



## Review Article

## Various applications of platelet rich fibrin in the field of dentistry: A review

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## ABSTRACT

Platelet rich fibrin is obtained from platelets, from human blood and can act as a biomaterial. Platelet plays a major role in the healing process as it contains various growth factors and cytokines. The main advantage of platelet rich fibrin is, it is prepared from patients own blood that's why it is known as autologous material. It is very commonly used in the field of dentistry in the process of recovery, healing of tissue after surgeries and also in tissue regeneration.

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## 1. Introduction

Platelet plays a major role in the process of healing, either by the process of hemostasis of blood or by whole process of wound healing.<sup>1</sup> Literature stated that platelets growth factors with in it that are responsible for the production of collagen, ingrowth of blood vessels, in the process of cell differentiation.<sup>2</sup> Platelet rich fibrin basically is a suspension of bioactive material that can be applied locally to promote the process of wound healing.<sup>2</sup>

Platelet rich fibrin was introduced by Choukroun et al in the year 2001<sup>2-4</sup> specifically to be used in oral surgical procedures, but with time, now a days platelet rich fibrin being used almost in every specialty of dentistry. Its major constituents are matrix of autologous fibrin material.<sup>5</sup> Platelet rich fibrin is totally an autologous preparation, as it is made up of totally with patient own blood, with the help

of centrifugal machine and no other material is required for chemical manipulation of the blood, as it is required in the case of platelet rich protein.<sup>6</sup>

There is a variety of factors that may influence the aesthetic outcome of the prosthesis that is supported by an implant. Some of the factors are dependent over the dental surgeon like implant positioning, angle of the implant, and some of the factors are dependent over patient and may vary from one patient to the other, i.e. amount of bone availability, type of bone, amount of soft tissue present, type of soft tissue available.<sup>7</sup> The major reason for the aesthetic failure was loss of surrounding bone structure.<sup>8</sup> This type of structure loss seen in dentistry mostly in cases of surgical extraction or present of any fistula due to underlying cause.<sup>9</sup>

The main fundamental of using platelet rich fibrin in association with implant placement is to increase the amount of bone tissue surrounding the implant. Platelet rich fibrin can be used in all types of patient even on smokers and

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on those patients who all were on anticoagulant therapy.<sup>10</sup> The platelet rich fibrin that is formed after centrifuging the blood in the centrifugal machine is a strong matrix which is formed by fibrin. That constitutes platelets and all the growth factors of the blood that is harvested.<sup>11,12</sup> Platelet rich fibrin itself is having identical mechanical properties which make it different from all the other concentrated aggregated material. Many studies stated that the wound healing was fast and accelerated when wound is covered with concentrated aggregate of platelet rich fibrin, than the wound being closed without the use of platelet rich fibrin aggregate.<sup>13,14</sup>

Platelet rich fibrin is found to be superior when compared to other concentrated aggregates like platelet rich proteins because it is quite easy to manipulate and is very much easy for use, in addition to all these it does not require addition of any of the exogenous material like bovine thrombin or calcium chloride.

## 2. Platelet Rich Fibrin

Platelet rich fibrin was firstly introduced by Choukroun's in France with its primary use in oral surgical procedures. It is a biomaterial composed of platelet rich fibrin and leukocyte. Platelet rich fibrin is prepared as natural concentrate that too without the addition of any anticoagulant and came under and is classified under second generation aggregate of platelet.<sup>15,16</sup> Platelet rich fibrin mainly constitute of fibrin, along with some glycoproteins, cytokines and leukocytes and some growth factors also, like TGF i.e. transforming growth factor  $\beta$ 1, PDGF i.e. platelet derived growth factor, endothelial growth factor, thromboplastin-1. Platelet rich fibrin creates physiological and favorable architecture in the process of wound healing.<sup>17</sup>

## 3. How to prepare platelet rich fibrin

The basic technique for the preparation of platelet rich fibrin was introduced by Dr. Choukroun in the year of 2000. In this classical technique the platelet rich fibrin was prepared without the use of any anticoagulant during harvesting of the blood. The most important equipment required for the preparation of platelet rich fibrin is a centrifugal machine, butterfly needle which is of 24 gauge, and a blood collection tube of 9ml respectively. Blood sample was collected from patient own blood in a 10 ml of tube and that too without the use of any anticoagulant, the tube containing blood sample was placed immediately in the centrifugal machine for 10 min and the machine works at 3000 rotations per minute. As the blood came in contact with the walls of the test tube, platelets gets activated, results in the initiation of aggregation. The end result consists of a product, which is having three layers. Platelet poor plasma forms the top most layer, red blood cells forms the bottom layer and the platelet rich fibrin forms the middle most layer. The clot

that contain fibrin, which was obtained after the process of centrifugation was removed from the tube along with red blood cells. It was mandatory to place the platelet rich fibrin after the centrifugal process in a sterile cup for a minimum time of 10 minutes, for the proper release of serum which was presented with in it. The contact between the blood and the silica surface is very much necessary for the process of clot polymerization. This is one of the reason, why PRF should be obtained in dry test tube or in glass coated with plastic tube.[19] After than the platelet rich fibrin membrane was squeezed in between the sterile gauge pieces, so the fibrin clot material will squeeze out from the platelet rich fibrin. Time plays a major role here beginning from the collection of blood from the patient to the centrifugal process, if not taken seriously can affect the clinical outcome of the procedure.

### 3.1. Application of platelet rich fibrin

1. Very much easy to prepare, can be prepared with simplified technique, easily accessible by all the clinicians.
2. Totally obtained thorough the patient own blood sample only, and can be prepared with the patient own blood sample, no any exogenous material is required for the preparation of platelet rich fibrin.
3. Minimum amount of blood is required for the preparation of PRF.
4. Contains natural framework of fibrin network along with various growth factors with in it that keeps its activity for a longer period of time.
5. Helps in the process of tissue regeneration very easily as well as effectively.
6. Platelet rich fibrin can be used alone or in combination with bone graft material, depending on the purpose or the type of defect.
7. Helps in increasing the healing tendency of the grafted material.
8. Very much economical and quick preparation when compared to other materials, with abundance of recombinant growth factors present with in it.
9. It reduces patient discomfort during the initial healing phase, when platelet rich fibrin used as a membrane, covering the defect.
10. It also act as a barrier membrane to the wound, during the initial phase of wound healing.
11. Final clinical results are much efficient enough in case of PRF when compared with PRP.
12. Platelet rich fibrin can be used in periodontal bone defects, and showed clinical results in reducing probing depth of the defect.
13. When platelet rich fibrin was used in oral surgical procedure of 3<sup>rd</sup> molar, results in at least 90% reduction of localized osteitis.

14. As an alternative to palatal wound healing, after the free gingival graft has been harvested.
15. Very helpful in revascularization procedure of pulp, of immature permanent tooth that is non vital. As platelet rich fibrin having great amount of various growth factors with in it, it can help in cellular proliferation, differentiation, angiogenesis, can act as a matrix for the growth of the tissue and can be helpful in regulating the inflammatory reaction.
16. Used in sinus lift procedures.
17. Can be helpful in maintaining the alveolar ridge height, in case when patient has to undergo multiple extractions.
18. Can be placed around the implant, for the process of bone regeneration.

### 3.2. Role of platelet rich fibrin in orthodontics

The prime most function of platelet rich fibrin in the field of orthodontics is its beneficiary effect over orthodontic tooth movement. A human pilot study been conducted by Tehranchi, et al to evaluate the effect of placing platelet rich fibrin in the extraction socket on orthodontic tooth movement. They revealed that when platelet rich fibrin membrane is placed in the extraction site they found accelerated orthodontic tooth movement.

### 3.3. Disadvantages

1. The success rate of platelet rich fibrin is directly related to handling process, mainly blood collection and transfer of blood sample to the centrifugal machine.
2. Chances of refusal of treatment due to puncture, required for blood collection.

## 4. Conclusion

It is a simple and inexpensive technique, used for the regeneration procedure. Its main advantage is that, it can be prepared from the patient own blood and no exogeneous material is required for the preparation of platelet rich fibrin. The use of platelet rich fibrin in daily clinical practise shows very good results.

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## 6. Conflict of Interest

The authors declare they have no conflict of interest.

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