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Treatment of Root Perforation with Portland Cement Associated with Iodoform: Case Report

Tratamento de Perfuração Radicularcom Cimento de Portland Associado a Iodofórmio: Relato de Caso

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Abstract

Endodontic perforation is a communication between the pulp cavity and the periodontal tissues in a tooth or its root. For ad - equate treatment, the perforation must be sealed with a material that is biocompatible, promotes excellent sealing, is easy to manipulate and capable of inducing tissue response. The objective of this study was to report the clinical case of an endodontic perforation sealing with Portland cement associated with a radiopacifying agent and its monitoring. A 24-year-old male patient, without painful symptoms, was referred for treatment of root perforation of tooth 12 caused 15 days before. The tooth had a temporary restoration, with no change in color, fistula, or mobility. Radiographically, the root canal of tooth 12 appeared filled and with the presence of a lesion in the apical periodontium, vertical periodontal bone loss and the perforation region filled with a temporary filling. At the first consultation, the root canal was accessed, the perforation was sealed with Portland cement as - sociated with iodoform, and intracanal medication was administered. At the following consultation, without painfulsymptoms, radiopaque granules related to iodoform were observed radiographically in the sealed perforation region. Next, the root canal system was filled with the single cone technique and coronal sealing with a temporary obturator. After 18 months, the patient returned without complaining of pain or tooth mobility and a new radiograph showed a significant reduction in the periapical lesion accompanied by bone healing in the periapicalregion. It was also observed that between eight and 18 months, the material lost the radiopacity previous ly conferred, but the repair remained adequate at five years of follow-up. Sealing the root perfora- tion with Portland cement associated with iodoformwas clinically and radiographically successful.

Keywords: Dental Materials. Endodontics. Iodoformium. Root Canal Therapy.

Resumo

Perfuração endodôntica é uma comunicação entre a cavidade pulpar e os tecidos periodontais em um dente ou sua raiz. Para um tratamento adequado, a perfuração deve ser selada com um material que seja biocompatível, promova ótimo selamento, seja de fácil manipulação e capazde induzir resposta tecidual. O objetivo deste estudo foirelatar o caso clínico de umselamento de per- furação endodôntica com cimento de Portland associado a um agente radiopacificador e seu acompanhamento. Um paciente do gênero masculino com24 anos de idade, semsintomatologia dolorosa, foiencaminhado para tratamento de perfuração radicular do dente 12 provocada havia 15 dias. O dente apresentava restauração temporária, sem alteração de cor, fístula ou mobilidade. Radiograficamente o canal radicular do dente 12 apresentava-se obturado e com presença de lesão no periodonto apical, perda óssea periodontal vertical e a região de perfuração preenchida com obturador temporário. Na primeira consulta foi realizada a desobstrução do canal radicular, selamento da perfuração com cimento de Portland associado a iodofórmio, e medicação intracanal. Na consulta seguinte, sem sintomatologia dolorosa, radiograficamente observou-se grânulos radiopacos referentes ao iodofórmio na região de perfuração selada. Em seguida, foi realizada a obturação do sistema de canais radiculares com a técnica de cone único e selamento coronário com obturador temporário. Após 18 meses o paciente retornou sem queixa de dor ou mobilidade dentária e em nova radiografia observou-se importante redução da lesão periapical acompanhada de cicatrização óssea em região de periápice. Observou-se que entre oito e 18 meses, o material perdeu a radiopacidade outrora conferida, mas o reparo permanecia adequado com cinco anos de acompanhamento. O selamento da perfuração radicular com cimento de Portland associado ao iodofórmio obteve sucesso clínico e radiográfico.

Palavras-chave: Endodontia. Iodofórmio. Materiais Dentários. Tratamento do Canal Radicular.

1 Introduction

Endodontic perforation is a communication between the pulp cavity and the periodontal tissues in a tooth or its root, created by pathological reabsorptions or iatrogenesis. The main complication resulting from perforation is periodontal inflammatory potential and bone insertion loss, eventually leading to tooth loss[2].

Iatrogenic perforations can be caused during endodontic therapy maneuvers (incorrect direction of trepanation,

inadvertent use of rotary instruments, access to the root canal in calcified and curved teeth, removal of foreign body from the root canal) or restorative (excessive dentin wear, preparation for intraradicular retainer, root canal clearance)[3].

For adequate treatment, the perforation must be sealed with a material that is biocompatible, promotes excellent sealing, is easy to manipulate and capable of inducing tissue response(osteogenesis and cementogenesis)[4,5]. Portland cement (CP) is considered as a material of chemical composition and physical properties similar to the addition of Mineral Trioxide (MTA)[6], presenting similar tissue reactions when studied in animal models[7] and in humans[8,9], but with a much lower cost. However, the MTA has Bismuth oxide, a component that confers radiopacity to the material and is not found in CP[10,11].

There is not yet an ideal method to repair all root perforations, so work has been carried out in an attempt to find an appropriate option that preserves the dental element and reintegrates it to normal functions[12-15]. Thus, the objective of this work is to report a clinicalcase of root puncturesealing treated with Portland cement associated with iodoform.

2 Case Report

The present study was submitted to the Research Ethics Committee of the University of Cuiabá (CEP-UNIC), and was approved by the opinion 6.029,760.

A 24-year-old male patient, ASA I, without painful symptoms, was referred to a university clinic for treatment of root perforation of tooth 12 caused 15 days before.

At clinical exa mination, the tooth was restored with temporary sealer, without color change, absence of fistula and without mobility. There was also no pain at palpation and percussion. Radiographically, the root canal of tooth was filled and with the presence of a lesion in the apical periodontium with approximately 6mm of diameter, vertical periodontal bone loss and the perforation region filled with a temporary filling. (Figure 1).

Figure 1 - Initial X-ray showing the tooth 12 treated endodontically, with perforation area in the cervical third sealed with temporary shutter

Source: authors.

Initially, it was chosen to performendodontic retreatment. Infiltrative anesthesia was performed with a 2% Lidocaine Hydrochloride tube and Epinephrine 1:100.000 (Alphacaine 100, DFL, Taquara, Brazil) and then absolute isolation with rubber dike and clamp 212. For access to the pulp ar chamber, it was used diamond spherical tip long Rod 1013 (FAVA Metalúrgica, Franco da Rocha, Brasil) and Endo Z tip (Angelus Ind. Produtos odontológicos, Londrina, Brasil) for convenience, where the sealed perforation region with temporary shutter was exposed and the entrance of the canal filled with gutta percha was exposed. The temporary shutter of the drilling region was removed with steel spherical drill number 4 at low speed and dentin spoon number 5. For root canal clearance, it was decided not to use solvent in order to avoid inflammatory reactions in the periodontal**.** ProTaper rotary instruments D2 and D3 were used, specific for retreatment (Dentsply/Maillefer, Belagues, Switzerland), installed in X-Smart Plus endodontics motor (Dentsply/ Maillefer, Belagues, Switzerland), with a torque of 3 N and a speed of 500 rpm, gently pressing them against the shutter material in uniform pecking movements, continuous and without pressure, up to the middle third and apical third, respectively. The D1 instrument was not used due to the presence of an active tip.

With a manual type #K 35 patency instrument, odontometry was performed using a Fine PEX apical localizer (Dentsply/ Maillefer, Belagues, Switzerland) for measuring working length. Due to the presence of perforation, with characteristics similar to an internal resorption, the measurement offered by the localizer could be questionable. Therefore, it was decided to check the length of work by means of periapical radiographic taking with a manual instrument inserted in the root canal (Figure 2).

Figure 2 -Tooth length determination with manual instrument

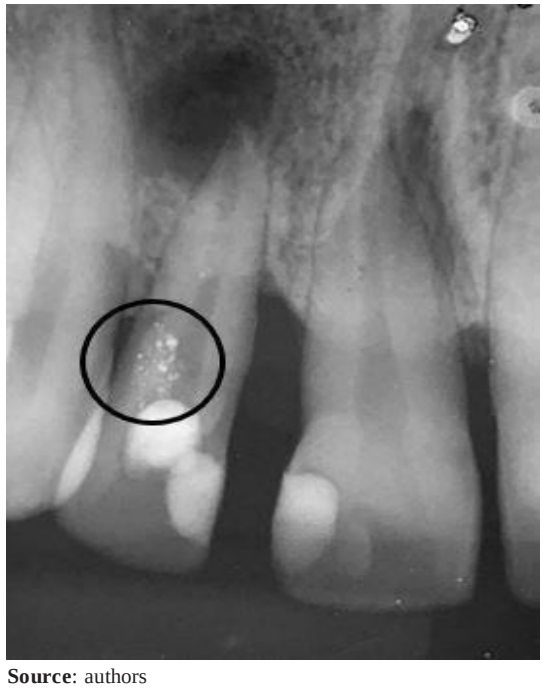
Source: authors.

After checking of the length of work (21 mm), the root canal was re-instrumented with a rotary instrument Logic 40.05 (Easy Dental Equipment – Belo Horizonte, Brazil), torque 4 N and speed 800 rpm, in brushstroke movements, sequentially working on the cervical thirds, medium and apical under irrigation of 1 ml chlorhexidine 2% prior to instrumentation, during and after instrumentation of each third.

For sealing the perforation white CP was manipulated (LPC Argos, Santo André, Brazil) with 0.9% saline, in a proportion of 1:1 plus 0.5 grams of iodoform (Maquira Indústria de produtos odontológicos S.A, Maringá, Brazil), as a radiopaciating agent. After manipulation, the cement was adapted to the channel of an endodontic ruler and removed with a pusher to be applied directly to the perforation allowing condensation to fill and adapt without leaving gaps and/or excess material. Due to the presence of bleeding, when moving to the obturation phase of the Root Canal System, it was decided to perform in a second session. As intracanal medication, a small portion of cotton was used slightly moistened with camphorated paramo chlorophenol (Biodinâmica Química e Farmacêutica LTDA, Ibiporã, Brazil) and sealed with a temporary shutter OBTUROBTUR (Maquira Indústria de produtos odontológicos S.A., Maringá, Brazil)

After 30 days, the patient returned to the clinic, without complaint of pain and the continuity of endodontic retreatment was given. An X-ray was performed to check the perforation sealing. Radiopaque granules were observed in the material referring to the radio pacifier additive (Iodoformium) that was inserted into CP during manipulation (Figure 3).

F**igure 3 -** Control radiography. Radiopaque granules are observed in the material used for sealing the perforation



Source: authors

Continuing the treatment, infiltrative anesthesia was performed with a 2% Lidocaine Hydrochloride tube and Epinephrine 1:100.000 (Alphacaine 100, DFL, Taquara, Brazil) and then absolute isolation with rubber dike and clamp 212. For removalof the temporary dressing, a spherical diamond tip long Rod 1013 was used (FAVA Metalúrgica, Franco da Rocha/Brazil) e xposing the sealed region and the entrance of the canal. Since there was no intracanal bleeding and the area of the perforation sealing was well sealed, the cone test, activation of the irrigating solution and continuity of endodontic filling were performed. A F3 ProTaper (Dentsply/ Maillefer, Belagues, Switzerland) principal gutta percha cone was cut in approximately 4 mm and inserted in the root canal in the working length for cone test, observed in radiography (Figure 4).

F**igure 4 -** X-ray for gutta conechecking in working length

Source: authors.

After radiography, copious irrigation was performed with 2% chlorhexidine and agitation of the solution according to the final irrigation protocol according to Van der Sluis [16], adapted for chlorhexidine solution 2% - three cycles of 20 seconds alternating between chlorhexidine 2% and EDTA renewing 1 ml of the solutions - under agitation by means of Easy Clean plastic file (Easy equipamentos odontológicos, Belo Horizonte, Brazil), coupled to the dental micromotor. The channel was dried with absorbent paper tips, where no bleeding was observed, and then the root canal system was filled. For this purpose, the gutta percha cone added of endodontic cement AH PLUS (Dentsply/Maillefer, Belagues, Switzerland) was inserted in the root canal and cut with a Paiva type pusher heated in lamparin at the level below the lap and using the cold tip of the instrument to condense exerting light apicalpressure (Figure 5). For coronary sealing, temporary shutter was used (Coltosol, Vigodente SA Indústria e Comércio, Rio de Janeiro, Brazil) and the patient was referred for periodontal and restorative treatment, as well as semi-annual proserving with radiographic follow-up.

Figure 5 - Obturation of the root canal system

Source: authors

After one month, the patient returned to the Clinic, without painfulsymptoms andwithoutdentalmobility in element 12. A periapical radiographic measurement was performed and bone repair was observed in periapicaltissues (Figure 6).

Figure 6 - Radiographic control after one month

Source: authors.

After eight months, the patient returned to the Clinic, without painful symptoms and without dental mobility in element 12. A radiographic measurement was performed that found an important reduction of periapical lesion (Figure 7).

Figure 7 - Eight-month radiographic control showing reduction of periapical lesion

Source: authors.

By enlarging the image in the perforation region, it was possible to observe, in more detail, the sealing provided by the material of choice in addition to the radioactive material, in the form of granules, used in addition to the CP (Figure 8).

Figure 8 - Drilling sealing with Portland cementandiodoform

Source: authors.

After 18 months, the patient was reevaluated by means of periapical radiographic taking that revealed significant remission of periapicallesion and bone healing attheperiapex

of the dental element, however, the radiopacity conferred by the iodoform associated with CP was no longer observed (Figure 9).

Figure 9 - Radiography after 18 months - involution of periapical lesion and loss of radiopaque granules in a perforation region sealed with Portland cement

Source: authors.

After five years, the patient went to the clinic and there was no painful symptomatology and without edema of endodontic origin. Element 12 remained in function and the patient denied having performed any clinical intervention during this period. It was observed, through periapical radiography, the permanence of bone repair and over obturation without damage to periapical tissues (Figure 10).

Figure 10 - Radiography after five years showingbone repair of the periapex

Source: authors

2.1 Discussion

This article presented the mediate sealing of a root perforation with Portland cement associated with iodoform in a patient undergoing endodontic retreatment with his follow-up for five years. The definitive root sealing occurred 15 days after the perforation and did not interfere negatively for the resolution of the clinical case. The iodoform was added to the CP to give it radiopacity, which was radiographically visible in the form of radiopaque granules.

Endodontic perforations are complications not as rare as one may imagine[3]. A study on the reasons for the extraction of endodontically treated teeth indicated that approximately 4.2% of cases were due to endodontic perforations[17]. However, iatrogenic lesions are often not diagnosed or published, and may generate a mistaken perception of low prevalence[18].When diagnosed quickly, it is possible to minimize the establishment of an infectious process at the site of the perforation, which improves the prognosis and often avoids the loss of the tooth involved[3]. In this study, although root perforation treatment was not performed immediately, it was possible to conduct its sealing after 15 days without irreversible involvement of the perforated tooth.

Regarding biocompatibility, CP and MTA were tested as direct capping materials after sterile pulp exposure and revealed similar effects on the pulp cells, being possible, in some cases, to visualize the apposition of repairing dentin [19]. Pratti and Gandolfi[20] compared the antimicrobial activities of MTA and CP and the results confirmed that there was no difference between the materials in sealing these types of perforation. For this study, given the working conditions, especially economic, and interesting properties of the material of choice, the CP was adequate for the treatment of the clinical case corroborating previous work[21] that revealed promising expectations of the replacement of the MTA by the CP making it accessible to the whole population, because it is a product of excellent quality and low cost.

The composition of CP is similar to that of MTA, consisting of tricalcium silicate, tricalcium aluminate, silicate oxide and small amounts of other oxides that modify the chemicaland physicalproperties[22,23]. However, bismuth oxide is also found in MTA, a component that gives radiopacity to the material and induces color change of the tooth. This component is not found in CP[10,11]. The presence of a radiopacity agent in the endodontic shutter material is of fundamental importance and is a requirement of the 57 Specification of the *American National Standards Institute and American Dental Association (ANSI*/ADA)[24]. Therefore, for this case, iodoformwas added, a material widely used in endodontics [25-28], in minimum concentration not to compromise the physical properties of CP, only to confer radiopacity, observed in the formof radiopaque granules that show thesealing region of the perforation. Among other compounds used as radiopaciating agents of endodontic plug cements, calcium tungstate 29,

zirconium oxide[30] and niobiumoxide[31,32]are highlighted.

Glass ionomer cement[33,34] and calcium hydroxide[12,35] are materials that also showed favorable results in the treatment of root perforations. Both allowed periodontal tissues to remain free of persistent inflammation, avoiding loss of clinical levelof insertion. They are, as well as Portland cement, in low-cost materials that make it possible to increase the tooth longevity as long as there is the presence of a root perforation.

3 Conclusion

The sealing of root perforation with Portland cement associated with iodoformium as a radio pacifier additive obtained clinical success evidenced by the absence of pain, edema or fistula, as well as radiographic success seen by the reduction of bone rarefaction and absence of root resorption and the presence of satisfactory coronary sealing, accompanied for five years. It was observed that between eight and 18 months the shutter material lost the radiopacity once conferred by iodoform.

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