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Components of Platelet Rich Plasma (PRP), its Uses and Advantages : A Review

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Abstract : Platelet rich plasma (PRP) is a breakthrough in stimulation and acceleration in bone and soft tissue healing. It represents a relatively new biotechnology that is a part of growing interest in tissue engineering and cellular therapy. Because of its newness there is a potential for misunderstanding & misuse**.**

Platelet-rich plasma was first introduced in oral surgery by Whitman *et al.;* in an article which stated that "through activation of the platelets and the resultant release of these growth factors, enhanced wound healing should be expected". PRP enjoyed a great increase in popularity after the publication of a landmark article by Marx et al in 1998 that proved combining PRP with autogenous bone in mandibular defects resulted in significantly faster radiographic maturation & histo morpho metrically denser bone regenerate.

Key Words : Platelet rich plasma (PRP),

Introduction : Platelet rich plasma (PRP) is a new approach to tissue regeneration: it is widely used in various surgical fields, including head and neck surgery, otolaryngology, cardiovascular surgery, and maxillofacial surgery. Commonly, PRP is used in a gel formulation, which is formed by mixing PRP (derived from the centrifugation of autologous whole blood) with thrombin and calcium chloride. PRP gel includes a high concentration of platelets and a native concentration of fibrinogen. It can be defined as "Volume of autologous plasma that has the platelet concentration above the baseline." or "as a high concentration of autologous platelets in a small volume of autologous plasma". Specifically, PRP is a platelet concentration with at least 1,000,000 per microliter in a 5 mL volume ofIt can be defined as "Volume of autologous plasma that has the platelet concentration above the baseline." or "as a high concentration of autologous platelets in a small volume of autologous plasma". Specifically, PRP is a platelet concentration with at least 1,000,000 per microliter in a 5 mL volume of plasma, when normal human platelet counts in the blood range from 150,000/1 L to 350,000/1 L.: the working definition of PRP

today. Concentration lesser than this cannot be relied upon and the concentration more than this have not shown enhanced bone healing.

During wound healing, platelets are among the first cells to respond at a wound site, being critical to the initiation of this process. Besides their procoagulant effects, platelets form a rich source of important growth factors, such as platelet-derived growth factor (PDGF), transforming growth factor-b (TGF-b) 1 and 2, and vascular endothelial growth factor (VEGF); all of these are involved in the angiogenic cascade which assists in hard and soft tissue wound healing. Recently, PRP has become a valuable adjunct to promote healing in many procedures in dental and oral surgery. Recently, the use of PRP has also been proposed in the management of bisphosphonate-related osteonecrosis of the jaw (BRONJ) or avascular necrosis, which is caused by other factors (e.g. radio-osteonecrosis), with the aim of increasing wound healing and bone maturation.

Components of platelet rich plasma

The growth factors and other cytokines present in PRP include **[**6]

Platelet-derived growth factor

Transforming growth factor beta

Fibroblast growth factor

Insulin-like growth factor 1

Insulin-like growth factor 2

Vascular endothelial growth factor

Epidermal growth factor

Interleukin 8

Keratinocyte growth factor

Connective tissue growth factor

Advantages of platelet rich plasma

It is Safe as it is by-product of the patient's blood; therefore, disease transmission is not an issue. PRP can be generated in the dental office while the patients can undergo an outpatient surgical procedure. Hence it is convenient. It promotes faster healing because of the super saturation of the wound with PRP, and thus growth factors produce an increase of tissue synthesis and thus faster tissue regeneration. It is cost effective as expenses of the harvesting procedure are greatly

reduced. It is Easy to use-PRP is easy to handle and actually improves the ease of application of bone substitute materials and bone grafting products by making them more gel-like. However, it cannot be used in patients with bleeding disorders. It does not reduce rapid venous hemorrhage and it is obviously not a substitute for good surgical techniques. Moreover, it cannot be used in patients on NSAIDS or anti-platelet drugs or in chronic liver diseases.

Review of literature

(Albanese, Licata, Polizzi, & Campisi, 2013) studied "Platelet-rich plasma (PRP) in dental and oral surgery: From the wound healing to bone regeneration" and found that Platelet-rich plasma (PRP) is a new approach to tissue regeneration and it is becoming a valuable adjunct to promote healing in many procedures in dental and oral surgery, especially in aging patients. PRP derives from the centrifugation of the patient's own blood and it contains growth factors that influence wound healing, thereby playing an important role in tissue repairing mechanisms. The use of PRP in surgical practice could have beneficial outcomes, reducing bleeding and enhancing soft tissue healing and bone regeneration.

(Surgery, 2015) studied "Review Article Platelet Rich Plasma: Clinical Applications in Dentistry" and found that Platelet rich plasma (PRP) is one of the new innovations of surgery today and is a new approach to tissue regeneration. It is helpful in both hard and soft tissue healing. PRP is derived from autologous blood and is a reservoir of various growth factors which are important for tissue repair. In the field of surgery, it tends to give an added advantage by both reducing bleeding and also helping in wound healing or tissue repair. Various studies have been carried out on humans to show the application and benefits of PRP in dentistry (especially enhancing healing of extraction sockets, implant surgery, periodontal surgery, bone regeneration etc). The use of PRP has also been proposed in the treatment of bisphosphonate- related osteoradionecrosis of the jaw (BRONJ), as a better treatment modality as compared to the conventional methods.

(Verma et al., 2011) studied "Assessment of aggressiveness of prostate cancer: Correlation of apparent diffusion coefficient with histologic grade after radical prostatectomy" and found that The purpose of this article is to evaluate the relationship between apparent diffusion coefficient

(ADC) values, tumor volume, and total Gleason grade in patients with prostate cancer before radical prostatectomy.

(Madiyal, Babu, Bhat, Hegde, & Shetty, 2018) studied "Applications of stem cells in dentistry: A review" and found that Stem cells have the capacity to replicate and produce cell lines that differentiate into multiple cell lineages. Stem cells may be harvested from various sites and are named adult stem cells or embryonic stem cells based on their origin. Owing to their self renewing capabilities, they are used to correct large defects caused by diseases, trauma or surgery. However, they are limited by ethical and moral considerations as well as difficulty in isolation, culturing and implantation.

(Motwani, Singh, Kaur, Singh, & Gangde, 2016) studied "Stem cells: A new paradigm in dentistry" and found that Stem cell (SC) therapy has a promising future for tissue regenerative medicine. However, because SC technology is still in its infancy, interdisciplinary cooperation is needed to achieve successful clinical applications. Dental SCs have drawn attention in recent years because of their accessibility, plasticity, and high proliferative ability.

(Egusa et al., 2012) studied "Stem cells in dentistry - Part II: Clinical applications" and found that New technologies that facilitate solid alveolar ridge augmentation are receiving considerable attention in the field of prosthodontics because of the growing requirement for esthetic and functional reconstruction by dental implant treatments. Recently, several studies have demonstrated potential advantages for stem-cell-based therapies in regenerative treatments.

The effects of PRP on healing the alveolar socket after tooth extraction

Tooth extractions a common dental procedure especially the 3rd molars are associated with pain, bleeding and discomfort. PRP tends to promote tissue repair, improving the quality of healing &healing time. Soft tissue healing was significantly improved in patients treated with PRP compared with patients of the control group (no treatment). Moreover, patients untreated with PRP experienced complications (dry sockets and acutely inflamed alveolus). Post-operative pain was also analyzed in the two groups (treated and untreated) and they reported significantly more pain in the control group, especially in the first three days post intervention. Ogundipe in 2011

proved that when post 3rdmolar extraction was treated with PRP they showed decrease pain and improvement in swelling and mouth opening.

The use of Platelet Rich Plasma in periodontal surgery

The growth factors present in PRP are capable of forming a fibrin clot, promoting fibroblast proliferation and up regulating collagen synthesis in the extracellular matrix . Thus, the use of PRP at injury sites might be able to promote wound healing and the regeneration of periodontal soft tissues. Moreover, the ability of these factors to accelerate bone repair by increasing the mitosis of osteoblasts & tissue vascularity might be useful in the treatment of infrabony defects [18]. However, the therapeutic efficacy of PRP in periodontal therapy still remains controversial. Various studies have been reported the use of PRP in period ontology.

Use of Platelet Rich Plasma in soft tissues surgery & bone tissue surgery & implant surgery

In the field of bone tissue surgery, arecent study by Daif investigated the effect of autologous PRP on bone regeneration in mandibular fractures. He concluded that direct application of the PRP along the fracture lines may enhance bone regeneration. The results of these studies demonstrate that PRP is effective in soft tissue healing and bone regeneration. PRP is used in bone regeneration after fractures; augmentation and even the reconstruction after jaw surgeries have shown strong effect of PRP on these treatment modalities. The combination of PRP application with other biomaterials seems to be promising as regards sinus lifting, but the results depend on the material used. Promising results have also been obtained in implant surgery, using PRP on its own as a coating material.

The use of platelet rich plasma in cosmetic surgery

There has been a recent widespread interest in use of PRP for anti-aging and regenerative purposes. It has been named as the vampire facial and can be used in face lifts, Reducing fine lines and wrinkles, Tightening and toning skin, Mild collagen and volume loss, Dark under eye circles &Acne scarring . It is less invasive &less expensive than plastic surgery, takes about 20 minutes for each treatment, and offers improvements for up to 18 months. Within a few weeks of treatment, an overall improvement in skin hydration, texture and tone can be seen. New collagen and blood vessels begin to grow after three to six weeks, and reduction of fine lines and wrinkles

and volume correction happens over the next three to six months. The effects of Cosmetic PRP can last 12 months to two years, depending on the individual.

Conclusion

PRP is new application of tissue engineering and can be used in the most varied areas of the dentistry, being applied in periodontal and maxillofacial surgeries. It is a storage vehicle for growth factors, especially PDGF and TGF-ß. Although growth factors and the mechanism involved are still poorly understood, the ease of applying PRP in the dental clinic and its beneficial outcomes hold promise for further procedures. However, that is new area of the science and many clinical results still will be published, that will cover some unanswered queries about PRP. Certainly, the use of PRP is a step in the history evolution of the regenerative methods and the tissue engineering that will be used next years.

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