PERIAPICAL SURGERY WITH L-PRF GRAFT FOR PERSISTENT APICAL PERIODONTITIS TREATMENT: CASE REPORT

CIRURGIA PERIAPICAL COM ENXERTO L-PRF PARA TRATAMENTO DE PERIODONTITE APICAL PERSISTENTE: RELATO DE CASO

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ABSTRACT

Teeth with persistent apical periodontitis represent a challenge in clinical practice, because bone repair cannot be promoted in certain situations with endodontic retreatment alone. Thus, periapical surgical approaches are needed, especially when dealing with true cysts, or in cases of extraradicular biofilm. This case report describes a case of endodontic surgery on teeth 11, 21 and 22, by using leukocyte and platelet-rich fibrin (L-PRF), considering previous endodontic retreatment. The planning included cone beam computed tomography images, surgical treatment with periapical lesion curettage, apicoectomy, retrograde preparation, retrograde filling, and grafting with plugs and L-PRF membranes. A 2-year clinical, radiographic and tomographic follow-up showed bone repair and absence of clinical signs of infection. The use of contemporary techniques, combined with modern imaging resources in diagnosis, planning and follow-up favored the success of the treatment.

KEYWORDS: Apicoectomy; radicular cyst; leukocyte- and platelet-rich fibrin; cone-beam computed tomography.

RESUMO

Dentes com periodontite apical persistente representam um desafio na prática clínica porque a reparação óssea não pode ser promovida em determinadas situações apenas com retratamento endodôntico. Assim, são necessárias abordagens cirúrgicas periapicais, principalmente quando se trata de cistos verdadeiros ou em casos de biofilme extrarradicular. Este relato de caso descreve um caso de cirurgia endodôntica nos dentes 11, 21 e 22, utilizando fibrina rica em leucócitos e plaquetas (L-PRF), considerando retratamento endodôntico prévio. O planejamento incluiu imagens de tomografia computadorizada de feixe cônico, tratamento cirúrgico com curetagem da lesão periapical, apicectomia, preparo retrógrado, preenchimento retrógrado e enxertia com plugs e membranas de L-PRF. O acompanhamento clínico, radiográfico e tomográfico de 2 anos mostrou reparação óssea e ausência de sinais clínicos de infecção. A utilização de técnicas contemporâneas, aliadas a modernos recursos de imagem no diagnóstico, planejamento e acompanhamento favoreceram o sucesso do tratamento.

PALAVRAS-CHAVE: Apicectomia; cisto radicular; fibrina rica em leucócitos e plaquetas; tomografia computadorizada de feixe cônico.

1. INTRODUCTION

Endodontic surgery has been performed in dentistry since the mid-19th century[1]. At that time, the intention was to remove the root apex without any real concern about microbial recolonization. It was only in the 1890s, in Germany, that the approach for preparing and later sealing the retrograde root canal cavity was discussed and put into practice with a significant increase in future success rates[1]. Even so, the instruments for this apical preparation were mostly improvised, and the materials for retrograde filling did not have the ideal characteristics of coming into direct contact with the biological tissue[1]. Amalgam was considered the material of choice for many decades, owing to its low cost and excellent marginal sealing[2], but it had disadvantages from a biological point of view, because of mercury release and soft tissues pigmentation[3]. In 1993, a study led by Professor Mahmoud Torabinejad[4] from Loma Linda University in California, USA, presented a material with excellent marginal sealing qualities, and excellent tissue tolerance, i.e., mineral trioxide aggregate (MTA), still considered the gold standard retrograde filling material today.

In recent decades, the technological revolution prompted by the diagnostic image resources of cone beam computed tomography (CBCT), magnification (using magnifying glasses or operating microscope), and the development of specific instruments (particularly, ultrasonic tips) for apical surgery has made apical surgery a less invasive and more predictable technique[5,6]. Furthermore, the use of

autogenous grafts to fill the surgical pocket to avoid postoperative complications, such as suture rupture and flap dehiscence, is another measure that reduces postoperative pain and incites biological responses[5]. L-PRF (fibrin rich in platelets and leukocytes) is a type of platelet aggregate obtained through intravenous puncture in the patient, and subsequent centrifugation of the extracted blood. Its use in the form of plugs or membranes for use in surgical surgery in implant dentistry and regenerative endodontic procedures, as post-extraction socket filling material, has been widely studied in the literature[6,7,8,9,10].

Although constant improvements have been made in techniques and resources in endodontic surgery, correct diagnosis of apical periodontitis, which cannot be treated with orthograde root canal therapy, and the anatomical variations of the root canal, can represent major challenges even for experienced professionals. In view of the difficulties of treating persistent periapical disease, the aim of this study was to describe a clinical case of endodontic surgery on maxillary anterior teeth by using modern surgical management techniques and autogenous L-PRF grafting.

2. CASE REPORT

A 27-year-old female, in good general health, sought care at a private clinic, complaining of "recurrent infections in the front teeth." She reported that she had started endodontic retreatment of teeth 21 and 22 six months prior with another professional, and that her teeth had been subjected to 3 changes of intracanal medication during this period, but that there was a recurrence in the local infection, characterized by swelling and pain in the vestibular region of the teeth. Clinical examination triggered pain upon palpation of the gingival mucosa and percussion of tooth 22. There were no clinical signs of mucosal inflammation, such as fistula, erythema or swelling. Radiographic examination revealed radiolucent areas in the periapical region of teeth 21, 22 and 11 (Figure 1). A CBCT examination (PreXion, San Mateo, CA, USA) was requested to obtain a more accurate assessment, and promote more predictable planning. The CBCT examination showed a hypodense periapical area involving teeth 21 and 22, measuring approximately 16 x 13 mm, and another smaller lesion on the periapex of tooth 11, in addition to disruption of the buccal and palatal cortices. (Figure 2 A-C).

Given the patient's clinical history, the hypothesis of a persistent lesion compatible with a true radicular cyst or extraradicular biofilm infection was raised. The proposed approach was to retreat teeth 11, 21 and 22 using a fiberglass post (Exacto, Angelus, Londrina, PR, Brazil) for intraradicular retention to restore teeth 11 and 21, followed by endodontic surgery making use of a periapical approach for the 3 teeth. Once the treatment plan was established, the patient signed an informed consent form agreeing to undergo the suggested procedures.

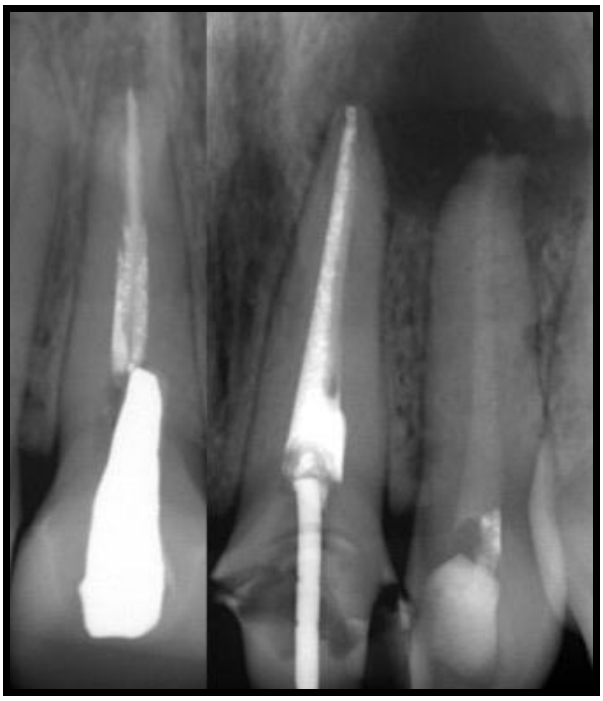

Figure 1. Presence of a radiolucent image suggestive of a periapical lesion in teeth 11, 21 and 22.

Endodontic retreatment

Previous endodontic retreatment consisted of removing the temporary crowns of teeth 11 and 21, and removing the metal retainer of tooth 11 with an E12 ultrasonic tip (Helse Ultrasonic, Santa Rosa de Viterbo, SP, Brazil), accompanied by R1 ClearSonic Black and R2 FlatSonic Gold tips (Helse Ultrasonic, Santa Rosa de Viterbo, SP, Brazil) to remove the remaining gutta-percha. Teeth 21 and 22 were instrumented with #50-70 K-type hand files, together with 2.5% sodium hypochlorite irrigating solution to remove intracanal medication, and prepare the root canal. The canals were filled using the lateral condensation technique with AH Plus Jet sealer (Dentsply Maillefer, York, PA, USA) in the same session.

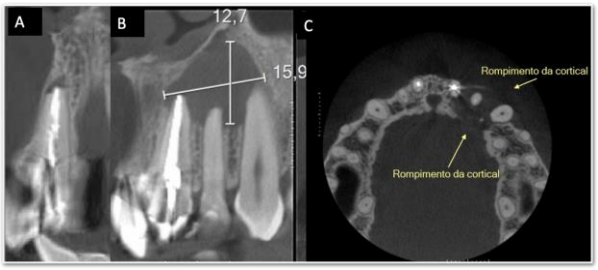

Figure 2. Periapical hypodense area in teeth 11 (A), 21 and 22 (B), and disruption of the buccal and palatal bone cortices (C).

L-PRF preparation

The protocol for obtaining fibrin rich in leukocytes and platelets (L-PRF) was carried out by collecting 8 tubes of blood (10 mL without anticoagulant) by venipuncture and centrifugation at 2,700 rpm for 12 minutes. Next, the fibrin clots from centrifugation were placed in a metal box used specifically for this type of procedure (Fibrin box). The L-PRF membranes obtained from 3 of the 8 tubes were made by light

compression in the metal box. The remaining clots were kept intact in the form of plugs until insertion into the surgical cavity.

Periapical surgery

The surgery was performed under magnification with Head Spot II MOD SE Loupes at 3.5x magnification, and LED photophore at maximum light intensity (5000 lux) (MMO, São Carlos, SP, Brazil). A full-thickness flap was opened with 2 relaxing incisions distal to teeth 12 and 23. Since there was only a thin layer of buccal cortical bone surrounding the rupture area, a Lucas curette, together with a straight Mosquito-type hemostatic forceps, was sufficient to gain access to and remove the periapical lesion (Figures 3A-D). The lesion was placed in a buffered 10% formaldehyde solution, and sent for anatomopathological diagnosis after surgery to the Goiás Center of Oral Diseases (Federal University of Goiás, Goiânia, GO, Brazil).

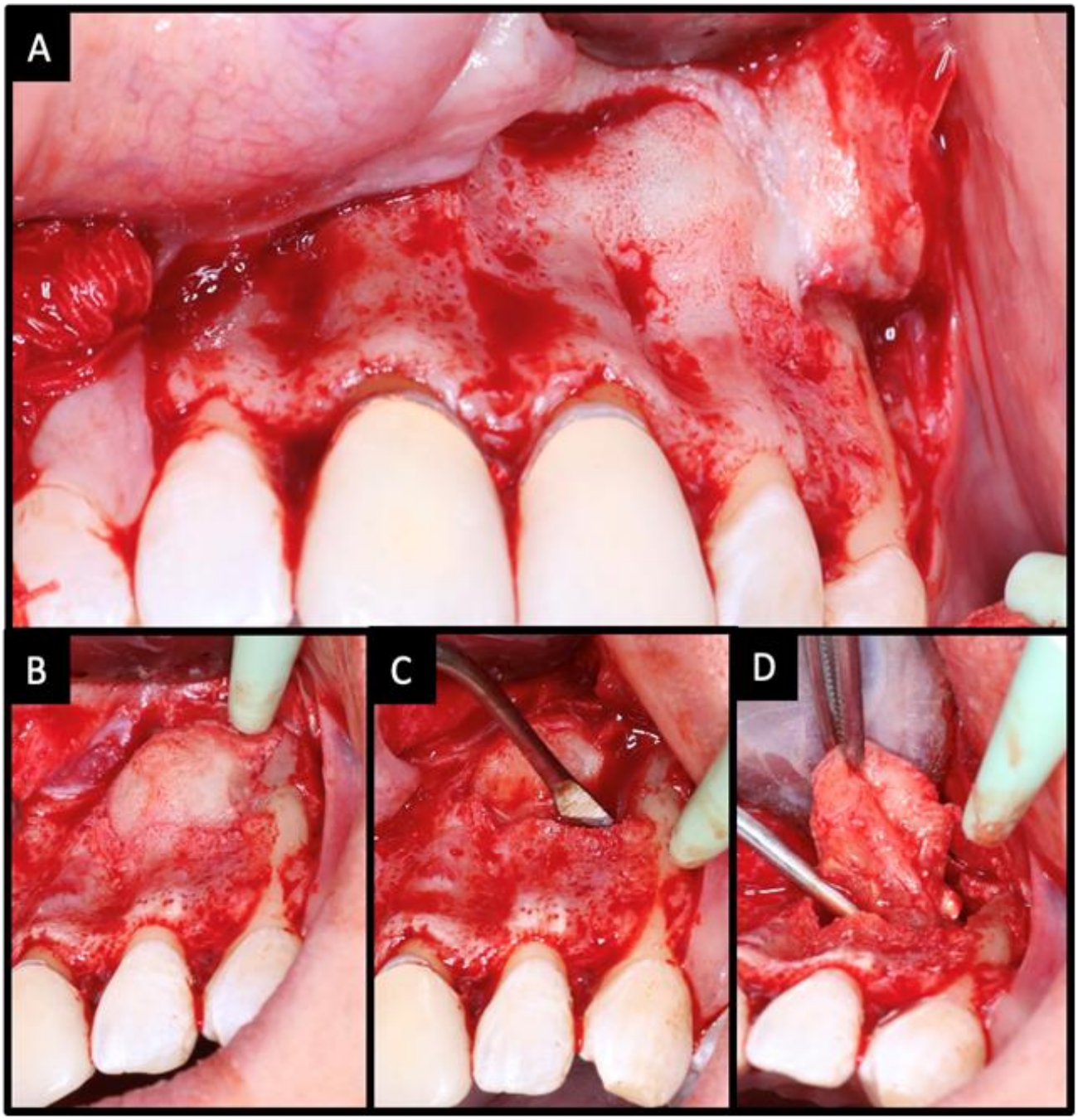

Figure 3. Total flap with relaxing incisions on the distal sides of teeth 12 and 23 (A); exposed lesion disrupting the buccal cortical (B); use of a Lucas curette and straight hemostatic forceps to remove the lesion (C and D).

Apicoectomy and retrograde preparation were performed with Bladesonic and P1M ultrasonic tips (Helse Ultrasonic, Santa Rosa de Viterbo, SP, Brazil) respectively (Figures 4A and 4B). After the apical

cavities were prepared, they were retrograde filled with Bio-C Repair bioceramic sealer (Angelus, Soluções Odontológicas, Londrina, PR, Brazil) (Figures 4C and 4D). Then, the L-PRF was removed from the test tube (Figure 4E), the surgical pocket was filled and covered with the plugs and membranes of this aggregate, and the flap was sutured with 5-0 nylon thread (Ethicon, Johnson & Johnson, Raritan, NJ, USA) (Figures 4F-H). The anatomopathological diagnosis was compatible with a radicular cyst, characterized by a chronic inflammatory process defined by macrophages, vascular hyperemia and a dense fibrous connective tissue capsule covered by non-keratinized stratified squamous epithelium (Figure 5). Clinical, radiographic, and tomographic follow-up indicated signs of bone repair, and absence of edema and infection. In the apical region of tooth 22, an image compatible with that of a scar was seen, characterized as a radiolucent/hypodense area circumscribed by new bone. Figure 6 shows the images before and after 2 years of treatment, and highlights the bone and the fibroscar tissue from the repair of the operated region, in addition to the clinical aspect of gingival health.

3. DISCUSSION

Careful planning based on accurate anamnesis/clinical history and multiplanar imaging exams (coronal, axial, sagittal and oblique planes) are crucial for optimal surgical management of complex cases. In the preoperative period of this study, CBCT allowed the authors to define the actual size of the lesions, their correlation with the surrounding anatomical structures (maxillary sinus and buccal and palatal cortices), and the best surgical access approach (whether through the buccal or palatal cortical plates, or else both). The limitation of periapical radiographic examinations represented by overlapping images, unfeasible measurements, and actual correlations with anatomical structures can put surgical interventions at risk, and lead to iatrogenic events that considerably reduce success rates[11]. Current endodontic microsurgery still includes magnification, piezoelectric approaches for osteotomy and apical management, and xenogeneic and autogenous grafts for reducing postoperative risks and discomfort[5,6]. Ultrasonic tips developed for use specifically in apical interventions have promoted more precise and bevel-free apicoectomies, and more conservative retrograde cavities with less risk of microcracks, especially in molars, compared with high speed drills [12,13]. This is particularly due to better wear control and instrument design. According to the manufacturer of the Bladesonic tip (Helse Ultrasonic) used in the present clinical case, this tip offers uniform and straight control in apical resection. Although there are no studies using this tip that prove this characteristic, the sensation of better clinical performance was noted. The use of grafts in large surgical crypts in endodontic surgeries represents an interesting tool for preventing postoperative accidents, such as suture rupture and flap dehiscence, because they offer a mineral or organic matrix that allows vascular invagination during the repair. Grafts of autogenous (or autologous) origin are osteoinductive because they not only serve as a structural framework, but also contain cells, proteins and growth factors, representing important allies in the bone healing process[6,7,8,9]. In dentistry, platelet aggregates have been frequently used for more than two decades to maximize the repair of oral tissues[14]. Developed as the second generation of platelet aggregates, leukocyte- and platelet-rich fibrin (L-PRF) stands out notably in oral and maxillofacial surgery and implant dentistry procedures as a material for filling post-extraction sockets, covering surgical wounds, and protecting implants. It may also be isolated or associated to xenogeneic grafts[7,8,9]. The material may be obtained by blood centrifugation, and appears as the intermediate portion of a test tube formed by the incorporation of leukocytes, platelets and growth factors in an autologous fibrin matrix, which acts as an immunomodulator capable of controlling inflammation, and thus of accelerating repair[7,8,9].

There is no scientific consensus on faster tissue healing rates promoted by platelet aggregates, contingent on the rationale that their rapid absorption by the body is not enough to promote significant differences in the long term. However, studies with a high degree of scientific evidence have demonstrated favorable results regarding the reduction of postoperative pain and local hemostasis[6,15]. Soto-Peñaloza et al. (2020)[15] carried out a randomized clinical study to evaluate pain perception and quality of life (functional limitations and other symptoms) one week after endodontic surgery with and without the use of advanced platelet-rich fibrin membranes (A-PRF). The results showed that the groups receiving A-PRF as an adjuvant treatment had lower pain perception. Control groups reported significantly worse sleep and speech functions ($p < 0.05$), as well as greater bleeding and halitosis. In the clinical case described, surgical crypts were large and exhibited disruption of the buccal and palatal bone cortical. Therefore, plugs were used to fill, and cortical membranes to cover and protect, these plugs. The patient reported that she had no adverse postoperative events, such as swelling, extreme pain or infection.

Platelet aggregates have the advantage not only of being biological, but also of being cost-effective, since the costs incurred are restricted to the equipment needed for blood collection and centrifugation. Since blood is a theoretically inexhaustible source of fibrin supply, venipuncture allows professionals to remove other amounts of blood in the trans-surgical stage, if their initial calculation was not established correctly. There are no systemic contraindications, thereby making it a simple, safe and low-cost technique in which there is no risk of disease transmission or rejection by the recipient organism[7]. Its limitations are restricted to patients who do not allow intravenous puncture for personal or religious reasons, or to

professionals who do not master the technique.

The choice of surgery as an alternative to retain the tooth(teeth) depends on how well the professional understands the etiological factors involved in persistent apical periodontitis. Well-conducted endodontic retreatments that did not result in clinical success must be carefully evaluated. Several anatomical and microbiological factors may be involved in persisting periapical lesions[16,17,18,19], such as intraradicular biofilms in isthmus areas, in flat and lateral canals, and in apical deltas that were not reached by the endodontic instrument or by the action of the irrigating solution; extraradicular biofilms (present in the external portion of the periapex); presence of cholesterol crystals arising from the disintegration of red blood cells, plasma cells, lymphocytes and macrophages resulting from chronic lesions and inorganic materials such as endodontic cement, gutta-percha and glove powder, which can induce the recruitment of macrophages and produce a foreign body reaction; rupture of the cementum (cemental tear), which makes the external surface susceptible to resorption; presence of true cysts, whose cystic capsule lining thwarts the action of irrigating solutions; and intracanal medications.

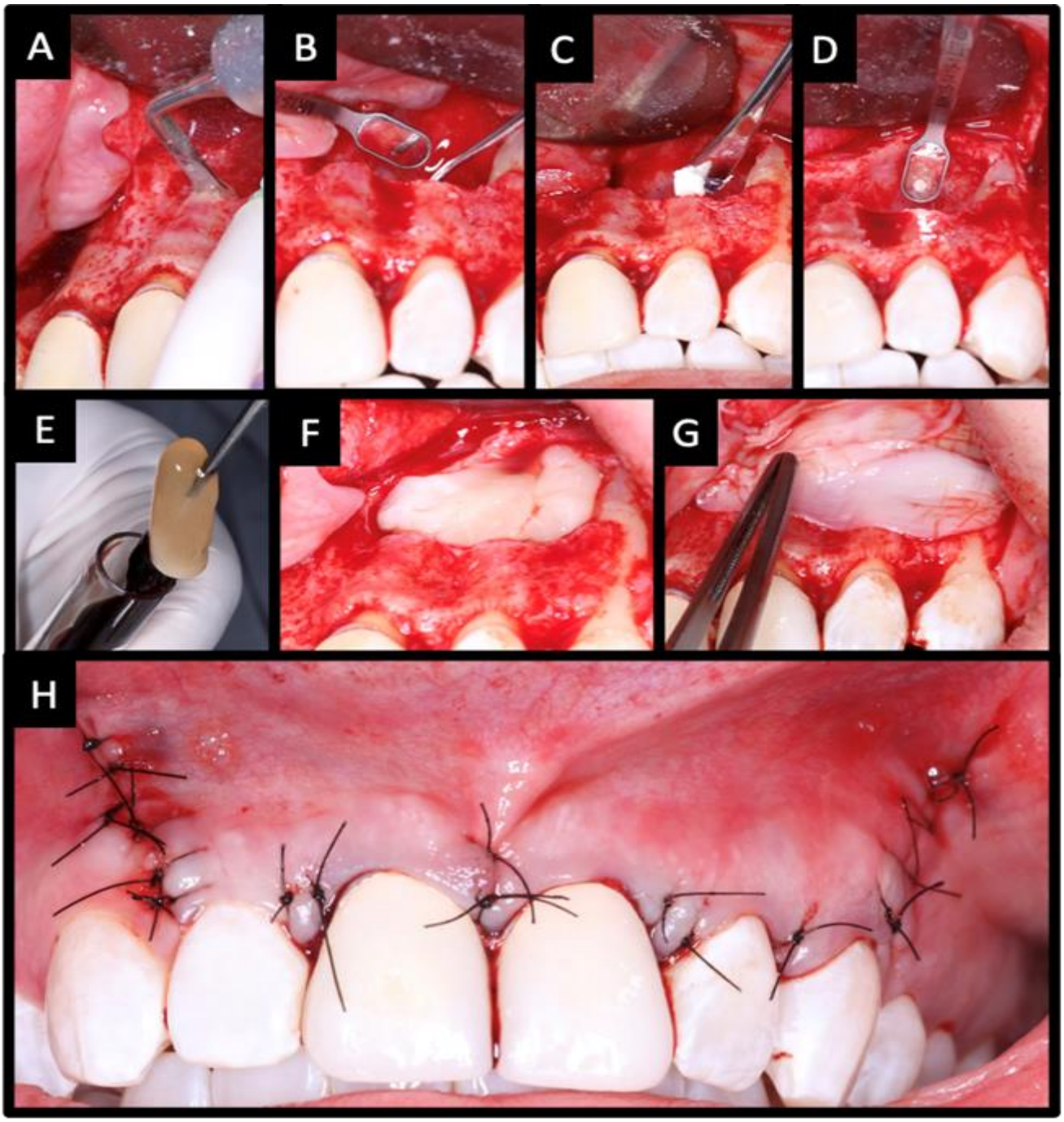

Figure 4. Apicoectomy with a Bladesonic tip (A); retrograde preparation with a P1M tip (B); retrofilling with Bio-C Repair bioceramic sealer (C and D); L-PRF plugs and membranes removed from the tube (E) and placed in the surgical crypt (F and G); suture (H).

Since the cystic lumen is not connected to the apical foramen, true cysts continue to grow due to a difference in osmotic pressure, and the vast majority are only treated efficiently by complete surgical curettage[16]. The clinical history of the reported patient, associated to the CBCT images, raised strong suspicions that the persistent lesion had a cystic behavior (proven by the anatomopathological examination); therefore, it was unlikely that it could be repaired with endodontic retreatment alone.

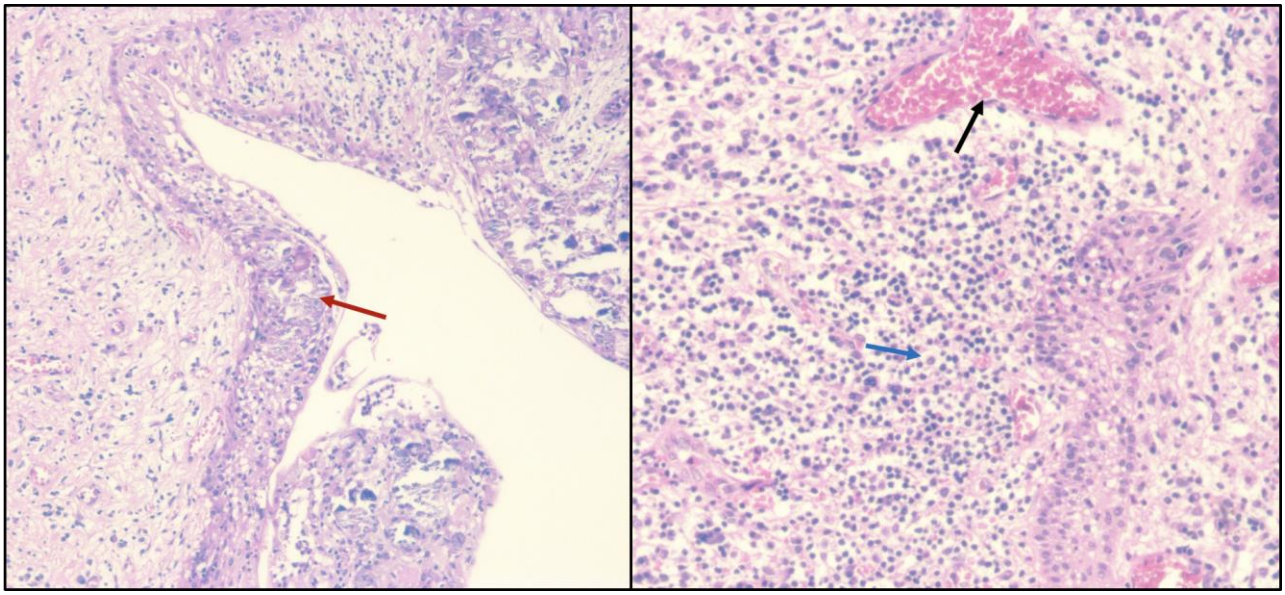

Figure 5. Dense fibrous connective tissue capsule covered by non-keratinized stratified squamous epithelium (red arrow); macrophage (blue arrow) and hyperemic vessels (black arrow).

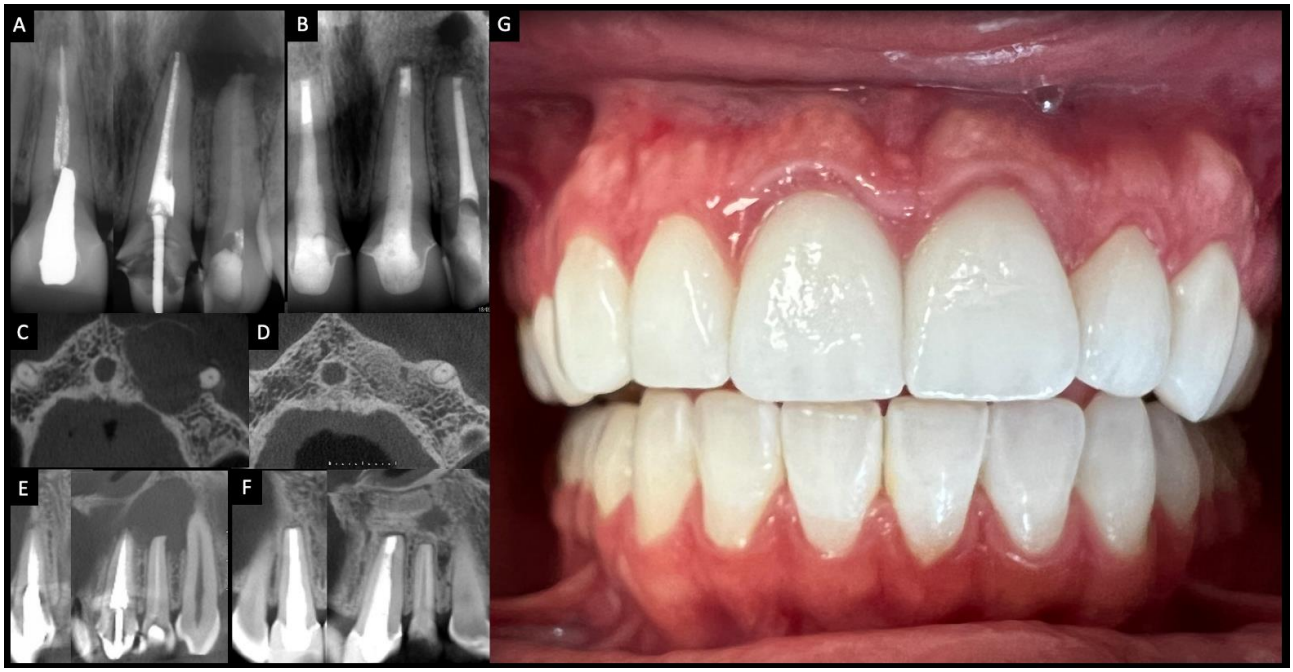

Figure 6. Periapical radiographs and CBCT scans (axial [C and D] and coronal [E and F] sections) before (A, C and E) and 2 years after (B, D and F) treatment, with evidence of bone repair (teeth 11 and 21) and fibroscarring (tooth 22). Clinical aspect of gingival health (G).

The professional must exercise diagnostic discernment to propose predictable alternatives that reflect more favorable prognoses. Decision-making should not be unilateral. On the contrary, it must consider the patient's wishes and complete commitment after detailed clarification has been given regarding proposed treatment plan changes.

Clinical monitoring and imaging exams may show that the teeth undergoing endodontic treatment and endodontic surgery are displaying incomplete bone repair patterns in the periapical region, without indicating treatment failure[20,21]. Postendodontic periapical fibrous scar is a type of scarring with a radiolucent/hypodense appearance often misinterpreted as a pathological lesion. Horka et al. (2012)[21] raised the hypothesis that the formation of periapical scars is

caused by osteoinhibitory molecular signaling from Malassez epithelial remnants, in which cytokines stimulate the production of fibrous tissue quickly and progressively, without allowing osteoblasts time to differentiate into bone.

In view of this specific type of scar pattern, successful definitive diagnosis must not only include radiographic and tomographic findings, but also ascertain that there are no clinical signs and symptoms, such as spontaneous pain, or pain caused by vertical and horizontal percussion, swelling and infection. Although the imaging exams in the present study show the presence of a radiolucent/hypodense area in the periapical region of tooth 22, the patient reported that there had been no sign or symptom that caused her pain or discomfort over the course of 2 years. This is conducive to acknowledging that the option for a surgical approach was assertive, and that the treatment was successful.

4. CONCLUSION

The decision to perform endodontic surgery must be made based on clinical and radiographic evidence of the failure of endodontic treatment/retreatment. Planning of the surgery requires modern imaging exams such as CBCT, associated to contemporary periapical techniques, such as specific ultrasonic inserts, biomaterials for apical sealing, and autogenous grafting (L-PRF). These tools have had an impact on reducing postoperative pain and affording more predictable results with high clinical success rates.

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