

# PRACTICE GUIDELINE FOR OBTAINING PLATELET-RICH FIBRIN (PRF)

## GUIA PRÁTICO PARA OBTENÇÃO DA FIBRINA RICA EM PLAQUETA (PRF)

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### ABSTRACT

Platelet-rich fibrin (PRF) is a fibrin matrix derived from the patient's own blood, concentrating platelets, leukocytes, cytokines and essential growth factors for healing and tissue repair, which has gained prominence as an effective alternative to accelerate tissue regeneration. There are different forms of PRF, such as L-PRF (membrane) and i-PRF (liquid), which vary according to the extraction protocol and the type of centrifuge used. This study aimed to describe in a didactic manner the protocols for obtaining these forms of PRF, based on different manufacturers of centrifuges and collection tubes used, contributing to the training of health professionals and advancement of regenerative medicine

**KEYWORDS:** Platelet-rich fibrin, platelet-rich plasma, practice guideline, regenerative medicine.

### RESUMO

A fibrina rica em plaquetas (PRF) é uma matriz de fibrina derivada do sangue do próprio paciente, concentrando plaquetas, leucócitos, citocinas e fatores de crescimento essenciais para a cicatrização e reparo de tecidos, que tem ganhado destaque como alternativa eficaz para acelerar a regeneração tecidual. Existem diferentes formas de PRF, como o L-PRF (membrana) e o i-PRF (líquido), que variam conforme o protocolo de obtenção e o tipo de centrífuga utilizada. Este estudo teve como objetivo descrever de maneira didática os protocolos de obtenção dessas formas de PRF, com base em diferentes fabricantes de centrífugas e tubos de coleta utilizados, contribuindo para o avanço da medicina regenerativa e formação de profissionais da saúde.

**PALAVRAS-CHAVE:** Fibrina rica em plaquetas, plasma rico em plaquetas, guia de prática clínica, medicina regenerativa

## 1. INTRODUÇÃO

Healthcare has been constantly evolving to develop procedures and materials that can optimize treatments and improve patient prognosis, both in the short and long term. Exploring alternatives to accelerate tissue neof ormation is a constant pursuit, and research to achieve this possibility is increasingly expanding. The use of platelet-rich fibrin (PRF) is an example. It is a

fibrin matrix derived from the patient's own blood, obtained through centrifugation to concentrate platelets and fibrin that contains a high concentration of leukocytes, cytokines and growth factors.

PRF is the second generation of platelet aggregates and was developed in 2001 in France by Dr. Choukroun, gaining popularity by accelerating the healing of soft and hard tissues<sup>1</sup>. The first generation of concentrated platelets was platelet-rich plasma (PRP), used in the 1970s, with the first generation specifically for bone regeneration in the documentation of bone defects and in aiding in the reconstruction of alveolar ridges. However, despite having proven to be an effective biomaterial for the purpose for which it was used, it was determined that PRP presents risks to life, since to obtain it, is necessary to combine bovine thrombin, which can induce coagulopathies<sup>2</sup>.

PRF membrane is formed by a natural polymerization process during centrifugation, where its three-dimensional fibrin architecture is responsible for the slow release of growth factors and glycoproteins from the matrix. PRF overcomes the limitations of Platelet-Rich Plasma (PRP), in addition to having unlimited availability and significant regenerative potential, which favors better and faster healing and repair of surgical injuries<sup>3</sup>.

The physical forms of the PRF varies according to the production protocols, which are influenced by the tube manufacturer and centrifuge brand. Currently, the most widely used forms are L-PRF (Leukocyte-Platelet Rich Fibrin) and i-PRF (Injectable Platelet Rich Fibrin). In both types, the fibrin matrix is autologous and has a high concentration of platelets and various growth factors, such as transforming growth factor- $\beta$  (TGF- $\beta$ ), insulin-like growth factor 1 (IGF-1), platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), fibroblast growth factor (FGF), epidermal growth factor (EGF) and platelet-derived epidermal growth factor (PDEGF). They have local and continuous action for a period of 7 to 14 days, thus promoting improved healing and tissue repair<sup>4</sup>.

Obtaining PRF may be a relatively simple procedure for the operator who is already accustomed to its use, but the excess of information and different

forms of obtaining it, whether flexible membrane (L-PRF) or liquid (i-PRF), may disarray professional who is not familiar with it. In this context, the objective of the present study is to describe three protocols for obtaining plate-rich fibrin in membrane and liquid forms.

## 2. MATERIALS AND METHODS

The following databases were explored: Virtual Health Library (VHL), Latin American and Caribbean Literature on Health Sciences (LILACS), PubMed, MEDLINE, CAPES Periodicals Portal, Clarivate - Web of Science, using the keywords descriptors. All descriptors were previously verified and included in MeSH (Medical Subject Headings).

Articles were selected since the first report on PRF, in 2001. Selection criteria were articles published in a journal with a high impact factor, which described tubes, centrifuges and PRF preparation methods.

## 3. RESULTS

To prepare PRF, it is necessary to centrifuge blood in a appropriate collection tube, that will allow operator to achieve it in L-PRF membrane or liquid i-PRF, without any addition of anticoagulant and bovine thrombin.

### Obtaining L-PRF (membrane):

To obtain L-PRF, a red glass tube must be used, which is characterized by the presence of the clot activator (silica). If the tube used is made of plastic, it must contain silica on its internal walls, since it does not have it naturally. The tube sold for this purpose by PRF Process by Choukroun® is sold in red, under the name A-PRF, and has the capacity to collect up to 10 ml of blood.

Centrifugation protocol for obtaining the L-PRF membrane varies according to the centrifuge used, with the main ones listed in Table 1.

**Table 1.** Time, revolutions per minute (rpm) and G-force required to obtain L-PRF, according to the centrifuge used.

Centrifuge	Time (minutes)	G-force	Rpm
Duo Quattro (PRF Process by Choukroun®)	12	208	1300
Intra Spin (Intra-Lock)	12	208	1500
Fibrin Fuge 25 (MontSerrat)	10	200	1659

Source: Kehrwald R *et al.*, 2020<sup>5</sup>.

After centrifugation, the tube should be left to rest on a test tube rack for at least 5 minutes. The upper contents of the collection tube (fibrin clot, with leukocytes and platelets) should be clamped using toothless Adson forceps or similar forceps<sup>5</sup>, as shown in Figure 1.



**Figure 1.** PRF membrane held with the aid of appropriate forceps  
Source: own authorship



**Figure 2.** PRF membranes after centrifugation. Source: own authorship

### Obtaining i-PRF (Liquid)

To obtain i-PRF, a white or green tube is used, which is characterized by the absence of additives or silica, so the fibrin coagulation/polymerization time will be the same as the patient's own. Note that this tube is made of plastic, since glass contains silica in its composition. Collection must be done within three minutes to prevent the coagulation process from starting, which would prevent the components from separating during centrifugation. Once sufficient collection has been made, the tourniquet must be removed before removing the needle from the patient's arm. From 4 to 8 blood tubes with a volume of 9 or 10ml can be obtained, according to clinical need.

The tube sold for this purpose by PRF Process by Choukroun® is sold in green, under the name S-PRF, and has the capacity to collect up to 10 ml of blood. The same manufacturer provides a purple tube, called i-PRF+, with a capacity of 13 ml and indicated for use in orthopedics and aesthetic procedures.

Centrifugation protocol for obtaining liquid i-PRF is presented in Table 2.

**Table 2.** Time, revolutions per minute (rpm) and G-force required to obtain i-PRF, according to the centrifuge used.

Centrifuge	Time (minutes)	G-force	Rpm
Duo Quattro (PRF Process by Choukroun®)	14	208	700
Intra Spin (Intra-Lock)	5	208	800
Fibrin Fuge (MontSerrat)	5	200	1659

Source: Kehrwald R *et al.*, 2020<sup>5</sup>.

Immediately after centrifugation, the upper part should be aspirated using a sterile dropper or syringe with a sterile needle. To delay the polymerization of i-PRF fibrin, the tube with centrifuged blood can be kept in a container with ice (storage without agglutination for approximately 10 minutes)<sup>5</sup>.

### 4. DISCUSSION

The use of PRF was considered an evolution of PRP and has demonstrated several advantages, including elimination of the risks of using bovine thrombin with the old PRP technique. Since then, some protocols for obtaining PRF have been developed, varying according to the equipment used and the professionals performing procedure<sup>6</sup>. True fact is that the characteristics of the centrifuge can interfere in obtaining the PRF clot, which requires special attention, especially when applying a certain protocol in a centrifuge other than the one for which it was developed<sup>7</sup>. In this sense, our work demonstrated in an easy and didactic way, clinical practice guidelines for obtaining the most used forms of PRF. In addition, our description of the tubes suitable for obtaining each type of PRF, as well as the nomenclature used by the company certified by Choukroun<sup>1</sup>, is extremely important to reduce understanding biases due the large

number of names used by the manufacturers of these tubes.

### 5. CONCLUSION

Through the analysis of different protocols, this work provides a clear and accessible understanding to health professionals, particularly those who are not yet familiar with the use of PRF in their clinical practices. We reinforce the importance of a well-established protocol for the use of PRF, contributing to the standardization of the procedure and expanding scientific understanding of its impact on regenerative medicine.

### 6. REFERENCES

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