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A study of the efficacy of skin needling and platelet rich plasma in the treatment of androgenetic alopecia

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ABSTRACT

Background: Platelet-rich plasma (PRP) is an autologous preparation of platelets in concentrated plasma that may be useful in the treatment of androgenetic alopecia (AGA). Its action depends on the released growth factors from platelets. Skin needling is a technique that uses a sterile dermaroller to puncture the skin and release growth factors. The combination of Skin needling and PRP should enhance the efficacy of both modalities. **Objective:** To establish the effectiveness of the combined use of Skin needling and PRP in AGA treatment. Method: The study enrolled 10 patients of AGA. The hair pull test was performed before each treatment session. PRP therapy with skin needling was given to them at monthly intervals for 6 months. The effects of therapy were evaluated based on clinical examination, hair pull test, photographic assessment and patient's satisfaction**. Result:** Before treatment, 80 % of our patients had a positive hair pull test with a mean number of 9 hairs which turned to be negative only after the third session. After 6 months, there was an overall improvement in hair density with the response of grade +2 in 8 patients and +1 in 2 patients on the standardised 7-point evaluation scale. 3 patients rated response as grade 4, 5 patients as grade 3 and 2 patients as grade 2 on patients' subjective evaluation of hair growth. Pain during the procedure and sensible scalp afterwards were the major complaints which subsided in 2-3 days. **Conclusion:** PRP combined with skin needling is a safe and effective treatment and can be considered as an alternative for management of AGA.

Key words: Androgenetic alopecia, platelet rich plasma, skin needling

Introduction

Androgenetic alopecia (AGA) is progressive patterned hair loss in which there occurs androgen mediated conversion of susceptible terminal hairs into vellus hairs in a defined pattern in genetically predisposed individuals. It is a common dermatological disorder affecting both men and women, with significant negative impact on their social and psychological well being. [1] It commonly begins by 20 years of age and affects nearly 50% of men by the age of 50 years.[2] Platelet rich plasma(PRP) and percutaneous collagen induction or skin needling have recently been used separately for hair stimulation both for male and female AGA. PRP is an autologous concentration of human platelets in a small volume of plasma that has a higher platelet concentration (4-7 times) above baseline. [3] Platelets release large amounts of platelet-derived growth factor (PDGF), transforming growth factor beta (TGFβ), epidermal growth factor (EGF), and vascular endothelial growth factor (VEGF). [4] It is hypothesised these growth factors may act on stem cells in the bulge area of the follicles, stimulating the development of new follicles and promoting neo-vascularisation.[5] Skin needling is a technique that uses a sterile dermaroller to puncture the skin and release growth factors. Hence, PRP can be combined with skin needling to enhance the efficacy of both modalities. Accordingly, this current study was conducted.

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Materials and methods

The study was conducted in the department of Dermatology, Veneorology and Leprology, ASCOMS Hospital, Jammu in collaboration with the department of Blood Transfusion Medicine, ASCOMS Hospital from Jan. 2016 to Dec. 2016. Ethical clearance was taken from the Ethical Committee of the institute. Patients in the age group of 20-35 years with AGA (Hamilton Norwood Classification Score 1-5) were selected. Exclusion criteria were patients with active infection at local site, patients with alopecia other than AGA, patients who received treatments for AGA within last 3 months, patients with history of bleeding disorders, patients on anticoagulant therapy, antiplatelet therapy, evidence or history of keloid scars, pregnancy or lactation, patients with unrealistic expectations, HIV or Hepatitis B or C positive patients.10 patients of AGA were selected on the basis of inclusion and exclusion criteria. Before each session hair pull test was performed by the same clinician. All patients were refrained from hair washing 2 days prior to treatment. A bundle of approximately 50–60 hairs were grasped between the thumb, index, and middle finger from the base close to the scalp. The hair was firmly tugged away from the scalp, and the extracted hair was counted in every session. Count >10% was considered to be positive test. Photographs (front, lateral, vertex and back views) of local site at start, during and end of treatment were taken.

Procedure

Before the procedure, written informed consent was taken. With all aseptic precautions, 20 ml of venous blood was withdrawn in sodium citrate (anticoagulant) containing vaccutainers. The tubes were rotated in a centrifugation machine at 1500 revolutions per minute for 6 minutes (soft spin). Plasma and buffy coat were aspirated and collected in another tube for second centrifugation at 2500 revolution per minute for 15 minutes (hard spin). Approximately ¾ of the supernatant was discarded and platelet rich pellet was resuspended in remaining amount of plasma. PRP was obtained. Scalp was disinfected with spirit swab, then a topical anesthetic was applied, left for 60 minutes. A dermaroller of 1.5 mm sized needles was rolled over the affected areas of the scalp in a longitudinal, vertical, and diagonal directions until mild erythema was noted, which was considered as the end point of the procedure. Calcium chloride was added to the PRP in an insulin syringe (1 part calcium chloride and 9 parts of PRP) to act as activator. 2-3 ml of PRP was injected over affected area by nappage technique (multiple small injections in a linear pattern one-cm apart) under proper aseptic precaution and the area was massaged to allow it to percolate through the epidermis. A total of 6 sittings were given to each patient at interval of 1 month over a period of 6 months. Results were assessed with the use of hair pull test and global pictures using the standardized 7-point evaluation scale (–3 = greatly decreased, –2 = moderately decreased, –1 = slightly decreased, 0 = no change, +1 = slightly increased, +2 = moderately increased, +3 = greatly increased).Patients also assessed their hair growth on subjective assessment scale of 0-4 (0: No improvement; 1: 1-25% improvement; 2: 26-50% improvement; 3: 51-75% improvement; 4: 76-100% improvement).

Results

10 patients were included in the study. Age and grading of patients according to Norwood-Hamilton classification of male AGA is shown in Table 1. Before treatment, 80 % of our patients had a positive hair pull test with a mean number of nine hairs. Only after the third session, the hair pull test was negative in all patients which was maintained at the sixth session. A significant reduction in hair loss was observed between first and sixth injection as noticed by patients. After 6 months, macroscopic photographs assessed by 2 evaluators showed an overall improvement in hair density and quality [figure 1& 2] with the response of grade +2 in 8 patients and +1 in 2 patients on the standardised 7-point evaluation scale. 3 patients rated response as grade 4, 5 patients as grade 3 and 2 patients as grade 2 on patients' subjective evaluation of hair growth. At the end of 18 months of follow up, 8 patients had maintained the same response that was achieved at the end of last session while 2 patients needed booster dose.

Table 1: Age distribution and Grading of AGA (Norwood- Hamilton Classification)

S.No.	Age	Grading of AGA
1	24	2
2	23	2a
3	25	3 vertex
4	23	3a
5	24	3a
6	26	4
7	27	4a
8	28	4a
9	31	5a
10	32	5a

Figure 1: a) At the start of treatment b) At 6 months of treatment

Figure 2: a) At the start of treatment b) At 6 months of treatment

Discussion

Hair loss has a significant influence on psychological state and can be associated with loss of self-esteem, depression, neuroticism, feeling unattractive, and introversion.[6] Treatment options include finasteride and/or minoxidil, scalp surgery including hair transplantation, excision of bald scalp, scalp flaps.[7] Drug therapies approved by FDA are limited to finasteride and minoxidil. However, there are side effects including loss of libido, increase in other body hairs, headache and graft failure after hair transplantation. [7] Hence, there is need for newer treatment options. A method of promoting hair growth by PRP combined with skin needling is an interesting and upcoming safe, easy and inexpensive modality to

treat AGA. PRP induces activation of antiapoptotic regulators, such as the Bcl-2 protein and Akt signaling, prolongs the survival of dermal papilla cells during the hair cycle. [8,9] It upregulates FGF-7/b-catenin signaling pathways, thereby stimulates hair growth by inducing follicular stem cell differentiation as well as prolonging the anagen phase of the hair growth cycle.[8,10] It also appears to increase the perifollicular vascular plexus through the increase of VEGF and PDGF levels, which have angiogenic potential.[11] Uebel et al [5] showed that pretreatment of follicular units with PRP before transplantation resulted in improved hair growth and density. The positive effect of PRP in the treatment of AGA has been documented in other studies. [11,12,13].Mechanisms of hair re-growth induced by skin needling include:[14,15,16] release of platelet derived growth factor, epidermal growth factors through platelet activation and skin wound regeneration mechanism; activation of stem cells in the hair bulge area; overexpression of hair growth related genes vascular endothelial growth factor, B catenin, Wnt3a, and Wnt10 b. A 12-week study by Dhurat et al [17] showed that dermaroller along with Minoxidil treated group was statistically superior to Minoxidil treated group in promoting hair growth in men with AGA. Studies by Jeong et al.[14] and Kim et al.[15] showed repeated skin needling enhanced the expression of hair related genes and stimulation of hair in mice. Kim et al.[15] also noted earlier and faster hair re-growth with more shiny texture of the hair in micro needle treated group than the untreated mice group. To the best of our knowledge, our study is the first study to assess the efficacy of combined use of skin needling and PRP therapy in AGA. After 6 months of treatment, the hair fall reduced, hair pull test was negative, hair growth was evident on global pictures and there was high overall patient satisfaction. Only 2 patients didn't show much improvement because their AGA grade was high and duration of hair loss was more. Our study has certain limitations: trichoscopic hair evaluation could have given more objective results. Sample size is very small. The mean follow-up is short to draw final conclusions about the long-term benefit of this treatment. To maintain the results, we suggest booster doses. Thus, further studies are needed with longer follow-ups.

Conclusion

In this study, we were able to show that PRP combined with skin needling for the treatment of AGA is efficient and feasible with a high overall patient satisfaction. It is safe and cheap. This procedure should be offered to patients with early stage of AGA along with the existing therapeutic modalities for faster hair re-growth and better patient compliance.

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