Parendodontic surgery — apicoectomy and simultaneous obturation of root canals with mineral trioxide aggregate (MTA): case report

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DOI: https://doi.org/10.14436/2358-2545.9.1.048-057.oar

ABSTRACT

Introduction: When conventional root canal treatment does not achieve the desired results, paraendodontic surgery should be performed to remove the causes of the persistent periapical cyst, preserve the tooth, contribute to the adequate functioning of the stomatognathic system and return health and wellbeing to the patient. **Methods:** A 27-year-old male presented with the right maxillary lateral incisor (tooth 12) with persistent exudate even after treatment of the root canal and the exchange of intracanal medication using calcium hydroxide paste. In the present clinical case, paraendodontic surgery was performed with the simultaneous filling of the root canal. After curettage of the cyst and apicoetomy, the root canal was filled with mineral trioxide aggregate (5 apical mm) through the pulp chamber. **Results:** The histopathological exam revealed a secondarily infected cyst. **Conclusion:** The surgical techniques employed were adequate for the present case, as demonstrated both clinically and radiographically through the formation of new bone and the absence of symptoms, confirming the successful treatment of the case.

Keywords: Apicectomy. Endodontics. Root Canal Obturation.

How to cite: Fehlberg BK, Bittencourt G. Parendodontic surgery — apicoectomy and simultaneous obturation of root canals with mineral trioxide aggregate (MTA): case report. Dental Press Endod. 2019 Jan-Apr;9(1):48-57.
DOI: https://doi.org/10.14436/2358-2545.9.1.048-057.oar

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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Submitted: September 01, 2017. Revised and accepted: June 07, 2018.

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Introduction

Endodontics has undergone considerable biological, scientific and technical evolution over the years, which has contributed to success rates ranging from 60 to 90%[1-3]. However, even root canals treated with high standards and diligence in terms of the cleaning, modeling and filling procedures can result in failure.[4-6]

Although the percentage of unsuccessful cases is small, the failure of therapy is related to the persistence of a large number of bacteria in the root canals under conditions that are favorable for their growth or the occurrence of new bacterial infection[2,7,8]. Root canal therapy is performed using a sequence of procedures, during which accidents, mistakes and diverse types of complications can occur.[8,9]

In cases of failed conventional treatment, a new intervention is required. The first option to consider is the retreatment of the root canal system. However, this is not always possible or may not solve the problem as expected.[9-12] When all traditional therapeutic resources and endodontic treatments have been exhausted, surgical exploration is indicated.[9]

Endodontic surgery constitutes a set of procedures consisting of the exposure of the tissues that surround the apex in an attempt to remove the agent responsible for the persistence of the periapical cyst and resolve the difficulties that traditional endodontic either was unable to solve or had caused.[5,11,13-15]

For the indication for paraendodontic surgery, the inherent risks of the surgical approach and the anatomy of the region must be considered. Therefore, each case should be evaluated individually. The following are the main indications for paraendodontic surgery: persistent exudate, maintenance of pain, persistent peri-root pathologies after endodontic treatment or retreatment, pathological root resorption and calcification, the impossibility of adequate endodontic treatment due to large root dilacerations, deviations or perforations, transverse fractures in the apical third, obstructions that impede endodontic retreatment, considerable leakage of the filling material and the need to perform a biopsy.[1,15,16,17]

There are different surgical methods. The most widely used are peri-root curettage, apicoetomy with back-filling, root canal filling simultaneous to the surgical act, root-end resection, tooth resection and root cyst surgery, all of which promote the disinfection not achieved by conventional endodontic therapy.[5,9,15,16,10,18,19]

The aim of paraendodontic surgery with apicoetomy is to eliminate bacteria and areas of imperfection of the apical cement, providing a hermetic seal as well as facilitating access to the canal.[11,14,20] The removal of three or more millimeters in depth is recommended to achieve safe, effective closure of the region and have sufficient space for adequate curettage of the root surface and bone cavity. This small portion may contain iatrogenic elements, accessory canals and an apical delta.[13,21]

Apicoetomy is performed after osteotomy and apical curettage. According to the literature, some factors may interfere with apical sealing capacity, such as the angle of the cut adopted during root-end resection and the tips of the equipment used in the preparation of the retrograde cavity.[18]

The current indication is to perform apicoetomy at a perpendicular angle to the root axis. This achieves better results by enabling the more efficient removal of the apical delta, which is a region that is difficult to fill and the site of bacterial contamination. This technique leads to less exposure of the sectioned dentinal tubules, causing less microinfiltration and providing better distribution of the tension forces in the periapical region, which results in a favorable environment for apical healing.[17,21]

The filling of the canal can be performed during the surgical act. Simultaneous filling is indicated particularly for cases in which it is not possible to contain the persistent exudate through systemic and intracanal medication. The disadvantages of this method are the difficulty in achieving hemostasis, the risk of sepsis, increases in the number of steps and surgical time and the involvement of both bone tissue and blood.[9,22,23]

The step after the creation of the retrograde cavity is obturation with a filling material, which should assist in the healing of the apical tissues through the hermetic sealing of the sectioned region, impeding microorganisms and their byproducts from exiting or entering the canal. Deficient marginal closure between the cavity walls and filling material will compromise the repair.[13,21,24] The most frequently employed materials in this type of surgery are amalgam, zinc oxide and eugenol (ZOE), gutta-percha, intermedi-

ate restorative material (IRM), super-EBA, resin composites, mineral trioxide aggregate (MTA) and, more recently, bioceramic cements, which are promising novel filling materials due to their ease of mixing and insertion as well as their bioactivity, but further scientific studies are needed and these products are not yet sold in Brazil.[5,13-15,17,24,25] Many researchers report that MTA is the material of choice due to its physicochemical and biological properties, such as greater biocompatibility, less bacterial infection, greater marginal adaptation, the possibility of application in a moist environment, its radiodensity and the possibility of healing through the induction of the formation of hard tissue.[5,11,13-15,17,21,25-29]

Paraendodontic surgery has changed considerably in the last 20 years with the inclusion of technologies, such as the operating microscope, ultrasound and more biologically acceptable filling materials, such as MTA. This has led to an increase in the success rate of this procedure to approximately 90%.[29-32]

The aim of the present study was to report a clinical case involving curettage of the endodontic cyst, apicoetomy with simultaneous filling of the root canal, together with the placement of a bone graft and biomaterial for the filling of the bone cavity formed by the periapical cyst.

Material And Methods

A 27-year-old male sought the endodontic specialization course with the complaint of intense pain and swelling in the region of the right maxillary incisors. The patient history revealed that he had been submitted to treatment at the same service two years earlier for the retreatment of tooth 11 and removal of the filling material, drainage and replacement of calcium hydroxide with camphorated paramonochlorophenol of tooth 12.

The clinical examination revealed pain upon palpation, edema and fistula draining a purulent secretion in the mucosa above tooth 14 (Fig 1). The thermal test was performed on teeth 13 and 14 and the response was negative. Radiographically, a well-defined radiolucent image was seen in the apical region of teeth 11 to 14, which had also been seen two years earlier (Fig 2 and 3).

The initial treatment involved the opening of the crown, neutralization of the root canal with sodium hypoclorite and drainage. After drying the canal, the intra-canal medication was inserted, consisting of calcium hydroxide, propylene glycol and camphorated paramonochlorophenol.

Due to the history of persistent exudate and the occurrence of a large cyst, a treatment plan was proposed involving the surgical intervention of tooth 12. Curettage of the cyst was performed and the specimen was sent for histopathological analysis. Apicoetomy perpendicular to the long axis of the tooth was performed with simultaneous filling of the root canal with MTA (five apical millimeters) and the rest of the canal was filled with gutta-percha). The bone defect was filled in with biomaterial (GenOx Org, Baumer AS, Brasil; Lumina - Coat - Critéria) (Fig. 4 to 12). Endodontic treatment was then performed on teeth 13 and 14 using a rotary system (Logic, Easy). Both teeth were filled with AH Plus cement (Dentsply) and gutta-percha (Fig 13 and 14).

Figure 1. Initial clinical image.

Figure 2. Tracking of fistula.

Figure 3. Initial radiograph.

Results

The histopathological diagnosis was a secondarily infected cyst. Due to the large amount and aggressive nature of the bacteria, the inflammatory process completely disorganized the lining of the cyst, which was used in the differential diagnosis, but, using a combination of clinical and radiographic findings, it could be considered an apical periodontal cyst.

During the clinical and radiographic follow up, the condition remained stable for one year, with the complete remission of the fistula and exudate and the absence of pain. The follow-up radiograph revealed complete bone repair (Fig 15 and 16).

Figure 4. Incision.

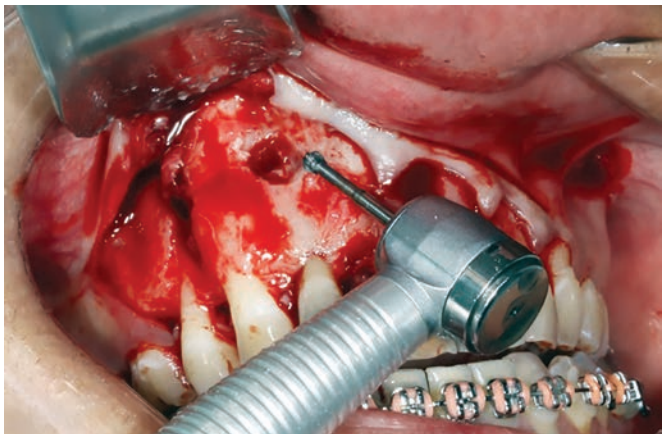

Figure 5. Osteotomy.

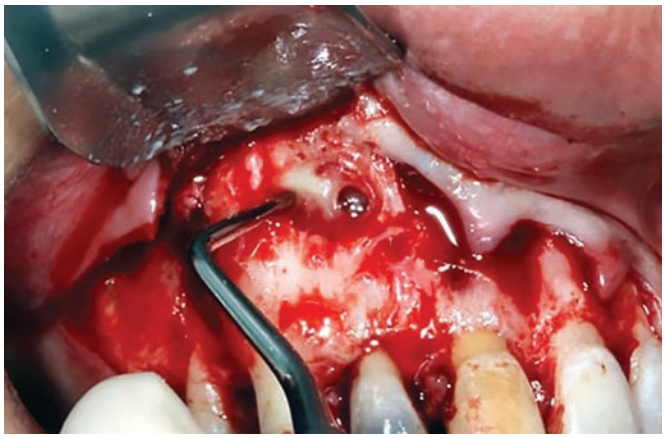

Figure 6. Curettage of cyst.

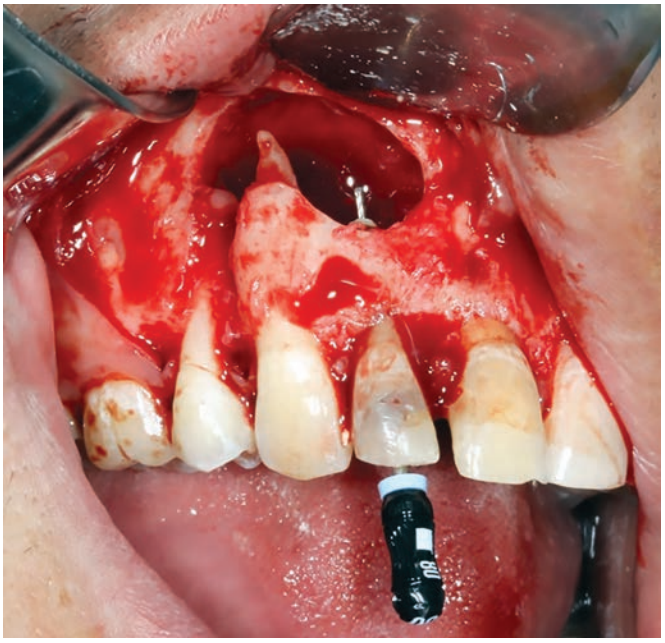

Figure 7. Mechanical preparation of root canal.

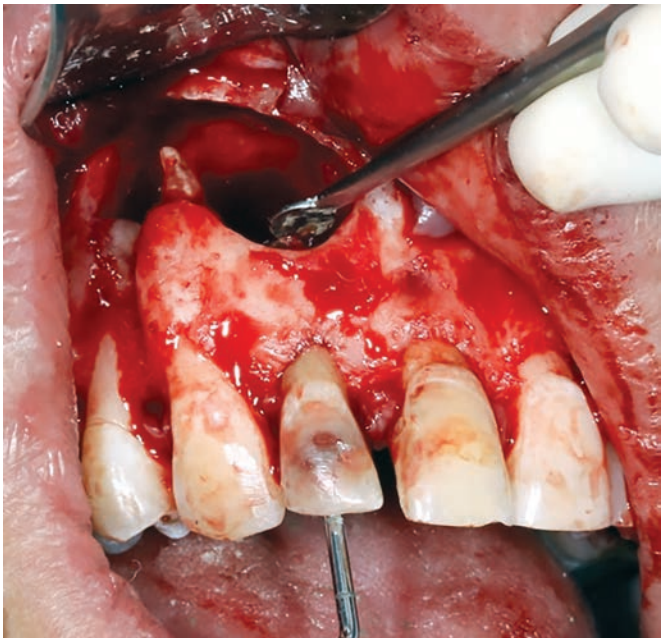

Figure 8. Simultaneous filling of root canal with MTA through pulp chamber.

Figure 9. Placement of bone graft (GenOx Org, Baumer AS, Brazil).

Figure 10. Insertion of membrane (Lumina - Coat - Critéria).

Figure 11. Suturing.

Figure 12. Final postoperative radiograph and filling with MTA (5 apical mm).

Figure 13. Treatment of Tooth 13 with Logic system (Easy).

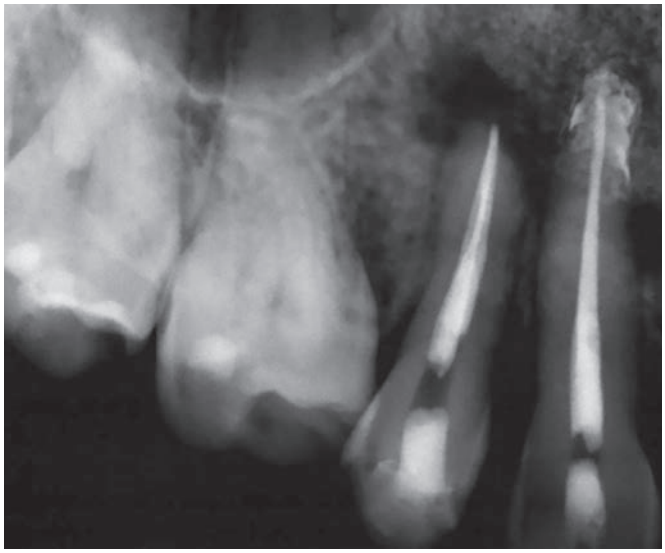

Figure 14. Filling of Tooth 14 with AH Plus cement (Dentsply) and gutta-percha.

Discussion

According to Lopes and Siqueira,[4] the success of endodontic treatment is verified by the absence of a periapical cyst after an appropriate follow-up period. Therefore, the prior treatment to which the patient in the present study had been submitted did not achieve the expected success, as evidenced radiographically by the permanence of the periapical cyst two years after treatment and clinically by the presence of pain and fistula.

Torabinejad and Walton[26] state that paraendodontic surgery is not indicated when a non-surgical procedure could be successful and its indiscriminant practice is both unethical and contraindicated. Surgical intervention has precise indications that must be respected. The present case fit the criteria for surgical

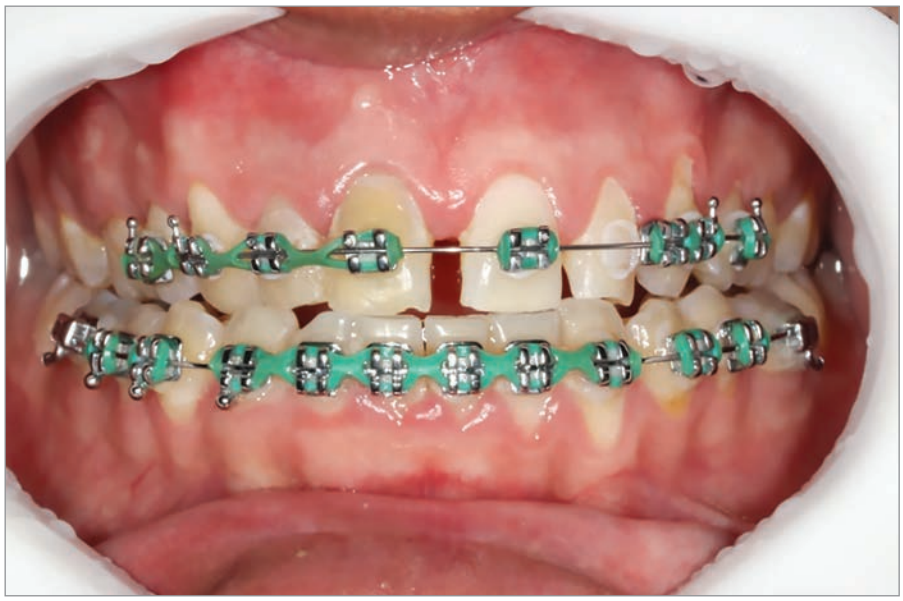

Figure 15. Clinical follow up one year after surgery.

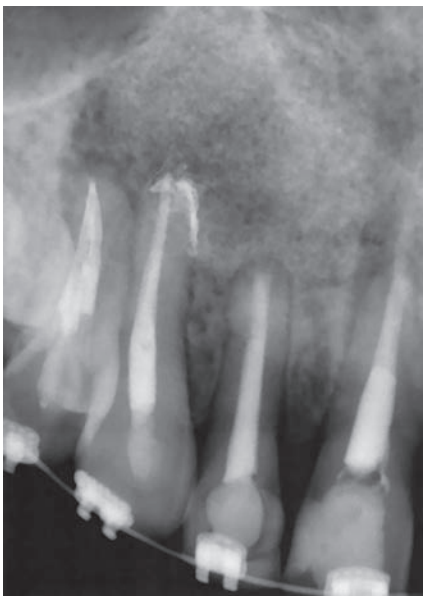

Figure 16. Radiographic follow up one year after surgery.

intervention; periapical surgery was only established as the treatment plan after the precise analysis of the patient history, clinical and radiographic findings and all resources of conventional endodontics had been exhausted.

Although infrequent, large chronic periapical cysts with persistent exudate can occur and the surgical modality indicated to solve this type of clinical situation is root canal filling simultaneously to the surgical act. In the present case, this conduct was determined based on the persistent exudate and size of the cyst. The simultaneous filling of root canals has the advantage of excellent apical sealing, enables the drying and direct view of the sectioned region and results in more effective three-dimensional obturation.[4,23]

Bramante & Berbert[19] and Torabinejad & Walton[26] report that periapical curettage removes the diseased soft tissue and/or foreign bodies that impede the repair process, reduces bleeding, provides a sample for biopsy, removes inflamed tissue and enables access to and visibility of the apex. In the present study, small portions of the specimen were sent for histopathological analysis and the diagnosis was a secondarily infected cyst.

Apicoetomy was performed at a 90° angle in the present case. The literature states that this angle has advantages over a 45° cut. The Zecrya bur was chosen for the end-root sectioning due to its efficient cut and good length. Moreover, studies involving scanning electron microscopy report that this type of bur provides a smoother and more even surface compared to diamond burs.[5]

While there is no ideal filling material, MTA has desirable characteristics that are extremely important during and after the surgical procedure, such as less apical infiltration, better marginal adaptation to the prepared walls, less need for condensation force and greater biocompatibility.[5,11,13,14,15] Therefore, this was the material of choice in the present case.

The placement of a barrier is recommended in cases of deep cavities to avoid the formation of fibrosis in the operating field, which could be radio-

graphically confounded with a periapical cyst. This can be achieved with filling materials, such as bone grafts and biomaterials. In the present study, we used a bone graft and the insertion of a membrane due to the large size of the bone cavity.[4,10,19]

Follow up should be performed with radiographs after six and 12 months. Some authors recommend follow up for up to 24 months.[23] In the present case, the patient was followed up in the first four months after surgery due to the continuation of the endodontic treatment of teeth 13 and 14, during which time no clinical or radiographic abnormality was found. One year after surgery, the patient returned for a follow-up examination and was free of clinical and radiographic signs, demonstrating the complete healing of the region.

Conclusion

Paraendodontic surgery is a potential tool for the maintenance of teeth after all therapeutic possibilities of traditional root canal treatment have been exhausted. When assessed, indicated and performed well, the different modalities of periapical surgery are very predictable and have a high success rate. The filling of the root canal simultaneously to the surgical act is an excellent option, as it promotes good root sealing and the reestablishment of favorable conditions for the formation of new bone.

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