

# Clinical Approach of Extensive Periapical Lesion with Periradicular Regenerative Surgery: A Case Report with 7 Year Follow Up

Abordaje Clínico de Lesión Periapical Extensa con Cirugía Regenerativa Perirradicular: Reporte de un Caso con Seguimiento de 7 Años

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**CASSIMIRO, M.; ROMEIRO, K.; ALMEIDA, A.; GOMINHO, L. & ALBUQUERQUE, D.** Clinical approach of extensive periapical lesion with periradicular regenerative surgery: A case report with 7 year follow up. *Int. J. Odontostomat.*, 16(4):517-524, 2022.

**ABSTRACT:** The aim of this study is to report a case of two maxillary incisors with chronic apical abscess and through-and-through lesion submitted to periradicular regenerative surgery, with clinical follow-ups and evaluation through cone-beam computerized tomography for 7 years. In the presentation, there was a persistent sinus tract in the palate and sensibility to touch at the apical region of the central and left lateral maxillary incisors. The initial tomography revealed the presence of an extensive radiolucent area in the apical third of the referred teeth, with loss of the buccal and palatal cortices. For the treatment, a periradicular regenerative surgery was performed, an association of endodontic surgery with Guided Tissue Regeneration technique, using bovine bone xenograft and bioabsorbable membrane. The clinical and radiographic evaluations, including cone-beam computerized tomography, at seven years postoperatively, showed absence of symptomatology and sinus tract, probing depth within normal standards and apical bone neoformation.

**KEY WORDS:** cone-beam computed tomography, periapical abscess, periapical tissue, periodontal surgery, case report.

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## INTRODUCTION

Teeth with apical lesions normally are satisfactorily healed after nonsurgical endodontic treatments (Karan & Ariciog̃lu, 2020). In some cases, bacterial infection may extend to the periradicular tissues and cause an extraradicular infection (Ricucci *et al.*, 2018). Biofilms which adhere to the apical extraradicular surface have been considered as a possible cause for the permanence of apical periodontitis after the treatment (Ricucci & Siqueira, 2010). The microorganisms from this biofilm possess characteristics which differ from their planktonic forms, such as resistance to phagocytic cells and medications, which results in persistent infections (Costerton *et al.*,

1999). Therefore, even if periapical periodontitis with extraradicular infection has been treated by standard root canal treatment, a lesion may not heal if the causative agents have already traveled beyond the reach of existing treatment procedures (Nair, 2006). Given this, endodontic surgery is a predictable and effective procedure for the treatment of periapical lesions, and is recommended in cases of failure after endodontic treatment/retreatment or when orthograde treatment is not feasible (Kourkouta & Bailey, 2014).

Chronic apical abscess is mostly characterized by a periapical radiolucency associated with an intraoral

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or extraoral sinus tract (Ricucci *et al.*, 2018). The longer this condition is left untreated, the greater the bone resorption in the region, causing extensive and difficult to repair lesions. Through-and-through lesions involve the erosion of the lingual/palatal cortical plates with concomitant loss of the buccal cortical plate due to the pathological process or the creation of the access path (von Arx & Cochran, 2001). One of the main concerns in the healing of such lesions is the growth of connective tissue in the bone defect (Dahlin *et al.*, 1990). In this sense, the application of tissue engineering in the form of Guided Tissue Regeneration (GTR) in association with endodontic surgery has showed favorable results at promoting bone healing in large periapical and through-and-through lesions (Tsesis *et al.*, 2011; Taschieri *et al.*, 2011; Kourkouta & Bailey, 2014; Chi *et al.*, 2015; Parmar *et al.*, 2019). This way, the performance of GTR using bone filling and absorbable membrane can be indicated to protect the existent bone and increase new bone regeneration and connective tissue (Chi *et al.*, 2015).

It is known that periapical radiography may not reveal the real size of the periradicular lesion (Patel *et al.*, 2012). The introduction of Cone Beam Computerized Tomography (CBCT) in endodontics provided a new tool to evaluate the periapical region with greater accuracy (Parmar *et al.*, 2019). It has been increasingly used to assist in the diagnosis, treatment planning and follow-ups based in the high resolution three dimensional evaluation (Kourkouta & Bailey, 2014). Also, several clinical studies demonstrated the superiority of 3D images over 2D images in the evaluation of post-operative healing after endodontic surgery (Tanomaru-Filho *et al.*, 2015; Schloss *et al.*, 2017).

Given these considerations, this study aims to report the performance of periradicular regenerative surgery, a endodontic surgery including the use of GTR, in the maxillary left central and left lateral incisors, with history of chronic apical abscess and through-and-through lesion. The present case presented clinical and radiographic success, including through CBCT, after 7 years of follow-up.

## CASE REPORT

A 44 year old woman, leukodermic, was referred to the Endodontics postgraduate clinic. Her main complaint being the presence of persistent sinus tract

in the palate, in the apical region of the left central and left lateral maxillary incisors. In the evaluation of medical records did not present significant comorbidities.

In the anamnesis she reported no history of trauma or acute symptomatology. She had received endodontic treatment to the left central and left lateral maxillary incisors at 3 months, prior to our examination. It was also reported that the sinus tract which was already present did not disappear after the treatment, and that endodontic retreatment was not performed to the aforementioned teeth.

In the dental evaluation, the patient presented good overall oral health. It was observed in the palate the presence of sinus tract in the region of the left central and left lateral maxillary incisors. There was no presence of painful symptomatology to the vertical and horizontal percussion tests and the teeth also did not present mobility. However, the patient complained about sensitivity to the a apical buccal palpation test. Pulp sensitivity tests with Endofrost (Roeko-Wilcos do Brasil Ind. e Com. Ltda, Rio de Janeiro, RJ) were performed to the neighbouring teeth, which responded positively. The periodontal probing performed in the aforementioned teeth presented itself within the normal standards.

In the periapical radiography, the endodontic treatments in the left central and left lateral maxillary incisors were evidenced, with relatively adequate filling of the obturator material and pulp chamber with permanent restorative material (Fig. 1A). Extensive periradicular bone loss in the aforementioned teeth was observed. Through Cone Beam Computerized Tomography (CBCT), it was possible to observe irregular apical root resorptions in the involved incisors (Fig. 1B). Also, the presence of an (hypodense) osteolytic area was observed, partially delimited by sclerotic halo (hyperdense), extending from the region of the upper midline (left central incisor) (Figs. 1C, 1D and 1E) to the mesial region of the left premolar (Fig. 1F). It was observed that the lesion involved the root apices of the maxillary left incisors, promoting slight bulging and significant thinning of the buccal cortical bone, added to partial rupture of the palatal cortical bone adjacent to the lesion.

After thorough analysis of the images and adding the clinical findings, the diagnostic of previous endodontic treatment with chronic apical abscess was reached. As treatment, endodontic surgery associated

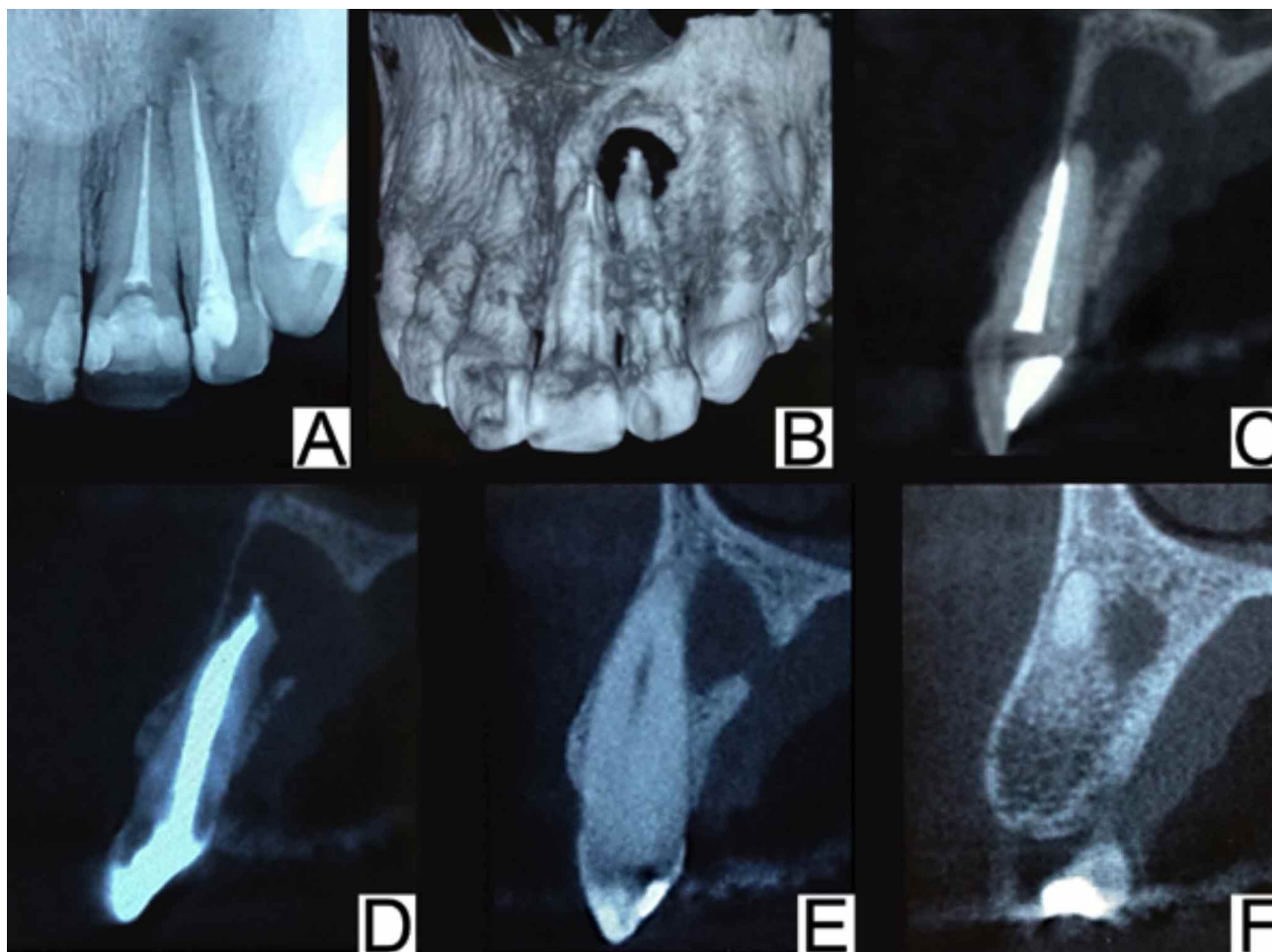


Fig. 1. A) Initial periapical radiography; B) Initial 3D image of the maxilla; C) CBCT image of the left central maxillary incisor; D) CBCT image of the left lateral maxillary incisor; E) CBCT image of the left maxillary canine tooth; F) CBCT image of the first left maxillary premolar.

to the Guided Tissue Regeneration (GTR) technique was selected. The performance of endodontic retreatments before the surgical procedure was discarded, for the treatment was performed by an experienced endodontist who had the necessary support for an adequate endodontic disinfection. Also, it was observed that the endodontic treatments for both teeth presented adequate filling and length, visualized through diagnostic periapical radiography and CBCT. The patient agreed and signed a consent form allowing the performance and scientific divulgation of her treatment.

To initiate the surgical procedure a mouth rinse was performed with chlorhexidine digluconate at 0,12 % (Periogard® Colgate) for a minute. Extra-oral antisepsis of the surgical field was performed with chlorhexidine digluconate at 2 %. The periradicular

regenerative surgery was performed under local anesthesia, as follows.

Local Anesthesia through blockage of the right infraorbital nerve and complimentary infiltrative in the apices of the central and lateral incisors and left canine tooth, and also the blockage of the nasopalatine nerve. 8.8 mL of the anesthetic articaine 4 % with 1: 100000 Articaine® epinephrine (DFL Indústria e Comércio Ltda, Rio de Janeiro, RJ), which has high penetration and tissue diffusion, was used.

Sulcular horizontal incisions to the buccal and palatal regions were made between the distal of the right lateral incisor to the distal of the left canine tooth. The relaxing vertical incision was performed in the buccal and distal of the right lateral incisor. The buccal and palatine mucoperiosteal flaps were obtained with Molt

Curette No. 2-4 (Trinity-Jaraguá –São Paulo / SP, Brazil) and then the buccal bone fenestration was located.

Initially, a partial osteotomy was performed using an Ochsebein chisel (n° 1, Trinity- Jaraguá –São Paulo/ SP, Brasil). A long rod spherical 1016 drill was used (KG Sorensen Cotia - SP - Brasil) under abundant saline irrigation. The bone cavity and the communication between the buccal and palatal region could be more easily observed. Curettage of the lesion was performed with a Lucas type alveolar curette (n° 86, Trinity, Jaraguá São Paulo/SP, Brasil).

With the help of magnification through operating microscope, the 3 apical millimetres of the left incisors were resected by means of a Zecrya No. 151 drill (Dentsply-Maillefer®, Ballaigues, Suíça) drip-cooled with saline. The cut was performed perpendicular to the direction of the obturation of the root canal, as to obtain a smooth root surface. The root extremities were prepared with the ultrasonic bit (Retro A3, Dabi Atlante®, Brasil) and filled with grey MTA Angelus® (Ange-

lus, Londrina, PR, Brasil). The bone cavity was filled with bovine bone xenograft Bio-Oss (Geistlich Pharma AG, Wolhusen, Suíça) and over it a bioabsorbable Bio-Guide collagen membrane (Geistlich Pharma AG) was placed.

Repositioned, the flap was initially sutured in the meeting point of the vertical and the horizontal incision, to obtain a closure free of tension. Following, a horizontal suture was performed with contention sutures and, finally, the suture of the vertical incision, all using a 4-0 wire (Prolene, Ethicon, São Paulo, SP).

Post-operative and pain management recommendations were made in writing, being: applying ice, using dental floss, careful brushing with a soft toothbrush and mouth rinsing with chlorhexidine digluconate at 0.12 % for a minute after morning and night brushing. Also, recommendations were made in regards to feeding, recommending a liquid, paste and frozen form for the first 24 hours and room or cold temperature for an additional 48 hours. In seven days, the patient returned and the sutures were removed.

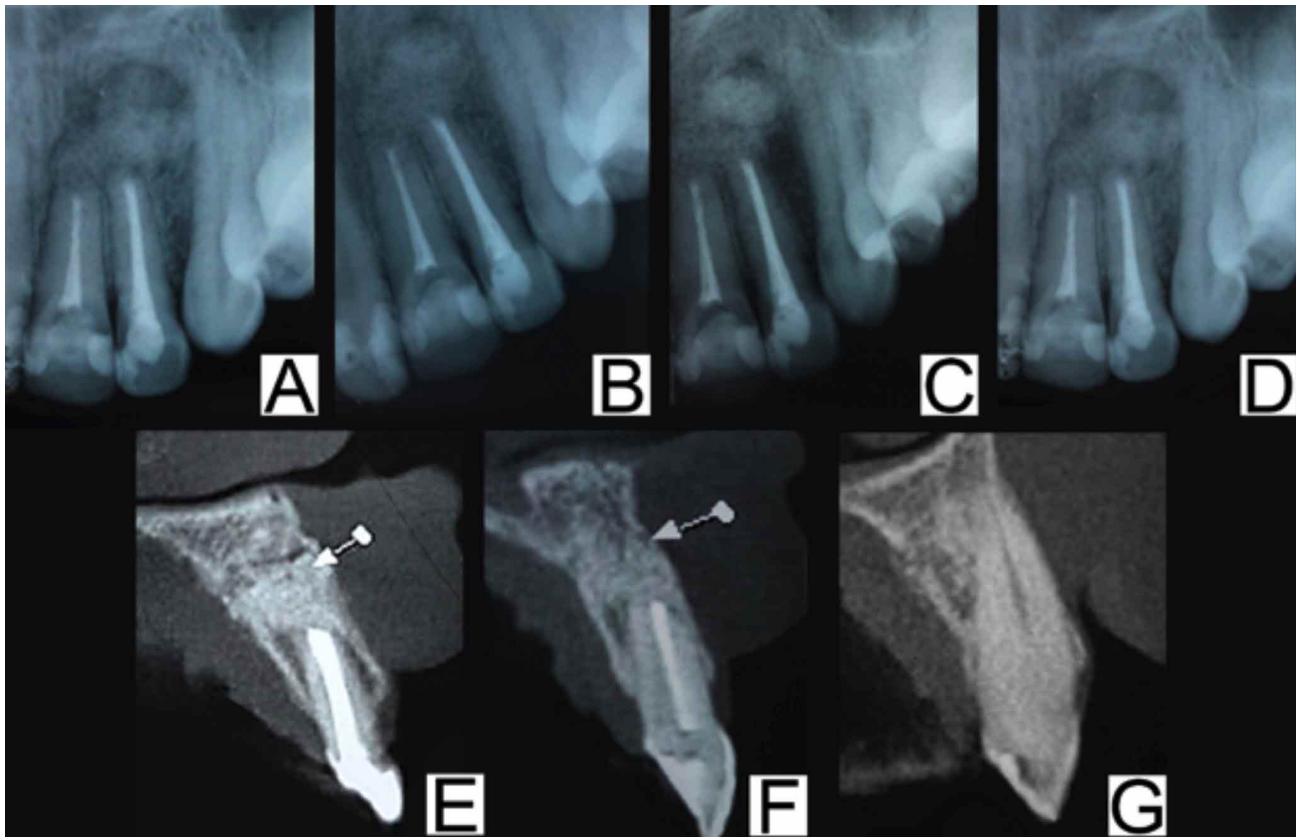


Fig. 2. A) Control periapical radiography after 1 month; B) Control periapical radiography after 4 months; C) Control periapical radiography after 1 year; D) Control periapical radiography after 18 months; E) CBCT image of the left central maxillary incisor after 2 years; F) CBCT image of the left lateral maxillary incisor after 2 years; G) CBCT image of the left maxillary canine tooth after 2 years.



There was minimal pain and localized swelling, which was solved in the revision period. A preservation protocol was established, with follow-ups at 1, 6, 12, 18 and 24 months after surgery.

All scheduled controls were performed (Figs. 2A, 2B, 2C and 2D). The cure progressed without complications. The post-operative follow-up indicated the resolution of the inflammation/infection, with absence of symptomatology and sinus tract. In the radiographic examinations and in CBCT after 24 months from the surgery, progressive apical bone

reparation and absence of signs of pathology were observed (Figs. 2E, 2F and 2G).

Clinical and radiographic evaluation 7 years after the surgery confirmed a stable result (Fig. 3A). The patient remains asymptomatic, with probing within normal standards and without mobility. CBCT showed the reconstruction of the periodontal ligament and presence of radiopaque apical material in the affected region (Figs. 3B, 3C, 3D and 3E). The tissue appears well integrated, although it is slightly more radiopaque and granular compared to adjacent bone.

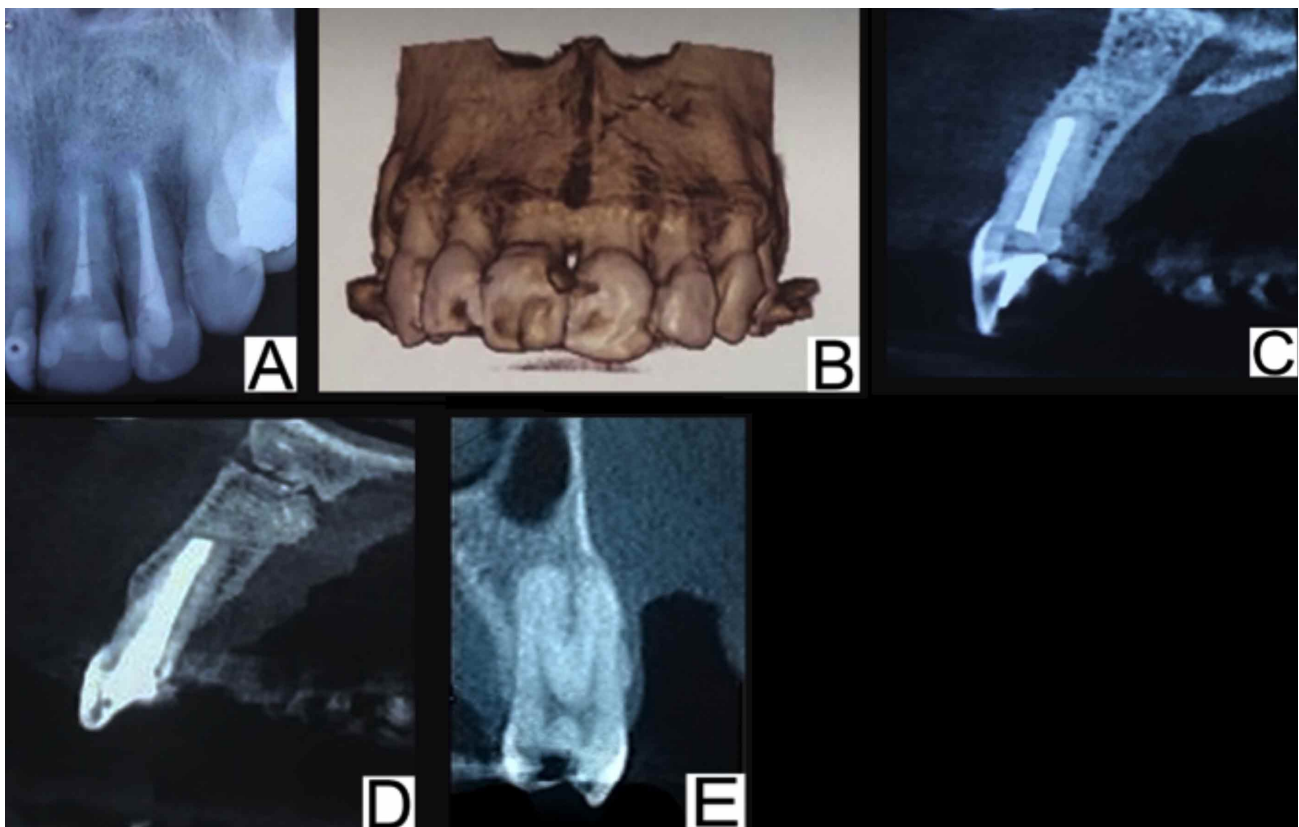


Fig. 3. A) Control periapical radiography after 7 years; B) 3D image of the maxilla after 7 years; C) CBCT image of the left central maxillary incisor after 7 years; D) CBCT image of the left lateral maxillary incisor after 7 years; E) CBCT image of the maxillary left first premolar after 7 years.

## DISCUSSION

Chronic apical abscess is linked, in some cases, to extraradicular infections (Ricucci *et al.*, 2018). Some studies indicate that bacteria can form a biofilm structure, invading the extraradicular area of the root canal through the apical foramen and annexing itself to the sealer around the root apex (Noiri *et al.*, 2002). Such extraradicular bacteria and their products cause

a defensive response from the host, generating bone resorption in the region, which over time becomes extensive (Wang *et al.*, 2012). Thus, these microorganisms become inaccessible to the defenses of the host, to conventional endodontic treatment and to systemically administered antibiotics, not allowing for the repair of the lesion and becoming a case which is

difficult to resolve. This study presents a case of clinical and radiographic success after 7 years post-operatively in the region of previously symptomatic to palpation left central and left lateral maxillary incisor which presented persistent sinus tract, with diagnosis of chronic apical abscess and through-and-through lesion.

Endodontic surgery is an indispensable treatment option in endodontics for dealing with non cured and symptomatic periapical lesions (Karan & Aricioglu, 2020). The main objective of this procedure is obtaining the regeneration of periradicular tissue, including the formation of a new ligament complex through the exclusion of any harmful agent within the physical limits of the affected root (Taschieri *et al.*, 2011). In particular, in certain cases, only surgical intervention can solve the problem, such as when a chronic lesion is related to a periapical cyst (Song *et al.*, 2011). In the present case, it was possible to observe in the tomography, hypodense image suggestive of inflammatory root cyst, which extended to 4 elements. Also, apical root resorption was detected in the affected incisors, which probably resulted in difficulties to perform cleaning and modeling in the apical third previously, allowing for the permanence of contaminated material and biofilm, which contributed to maintaining the periradicular pathology and, consequently, the presence of sinus tract. In this context, endodontic surgery was indicated as the treatment of choice.

The procedures of endodontic surgery comprise of the elimination of necrotic and infected tissues, the resection of the apical part of the tooth and the preparation of the apical cavity for the insertion of retrograde filling material (Karan & Aricioglu, 2020). The literature emphasizes the importance of this retrograde filling, which should hermetically seal the root extremity to avoid reinfection of the root canal (De Bruyne & De Moor, 2009). The Mineral Trioxide Aggregate (MTA) is a hydrophilic biomaterial which has been successfully used in root canals since 1993 and has been recommended as a gold standard for apical sealing due to its sealing ability, its osteogenic potential and its biocompatibility (Kruse *et al.*, 2016). In randomized clinical trials, the success rate of MTA, in endodontic surgery, have been reported as being more than 80 % after 12 months and more than 90 % with 2 years of follow-ups (Chong *et al.*, 2009). The clinical study of Kruse *et al.* (2016), in the same segment, showed better healing of the periapical bone in the group with MTA retrograde filling than the group which had only gutta-percha after 6 years of follow-ups. Also,

Karan & Aricioglu (2020) evaluated the bone consolidation with the use of MTA and/or platelet-rich fibrin application (PRF) in periapical lesions, during endodontic surgeries, through CBCT analysis, and high chances of success with the use of MTA and that the application of PRF in the surgical cavity did not necessarily improve the results. Given this, the retrograde sealing performed with MTA provides the trapping of any residual microorganisms within the root canal, thus avoiding aggression to periapical tissues and favoring repair (Vera *et al.*, 2012).

According to the American Academy of Periodontology, guided tissue regeneration (GTR) is defined as a surgical procedure with the goal of achieving new bone, cementum, and periodontal ligament attachment to a periodontally diseased tooth, using barrier devices or membranes to provide space maintenance, epithelial exclusion, and wound stabilization. However, a more ample application of the RTG techniques is observed, such as in Endodontics in conjunction with endodontic surgery. Periradicular regenerative surgery has presented clinically positive results for questionable teeth, confirming the formation of new tissues, showing radiographic resolution and even histologic evidence of apical tissue regeneration (Komabayashi *et al.*, 2011; Kourkouta & Bailey, 2014; Chi *et al.*, 2015; Parmar *et al.*, 2019). In GTR, the main objective behind the application of a membrane is to ease selective migration and the repopulating of progenitor cells in selected areas in the periodont (Parmar *et al.*, 2019). Thus, the fast way in which the oral epithelium proliferates and growth of the connective tissue for the bone defects is impeded, facilitates bone reparation (Gottlow *et al.*, 1986).

Bone grafting is a widely used therapeutic strategy for the correction of bone defects related to periodontal and/or periradicular lesions. Nowadays in RTG therapeutic procedures, inorganic bovine bone (xenograft) has been widely used with positive results. According with the study of Artzi *et al.* (2012), which analysed the influence of the usage of inorganic bovine bone as grafting in periapical regions after endodontic surgery in cats, concluded that there was significantly more bone formation when membrane and bone grafting were used, in comparison to only bone grafting or sites without filling. In correspondence, the case reports from Komabayashi *et al.* (2011), Korkouta & Bailey (2014) and Chi *et al.* (2015), which used RTG technique with bioabsorbable membrane in association with bovine xenograft in large bone defects, showed positive results in cure and repair. In the present case

it was opted to perform GTR using bovine bone graft Bio-Oss, to serve mainly as a space filling agent, to support the absorbable membrane Bio-Gide and as a potential skeleton to provide osteo constructive properties for the formation of new bone.

Through-and-through lesions, by definition, include lesions with lingual/palatal erosion, since buccal lesion by surgical approach will invariably lead to the formation of a passage defect (von Arx & Cochran, 2001). The present case obtained the diagnostic of chronic apical abscess with through-and-through lesion and a periradicular regenerative surgery was performed, combination of endodontic surgery with the GTR technique. The study of Taschieri *et al.* (2008) showed that the use of GTR associated with anorganic bovine bone in the treatment of through-and-through lesions may positively affect the healing process. According to the systematic review from Tsesis *et al.* (2011), GTR techniques favorably affected the outcome of surgical endodontic treatments in cases of large periapical lesions and through-and-through lesions. The retrospective cohort study from Taschieri *et al.* (2011) showed that the association of endodontic surgery and guided tissue regeneration for the treatment of through-and-through periapical lesions leads to excellent outcomes up to 4 years. Also, the systematic review from Sánchez-Torres *et al.* (2014) showed that the combined GTR technique obtains a greater success rate both in 4-wall lesions and in through-and-through lesions.

According to Karan & Ariciog̃lu (2020), there is a significant difference between the calculations of the size of periradicular lesions when there is a comparison between the bi and tridimensional methods. The radiographic bidimensional periapical measuring only describes the mesiodistal and apico-coronal extensions of periradicular lesions, while tridimensional CBCT allows also for evaluating the depth of the lesions (Parmar *et al.*, 2019). In the present case, it is possible to observe in the initial radiograph that the lesion apparently involves only the left maxillary incisors. However, during the CBCT analysis, it is possible to observe that the periradicular lesion, besides affecting the buccal and palatal bone plates, extends from the upper midline of the left central incisor to the mesial region of the left premolar.

In general, endodontic success is evaluated based on clinical, radiographic and histopathologic characteristics (Karan & Ariciog̃lu, 2020). In relation to the radiographic criteria to evaluate the cure, it is

noted that CBCT is a valuable tool for endodontic therapy, being an important resource for the evaluation of bone reparation in the post-treatment (Patel *et al.*, 2015). Schloss *et al.* (2017) observed that the CBCT analysis allowed for a better evaluation of the healing post periapical surgery than periapical radiographs. In the present case it is possible to observe the evolution of the repair through CBCT after 7 years from the performance of the procedure in comparison to the start of the case. The image after this period shows presence of apical radiopaque tissue in the affected region, even though it is slightly more opaque and granular in comparison to adjacent bone. Also, it is possible to observe the continuity of the lamina dura around the affected teeth. This way, the tridimensional image from the CBCT allows for a more precise evaluation and is recommended as a valuable tool for endodontic surgery (Karan & Ariciog̃lu, 2020).

## CONCLUSIONS

The absence of any clinical alteration, associated to the significant repair of the through-and-through lesion, observed through CBCT, after 7 years, proved that periradicular regenerative surgery allowed the resolution of the proposed case effectively. Thus, the final goal was achieved with the healing of periradicular tissues, reconstitution of the original architecture and the recovery of the patient's health.

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**RESUMEN:** El objetivo de este estudio fue reportar un caso de dos incisivos superiores con absceso apical crónico y lesión transversal sometidos a cirugía regenerativa perirradicular, con seguimiento clínico y evaluación mediante tomografía computarizada de haz cónico durante 7 años. En la presentación, había un trayecto sinusal persistente en el paladar y sensibilidad al tacto en la región apical de los incisivos maxilares laterales central y lateral izquierdo. La tomografía inicial reveló la presencia de una extensa zona radiolúcida en el tercio apical de los dientes referidos, con pérdida de las cortezas bucal y palatina. Para el tratamiento se realizó una cirugía regenerativa perirradicular, asociación de cirugía endodóntica con técnica de Regeneración Tisular Guiada, utilizando xenoinjerto óseo bovino y membrana bioabsorbible. Las evaluaciones clínicas y radiográficas, incluída la tomografía computarizada de haz cónico, a los sie-

te años del posoperatorio, mostraron ausencia de sintomatología y tracto sinusal, profundidad de sondaje dentro de los estándares normales y neoformación ósea apical.

**PALABRAS CLAVE: tomografía computarizada de haz cónico, absceso periapical, tejido periapical, cirugía periodontal, reporte de caso.**

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