

Commentary on Autologous Platelet-Rich Plasma: A Potential Therapeutic Tool for Promoting Hair Growth

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The use of platelet-rich plasma (PRP) has been investigated in numerous fields of medicine, particularly for its role in wound healing. These fields include orthopedics, dentistry, and most recently dermatology. Data published in peer-reviewed journals have demonstrated dermatologic applications in areas ranging from acne scarring¹ to lower extremity wound healing² to fat transplantation.³ Thicker collagen bundles were seen in skin treated with PRP than in control areas after ablative fractional carbon dioxide laser resurfacing.⁴ Basic scientific data suggest that the mechanism of action for PRP is by upregulating levels of type I collagen, matrix metalloproteinase (MMP)-1, and MMP-2. It also appears to increase the expression of G1 cell cycle regulators.⁵

What is less well understood is what role PRP plays in hair transplantation. We are presently limited in the amount of published data for this application. Uebel in 2006 documented 15% better graft survival in 20 male patients whose grafts were stored in PRP for 15 minutes before implantation than in control areas on the opposite side of their scalps.⁶ In this study, the PRP was four to six times as concentrated as normal serum and was activated with calcium chloride to convert fibrinogen into fibrin.⁶ The difference in graft survival was recorded as 2.4 follicular units/cm² transplanted and found to be statistically significant according to their analysis. Limitations

of the data were that there was no tattooing or area of (nontransplanted) demarcation to reliably differentiate the treated area from the surrounding hairs. Likewise, the trial was not blinded or interpreted by independent researchers.

Since then, there have not been any peer-reviewed studies investigating the clinical results of hair transplantation treated with PRP. This study is important because it investigates the molecular mechanism of PRP on hair growth factors and shows preliminary support for a clinical application. The authors found that, within the treatment group, dermal papilla cells treated with PRP had a higher rate of proliferation on day 3 than untreated controls.⁷ Their studies demonstrated that this was modulated through greater phosphorylation of extracellular signal-regulated kinase, Akt, and Bcl-2 expression in dermal papilla cells. The last is helpful for its antiapoptotic properties. They found higher levels and greater transcriptional activity of the signaling molecule β -catenin in cells treated with PRP. Finally, they found that the level of fibroblast growth factor-7 (FGF-7) was higher in PRP-treated dermal papilla cells, which helps to prolong the anagen phase and delay progression to the telogen phase. The authors confirmed their *in vitro* findings with *in vivo* results showing more-rapid growth of hair in mice treated with PRP every 3 days for 3 weeks than in untreated controls.

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We await larger blinded clinical trials demonstrating the efficacy of PRP not only enhancing wound healing after hair transplantation, but also in enhancing the survival of transplanted follicular units. Takikawa and colleagues found that the addition of dalteparin and protamine microparticles to PRP helped to increase the hair caliber of transplanted follicles.⁸ Further additional modifications to the standard PRP formula may continue to improve hair transplantation results.

We also await evidence-based data regarding the exact concentration and dosing parameters. Will PRP work better if injected weekly, daily, or monthly? For how long after transplantation? 6 months? 1 year? Indefinitely? For now, all we have are arbitrary guidelines. No comparison dosing studies have been performed for PRP in the application of hair growth and hair transplantation. For many doctors, these unknowns, plus the time and cost of equipment setup, are obstacles to widespread implementation of PRP in hair transplantation.

There is consensus that the use of topical minoxidil after hair transplantation can enhance the growth of new follicles.⁹ PRP may be one more adjunct to the hair transplantation process that provides some additional marginal benefit. The question is whether PRP will provide as much benefit as existing treatment options such as minoxidil. If the benefit is worth the added resources of PRP collection and processing, the process may soon be widely adopted.

We appear to be on the cusp of an exciting development. The use of PRP has been proven to improve wound healing, and for this reason alone

may be worth including in the hair transplantation process, but as more studies like this confirm that it also can help the follicles grow and improve their survival after transplantation, it will gain more support among mainstream hair specialists.

References

1. Lee JW, Kim BJ, Kim MN, Mun SK. The efficacy of autologous platelet-rich plasma combined with ablative carbon dioxide fractional resurfacing for acne scars: a simultaneous split-face trial. *Dermatol Surg* 2011;37:931–8.
2. Chen TM, Tsai JC, Burnouf T. A novel technique combining platelet gel, skin graft, and fibrin glue for healing recalcitrant lower extremity ulcers. *Dermatol Surg* 2010;36:453–60.
3. Oh DS, Cheon YW, Jeon RY, Lew DH. Activated platelet-rich plasma improves fat graft survival in nude mice: a pilot study. *Dermatol Surg* 2011;37:619–25.
4. Na JI, Choi JW, Choi HR, Jeong-Bok J, et al. Rapid healing and reduced erythema after ablative fractional carbon dioxide laser resurfacing combined with the application of autologous platelet-rich plasma. *Dermatol Surg* 2011;37:463–8.
5. Cho JW, Kim SA, Lee KS. Platelet-rich plasma induces increased expression of G1 cell cycle regulators, type I collagen, and matrix metalloproteinase-1 in human skin fibroblasts. *Int J Mol Med* 2012;29:32–6.
6. Uebel CO, da Silva JB, Cantarelli D, Martins P. The role of platelet plasma growth factors in male pattern baldness surgery. *Plast Reconstr Surg* 2006;118:1458–66.
7. Li ZJ, Choi HI, Choi DK, Sohn KC, et al. Autologous platelet-rich plasma: a potential therapeutic tool for promoting hair growth. *Dermatol Surg* 2012;38:1040–46.
8. Takikawa M, Nakamura S, Nakamura S, Ishirara M, et al. Enhanced effect of platelet-rich plasma containing a new carrier on hair growth. *Dermatol Surg* 2011;37:1721–9.
9. Avram MR, Cole JP, Gandelman M, Haber R, et al. The potential role of minoxidil in the hair transplantation setting. *Dermatol Surg* 2002;28:894–900.

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