

Endodontic Surgery Associated with Guided Tissue Regeneration Technique: Case Report

Cirurgia Parendodôntica Associada à Técnica de Regeneração Tecidual Guiada: Relato de Caso

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Abstract

Non-surgical endodontic retreatment should always be the first option for reintervention when the initial endodontic treatment fails. The surgical treatment, called periradicular surgery, will be the procedure of choice when there is no success after the conventional endodontic retreatment. The purpose of this article is to describe clinical case of endodontic surgery, associated with guided tissue regeneration (GTR). A male patient, 24 years old, was referred for endodontic surgery on tooth 12 after two unsuccessful endodontic interventions. During the surgery, osteotomy, lesion curettage, apicectomy, retrograde obturation with Mineral Trioxide Aggregate (MTA), and filling of the bone failure with lyophilized bone and reabsorbable collagen membrane were performed. After six months of follow-up, the patient did not present any type of painful symptomatology. The endodontic surgery, associated with a technique of guided tissue regeneration, was efficient to solve this clinical case.

Keywords: Endodontics. Apicoectomy. Guided Tissue Regeneration.

Resumo

O retratamento endodôntico não cirúrgico deve sempre ser a primeira opção de reintervenção quando o tratamento endodôntico inicial falha. Já o tratamento cirúrgico, ou cirurgiaarendodôntica, será o procedimento de escolha quando não há sucesso após o retratamento endodôntico convencional. O objetivo deste artigo é descrever um caso clínico de cirurgiaarendodôntica, associada à regeneração tecidual guiada (RTG). O paciente, gênero masculino, 24 anos, foi encaminhado para cirurgiaarendodôntica no dente 12 após duas intervenções endodônticas sem sucesso. Durante a cirurgia foram realizadas manobras de osteotomia, curetagem da lesão, apicectomia, obturação retrógrada com Mineral Trióxido Agregado (MTA), além de preenchimento da falha óssea com osso liofilizado e membrana de colágeno reabsorvível. Após seis meses de acompanhamento do caso, o paciente não apresentou nenhum tipo de sintomatologia dolorosa. A cirurgiaarendodôntica, associada à técnica de regeneração tecidual guiada, foi eficiente para solucionar este caso clínico.

Palavras-chave: Endodontia. Apicectomia. Regeneração Tecidual Guiada.

1 Introduction

The absence of painful symptoms, fistula, edema and/or periapical lesions are the main indicators of success of endodontic treatment¹. However, several factors may lead to treatment failure². The most frequent causes are the non-elimination of microorganisms present in the system of canals, or its reintroduction after completion of treatment³.

Before the failure, the non-surgical endodontic retreatment should always be the first choice for reintervention, aiming at the removal of microorganisms that may have been left or brought to the system of canals during the first procedure⁴. Whereas the surgical treatment, or periradicular surgery, is the procedure of choice when there is no success after the conventional endodontic retreatment⁵ having as main objective to reestablish the health and promote the healing of the periapical tissues⁶.

This modality of treatment is indicated in several cases, especially those in which there are anatomical complications, such as severe root calcifications, lacerations and difficulties

of access; traumatism, need for removal of tissue for biopsy, endoperiodontal defects and failures in procedures previously performed⁷. However, non-identification of causes of failure of initial endodontic treatment, difficulties for the surgical access, teeth with too short roots or which have already suffered apicectomy, and patients with systemic complications⁸ are considered contra-indications of surgical retreatment.

The periradicular surgery consists of the removal of the root apical portion, thus allowing the realization, by retrograde pathway, cleaning, shaping and obturation of root canals^{9,10}. During the surgical procedure they might be significant loss of bone tissue, varying in accordance with the extension of the lesion⁶. Thus, it has been suggested, associated to periradicular surgery, techniques of guided tissue regeneration (GTR) to assist in the healing process of bone tissue¹¹, and accelerate the repair of the periapical region⁶. In this technique, lyophilized bone and bioactive resorbable membrane are frequently used, which protect the affected area and stimulate the deposition

and growth of mineralized surrounding tissue⁶.

Thus, the objective of this article is to report a clinical case of periradicular surgery, which was associated with a technique of guided tissue regeneration.

2 Case Report

Male patient, 24 years old, attended the Graduate course in endodontics of UniNorte, forwarded to periodontal surgery after two endodontics interventions without success (endodontic treatment and retreatment). Upon clinical examination the presence of fistula was observed with drainage of purulent secretion in periapical mucosa of tooth 12 (Figure 1).

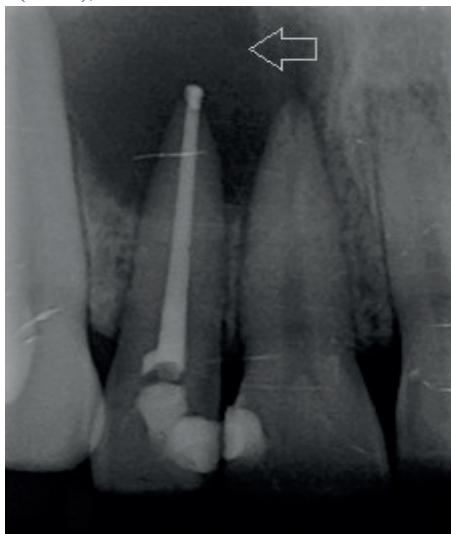
Figure 1 - Initial aspect observed during the clinical examination. Presence of fistula (circle) with drainage of purulent secretion in the periapical region of the tooth 12.



Source: The authors.

The radiographic examination revealed over-obturation of the root canal of tooth 12, and extensive radiolucent image involving the apical region of the root, suggesting the diagnosis of cyst or granuloma (Figure 2).

Figure 2 - initial radiograph. Note the presence of extensive radiolucent image involving the apical region of the root of the tooth 12 (arrow), and over-obturation of the root canal.

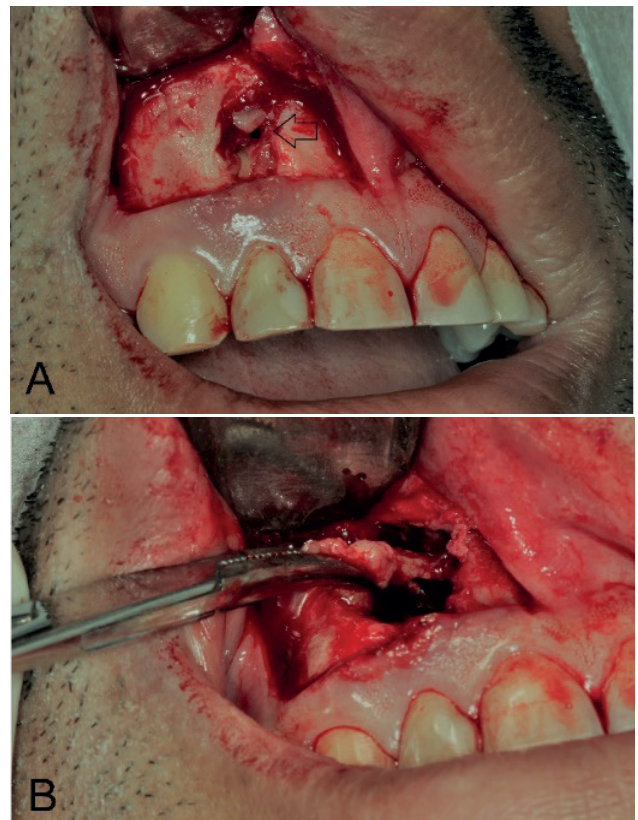


Source: The authors.

Prior to surgery, it was opted for antibiotic prophylaxis with 2 g of amoxicillin and 1 g of dexamethasone, 1 hour before the procedure, with the aim of reducing the number of pathogenic microorganisms and prevent trans and post-operative bacteremia, as well as a possible edema. Initially, extra-oral antisepsis was carried out with chlorhexidine solution at 2%, and intra-oral solution with 0.12% chlorhexidine digluconate (Mouthrise Colgate PerioGard Oral, Colgate-Palmolive Comercial Ltda., São Paulo, SP, Brazil). Afterwards, blockade was performed from the anterior superior alveolar nerve, followed by supplementary infiltrative anesthesia at the apex of the tooth 12, both with the hydrochloride 3% lidocaine and epinephrine 1:100,000 (Critália Produtos Farmacêuticos Ltda., Itapira, SP, Brazil).

After the anesthesia, an incision was made of Wassmund type with n 15 scalpel blade^o, extending from the distal surface of the tooth 13, until the mesial surface of the tooth 11. With the aid of a drift of Molt periosteum elevator, mucoperiosteal detachment was performed and clinically observed that the lesion had already broken the vestibular cortical bone, thus facilitating the lesion curettage (Figure 3a).

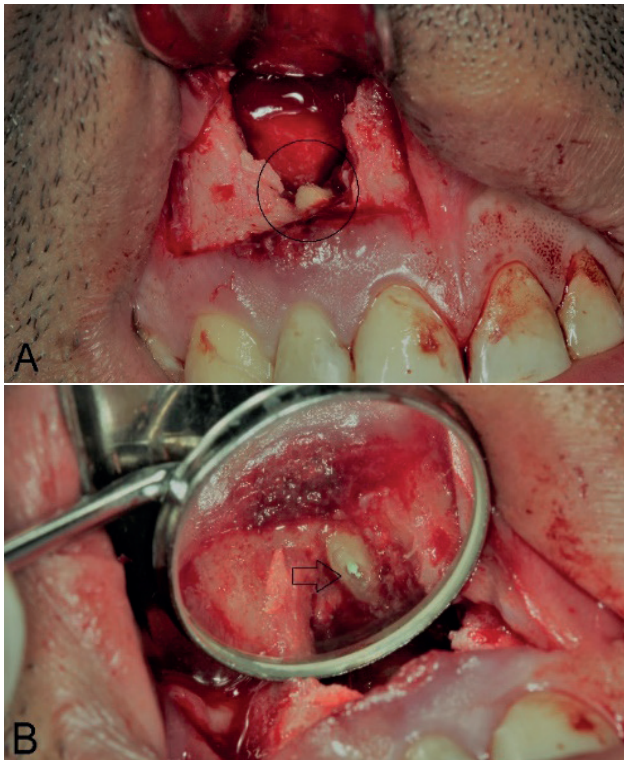
Figure 3 - a) mucoperiosteal detachment, evidencing the rupture of the cortical vestibular bone in the lesion area (arrow). **b)** curettage of the lesion area after osteotomy, with collection of the affected tissue for biopsy.



Source: The authors.

Then, osteotomy was performed with spherical diamond-tipped drill bit 1014 HL (KG Sorensen, Barueri, SP, Brazil) attached at high speed (Extra Torque 605C, Kavo, Joinville, SC, Brazil), and intense irrigation with sterile saline, with the objective of regularizing the bone cavity. After osteotomy, the tissue present in the lesion area was completely removed with Lucas curette (Figure 3b), followed by apicectomy with drill Zecrya (KG Sorensen), where 3 mm of the root apex were removed (Figure 4a).

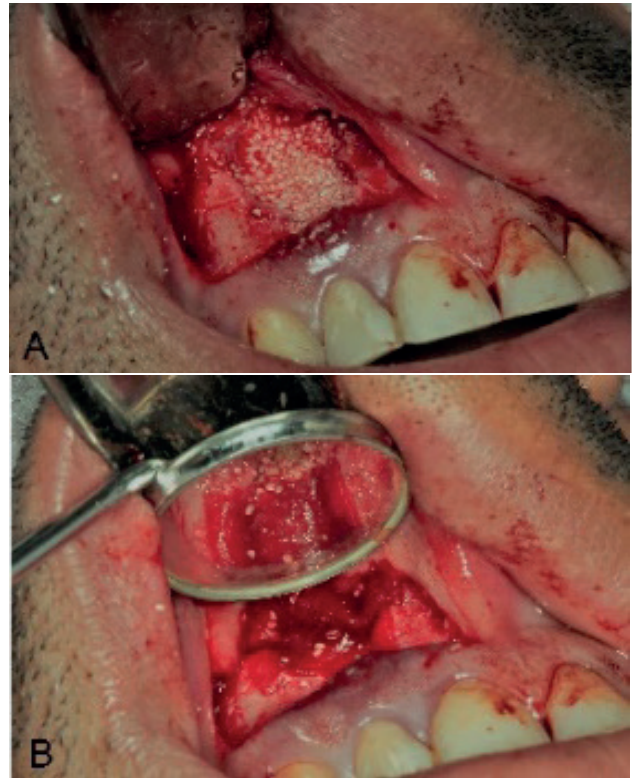
Figure 4 - a) Apicectomy, with removal of the 3 mm final of the root apex (circle). Note the remodeling of the remaining root angulation of 90°, to promote the reintegration of the periodontal ligament more adequately. **b)** Retro filling with MTA (arrow).



Source: The authors.

In order to ensure a better reintegration of the periodontal ligament, the root remnant was remodeled in an angle of 90°. The confection of the cavity was performed with 1013 and the retro filling was performed with MTA (Angelus, Londrina, PR, Brazil) (Figure 4b). Then the bone cavity was filled with lyophilized bone (bovine deproteinized bone) (GenOx, Baumer, Mogi Mirim, SP, Brazil) and acellular biological membrane of resorbable bovine pericardium (Techgraft, Baumer), biocompatible products, with mild antimicrobial action, and responsible for stimulating tissue regeneration (Figures 5a and 5b). The suture was performed with nylon wire to prevent the buildup of bacterial plaque (Figure 6). Then final radiography was performed of the case (Figure 7).

Figure 5 - a) Filling of the bone cavity with lyophilized bone of medium granulation. **B)** Positioning of the collagen resorbable bio membrane on the lyophilized bone.



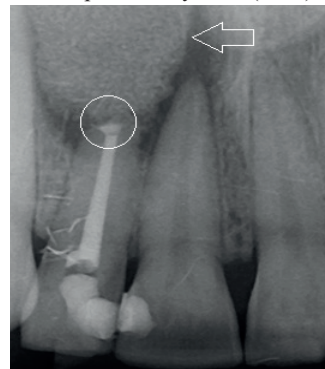
Source: The authors.

Figure 6 - Suture with nylon thread .



Source: The authors.

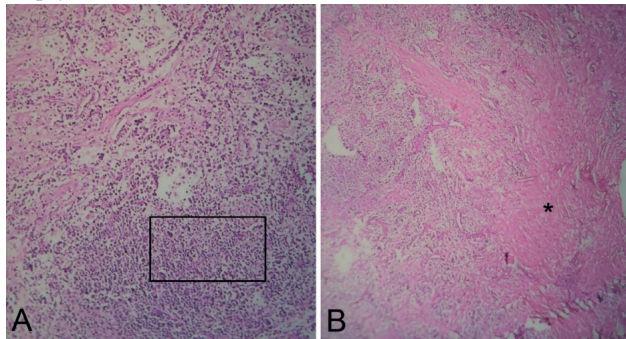
Figure 7 - Final Radiograph, where it is possible to observe the area of the lesion completely filled by lyophilized bone (arrow), and the remainder of the root apex filled by MTA (circle)



Source: The authors.

The tissue collected during the surgical procedure was kept in formalin at 10% and sent for histopathological analysis. The macroscopic and microscopic analysis of tissue subjected to biopsy revealed the presence of a cystic cavity, partially covered by stratified odontogenic stratified squamous epithelium (Figure 8), confirming the initial suspicion of apical periodontal cyst.

Figure 8 - histopathological analysis of the tissue subjected to biopsy

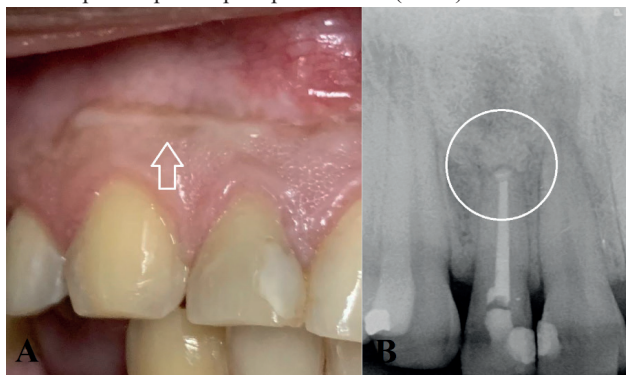


(a) underlying the connective tissue, it is possible to observe focal areas of disorganization due to the presence of mononuclear inflammatory infiltrate of intense amplitude, composed mainly of lymphocytes in the epithelial regions. Also, it is noted the presence of eventual cholesterol crystals surrounded by giant, inflammatory cells, characterizing a foreign body-type reaction (delimitation). 100 X, H. E. **b)** In peripheral regions (*) it was not detected inflammatory process. It is possible to notice intense collagenization in the area, with low cellularity, and vascularized connective tissue and notably organized. Still, it was possible to observe in these areas the presence of remnants of viable trabeculae bones. 100 X, H.E.

Source: The authors.

The patient is currently with six months of prosthesis, without painful symptoms. The fistula and the edema present in the mucosa adjacent to the area of the lesion are no longer present, demonstrating a satisfactory clinical progress of this case (Figure 9). Future clinical and radiographic evaluations are scheduled to be performed every six months during the next two years to identify possible failures and follow the periapical lesion regression.

Figure 9 - a) Image of the area where the surgical procedure was performed. Note the evolution of the healing process (arrow) after 1 year. b) follow-up radiograph performed 1 year after the surgical and endodontics intervention. It is possible to observe the complete repair of periapical tissues (circle).



Source: The authors.

2.1 Discussion

The non-surgical endodontic retreatment presents a high rate of success, however, there are cases in which the periradicular surgery becomes indispensable to the tooth maintenance in the oral cavity¹². In decision-making the most appropriate method of retreatment (surgical or non-surgical), the causes that led to treatment failure, as well as the possibility and/or risks of canal path access must be well established¹³.

The reason for the choice of periradicular surgery, associated to apicectomy and guided tissue regeneration in this clinical case, was due to the persistence of periapical lesions and painful symptoms, presence of fistula and edematous mucosa. According to Villa-Machado *et al.*¹⁴, the periradicular surgery is the most reliable alternative to solve cases such as this, in which the conventional treatment has failed.

The periradicular surgery facilitates the tissue removal that composes the periapical lesion and the apical portion of the root, considered a critical zone¹⁵. In this specific portion of the root canal, a clean and appropriate modeling are difficult to be performed due to its anatomical complexity, full of branches and side canals¹⁵. In addition, through the root-end cavity preparation and canal retro fillings, there is a more effective sealing of the root canal system, preventing microorganisms, still present inside the canal, from reaching the periapical tissues⁹.

Due to the extension of the periapical lesion observed radiographically, the type of flap chosen for this case was the Wassmund^{15,16}. This procedure consists of the realization of two vertical incisions that attach themselves to a third horizontal sub marginal incision¹⁶. This surgical maneuver is often used as a replacement for the flap *Oschsenbein-Luebke*¹⁶. However, the likelihood of gingival recession when this type of flap is performed is higher¹⁶.

During the periradicular surgery, it was opted for the realization of the apicectomy at an angle of 90°, following the guidelines of Gagliani *et al.*¹⁷ According to the authors, the apicectomy at 90° is considered a more effective surgical option, because such angulation, followed by the preparation of a retrograde cavity with 3 mm depth, allows the removal of all the faces of the extreme apical, decreasing the infiltration when compared with a more inclined angle.

The use of MTA as retro filling material is justified by presenting good apical sealing, being biocompatible with the periapical tissues and inducing repair by deposition of mineralized tissue¹⁸. Its action mechanism is the reaction of calcium oxide (one of its constituents) with water, forming the calcium hydroxide, which when in contact with the tissue fluids is dissociated in calcium ions (Ca²⁺) and hydroxyl ion (OH⁻), initiating the formation of hard tissue and thus encouraging the repair of the affected area¹⁹. In addition, due to being a hydrophilic material, the moisture present

in the periradicular surgeries is not capable of affecting its physicochemical properties¹⁹. Jain *et al.*²⁰ upon comparing the apical sealing ability of four biomaterials used in periradicular surgeries (MTA, Portland Cement, zinc oxide and eugenol cement based, and glass ionomer based cement) demonstrated that MTA is the most suitable material for the refilling.

Before such a large periradicular lesion, as described in this case, it is important to evaluate the type of tissue repair that the region will possibly present after the surgery²¹. In an attempt to an adequate tissue repair, it was decided, in this clinical case, by the completion of the technique of guided tissue regeneration, indicated in cases of large bone injuries, bio cortical injuries, endodontics injuries and perforations¹¹. The lyophilized bone and the bioactive membrane, used in guided tissue regeneration, have antibacterial properties, which suppress the inflammation and have a chemotactic effect on stem cells²¹. Still, the insertion of a biomaterial into the bone cavity accelerates the tissue repair process⁶.

After the histopathological analysis, a diagnosis of apical periodontal cyst was issued, which has its origin in an inflammation of the epithelium of the root apex due to the presence of necrotic material²². This type of cyst has a capsule of fibrous connective tissue coated by epithelium and contains liquid and cellular remnants in its interior²³. When it reaches a size big enough it is possible to observe swelling and sensitivity to palpation in the region; and radiographically is identical to the apical granuloma²³.

The report revealed the existence of a cystic cavity, virtual partially covered by stratified odontogenic stratified squamous epithelium, largely disorganized by the presence of mononuclear leukocytes exocytosis. The underlying connective tissue showed limited areas of disorganization due to the presence of a mononuclear inflammatory infiltrate of intense amplitude, composed mainly of lymphocytes, where the presence of eventual cholesterol crystals surrounded by giant cells was observed, triggering an inflammatory reaction of the foreign body type. However, in outlying regions to the area of the lesion absence of inflammatory process was observed, with intense collagenization, and connective tissue with organization and adequate vascularization. These findings suggest that the prognosis of this case in the long term will be favorable, since the complete surgical removal of the compromised tissue, and the existence of healthy adjacent tissue, allied with the biomaterials used will stimulate a proper repair of the affected area²⁴.

3 Conclusion

The proposed plan of treatment, periradicular surgery associated to a technique of guided tissue regeneration, was successfully performed, being capable of favoring the necessary repair of periapical tissues.

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