Our Dermatology Online

Opinion Article

Platelet rich plasma in dermatology and aesthetic medicine

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ABSTRACT

Platelet rich plasma is a promising therapy in dermatology and aesthetic medicine. In this article we will discuss the pros and cons of platelet rich plasma (PRP) and the usage of PRP in aesthetics. PRP is especially used for conditions like facial and neck rejuvenation, fine lines and wrinkles, abdominal striae and facial scarring.

Key words: Platelets; growth factors; granules; collagen; platelet rich plasma.

INTRODUCTION

Usage of platelet rich plasma (PRP) in aesthetic medicine is a new concept. In dermatology and cosmetic medicine, PRP has been used to treat acne, scarring, and alopecia (especially in women). It is also effective for skin rejuvenation and tightening around the eyes. Before injecting PRP to treat hair loss, a tiny scalp roller with spikes is used to stimulate the thinning areas. The rationale is that this sends a message to the hair follicles to start the healing process. Then, PRP is injected over the affected area to further stimulate stem cells in the follicle. Platelet-rich plasma is injected by multiple tiny punctures under the dermis, with or without topical local anesthesia [1,2]. The process is painless if sufficient topical anesthesia is applied. When PRP is injected into the damaged area, it stimulates the tissue, causing mild inflammation that triggers the healing cascade. As a result, new collagen begins to develop. As this collagen matures, it begins to shrink and tightens and strengthens the skin. Improvement in skin texture and tone is noticeable within 3 weeks. Full collagen regeneration requires 3 months [3,4]. The PRP treatments can be used on all skin types and tones. Minimal swelling, bruising, and redness for the initial 12 to 24 hours are expected. A bruise at the needlestick site may be visible for 2 to 3 days. Swelling from the fluid is what the patient will notice first. During several weeks, the platelets stimulate growth factors, which assists in more collagen stimulation. Treatment results vary but last up to 18 months in most patients.

In PRP, activated platelets release many other bioactive proteins responsible for attracting macrophages and mesenchymal stem cells. Inside the platelet are two types of granules, namely, alpha granules and dense bodies. Alpha granules contain the clotting and growth factors that are released in the healing process. Normally at the resting state, platelets require a trigger to activate and become a participant in wound healing and hemostasis.Growth factors and other cytokines in platelets include the following: platelet-derived growth factor, transforming growth factor, fibroblast growth factor, insulinlike growth factor 1, insulin like growth factor 2, vascular endothelial growth factor, epidermal growth factor, interleukin 8, keratinocyte growth factor, and connective tissue growth factor [5,6]. The platelets secrete growth factors, including platelet-derived growth factor and vascular endothelial growth factors. Platelet-derived growth factor is one of numerous growth factors or proteins that regulate cell growth and division [7-9]. In particular, it has a significant role in the formation of blood vessels (angiogenesis) and the growth of blood vessels from already existing blood vessel tissue. Vascular endothelial growth factor is a chemical signal produced by cells that stimulates the growth of new blood vessels. It is part of the system that restores the oxygen supply to tissues when blood circulation is inadequate.

How to cite this article: Puri N. Platelet rich plasma in dermatology and aesthetic medicine. Our Dermatol Online. 2015;6(2):207-211.
Submission: 03.12.2014; **Acceptance:** 13.03.2015
DOI:10.7241/ourd.20152.57

DISCUSSION

Advantages of using PRP for aesthetic medicine include the following: tissue regeneration and rejuvenation, induction of cell differentiation, extracellular matrix formation, recruitment of other cells to the site of injury, and an increase in collagen production, which can increase skin thickness and overall skin health [10,11]. In addition, PRP is nonallergenic, is an autologous physiological product, eliminates donor transmissible infections, and is a biological glue for tissue adhesion, especially in skin flaps, bone grafts, and trauma.

Alhough PRP is a promising therapy for most patients, the practitioner must take into account some considerations during the initial assessment before suggesting this treatment. Contraindications include the following: sepsis, cancer, chemotherapy, platelet dysfunction syndrome, critical thrombocytopenia, hypofibrinogenemia, hemodynamic instability, anticoagulation therapy, acute and chronic infections, chronic pathological conditions of the liver, severe metabolic and systemic disorders, and skin disease (systemic lupus erythematosus, porphyria, and allergies), as well as heavy nicotine, drug, and alcohol consumption. Adverse effects of PRP treatment may occur, some of which are significant. The most common adverse effects are infection, skin discoloration and bruising, pain in the injected area, allergic reaction (a rare occurrence), and blood clot (because PRP therapy uses a needle, a vein could be damaged). Certain factors (eg, smoking and alcohol intake) diminish stem cell release. Avoiding these will increase the success of the PRP procedure. The platelets work by causing an inflammatory reaction. If this inflammatory reaction is diminished, the clinical outcome is significantly compromised [12,13]. For this reason, the use of anti-inflammatory drugs is not recommended. This restriction should be in place for about 1 to 2 weeks.

Platelet concentration is a rich source of various cytokines and growth factors, which are activated after its injection into the target tissue. Platelets are activated endogenously by coagulation factors (in some methods of preparing PRP, the activated PRP is injected to the tissue). Following their attachment to special receptors on the cell surfaces, some intracellular processes are activated, that facilitate extracellular matrix (ECM) accumulation and improve cell proliferation and differentiation. Tissue regeneration is resulted from cell proliferation, angiogenesis and cell migration [14,15]. Matrix metaloproteinas proteins (MMP) are involved in aging process by degradation of collagen and other extracellular matrix (ECM) proteins, this characteristic can be used to benefit rejuvenation. They can help regeneration of dermis through omission of collagen fragments that are harmful to the dermal connective tissue, and so, provide an appropriate foundation for new collagen deposition. In some studies aPRP (activated PRP) increases the expression of MMP-1 and MMP-3 protein. Thus, aPRP may cause ECM remodeling through stimulating the removal of photo-damaged ECM components and inducing the synthesis of new collagen by fibroblasts, which are in turn proliferated by their stimulation. Another mechanism of PRP for skin rejuvenization, is through acceleration of hyaluronic acid production. Hyaluronic acid absorbs water and makes hyaluronic acid matrix swelled which increases skin volume and turgor. It also promotes cell proliferation, extracellular matrix synthesis and helps to the adjustment of the collagen fibers diameter. Overall, it could enhance skin elasticity [16,17]. All these processes and some other unknown ones contribute to tissue rejuvenation through PRP.

Platelet Rich Plasma (PRP) is used for stimulation of both superficial and deep dermis layers. For superficial stimulation, the injection must be done in the superficial dermis. The PRP must be injected into the deep dermis or subdermal tissues when using as filler. The superficial injection might be done just like mesotherapy technique in order to improve the skin texture, volume and hydration. The technique is easy to be performed and has no important side-effects [18,19]. Side-effects might appear from mild bruising and occasional swelling to rarely infections. Compared with other skin rejuvenation therapies, the clinical experience using PRP can result in skin rejuvenation and global facial volumisation. PRP is a form of bio-stimulator that is safe and creates an immediate, long lasting volumetric effect with natural looking results.

To prepare PRP, a small amount of blood is drawn from the patient's arm. The blood is then placed in a centrifuge that spins at high speed and separates the platelets from the rest of the blood components. The typical baseline blood platelet count is approximately 200 000 per microliter; therapeutic PRP centrifuges concentrate the platelets by roughly 5-fold. However, broad variability exists in the production of PRP by various concentrating equipment and techniques. The platelets collected in PRP are activated by the addition

of thrombin and/or calcium gluconate, which induces the release of these factors from alpha granules. The entire process takes less than 15 minutes and increases the concentration of platelets and growth factors up to 600%, along with an inherent rise in human stem cell proliferation due to exposure to concentrated platelets up to 10 times above native levels. The concentrated PRP is then injected into and around the affected area, jump-starting and significantly strengthening the body's natural healing signals. Injections of PRP heal the area over time, during 1 to 3 months. Because the patient's blood is used, there is no risk of a transmissible infection and a low risk of allergic reaction.

Aging of the skin, dermal components, and cells means that the skin texture and appearance deteriorate and have been damaged [20].Aging affects the hands and soft tissue of the face, neck, and decollete. This is characterized by sagging jowls, thinning of the skin, puffiness, age spots, and wrinkling.In dermatology and cosmetic medicine, PRP has been used to treat acne, scarring (Figs 1A and B), and alopecia (especially in women). It is also effective for skin rejuvenation and tightening around the eyes (for thin crepe-like skin and fine lines) and in the following areas: cheeks and midface, thinning skin on the neck, jawline and submalar regions, back of hands, decollete, and others (eg, knees, elbows, and upper arms, as well as for postpregnancy skin laxity). Platelet-rich plasma is injected by multiple tiny punctures under the dermis, with or without topical local anesthesia. The process is painless if sufficient topical anesthesia is applied. When PRP is injected into the damaged area, it stimulates the tissue, causing mild inflammation that triggers the healing cascade. As a result, new collagen begins to develop [21]. As this collagen matures, it begins to shrink and tightens and strengthens the skin, as well as the tendons and ligaments of the damaged area when it is injected at that level. Improvement in skin texture and tone is noticeable within 3 weeks. Full collagen regeneration requires 3 months. Topical skin care and light therapies can enhance these results. Advanced wrinkling cannot be reversed, and severe scarring may not respond to treatment. In my experience, surgical scars respond well cosmetically. The PRP treatments can be used on all skin types and tones. Minimal swelling, bruising, and redness for the initial 12 to 24 hours are expected. A bruise at the needlestick site may be visible for 2 to 3 days. Swelling from the fluid is what the patient will notice first. During several weeks, the platelets stimulate growth factors, which assists in more collagen stimulation. Treatment results vary but last up to 18 months in most patients. Biannual touch-up treatments will maintain the results. As an initial treatment strategy, up to 3 injections may be given within a 6-month time frame. These are usually performed 2 to 3 weeks apart. Certain factors (eg, smoking and alcohol intake) diminish stem cell release. Avoiding these will increase the success of the PRP procedure. The platelets work by causing an inflammatory reaction. If this inflammatory reaction is diminished, the clinical outcome is significantly compromised. For this reason, the use of anti-inflammatory drugs is not recommended. This restriction should be in place for about 1 to 2 weeks. Proponents of PRP therapy argue that negative clinical results are associated with poor-quality PRP harvest or concentration by inadequate devices. The specification that gathering devices capture a percentage of a given thrombocyte count is a marketing bias because significant individual variability exists in the platelet concentration of human plasma [22]. More is not necessarily better in this case. Variability in platelet concentrating techniques may alter platelet degranulation characteristics, which could affect clinical results.

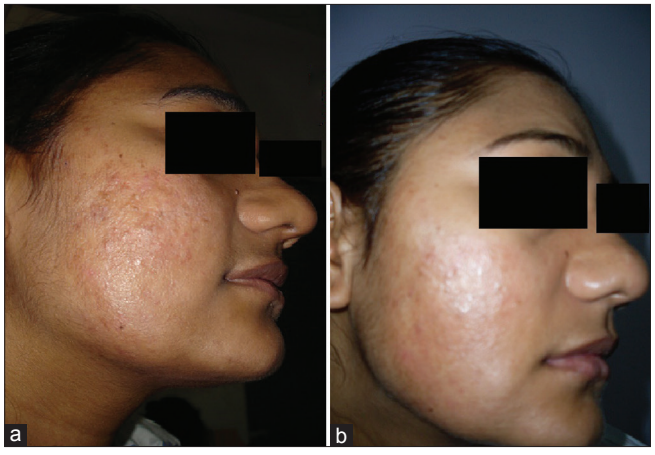

Figure 1: (a and b) Pre and post treatment of a 37 years old girl with acne scarring after 3 sessions of PRP.

There are various uses of PRP in aesthetic medicine:

- PRP has made the most significant progress in the facial area. Platelet Rich Plasma (PRP) with fat transfer is the surgical combination of injecting a patient's own plasma containing growth factors along with their own purified fat to augment areas of lost volume and wrinkles on the face.
- Containing beneficial growth factors, PRP may additionally be used with fat transfer or subcision to re-plump areas of lost volume or depressed scarring

from acne or trauma [23]. Subcision surgically releases the pulled down portion of the scar from within, inducing the body's healing response to create blemish free skin cells.Combined with fat transfer, PRP softens the appearance of depressed, roling scars.

- The latest facial rejuvenation procedure is the face lift which combines the power of new PRP technology and facial fillers to minimize the signs of facial aging. This non- surgical procedure promotes new tissue growth to improve overall facial skin tone for a more youthful appearance. The PRP is combined with a facial filler and then re- injected into areas of concern around the face [24]. Patients benefit from this procedure as there is minimal downtime and results can last for over a year. The true "lift" effect is achievable with a combination of fillers, layered with the PRP serum. The fillers provide an instant fill or volume correction and the PRP – injected above the filler – immediately kick-starts a skin regeneration process. Patients can see and feel the effects within minutes as their skin becomes tauter and smoother.The use of PRP with fillers not only enhances the skin tone and texture, but prolongs the effective filler correction for 3 to 6 months longer than when fillers are used alone. Monthly intradermal injections of PRP in 3 sessions have shown satisfactory results in face and neck rejuvenation and scar attenuation. A study showed that a combination of fractional non-ablative (erbium glass) laser therapy with topical application of PRP, resulted in objective improvement in skin elasticity, a lower erythema index and an increase in collagen density as well. Histological examination showed an increase in length of dermoepidermal junction, amount of collagen and fibroblasts in the treated skin.
- Patients who don't want or need fillers can benefit from PRP. The activated PRP serum can be injected just under the skin surface to stimulate the body to make a small amount of its 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.
- PRP in combination with fractional ablative lasers (carbon dioxide) for deep wrinkles and severe photodamaged skin, has also been shown to reduce commonly encountered, transient adverse effects and decrease the downtime. Fractional laser treatments are known for their ability to retexture skin. Adding PRP takes laser resurfacing to a new level by accelerating healing and increasing desired new collagen formation. Following your laser treatment,activated PRP serum is applied to skin that is ideally suited to accept the wound-healing platelet serum.
- PRP can also be used as 'PRP Facial'(Figs 2A and B) which consists of PRP applied to skin that has been prepared by an automatic microneedle. Thise micro-needling makes tiny "wounds" in the skin which accept the PRP serum and begins the process of collagen creation along with the tissue enhancement from growth factors found in the plasma serum. The micro needling based procedure is also producing great results in terms of minimizing the appearance of both scarring and stretch marks.In scarring, the micro needling is used to break up the fibrous tissues of the scar and the PRP spurs the growth of healthy tissue. For stretch marks, micro needling creates damage over the thinned skin of the stretch mark. PRP then promotes growth of thicker skin (Figs 2A and B).

Advantages of PRP Rejuvenation

- Uses bodys own natural platelets so there is no risk of allergic reaction
- Natural collagen is formed in response to the presence of the activated platelets
- PRP is ideal for the patient who does not want any synthetic fillers
- There is little to no swelling, bruising or lumping as the fluid assimilates in the natural skin environment
- PRP can be used to enhance Laser procedures for faster and improved healing
- PRP Therapy is equally as effective in men as in women

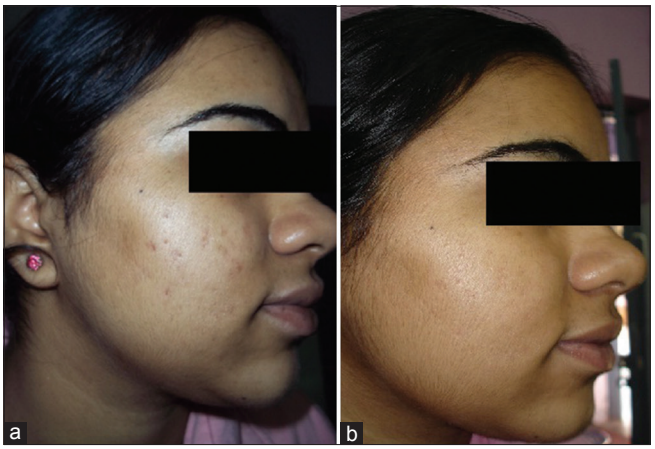

Figure 2: (a and b) Pre and post treatment of a 24 years old girl after 3 sessions of PRP

- Can provide outstanding results either with or without the use of underlying fillers.

CONCLUSIONS

As with all therapies, adequate training and experience are paramount. The beauty of the PRP technique, especially in dermatology and as an adjunctive tool in practice, is that it can be used as part of a multifaceted or layered approach. Significant clinical outcomes can be obtained with concomitant use of light therapies, fillers, and mesotherapy. Due to limited studies on clinical efficacy and safety, further studies are required to investigate the mechanism of action behind the therapeutic effects of these products and their long term safety.Still,the PRP has certain limitations as there is no standardisation in PRP preparation and specific quality parameters in PRP preparation are still lacking.

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Source of Support: Nil, **Conflict of Interest:** None declared.