

Figura 4: A) Diamond-tipped enamel acess. **B**) Root canal access via surgical guide with implant cutter. **C**) Ultracal intracanal medication. **D**) Medication test.

Source: Authors' records.

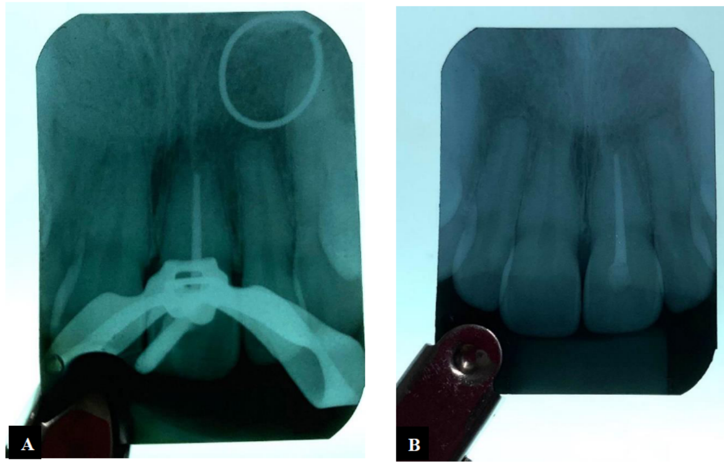

Figura 5: A) Conometry. **B**) Final radiography with positioner.
Source: Authors' records.

beam tomography, which significantly improves the accuracy of root canal location and reduces the chances of deviation and damage to the surrounding tissues. It also improves the efficiency of the chemical-mechanical preparation and reduces the operative time in this complex treatment [13, 23].

Pulp tissue can be calcified due to trauma, surgery, or damage caused by cavities. This phenomenon is primarily manifested by the apparent loss of pulp space and yellowish discoloration of the clinical crown, which may complicate root canal treatment and make disinfection more challenging [12]. The partial or complete obliteration of the root canal can hinder instrumentation and complete disinfection of the root canal system, as well as increase the risk of iatrogenic errors such as perforations, trepanations, weakening of the remaining tooth structure, and file fractures [15]. The Guided Endodontics Technique allows adequate endodontic treatment without significant removal of coronal or root tooth structure [5]. Therefore, pre-operative planning using the three-dimensional (3D) imaging modality is highly recommended [9]. In guided endodontics, a digital impression is taken and superimposed onto the CT scan images. The drilling path is planned, and a guide is fabricated using computer- aided design software to facilitate access to the root canal. Finally, a 3D printer is used to produce the guide [9]. The reduction in the number of X-rays with this approach is also a benefit and compensates for the radiation received by the patient in CBCT, as the latter would be considered a possible disadvantage of this technique [18].

Intraoral scanning provides an accurate reproduction of dental crowns and gingival tissues, ensuring a complete digital record of the patient's arch. With the advancement of oral scanning technology, the accuracy of models has significantly improved. Direct scanning of the teeth allows for faster and more reliable copying, which is essential for success in cases that require high sensitivity [1].

Furthermore, 3D printers using stereolithography are becoming increasingly accessible and integrated into dentistry practices. Significant progress has also been made in navigation and virtual planning software, which allows imaging exams to be integrated to make more efficient use of their benefits. This methodology facilitates the execution of appropriate instrumentation and disinfection of the SCR [19].

A guide supported by the teeth provides effective stabilization, alleviates gum trauma, and enables the dental surgeon to utilize complete isolation during the procedure. After aligning the DICOM and STL files, the model is projected with support for teeth. For adequate intraoral stabilization, the guide must cover the labial and palatal surfaces of the three adjacent teeth [8].

From a clinical perspective, guided access provides the operator with a more predictable and reliable technique that improves results in the short, medium and long term because it allows more conservative access, thus preserving tooth structure [13, 23]. The "guided endodontics" (GE) technique was introduced 6 years ago as an alternative to conventional cavity preparation for teeth with pulp canal calcification and apical pathology or irreversible pulpitis. Using three-dimensional radiological images, such as cone beam computed tomography and digital surface scanning.

Optimal access to the calcified root canal orifice can be structured virtually with suitable software [10].

Once the technique has been selected, the impression is of paramount importance to the treatment and must be executed meticulously. It is essential to observe every detail, as proper scanning and printing are essential to prevent failures from occurring when locating the root canal with the implant cutter [2, 24]. Concomitant irrigation between the use of the drill is essential to prevent the dentin from heating up and subsequent microcracks or lesions in the periodontal ligament, such as external cervical resorption [16].

The guided endodontic technique provides the dental surgeon and the patient with better predictability, safety and reduced operating time. All these factors combined are of Paramount importance for successful treatment. It avoids inconvenience and complications [12, 25]. Similarly, the treatment has limitations, such as physiological dental anatomy; surgical handling; in-depth technical/scientific knowledge; high additional expenses that would not be incurred in conventional endodontic treatment, such as more complex detailed radiographic examinations, intraoral scanning and making the endodontic guide [25].

In conclusion, the guided endodontic approach has proved effective enough to be considered a safe method for treating teeth with obliterated pulp. Furthermore, guided endodontics provides numerous advantages, such as preserving tooth structure and reducing chair time. The main advantage of guided endodontics is the minimal risk of root perforation, since endodontic treatment in teeth with calcified root canals can be challenging even for the most experienced dental surgeons, as reported in the literature [16, 24] and confirmed in this case report.

CONCLUSION

The endodontic guide used was essential for safely accessing and locating the calcified root canal and preserving tooth structure. It mitigated iatrogenic damage, including excessive enamel wear, perforation, and root deviation. The use of the endoguide also enabled correct instrumentation and disinfection of the SCR. The procedure is a quick method that reduces chair time. It was demonstrated that its efficacy and sophistication in locating calcified root canals was evident, and it was verified that its appropriate clinical management enhances the success of surgical procedures in cases of calcified canals.

CONFLICTS OF INTEREST

None

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