

Use of Biodentine in the resolution of a failure in paraendodontic surgery

Uso de Biodentine na resolução de um insucesso na cirurgia paraendodôntica

Uso de Biodentine en la resolución de un fracaso en cirugía paraendodóntica

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Abstract

To present a clinical case report of successful endodontic retreatment, in a maxillary first molar, with symptomatic apical periodontitis in the mesiobuccal root that had already undergone endodontic treatment and paraendodontic surgery. A patient was referred for evaluation of upper right first molar with swelling, severe pain and sensitivity to percussion and palpation. She reported having undergone endodontic treatment 1 year ago and, 6 months later, when the symptoms returned, a paraendodontic surgery was performed by the same professional. A cone-beam computed tomography (CBCT) was requested and the images showed extensive bone rarefaction associated with the mesiobuccal root, which had the MB1 canal treated and the MB2 canal untreated. The periapical region of the apices of the distobuccal and palatine roots showed signs of normality, and the treatment plan was established with selective endodontic retreatment only in the mesiobuccal root, with the location and treatment of the MB2 canal and retreatment of the MB1 canal. Retreatment was performed in 2 sessions with an intracanal dressing with calcium hydroxide paste. The canals were filled with Biodentine (BD, Septodont, Saint Maur de Fossés, France). Clinically, the patient had no further signs or symptoms and tomographic images showed evidence of bone repair after 24 months. Correct planning and execution of all phases of endodontic retreatment were fundamental for the success of this case report.

Keywords: Silicate cement; Endodontics; Apical periodontitis; Retreatment; Cone-beam computed tomography.

Resumo

Apresentar um relato de caso clínico de sucesso no retratamento endodôntico, em um primeiro molar superior, com periodontite apical sintomática na raiz mesiovestibular que já havia passado por um tratamento endodôntico e cirurgia paraendodôntica. Uma paciente foi encaminhada para avaliação do dente 16 apresentando edema, dor forte e sensibilidade à percussão e palpação. Relatou a realização do tratamento endodôntico há 1 ano e, 6 meses após, quando o quadro sintomático retornou, foi realizada uma cirurgia paraendodôntica pelo mesmo profissional. Foi solicitada uma tomografia computadorizada de feixe cônico e as imagens mostraram extensa rarefação óssea associada à raiz mesiovestibular, que possuía o canal MV1 tratado e o canal MV2 sem tratamento. O contorno dos ápices das raízes distovestibular e palatina apresentavam sinais de normalidade, sendo estabelecido como plano de tratamento, o retratamento endodôntico seletivo apenas na raiz mesiovestibular, com a localização e tratamento do canal MV2 e retratamento do canal MV1. O retratamento foi realizado em 2 sessões com um curativo de demora com hidróxido de cálcio. Os canais foram obturados com o Biodentine (BD, Septodont, Saint Maur de Fossés, France). Clinicamente, a paciente não apresentou mais sinais ou sintomas e as imagens tomográficas mostraram evidências de reparo ósseo após 24 meses. Um correto planejamento e a execução de todas as etapas do retratamento endodôntico foram fundamentais para o êxito do presente relato de caso.

Palavras-chave: Cimento de silicato; Endodontia; Periodontite apical; Retratamento; Tomografia computadorizada de feixe cônico.

Resumen

Presentar un reporte de caso clínico de retratamiento endodóntico exitoso, en un primer molar superior, con periodontitis apical sintomática en la raíz mesio-vestibular que ya había sido sometido a tratamiento endodóntico y cirugía paraendodóntica. Un paciente fue remitido para evaluación del diente 16 con tumefacción, dolor intenso y sensibilidad a la percusión y palpación. Refiere haber tenido tratamiento de endodoncia durante 1 año y, 6 meses después, cuando reaparecieron los síntomas, se realizó una cirugía de paraendodoncia por el mismo profesional. Se solicitó una tomografía computarizada de haz cónico y las imágenes mostraron una extensa rarefacción ósea asociada a la raíz mesio-vestibular, que tenía el canal MV1 tratado y el canal MV2 sin tratar. El contorno de los ápices de las raíces disto-vestibulares y palatinas presentaba signos de normalidad, y se estableció el plan de tratamiento con retratamiento endodóntico selectivo solo en la raíz mesio-vestibular, con localización y tratamiento del canal MV2 y retratamiento del canal MV1. El retratamiento se realizó en 2 sesiones con un apósito permanente con hidróxido de calcio. Los canales se rellenaron con Biodentine (BD, Septodont, Saint Maur de Fossés, Francia). Clínicamente, el paciente no presentó más signos ni síntomas y las imágenes tomográficas mostraron evidencia de reparación ósea después de 24 meses. La correcta planificación y ejecución de todas las etapas del retratamiento endodóntico fueron fundamentales para el éxito de este reporte de caso.

Palabras clave: Cemento de silicato; Endodoncia; Periodontitis apical; Retratamiento; Tomografía computarizada de haz cónico.

1. Introduction

Bioceramics are biocompatible materials specifically designed for the repair and reconstruction of diseased or damaged parts of the body in medicine and dentistry (Baino et al., 2015).

Bioceramic endodontic materials are used to seal root canal communications with the periodontal ligament, being nonsensitive to moisture and blood contamination and they are dimensionally stable and expand slightly after hardening, becoming rigid and insoluble (Nekoofar et al., 2010; Jefferies, 2014). When the bioceramic materials come in contact with the tissue fluids, they release calcium hydroxide, which interacts with the phosphates to form the hydroxyapatite, having a tissue-inducing capacity (Richardson, 2008; Debelian & Trope, 2016). These materials are indicated for pulp coating, pulpotomy, repair of perforations and resorptions, retrobturation and obturation of immature teeth with open apices (Tran et al., 2012).

Biodentine (BD, Septodont, Saint Maur de Fossés, France) is considered as second generation, which has a similar property to the MTA with its clinical indications (Bozeman et al., 2006; Parirokh & Torabinejad, 2010). Biodentine powder is mainly composed of tricalcium silicate, calcium carbonate (filling material) and zirconium oxide (radiopacifier). While the liquid used to blend with the powder for calcium chloride (used to speed up the setting and a water-soluble polymer (water-reducing agent / super-plastification) (Laurent et al., 2008). As its advantages over MTA is that it has a shorter hardening time (approximately 10-12 minutes) and a resistance to dentin compression (Grech et al., 2013; Mori et al., 2014). Its capacity to induce an apposition of reactionary tertiary and restorative dentin, via stimulus of the odontoblastic activity, was confirmed with positive influence without repair by cell-part difference and biomineralization in in vitro studies after the direct pulpal coating (Laurent et al., 2021). Another important aspect of biomaterials is the outermost chemical surface, as this is the layer that will be in close contact with vital tissue. Several reactions occur at the interface between cells and the biomaterial (Tomás-Catalá et al., 2018). Among these reactions, there is the bioactivity where there is an interaction and a stimulus to the tissue in contact with the biomaterial (Michelotto et al., 2022). Therefore, the objective of the case report below was to show the rapid bone repair obtained with the use of Biodentine, as a filling material in the mesial canals of a maxillary molar, with symptomatic apical periodontitis, which had already undergone endodontic treatment and paraendodontic surgery.

2. Case Report

Considering the legal aspects, all steps were carried out in accordance with the Declaration of Helsinki and Resolution 466/12 of the National Health Council (CNS). The study participant was included after signing the Free and Informed Consent Term (FICT) declaring to accept to participate in the study and releasing the use of their image for academic purposes.

A 40-year-old Caucasian female patient was referred for evaluation of tooth 16, which presented swelling, severe pain and sensitivity to percussion and palpation. In her previous history, she reported that the endodontic treatment had been carried out 1 year ago and that 6 months later, the symptomatic condition returned and a paraendodontic surgery was performed by the same professional. The radiographic evaluation showed a lack of filling material in the mesial root and satisfactory treatment in the DB and P roots (Figure 1).

Figure 1 - Pre-operative radiograph.



Source: Authors.

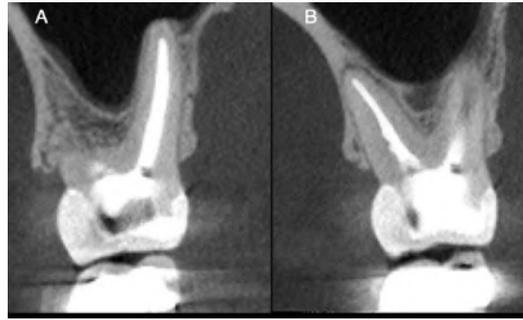
The patient was using systemic medication (antibiotic and anti-inflammatory) that kept her sensitivity under control. She was referred for a cone beam computed tomography (Prexion Elite, Yoshida, Japan). The image acquisition parameters were 90KVp, 5mA, a spatial resolution of 150 μ m and a field of view of 50 x 50 mm. The images showed absence of the apical third of the mesial root, compatible with apicectomy, with the MB1 canal treated and the MB2 canal untreated (Figure 2). The periapical region of the DB and P roots apices showed signs of normality (Figure 3).

Figure 2 - CBCT pre-operative images of MB root: (a) coronal, (b) sagittal and (c) axial images. Note periradicular lesion and a loss of the apical region by performing the apicectomy.



Source: Authors.

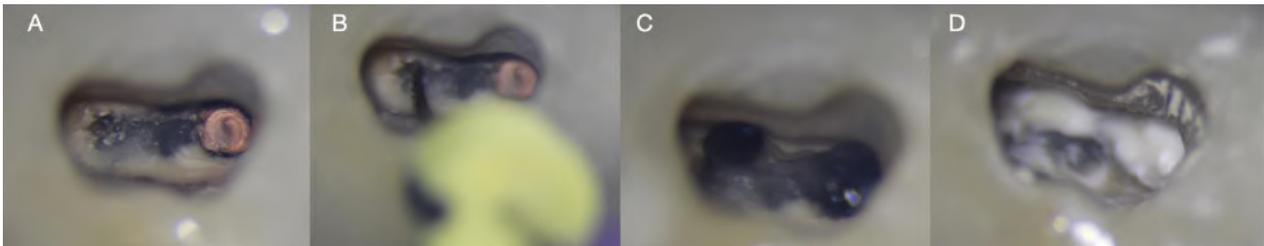
Figure 3 - CBCT coronal images of (a) palatal and (b) distal roots.



Source: Authors.

The presence of extensive bone rarefaction associated with the mesial root was observed. With the imaging tests and clinical findings, a symptomatic apical periodontitis was established as a diagnosis and as a treatment plan, selective endodontic retreatment, only in the mesial root, with the location and treatment of the MB2 canal and retreatment of the MB1 canal. In the first session, after performing the access cavity, the MB1 and MB2 orifices were located (Figure 4).

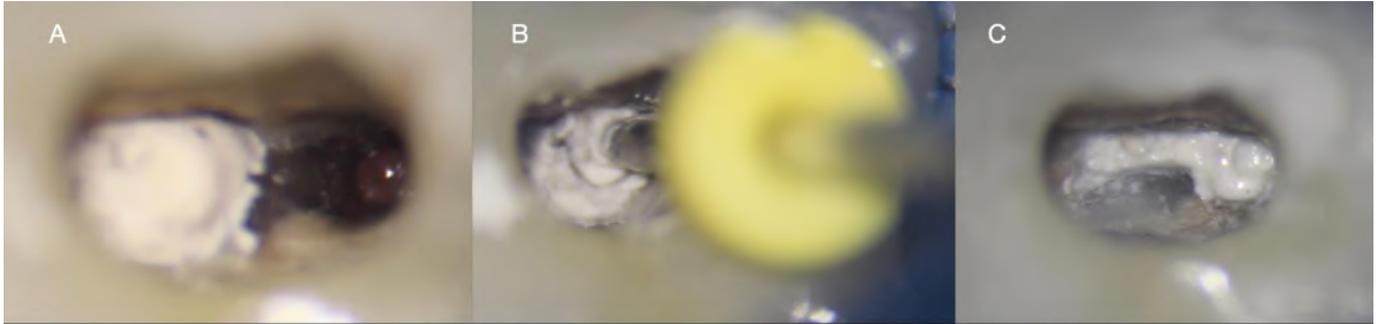
Figure 4 - Clinical images: (a) access cavity, (b) MB2 root canal located, (c) MB1 and MB2 orifices after instrumentation and (D) intracanal dressing with calcium hydroxide paste.



Source: Authors.

The MB2 canal was explored with #10 and #15 C-Pilot files (VDW Dental, Munchen, Germany) and the MV1 canal filling material was removed with a #25 Reciproc file (VDW Dental, Munchen, Germany). The procedure was performed using an operating microscope (Alliance, São Carlos, Brazil) at 16x magnification. Then, the working length was performed with a foraminal locator (Root ZX; J. Morita Inc., Japan). Root canals were prepared to a #40 Reciproc, followed by hand instrumentation to a #60 instrument 1.0 mm beyond working length. A 2.5% sodium hypochlorite solution was used as an irrigant during instrumentation. After root canal preparation, EDTA solution was used, which remained in the canals for 5 minutes and a final irrigation with sodium hypochlorite. The solutions were activated with passive ultrasonic irrigation (Irrisonic, Helse, São Paulo, Brazil), in 3 cycles of 20 seconds for each solution, being renewed at each cycle. The root canals were dried with absorbent paper cones and intracanal dressing with calcium hydroxide paste (UltraCal XS, Ultradent) was used for 1 month (Figure 4). In the second session, the tooth was asymptomatic, without signs or symptoms. After removal of the temporary restoration, the intracanal dressing was removed with copious irrigation in the same way as in the previous session. The root canals were dried, and the filling was performed with a repairing bioceramic material (Biodentine, Septodont, Saint Maur Des Fosses, France) (Figure 5, 6) and the tooth temporarily sealed with glass ionomer cement (Ionoseal, Voco, Cuxhaven, Germany).

Figure 5 - Clinical images: (a) Biodentine in the MB2, (b) Biodentine condensation and (c) MB1 e MB2 filled with Biodentine.



Source: Authors.

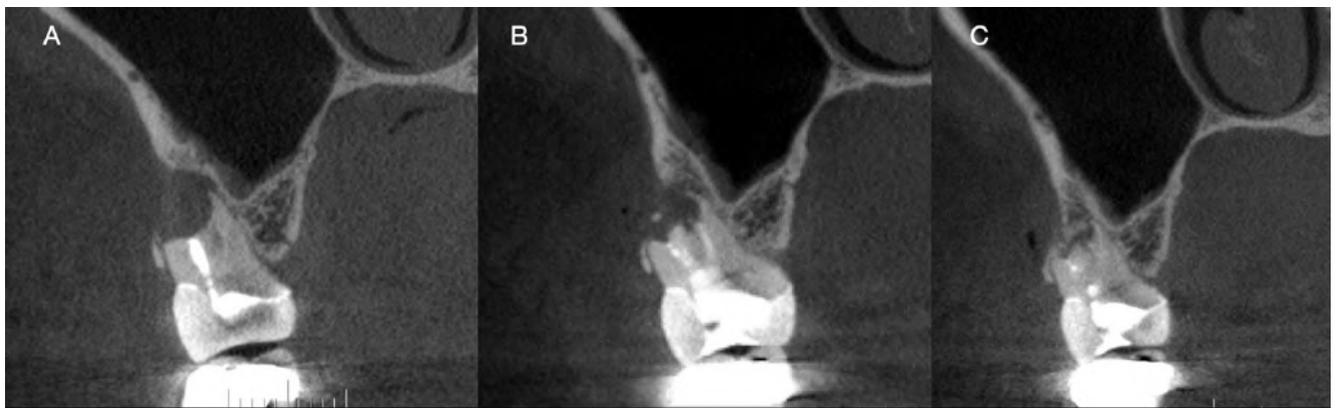
Figure 6 - Pos-operative radiograph.



Source: Authors.

The patient was referred to the referring professional to perform the definitive restorative procedure. After 4 months, the CBCT was performed showing an advanced stage bone repair and another examination after 24 months, with complete bone formation (Figures 7, 8, 9, 10).

Figure 7 - CBCT coronal images: (a) pre-operative, (b) 4-month follow-up e (c) 24-month follow-up.



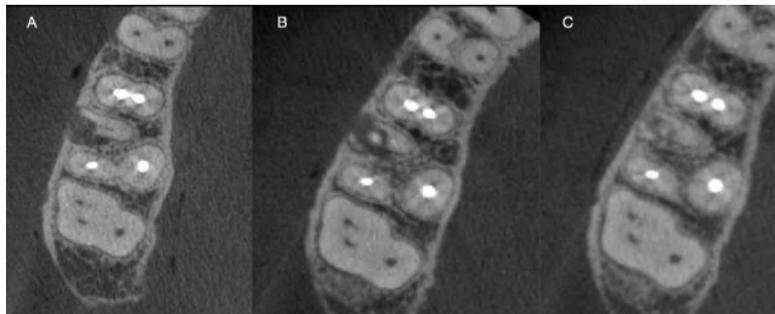
Source: Authors.

Figure 8 - CBCT sagittal images: (a) pre-operative, (b) 4-month follow-up e (c) 24-month follow-up.



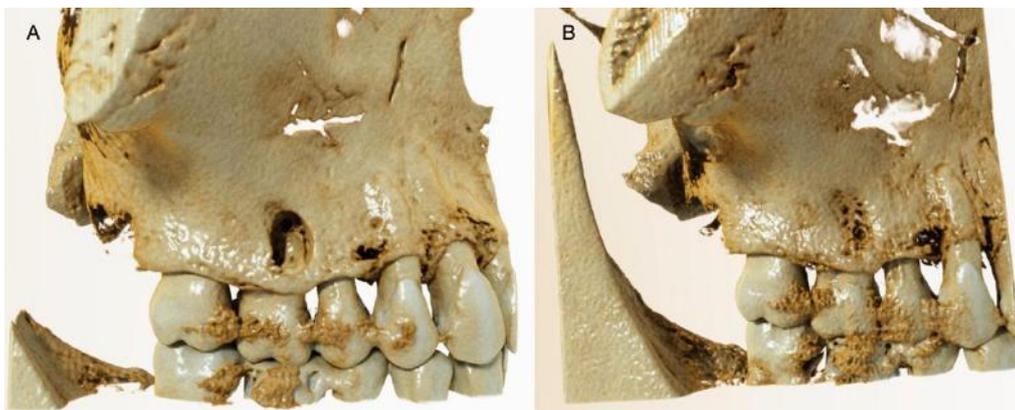
Source: Authors.

Figure 9 - CBCT axial images: (a) pre-operative, (b) 4-month follow-up e (c) 24-month follow-up.



Source: Authors.

Figure 10 - CBCT 3D images: (a) pre-operative, (b) 24-month follow-up showing repair with cancellous bone formation.



Source: Authors.

3. Discussion

Achieving success in endodontic treatment is a consequence of correctly carrying out all its steps. Knowledge of the root canal system is essential, being that missed root canals can lead to apical periodontitis in 98.0% of cases (Costa et al., 2019). Considering all dental groups, the MB2 canal is the most frequently untreated canal (85.0% of cases) (Martins et al., 2018). To aid in diagnosis and planning, CBCT has become an important tool. This better accuracy is essential in cases of retreatment, in which identifying the cause of the failure of the previous intervention allows for a more assertive and conservative treatment. A total of 62.2% of the treatment plans defined from the periapical radiograph were altered after

evaluation by tomography (Ee, Fayad, Johnson, 2014). In the present case report, we can consider two failures: failure to locate the MB2 canal in the first treatment, with apical periodontitis persisting, and, months later, due to paraendodontic surgery, without treatment of this canal, leading to failure of the surgical procedure. Using CBCT, it was possible to verify the cause of failure, carry out planning and follow-up, since the visualization of radiographs in the maxillary molar region is generally hampered by anatomical structures. The performance of selective endodontic retreatment has been indicated since the evaluation in CTCB images (Nudera, 2015; Azim et al., 2021).

Several studies have shown the advantage of using magnification in endodontic treatment (Monea et al., 2015; Khalighinejad et al., 2017) and in the location of the MB2 canal (Wolcott et al., 2002). In the present case, an operating microscope was used under 16x magnification.

Repairing bioceramic materials have been used in endodontics both with the aim of maintaining pulp vitality and in cases of root canal communication with the external surface of the root, in apical, lateral and furcation regions. Among its properties, biocompatibility and bioactivity stand out for stimulating the repair and formation of mineralized tissue (Koch & Brave, 2012). In the present case, due to the shorter length of the mesial root due to the apicectomy, with the absence of apical constriction, filling with conventional materials such as gutta-percha associated with a filling sealer would not be convenient, with a high chance of extravasation. Therefore, Biodentine bioceramic material (Septodont, Saint Maur Des Fosses, France) was used as filling material in the two mesial canals. After 4 months, a CBCT was performed where bone neoformation was observed in an advanced stage, showing the bioactivity of this material in a short time and in 2 years the complete bone formation showing the repair.

4. Conclusion

From the present case report, it can be concluded the importance of performing a CBCT to establish a correct diagnosis and planning and that Biodentine presented excellent biological properties stimulating bone formation in a short period, allowing the successful resolution of a case of failure in the endodontic treatment and paraendodontic surgery.

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