Treating Hair Loss With Platelet-Rich Plasma

This technique has become an effective alternative for a common cosmetic condition that has traditionally had limited treatment options.

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Androgenetic alopecia (AGA) is the most common cause of hair loss among both men and women, affecting up to 40% of women and 70% of men. Visually, it is characterized by decreased hair density, diameter, and length. Thick, terminal hairs transition into thin, vellus hairs. These changes often occur in a characteristic, gender-specific pattern. AGA has been associated with negative social implications and psychological conditions.[1]

Current FDA approved treatment options include oral finasteride for men and minoxidil for men and women, both of which are associated with potentially irreversible side effects, and linked with low patient compliance. Due to limited effective therapies for AGA, platelet-rich plasma (PRP) has become an effective alternative treatment.

History of PRP

PRP is an autologous concentration of platelets in plasma with numerous growth factors that contribute to hair regeneration. The growth factors contained within alpha granules of platelets act on stem cells in the bulge area of the hair follicles and stimulate development of new follicles along with neovascularization. Since the early 2000s, PRP has been used for its wound-healing properties across medical specialties, including neurosurgery, orthopedics, and maxillofacial surgery.[2]

PRP is a volume of blood plasma which is concentrated (>1 million platelets/μL) with platelets. It is rich in growth factors contained in platelet alpha and dense granules. These include platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-β), epidermal growth factor (EGF), and vascular endothelial growth factor (VEGF). These growth factors bind to their receptors at the bulge area of the hair follicle, in turn helping to activate the proliferative phase of hair growth.[3]

PRP has multiple actions at the hair follicle, leading to alterations in the hair cycle and improvement in hair growth. Mediated by PDGF and VEGF, PRP increases vascularity around the hair follicle. This is important, as perifollicular vascularity induced by VEGF has been shown to accelerate the growth of hair and increase hair shaft and follicle diameter. PRP has also been shown to upregulate β-catenin and FGF-7, which promote prolongation of the anagen, or growth, phase of the hair follicle.[4,5]

PRP Preparation Systems

There is no standardized method of preparing and administering PRP. It is produced through centrifugation and cell separation and then injected into androgen-dependent areas of the scalp. Multiple methods of preparation of PRP are available, including commercial kits and manual methods using laboratory centrifuge. Some devices include an accessory to reduce leukocyte count and increase platelet purity. These systems differ in their ability to collect and concentrate platelets depending on the method and time of its centrifugation. Consequently, suspensions of different concentration of platelets and leukocytes are obtained.

All PRP preparation protocols follow a generic method: blood is collected with an anticoagulant, such as citrate (a calcium chelator), to prevent spontaneous blood clotting and consequent platelet activation. Whole blood is then centrifuged to separate red blood cells and to concentrate platelets. PRP is administered into the frontal, parietal, or temporal scalp areas through a series of subdermal or intradermal injections in a grid-like pattern.

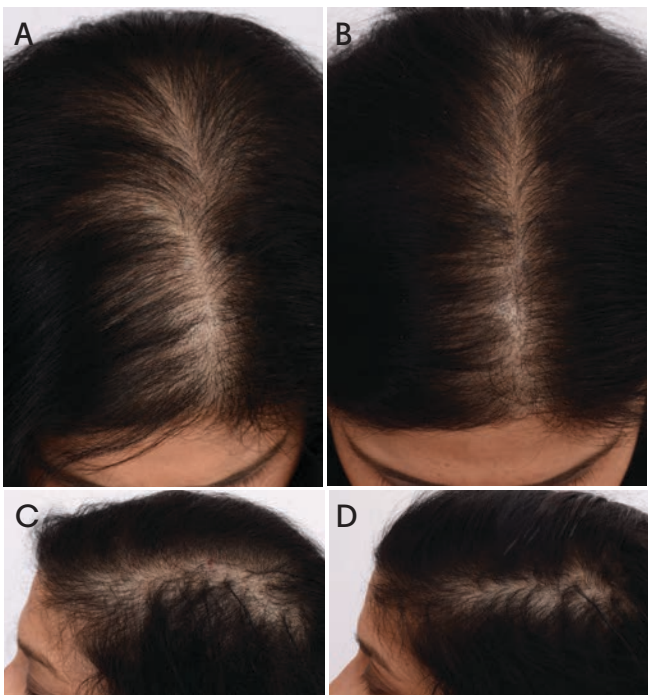

Figure 1. A 42-year-old woman with AGA shown before (A and C) and after (B and D) three PRP treatments administered over 5 months.

The optimal volume of PRP injected per treatment, the time interval between treatments, and the total number of treatments required for optimal improvement is unclear. The wide variation in reported protocols to obtain PRP may lead to samples with different compositions of platelets, leukocytes, erythrocytes, and growth factor concentrations that may induce different biological responses.[6] Establishing the significance of these elements is crucial to identify the most effective preparation for AGA.

Platelet concentration factor is the most frequently described parameter and thought to primarily influence efficacy. Several studies have reported the importance of platelet concentration factor to promote tissue regeneration, indicating that an intermediate concentration (2-6 fold higher than basal platelet count) is necessary to achieve an optimum outcome.[7]

There is currently debate in the literature as to whether leukocytes in PRP have a positive or negative effect in AGA. It is believed that leukocytes release pro-inflammatory cytokines, such as TNF-α, and reactive oxygen species that can increase inflammation and destroy surrounding tissue. Leukocytes may also increase matrix metalloproteinase levels, which leads to matrix degradation.[8]

Proposed Treatment Protocol

Based on clinical experience, the use of PRP is recommended as a coadjuvant treatment for AGA, and patients are encouraged to continue topical and/or oral therapies (such as minoxidil, spironolactone, and finasteride), as PRP does not suppress the hormonal component of AGA. PRP preparation by a single-spin centrifugation method to produce pure PRP with a mean platelet enrichment of 3-6x fold the mean concentration of whole blood and minimize granulocytes is suggested. Administration of PRP as subdermal depo bolus injections is recommended, as this is less painful and an overall more efficient injection technique, given that it allows for greater diffusion resulting in fewer injections.

Injections should be spaced out in the thinning area, which is typically along the hairline, part, vertex, and crown of the scalp. From our experience, treatment intervals should include monthly sessions for the first 3 months, then a fourth treatment 6 months later (for a total of four treatments over 12 months), followed by maintenance treatments every 12 to 18 months. Hausauer et al[9] found this protocol to be successful along with using the subdermal injection technique. Overall, female (**Figure 1**) and male (**Figure 2**) patients have had positive results from PRP injections in AGA in regrowth, increased hair density, and improved quality of life.

Future Directions

Additional areas for future investigation include studies of efficacy of PRP beyond one year of treatment. While many prospective and randomized controlled trials show benefit at 3 to 6 months of treatment, it is unclear when peak hair density is reached, how long treatment effects last, and how often treatment must be continued after the short term. Longer-term, controlled studies examining these questions could eventually assist clinicians in establishing standardized treatment protocols. ■

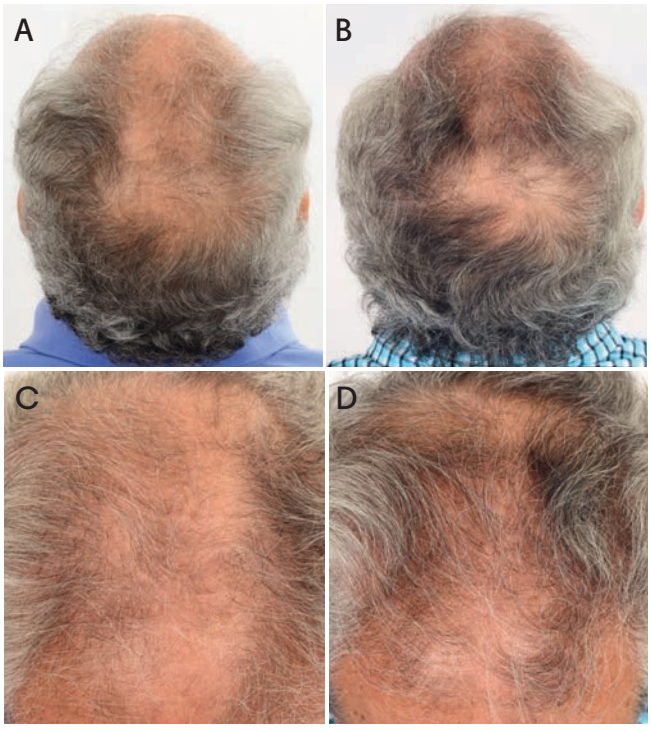

Figure 2. A 65-year-old man, shown before (A and C) and after (B and D) three PRP treatments administered over 4 months.

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