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MTA ABILITY IN THE REPAIR OF LATERAL PERFORATIONS AND RETROGRADE OBTURATION[1]

CAPACIDADE DO MTA NO REPARO DE PERFURAÇÕES LATERAIS E OBTURAÇÃO RETRÓGRADA

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ABSTRACT

Introduction: Root perforations may occur during endodontic treatment or canal preparation for intraradicular retainers, resulting in communication between the pulp cavity and adjacent tissues. Prognosis depends on factors such as perforation location, sealing ability, and the physical and chemical properties of the repair material. Mineral trioxide aggregate (MTA) has been widely used in the management of root perforations and retrograde fillings due to its favorable biological and physicochemical properties. **Objective:** To report a clinical case of lateral root perforation and retrograde obturation of a mandibular premolar surgically treated with MTA, aiming to preserve an existing fixed prosthesis, and to discuss the outcome based on the literature. **Methodology:** A 49-year-old female patient presented with a recurrent fistula associated with a mandibular premolar rehabilitated with a fixed prosthesis. Radiographic examination revealed a lateral root perforation and a

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periapical lesion. Due to the high risk of fracture associated with post removal, paraendodontic surgery was performed, including lesion enucleation, sealing of the lateral perforation, apicectomy, ultrasonic retropreparation, and retrograde obturation with MTA. Histopathological analysis and clinical and radiographic follow-up for 24 months were conducted. **Results:** Histopathological findings confirmed a periradicular granuloma. Follow-up demonstrated satisfactory healing, bone neoformation, and absence of clinical or radiographic signs of recurrence. **Conclusion:** Surgical repair of lateral root perforation and retrograde canal obturation using MTA promoted adequate tissue repair without removal of the existing prosthesis, representing a viable therapeutic alternative in selected cases.

Keywords: Retrograde obturation. Trepanation. Mineral trioxide aggregate (MTA).

INTRODUCTION

During the endodontic treatment and / or preparation of the canal accidents such as root perforation can occur [1,2]. This occurrence may be defined as an artificial opening of iatrogenic origin, this occurs when an error is made in guiding the drill during access to the pulp chamber or during the preparation of an intraradicular retainers, may also occur due to pathological conditions, such as caries and resorption. This results in the communication of the pulp cavity with the adjacent tissues, or even with the buccal cavity [1,3]. Tissue reactions in root perforations have long been studied and the literature shows that the prognosis of these perforations in the middle and apical thirds is generally better when compared to perforations in the cervical third [3-5].

In order to promote tissue repair in the drilling area, it is important to ensure a good sealing and marginal adaptation of the perforated area by the material used for this purpose [6]. The perforation can be repaired either intracoronally or externally by means of a surgical procedure. For this, factors such as size, shape, location of the drilling, the clinician's expertise, early diagnosis of the defect, treatment approach, physical and chemical characteristics of the material should be considered [1, 3].

Materials for this type of application should ideally present biocompatibility, dimensional stability and sealing ability as primary characteristics, radiopacity and bacteriostatic properties also being desirable [3]. Materials such as amalgam and cement based on zinc oxide and eugenol (MRI) have already been used for this purpose, although they did not have the ideal characteristics to be used in the

treatment of perforations, such as the presence of irritants such as eugenol (MRI) and are sensitive to the presence of moisture (amalgam) [1,3].

The Mineral Trioxide Aggregate (MTA) MTA is composed primarily of tricalcium silicate, tricalcium aluminate, and other mineral oxides responsible for its chemical and physical properties. Studies have demonstrated its sealing ability and biocompatibility, including cementum repair at the interface with the material. The MTA presents a high pH, which discourages the growth of bacteria that thrive in acidic environments and appears to promote bone formation at the site. Among the disadvantages of this material are its prolonged setting time and relatively high cost. This material, which was initially used as a sealant cement, is now widely used in the treatment of root perforations and retrograde fillings because of their physical and chemical properties and their biological properties favoring tissue repair [1,3,6].

In many cases, perforated teeth may have prostheses in perfect condition, with optimal marginal adaptation, color and occlusal contacts. In addition, removal of intraradicular retainers may increase the risk of fracture and perforation of the teeth in question. In these cases, performing the treatment of perforations through a surgical procedure may be a better alternative. This can also be applied in cases of incomplete fillings of the root canal that were not treated satisfactorily or due to anatomical difficulties, leading to the appearance of periradicular lesions [7,8].

The objective of the present study was to present a clinical case of lateral root perforation and retrograde obturation of the apex of a lower premolar, both situations treated with MTA by means of a surgical procedure aimed at preserving the present fixed prosthesis and later discussion with the data present in the literature. This work has been reported in line with the SCARE criteria [9].

CASE REPORT

A 49-year-old female patient sought treatment at our institution, presenting with a complaint of a recurrent sinus tract in the vestibular region associated with the mandibular left premolar area. The patient reported no relevant systemic medical history.

Intraoral examination revealed the presence of a fixed partial prosthesis extending from tooth 34 to tooth 38, with these two teeth serving as abutments for the prosthetic restoration. Clinical inspection indicated that the prosthesis was intact, with no apparent structural deficiencies. (Figure.1a).

Radiographic examination revealed the presence of circumscribed radiolucent areas located in the mesial and apical regions of tooth 34. The image of the middle

third of the root had approximately 10mm in its longest length. The origin of the lesion was possibly related to lateral perforation, caused by a deviation during preparation for the molten metal core. An apical radiolucent image was also observed, suggestive of periapical lesion probably due to the incomplete endodontic treatment previously performed. (Figure.1b). The diagnosis hypothesis was chronic periradicular alteration, compatible with cyst or root granuloma.

The surgical procedure was performed under local anesthesia, achieved by inferior alveolar, lingual, and buccal nerve blocks using 2% lidocaine with epinephrine 1:100,000, followed a full-thickness mucoperiosteal flap was raised to provide access to the surgical site. The flap design consisted of an intrasulcular incision extended with a vertical releasing incision, following a Neumann-type approach, extending between the canine and the distal aspect of the first premolar,

The periapical lesion was subsequently enucleated (Figure 2a) and submitted for histopathological examination. The region corresponding to the middle third of the perforation was curetted to remove any granulation tissue and potential contaminants and irrigated with saline solution. Following hemostasis and site preparation, the perforation was sealed with mineral trioxide aggregate (MTA) (Angelus SA, Londrina, Brazil).

For the treatment of the periapical region, an apicetomy was performed followed by an ultrasound retropreparation and retrograde obturation with MTA cement (Figure 2b). Suturing with simple interrupted stitches so that, in the event of suture dehiscence, there is no exposure of the surgical site. Analgesic and non-steroidal anti-inflammatory drugs were prescribed to control postoperative pain and the sutures were removed after 7 days.

The histopathological examination showed the presence of chronic inflammatory infiltrate and a capsule of fibrous connective tissue. The final diagnosis was periradicular periapical granuloma.

Follow-up was performed through clinical and radiographic examination after 3, 6, 12 and 24 postoperative months.

At the 24-month follow-up, bone neoformation was observed at the site of the lesions (Figure. 3) and the patient did not present signs or symptoms of relapse after two years of surgical treatment.

DISCUSSION

The preparation of spaces for the placement of intraradicular retainers is one of the most common iatrogenic causes of root perforation, occurring in approximately

2–12% of the endodontically treated teeth [3]. According to Kvinnsland et al. [10], more than half of these cases of perforation occur during preparation for placement of intraradicular retainers.

When a root perforation occurs, the presence of pre-existing pathological conditions within the root canal system or the surrounding periodontal tissues may significantly compromise the healing potential of the affected area. The communication between the root canal system and the periodontal tissues may facilitate microbial contamination and the persistence of inflammation, thereby hindering tissue repair and regeneration. Consequently, clinical signs such as abscess formation and fistulas development may be observed, with or without associated localized bone resorption [3]. The severity of these manifestations is generally influenced by the extent of contamination, the duration of exposure, and the timeliness of therapeutic intervention.

In the case presented, the deviation in the original canal path during the preparation of the canal for placement of intraradicular retainer resulted in iatrogenic perforation in the middle third of the root. Instrument failure is a multifactorial clinical problem, with variables related to the operator and canal anatomy exerting a greater influence than the instrument itself [11]. Perforations occurring in these areas have a good prognosis [3,4], as long as they are away from marginal bone crest and epithelial tissue, thus reducing the risk of contamination [3].

The management of root perforations may be performed through either a conservative (nonsurgical) or a surgical approach, depending on the size, location, and accessibility of the defect, as well as the degree of contamination and time elapsed since its occurrence. Treatment may be instituted either immediately after the perforation event or at a later stage during endodontic therapy, which can significantly influence the prognosis. Early diagnosis and prompt sealing are generally associated with more favorable outcomes, whereas delayed management is often related to increased microbial contamination and more complex clinical scenarios, potentially requiring surgical intervention for adequate repair and healing [3,12].

In order to seal the cavities from the root perforations, several sealing materials were used and tested over time with differing levels of success, including metallic materials such as amalgam, tin foil, and indium foil; zinc oxide–eugenol-based materials such as zinc oxide eugenol and SuperEBA; resin-based materials such as AH-26; glass ionomer cement and resin-ionomer cement; gutta-percha; Cavit; dentin chips; calcium phosphate–based materials such as tricalcium phosphate,

hydroxyapatite, and phosphate cement; various formulations of calcium hydroxide; and mineral trioxide aggregate (MTA), however no single material presents all the characteristics required of an ideal material for endodontic surgical procedures [1,3,4].

Mineral trioxide aggregate (MTA), primarily due to its excellent biocompatibility and its ability to stimulate hard tissue formation, has been widely used in several clinical applications, including apexification, retrograde obturation, and the management of root perforations [6]. However, its clinical use has been reported to present certain handling difficulties, particularly related to its consistency and manipulation characteristics. In this context, the incorporation of a viscous vehicle has been suggested to improve its physicochemical properties, enhancing its handling properties and, consequently, its clinical applicability. [13].

During treatment planning, it was considered that any attempt to remove the core would be associated with a considerable risk of root fracture, mainly due to the unfavorable angulation and substantial thickness of the intraradicular post. This limitation is well documented in the literature, particularly in cases involving extensively restored teeth with reduced structural integrity. The potential risk was therefore carefully weighed against the biomechanical constraints of the remaining tooth structure. In addition, the patient's preference to preserve the tooth and maintain the existing prosthetic rehabilitation played a decisive role in the therapeutic decision-making process. Consequently, a conservative and multidisciplinary approach was adopted, consisting of endodontic surgical intervention to manage the periapical pathology, with simultaneous sealing of the root perforation performed during the same surgical procedure.

It is also important to emphasize that endodontic treatment must be adequately performed in order to effectively reduce or eliminate intracanal microbial contamination, which is a critical factor associated with periapical disease persistence. In this context, Kang et al. [7] conducted a systematic review and meta-analysis to evaluate and compare the clinical and radiographic outcomes of nonsurgical endodontic retreatment (ER) and endodontic microsurgery. The authors reported overall success rates of 92% for endodontic microsurgery and 80% for ER, respectively, indicating that microsurgical intervention demonstrated a significantly higher success rate compared with nonsurgical retreatment in the analyzed studies. These findings highlight the potential predictability of endodontic surgery in cases where conventional retreatment may present limitations in eliminating persistent intraradicular infection. When the data were analyzed considering a follow-up period

of up to 4 years, a significantly higher success rate was observed for the microsurgery group compared with nonsurgical retreatment. However, no statistically significant difference was found between the two treatment modalities when long-term outcomes (beyond 4 years) were evaluated. Based on these findings, the authors suggested that both endodontic microsurgery and nonsurgical endodontic retreatment may be considered predictable and effective therapeutic options. Nevertheless, the choice between these approaches should be guided by careful case selection, taking into account the specific clinical conditions, anatomical limitations, and prognostic factors present in each individual case.

Jonasson et al. [8] reported the management of cases with inadequate previous endodontic treatment in which the existing prosthetic restorations were not removed, and satisfactory clinical outcomes were achieved. In the present case, nonsurgical endodontic retreatment was not feasible due to clinical limitations; therefore, a retrograde obturation was performed using mineral trioxide aggregate (MTA). This approach allowed adequate sealing of the root-end and promoted favorable healing of the periapical tissues, while preserving the existing prosthetic rehabilitation and avoiding its removal. This treatment modality may represent a valuable alternative in carefully selected cases, particularly when conventional retreatment is contraindicated or associated with a high risk of complications.

Conflict of Interest Statement

None.

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None.

Ethical Approval

Written consent form was obtained from patient, and can be provided upon editor's request.

Author Contributions

Oliveira, Castro and Silveira collected all datas and photographs to draft the manuscript. Oliveira and Castro have done the surgery of the patient. Oliveira, Mattos, Silveira and Castro wrote the manuscript for submission. All authors presented substantial contributions to the article and participated of correction and final approval of the version to be submitted.

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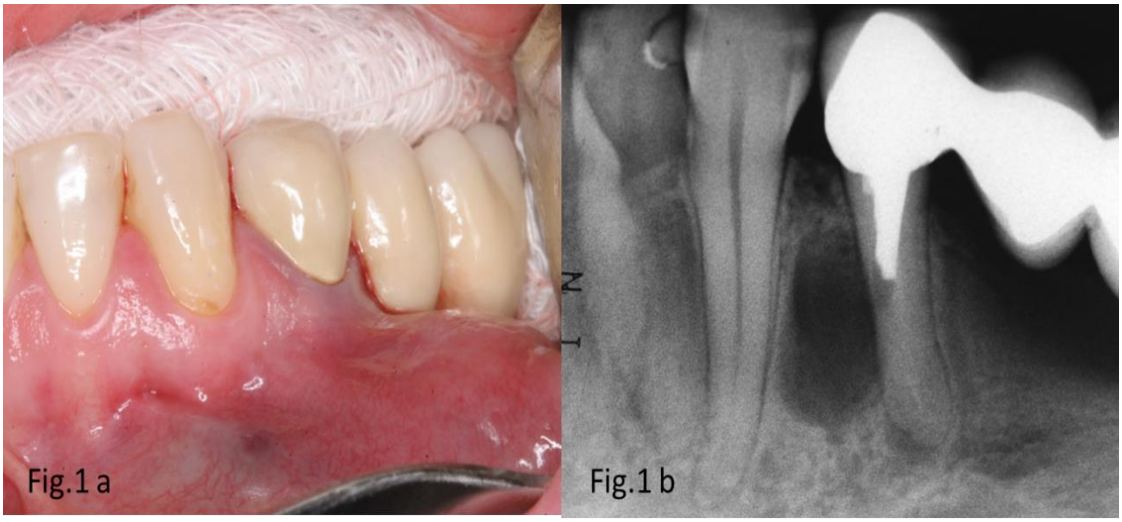
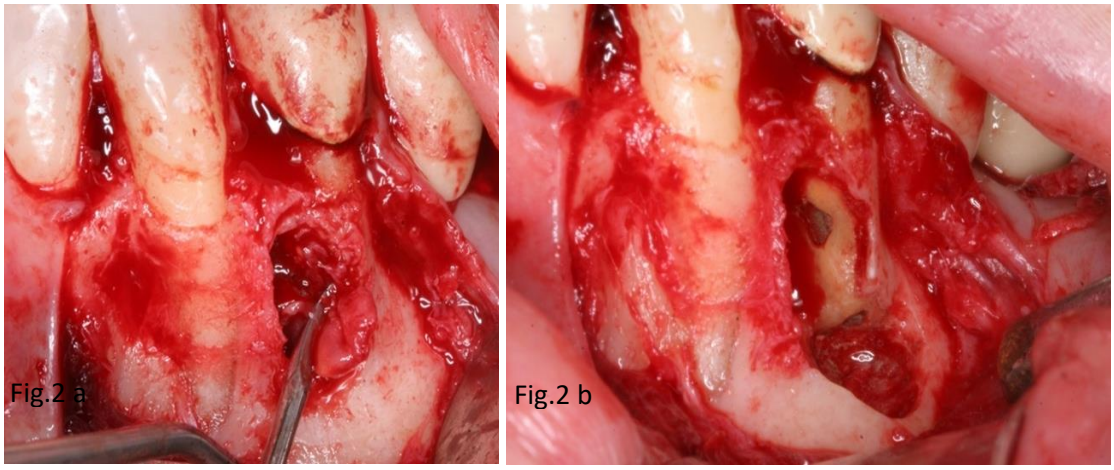
Figure 1: a - intrabuccal examination image; b - radiographic examination showing radiolucent image.



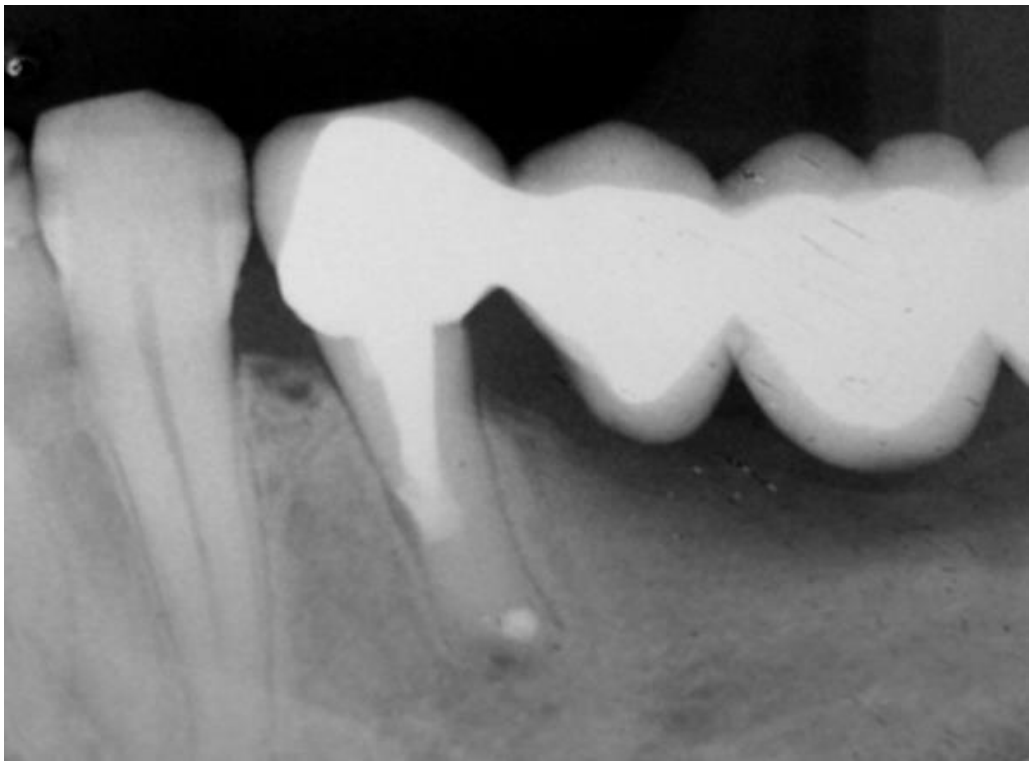
Source: Author's own work.

Figure 2: a – Lesion curettage; b - The region of the perforation and periapical region sealed with MTA cement.



Source: Author's own work.

Figure 3: radiographic examination after two years of surgical treatment.



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