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Review Article

A literature review on uses of platelet rich plasma in the periodontal therapy

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ABSTRACT

Now a days platelet rich plasma is the new approach to the tissue regeneration process along with it platelet rich plasma is found to be of valuable use in promoting healing in various periodontal, dental and oral surgical procedures. Platelet rich plasma is basically derived from the own blood of the patient, that is containing growth factors with in it, which promotes the healing process in periodontal or other dental procedures.

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1. Introduction

The prime goal of the periodontal therapy is to improve the health of the periodontal tissue and finally to enhance the functions and aesthetics of the patient. From past few years the aim of the periodontal therapy has been changed from repair of the periodontal soft tissue to reconstruction of the periodontal soft tissue.¹⁻³ The concentrate of the platelet rich plasma constitutes of platelet growth factor and along with it, it constitutes of transforming growth factor which plays an important role in wound healing process and they also help or act as promoter of the tissue regeneration. They play an important role in the recruiting of the cells at the site of the tissue injury, they also helps in initiating the vascular growth at the site of the injury and helps in cellular differentiation.⁴⁻⁸ So platelet rich plasma is an autologous platelet concentrate. Whitman in the year of 1997 firstly utilized platelet rich plasma in oral surgical procedure.⁹

Other than oral surgical procedure or dental procedure or periodontal therapy, platelet rich plasma concentrates can also be used in other surgeries like head and neck surgeries, in otolaryngology and in maxillofacial surgeries. Platelet rich plasma is used in the formulation of a gel, which is derived from mixing of the platelet rich plasma concentrates with calcium chloride and thrombin.^{8,10-12}

Platelets plays coagulant effect, along with it platelets are the rich source of platelets derived growth factors, transforming growth factors – b, and vascular endothelial growth factors too. These all factors plays an important in the healing process of the soft and the hard tissue.

Now a days platelet rich plasma has been used in various oro dental surgical procedures like reconstruction surgeries of the mandible, surgical repair of the alveolar clefts, in the treatment of various infrabony periodontal defects, as well as during the placement of the implant, platelet rich plasma concentrate is used after the placement of the implant to promote the healing process near the implant. In these procedures platelet rich plasma facilitates

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the easier handling of the graft material and also facilitate easy and close adaptation of the flaps after the surgical procedure.¹³⁻¹⁶

Recently studies stated that platelet rich plasma is also used in the management of the osteonecrosis of the jaw with the prime aim of healing the bone along with bone maturation.

2. Main Components of Platelet Rich Plasma

Platelet rich plasma mainly comprises of different growth factor in it, phagocytic cells, white blood cells, native concentration of the fibrinogen, different vasoactive agents, and lastly high concentration of platelets. Bone and soft tissue healing can be promoted by the use of different growth factors and platelet rich plasma is the definitive and rich source for different growth factors. Literature shows that the use of platelet rich plasma helps in increasing the rate of bone formation as well as also helps in increasing the density of the bone from 19 percent to 25 percent when measured after 4 months. Platelet rich plasma also eliminates the risk of transmission of the disease as well as it eliminates the risk of any immunogenic reaction.¹⁵⁻¹⁸

Platelet rich plasma has its beneficial effects due to the release of the various growth factors from the granule alpha. The early wound strength has been provided by platelet rich plasma, as it promotes the process of collagen synthesis and the process of angiogenesis. These products as peptides act locally as well as systemically in the system. The antimicrobial effect of the platelet rich plasma is because of high concentration of leukocyte count in it.

2.1. Classification of platelet rich plasma

1. Pure platelet rich plasma.
2. Leukocyte platelet rich plasma.

2.2. Pure platelet rich plasma (P – PRP)

These are basically the preparations that are without leukocyte count with in it. And they have very low fibrin network within it. Pure platelet rich plasma products can be used in the form of liquid solutions and as well as in the form of gel, and they can be applied directly over the wound on the skin or can be applied with suture.

2.3. Leukocyte platelet rich plasma

These are the preparations of platelet rich plasma that contains leukocyte concentration within it. These products can also be used in the form of liquid solutions and as well as in the form of gels which can be applied over the skin wound and can be applied or given along with the suture.

2.4. Preparation of platelet rich plasma

Platelet rich plasma is made with the patient's own blood which is used to deliver the growth factors that too in the high concentration at the site of soft tissue injury or at the site of bone defect.

1. Venous blood is drawn from the patient and placed in the tube, which is already containing an anticoagulant with in it.
2. To avoid the degranulation as well as activation of the platelet, anticoagulant is mixed with the venous blood.
3. Soft spin is known as the first cycle of centrifugation.
4. After the first cycle of centrifugation, the end product is formed in three different layers, namely the bottom layer of red blood cells which constitutes about 55 percent of the total volume, top most layer is the PPP layer, which is made up of a cellular plasma layer and it constitutes about the 40 percent of the total volume and the third layer is buffy layer which is an intermediate layer.
5. Now we transfer the PPP along with PRF and red blood cells in to the new tube, which is not containing any anti-coagulant with in it.
6. Now the second turn of centrifugation is known as the hard spin, in which usually the centrifugation occurs for the longer time as well as centrifugation done at higher speed when compared to the soft spin cycle of centrifugation.
7. This centrifugation helps in settling the platelet rich plasma in the bottom of the tube along with very few number of red blood cells within it.
8. After this, platelet rich plasma is mixed with the bovine thrombin and calcium chloride during the time of application of platelet rich plasma.
9. Calcium chloride solution is used to nullify the effect of anticoagulant which is used earlier and bovine thrombin is used in the activation of the fibrinogen which is ultimately converted into fibrin and gets cross linked.

2.5. Different growth factors seen in platelet rich plasma are as follows

Platelet derived growth factor – AA, AB, BB:- They are mostly used in the periodontal regeneration procedure. They increase the number of cells that helps in healing process at the site of injury. They promote generation of new capillaries. Also helps in increasing the proliferation rate of stem cells.

Trans forming growth factor beta:- This is a peptide which helps in regulating the growth, adhesion and proliferation of the cells.

Epithelial growth factors:- Helps in migration of different cells at the injury site. It also helps in re-epithelialization process.

Fibro blast growth factor:- It primarily helps in the proliferation of fibroblasts and the endothelial cells. It helps in synthesis of collagen, helps in stimulation of angiogenesis.

Clinical benefits of platelet rich plasma:- It helps in promoting the soft tissue healing after any periodontal therapy, it helps in reducing the inflammation at the injury site, it helps in holding the graft material in periodontal defect procedure, it helps in close approximation of the flaps.

2.6. Some other benefits of platelet rich plasma

1. It is non-irritating to the tissue
2. It is non-toxic to the tissue
3. Can be made easily
4. Made from patient's own blood, as it is autogeneous
5. Induces endothelial and epithelial regeneration
6. Induces angiogenesis
7. There is no such risk of transmission of infection between individuals
8. Helps in promoting soft tissue as well as hard tissue healing.

3. Conclusion

Platelet rich plasma is found to be one of the best autologous material in promoting the wound healing. It is easily available and is made by the patient's own blood and neither it is a time consuming process.

4. Conflict of Interest

The authors declare that there is no conflict of interest.

5. Source of Funding

None.

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