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Case Report

Autologous Graft Derived from Tooth as Material for Alveolar Preservation - Case Report

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Abstract

Introduction: Alveolar preservation techniques aim to reduce bone loss after dental extraction, to maintain bone volume that allows functional and aesthetic rehabilitation with dental implants. The dental matrix, as an autologous graft, has a chemical composition like natural bone, osteoconductive and osteoinductive properties, allowing three-dimensional protection of the metal alveolus at a low cost and free of antigenic occurrence.

Objective: To report a clinical case of alveolar preservation with autologous graft derived from a tooth prior to rehabilitation with premature implants.

Material and Methods: Case report of tooth extraction and alveolar preservation with crushed dental matrix associated with fibrin rich in plaques and leukocytes in a patient with a previous history of harmful periodontitis, furcation lesion and grade 3 tooth mobility.

Results: After 6 months, the imaging exam showed, in the regions addressed, bone density compatible with type III bone, where rehabilitation with implants was performed. After 24 months the entire autologous graft derived from tooth was replaced by natural bone tissue.

Conclusion: This method proved to be viable for preserving the alveolus and obtaining a bone structure of good density for the installation of dental implants, being an alternative to xenogeneic and allogeneic grafts.

Keywords: Dentin; Bone Graft; Tooth Socket; Fibrin-Rich Plasma; Dental Implant

Introduction

After tooth lengthening, due to the contractile activity of myofibroblasts, the alveolar bone tends to reduce its volume, especially in the vestibular region, resulting in rapid and significant dimensional changes, compromising the gingival contour and, consequently, aesthetic and functional deficiency [1,2].

Preserving and regenerating alveolar bone has historically been a major challenge in implant dentistry [3]. Preservation techniques promote a significant reduction in dimensional changes in the alveolar bone when compared to unassisted healing [4].

An ideal graft material, in addition to being easy to handle and cost-effective, should be biocompatible, osteoconductive/osteoinductive, have mechanical properties that allow preservation of the alveolar contour, porosity, and allow angiogenesis and bone formation [5].

Although there are good studies that aim to evaluate the efficacy of different bone graft materials for alveolar preservation, the evidence is not clear as to the most suitable biomaterial for these purposes [6]. Xenogeneic grafts have shown space-maintaining characteristics and are incorporated into the bone matrix in formation, with the newly formed bone tissue consisting mainly of residues of the graft material and a small percentage of new bone [7].

Autogenous bone is still considered the "gold standard", as it is the only substitute that has osteoinductive, osteoconductive and osteogenic properties, despite the need to be harvested and the possible morbidity that this implies [6].

The dental matrix, as an autologous graft, has a chemical composition similar to natural bone [8], osteoconduction and osteoinduction properties, allows three-dimensional reconstruction of the bone, is easy to prepare, low cost, free of antigenic reaction [9], and is therefore safer than xenografts [1].

The technique for obtaining the autologous dentin graft is performed in a few minutes, in an outpatient setting, representing the current and future "gold standard" technique for addressing situations in which alveolar preservation is necessary [10].

When combined with Platelet-Rich Fibrin and Leukocyte-Rich Fibrin (L-PRF) and Liquid Fibrinogen (i-PRF), it becomes even more effective in preserving alveolar dimensions, accelerating the formation of new high-density bone, important for the stability of the dental implant [11-13]. This study aims to report a clinical case of alveolar preservation with autologous graft derived from a tooth prior to rehabilitation with dental implants.

Materials and Methods - Clinical Case

A 34-year-old patient was referred by a periodontist requesting extraction extraction of dental units 26, 27 and 36 after the acute aggressive periodontitis had ceased. The physical examination revealed periodontal pockets, furcation lesions and grade 3 mobility in the cited dental units (Figure 1). The extractions were performed, and the units were ground using a tooth grinder (KometaBio Inc., NJ, USA ®, Smart Dentin Grinder - SDM), and the resulting material was decontaminated, according to the manufacturer.

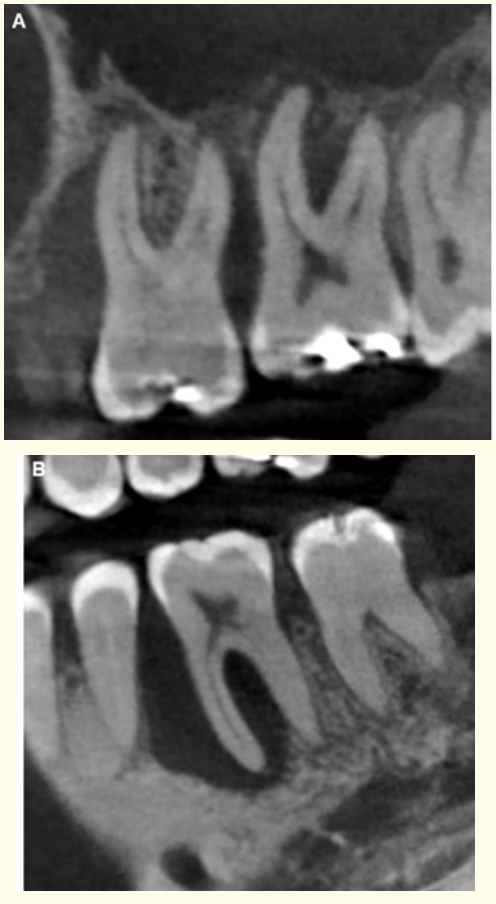

Figure 1: (a) UD 26 presenting periodontal lesion in the medial and distal region. U 27 presenting periodontal lesion in the medial, distal region and furcation. (b) UD 36 presenting periodontal lesion in the medial region and furcation, in addition to involvement of the vestibular wall.

Tooth preparation consisted of removing tartar and periodontal tissue with a carbide burr with abundant irrigation of 0.9% saline solution to prevent degradation of the dentin collagen. The teeth were dried with oil-free air and placed in the grinder with a 3-second grinding time and 20 seconds of vibration to separate large particles from small ones, using particles between 300 and 1,200 µm.

The particles were transferred to a sterile glass container with a chemical cleaner based on 0.5 M sodium hydroxide (NaOH) and 30% ethanol (Dentin Cleanser, KometaBio Inc., NJ, USA) for 10 minutes. After this period, the excess NaOH and ethanol was removed with gauze and the material was washed twice with phosphate-buffered saline (PBS) for a total of 6 minutes in this second stage, making the graft ready for use (Figure 2).

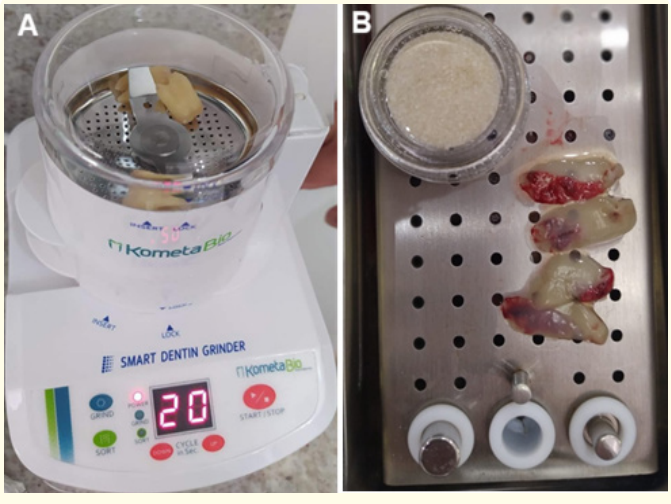

Figure 2: (a) Teeth in the Smart Dentin Grinder® chamber after decontamination. (b) Dentin material particles between 300–1200 microns and L-PRF membranes.

The autologous graft derived from the tooth was then mixed with Platelet-Rich Fibrin and Leukocytes, L-PRF/i-PRF, 400G for 15 minutes (Biocon® Centrifuge, Spinplus CE 1161), forming the "Stick Tooth", inserted into the dental alveoli and covered with L-PRF membrane, maintained by suture with Nylon 5.0 thread for 15 days.

Results

After 6 months, Cone Beam Tomography (CBCT) showed bone density compatible with type III bone in the regions studied (Figure 3), enabling rehabilitation with dental implants. After 24 months of follow-up, we can observe a radiographic appearance in the peri-implant regions that are compatible with natural bone tissue, with the entire autologous graft derived from tooth having been replaced. (Figure 4).

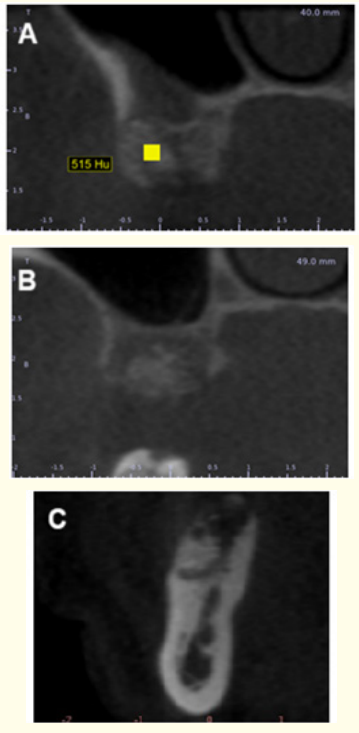

Figure 3: (a) region 26 showing bone desity of 515 HU. (b) region 26. (c) region 36.

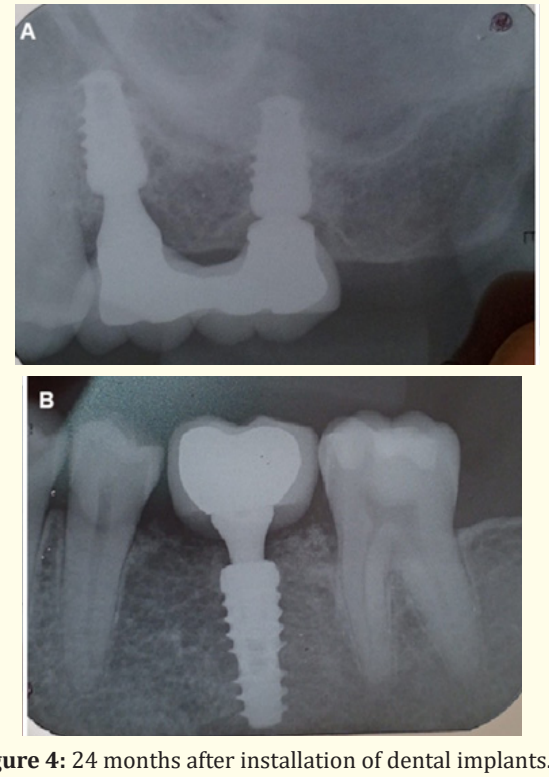

Figure 4: 24 months after installation of dental implants. (a) region 26 and 27. (b) region 36.

Discussion

In addition to existing methods and bone replacement materials (autologous, allogeneic, xenogeneic and alloplastic) with their different potentials in relation to osteogenic, osteoinductive and osteoconductive properties, tooth-derived grafts can allow alveolar preservation with safe, predictable and easy-to-prepare protocols [14].

The capacity of dentin in bone formation can be explained by the same embryological origin, with the organic and inorganic composition of dentin being very similar to that of bone [15]. Dentin particles have open tubes that allow capillaries to access their interior, having a high rate of bone resorption and replacement without inflammation after 24 months, and clinically and histologically, their performance is comparable to the widely used xenogeneic or allogeneic biomaterials [16]. In addition to hydroxyapatite and collagen, dentin also contains several growth factors that play significant roles in bone formation, such as bone morphogenetic protein 2 (BMP-2) and transforming growth factor-β (TGF-β) [17].

The positive features of using L-PRF/i-PRF in both bone and soft tissue regeneration are based on the release of a variety of growth factors (VEGF, EGF, TGF-β, PDGF) in high concentrations, thus supporting cascades such as angiogenesis by positively influencing cell recruitment [18,19].

In the present study, the L-PRF/i-PRF preparation, 400G for 15min, was based on classic protocols already established in the literature [20] and the preparation of the autologous graft derived from teeth, according to its creators and manufacturer, was Dentin Cleanser, KometaBio Inc., NJ, USA, efficient in dissolving all organic debris from dentin particles, including dentinal tubules [21].

The use of the L-PRF/i-PRF preparation and autogenous dentin particles produces, in a short period of time, an agglomerate called "sticky tooth" with a potential biological effect that accelerates the alveolar repair process.

A retrospective study on the maintenance of alveolar dimensions using "sticky tooth" showed an average gain in bone height of up to 5.6% [22]. A pilot study demonstrated that after 4 months, the bone density analysis of the alveolar area grafted with "sticky tooth" showed 922.68 ± 250.82 HU [16].

In the present clinical case, after 6 months of alveolar preservation, CBCT revealed a bone density of 515 HU (Figure 3 A), and dental implants were installed and the osseointegration period was awaited to begin prosthetic rehabilitation after 4 months. During the insertion of dental implants, no additional bone augmentation was necessary (Figure 4), indicating that the clinical goal of preserving the dimensions of the alveolus for subsequent rehabilitation was achieved.

Conclusion

Within the limitations of our study, it is suggested that preservation of the dental alveolus using tooth-derived autograft associated with L-PRF results in the maintenance of its dimensions and provides good bone density for the placement of dental implants. L-PRF appears to play a role in accelerating healing of the site due to the presence of growth factors, while dentin, in addition to also having growth factors, provides mineral structure and can replace allogeneic and xenogeneic grafts. Long-term observations and a larger number of cases would be recommended to draw better conclusions.

Conflict of Interest

There was no conflict of interest

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