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Use of Platelet-Rich Fibrin in the Treatment of Gingival Recession: Literature Review

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Abstract

Currently, recent innovations describe the preparation and use of platelet concentrates to stimulate tissue regeneration and healing of both hard and soft tissues. Platelet-rich fibrin (PRF) corresponds to the second generation of these preparations. Its mechanism of action based on the growth factors found in platelets favors reparative processes at the cellular level in the surgical area. The present observational, analytical, and descriptive research aims to study biological properties and the use of PRF in root coverage procedures.

Keywords: *Gingival recession, Platelet-rich fibrin, Periodontics.*

1. Introduction

Gingival recessions correspond to gingival migration of the cementum-enamel junction, with related exposure to the root surface. These may appear as a localized or generalized gingival recession. Recession can occur with or without loss of adhered tissue. It can also affect sensitivity, due to exposed dentin, it can be evaluated by the appearance of a long clinical tooth and a varied proportion of teeth compared to adjacent teeth (Pradeep et al., 2012). Several periodontal plastic procedures have been proposed for the successful coverage of exposed roots, such as soft tissue grafts, which include free gingival graft and subepithelial connective tissue grafts, and pedunculated grafts, in which rotational flaps and those displaced in coronal direction are found (Henry et al., 2012). An evolution in stomatology is the use of second-generation platelet concentrates, such as platelet-rich fibrin (PRF), developed in France by Choukroun (2000), is a platelet concentrate obtained from a fibrin membrane, which contains all the constituents of blood favorable for bone and tissue regeneration. One of its most important features is to provide a concentration of growth factors that stimulate biological functions, such as chemotaxis, cell proliferation and differentiation in the areas operated on surgically to stimulate the regeneration process (Orozco et al., 2016). In an attempt to minimize costs and

ensure the biocompatibility of the graft to the host, the use of Platelet Rich Fibrin (PRF) has been increased, its production requires only centrifugation equipment and a small amount of blood. The platelets, leukocytes, cytokines and growth factors present in the patient's blood form a potent suspension of fibrin that can be quickly prepared and applied to the surgical site in membrane form. However, studies involving PRF for tissue repair are insufficient and its use as a substitute for free gingival grafts is well debated, so based solely on clinical results, it is not yet possible to confirm its applicability and predictability as a substitute for autogenous gingival grafts, although its advantages in relation to cost and ease of preparation and manipulation are already observed (Luísa et al., 2017). The objective of this review is to know the biological properties and the use of PRF in root cover procedures.

2. Materials And Methods

The present study is cross-sectional, retrospective, qualitative approach with non-experimental descriptive design, a review of the scientific literature reported on the efficacy of PRF in periodontics specifically its use in the treatment of gingival recession was carried out, the titles found in this studies were those that met the inclusion criteria: articles published in their highest percentage in a timeless cut between 2015 and 2021, in Spanish, Portuguese and English that address the subject, with a search strategy for Pubmed, Embase, Web of Science, Scielo and Scopus, Dialnet.

3. Results and Discussion

To enter into the approach of treatments for gingival recession, we must bear in mind that the current gold standard, defined by Chambrone et al. (2008) is the grafting of connective tissue next to the coronally advanced flap, with the advantage of keratinized tissue gain, but with disadvantages of postoperative pain and bleeding at the second surgical site (Zucchelli, & Mounssif, 2015). Since Choukroun et al. described the first concentrate rich in platelets and leukocytes in a fibrin matrix, the interest generated by platelet concentrates increased. PRF is not a simple fibrin membrane, it is a matrix containing many favorable cells and molecules. to the treatment of wounds. It is defined as a "physiological concentrate" biomaterial, since it is obtained from the patient and there are no chemical additives (Choukroun et al., 2000). Therefore, PRF membranes have been used in different types of tissue regeneration in dentistry and medicine, and it was in this trigger that researchers began to test the possibilities of using PRF in treatments of gingival recessions, seeking to simplify the technique, improve results and decrease patient morbidity in the trans and postoperative period (Salgodo & Salgodo, 2017).

At present, there is great confusion with the terms that are reflected in the different classifications. One of the most didactic is the one carried out by Giannini et al. (2015) which divided platelet derivatives into four groups depending on their leukocyte content and their fibrin architecture and thus established: pure platelet-rich plasma, platelet-rich plasma and leukocytes, pure platelet-rich fibrin and platelet and leukocyte-rich fibrin. Compared to platelet-rich plasma (PRP), plasma rich in fibrin and leukocytes (L – PRF) has a higher amount of platelets and leukocytes, as well as growth factors such as PDGF, VEGF and TGF, and very representative proportions of fibrin, fibronectin and vitronectin (Khorshidi et al., 2016; Uraz, 2015). Its use in oral and maxillofacial surgery, oral implantology and in particular in periodontics is a current and interesting trend. The strong and elastic architecture of the fibrin membrane allows its application as a true membrane or tissue, suturable, and with wide clinical versatility (Tunali et al., 2015). It does not need additives, eliminates the probability of transmission of diseases, rejection, immune reactions and allergies, since it is prepared from the patient's blood therefore becomes harmless. Hemostasis helps and prevents gingival dehiscence, promotes gum remodeling and healing8. Several studies show that platelet concentrates are promising alternatives in root covering (Jankovic et al., 2012; Sciani et al., 2020; Gomez et al., 2015).

Some studies suggest that not only is the response of the tissues more satisfactory, but they also show that the presence of such agents could alleviate the postoperative symptoms inherent in any surgery, whether curative, regenerative or even palliative in severe cases such as communications due to osteonecrosis of the jaws. It should also be noted that, until now, one of the limitations of these techniques was the limited time available for their use in the patient, however, with current protocols

and the use of L-PRF surgical boxes, the placement of the biomaterial in the patient's recipient bed can be delayed up to five hours (Kimble et al., 2004). The authors They selected a female patient, 44 years old, healthy in terms of her systemic and periodontal condition, without smoking, with symmetrical recessions due to abfraction and traumatic brushing, bilateral gingival recessions in vital teeth 13 and 23 and free of restorations. Both recessions were treated in the same surgical procedure. On one side a displaced coronal flap plus connective tissue graft (CDC + ITC) tooth number 23 was performed, the measurement of the gingival margin to the cement amelo line (LAC) was 4mm, groove depth 2mm, after 6 months the distance from the gingival margin to the cement amelo line (LAC) was 0 mm and groove depth 1mm, and on the other side a displaced coronal flap plus a fibrin membrane rich in platelets and leukocytes (CDC + L-PRF) tooth number 13, the measurement of the gingival margin to the cement amelo line (LAC) 4mm, and groove depth 3mm, after 6 months the distance from the gingival margin to the cement amelo line (LAC) was 2mm and groove depth 1 mm (Eren, 2014; Tunali, 2015).

Studies comparing autologous gingival grafting with PRF have a follow-up period of 6 months. A follow-up of 6 months can be considered relatively little due to possible additional scarring observed over longer periods18. However, some authors believe that 6 months is sufficient for stability of the gingival margin (Simonpieri et al., 2004). Thus, in the study by Tunali et al. the follow-up was extended to 1 year in which a total of 44 Bilateral gingival recessions Miller Classes I / II, adjacent and greater than 3 mm in size. Each recession site was randomly assigned to the test group 22 recessions with fibrin-rich plasma and leukocytes (L-PRF) and the control group 22 recessions with connective tissue grafting. The initial recession in the L-PRF group was 4.45mm, control at 6 months presented a recession of 3.32mm and at 12 months presented a recession 1.05mm, root coverage was 76.63%, in the L-PRF group. And in the connective tissue graft group the initial recession was 4.02mm, control at 6 months presented a recession of 2.98mm and at 12 months presented a recession of 0.98mm, root coverage was 77.36% in the connective tissue graft group. It is suggested that the L-PRF membrane may be an alternative graft material to treat multiple recessions larger than 3 mm in size without the need for additional surgery (Dohan et al., 2009).

Jankovic et al. in a randomized clinical trial with follow-up of 6 months compared the use of a platelet-rich fibrin membrane (PRF) and connective tissue graft, in the treatment of gingival recession where no difference was observed between the procedures in terms of the degree of coating (88% and 91%, respectively) and clinical parameters such as probing depth (PS) and clinical insertion level (CIN). However, in the group where the PRF membrane was placed, earlier healing was observed. PRF grafting also shows keratinized tissue gain, but in smaller proportions compared to connective tissue grafting and can be explained as a result of the proliferation of gingival / periodontal fibroblasts under the influence of growth factors present in the fibrin mesh. PRF has a combination of characteristics that, according to the authors, this faster healing in the PRF group occurs as a result of the high density of fibrin fibers that is 100 times above normal levels, which promotes additional stability in healing and accelerates angiogenesis (Choukroun et al., 2006). Another factor that may influence healing would be the action of the growth factor concentrate (PDGF, VEGF, TGF-β), being released gradually for at least one week and influencing angiogenesis, matrix synthesis accelerating the regenerative potential (Miron et al., 2017; Thamaraiselvan et al., 2015).

In 2017, a systematic review was published on the role of PRF in tissue regeneration. Of the 7 in vitro studies analyzed, 6 of them (85.7%) demonstrated statistically significant differences in the use of PRGF as a regenerative therapy. Of the 11 in vivo studies analysed, all showed significant differences in the advantages of using PRF in tissue repair. Of the 31 clinical studies reviewed, 27 (87%) support the use of PRF in soft tissue repair in very 89 varied procedures in different areas of medicine and dentistry. In conclusion, the results of this systematic review highlight the positive effects of PRF on wound healing after regenerative therapy for the management of several soft tissue defects found in medicine and dentistry (Miron et al., 2017). Although Chambrone et al. describe the coronally advanced flap plus connective tissue graft as the gold standard in the treatment of gingival recessions, due to its ability to achieve complete blood support after 2 weeks5, several authors argue that methods and techniques that obtain more advantageous characteristics should be sought. In that controversy, tests began with the biomaterial described by Choukroun (Thamaraiselvan et al., 2015; Grifffin et al.,

2006; Pazmino et al., 2017; Culhaoglu et al., 2018). Gemonstrate that connective tissue grafting provides a higher percentage of root coverage and a better aesthetic result than the L-PRF membrane after 6 months, however the use of an L-PRF membrane provides partial coverage of recession and less subjective discomfort of the patient when compared to connective tissue grafting (Gomez et al., 2015). The use of the PRF membrane means a significant increase in the thickness of keratinized tissue according to the results of Jankovic's study13. Other authors corroborate this information by mentioning in their studies that the PRF matrix provided an increase in the thickness of the keratinized gum in the areas where it was applied as a treatment for gingival recession defects (Aroca, 2009). This effect may be the result of the proliferation of periodontal ligament fibroblasts, due to the influence of growth factors present in the PRF matrix (Keceli et al., 2015; Uzun et al., 2017).

On the contrary, Uzun et al. commented in their study that both the defect areas treated with the PRF matrix and the subepithelial connective tissue graft showed an increase in keratinized tissue thickness (Heber et al., 2017). This increase can be attributed to the fact that these biomaterials create a conductive effect by serving as space maintainers, being able to increase soft tissue in defective areas. This is consistent with Choukron et al., these events lead to accelerated tissue healing due to the effective development of neovascularization, accelerated wound closure with rapid remodeling of scar tissue, and almost total absence of infectious events (Choukroun et al., 2006). The absence of a clear protocol for the execution of this type of treatment has been shown as a limitation, thus leaving an indefinite opening on how to proceed31. However, Dohan et al. state that most protocols lead to a low-density fibrin gel, which allows convenient surgical application, but lacks a true supporting fibrin matrix. Conversely, a high density of the fibrin network means that the platelet concentrate can be considered as a biomaterial, and the fibrin matrix itself can have potential therapeutic effects (Dohan et al., 2009).

The limitations and disadvantages are low, currently, with the use of L-PRF surgical boxes, the insertion of the already prepared membranes can be delayed up to 3 h, as long as they are not removed from the box. Limiting the production of 8 membranes simultaneously8 is not a drawback, since few are used in practice. Another limitation is that some patients do not like the blood draw, so we can list this as an unfavorable element. The greatest limitation is to expand knowledge regarding the efficiency of this biomaterial in the long term, in order to define the limits of this in tissue regeneration. PRF is a bioactive material with evident regenerative benefits that avoids the need to take grafts from a donor area on the palate, thus reducing postoperative morbidity. The biological activity of the fibrin molecule alone is sufficient to explain the healing capacity of PRF. Resulting in a favorable therapeutic alternative in the dental area. Although the clinical use of PRF has promising results in the treatment of gingival recessions, few studies have sought histological results. In periodontics, this field of research will soon find its golden age with the development of easy-to-use platelet concentrate procedures and the definition of new concepts and efficient clinical protocols.

4. Conclusion

PRF is a bioactive material with evident regenerative benefits, stimulates the repair of hard and soft tissue, is an autologous material that can be used as a clot or as a membrane, its method of obtaining is simple and economical compared to other tissue regeneration materials, therefore, it is a good therapeutic alternative in dentistry and that, In combination with other biomaterials, it can improve their regenerative properties. The literature shows that the use of PRF in procedures in the area of periodontics, is effective in improving clinical parameters such as compared to the coronal replacement flap, has the advantage of increasing gingival biotype and keratinized gum width. However, despite its significant advantages, it is clear that a greater number of clinical trials are needed in the medium and long term to define the limitations of this biomaterial, analyzing its biological behavior will allow it to evolve in the study of new strategies and devices supported by intelligent engineering, predictably directing the natural capacity of the organism to regenerate lost tissues.

Conflict of interest:

The authors declare no conflict of interest.

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