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PLATELET-RICH PLASMA (PRP) IN AESTHETIC DERMATOLOGY

Platelet-rich plasma (PRP) has been used in the field of orthopedics since the 1970s for cartilage repair, bone grafting, and musculoskeletal healing.[1] PRP is an autologous blood product composed of an increased concentration of platelets, and is defined as a "drug" by Health Canada.[2]

In the last decade, this treatment modality has emerged in the aesthetic dermatologic therapeutic armamentarium. It has been gaining significant real-world popularity, likely boosted by social media and other forms of media. The purpose of this article is to review PRP in aesthetic dermatology.

Physiology

Platelets are anucleate cytoplasmic fragments of megakaryocytes. Platelets play a primary role in hemostasis: platelets adhere to the damaged vessel wall to form a platelet plug which then initiates thrombus formation. Platelets have alpha granules which have over 30 mitogenic and chemotactic growth factors, such as platelet-derived growth factors (PDGF) and vascular endothelial growth factor (VEGF), and cytokines.[3]

A centrifugation process is utilized to isolate the PRP from whole blood, at a concentration 3 to 7 times greater than unaltered plasma.[3] This supraphysiologic level of growth proteins is postulated to induce stem cell cellular proliferation and differentiation, and activation of fibroblasts.[3] It has thus been suggested as a potential treatment modality, either as monotherapy or as adjunct therapy, in aesthetic dermatology.

Harvest Method

There is significant variability in PRP harvesting methods: there are many commercially available PRP systems and protocols vary by brand name. Traditionally accepted protocols involve initial venipuncture to obtain 10 to 22 mL of whole blood.[4] Pearls for difficult blood draws are included in **Table 1**.

- Ensure oral hydration for 24 hours prior
- Avoid caffeine and alcohol for 24 hours prior
- Warm the area with a heating pad or warm compress
- Lightly exercise the arm

Table 1. *Pearls to improve venous blood draw;[21] courtesy of Malika Ladha, MD*

Either the syringe used for collection is coated in an anticoagulant (acid citrate dextrose or sodium citrate solution), or an anticoagulant is added to prevent clotting. The next step is centrifugation. There is variation in many factors: the rate of the spin – ranging from 1200 to 3100 revolutions per minute (rpm); the length of the spin – ranging from 5 to 15 minutes; and the number of spins (single or double).

A single spin protocol separates the whole blood into 3 distinct layers, from bottom to top: red blood cells; buffy coat with leukocytes; and PRP. In the double spin method, the first spin separates the red blood cells from the plasma, and then the second spin, also known as the soft spin, produces PRP and platelet-poor plasma.[5] The PRP is then separated out.

For dermatological uses, activation of the PRP with calcium chloride or thrombin is not required. Recent studies have demonstrated that the use of such aggregators are not necessary to induce the platelets.[6]

Treatment with PRP

Once separated, PRP can be injected intradermally or applied topically post-procedure. It is thought that skin needling for intradermal application also plays a role in dermal collagenosis induced by PRP treatment. In a prospective study from 2016, researchers injected the infra-auricular area of subjects either with PRP or saline injections.[7] Punch biopsies were performed before the injection and 28 days after the treatment. While the density of collagen fibers was thickest for the PRP-treated group, those treated with saline had increased

collagen fiber bundles and thickened elastic bands.

Pain management is an important consideration especially with intradermal application with injections. Pain reduction methods include topical anesthesia, air-cooling devices, and vibratory devices for distraction. Local anesthesia must be used with caution as it can alter the pH of the PRP and may potentially decrease efficacy.[8]

There are no international consensus guidelines on PRP treatment. There is significant variability in the amount of PRP used, the total number of treatments, and time interval between treatments.

Patient Selection & Adverse Events

PRP is considered safe in most people. PRP is not recommended in certain scenarios related to underlying comorbidities or concomitant medication use (**Table 2**).[9] In addition, PRP requires multiple consecutive treatments (spaced 2 to 12 weeks apart); thus, consideration must be given to a patient's lifestyle

- Acute or chronic infections, including HIV and Hepatitis C
- Hematologic malignancy
- Thrombocytopenia
- Hemodynamic instability
- Anticoagulation therapy
- Skin cancer in the area being treated
- Active infection in the area being treated

Table 2. *Clinical conditions to avoid PRP treatment; courtesy of Malika Ladha, MD*

Adverse events are typically mild and transient. The most common adverse events are listed in **Table 3**. No serious adverse events, such as infection, scarring or post-inflammatory hyperpigmentation, were reported in the below discussed systematic reviews.

PRP for Acne Scarring

At sites of PRP application, it is thought that fibroblasts are recruited and deposit collagen, leading to reduction of the overlying scarring.[10] PRP has thus been used an adjunctive treatment for acne scarring, combined with microneedling or ablative laser treatments.

While limited in nature, the current data demonstrates that the combination of PRP and microneedling improves cosmetic outcomes,

- Post-injection pain and burning
- Erythema
- Ecchymosis
- Edema
- Tenderness
- Pinpoint bleeding
- Scalp sensitivity when washing hair for the 1st time after treatment*
- Scalp hematoma*
- Headache lasting <24 hours*

*Specific to PRP on the scalp

Table 3. *Transient adverse events for PRP therapy;[17,20] courtesy of Malika Ladha, MD*

postprocedural downtime, and overall patient outcomes.[11] In addition, a meta-analysis of nine studies on fractional CO2 laser and PRP for acne scar treatment showed that this dual therapy had more clinical improvement, increased patient satisfaction, and a decreased crusting period compared with CO2 ablative fractional laser alone.[12]

PRP for Androgenetic Alopecia

The effects of PRP for hair growth in androgenetic alopecia (AGA) patients was first noted in 2006.[13] Its mechanism has only been partially elucidated. It is thought that PRP stimulates growth through multiple mechanisms: stimulate stem cell differentiation of hair follicles via the MAPK/ERK pathway; prolong the anagen phase of the hair cycle; and induce angiogenesis to increase perifollicular vascularization.[14-16]

A systematic review on PRP for hair loss included 30 studies with 687 patients.[17] Ten randomized control trials were included. The authors reported that 29 studies demonstrated benefit and 24 studies reached statistical significance on a measured outcome, including hair density and hair thickness.[17]

PRP in Aging Skin

Skin aging can manifest as rhytids, laxity, and general textural changes. PRP is thought to induce extracellular matrix (ECM) remodelling by stimulating proliferation of fibroblasts and synthesis of collagen.

The data for PRP for facial rejuvenation is limited.[18] The first randomized control trial was conducted in 2018.[19] Participants received 3 mL intradermal

injections of PRP to one cheek and normal saline to the contralateral cheek. Two masked dermatologists completed a photoaging score on fine lines, pigmentation, roughness, and sallowness. Participants completed a self-assessment score on improvement and satisfaction. While there was not a statistically significant improvement in the photoaging score, participants themselves rated the PRP-treated cheek to have more improvement in the domains of wrinkles and texture.

Another systematic review of 24 studies was published, of which 8 were randomized controlled trials, and represented 480 total patients who underwent PRP for facial rejuvenation.[20] PRP monotherapy yielded modest improvement in facial skin quality and lines. However, the true persistence of these effects is unknown. When used as adjuvant therapy for laser resurfacing, PRP improved results, and decreased both downtime and erythema.[18,20] Interestingly, patients self-reported high satisfaction outcomes, despite a less than 50% degree of clinical improvement.[20]

Future Directions

The technology used to prepare the PRP, centrifugation protocols, and clinical application methods varied in the studies highlighted in this review. Differences in clinical outcomes may be attributed to this lack of standardization in harvesting protocols. In addition, there is significant variability in the ideal volume, technique for administering PRP, total number of treatment sessions, and interval periods between treatments. Further research is thus required to standardize harvesting and treatment protocols.

Conclusion

PRP is gaining clinical popularity, despite the limited-to-moderate body of evidence at present. It has promise as a therapeutic modality in aesthetic dermatology and can be used as monotherapy or in combination with other treatments. There are no standardized PRP protocols. Further studies are required to better understand its mechanism of action, benefits, and limitations.

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