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Case Series

Injectable platelet rich fibrin therapy for androgenetic alopecia: a series of 15 cases

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ABSTRACT

Androgen dependent hair loss is the most common cause of progressive hair loss due to androgenetic miniaturization of hair follicles. Grade 1 and 2 of alopecia is managed well with topical and oral modalities, however grade 3 onwards the need adjuvant treatment arises. To evaluate the efficacy, safety profile and feasibility of injectable-platelet rich fibrin (I-PRF) in androgenetic alopecia and assess the patient satisfaction with this new treatment modality, we conducted a pilot study. Here, 15 patients of androgenetic alopecia were treated with injectable PRF and micro-needling at 2 weekly interval for 4 sittings with a background therapy of minoxidil, finasteride and multivitamin supplements. Monitoring was done with clinical photographs and dermoscopic evaluation prior to each session and a standard assessment questionnaire was given at the end of the study. A significant improvement in hair growth was observed clinically with positive score of 7.42 on the patient satisfaction scale and visible changes were noticed on clinical photographs and dermoscopy. Hence, we concluded that I-PRF is safe, easy, time and cost-effective adjuvant modality for managing androgenetic alopecia with some theoretical advantages over PRP.

Keywords: Androgenetic alopecia, Injectable platelet rich fibrin, Stem cells, Platelets

INTRODUCTION

Androgen dependent hair loss in males and females is the most common cause of progressive hair loss due to androgenetic miniaturization of the hair follicles.[1] FDA approved treatment modalities such as minoxidil and oral finasteride work well for grade 1 and 2 of alopecia however from grade 3 onwards the need adjuvant treatment options arises.[2] Till now, platelet rich plasma has been used commonly for hair regeneration. Injectable platelet rich fibrin (I-PRF) is an advanced version of PRF in a liquid form which is prepared by centrifuging the blood at 700 rotations per minute for 6 minutes without an anticoagulant. PRF is known to have a role in various other domains of dermatology such as acne scars, chronic non-healing ulcers, striae.[3] Hence, a pilot study involving 15 patients was carried out in our department with the following objective: to evaluate the efficacy, safety profile and feasibility of I-PRF in androgenetic alopecia and to assess the patient satisfaction with this new treatment modality.

CASE SERIES

We had discussed a series of 15 cases of AGA and FPHL, of which 12 were males and 3 were females. The diagnosis was on the basis of a detailed history, in order to rule out other causes of alopecia such as telogen effluvium, history of any drugs, systemic disease and lifestyle-related factors such as smoking and ultraviolet

exposure which can aggravate AGA and a family history of AGA was asked for a thorough clinical examination of the scalp to rule out any other local dermatological disorder and trichoscopic imaging. The patients were selected after counselling regarding the procedure and obtaining a written informed consent, on the basis of the following criteria (Table 1).

Table 1: Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Age group of 20-50 years	Patients with alopecia other than androgenetic alopecia
Presenting with patterned hair loss	Patients with active infection at the local site
No satisfactory improvement to the standard line of treatment for a period of 6 months	Patients having keloidal tendency
Males-Norwood Hamilton grade 3, 4, 5	Patients with blood coagulopathies
Females-beyond grade 1 as per Ludwig's classification	Pregnant and lactating females

Procedure

Total 10 ml of blood was collected and filled in 2 plain bulbs (without an anti-coagulant) of 5 ml each and were centrifuged immediately at 700 rotations per minute for 6 minutes using a REMI-R8C centrifuge machine (Figure 1 and 2).[3]

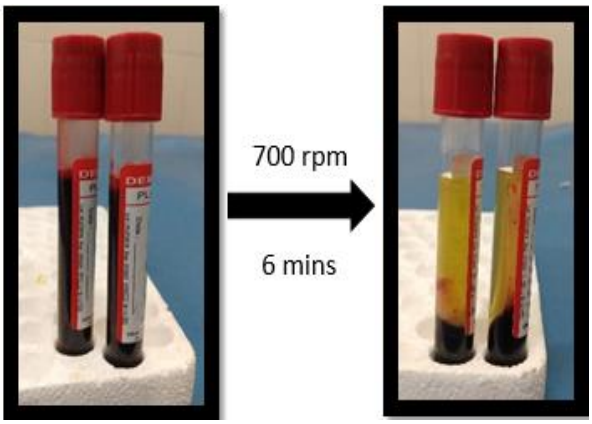

Figure 1: 10 ml blood divided in 2 plane bulbs without anticoagulant, centrifuged at 700 rpm for 6 mins, gives the supernatant serum.

The I-PRF liquid was collected using 31G insulin syringes and was injected through a hypodermic needle entering for 2-4 mm on the entire scalp. A total of 2 to 3 ml of liquid was injected at a distance of 1cm apart known as the Nappage technique (Figure 3). Following the injections, micro-needling was done with a 2 mm derma-roller under a supraorbital and occipital nerve block.

Figure 2: Remi R8C centrifuge machine.

Figure 3: Nappage technique of injection on the scalp, insulin syringe loaded with IPRF liquid and 2 mm dermaroller.

The fluid was injected first in order to prevent the clotting as no anti-coagulant was used. Each patient underwent 4 sittings at 2 weekly intervals. After the procedure, patients were asked to not wash their head for 8 hours, to avoid exposure to sun or dust and to cover their head and restrict activities like swimming for 1 week at least. All patients were on a background therapy of 5% minoxidil solution, oral finasteride 1 mg per day and multivitamin supplements. Oral diclofenac 50 mg was prescribed in case of post-procedural pain. These patients were already treated with platelet rich plasma and dermaroller for 1 year prior to the study and hence they acted as their own respective control subjects. These patients were treated every 2 weekly with I-PRF and the results were interpreted at the end of 4 sittings which was by the end of 2 months. The Data was monitored before every sitting by means of clinical photographs which were taken at the

baseline and then before every sitting. Trichoscopy images (using Dinolite 200X video dermoscope) from a square area of 1 sq cm marked for individual patients by a surgical marker pen which was shaved prior to imaging (female patients did not give consent for shaving), were taken at the baseline and then prior to every sitting. Standardized hair growth assessment questionnaire was given to all the patients at the end of 2 months and the results were interpreted. Subjective outcome of the patients was also judged on the basis of their interpretation about the amount of hair fall reduced or increased and the hair density improvement and a patient satisfaction score on a scale of 1 to 10 was obtained. All the 15 patients included, were in the age group of 20 to 50 years, of which 12 were males and 3 were females. Out of the 12 males, 7 had grade III, 4 had grade IV and 1 had grade V alopecia as per Norwood Hamilton grading system. Amongst the 3 females 2 had a grade II and 1 had grade III alopecia as per Ludwig's classification. The patients were monitored as follows.

Clinical photographic analysis

Total 11 out of 15 patients showed a clinically noticeable improvement in the hair growth (Figure 4).

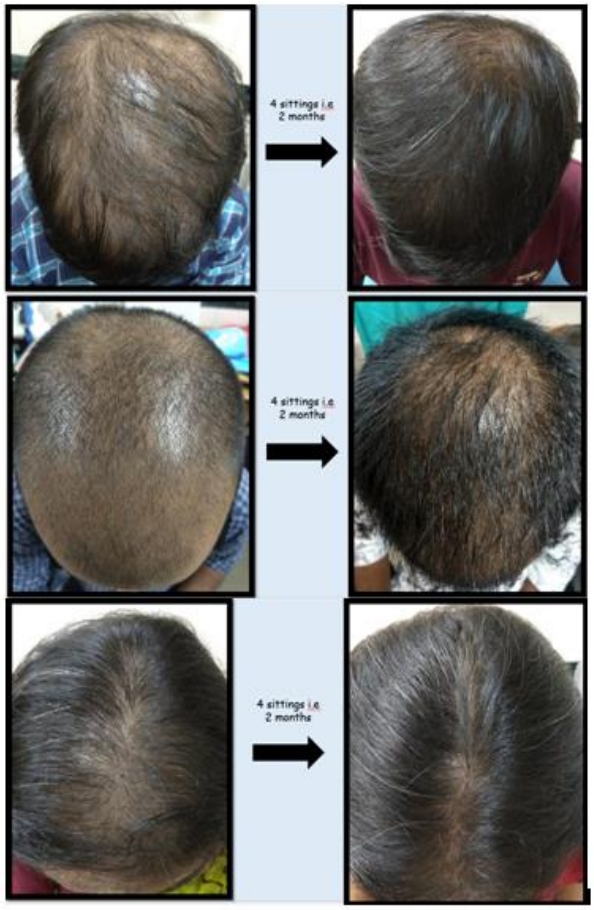

Figure 4: Improvement seen in the frontal area of the scalp in the form of increased hair density seen on clinical photographs.

Dermoscopic analysis

The dermoscopic analysis showed an increase in the number of hair per follicular unit, decrease in the shaft diameter variability, decrease in the number of yellow dots and increase in the number of re-growing vellus hair (Figure 5).

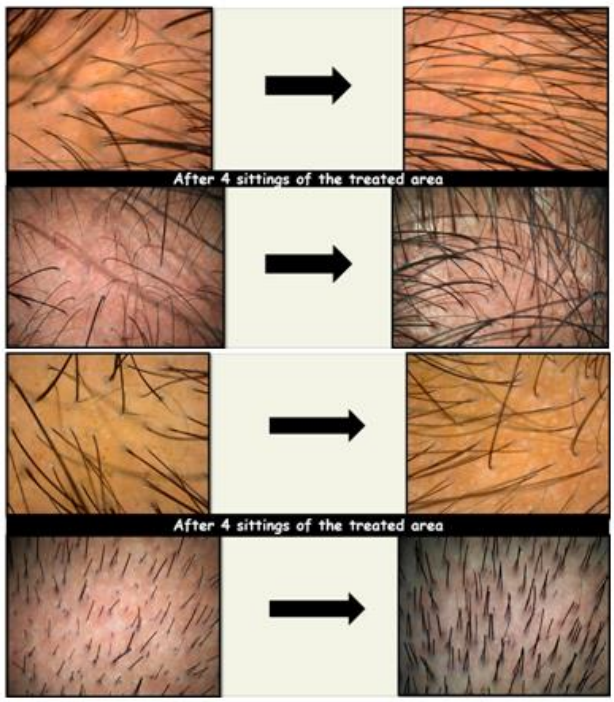

Figure 5: Dermoscopic images showing improvement after 4 months in the form of decrease in the diameter variability of the hair shaft, increase in the hair per follicular unit and growth of new velus hair.

Standard assessment questionnaire as mentioned in (Figure 6) depicted; question 1: since the start of the study, I can see my bald spot getting smaller. Results: 12 patients (80%) agreed that their bald spot was getting smaller. Question 2: Because of the treatment I have received from the start of the study the appearance of my hair is getting better. Results: 14 patients (93.33%) noticed that the appearance of their hair was getting better. Question 3: Since the start of the study, how would you describe the growth of your hair? Results: 3 patients noticed great increase, 4 noticed moderate increase and 8 noticed slight increase in their hair growth. Question 4: Since the start of the study, how effective do you think the treatment has been in slowing down your hair loss? Results: 12 patients (80%) felt that the treatment was effective in slowing down their hair loss. Question 5: Compared to the beginning of the study, which statement best describes your satisfaction with the appearance of? a) Front of the head: 13 patients (86.66%) were satisfied with the appearance of hair at the front of the head, b) Top of the head: 9 patients (60%) were satisfied with the appearance of hair on the top of the

head and c) Our hair overall: 11 patients (73.33%) were satisfied with the overall result.

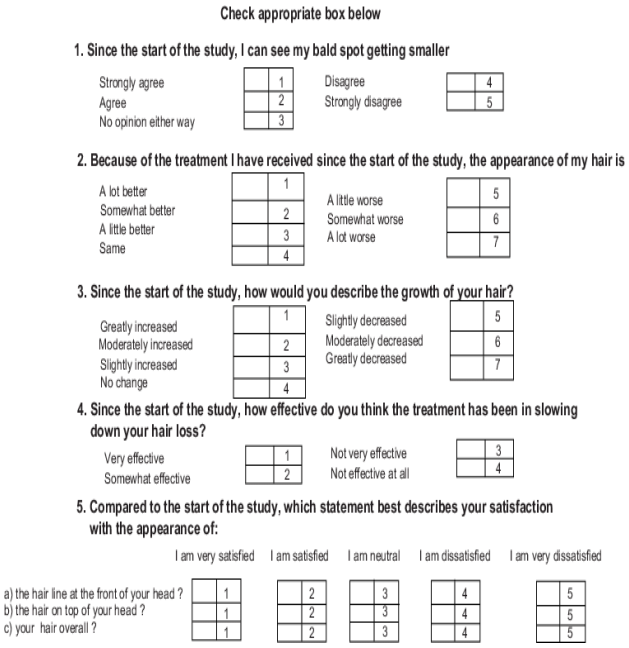

Figure 6: Subjective hair growth assessment questionnaire.

Patient satisfaction score

The subjective improvement was judged on the basis of amount of hair fall reduction noticed and the patient satisfaction score (Table 2). The patients were asked to grade their satisfaction with the treatment provided, and at the end of treatment they had to give a score on a scale of 1-10 which was 7.46 with standard deviation of 1.02.

Table 2: Post procedural perception (n=15).

Post-procedural perception	N
Hair fall reduced significantly	9
Hair fall reduced mildly	3
No change in hair fall	3
Hair fall increased	0
Density increased	11

DISCUSSION

Hair loss is a significant stressor and a major cause of low self-esteem and depression. Androgenetic alopecia is the most common type of hair loss and occurs due to two primary causes, genetic predisposition and hormonal stimulation.[3] The use of regenerative modalities has become a standard of care for many clinicians in dermatology, dentistry, surgery and orthopedics. A variety of biomaterials are routinely being utilized including barrier membranes, bone grafting materials, and bioactive growth factors to facilitate tissue regeneration. One such proposed method has been the use of platelet concentrates. Platelet rich plasma and platelet rich fibrin are two such modalities using supra-physiological doses of autologous growth factors derived from the patient's own blood to speed up the tissue regeneration.

Table 3: Comparison between PRF and PRP.

PRF	PRP
Single spin technique	Double spin technique
No need for anticoagulant to procure it	Anticoagulant needed to prepare this formulation which inhibits wound healing
Cost effectiveness	High cost of commercially available PRP kits
Lesser duration of procedure	Longer duration to prepare the concentrate
Less amount of blood is required and only the RBC clot is discarded.	More quantity of blood is required and the platelet poor plasma after first as well as second centrifugation is discarded.
Single protocol is used to prepare the PRF formulation.	Wide variation in the protocols preparation of PRP and different machines & temperatures affecting the platelet yield.
The release of growth factors continues till more than 10 days due the in-situ clot formation.	The plasma diffuses in the surrounding and dissolves within 10 days.
Less painful while injecting with easy flow	More painful

I-PRF is different from the conventional PRF and is based on the concept that low speed of centrifugation, will give a better yield of leukocytes, platelets, stem cells and growth factor concentration, thereby enhancing the regeneration process.[3] PRF is a new platelet concentrate concept which accumulates platelets and the released cytokines in a fibrin clot which acts as a scaffolding to keep the growth factors and stem cells in the area they are injected, keeping them from diffusing, which can happen with PRP. I-PRF provides an increased concentration of growth factors (vascular endothelial growth factor (VEGF) and transforming growth factor-β1) which are very much required for neovascularization and angiogenesis.[4-6]

Mechanism of action of PRF

PRF induces differentiation of stem cells, prolongs survival of dermal papillary cells, prolongs the Anagen phase of the hair cycle, increases perifollicular vascular plexus by multiple mechanisms through various growth factors such as platelet-derived growth factor (PDGF),

transforming growth factor (TGF), vascular endothelial growth factor (VEGF), insulin-like growth factor (IGF), epidermal growth factor (EGF) and interleukin (IL)-1. These act on stem cells in the bulge area of the follicles, stimulating the development of new follicles and promoting neovascularization.[7-9] Ghanaati et al. introduced the low-speed concept of blood centrifugation whereby lower centrifugation speed increases the numbers of cells including leukocytes in the fibrin clot. High centrifugation forces during the fabrication of PRP or PRF are known to shift cell populations from the top of centrifugation tubes towards the bottom, so by reducing the centrifugation G-force, higher counts of leukocytes would remain in the top one third layer of platelet concentrate tubes from where the supernatant fluid is collected.[10] I-PRF forms a small clot as a result of its fibrin components that acts as a dynamic gel with cells contained within it.[11] It is therefore, that even following 10 days, an additional release of growth factors still occurs from i-PRF. In a study conducted by Arora et al, only 3 patients were treated with this method and improvement was noted only on the basis of clinical photographs.[3] In our study, the clinical and dermoscopic assessment of the results was done and the patients acted as their own control subjects.

Limitations

Limitations of current study were larger sample size was required and a separate set of subjects treated with PRP and dermaroller were required who will act as control group and help in a better comparison between the 2 modalities.

CONCLUSION

Thus, i-PRF is a safe, easy to perform, time and cost-effective adjuvant modality for managing difficult to treat cases of androgenetic alopecia. Owing to the cost effectivity and less time consumption, it is an innovative technique for a developing country like India and also during a busy schedule. Considering its added advantages over PRP it can be used for more than 4 sittings in order to get a better result. However, a study with longer duration of follow up, larger sample size and control group is needed to further study this treatment modality.

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Ethical approval: Not required

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