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ABSTRACT:

Loss of connected connective tissue and other periodontal tissues is a hallmark of periodontal disease. Platelet-secreted growth factors aid in the development of new tissue and the healing of wounds.

AIM The current review sought to shed light on the function and workings of PRF in periodontal regeneration for periodontally compromised teeth.

DISCUSSION : The rationale of these technologies is to extract all the elements from patient's own blood sample, which could be used to improve healing by promoting tissue regeneration. PCs have evolved a long way since its introduction in 1954.

CONCLUSION: PRF is regarded as an easy and affordable method for effective periodontal regeneration.

KEYWORDS : Platelet concentrate, platelet-rich fibrin, and periodontal regeneration

INTRODUCTION

The connected tissue and supporting bones are destroyed by periodontal disease, which is thought to be a multifactorial illness that can cause tooth loss. Bacterial plaque is the main cause of periodontal disease. The goal of periodontal therapy is to restore healthy periodontal tissue by removing the damaged, inflammatory tissues^[1]. Cell adhesion, migration, proliferation, and differentiation are among the biological processes that must be managed in order for periodontal regeneration to occur. Periodontal tissue regeneration can be accomplished in a variety of techniques and stages, including root surface biomodifications, directed tissue regeneration, tissue grafts, and bone grafts^[2]. Yet it is clear that prior regenerative therapies had limited ability to restore all healthy periodontal tissues and could only restore the original tissue volume^[2].

In addition to autogenous and allogenic bone transplants, several biomaterials are employed to repair intrabony deficiencies and regenerate periodontal tissue. All periodontal tissues, including epithelial tissue, fibroblasts, periodontal

ligament fibres, and osteoblasts, must be recovered during periodontal regeneration^[3]. According to research, many growth factors are released into tissues by platelets as they consolidate within the fibrin clot during the healing of wounds^[4]. The growth factors and cytokines found in platelets play a significant role in the healing of wounds^[5]. Fibrin, vitronectin, and fibronectin are secreted by platelets.

All of these point to the potential function that platelet concentrates may play in the regeneration of periodontal tissue^[6]. Platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) are the first and second generations of platelet concentrates, respectively^[6].

PLATELET WITH PLASMA

PRP is a particular kind of platelet concentrate that has the potential to serve as a source of growth factors, which are crucial for wound healing and the regeneration of periodontal tissue. PRP may be utilised to repair intrabony abnormalities and the loss of periodontal bony tissues because prior research has shown that it increases the rate and degree of bone growth [6]. PRP has been identified

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to release a variety of growth factors that have significant chemotactic potential and mitogenic effects that encourage and regulate cell proliferation, tissue regeneration, and repair^[5].

A substantial number of platelets and leukocytes make up the majority of Platelet-Rich Fibrin PRF^[5]. Dr. Choukroun first created PRF using blood samples from his own patients, centrifuged without the addition of any anticoagulants, bovine thrombin, or other jellifying agents. The PRF is typically dense, composed of fibrin tissue, leukocytes, and platelets, and is distinguished by slowly releasing growth factors and cytokines over the course of seven days. On the other hand, PRP rapidly and in high amounts produces growth factors^[1].

PRF's Function in Infection Prevention

It is important to prevent infection at the wound site for effective periodontal regeneration. Leukocytes are thought of as the wound's defence mechanism against infection. Moreover, fibrin mesh is distinguished by its capacity to control neutrophil phagocytosis and enzymatic breakdown. Chemotactic substances that become trapped in the fibrin mesh can prevent macrophages from colonising wounds^[1].

Periodontology PRF applications

PRF is a biocompatible tissue that is entirely autogenous and has a great capacity for promoting wound healing and tissue regeneration. In order to cure furcations, periodontal intrabony deformities, and sinus lifting, it is employed in various periodontology techniques.

Treatment Approaches Used by PRF

Dry socket

Following tooth extraction, a multifactorial disease known as "dry socket" may develop. It is

characterised by a painfully inflamed socket. Over the other teeth, the wisdom tooth socket is where it most frequently occurs. The PRF procedure is one of the several therapy techniques for dry socket. Several investigations have demonstrated that the use of PRF in dry sockets has an analgesic effect, hence reducing discomfort

Furcation Defects

Due to their difficult accessibility and uneven structure, furcation defects are regarded as a difficult area to repair. Thus, to enable optimal root planning, periodontal regeneration, and osseous recontouring, this area is typically treated surgically^[6]. This method of treating furcations has produced excellent results, particularly when treating early grade II furcation involvement. Many regenerative techniques, including the use of several growth factors, directed tissue regeneration, bone grafting, and PRF, can improve periodontal regeneration.

Intrabony Defects

The most prevalent intrabony dental abnormality is the periodontal pocket. A lack of periodontal attachment is one of its many manifestations. Many growth factors found in PRF can stimulate tissue regeneration and gingival attachment after 3-6 months of application in the dental pocket^[6].

Sinus Lifting

The surgeon may encounter atrophic maxillary bone during implant placement in the maxilla, resulting in a reduction in the bony height required for implant placement. To enhance the bony height in these circumstances, sinus lifting with bone graft should be performed^[3]. Several investigations have demonstrated that PRF can be employed in sinus lifting as a graft material. The

findings showed that when administered to the sinus floor, PRF can promote bone growth.

PRF characteristics

Benefits of PRF

In addition to the leukocyte and cytokine release from the fibrin mesh that lasts for more than 7 days, PRF is distinguished by its extended release of growth factors for more than 300 minutes after preparation ^[6]. PRF is an expensive, entirely autogenous graft that needs to be used right away after preparation since any delay could cause the fibrin to diffusely polymerize, leaving just a tiny, poorly formed clot in the test tube . Without chemicals or clotting agents like bovine thrombin, PRF can be made more quickly and easily. It's also extremely biocompatible and resistant to autoimmune reactions .

PRF disadvantages

The two main drawbacks of PRF that prevent widespread use are as follows: (1) its preparation, as PRF is made without the use of anticoagulants like bovine thrombin and the therapeutic effectiveness of PRF depends on the amount of time between blood collection and centrifugation . (2) PRF should be used right away after preparation because shrinkage could happen, leading to dehydration of PRF decreasing its integrity and growth factor release. Additionally, PRF has leukocyte content, which changes the biological effects of PRF, particularly its anti-inflammatory and anti-infection characteristics ^[1].

Procedure for Preparing PRF

In 2000, Dr. Choukroun developed the original PRF preparation method ^[2]. To get the right platelets, leukocytes, fibrin-matrix, and growth factor quality and quantity, the PRF preparation technique must be correctly followed. There are

certain pieces of equipment required for PRF preparation. A blood collection kit and centrifuge are included in this equipment ^[3]. A 24-gauge butterfly needle and nine-milliliter blood collection tubes make up the blood collection set. After that, a sample of the patient's blood is drawn into 10 ml tubes without the use of any anticoagulants, and this sample is immediately centrifuged for 10 minutes at a speed of 3,000 rpm. Anticoagulants were not added during blood centrifugation or during the entire preparation process. During the centrifugation process, when the blood gets in contact with the test tube wall, the platelet gets activated leading to the initiation of the coagulation cascade. When centrifugation finishes, we get a product which consists of three layers. The first layer on the top is the platelet poor plasma layer. The second layer on the middle of the product is PRF clot, while the third layer on the bottom is RBCs . After that, the fibrin clot obtained after centrifugation is discarded from the tube and the attached RBCs is detached from it and For preparing PRF in the form of a membrane, the fibrin clot is squeezed from the fluids present. For the success of PRF preparation, centrifugation should start immediately after the blood specimen is collected. If centrifugation is not done immediately after blood specimen collection, a small blood clot will be formed with irregular consistency due to diffuse polymerization of fibrin ^[2].

Evidence for the Role of PRF in Periodontal Regeneration

PRF is characterized by its biocompatibility and ability to release growth factors and cytokines which increase the healing of hard and soft tissues ^[4]. So, PRF is used in implant and plastic

periodontal surgery procedures to enhance bone regeneration and soft-tissue wound healing^[3]. PRF was primarily used in implant surgery for enhancing the healing properties of the bone^[4]. PRF can promote the healing of intrabony defects by different mechanisms.

CONCLUSION

The first PRF preparation process, discovered by Dr. Choukroun, is easy, secure, and affordable. Several growth factors, such as platelet-derived growth factors and transforming growth factors, are released by PRF. These elements promote the proliferation and differentiation of osteoblasts and other periodontal tissue cells. In situations where there are intra-bony defects, PRF can be combined with an alloplastic graft to fill in the defect's sites with bone, which can be seen radiographically within three months. so that PRF can regenerate periodontal tissues under various periodontal circumstances.

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