**Association of the L-PRF Technique in apicoectomies of different etiopathogenies**

**Associação da técnica da L-PRF em apicectomias de diferentes etiopatogenias**

**Asociación de la técnica L-PRF en apicectomías de diferentes etiopatogenias**

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**Helen Alvarenga Leopoldo**

Graduate Student in Dentistry
Institution: Faculdade de odontologia Universidade do Grande Rio (UNIGRANRIO)
Address: R. Prof. José de Souza Herdy, 1160, 25 de Agosto, Duque de Caxias – RJ, CEP: 25071-202
E-mail: ha.leopoldo@gmail.com

**Marcella Maria Pinna Lopes**

Graduate Student in Dentistry
Institution: Faculdade de odontologia Universidade do Grande Rio (UNIGRANRIO)
Address: R. Prof. José de Souza Herdy, 1160, 25 de Agosto, Duque de Caxias – RJ, CEP: 25071-202
E-mail: marcellamaps.pina@gmail.com

**Fabiano Luiz Heggendorn**

Doctor in Oral Pathology
Institution: Faculdade de odontologia Universidade do Grande Rio (UNIGRANRIO)
Address: R. Prof. José de Souza Herdy, 1160, 25 de Agosto, Duque de Caxias – RJ, CEP: 25071-202
E-mail: fabianohegg@gmail.com

**ABSTRACT**

The objective of this series of clinical case reports was to demonstrate the longitudinal follow-up in the repair of periapical lesions treated using a therapeutic protocol combining apicoectomy with Guided Bone Regeneration (GBR) and Leukocyte-Platelet Rich Fibrin (L-PRF) techniques. Three cases of extensive periapical lesions were treated using the apicoectomy technique, followed by retro-preparation and retro-obturation with Mineral Trioxide Aggregate (MTA). The surgical sites were filled using L-PRF, PRF Block, and a composite of bone biomaterials with L-PRF. Histological results demonstrated different pathognomonic origins of these periapical lesions, including cemento-osseous dysplasia, actinomycosis, and periapical granuloma. The cases were followed for a period ranging from 6 months to 2 years and 4 months. In all three cases, the apicoectomy combined with the GBR technique using L-PRF resulted in the elimination of the inflammatory process and subsequent bone neoformation. The apicoectomy technique, when performed in conjunction with GBR and L-PRF to enhance
repair, enabled bone neoformation even in extensive intraosseous lesions, thus preserving the dental element.

**Keywords:** Actinomycosis, Apicoectomy, Cemento-Osseous Dysplasia, Periapical granuloma, L-PRF (Leukocyte-Platelet Rich Fibrin), GBR (Guided Bone Regeneration).

**RESUMO**

O objetivo desta série de relatos de casos clínicos foi de demonstrar o acompanhamento longitudinal no reparo de lesões paraendodônticas tratadas a partir de um protocolo terapêutico associando a técnica da apicectomia com a técnica de ROG e a da L-PRF. Os Três casos de lesões paraendodônticas extensas foram tratados utilizando a técnica da apicectomia, seguindo de retro preparo e retro obturação com aplicação de Agregado de Trióxido Mineral (MTA). Os sítios cirúrgicos foram preenchidos utilizando L-PRF, PRF Block, um agregado de biomateriais ósseos com o L-PRF. Os resultados histológicos apresentados demostraram diferentes origens patognomónicas destas lesões paraendodônticas, sendo Displasia cemento óssea, Actinomicose e Granuloma periapical. Os casos foram acompanhados por um período de 6 meses a 2 anos e 4 meses. Nos três casos apresentados, a apicectomia associada a técnica de ROG com a L-PRF possibilitou a eliminação do processo inflamatório com subsequente neoformação óssea. A técnica da apicectomia quando realizada em associação com a técnica de ROG e da L-PRF, visando a potencialização do reparo, possibilitou a neoformação óssea, mesmo em lesões intraósseas extensas, possibilitando a manutenção do elemento dental.

**Palavras-chave:** Actinomicose, Apicectomia, Displasia Cemento Óssea, Granuloma Periapical, L-PRF (Fibrina Rica em Plaquetas e Leucócitos), ROG (Regeneração Óssea Guiada).

**RESUMEN**

El objetivo de esta serie de informes de casos clínicos fue demostrar el seguimiento longitudinal en la reparación de lesiones paraendodônticas tratadas a partir de un protocolo terapéutico que asocia la técnica de la apicectomía con la técnica de ROG y L-PRF. Tres casos de lesiones paraendodônticas extensas fueron tratados utilizando la técnica de apicectomía, seguida de retropreparación y retroobturación con aplicación de Agregado de Trióxido Mineral (MTA). Los sitios quirúrgicos fueron rellenados utilizando L-PRF, PRF Block, un agregado de biomateriales óseos con L-PRF. Los resultados histológicos presentados demostraron diferentes orígenes patognomónicos de estas lesiones paraendodônticas, siendo Displasia cemento-óssea, Actinomicosis y Granuloma periapical. Los casos fueron seguidos durante un período de 6 meses a 2 años y 4 meses. En los tres casos presentados, la apicectomía asociada a la técnica de ROG con L-PRF posibilitó la eliminación del proceso inflamatorio con la subsecuente neoformación ósea. La técnica de la apicectomía, cuando se realiza en asociación con la técnica de ROG y L-PRF, con el objetivo de potenciar la reparación, posibilitó la neoformación ósea, incluso en lesiones intraóseas extensas, permitiendo el mantenimiento del elemento dental.

**Palabras clave:** Actinomicosis, Apicectomía, Displasia Cemento-Ósea, Granuloma Periapical, L-PRF (Fibrina Rica en Plaquetas y Leucocitos), ROG (Regeneración Ósea Guiada).
1 INTRODUCTION

Platelet-Rich Fibrin (PRF) is part of the second generation of platelet concentrates initially developed for oral surgery (Choukroun et al., 2006), being an autologous biomaterial obtained from the patient's own blood. Centrifugation of this biomaterial allows the formation of fibrin membranes rich in platelets and leukocytes (L-PRF). These L-PRF membranes are characterized by an autologous fibrin matrix with a high concentration of platelets, where cytokines are released (Gugliano, 2017).

Through these platelet concentrates, it is expected that tissue healing and lesion repair will be enhanced, leading to accelerated bone regeneration. The L-PRF technique allows for increased cell differentiation, enhancing osteogenesis and neovascularization, reducing post-operative edema and pain (Castro et al., 2017).

In this context, the application of Guided Bone Regeneration (GBR) technique is based on promoting regional bone gain through the placement and stabilization of a barrier membrane over the grafted biomaterial. This barrier membrane serves as a physical barrier to separate soft tissue from bone tissue, preventing other tissues such as connective tissue and epithelial cells from migrating into the defect site, thus not interfering with osteogenesis. This allows for bone neoformation to fill the region and maintains the direction of bone formation (Dos Anjos et al., 2021).

Regarding periapical surgery, Bramante and Berbert (2000) mentioned various surgical modalities, including apicoectomy. When conventional endodontic treatment fails to achieve adequate results, periapical surgery proves to be a suitable and safe technique for teeth with periapical lesions. This failure often stems from microorganisms deep within the root canal system that persist even after cleaning and shaping procedures. In this context, apicoectomy emerges as a surgical treatment involving the apical resection of the root (Harrison, 1992).

Used as a last resort after failure or when conventional treatment and retreatment are not possible, this technique is indicated for cases of apical resorptions, inaccessibility to the apex due to calcifications, curvatures, and steps in teeth with apical lesions, apical perforations, fractured instruments, instrument deviation, and surgical convenience. Its contraindications include cases of surgical inaccessibility, short roots, significant bone loss, and inadequately obturated canals (Bramante; Berbert, 2000).
Apicoectomy is performed using a tapered bur as perpendicular as possible to the root axis to avoid excessive exposure of the root surface, dentinal tubules, and canal lumen. The cut should be continuous, with constant pressure and vestibulo-lingual and disto-mesial movements. It is important to minimize this as much as possible, maintaining a crown/root ratio of 1:1.5 (Bramante; Berbert, 2000).

Therefore, in order to ensure success when performing apicoectomy, it is necessary to consider and observe several factors such as local anatomical conditions, the response of periapical tissues to the apicoectomized surface, and the technical resources available to perform it (Leonardi et al., 2006). Another aspect to take into account is the apical cut in apicoectomies, which can influence the capacity for repair of apical periodontal tissues over the apicoectomized surface depending on how it was performed (Maillet et al., 1996).

Following surgery, it is necessary to fill the surgical site with blood, which serves as the precursor to the repair process (Bramante; Berbert, 2000). In this regard, surgical adjuncts have been introduced to enhance the healing process in such surgeries, with the use of L-PRF being one of them. Additionally, the use of a membrane associated with apicoectomy aims to prevent the migration of epithelial and connective tissue cells, thereby allowing mesenchymal cell migration to assist in bone and periodontal ligament neoformation, thereby improving the quality of surgical repair and prognosis (Chi et al., 2015; Torres et al., 2014; Aguiar, 2017).

This combination of techniques, apicoectomy and GTR technique, reduces sequelae by preventing epithelial and connective cell migration, promoting surgical neoformation and repair, inducing rapid healing, bone maturation, and improved periodontal appearance. The L-PRF membrane functions as a biomaterial capable of osteoinduction, osteoconduction, and osteoproliferation (Mauceri et al., 2021), while the grafting biomaterial acts as a biological connector, forming a matrix for neovascularization and stem cell migration to the site. Thus, the application of L-PRF associated with GTR in apicoectomy surgeries facilitates blood clot formation, supporting and inducing the repair process (Aguiar, 2017).

The objective of this series of clinical case reports was to demonstrate longitudinal follow-up in the repair of endodontically treated lesions using a therapeutic protocol that combines apicoectomy with GTR and L-PRF techniques.
2 CASE REPORT

This study was submitted to the ethics committee for research involving human subjects at the University of Grande Rio, Unigranrio.

2.1 APICOECTOMY – TECHNIQUE AND APPLICATION

The apicoectomy technique followed the same protocol for apical resection in the three initial cases presented, with only the angle of the cut alternating: 45° in cases 1 and 2, and 90° in case 3, following the technique described by Bramante and Berbert (2000).

For the root apex sectioning technique, a high-speed handpiece and a tapered conical bur were used. The apical sectioning was performed as perpendicular as possible to the root axis when applying the 90° cutting angle, whereas for the 45° angle, the sectioning was done to allow the lower tip of the angle to be on the palatal aspect of the root and the upper end on the vestibular aspect, ensuring minimal exposure of the root surface, dentinal tubules, and canal lumen. In both angulation techniques, the bur penetrated the root from distal to mesial with continuous and uniform cutting under constant irrigation with saline solution to prevent root heating. After completing the cut, a smoothing was performed with apical files to reduce grooves left by the bur and to smooth the cutting edges. (Bramante; Berbert, 2000)

At the end of the procedure, retro-preparation was performed on the apicectomized roots using a spherical bur and ultrasonic instrumentation. The ultrasonic tip was maneuvered within the canal limits in a circular motion, with the tip moving in a peak direction following the canal path, approximately 2 mm deep into the canal. After retro-preparation, Mineral Trioxide Aggregate (MTA Angelus) was condensed into the retrofilling region of the canal.

2.2 PRF- PREPARATION AND APPLICATION

The L-PRF technique followed the same preparation protocol for the three cases presented, according to Choukroun (Dohan et al., 2006). Prior to each surgery, intravenous blood was collected into 8 sterile 10 ml tubes without anticoagulant and immediately centrifuged at 2,700 RPM to separate the blood sample into three layers: the
bottom layer containing red blood cells, the middle layer with the PRF clot, and the top layer consisting of acellular plasma (Ehrenfest et al., 2010).

Out of the 8 tubes, two were centrifuged for 3 minutes to prepare PRF Block, while the remaining 6 tubes were centrifuged for 12 minutes to prepare L-PRF membranes. After centrifugation, the PRF clot was collected from the 6 tubes using sterile forceps, and subsequently, the red blood cell layer was separated from the PRF clot, keeping the buffy coat intact, which was then compressed in the PRF-BOX to obtain the L-PRF membrane (Figure 1).

A L-PRF membrane was minced and mixed with the liquid fibrin from the 2 tubes of PRF centrifuged for 3 minutes. In cases 1 and 2, this mixture was added to Nanosynt–FGM bone biomaterial, and in case 3, it was added to Extra Graft XG-13 bone biomaterial to prepare PRF Block, resulting in a moldable composite applicable at each presented case's surgical site (Figure 1).

For filling the cystic cavities, L-PRF membranes were used first, followed by PRF Block, lightly pressed into each lesion, with subsequent covering by additional L-PRF membranes to overlay the bone defect under the surgical suture area. After positioning and embedding the membranes beneath the surgical margins of the incisions, soft tissue sutures were performed to approximate the margins.

Figure 1: Sequência metodológica do preparo da membrana de L-PRF e do PRF Block

Source: Authors' own elaboration
2.3 CASE 1

A 53-year-old female patient with melanodermia presented at the dental clinic complaining of increased vestibular cortical between teeth 31 and 42 for the past 2 years, accompanied by purulent discharge and no pain. Periapical radiographic examination revealed endodontic treatment on teeth 31, 32, and 41. Teeth 32 and 41 showed inadequate root canal filling short of the apex and a cystic lesion extending from tooth 33 to 43 associated with their roots. Tomographic examination identified an expansive-appearing lesion, predominantly hypodense, affecting the mandibular body. There was thinning of the bone cortical with rupture, measuring 21 x 9.2 mm in the axial plane, closely related to the roots of the lower central incisors, lateral incisors, and canines (Figure 2).

Figure 2: Case 1 – intraoral condition showing increased volume in the vestibular cortical of the patient (A) and panoramic radiograph indicating the extent of the intraosseous lesion between teeth 33 and 43 (A.1). Panoramic radiographs demonstrating the condition of the intraosseous lesion and root canals after retreatment of tooth 32 (B.2 and B.1) and endodontic treatment of tooth 43 (B), 42 (B and B.1), 33 (B.2). Reduction in volume in the vestibular cortical (C) and panoramic radiograph (C.1) after retreatment and endodontic treatments of the teeth.

Source: Authors’ own elaboration
Initially, an aspiration biopsy was performed for subsequent cytological evaluation to characterize the inflammatory process associated with an incisional biopsy at the center of the lesion. At the end of the procedure, a drain was placed for decompression of the surgical lesion. Subsequent analysis of the cytological material revealed findings consistent with inflamed cystic content, including presence of bacteria and rare epithelial cells. The histopathological examination diagnosed periapical cemento-osseous dysplasia.

Next, the retreatment of tooth 32 was planned, with intraoperative identification of root canal obstruction, followed by endodontic treatment of teeth 43, 42, and 33, each involving two sessions of calcium hydroxide.

Once the root canals were adequately prepared, apicoectomy surgery was performed on teeth 31, 32, 41, 42, and 43, along with an incisional biopsy of the lesion, followed by curettage of the cystic cavity to remove fibrous tissue. The apicoectomy technique applied involved a 45° beveled section on teeth 31, 32, 41, 42, and 43.

Next, retro-preparation of the apicoectomized roots was performed following the protocol of the apicoectomy technique, and Mineral Trioxide Aggregate (MTA, Angelus®) was applied into the cavity using a condenser for retrofilling of the canal.

After the apicoectomy surgery, the cystic cavity was filled with PRF Block, composed of Nanosynt synthetic graft (FGM Ref. 8961 Lot.164888), L-PRF membranes, and liquid fibrin, as described in the L-PRF technique. Finally, four L-PRF membranes were placed over the grafted site, covering the entire graft area, followed by tissue suturing (Figure 3).

Subsequently, the histopathological examination confirmed the diagnosis of periapical cemento-osseous dysplasia, previously diagnosed before the apicoectomy surgery.
Figure 3: (A) Surgical sequence with bone defect opening, apex exposure with beveled cut at a 45° angle. (B) GBR technique associated with L-PRF. (C) PRF Block being inserted into the cystic cavity (D) followed by covering with L-PRF membranes (E). Surgical site approximated and sutured (F).

Source: Authors' own elaboration

Regular follow-up was conducted over 2 years and 4 months, demonstrating significant regression of the lesion and new bone formation with isolated new bone nuclei on radiographic examination (Figure 4).

Figure 4: 2 years and 4 months postoperative follow-up. Panoramic radiograph (A) showing higher concentration of MTA (red arrows) and lower concentration in the retro preparation region of the apicectomized teeth. Periapical radiographs do not show MTA presence in elements 43, 42, and 41 (B, C, and D), with MTA presence visible in elements 31 and 32 (red arrows). Radiographic images indicate new bone formation throughout the region previously occupied by the lesion.

Source: Authors' own elaboration
2.4 CASE 2

A 54-year-old female patient with leucoderma presented at the dental clinic complaining of a fistula in the distal region of tooth 11 (Figure 5). Radiographic and tomographic examinations revealed satisfactory endodontic treatment in teeth 11, 12, and 13.

Figure 5: Presence of fistula in the distal region of tooth 11 (A), panoramic section of the initial tomography showing intraosseous lesion (B, yellow arrows) involving tooth 13, with hyperdense image within the lesion (C, green arrow), tooth 12 (D), and interdental region between teeth 12 and 11 demonstrating bone rarefaction (blue arrows), and tooth 11 demonstrating loss of continuity of the nasal floor (F, orange arrows). Axial section of the initial tomography demonstrating the extent of the intraosseous lesion (G). Surgical excision of multiple soft tissue fragments from the intraosseous lesion (H and I). Root exposure after apicoectomy, followed by application of MTA in the retro-obturated cavity of teeth 11, 12, and 13 (J), subsequent application of PRF Block (K), coverage with L-PRF membranes (L and M), and suturing of the surgical area (M).

In the tomographic examination, a hypodense image well delimited by a hyperdense halo was observed, extending from tooth 11 to tooth 13 in the anterior maxilla region, both of which had undergone previous endodontic treatment (Figure 5). The panoramic section of the tomographic exam revealed bulging of the floor of the right nasal cavity, indicating apical root resorption, with a unilocular radiolucent image in the anterior maxilla associated with the periapical region of these elements, showing cystic characteristics (Figure 5).
Initially, during surgery, surgical excision of multiple irregularly shaped and fibroelastic soft tissue fragments with a brownish coloration, measuring 22 x 10 x 9 mm collectively, associated with purulent material, was performed (Figure 5).

After removing the fragments, apicoectomy surgery was performed, with a 45° bevel cut as described above (Figure 5). The apicoectomy cut technique applied was a 45° bevel cut, and at the end of the procedure, retro-preparation was done on the apicoectomized roots using a spherical bur and ultrasonics, with Mineral Trioxide Aggregate (MTA) used for retro-obturation of the canal (Figure 5).

The guided bone regeneration (GBR) technique associated with L-PRF followed the previously described protocol, using Nanosynt synthetic graft (FGM, Joenville, Brazil Ref. 8960 Lot. 158788), combined with PRF Block technique, and subsequent covering with L-PRF membranes. After inserting the biomaterials, the edges were approximated, and the surgical site was sutured (Figure 5).

Subsequently, histopathological examination revealed the diagnosis of actinomycosis. Six months post-operation, a new tomography showed the presence of hyperdense cores suggestive of new bone formation throughout the grafted surgical cavity (Figure 6):

Figure 6: 6-month postoperative showing areas of new bone formation around teeth 13 (A), 12 (B), and 11 (C). Axial section demonstrating horizontal filling in the bone cavity (D).

2.5 CASE 3

A 62-year-old female patient with leucoderma presented at the dental clinic complaining of an inflammatory cyst for about two years. Tomographic examination
revealed the presence of a radiolucent image extending from tooth 11 to tooth 13, related to the apical portion of the root of tooth 12. This was associated with destruction of the vestibular cortical wall in tooth 12, extending from tooth 13 to 11 (Figure 7).

Figure 7: Initial condition of case report 3. Panoramic section (A), 3D reconstruction (B), axial section (C), and transverse section (D) demonstrating the extent of the lesion with destruction of the vestibular cortical bone wall, closely associated with tooth 12.

Source: Authors' own elaboration

After full-thickness flap surgical access, an aspirative puncture was performed, followed by removal and curettage of the lesion. Multiple irregularly shaped and fibroelastic soft tissue fragments with brownish coloration, measuring 25 x 15 x 10 mm collectively, were removed and sent for histopathological analysis.

Subsequently, surgical debridement was performed to expose the root portion of tooth 12, followed by apicoectomy surgery using a 90° section technique, following the previously described surgical sequence.

The guided bone regeneration (GBR) technique associated with L-PRF followed the previously described protocol, using Extra Graft XG-13 synthetic graft (Silvestre Labs Química & Farmacêutica LTDA, Lot.1702003), combined with PRF Block technique, and subsequent covering with L-PRF membranes. After inserting the biomaterials, the edges were approximated, and the surgical site was sutured (Figure 8).
Figure 8: Case 3, intraoperative view of apicoectomy surgery associated with GBR and L-PRF technique. Aspirative puncture (A) followed by curettage of the lesion (B) and apicoectomy using a diamond bur (C) and retro-preparation with ultrasonics (D). Image E demonstrates the final shape of the apicoectomized apex. The grafting sequence with PRF Block (F) and its placement in the cavity (G), followed by application of L-PRF membranes (H).

The histopathological examination revealed the origin of the lesion to be a periapical granuloma located in the periapical region of tooth 12. Additionally, the 1-year and 7-month follow-up tomographic examination showed the absence of the lesion with bone neoformation, without inflammatory processes. Furthermore, the tomographic image indicated periapical bone neoformation and regeneration of the vestibular cortical wall in tooth 12 (Figure 9).

Figure 9: Case 3 – 1 year and 7 months postoperative follow-up of case 3. Panoramic image (A), axial (C), and transverse sections (D and E) showing the presence of bone neoformation cores, with regeneration of the vestibular cortical wall in the 3D image. Image E demonstrates the presence of MTA in the retro-obturation in the apical region of the tooth.
3 DISCUSSION

In Case 1, cemento-osseous dysplasia typically presents as a fibro-osseous lesion with a predilection for the supporting structures of teeth in the gnathic bones, predominantly associated with the anterior mandible, often appearing as solitary or multifocal lesions, as presented in this case report (Neville et al., 2016). As the pathology progresses, the lesions merge into a linear pattern of radiolucency involving the apices of multiple teeth. In its final stage, this lesion reveals dense calcification circumscribed by a narrow radiolucent halo with intact periodontal ligament (Neville et al., 2016).

On the other hand, actinomycosis, diagnosed in Case 2, is an infection caused by actinomycetes, which are filamentous, branching, gram-positive anaerobic bacteria. Actinomyces israelii is the predominant causative microorganism, often in combination with streptococci or staphylococci (Neville et al., 2016). It manifests as either acute infection with rapid progression or chronic infection with slow dissipation associated with fibrosis. Most cases are diagnosed in the cervicofacial region, where the bacteria penetrate tissue through areas of previous trauma, such as soft tissue injury, periodontal pockets, non-vital teeth, post-extraction dental sockets, or infected tonsils. It presents as a hardened area of fibrosis with a "woody" appearance, as shown in Figure 5.H and I, often forming a softer abscess center (Neville et al., 2016).

Regarding clinical Case 3, periapical granuloma is characterized by a mass of chronically or acutely inflamed granulation tissue at the apex of a non-vital tooth. Periapical granulomas are typically asymptomatic. They represent 75% of periapical inflammatory lesions, and 50% do not respond to conservative endodontic treatments. These lesions are identified through routine radiographic examinations where loss of the periapical lamina dura can be observed, appearing well-circumscribed or poorly defined, and may or may not have a surrounding radiopaque halo (Neville et al., 2016).

In this context, it is up to the clinician to identify and choose the appropriate technique and approach that can lead to lesion regression, adequate bone neoformation, and resolution of the inflammatory process. For Cemento-Osseous Dysplasia treatment, when the patient is asymptomatic, regular follow-up appointments with prophylaxis and reinforcement of oral hygiene are necessary to control periodontal disease and prevent attachment loss. Symptomatic patients may require antibiotics, excision of necrotic bone, and curettage of the cyst and fibro-osseous proliferation in the surrounding bone.
In the case of Periapical Granuloma, conventional endodontic treatment is performed, but when restorative treatment is not feasible, extraction of the tooth followed by curettage of all apical soft tissue is necessary. Teeth that have undergone endodontic treatment should be reassessed every 1 to 2 years at a minimum to rule out any possible increase in the lesion and ensure proper healing. If initial conventional endodontic treatment fails, retreatment is the preferred approach to reduce bacterial contamination and should be considered before periapical surgery. Periapical surgery involves curettage of all periradicular soft tissue, apicoectomy, and sealing of the root apex.

Treatment for Actinomycosis consists of surgical debridement of the lesion and prolonged antibiotic therapy (Neville et al., 2016). Therefore, it is essential to follow the correct surgical protocol, which involves accessing the lesion, complete curettage, apicoectomy, retrograde cavity preparation with ultrasonic tips, and appropriate selection of retrofilling material (Morales, 2014). The proper choice of retrofilling material is crucial as its adaptation to the cavity walls is essential to prevent marginal leakage, which can lead to technique failure (Von Arx et al., 2012).

In all three cases presented, Mineral Trioxide Aggregate (MTA) was used for apical sealing of the apicoectomized roots. The use of MTA has been increasingly adopted in endodontics for retrofilling due to its ability to form a protective barrier in conjunction with dentin tissues and its biocompatibility with the periodontium. MTA possesses physical and chemical properties that provide good results in partial or total root canal obturation. It exhibits low solubility, adhesion to dentin, resistance to moisture, and compressive strength (Sousa et al., 2014).

However, in apicoectomy techniques without the use of grafting biomaterials, it becomes necessary to fill the surgical site with blood, which serves as the precursor to the repair process (Bramante; Berbert, 2000). The physical, chemical, and biological properties of bone grafts can be enhanced when combined with the L-PRF technique, resulting in better clinical outcomes compared to their isolated applications. Guéhennec et al. (2004) reported on the association of a three-dimensional fibrin mesh with the microstructure of bone biomaterials. The authors suggested improved initial stability in bone filling due to fibrin adhesion to bone tissue walls. In terms of biological properties, they proposed a positive effect of fibrin associated with bone grafts, promoting neovascularization, highly vascularized granulation tissue development, and the presence of various growth factors facilitated by fibrin (Guéhennec et al., 2004).
Bone grafting associated with L-PRF is a safe and effective biomaterial in osteogenesis and osteoconduction processes. Del Corso et al. (2012) reported the application of 6 L-PRF membranes in a radicular cyst lesion, resulting in bone tissue remodeling. Both Del Corso et al. (2012) and Bastami & Khojasteh (2016) indicated various clinical applications of L-PRF, with few clinical reports on its use in cystic and endodontic lesions. However, Simonpieri et al. (2004) reported contradictory use of this technique in cysts but suggested that with proper debridement and post-operative control, PRF techniques could be applied in such situations.

Another aspect to consider is the apical cut in apicoectomy procedures, which can influence the ability of apical periodontal tissues to repair over the apicoectomized surface depending on how it was performed (Maillet et al., 1996). In the cases presented here, apicoectomies performed at 45° and 90° angles demonstrated satisfactory periapical repair, allowing for the preservation of dental elements. However, to evaluate the procedure's effectiveness, various factors must be considered, including the initial size and origin of the lesion, as discussed in this study, where we report three different etiopathogeneses for the development of extensive periapical lesions, demonstrating long-term therapeutic success in all three cases. Song et al. (2013) reported that bone thickness near the lesion and the type of material used for root sealing are crucial determinants of successful repair.

4 CONCLUSIONS

The technique of apicoectomy, when performed in conjunction with ROG (guided bone regeneration) and L-PRF techniques aimed at enhancing repair, facilitated bone neoformation even in extensive intraosseous lesions, allowing for the preservation of the dental element.
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