A study of the efficacy of platelet-rich plasma in the treatment of androgenetic alopecia in males

Sir,
Androgenetic alopecia is a type of progressive patterned hair loss, where there is androgen-mediated conversion of susceptible terminal hairs into vellus hairs in genetically predisposed individuals.[1] It is known that transforming growth factor-β, an inhibitory factor secreted by hair follicles, plays an important role in the pathogenesis of androgenic alopecia.[1,2] The potential of platelet-rich plasma in promoting hair growth is known since 1993.[3] This study was conducted to determine the effect of platelet-rich plasma in the management of androgenetic alopecia, mainly in terms of improvement in hair density and diameter and assess the variation in response among the different grades of androgenetic alopecia.

This was an open-labeled pilot study conducted in the department of dermatology, venereology and leprosy, Bangalore Medical College and Research Institute, Bengaluru. Approval of the Institute Ethics Committee was obtained. A convenience sample of 30 men in the age group of 20–50 years, with androgenetic alopecia Grade III-VII (Hamilton–Norwood classification) were included in the study. Patients with alopecia other than androgenetic alopecia, those on any other treatment modalities for androgenetic alopecia, history of bleeding disorders and active infection at the local site were excluded from the study. After obtaining written informed consent, a detailed history was elicited from each patient and a clinical examination was performed. Hair density and diameter were measured using a CapilliCARE hair and scalp analysis system (trichoscan).[4] Blood investigations were performed to rule out metabolic causes of alopecia.

Platelet-rich plasma was prepared by the double spin method.[5,6] The scalp was activated by microneedling following which platelet-rich plasma was massaged on the scalp. A total of six sittings were administered in each patient at an interval of 15 days. Hair density and diameter were measured over an area near the vertex, 10 cm from the glabella. Digital photographs were taken before starting the treatment and periodically thereafter. Results were assessed at the end of 6 months on the basis of change in the density and diameter of hair as measured by trichoscan, by an independent observer evaluation of global photographs and

patient's self-satisfaction, as evaluated by a questionnaire. Data analysis was done with the help of Epidemiological Information Package (2010) developed by the Centre for Disease Control, Atlanta.

The age of participants ranged from 25 to 35 years with a mean age of 28.3 ± 3.1 years. The number of patients belonging to androgenetic alopecia grades 6, 5A, 5, 4A, 4, 3V and 3 were 11, 7, 3, 2, 2, 3 and 2, respectively. The age at onset of androgenetic alopecia ranged between 20 and 28 years with the mean age being 23.2 ± 2.3 years. The duration of hair loss varied from 1 to 11 years with the mean duration being 5.5 ± 2.6 years. A positive family history was present in 26 (86.7%) of thirty patients.

On the basis of trichoscan evaluation, the percentage increase in hair diameter was 39.8 ± 17.2 [Table 1] and the percentage increase in hair density was 39.7 ± 16.5 [Table 2]. On the basis of independent observers' evaluation of global photographs, the average

Table 1: Change in the diameter of hair as measured by trichoscan

Follow-up	Hair diameter (in mm) (mean±SD)
Hair diameter (in mm) at	
Pre-treatment stage	0.055±0.015
3 months	0.072±0.017
4 months	0.073±0.018
5 months	0.075±0.019
6 months	0.075±0.019
Increase in hair diameter at (months)	
3	0.017±0.005
4	0.02±0.008
5	0.02±0.008
6	0.021±0.008
Percentage change	39.85±17.21

SD: Standard deviation

Table 2: Change in the density of hair as measured by trichoscan

Follow-up	Hair density (in/10 mm²) (mean±SD)
Hair diameter (in mm) at	
Pretreatment	6.13±1.72
3 months	7.67±1.88
4 months	7.97±1.78
5 months	8.2±1.95
6 months	8.43±2.06
Increase in hair diameter at (months)	
3	1.53±0.68
4	1.83±0.79
5	2.07±0.78
6	2.3±0.99
Percentage change	39.73±16.54

SD: Standard deviation

improvement was 30.2 ± 12.2%. Ten (33.3%) patients had <25% improvement, 17 (56.7%) had 25–49.9% improvement and 3 (10%) had 50–74.9% improvement [Figures 1 and 2]. On the basis of self-assessment by the patient, the mean percentage improvement was 30 ± 13.1, the range being 10–70. Twenty eight (93.3%) patients reported complete cessation of hair fall as early as at the end of 2 months of treatment. Twenty (66.7%) patients reported an increase in hair growth. Eleven (36.7%) patients also noticed an improvement in hair quality in terms of hair texture. Patients with a lower grade of alopecia responded better to the therapy [Table 3]. The response to platelet-rich plasma was found to be inversely proportional to the duration of alopecia [Table 4]. The response also varied significantly with family history [Table 5]. No adverse effects were noted.

Androgenetic alopecia is the most common cause of hair loss. Platelet-rich plasma contains a large array of growth factors such as platelet-derived growth factors, vascular endothelial growth factors,

Figure 1: Pre- and post-treatment (at 6 months) photograph of patient 1

Figure 2: Pre- and post-treatment (at 6 months) photograph of patient 2

epidermal growth factors, fibroblast growth factor-2 and insulin-like growth factors which promote hair growth by inducing the follicular stem cells to shift from a dormant to an active state. Vascular endothelial growth factor-8 and platelet-derived growth factor-4 also facilitate angiogenesis around the hair follicle.[7] Rinaldi *et al*. found that growth factors from platelet-rich plasma could prevent dermal papilla apoptosis, prolong anagen phase and delay catagen and telogen phase.[8] There is histopathological evidence supporting these findings.[9]

The findings from our study also support the beneficial role of platelet rich plasma in androgenetic alopecia; the improvement in length and density of hair was objectively measured and confirmed [Figure 3]. Complete cessation of hair fall was seen as early as following 3–4 sittings. Another interesting fact noticed was that the response to platelet-rich plasma depended significantly on the grade of androgenetic alopecia, duration of hair loss and the presence of family history of androgenetic alopecia.

The major limitation of this study is small sample size. Other limitations are lack of a control group and short follow up period. Controlled, prospective clinical trials are needed to assess the role of this modality in the treatment of androgenetic alopecia.

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Table 3: Efficacy of platelet-rich plasma with respect to grade of androgenetic alopecia

Androgenetic alopecia grade	6 months increase in (mean±SD)	
	Hair diameter (in mm)	Hair density (in/10 mm²)
3	0.025±0.007	3.0±0
3V	0.023±0.006	3.67±1.53
4	0.025±0.007	3.5±0.71
4A	0.02±0	3.0±1.41
5	0.03±0.01	2.33±0.58
5A	0.023±0.008	1.86±0.69
6	0.015±0.007	1.73±0.47
P	0.0446 (significant)	0.0196 (significant)

SD: Standard deviation

Table 4: Efficacy of platelet-rich plasma with respect to duration of alopecia

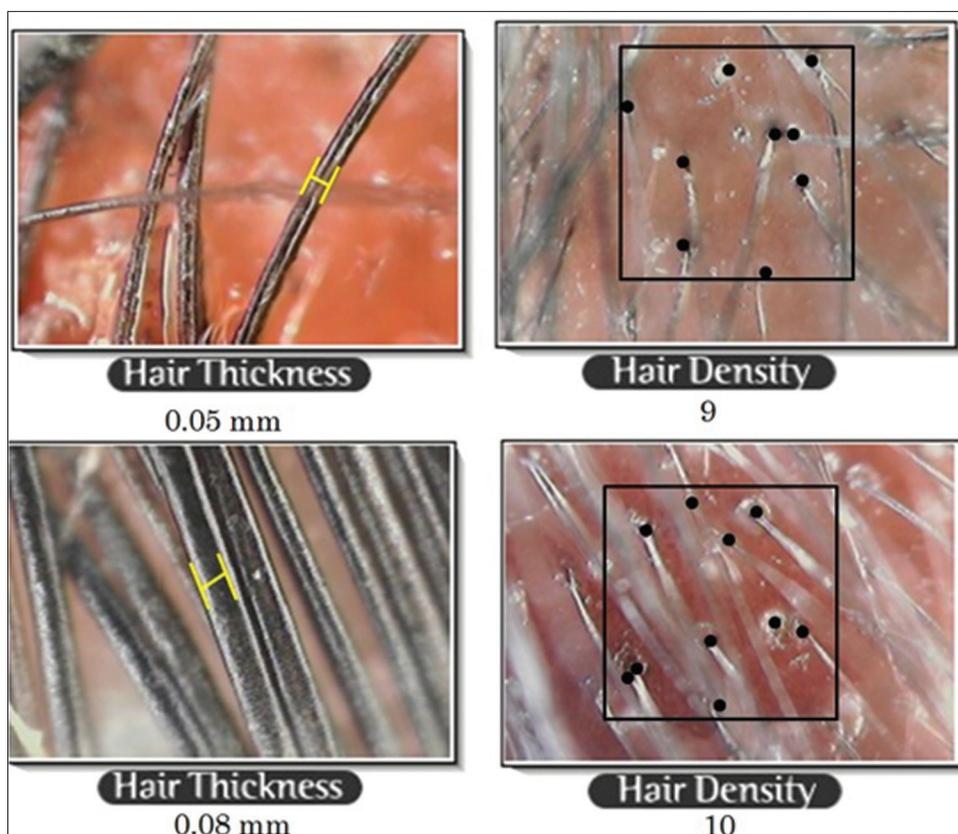| Duration of alopecia	6 months increase in (mean±SD)	
	Hair diameter (in mm)	Hair density (in/10 mm²)
Upto 5 years	0.026±0.008	2.68±1.0
6-10 years	0.018±0.008	1.6±0.52
>10 years	0.01±0	2.0±0
P	0.0485 (significant)	0.0096 (significant)

SD: Standard deviation

Figure 3: Trichoscan findings showing change in diameter and density of hair

Table 5: Efficacy of platelet-rich plasma with respect to family history

Family history of alopecia	6 months increase in (mean±SD)	
	Hair diameter (in mm)	Hair density (in/10 mm²)
Present	0.019±0.007	2.15±0.97
Absent	0.03±0.008	3.25±0.5
P	0.0272 (significant)	0.0114 (significant)

SD: Standard deviation

Conflicts of interest

There are no conflicts of interest.

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