

Apical surgery in complement to the endodontic treatment: Case report

Maria Antonieta Veloso Carvalho de **OLIVEIRA**¹

Juliana **SOARES**²

Kellen Cristina Mendes **AZEVEDO**³

João Carlos Gabrielli **BIFFI**⁴

Leandro Carvalho **QUIRINO**⁵

Rodrigo Antônio **FARIA**⁵

ABSTRACT

Introduction: The failure of endodontic treatment may be related primarily to complications arising from the execution of technique, such as the persistence of microorganisms in the canals and iatrogenies. However, even after an endodontic treatment considered technically correct, the persistence of infection may be related to the complexity of the root canal system and extraradicular factors located within the inflamed periapical tissue. The resolution of failures or accidents in endodontic treatment can be achieved through the retreatment and if necessary, an

apical surgery. **Objective:** This article describes a case of endodontic treatment followed by apicectomy surgery with retrofilling using Mineral Trioxide Aggregate (MTA) with a 5 years follow-up. **Conclusion:** In view of the clinical case follow-up, we can conclude that in teeth with persistent periapical lesions and fistula, after having undergone an appropriate endodontic treatment, surgical retreatment with retrofilling can be an efficient option in the resolution of the infection and periapical tissue repair.

Keywords: Root canal treatment. Surgical retreatment. Root-end filling. Retrofilling. MTA.

How to cite this article: Oliveira MAVC, Soares J, Azevedo KCM, Biffi JCG, Quirino LC, Faria RA. Apical surgery in complement to the endodontic treatment: Case report. *Dental Press Endod.* 2011 July-Sept;1(2):70-4.

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

¹Endodontics specialist and MSc in Integrated Dental Practice, School of Dentistry, Federal University of Uberlândia - Brazil.

²Endodontics specialist.

³Endodontics specialist and MSc student in Integrated Dental Practice, Federal University of Uberlândia - Brazil.

⁴Full Professor of Endodontics, Federal University of Uberlândia - Brazil.

⁵Professor of the specialization course in Endodontics, UNITRI, Uberlândia - Brazil.

Received: July 6, 2011. Accepted: July 21, 2011.

Contact address: Maria Antonieta Veloso Carvalho de Oliveira
Av. Pará, 1720, bloco 2B s/25, 38.403-036 - Uberlândia / MG - Brazil
E-mail: antocassia@hotmail.com

Introduction

Periapical lesions resulting from an inflammatory response in front of a bacterial infection can be prevented or resolved by endodontic treatment.¹ The failure of endodontic treatment may be related to complications in the execution of endodontic technique, leading to contamination or allowing the persistence of microorganisms in the root canals.^{2,3,4} There is also the influence of anatomical complexity, the presence of calcifications⁴ and a pre-operative periapical lesion.^{3,5}

When the steps of endodontic treatment are properly executed, the persistence of periapical disease may be related to extra-radicular contamination located within the inflamed periapical tissue, such as an infection, a true cyst or a reaction to a foreign body remaining from endodontic treatment.^{1,2} The resolution of failures or accidents in endodontic treatment can be achieved by retreatment or periradicular surgery, which includes various forms of procedures.⁴ One is the retrograde filling that aims to seal the root canal system by means of an apical preparation and root filling, using a material with physical, chemical and biological appropriated properties to allow or induce apical healing and deposition of mineral tissue.^{4,6}

The Mineral Trioxide Aggregate (MTA) is the retrofilling material with better properties than amalgam, gutta-percha, composite resin, glass or zinc oxide ionomer and eugenol, intermediate restorative material (IRM) and Super-EBA.^{4,7} The biocompatibility and the potential of inducing cementoblasts and osteoblasts, makes the MTA a material capable of carrying a full histological repair after periapical surgery and retrofilling.⁸⁻¹¹

This article describes a clinical case of root canal treatment complemented by an apicectomy surgery with retrofilling using MTA with a five years follow-up.

Case report

A 13-year-old boy presented to the dental clinic in August 2004, with the chief complaint of pus in the region of mandibular right first molar tooth. On examination, the tooth had occlusal amalgam restoration, vestibular and lingual fistulas, with purulent secretion and granulomatous tissue, with no increase in volume, but with pain to percussion and palpation. According to the report of the patient and their responsible, the fistula appeared two months before the first appointment, with local pain, spontaneous and exacerbated by chewing.

In the cold thermal pulp test, the tooth showed a negative response and in radiographic examination (Fig 1A), the amalgam restoration was close to the pulp chamber and had an extensive radiolucent area in the periapical region of the mesial and distal roots. The diagnosis of this tooth was pulp necrosis with endo-perio lesion in the vestibular.

After two weeks, endodontic treatment was initiated and after chemical and mechanical cleaning of the three root canals, calcium hydroxide medication associated with saline solution was placed in the tooth and replaced after 15 days. After one month of the permanence of this intracanal medication, it was clinically observed the repair of the fistula, the absence of exudate and pain. The tooth was obturated by lateral condensation technique with gutta-percha and zinc oxide and eugenol based sealer (Fig 1B).

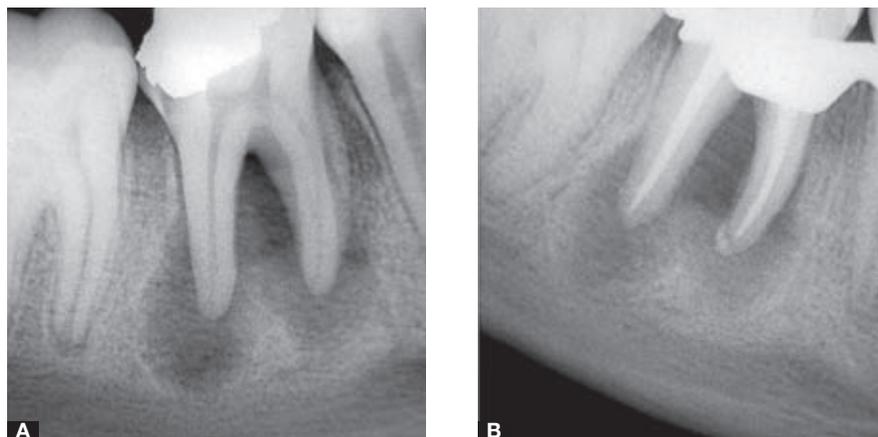


Figure 1. A) Diagnostic radiograph. B) Radiograph after root canal filling.

In the clinical control 17 months after the root filling, the tooth clinically presented an increased gum volume in the vestibular region and pain symptoms. Radiographically, the periapical lesion of the mesial roots was repaired, however, the periapical region of the distal root showed greater radiolucency than at the beginning of treatment (Fig 2A). As the endodontic treatment was satisfactory and without complications, the apicectomy surgery with retrofilling was indicated.

In April 2006, it was carried out apicectomy with retrofilling using gray MTA (Angelus®) in the distal root and collecting of the material from the periapical region for histopathological examination (Figs 2B, 3 and 4), confirming the case of a periapical granuloma.

In the follow-up after surgery it was observed that the tooth had no signs and symptoms of infection and

it was noticeable the healing of the periapical region of distal root (Fig 5). Such repair occurred despite the patient had started orthodontic treatment three months after surgery and had not put the definitive restoration, with only a core filling of glass ionomer and zinc oxide and eugenol sealer.

Discussion

The success rate of endodontic retreatment is usually between 70 and 86%,⁵ however when there is a preoperative periapical lesion this rate is 49% lower than when there is no lesion.¹ The influence of the periapical condition in endodontic retreatment may support the hypothesis that the infection in the root canal with persistent periapical lesions could be more resistant because of inaccessible location of the infection inside the root canal.^{2,5}



Figure 2. A) Follow-up after 17 months. B) Immediately after apical surgery.

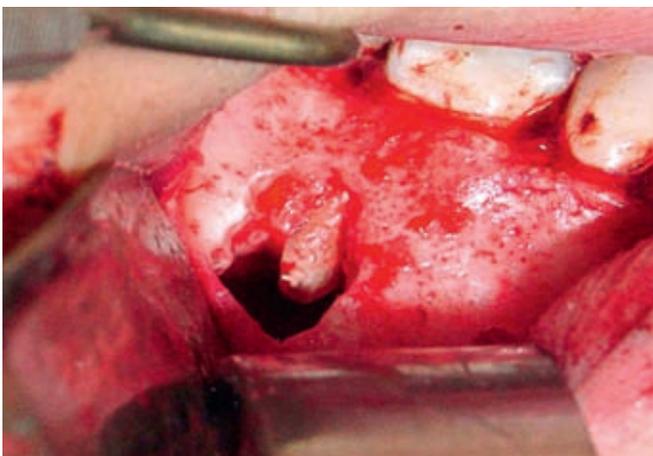


Figure 3. Enucleated periapical lesion and apicectomy of distal root apex, with visualization of the root filling material.

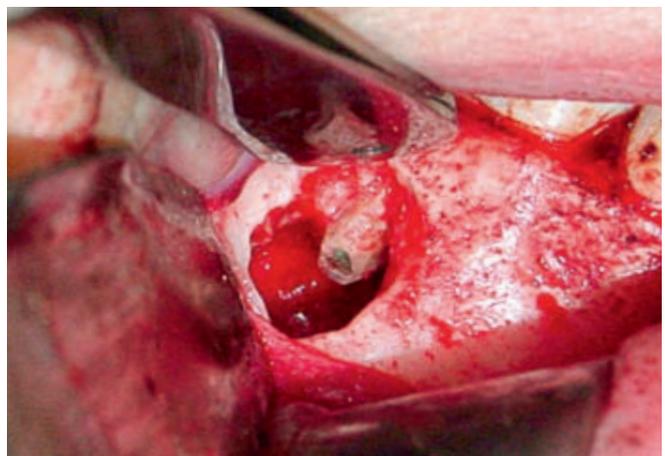


Figure 4. View of the MTA in apical retrofilling.



Figure 5. Follow-up of bone formation in the distal root: **A)** After 8 months, **B)** after 5 years.

The success rates of endodontic treatment were found to decrease by 14% for every 1 mm increase in the diameter of the lesion before treatment.¹ The negative influence of large periapical lesions is due to the presence of greater diversity of bacteria, consequently, more resistant to the treatment. This type of chronic injury, characterized by long duration, allows the microorganisms to penetrate deeper into dentinal tubules. This contamination may even extend to the level of the apical cementum causing failures in chemical and mechanical decontamination procedures.¹ In addition, large lesions may also cause cystic transformation or extra-radicular infections, which render nonsurgical root canal treatment ineffective.²

The presence of fistula significantly reduces to 48% the success rate for endodontic retreatment.¹ In a tooth with pulp necrosis, the fistula characterizes this lesion as a chronic apical abscess, which is the result of the exit of irritant substances from the infected root canal to the periapical tissues or may result from an acute apical abscess that became chronic. The fistula may facilitate the influx of bacteria from the oral cavity to colonize the periapex and predispose to extra-radicular infection.¹

The reason for the choice of surgical retreatment in this clinical case was the persistence of periapical lesion in the distal root, despite its repair in the mesial

roots after adequate root canal filling. It was taken into account when opting for the apical surgery that radiographic follow-up has a questionable accuracy, as the use of conventional radiographic images for detection of apical periodontitis shows a high likelihood of false-negative diagnosis. This is because you can only identify the apical periodontitis with these methods if it is already at an advanced stage of bone mineral loss.¹²

The persistence of the lesion in this reported case can happen due to the difficulties in the instrumentation of canals recesses, the isthmus and accessory canals, and extra-radicular infection.² Apical surgery provides an opportunity to remove the periapical lesion and the apical portion of root that has the highest anatomical variations of the root canal and can, in combination, sustain the periapical lesion after endodontic treatment. Simultaneously allows a retroprepare and apical retrofilling, which aims to seal the canal system, preventing microorganisms that might still remain within the canal system, to reach the periapical tissues.²

The use of MTA as retrofilling material is justified because it has excellent physical properties,^{9,10} is biocompatible with the periapical tissues^{9,10,11} and has the potential of conducting and inducing cementoblasts and osteoblasts, and the ability to release the main cationic components and trigger the surface of precipitates

chemically and structurally similar to hydroxyapatite.^{4,7,9} The ability of MTA to induce the cellular response is due to the phase of calcium phosphate, which can cause a change in cell behavior, simulating the adhesion of osteoblasts to this material.¹⁴ In addition, the MTA is non-mutagenic or non-neurotoxic and produces no side effect on microcirculation.¹⁰

The drawbacks of MTA are related to difficulty in controlling the length of the filling, the chance of producing voids¹⁰ and the absence of solvent material for removal.^{10,11} Besides the presence of difficult handling, long setting time and high material cost.¹¹

Placing a good quality coronal restoration after root filling is considered the final step for completion of root

canal treatment, because it prevents contamination of the root canal.¹ Although the patient presented along the follow-up without the final restoration and only with the glass ionomer filling core and the provisional sealing, which is not advised, there was apical repair.

Conclusion

Based on results found in literature and in the follow-up of this clinical case, we can conclude that in teeth with persistent periapical lesions and fistula, after having undergone an appropriate endodontic treatment, the surgical retreatment with retrofilling can be an efficient option in resolving the infection and periapical tissue repair.

References

1. Ng Y-L, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of nonsurgical root canal treatment: part 1: periapical health. *Int Endod J.* 2011;44(7):583-609.
2. Nair PNR. On the causes of persistent apical periodontitis: a review. *Int Endod J.* 2006;3(4):249-81.
3. Ng Y-L, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of non-surgical root canal treatment: part 2: tooth survival. *Int Endod J.* 2011; 44(7):610-25.
4. Mota CCBO, Brasil CMV, Carvalho NR, Beatrice LCS, Teixeira HM, Nascimento ABL, et al. Properties and biological aspects of mineral trioxide aggregate: literature review. *Rev Odontol UNESP.* 2010;39(1):49-54.
5. Ng Y-L, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of secondary root canal treatment: a systematic review of the literature. *Int Endod J.* 2008;41(12):1026-46.
6. Tanomaru-Filho M, Luis MR, Leonardo MR, Tanomaru JMG, Silva LAB. Evaluation of periapical repair following retrograde filling with different root-end filling materials in dog teeth with periapical lesions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006;102(1):127-32.
7. Favieri A, Campos LC, Burity VH, Cecilia MS, Abad EC. Use of biomaterials in periradicular surgery: a case report. *J Endod.* 2008;34(4):490-4.
8. Leonardo MR, Barnett F, Debelian GJ, Lima RKP, Silva LAB. Root canal adhesive filling in dog's teeth with or without coronal restoration: a histopathological evaluation. *J Endod.* 2007;33(11):1299-303.
9. Tingey MC, Bush P, Levine MS. Analysis of Mineral Trioxide Aggregate surface when set in the presence of fetal bovine serum. *J Endod.* 2008;34(1):45-9.
10. Torabinejad M, Parirokh M. Mineral Trioxide Aggregate: a comprehensive literature review - Part II: leakage and biocompatibility investigations. *J Endod.* 2010;36(2):190-202.
11. Parirokh M, Torabinejad M. Mineral Trioxide Aggregate: a comprehensive literature review - Part III: clinical applications, drawbacks, and mechanism of action. *J Endod.* 2010;36(3):400-13.
12. Estrela C, Bueno MR, Leles CR, Azevedo B, Azevedo JR. Accuracy of cone beam computed tomography and panoramic and periapical radiography for detection of apical periodontitis. *J Endod.* 2008;34(3):273-9.