EFFICACY OF PLATELET-RICH PLASMA IN ANDROGENETIC ALOPECIA AND CORRELATION BETWEEN PLATELET COUNT IN PRP WITH CLINICAL AND TRICHOSCOPIC IMPROVEMENT.

Dermatology

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ABSTRACT

Background: Androgenetic alopecia (AGA) is the most common form of patterned hair loss in males. All the available treatment options have limited clinical response. Platelet rich plasma (PRP) is one of the new promising treatment modalities in AGA and there is limited data correlating platelet count in PRP with clinical as well as trichoscopic response.
Aims And Objectives:
1. To evaluate the efficacy of PRP in AGA.
2. To find correlation between platelet count in PRP with clinical and trichoscopic response.
Materials And Methods: Thirty male patients of AGA were enrolled. Every patient was given 3 sittings of PRP once a month for 3 consecutive months. Platelet count in PRP was done by improved Neubauer chamber at every sitting. Patients were followed up every 4 weekly for 24 weeks. Assessment of patients was done using global photography and trichoscopically by calculating hair density, hair diameter and terminal: vellus hair ratio (T:V ratio). Objective grading of response was done at 24 weeks. Patient satisfaction scores were calculated using visual analog scale (VAS) at 12 and 24 weeks. **Results:** Statistically significant improvement in mean hair density, hair diameter and T:V ratio were seen with PRP. Patients with mean platelet count of 12.84±2.35 lacs in PRP had better improvement in trichoscopic parameters compared to cases having platelet count in PRP above or below this range. **Conclusion:** PRP therapy can be an effective therapy in the management of AGA and by means of proper centrifugation technique, optimum platelet count in PRP can be obtained which enhances the treatment outcome.

INTRODUCTION

Androgenetic alopecia (AGA) is a type of alopecia identified by patterned hair loss from the scalp.[1] In AGA there is progressive miniaturization of thick terminal hairs to fine, lightly pigmented vellus hairs under the influence of androgens in genetically predisposed individuals.[2] AGA causes a significant impact on quality of life. Currently, minoxidil and finasteride are the only US-FDA approved drugs for the treatment of AGA.[2] There is extensive research undergoing to develop new, safer, and effective therapies for AGA.

PRP is an autologous concentrate of platelets in plasma which are rich in plenty of growth factors (GF) like platelet-derived GFs, transforming GF-ß, vascular endothelial GF, and insulin-like GF-1 along with their isoforms. PRP has come to light as an effective therapy in the management of AGA. It is minimally invasive and cost-effective. Being autologous in nature has low side effect profile. PRP is a powerhouse of growth factors, acts on stem cells, and promotes hair growth and revascularization.[3]

The purpose of this study was to evaluate the efficacy of PRP in AGA and find correlation between platelet count in PRP with clinical as well as trichoscopic response.

MATERIAL AND METHODS:

This open-labelled prospective interventional study was conducted at the Department of Dermatology and the Department of plastic surgery in a tertiary care hospital in North India. The study protocol was reviewed and approved by the Institutional Ethics Committee(3386/D-26/2020).

Thirty patients attending derma OPD were enrolled in the study after screening with proper inclusion and exclusion criteria. Patients of AGA in the age group 18-40 years were included in the study. Cases with active and chronic scalp infection, medical conditions like chronic liver disease, thyroid disease, bleeding diathesis, critically low platelet count, history of treatment in the past 6 months with minoxidil and/or finasteride or hair restorative surgery and unrealistic expectations from the procedure were excluded from the study.

Diagnosis of AGA was done on clinical grounds. Written informed consent was taken from each patient before starting the therapy. Detailed history, general physical examination and relevant laboratory investigations of every enrolled patient were done and recorded. Each patient was given monthly PRP therapy for 3 consecutive months and followed up every 4 weeks for 24 weeks. On each visit, photographic documentation along with trichoscopy was done. For trichoscopic evaluation, three areas of 1cm2 each were fixed. Two areas were taken at eight centimeters (cm) above the highest point of supraciliary arches on both sides and third at the vertex of the scalp. These areas were evaluated for hair density, hair diameter and terminal: vellus hair ratio. The average of the three areas was documented. A hair pull test was performed at baseline and at 6 months in patients having positive tests at baseline. At every sitting, the platelet count in PRP was done using an improved Neubauer chamber. Objective grading of improvement was done into the following grades based on change in mean hair density and mean hair diameter as follows:
Grade 0 <25% improvement
Grade 1 26-50% improvement
Grade 2 51-75% improvement
Grade 4 76-90 % improvement
 Grade 5 >90% improvement

Preparation of PRP: PRP was prepared using manual double spin technique at centrifugation speeds of 2600rpm/4000rpm for hard and soft spin.
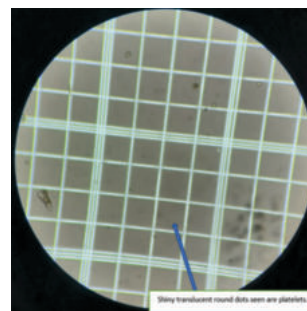
Figure 1- Showing shiny translucent platelets at 40x magnification

Platelet Counting: Platelet count in PRP was determined using improved Neubauer chamber before the procedure. Platelets were counted in central 1*1 mm square (Figure 1).

$$\text{Platelet count} = \frac{\text{no. of platelets counted in central } 1\times1 \text{ mm square} \times \text{dilution factor}}{1\times1 \text{ sqmm (area)} \times 1/10 \text{ mm (depth)}} = N\times200 \times 1/10$$
$$= N \times 2000 \text{ platelets/cumm}$$

Method of administration: PRP was administered as multiple intradermal injections at 1cm2 distance.

Follow up: Improvement was assessed using global photography and change in hair density, hair diameter, and T: V ratio from baseline. Correlation of clinical as well as trichoscopic response was done with platelet count in PRP. Patient satisfaction was assessed using a visual analog scale at 12 weeks and 24 weeks.

Statistical evaluation: Study variables were correlated using Chi-Square test. Pearson Correlation coefficient was used to assess the association between various parameters. A 'p' value of <0.05 was considered statistically significant. The data was analyzed using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS:
The study enrolled 30 male patients of AGA (table1). The mean age of patients in our study was 26.70 ±5.01 years. Mean duration of the disease was 39.06±28.04 months. Grading of the patients was done as per the modified Norwood–Hamilton scale. Grade 2 was the most common grade observed in 40% of the cases.

All the study cases were educated and among them, 90%(n=27) of cases were graduates from various streams. About 10%(n=3) of cases completed high school. Majority of cases enrolled were unmarried i.e., 86.66% (n=26) and a total of 13.33% (n=4) were married.

Family history was present in 60%(n=18) of the cases in the first-degree relatives either maternal or paternal.

Treatment history in the form of either topical or oral allopathic medicine was present in 56.7% (n=17) of cases. The history of some cosmetic procedures like hair smoothening and coloring before the start of hair fall was present in 13% (n=4) of cases.

Frontotemporal region was the most common site of origin of AGA in 90% of the cases. The remaining 10% had origin in the vortex region of the scalp.

On trichoscopic evaluation:
1. A rising trend of T: V ratio was seen in the study population. At 4 weeks, the mean T: V ratio was 0.30 ±0.46 which increased to 2.30±0.65 at the end of 24 weeks.
2. Statistically significant improvement in mean hair density was observed compared to the baseline, with the mean change of 10.37±2.92, 40±6.36, 61.23±7.55 hairs/cm2 (p-value=0.001) at 4 weeks, 12 weeks, and 24 weeks respectively.
3. The baseline mean hair diameter was 38.67±4.53μm, which increased to 46.37±4.47 μm at 12 weeks of treatment and continued to increase throughout the follow-up period up till 20 weeks.

Hair pull test was positive in 10% (n=3) of cases which became negative at the end of the study period of 24 weeks. On serial photographic follow-up, improvement was seen in the study population (Figure 2,3). The mean VAS at 12 weeks and 24 weeks was 5.53±0.66 and 7.56±0.84.

- A

- B

- C
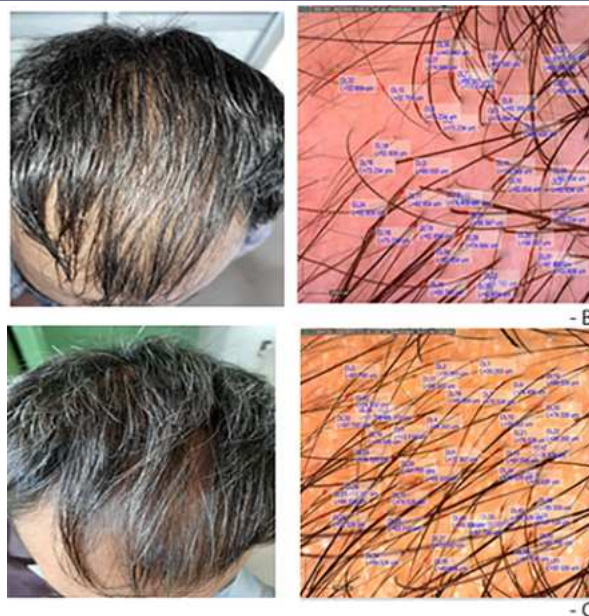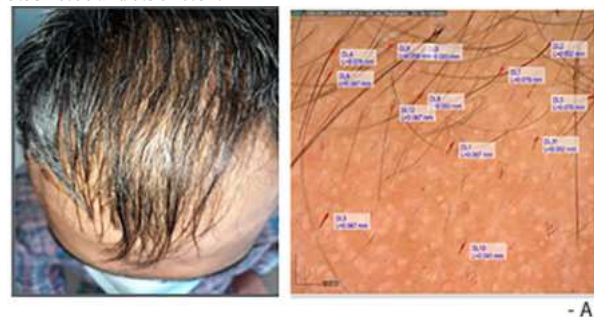
Figure 2- Patient of grade 3 Androgenetic alopecia showing clinical and trichoscopic improvement (A) baseline (B) 12 weeks (C) 24 weeks. [Dermoscopy -polarized mode done at 33x magnification using DINOLITE video-dermoscope, Model- AF4515ZT(R9)]

- A

- C

Figure 3- Patient of grade 4 alopecia showing clinical and trichoscopic improvement (A) baseline (B) 12 weeks (C) 24 weeks. [Dermoscopy-Polarized mode done at 33x magnification using DINOLITE video-dermoscope, Model- AF4515ZT(R9)]

Grade 2 improvement in hair density was seen in 56.67%(n=17) of cases and most of the study cases i.e., 76.67% (n=23) of cases showed grade 1 improvement in hair diameter.

Mean platelets count in PRP was 12.85±2.36 lacs. Statistically significant correlation (p=0.028) was observed between improvement in mean T:V ratio, hair diameter and hair density at 24 weeks and mean platelet count in PRP.

DISCUSSION:

AGA is one of the most common causes of hair fall in males causing considerable psychosocial impact. Besides the standard therapies, a continuous search for newer effective, and safe therapy are ongoing, thus creating a large market full of hair pharmaceuticals. PRP being a cocktail of growth factors has emerged as a new promising therapy in the treatment of AGA.

PRP has been in use for more than a decade but still, no standard guidelines have been laid down regarding its use in AGA.

In our study, PRP was prepared using a manual double spin technique and platelet counting in PRP was done using an improved Neubauer chamber. The patient was given 3 sittings at monthly intervals and follow-up done using global photography, hair pull test, trichoscopy, and patient satisfaction score 4 weekly for up to 24 weeks.

Automated devices were used for platelet counting in studies by Ubel et al. Khatu et al., Betsi et al., Cervelli et al., and Gkini et al [(4-8)].

Mean age of patients in our study was 26.70 ±5.01 years. Maximum number of cases i.e., 50%(n=15) were in the age group 25-35 years (Table 1). However, the obsevations in our study as compared to Salman et al. (31.18±11.74) showed younger age of onset.[9] The younger age of onset in our study could be attributed to increased social media exposure and constant desire to look picture-perfect and appealing to society.

The duration of disease varied from 3 months to 120 months with a mean of 39.06±28.04 months. The majority of the cases i.e., 50% (n=15) cases had hair fall from 2-5 years and only 23.33% (n=7) had a duration of less than 2 years. Similar findings were seen in a study conducted by Sehgal et al., where a maximum number of cases presented within the 1- 4 years of duration of hair fall, indicating that cases are more concerned at the initial stage of hair loss.[10]

The most common grade of alopecia observed was grade 2 followed by grade 3 i.e.,40% and 26.7% respectively. These findings are in accordance with a study by Shankar et al, where grade 2 was the most common form of alopecia.[11]

Among the cases in the 25-35 years age group, 26.67% had grade 2 AGA followed by grade 3 in 16.67%. Only 6 patients had grade 4 alopecia, of which 3 patients belonged to less than 25 years of age. Thus, showing that the younger age group has a more severe form of alopecia. Findings were in contrast with study done by Shankar et al., in which it was noted that the grade of alopecia increased with increase in age (In the 30-35 years age group, 51.18% had grades 1 and 18.52% had grade 6 alopecia while in the 41-45 years age group, 13.38% had grade 1 was and 66.67% had grade 6.[11]Higher grades of alopecia in younger population can be attributed to change in lifestyle, stress, and hormonal factors.

The most common site of onset of hair loss observed in our study was frontotemporal in 90% of the cases, whereas 7% had the onset over the vertex respectively. The site of onset was bitemporal in 66%, bitemporal and vertex in 33%, and vertex alone in 1% in a study conducted by Sehgal et al which is in concurrence with the present study.[10]

In the present study, 60% (n=18) of cases had a positive family history of AGA in family members. Most of the cases had a history of hair fall either in father or brother. In a study conducted by Sehgal et al., it was observed that 85% of cases had a positive family history. [10] The difference observed could be due to the small sample size.

In the present study, grade 2 clinical improvement was seen in 56 % (n=16) of the cases whereas grade 3 improvement was seen in 36.6% (n=11 cases). The results of our study are in concordance with Sehgal et al.[10] In only 10% of the cases, improvement was only grade 1 after 6 months of followup. These study subjects have higher grades of alopecia.

Baseline mean hair diameter was found to be 38.67±4.53μm, which increased to 46.37±4.47 μm and 47.81±4.70 μm at 12 weeks and 24 weeks respectively. The mean change in the hair diameter after 4 weeks of therapy was 5.45± 1.62 μm (p=0.001) and after 12 weeks of therapy was 7.70±1.87μm (p-value=0.001). This was slightly lower than study by Gentile et al., where hair diameter increased by 42.3±12.8 μm from the baseline (80.9±20.9μm).[12]

The mean change in hair density after 4 weeks, 12 weeks, and 24 weeks was found to be 10.367±2.918, 40±6.363, 61.233±7.546 hair/cm2(p<0.001). This was found to be higher than studies by Alves et al., Cervelli et al., and Gikini et al., and in them, mean change was found to be 11.1±29.6 hair /cm2, 27.7±4.9 hair /cm2, and 13.15±8.25 hairs/cm2 respectively [(13,7,8).]

At baseline, in our study the mean T:V ratio was found to be 0.30 ±0.46 which increased to 2.30±0.65 at the end of 24 weeks. This shows an increase in terminal hairs post-PRP. On extensive English literature studies search, we could not find any study evaluating T:V ratio as a parameter of hair improvement parameter.

In study cases, mean baseline platelet count was found to be 2.041±0.304 lac/mm3. Mean platelet count in PRP was 12.848±2.357 lacs with mean multiplication factor as 4.66±0.66 times. This is in concordance with study by Ubel et al., Cervelli et al., Gkini et al., and Verma et al [(4,7,8,14).] A statistically significant correlation (p=0.028) was found between improvement in mean T:V ratio, hair diameter and hair density at 24 weeks and mean platelet count.

Mean patient satisfaction scores at 12 weeks and 24 weeks were 5.53±0.66 and 7.56±0.84. The patient satisfaction scores in the present study were higher as compared to the study by Verma et al., in which it was moderate i.e., 6.56±1.09. This could be attributed to differences in social experience and personal expectations regarding the treatment of alopecia [(14).]

CONCLUSION:

Significant improvement was observed in hair growth trichoscopically as well as clinically and the effect continued even after the treatment period. Minimal side effects were noted in few cases like post procedural pain and erythema. Therefore, we conclude that PRP is safe and can be used as monotherapy or in combination with other modalities. By means of proper centrifugation technique, optimum platelet count in PRP can be obtained which enhances the treatment outcome.

Limitations Of Study:
- The study had a small sample size and did not include a control group.
- The study was neither blinded nor randomized.
- Shorter period of follow-up.

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