ORIGINAL ARTICLE

Clinical Profile of Androgenic Alopecia and Efficacy of Platelet-rich Plasma in these Patients: A Single Center Study

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Abstract

Background: This study was performed to describe clinical profile of patients with androgenic alopecia and investigate the efficacy of autologous platelet-rich plasma (PRP) injection in androgenic alopecia.

Methods: In this prospective study, adult patients in stage III-VI androgenic alopecia were enrolled. Their clinical profile, i.e., age, duration of alopecia, history of previous treatment, family history of alopecia, pattern of alopecia, grade of alopecia, and hair pull test were noted. The enrolled patients were treated with PRP once a month for 3 months and evaluated with clinical photographs. Hair density and hair thickness were measured using USB portable digital trichoscope and digital computerized trichoscan analysis. Clinical evaluation was performed using a 4-point scale including worsening, no improvement, mild improvement, and moderate to significant improvement. Patients were followed every month for 4 months after the procedure.

Results: Out of 36 patients, 7 (20%) had a history of previous treatment and 12 (33.3%) had a positive family history of alopecia. The mean (SD) hair count of 17.33 (4.42) at visit 1 increased to 19.20 (6.24) at visit 4 ($P<0.0001$). The mean hair thickness increased from 0.07 (0.058) mm at visit 1 to 0.11±0.09 mm at visit 4 ($P<0.0001$). Overall, clinically significant and mild improvement was observed in 11 (33.66%) and 9 (30%) patients, respectively. No improvement was observed in 4 (13.33%) patients, whereas 2 (6.66%) patients experienced worsening of the condition.

Conclusion: PRP is effective in increasing the hair count and hair thickness. However, clinically significant improvement was observed in only one third of the patients. PRP can be considered as an adjuvant treatment for patients with androgenic alopecia.

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Keywords: Androgenic alopecia, Efficacy, Platelet rich plasma, hair loss, autologous

Introduction

Androgenetic alopecia is one of the commonest causes of patients visiting dermatologic clinics. It can be a cause of significant psychological impact on the patients due to perceptions by others. The condition is characterized by progressive miniaturization of the hair follicles. In this multifactorial condition, androgens, genes and environmental factors play a role in pathogenesis.[1]

A population-based study from India reported the presence of androgenic alopecia in 58% males from 30 to 50 years of age.[2] The severity of condition

increases with rising age. Important treatment options for androgenic alopecia include minoxidil, 5-alpha reductase inhibitor (finasteride) and hair tansplantation.[1] Treatment of androgenic alopecia can be selected based on the grade of the condition. Grade I to III might be treated with medical treatment, whereas for higher grades, hair transplantation may be a suitable option.[2] Each treatment option is associated with its own limitation. Topical application of minoxidil may be associated with hypertrichosis. In some patients, it may cause allergic contact dermatitis. Finasteride does not result in effective improvement in post-menopausal women. Moreover, it is avoided in pregnancy. There is no significant place for hormonal treatment such as anti-androgens in male patients.[1] Cost of therapy is an important limitation of hair restoration surgery. In this backdrop, newer effective and safer options are needed for the treatment of androgenic alopecia.

Platelet-rich plasma (PRP) is an autologous preparation of platelets in concentrated plasma (usually 1, 000, 000 platelets/**µl** or four to seven times the inhabitant concentration of the whole blood).[3]

The preparation contains various growth factors released by platelet alpha granules following their activation. These growth factors, especially platelet-derived growth factors (PDGF), transforming growth factors (TGFβ1), epidermal growth factors (EGF), fibroblast growth factors (FGF), and insulin growth factors (IGF) stimulate the cell proliferation and have a role in chemotaxis and angiogenesis as well.[4] The injection is administered to transport high concentrations of growth factors to the scalp, with the hope of stimulating hair regrowth.

The objective of this study was to describe clinical profiles of patients with androgenic alopecia and evaluate the efficacy of autologous PRP injection in these patients.

Methods

In this prospective study, patients with stage III-VI androgenic alopecia according to Hamilton-Norwood classification in the age group of 20 to 50 years who have not taken any treatment, at least in the past six months, were enrolled.[5] Patients with a history of bleeding disorders, those on anti-coagulant medications (aspirin, warfarin, and heparin), active infection at the local site, or history of psoriasis or lichen planus were excluded.

After obtaining the patients' written informed consent, clinical profile including age, duration of alopecia, history of previous treatment, family history of alopecia, and result of hair pull test were noted. Scalp examination was conducted in bright light for recording the type of hair (terminal or vellus hair, density, caliber i.e., coarse or fine, color, texture) and degree and pattern of hair loss. Clinical photographs were taken with digital camera (Sony-cybershot) and trichoscopy was done using USB portable digital trichoscope.

Fifteen milliliters of venous blood was taken from the patient and kept in a tube with anticoagulant. Two centrifugations were performed within an hour. First, centrifugation was done at 2400 RPM for 6 minutes for the separation of blood in three layers. Buffy coat (white blood cells) was seen above the erythrocytes layer, whereas the platelets were present above the buffy coat. Buffy coat and plasma were pulled and centrifuged with the 2nd spin which is hard spin at 3600 RPM at 15 minutes; after this 2nd spin, the platelets were concentrated at the bottom of the tube. Upper half, i.e., platelet-poor plasma spread over the scalp, whereas the lower half was mixed with pellet to make a homogenized solution, PRP. The obtained PRP was mixed with activators (thrombin and calcium chloride) to activate the release of growth factors from the platelets (Figure 1).

A total of three such sittings were done for each patient at an interval of 30 days. Patients were instructed not to apply any other medications after procedure. Measurement of hair density and diameter (thickness) was done using trichoscope and trichoscan analysis at baseline and subsequent visits for the first two months to evaluate the overall hair growth, hair volume, hair quality, and fullness. Clinical pictures were taken in every session from the front, vertex, lateral, and back view, and trichoscopic images were taken after applying a hairband (Figure 2) to mark out a specific point, so that the trichoscopic image could be taken from the same marked point in each visit and changes in hair count and thickness could be assessed.

After the third sitting, the patient was followed up regularly at one month interval for the next four months and evaluated clinically and with a trichoscope. Clinical evaluation was performed using a 4-point scale: -1=worsening; 0=no improvement i.e., up to 10% improvement in hair count and hair thickness (10%);

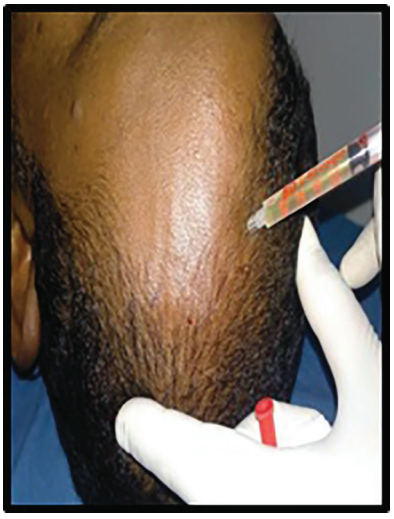

Figure 1: Injection of activated platelet-rich plasma

Figure 2: Defining specific point using hairband and a tapeline

1=mild improvement i.e., 10-20% improvement in the hair count and hair thickness (10-20%); 2=moderate to significant improvement i.e., more than 20% improvement in hair count and hair thickness (>20%)

Statistical Analysis

Continuous data are summarized as mean and standard deviation, whereas count and percentages are given for categorical variables. Paired t-test was used to compare the results before and after the procedure. P values less than 0.05 were considered as significant.

Results

A total of 36 patients were enrolled, of whom 30 completed the study. Three patients withdrew from the study after first session. Two patients did so after the second session, whereas one patient did not turn up after the third session. We used data of all patients for demographic features. However, for the efficacy analysis, we excluded six patients who did not complete the study.

Table 1: Baseline characteristics of the patients in the study

Parameter	Result
Mean (SD) age in years	28.83 (5.11)
Age range (years)	21-43
Age group n (%)	
21-25 years	10 (27.8%)
26-30 years	14 (38.9%)
31-35 years	8 (22.2%)
36-40 years	3 (8.3%)
41-45 years	1 (2.8%)
Duration of androgenic alopecia n (%)	
<1 year	1 (2.8%)
1-2 years	14 (38.9%)
>2 years	21 (58.3%)
Mean (SD) duration of alopecia in years	3.44 (2.28)
Range of duration of alopecia in years	0.5-10
Associated symptom of dandruff n (%)	4 (11.1%)
Number of patients with previous treatment (n=35) n (%)	7 (20%)
Family history of alopecia	12 (33.3%)

A total of 36 patients with a mean age of 28.83 years were included in the study. Out of them, 14 (38.9%) were from the age group of 26-30 years, and 10 (27.8%) were from the age group of 21-25 years.

A total of 21 (58.3%) patients had a history of alopecia since more than two years, whereas 14 (38.9%) patients had alopecia since one to two years. Overall mean duration of alopecia was 3.44 years (Table 1). Seven (20%) patients had a history of previous treatment of alopecia, and 12 (33.3%) of them had positive family history of alopecia.

A total of 9 (25.0%) patients had frontoparietal, 25 (69.4%) patients had frontoparietal and vertex and 2 (5.6%) had vertex pattern of alopecia (Figure 3). Also, a total of 4 (11.1%) patients had grade III alopecia, and 5 (13.9%) of them had grade III A alopecia. Grade III vertex alopecia, grade IV, grade IV A, and grade V alopecia were present in 2 (5.6%), 10 (27.8%) 4 (11.1%), and 9 (25.0%) patients, respectively. One (2.8%) patient

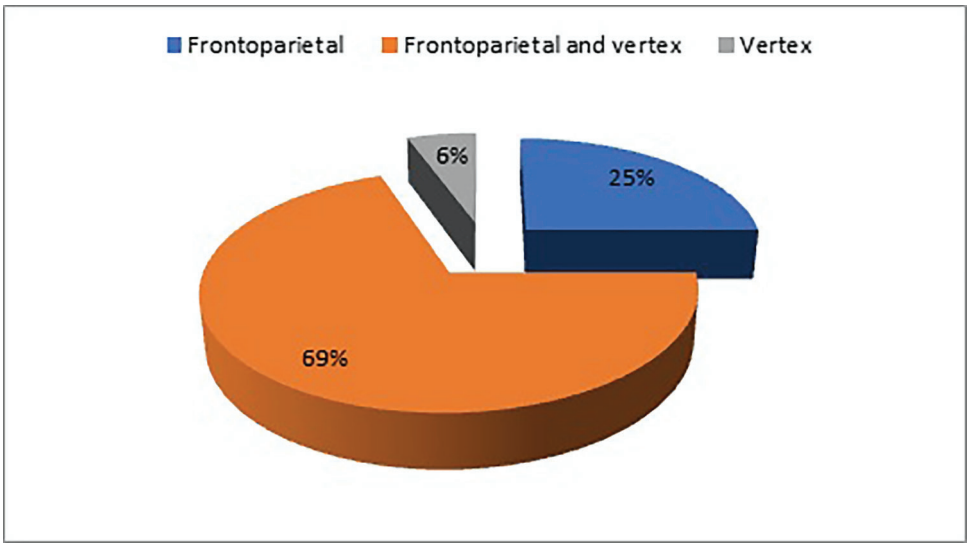

Figure 3: Distribution of the pattern of alopecia among the study participants

had grade V A and grade VI of alopecia. Hair pull test was positive in 31 (86.1%) patients. Miniaturized hairs were present in all 36 (100%) patients.

The mean hair count of 17.33 (4.42) at visit 1 increased to 19.20 (6.24) at visit 4 (Figure 4). The difference of mean hair count visit 1 and hair count visit 4 was statistically significant (P<0.0001). Mean percentage improvement in the hair count was 12.6%. The mean hair thickness increased from 0.07±.058 mm at visit 1 to 0.11±0.09 mm at visit 4 (Figure 5). Difference of mean hair thickness from visit 1 and visit 4 was statistically significant (P<0.0001). The percentage of improvement in hair thickness was 69.1%. Overall, clinically significant (Figure 6) and mild improvement (Figure 7) was observed in 11 (33.66%) and 9 (30%) patients, respectively.

No improvement was observed in 4 (13.33%) patients, whereas 2 (6.66%) patients showed worsening of the condition. In 4 (11.33%) patients, only hair count decreased, but hair thickness was improved. Hair pull test of all study participants became negative after one session of PRP. Overall, a better response was observed in patients with early grade of androgenic alopecia as compared to advanced stages.

Discussion

In this study, we evaluated the efficacy of PRP in patients with androgenic alopecia. The mean age of the patients in our study was similar to that of a study by Sharma and colleagues, whereas in another study, the mean age of the patients was higher.[6, 7] The mean duration of alopecia in our study was about one year less than the patients in the study carried out by Sharma and colleagues.[6]

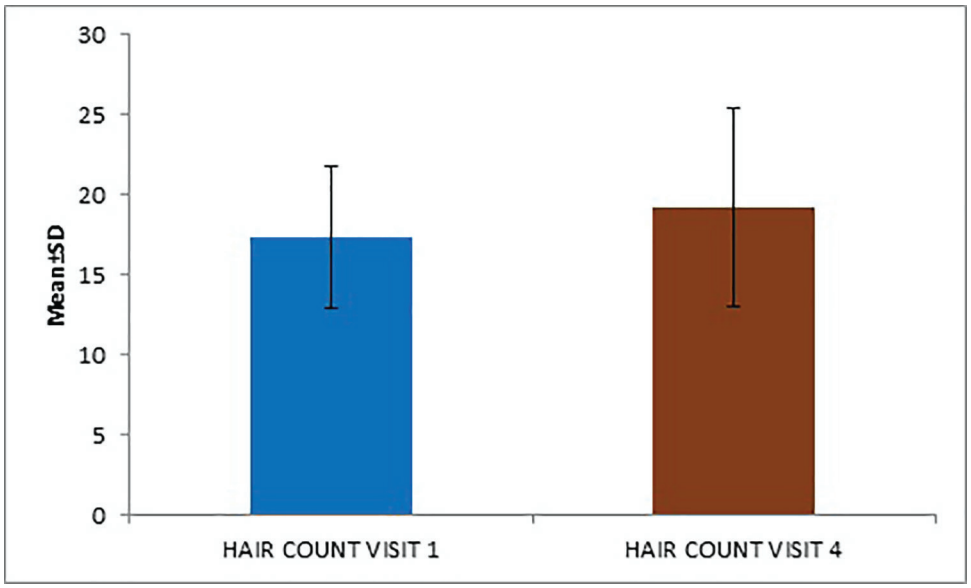

Figure 4: Trichoscopic analysis of the hair count

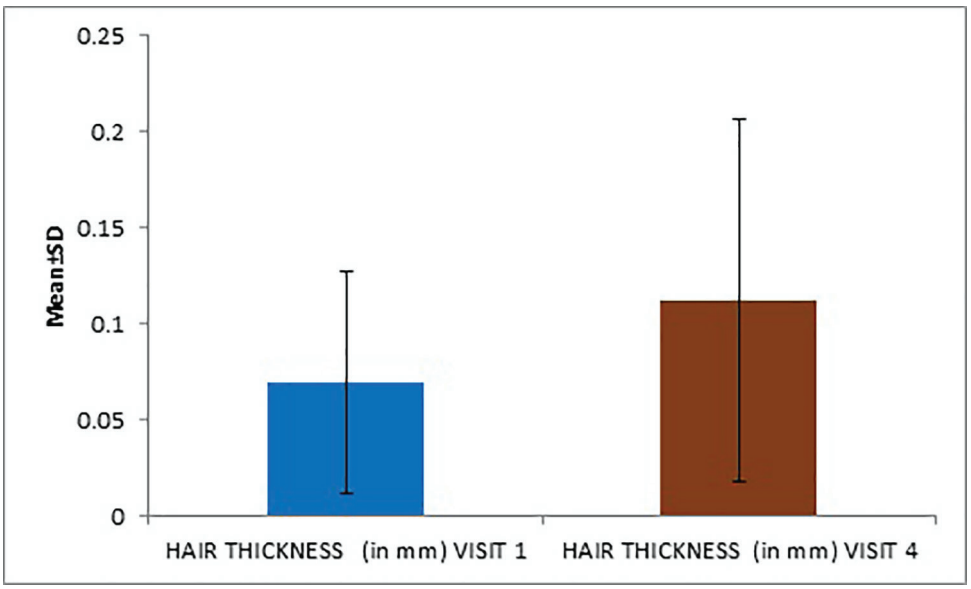

Figure 5: Trichoscopic analysis of the hair thickness

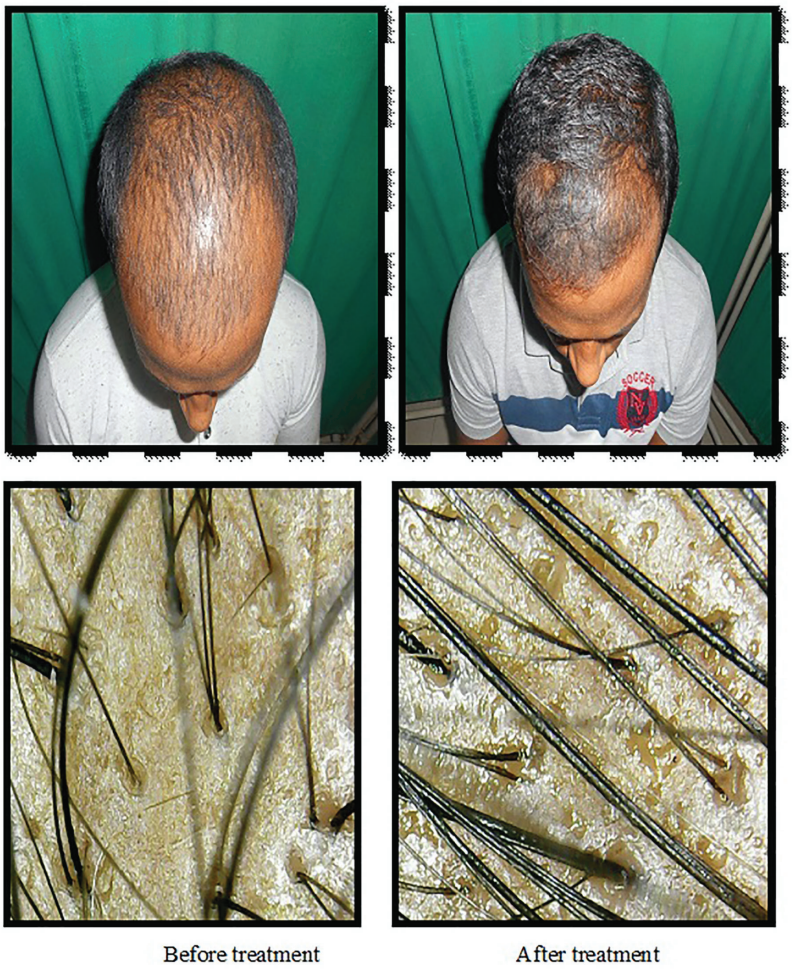

Figure 6: A patient's photographs and trichoscopic images before and after treatment (significant improvement)

A total of one fifth of patients provided a history of past treatment, suggesting dissatisfaction of previous treatment for alopecia. In other studies, the percentage of patients with family history of androgenic alopecia was more than ours.

In our study, about one third of the patients had a significant family history, underlining the possibility of genetic component in the pathogenesis of androgenic alopecia. Others have reported higher rates of family history than observed in our study.[7, 8] In one study,[7] 71.02% of the patients had a family history of androgenic alopecia, whereas another study reported positive family history of androgenic alopecia in 42.2% of patients.[8] Some patients also had a history of dandruff.

In our study, most of the patients had frontoparietal and vertex involvement. Similar to the study carried out by Salman and colleagues.[7] in our study, also grade three alopecia was mostly common. Another study from India reported type two as the commonest presentation of AGA.[9] A study revealed type two and type three as the commonest presentation.[10] The Chinese study had type 4 whereas Korean study had type three as the commonest type.[11, 12] We found that 31 (86.1%) patients had hair pull test positive, and 36 (100.0%) patients had miniaturized hair.

Trichoscopic analysis showed significant improvement in the hair count and hair thickness with improvement of 12.6% and 69.1%, respectively. Many studies suggest that subcutaneous injection of PRP is likely to reduce the hair loss and increase the hair diameter and density in patients with androgenic alopecia. In a study by Gupta and colleagues, results favoured treatment with PRP.[13] In another study, a significant increase in the hair number per cm,[2] was observed after injection of PRP, as compared to the controls.[14] Similarly, a significant increase in the hair thickness was also observed per unit cross-section area.

A meta-analysis reported significantly increased terminal hair density in patients with androgenic alopecia receiving PRP, as compared to the control group (mean difference 22.83, 95% CI 0.28–45.38, P=0.05).[15] Another study reported a significant increase in the hair count (P=0.0018).[16] In another study, there was a significant reduction in the hair loss between the first and fourth injections. Hair count increased from the average number of 71 hair follicular units to 93 hair follicular units.[17]

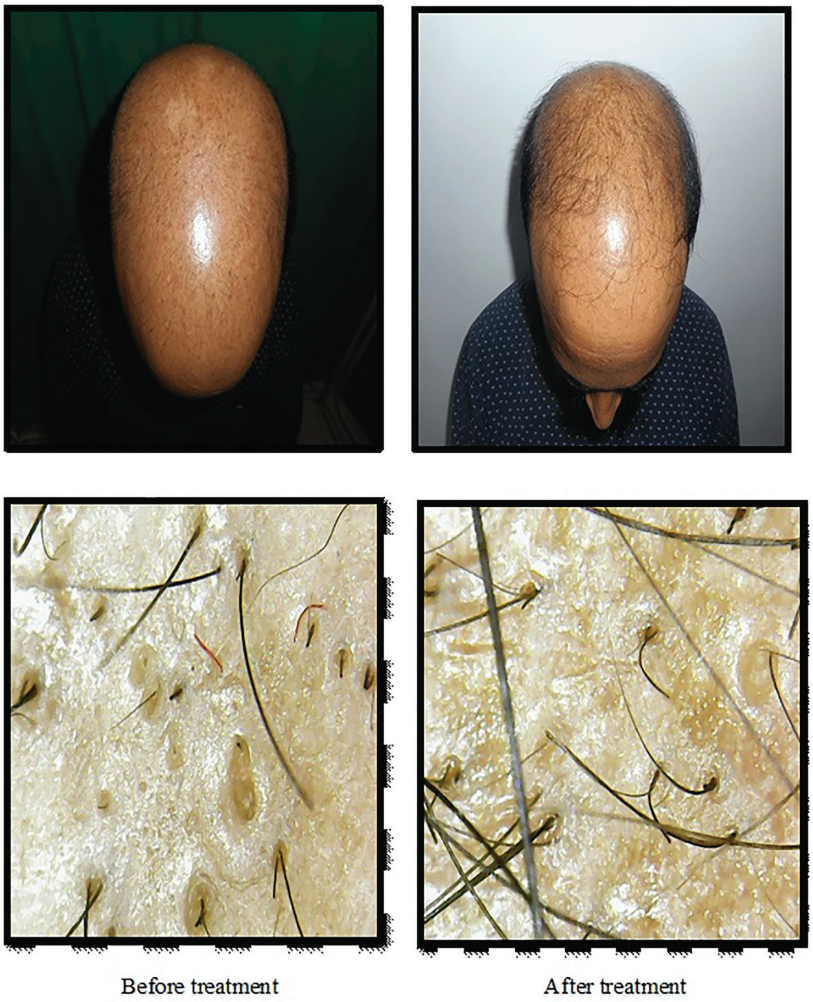

Figure 7: A patient's photographs and trichoscopic images before and after treatment (mild improvement)

Cervantes and colleagues examined the effectiveness of PRP in the treatment for androgenic alopecia.[18] In twelve studies conducted from 2011 to 2017 with a total of 295 subjects, receiving PRP or control treatment was evaluated. They reported the effectiveness of PRP in increasing the terminal hair density/diameter. An analysis of 21 studies reported positive outcomes by objective criteria (88%), while three suggested no clinical improvement, although in two of these studies patients still reported increased satisfaction.[19]

Borhan and colleagues performed a quantitative assessment of hair density by hair count with Trichoscan and the cosmetic assessment by Canfield stereotaxic system.[20] A slight improvement of hair density was observed in 11 cases, while a cosmetic improvement on the vertex was noticed only in two cases according to three assessors. In another study, hair loss reduced and at three months it reached normal levels. Hair density reached a peak at three months (170.70±37.81, $P<0.001$).[21]

In our study, PRP resulted in significant improvement in one third of the patients with androgenic alopecia. This suggests that PRP alone may not provide satisfactory results in all patients. In our study, growth was observed in the hair count, and hair thickness was increased as well, but it had more effects on the hair thickness when compared to growth in the hair count. Based on our observation, we proposed that PRP should not be considered as the sole therapeutic option, but as an add-on therapy to medical treatments, and growth observed by using PRP should also be maintained with a regular PRP session in 3-4 months.

Small sample size, no control group, and no quantification of the platelet count are some of the limitations of our study. Studies with larger sample size and control group are required to confirm our observations.

Conclusion

PRP is effective in increasing the hair count and hair thickness. However, clinically significant improvement was observed in only one third of the patients. The procedure may be useful as an adjuvant therapy along with standard treatment in patients with androgenic alopecia.

Ethics Approval

The study was approved by institutional ethics committee at Dr DY Patil Medical College and Hospital, Navi Mumbai, India

Availability of Data and Material

The data are available with corresponding author with reasonable request.

Authors' Contribution

RS, SP and NN were involved in conceptualization of the study, literature search, and representation of data and interpretation of the findings. RS, NS, RH were involved in data collection. RS, NS, RH and AP were involved in literature search and manuscript preparation. MG was involved in editing and revision of the manuscript. All authors reviewed and approved the manuscript.

Conflict of Interest: None declared.

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