



**Comprehensive Review On PRP and PRF  
Applications In Oral And Maxillofacial Surgery**

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**Abstract**

*Platelet-rich fibrin (PRF) is an immune and platelet concentrate that contains all constituents of a blood sample favourable to healing and immunity on a single fibrin membrane.*

*Being a strong reservoir of platelets, leucocytes, cytokines and immune cells , PRF is reported to allow slow release of cytokines: Transforming Growth Factor  $\beta$ -1(TGF), Platelet Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF) and Epidermal Growth Factor ( EGF) which play a critical role in angiogenesis and tissue healing and cicatrization. In this review we are listing the*

*various advantages, disadvantages ,differences between PRP and PRF,applications of PRF and PRP in Maxillofacial surgery which includes preservation of tooth socket after extraction, after apicoectomy procedure to induce bone formation and healing, sinus lift procedure, application in an established dry socket, osteomyelitis of jaws, dental implant surgery, oroantral fistula closure, as a natural skin filler, hair loss treatment etc.*

### **Introduction**

Kingsley (1954) first used the term PRP to earmark thrombocyte concentrate during experiments related to blood coagulation. <sup>1</sup>Choukroun et al (2001) from France developed PRF for the first time for its various use in Maxillofacial Surgery<sup>2</sup>, its preparation was done by collecting blood in 10ml test tubes without any anticoagulant and immediately centrifuged for 10minutes at 3000rpm. Its architecture is made by slow natural polymerization on contact with glass particles of the test tube results in physiologic thrombin concentration Equilateral junctions (connected trimolecular) allow the establishment of a fine and flexible fibrin network able to support cytokines enmeshment and cellular migration. This 3-dimensional organization gives great elasticity to the fibrin matrix which is observed in a flexible, elastic and very strong PRF membrane<sup>3</sup>. PRF releases high quantities of 3 growth factors TGF- $\beta$ 1, PDGF-AB(Platelet Derived Growth Factor), VEGF(vascular endothelial growth factor), and an important coagulation matricellular glycoprotein (TSP-1) during the first 7 days. Along with this PRF also secrete EGF, FGF, and three important proinflammatory cytokines - interleukin (IL)-1b, IL-6, IL-4 and TNF- $\alpha$  (Tumor Necrosis Factor ).The easily applied fibrin acts much as a fibrin bandage with biochemical components that already have well known synergistic effects on healing processes. The presence of fibrin network composed up of leukocytes and cytokines play a significant role in

self-regulation of the inflammatory and infectious phenomenon within the grafted material.<sup>4</sup> P,L,T,A and I are the different types of PRF that can be prepared of which L- type is the most commonly used one. I – type that is the injectable type the recently invented one is only used for injections at various sites. They are mostly used for using as a natural skin filler and for the treatment of hair loss.

### **Differences between PRP and PRF**

- 1.PRP requires more blood to be withdrawn than PRF
- 2.To prepare PRP , the collected blood should be spun at a higher speed compared to PRF preparation.
- 3.PRFallows some of the white blood cells and stem cells to remain within the platelet layer that is collected for treatment
- 4.Increased number of healing factors are present in PRF
- 5.Usage of an anticoagulant such as ACD for PRP preparation, whereas PRF preparation don't use any of the anticoagulants<sup>24</sup>

### **Applications in Oral and Maxillofacial Surgery**

Various application of PRF in Maxillofacial Surgery includes the alveolar ridge preservation, after third molar removal, after apicoectomy, sinus lift procedures, management of dry socket, cases of osteomyelitis (OML) and osteoradionecrosis (ORN), dental implant surgery, oroantral fistula closure ,reconstruction of large

bony defects after cancer surgery, as a natural skin filler and for the hair loss treatment, TMJ osteoarthritis etc.

### **1.Socket preservation and after surgical removal of third molars**

A variety of previous reports from the past literature confirms that PRF may be used for alveolar ridge preservation.<sup>5,6</sup> PRF also has been proved to alleviate the soft tissue inflammation and has osteogenic potential.<sup>7,8</sup> PRF in combination with 2% Metronidazole after the surgical removal of third molars has shown improvements in the pain, swelling, wound dehiscence ,wound infection and bone formation postoperatively.<sup>9</sup> As PRF is made from the patients own blood its allergic reactions are negligible.

### **2.After apicoectomy and cyst removal**

PRF in combination with bone grafts or alone can be used after the cyst removal , which produces a faster healing of the site and an increased bone growth of the site. It also prevents the soft tissue growth into the bony cavity when its used as a membrane and thereby enabling the bone growth.<sup>10</sup>

### **3.Sinus lift procedures**

PRF can be used in cases where sinus augmentation is needed and it can be used in a combination of variety of bone grafts for the same shows promising results. It can be also used in cases where accidental perforation of sinus mucosa during implant placement.<sup>11</sup> PRF can be manipulated with pressure, thereby the membrane

formed can be used a covering for the lateral window following sinus lift procedures.<sup>12</sup>

#### **4.Management of dry socket**

When a dry socket is established the primary factor for which a patients seeks for the treatment is for the pain and inflammation of the site .After thorough curettage, irrigation and application of PRF in the established dry socket showed promising results in the literature, by its reducing effect of pain and inflammation and pain.

A study conducted by Sam Paul et al concluded that PRF is an alternative and its effects are superior to the conventional treatment, ie, treating with the ZOE pack for relieving the pain and inflammation and an increased wound healing of the site for treatment of an established dry socket.<sup>13</sup>

#### **5.Management of osteomyelitis**

Osteomyelitis is an infection in a bone commonly occur in patients with malnutrition and such systemic diseases caused by decreased resistant to infection. After removing the necrotic bone and correction of the bony irregularities the PRF can be packed into the site and can be sutured. The application of PRF in the site and ozone application postoperatively shows promising results in the literature.<sup>14</sup>

#### **6.Management of Osteoradionecrosis**

ORN, a complication of radiation therapy, has multiple treatment options for which HBO therapy with Marx protocol is the most widely accepted treatment. Tooth extraction after radiotherapy is strongly associated with the development of

ORN.<sup>15</sup> After the removal of tooth the PRF can be placed into the socket followed by closure produces a satisfactory healing in patients treated with radiotherapy.

Yi-Tzu et al. in their case report concluded that the combination of sequestrectomy and PRF might be effective and beneficial for treatment of ORN.<sup>16</sup>

### **7. Dental implant surgery**

PRF has wide variety of implications on dental implant surgery starts from preservation of the alveolar ridge height and socket for future implant placement, after ridge expansion as a covering membrane to the bone, PRF mixed with various bone grafts can be used for increasing the bone density,<sup>9</sup> in sinus lifting for the placement of implants etc. to the bone regeneration around immediate implants, inside the alveolar defect .<sup>17</sup>

### **8. Closure of an oroantral communication**

Oro antral fistula is an abnormal communication between maxillary sinus and the oral cavity. Frequently occurs during excessive application of force for the removal of molar roots which are very close to sinus, inadvertent instrument usage etc. After irrigation of the site PRF can be packed and the membrane can be sutured to the site with minimal manipulation of flaps for the closure.<sup>18</sup>

### **9. PRF as a natural skin filler**

As the age advances facial wrinkling occurs at variety of sites such as in the forehead, below the eyes, corners of the mouth, lateral to the eyes, chin region etc. I type PRF can be injected to these sites for the improvement of skin texture based

on the analysed amount which is needed using an insulin syringe. It can be also used for the improvement of deep nasolabial folds and the results are promising. The advantages of using PRF as a filler are the cost advantage as is made from the patients own blood and negligible allergic reactions, so anyone can be a candidate for this injections. Drawbacks are repetition of the injection after specific time and a little burning sensation on the sites after the injections and which resolved in few days without any treatment.<sup>19,20</sup>

### **10. PRF for the treatment of androgenetic alopecia**

After the filtration process 6-14 ml of iprf can be injected to the very superficial scalp layers by 26 gauge luer lock syringes. It has advantages as it has a roughly 4.5-fold average increase in platelets concentration, a nearly 2-fold increase in granulocyte numbers, a 4.5-fold increase in lymphocyte number, a 5-fold increase in fibrinogen values. These enables the activation of hair follicles and thereby the hair growth occurs. Thereby injecting the scalp with autologous iL-PRF ensures a good degree of clinical efficacy in patients with AGA.<sup>21</sup>

### **11. Treatment of TMJ osteoarthritis**

TM joint osteoarthritis results from wear and degenerative changes in the synovium, cartilage, capsules, tendons, condyles, and/or articular eminences in the TMJ region that are accompanied by remodeling of the underlying subchondral bone. Various non surgical approaches such as reassurance, physiotherapy, pharmacotherapy, occlusal splint usage, arthrocentesis etc are advised as the treatment. Arthrocentesis is a procedure in which the irrigation of the superior joint space for removal of synovial fluid and other elements from the joint. Because of

its advantages such as high safety and quick removal of inflammatory tissue and degradants the effectiveness of arthrocentesis in improving TMJ-OA from the “dysfunctional state” to the “functional state” has been proven.<sup>22</sup> Arthrocentesis with PRP and PRP injections alone treatment approaches can effectively improve multiple symptoms of TMJ-OA.<sup>23</sup>

### **CONCLUSION**

Considering the limitations of this study, we conclude that PRP and PRF have a wide variety of applications in the field of maxillofacial surgery for being cost effective and easy preparation protocol and its effectiveness. Its results are promising. PRF is superior to PRP due to its higher concentration of healing factors and is less allergic because of not using any anticoagulants while the making process unlike PRP. Further studies with more subjects and longer duration are needed for the comparison of the same in various treatments such as after arthrocentesis.

### **CONFLICTS OF INTEREST**

The authors declare they have no potential conflict of interests regarding this article.

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