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Case Report

The Platelet-Rich Plasma Use After Enucleation of Cystic Lesion Resulting from Pulpal Necrosis due to Dental Trauma: 20-Years Follow-up

José Ferreira Mendes[1], Erika Regina Stocco Di Francesco[2], Carlos Henrique Dáguila[3], Mary Lucia Maia[4], Marcelo do Lago Pimentel Maia[5] and Irineu Gregnanin Pedron[6]*

[1]*Undergraduate Student, Universidade Brasil, São Paulo, Brazil.*

[2]*DDS, Private practice, São Paulo, Brazil.*

[3]*Professor, Department of Implant Dentistry, IAP Sergio Jayme Institute, São Paulo, Brazil.*

[4]*Postgraduate Student, Department of Implant Dentistry, My Implants Institute, Brazil.*

[5]*Professor, Department of Implant Dentistry, My Implants Institute, Brazil.*

[6]*Professor, Department of Periodontology, Implantology, Stomatology and Therapeutics, Universidade Brasil, São Paulo, Brazil.*

***Corresponding Author:** Irineu Gregnanin Pedron, Professor, Bottoxindent Institute and Department of Periodontology, Implantology, Stomatology and Therapeutics, Universidade Brasil, São Paulo, Brazil, Tel: +55 11 2944-4067*

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Abstract

The exeresis of cystic lesions may involve some complications such as slow bone neoformation, pathological fractures, infections and dental instability. The use of platelet-rich plasma is a promising resource that has been frequently used in dental practice. It presents several benefits related to bone regeneration and tissue healing, based on concepts of tissue bioengineering. The purpose of this report is to present a case of use of platelet-rich plasma in bone cavity after cystic enucleation, followed by a period of 20-years. A male patient complaining of dental trauma and requiring endodontic treatment, presented a well-defined radiolucent image between the tooth 21 and 22, suggestive of cystic lesion. After 6 months of endodontic treatment without signs of periapical repair, enucleation of cystic capsule and detoxication of bone cavity were performed, followed by application of platelet-rich plasma (collected from the patient before the surgical procedure) with particulated bone, was inserted into the bone cavity. Patient has been assessed clinically and radiographically for 20-years, with no signals of recurrence of the lesion. Based on radiographic evidences, we can conclude that the use of platelet-rich plasma after the exeresis of the cystic lesion showed to be efficient regarding bone repair. The lesion has not regressed with conventional endodontic treatment. In this perspective, the use of platelet-rich plasma can be an alternative method with satisfactory results.

***Keywords:** Platelet-Rich Plasma; Radicular Cyst; Bone Grafts; Bone Regeneration; Endodontic Treatment; Intrabony Defects.*

Introduction

Management of traumatic injuries to teeth are frequent in dental practice. They usually involve the anterior teeth of young patients. Pulp necrosis is a frequent sequela of trauma and may evolve to microbial infection, resulting in the development of periapical lesions. The first objective is to eliminate these microorganisms and endodontic treatment should be instituted[1-6].

The use of calcium hydroxide has shown high frequency of periapical repair, partially or completely reducing lesions after endodontic treatment (1 to 3 months). Additionally, calcium hydroxide shows satisfactory results in apecification in mature teeth with periapical cystic lesions[1-4].

In cases of larger periapical cystic lesions, several therapeutic options can be employed. Besides endodontic treatment or endodontic retreatment, apical surgery, marsupialization, decompression or even exodontia of the involved tooth may be necessary[1-6]. However, cysts lined by intact epithelial membrane (true apical cyst), may not show repair when not treated surgically[2].

The exeresis of cystic lesions may present some postoperative complications. From the reduction of bone structure, pathological fractures may occur, possibility of tooth loss, high risk of infection and recurrence of the cystic lesion. In this perspective, the use of regenerative techniques after surgery for the removal of cystic lesions, by means of grafts associated or not with biomaterials, to increase bone neoformation is encouraged[6-8].

Several grafting techniques (guided bone regeneration and guided tissue regeneration) have been advocated and have been used with the aim of regenerating the bone and the soft tissues of the oral cavity, thus improving function and aesthetics. Currently in Dentistry, these techniques have been employed in Implant Dentistry, Periodontics, Oral and Maxillofacial Surgery and Oral Pathology. Many biomaterials have been used, although currently the most important are bone morphogenetic proteins (BMP) and growth factors, released from platelets, which regulate cellular processes such as mitogenesis, chemotaxis and cell differentiation. Platelet-rich plasma obtained by centrifugation of blood collected from the patient immediately before the surgical procedure has been used as an autologous alternative to fibrin glue, as recommended and indicated in surgical procedures, by accelerating and potentiating the mechanisms of wound healing in bone and soft tissues[6,8-29].

The purpose of this report is to present a case of use of platelet-rich plasma in bone cavity after cystic enucleation, followed by a period of 20-years.

Case Report

An African-descendent male, 24 years-old, attended the clinic complaining of dental trauma and painful symptoms.

Radiographically, well-defined periapical radiolucent images were observed on teeth 21 and 22, suggestive of cystic lesions (Figure 1). Clinically, a fistula was observed in the alveolar mucosa with purulent suppuration, with late painful symptomatology on palpation.

The patient reported dental trauma of teeth 11, 21 and 22, 12 months ago, caused by convulsive crisis. Phenytoin was also reported to have been administered for seizure control 4 years ago.

Endodontic treatment of teeth 21 and 22 was performed using calcium hydroxide (Sealer 26™, Dentsply, Rio de Janeiro, Brazil) as intracanal medication. The extravasation of calcium hydroxide paste beyond the apical foramen was intentionally performed with the purpose of favoring periapical repair (Figure 2). No painful symptoms were reported after the endodontic treatment.

After 12 months of endodontic treatment, no signs of periapical repair were observed. Surgical removal of the cystic lesion was suggested, with the use of platelet-rich plasma to accelerate bone tissue repair and healing. After elucidating all the doubts of the patient and clarifying all the information, the patient agreed to the procedure and signed the consent form.

Fig. 1: *Well-defined periapical radiolucent images observed on teeth 21 and 22.*

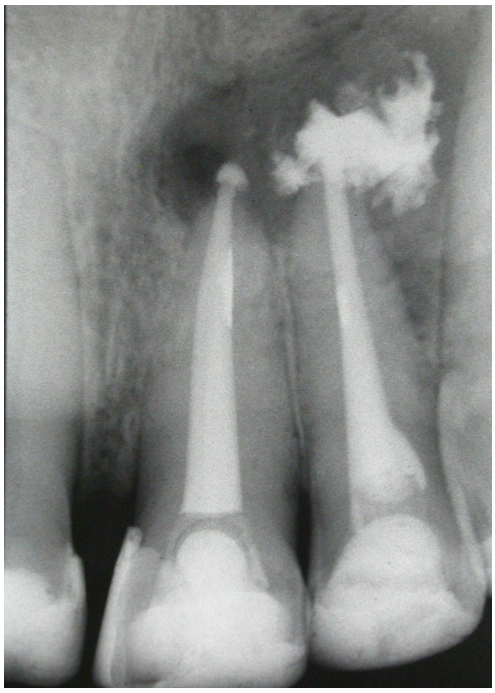

Fig. 2: *Endodontic treatment of teeth 21 and 22 with intentional extravasation of calcium hydroxide paste beyond the apical foramen.*

Prior to the start of the surgical procedure, blood was drawn from the right brachial vein following the protocol established by Marx et al.[9] (1998) (Figure 3). Five test tubes of 15 mL each containing anticoagulant (citrate phosphate dextrose) were collected. A laboratory centrifuge (Centribio 80-2B™, Centrilab, Campinas, Brazil) received the tubes for centrifugation (Figure 4). Cellular separation was achieved by double centrifugation: the first with 5,600 rpm and the second with 2,400 rpm. After the second centrifugation, the PRP was collected by pipetting and conditioned in a Petri dish containing 10% calcium gluconate to promote gel consistency, followed by mixing with lyophilized bovine bone (Osseobond™, Dentoflex, São Paulo, Brazil). The gel composed of platelet-poor plasma (Figure 5A) and another gel composed of platelet-rich plasma associated with particulate bone (Figure 5B) were obtained.

Fig. 3: *Blood collected from the right brachial vein.*

Fig. 4: *Test tubes of blood collected (A). Centrifugation of the tubes (B/C).*

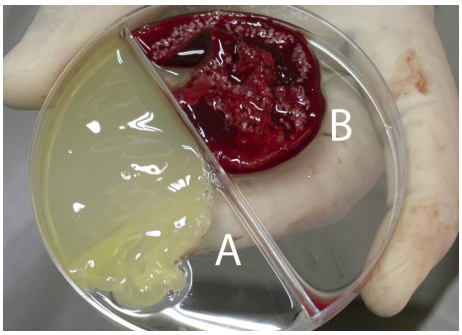

Fig. 5: *Platelet-poor plasma (A) and platelet-rich plasma associated with particulate bone (B).*

Fig. 6: *Exposition of the bone cavity after curettage of the cystic lesion.*

Fig. 7: *Platelet-rich plasma inserted into the bone cavity.*

Under local anesthesia, an incision was made in the gingival sulcus of teeth 11, 21, 22 and 23, with two relaxants for detachment and release of the mucoperiosteal flap and presentation of the cortical bone of the region. Erosion of the buccal cortex was observed with exposure of the lesion. The lesion was curetted followed by removal of the cystic capsule and apicectomy of elements 21 and 22. The bone cavity was abundantly irrigated with sterile saline solution (Figure 6). Platelet-rich plasma was inserted into the cavity (Figure 7) and covered with platelet-poor plasma. The flap was repositioned and sutured. Analgesic, anti-inflammatory and antibiotic medications were administered.

The lesion was fixed in 10% formalin and sent to the Laboratory of Surgical Pathology of the School of Dentistry of the University of São Paulo. Histopathological examination revealed a fragment of cystic capsule composed of dense connective tissue permeated by a discrete inflammatory infiltrate of mononuclear leukocytes. Fragment of epithelial tissue was observed in the focal region, besides the hemorrhagic areas (Figure 8). The histopathological diagnosis was of radicular cyst.

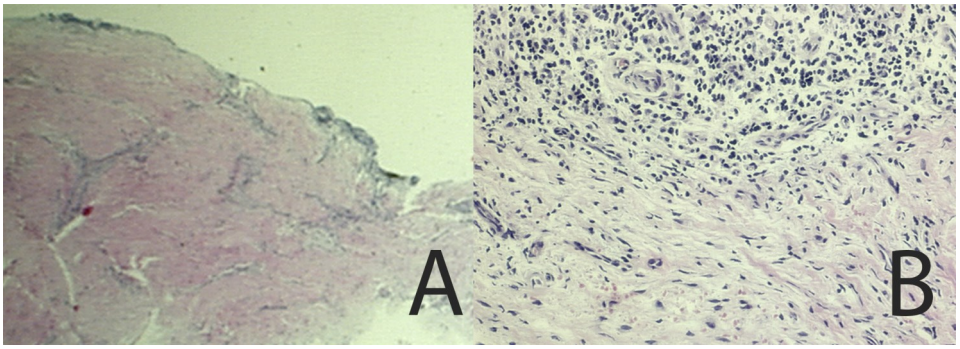

Fig. 8: *Histopathological aspects of the radicular cyst. Smaller magnification: cystic capsule composed of dense connective tissue (A). Greater magnification: cystic capsule inflammation (B).*

The sutures were removed after 14 days. No complaints or complications were reported. In the first 3 years, the patient was evaluated every six months (Figure 9). The patient has been evaluated for 20 years without signs of recurrence of the lesion (Figure 10).

Fig. 9: *Periapical radiograph after six months of the surgery.*

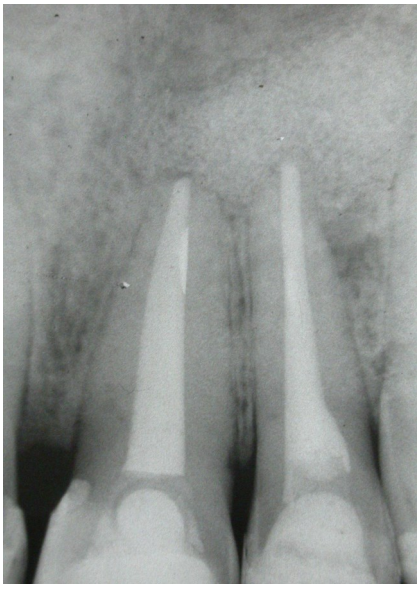

Fig. 10: *Periapical radiograph after 20 years of the surgery.*

Discussion

Platelets act in clot formation and in the synthesis and release of growth factors and bone morphogenetic proteins (BMP). Platelet degranulation and the release of growth factors vary from 3 to 10 days[23]. Among the main growth factors released by platelets are platelet-derived growth factors (PDGF), insulin-like growth factor-1 (IGF-1), transforming growth factor-beta (TGF-β), epidermal growth factors (EGF) and vascular endothelial growth factors (VEGF). Growth factors have several properties, such as chemotaxis, cell differentiation and proliferation (mitogenesis), of osteoblast and osteoblast precursor cells (osteogenesis and osteoconduction), polymorphs, macrophages, fibroblasts, smooth muscle cells and endothelial cells; angiogenesis; in collagen and fibronectin production; inhibition of osteoclast action, reducing bone resorption; inhibition of collagen degradation by reduction of proteases, and favor fibrogenesis[6-9,11-24,26-28,30-33]. Apart from growth factors, the local release of thrombin, thromboxane A2 and adenosine diphosphate promote intense vasoconstriction and attract additional platelets for the development of the clot, increasing the hemostatic response[8,10,14].

The interaction of these growth factors determines the acceleration of the healing process and repair of soft and bone tissues, with bone maturation reduced to 4 to 6 months[6,9,10,12,22-29], as observed in the present case. Assistance in hemostasis and adhesion of graft material has also been reported[6,10,12,22,29].

In view of this, platelet-rich plasma presents a platelet concentrate 2 to 5 times greater, from 200,000/ml to 1,000,000/ml, or an increase of up to 338% of the normal platelet count[7,9,24,27,28], promoting the acceleration of physiological activities[32,35].

Among the benefits of using platelet-rich plasma, besides those mentioned above, are the characteristics of the autogenous graft, eliminating the risk of contamination and transmission of diseases to the patient, as well as immunogenic reactions[6,8,23,25,27].

Indications for the use of platelet-rich plasma include bone grafts, such as the filling of bone defects originated by exodontias, oro-sinusal and oro-nasal fistulas, cysts and benign tumors of maxillary bones; drug-related osteonecrosis (MRONJ) or osteoradionecreosis; in the installation of implants to favour osseointegration; maxillary sinus lift; in maxillofacial reconstructions; repair of periodontal bone and gingival defects[6-8,10-20,22-25,27-29,31,33,34,36-41].

Several biomaterials can be associated with platelet-rich plasma. Demineralized freeze-dried allografts of cortical (DFDBA) and cancellous (DFBA) bone, freeze-dried particulated bovine bone, hydroxyapatite, tricalcium phosphate have been reported[6,8,22,24,33]. In the present report, PRP associated with freeze-dried particulated bovine bone was used.

In this report, the use of platelet-rich plasma presented a satisfactory result regarding bone repair, verified radiographically by the increase in bone density. The bone neoformation was visualized radiographically by the gradual appearance with the adjacent healthy bone, comparing Figures 10 and 11. Despite the clinical parameters (maintenance of the teeth involved, gingival health, absence of fistula and suppuration) and radiographic (increased bone density and absence of recurrence of the cystic lesion) observed 20 years ago, more longitudinal studies are necessary.

Conclusions

Based on clinical and radiographic evidence, we can conclude that the use of platelet-rich plasma after the excision of the cystic lesion proved to be efficient in terms of bone repair. Platelet-rich plasma is an autologous preparation that includes high concentrations of platelets and growth factors. This application is an effective way to induce tissue repair and regeneration. The ability to increase growth factors in oral defects with the application of platelet-rich plasma provides a promising approach to achieve the established regenerative goals.

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