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PRP -An aid to dentistry

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Abstract
The use of platelet concentrates has gained decent attention in recent years for regenerative procedures in modern dentistry. 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. This article takes a dive into the detailed discussion about PRP: content, preparation, treatment procedures, uses in aesthetic and healing zones of dental practice, advantages, disadvantages, indications, contraindication, complications and it's use as an adjunct to implant, laser and surgeries.

Keywords: PRP; laser; facial rejuvenation; oral surgery

1. Introduction
The use of platelet concentrates is running under the highlights of dentistry. Platelet-rich plasma (PRP) is a new approach to tissue repair regeneration and replacement and it is becoming a valuable adjunct to promote healing in many procedures in dental and oral surgery. PRP therapy provides faster healing. During the body's healing process, it sends different cell types, including platelets to the site of trauma to initiate healing. In PRP therapy, the patient's own blood is drawn out in proper aseptic manner and centrifuged resulting in a concentration of platelets at the bottom. When this heavily concentrated portion of the blood is isolated it contains three to five times the number of growth factors found in normal blood. PRP therapy is currently being used to reduce post-operative pain, promote tissue repair, and reduce healing times in a variety of different disciplines.

What is platelet rich plasma (PRP)
[1]. PRP is a volume of autologous plasma that has a platelet concentration above baseline. Normal platelet count in blood is 150,000/ul to 350,000/ul. PRP is used for bone and soft tissue healing with 1,000,000 platelet in a 5ml volume of plasma (It is a proven fact that PRP accelerates soft tissue as well as hard tissue healing without less structure contraction. The preparation should contain 1,000,000 platelet in a 5ml volume of plasma). Lesser concentration cannot be relied upon to healing. PRP increases delivery of platelet derived growth factors (PDGF) at surgical sites. Seven known growth factors in PRP are PDGFaa, PDGFab, transforming growth factor beta 1 and 2 (TGF-ß1- ß2), vascular endothelial growth factor (VEGF) and epithelial growth factors (EGF). PRP should possess a concentration of at least 10 lac platelet/ul in a 5ml volume. PRP is processed in a sterile fashion and has to be pyrogen free [2]. PDGFs are potent molecules and small variation in their concentration can produce very different effects. PDGFs may present suboptimal effects at low concentration but paradoxically inhibitory or cytotoxic effects at high concentration and potentially negative effects of PRP.

Anticoagulants used
Citrate dextrose-A (ACD-A)
Citrate phosphate dextrose (CPD)
CPD is 10 percent less effective than ACDA.

Method of Preparation
To truly concentrate platelets from autologous blood, the device must use a double centrifugation technique. The first spin (hard spin/separating cycle involves centrifugation of blood at 1800 rpm for15 min to separate erythrocytes [1]. will separate the red blood cells from the plasma, which contains the platelets, the white blood cells, and the clotting factors. The second spin (soft spin or concentration cycle- and centrifuged at 3500 rpm for 10 min [1]. finely separates the low platelet carrying plasma [(Platelet poor plasma (PPP)], white blood cells and remaining few red blood cells from the concentrated plasma known as PRP. In simple language Plasma which is 2/3rd level is known as PPP and plasma at bottom 1/3rd of vial is known as PRP. present in upper section PRP must be separated from PPP soon after centrifugation because the concentration platelets will slowly diffuse into PPP over time and would reduce the platelet count of PRP [3].

Classifiaction
The PAW classification system of PRP is based on 3 components:
1. The absolute number of Platelets,
2. The manner in which platelet Activation occurs, and
3. The presence or absence of White cells

[1]. Application of Prp- PRP maybe mixed into a bone graft, layered in as the graft is placed, sprayed on a soft tissue surface, applied on top of a graft, or used as a biologic membrane.
Clinician should only clot (activate) PRP when ready to use it and not in advance as clotting activates platelets, which begin secreting their growth factor immediately within 10 minutes they secrete 70 percent of their stored growth factors and close to 100 percent within first hour. They then synthesize additional amounts of growth factors for about 8 days until they are depleted and die.
PRP is best developed from autologous whole blood shortly before at the very beginning of the surgical procedure. This

is cause platelet will collect at the surgical site to initiate clotting and healing. This will decrease the whole blood platelet count somewhat. In addition during surgery I.V will dilute whole blood, further reducing platelet numbers. Once developed PRP is stable and sterilized for 8 hours.

Uses of PRP

PRP is widely used for aesthetic purposes. Aged skin is known histologically,

by a flattened dermo–epidermal junction, dermal atrophy and fewer fibroblasts.

[5]. Among different degenerative processes cause skin aging, decreasing in fibroblasts collagen production the most important one. Interaction of fibroblasts with keratinocytes, adipocytes and mast cells is important in skin aging processes. In addition, they are loaded with several kinds of ECM (extracellular matrix) proteins, glycoproteins, adhesive molecules and cytokines.

For facial rejuvenation PRP is injected in superficial dermis and deep layers of dermis. For superficial effects it is injected in superficial dermis that can be done by mesotherapy to enhance the skin texture, glow and hydration. When used as a filler, PRP is injected into the deep dermis or into subdermal tissues in a manner similar to fillers. This is done to voluminise and reshape the skin. Autologous characterstics of the product produce minimal side effects like mild bruising, occasional swelling or infection.

[6]. Use of PRP during fat gratification is done to Improves adipose tissue maintainence and survival. PRP can stimulate an optimal micro environment that allows correct interaction, adipose tissue growth and differentiation from ASCs, the later offers early protection from surrounding inflammatory events. Secondary PRP induced development of neoangiogenetic microcapillary network facilitates the delivery of proper nutrients and oxygen levels to grafted cells.

PRP accelerate skin chronic ulcer re-epithelization in patient who underwent maintainence and function of adipose tissue graft in patient who underwent plastic reconstructive surgery, possibly by stimulating ASC proliferation. PRP lacks surface antigens responsible for potential allergic reactions.

[7]. Acne occurs in all areas of body with high concentration of pilosebaceous gland, but occurs on the face, back, chest in particular. Inflammatory acne lesions may result in permanent scars, the severity of which may depends on delay in treating acne patients. Traditional laser therapy has been shown to be effective treatment method for acne or acne scars, however it is associated with a long period of erythema and edema [5-10 days]. Treatment includes:

Cleaning with mild cleanser

Application of topical anaesthetic cream for 30 mins.

Treat face with an erbium fractional laser.

End point of treatment of laser includes moderate erythema or punch form errhysis (for sever acne).

Following treatment PRP mixed calcium gluconate was coated onto each therapeutic area (thickness -0.5). Patient were instructed to compress the faces with gauge for 15-20mins while remaining supine before going home. Patients advised to avoid sun exposure.

Side effect included burning pain, punctiform errhysis, erythema, acne, infection, scarring or pigmentation.

Contraindication [8].

Sepsis, cancer, chemotherapy, platelet dysfunction syndrome, clinical thrombocytopenia, hemodynamics, instability, anticoagulation therapy, acute and chronic infection, chronic pathological conditions, of liver, severe metabolic and systemic disorders and skin diseases (SLE, porphyria and allergy) as well as heavy nicotine, drugs and alcohol consumption.

Adverse effects: Infection, skin discoloration and blood clot because PRP therapy uses a needle, a vein could be damaged. Certain factors (example -smoking and alcohol intake) diminish stem cell release.

Patients who don't want or need fillers can benefit from PRP serum. The activated PRP serum can be injected just under the skin surface to stimulate the body to make a small amount of it's own filler. Although this will not approximate the same results as one gets from a gel filler, some improvement in textural changes can be seen.

Advantage

Uses body's own natural platelets so there is no risk of allergic reaction.

Natural collagen is formed in response to the presence of the activated platelet.

Ideal for patients who does not want any synthetic fillers.

Can be used to enhance laser procedures for faster and improved healing.

Equally as effective in men as women.

[9]. Shin et al combined PRP treatment with fractional laser and reported increased length of dermal-epidermal junction, volume of collage and objective improvement of skin elasticity PRP was found to have capacity to increase dermal elasticity by keratinocyte and fibroblast proliferation and collagen production.

Uses in oral-maxillofacial surgeries [10].

The introduction and use of autologous platelet concentration in oral and maxillofacial surgery seems to have changed and challenged over approach toward extensive reconstruction of resorbed maxilla and mandible for implant reconstruction with a simple office procedure and proper technology, platelets can be sequestrated and concentrated. In recent studies, PRP had been found to influence bone matrix protein expression during early stages of bone regeneration and a significant increase in bone formation occurs two weeks after its implantation. A possible role of PRP in local regulation of fracture healing and bone regeneration was suggested and that might be probable because of the synergic effect of PDGF present in the granules of PRP.

[11]. In vitro study on cultures of alveolar bone cells has been done. The result of this study showed that when alveolar bone cells are cultured with high PRP concentration, the cellular viability and proliferation decreases in a concentration dependent manner, suggesting high PRP concentration might influence bone formation within the PRP treatment bone grafts.

Discussion

[12]. Several authors showed that PRP gel decreases post-operative pain and discomfort after tooth avulsion and avoid the development of osteitis. Since this act as optimized blood clots and allow a quick insitu neoangiogenesis and wound drainage. Moreover, local bone stimulation with

growth factors release could counter abuse the bone traumatism due to surgical procedures.

Avulsion (except 3rd molar) are followed by implant placement and that the preservation of alveolar bone wall around the implant and the bone of the avulsion site are a medical obligation for the dental surgeon.

The main concern in PRP gels are expensive time consuming, not very easy to handle in daily oral practice and their filling volume are often acute small. For all these reasons, it is highly probable that only a few techniques such as the L-PRF will still be used in these application in near future. The use of 8L-PRF membrane or plug is easy, requires only a small table centrifuge and less than 15 minutes. The plug and membrane can be used to fill avulsion sockets, even when associated with severe cystic destruction after cyst excersis and allow a quick bone and gingival regeneration required for implant placement. [13]. The two commercial systems available or creating PPP (fibrin glue) are the Smart PReF autologous platelet on system and Tusseel System.

[14]. The concentration of coagulation factors with in the platelet gel was also used to control bleeding in anticoagulated patients.

Several points regarding PRP has been a point of concern:

What is the level of platelet is enough: Most individuals have a baseline blood platelet count of 2,00,000 +/- 75,000/ul, as PRP platelet count of 1 million/ul as measured in the standard 6ml aliquot has become the benchmark for "therapeutic PRP".

Safety of PRP: [15]. Because it is an autologous preparation, PRP is inherently safe and therefore free from concerns over transmittable diseases such as HIV, hepatitis, West Nile fever.[14]. Related to the use of Cruetzfield- Jacob disease (CJD), concerns have been advanced about the use of bovine thrombin as the clotting initiator. However, bovine thrombin has a completely negative history of CJD in more than 10 million uses in a wide variety of surgeries worldwide. Because the transmission vector of CJD is a prion that to date has been found only in neural tissues of the CNS in cattle, sheep, cats,, humans etc and because bovine thrombin is derived solely from blood and is also heat processed for purification, it remains in standard use today in many surgeries and is the safe initiator of clotting related to PRP.

Infection and PRP- PRP is no different in substrate than the blood clot that forms in every wound and therefore could not support bacterial growth any more than any blood clot. Infact PRP has a pH of 6.5 to 6.7 compared with a mature blood clot of 7.0 to 7.2. It has thus been counter suggested that PRP actually inhibits bacterial growth.

Conclusion

Platelet-rich plasma (PRP) has been the subject of hundreds of publications in recent years. Reports of its effects in tissue, both positive and negative, have generated great interest in the dental and medical community. Platelet rich plasma, and the associated fibrin clot, can potentially aid in wound repair and help achieve and maintain hemostasis, or can be mixed with other tissues as an adjunct to their transplantation healing [16]. Marx et al with autogenous mandibular bone grafts [17]. Garg with composite of autogenous bone substitutes in sinus lifts, [18]. Man et al with cosmetic surgeries, [19]. Adler and Kent with face lift surgeries [20]. Camargo et al with intrabony periodontal defects, [21]. Kim et al with peri implant defects, [22]. Abuzeni and Alexander with cosmetic dermal fat grafts, are some of the authors who have reported positive results in either or both bone and soft tissue healing area. Both superficial and deep dermal applications can result in skin rejuvenation and global facial volumisation. [23]. Under a comparative analysis done by Akash Rajput on Intra-articular Injection of platelet-rich plasma and arthrocentesis in temporomandibular joint disorders PRP was found to be more effective in elimination of joint noise, tenderness and improvement in jaw deviation on mouth opening. [24]. PRP is a form of biostimulation that is safe and creates an immediate, long lasting volumetric effect with natural looking results. The technique is easy to perform and has virtually no side-effects. The PRP injections provided a high level of patient satisfaction.

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