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Membranous form of Platelet-Rich Fibrin in the Therapy of Gingival Recession

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ABSTRACT

Gingival recession is defined as an apical displacement of the gingiva with its attachment apparatus. It is considered an entity that is difficult to manage in Periodontics. The treatment is aimed at achieving coverage of the exposed root through free and pedicled grafting techniques. It has been observed that with traditional procedures a certain degree of coverage achieved is lost over time, which is why other techniques and their combinations have been sought that allow more stable results, which has been supported by regenerative medicine. specifically in tissue engineering, through which platelet-rich fibrin can be obtained, which constitutes a second-generation platelet concentrate. This biomaterial in its membranous form has biological and physical properties that guarantee true regeneration at the sites of gingival recessions. Therefore, this new therapeutic procedure is proposed in the therapy of these processes, which was protocolized by the authors of this study.

Keywords: Gingival Recession; Periodontal Regeneration; Periodontal Plastic Surgery

Abbreviations: GR: Gingival Recession; CRC: Coronal Replacement Flap; GTR: Guided Tissue Regeneration; PRF: Platelet-Rich Fibrin Membrane

Introduction

Gingival recession (GR) has been conceptualized as a displacement of the gingiva in an apical direction, which occasionally involves the mucogingival junction and the alveolar mucosa. [1,2]. GR, considered in 1946 by Orban [3] as: periodontal atrophy, bone recession or premature aging, has received different names until reaching the latest classification of the American Academy of Periodontology and the European Federation of Periodontology in their international workshop held in Chicago. in 2017, [4] where they named it gingival recession and included it in the section of mucogingival deformities and alterations around the tooth. The periodontal plastic surgery procedures used to attempt root coverage and augmentation of the attached gingiva are classified into: free soft tissue grafts, which are subdivided into autogenous (free gingival graft and subepithelial connective tissue graft) and allogeneic (Acellular Dermal Matrix allograft and other tissue engineering materials), pedicled soft tissue grafts (rotational flaps: lateral sliding, double papilla, oblique rotated and advanced, displaced or positioned flaps: coronal repositioning, semilunar coronary relocation) and Guided Tissue Regeneration (GTR) [2,5-7].

These periodontal plastic procedures mentioned above take into consideration very precise indications for their performance, which sometimes limits their use in the surgical approach to GR. Several ways have been proposed to combine these techniques with different biomaterials, which expands their possibilities of use and sometimes with greater gain in attached gingiva and root coverage. [5] The

coronal replacement flap (CRC) is the most used plastic procedure in Periodontics and of choice for performing bilaminar techniques, that is, those that interpose any biomaterial between the flap and the exposed root surface. This surpasses the other pedunculated type grafts because the displaced tissue comes from the inserted gum located apical to the RG and following this is the alveolar mucosa that, with great elasticity, guarantees a stretch greater than that achieved with laterally displaced ones. which allows it to be placed in the positions desired by the operator [1] The potentialities described above for this graft make it the most suitable for the possibilities of combination with subepithelial connective tissue or biomaterials that are achieved through tissue engineering. The different grafts proposed for root coverage have undergone modifications in recent times in order to increasingly adapt them to the demands of the affected sites.

The most encouraging proposal is the bilaminar technique which guarantees better healing and optimal gain in root coverage and keratinized gingiva in the area around the GR [1] If the possibility of performing these bilaminar techniques with autologous material is analyzed, in such a way that the intervention of a second surgical area is not necessary, as in the case of the graft of subepithelial connective tissue, an advanced procedure would be proposed in terms of achievement of root coverage, provided the results are equal or superior. This is why the authors propose the use of platelet-rich fibrin membrane (PRF) in combination with CRC, which also constitutes the pedunculated technique with the greatest predictability in the treatment of exposed roots [8,9]. FRP is considered a second-generation platelet concentrate described by the Frenchman Choukroun (2001), cited by Guerrero and others, [10] considered an autogenous and bioactive material widely used to accelerate the healing of hard and soft tissues. FRP does not require anticoagulant or bovine thrombin (or other gelling agent), it is only centrifuged blood, without additives. Obtaining is carried out by depositing a blood sample in test tubes to be centrifuged instantly. A benchtop centrifuge can be used for this purpose for 12 minutes at 2700 rpm or 10 minutes at 3000 rpm.

The resulting product is composed of three phases: an upper one of acellular plasma poor in yellowish platelets, an intermediate one corresponding to the FRP clot and a lower reddish phase, corresponding to red blood cells (red blood cells) [11-13]. FRP has biological and physical properties that allow it to be placed under pedicle grafts and guarantees, with its contribution of growth factors, a regeneration of several of the tissues lost at the site of the GR as a cause of dystrophy. The different growth factors contained in the fibrin mesh stimulate a group of biological functions such as chemotaxis, mitogenic activity, proliferation and cell differentiation, which facilitate regeneration. The fibronectin and adhesion proteins present guarantee better adaptation of the displaced tissue on a denuded root, which prevents the creation of dead spaces in the graft. The stimulation of mesenchymal cells in the area to be regenerated induces the synthesis of type I collagen and fibronectin, which are the main components needed for the repair of the exposed site in a root affected by GR; This is the type of collagen that will offer greater attachment to the root cement, in addition to the potential of this structure to promote the differentiation of cementoblasts and osteoblasts in the affected site, which will allow better repair and healing at the site, not only due to replacement but by regeneration [12-17].

FRP slowly releases growth factors and matrix proteins that stimulate healing for more than seven days through two biological mechanisms: impregnation and induction. In the first, the root surface is impregnated by blood proteins that constitute the first link or biological connection between the surface and the new insertion and in the second, the release of long-term growth factors that cause cell induction. These factors stimulate cell proliferation of the periosteum and new blood vessels develop inside the fibrin matrix. Gingival fibroblasts migrate into this matrix, provide slow remodeling, and the membrane surface induces epithelialization. These processes allow the wound to close and heal quickly and in the long term, can result in more stable coverage of the recession and thicker gingiva [18].

The strong three-dimensional network of FRP provides it with the possibility of being used as a membrane and at the same time as a soft tissue. Its physical characteristics constitute a favorable element in the design of gum grafts; it has a consistency that allows it to be sutured in place; Its manipulation is easy, as is its adaptation. This membrane can be cut according to the requirements of the receiving bed, and adapted to multiple teeth in the case of several RG, since its size only depends on its preparation and not on the donating capacity of the palate in terms of its thickness. as in the case of free grafts and subepithelial connective tissue. [14,17-18] The membrane shape obtained from compression in a box made for this purpose does not alter the concentration of platelets and increases the density of fibrin after compacting, which proves the quality of the material for clinical use as a barrier and can be considered as part of active tissue engineering due to its potential to achieve RTG. (fifteen) If the thickness of the FRP membrane is analyzed for regenerative treatment, it already includes in its fibrin structure the creation of the necessary space for cellular repopulation and for the creation of healing tissue, which will subsequently differentiate during its maturation. in the tissue necessary for regeneration. Its possibility of scaffolding based on its fibrin structure guarantees its osteoconductive properties [15,18].

The FRP used as a membrane prevents unwanted migration of the epithelial lineage on the root surface and creates a space to promote the migration of osteogenic and angiogenic cells , which allows the transformation of the blood clot into mineralized tissue [18] It is valid to point out among the advantages of the FRP membrane its easy handling, strong scientific foundations, good intraoperative handling characteristics and low cost. [11,16] It is proposed that the elements contained in the membrane prevent bleeding during surgery and in the postoperative period improve the inflammatory phase, which considerably influences the final result. [13,17-18] In this research,

since it was the first experience of using FRP for root coverage, post-operative complications and healing were evaluated, which allowed us to confirm what was previously stated. In the studies reviewed so far, some variability can be seen in the effectiveness of this biomaterial for clinical success in the treatment of GR , ranging from those who did not obtain greater gain with this technique although they achieved optimal results in terms of modification of the periodontal biotype and the width of keratinized gingiva and those who prefer it for root coverage due to its not only reparative but regenerative potential, which would ultimately be the ideal result of periodontal plastic surgery procedures [11,14,18].

Although the FRP can be considered a true membrane from the point of view of its physical functions, the element that most enriches it and converts it into a new form of regeneration is its biological properties, which are explained in this chapter. Regeneration in RG is known to be a complex process, since it is a mucogingival defect that not only involves destruction of bone and periodontal ligament, but of all the tissues that make up the marginal periodontium. With the techniques described above, both soft tissue grafts and GTR and MDA, it is very difficult to achieve complete regeneration of all the tissues lost due to dystrophy, but several of them manage to be re-established again on the denuded root, whose stability over time it will be determined by different factors depending or not on the individual. However, with the use of FRP as a true membrane, a double effect is enhanced, both of isolating the epithelial and connective cells throughout the entire extension of the root surface, to guarantee some degree of GTR and the regeneration provided by the induction, based on growth factors and the presence of stem cells contained in its matrix for the repair and regeneration to a variable extent of the tissues lost due to dystrophy.

(fifteen)Although currently, clinical evidence surpasses the histological aspect of regeneration, through biomaterials that provide growth factors, this can change the way of thinking that periodontal regeneration is a process only attributable to the formative function of the cellular component of the ligament. periodontal. These are new perspectives in the field of periodontal plastic surgery, to improve the results of said therapy in the face of a disorder that, in addition to affecting aesthetics, can compromise the permanence of the tooth in the oral cavity. [15,18] Everything discussed so far constitutes the basis for the selection of FRP associated with CRC as a therapeutic option that aims to achieve greater root coverage based on the regenerative potential of this biomaterial when compared with the traditional CRC procedure, which It can enhance its benefits in the therapy of GR. The results of this therapeutic procedure have been protocolized by the authors as a new therapeutic procedure in root coverage [19].

Conclusion

Platelet-rich fibrin in its membranous form constitutes a biomaterial that can be placed in association with the coronal repositioning flap to cover the GR. Its biological and physical properties guarantee the regeneration of tissues lost due to dystrophy, with excellent coverage results that are stable over time. This therapeutic modality constitutes a new advanced therapeutic procedure in Periodontology.

Conflict of Interest

The authors declare not to have any interest conflicts.

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