



## Comparative Evaluation of Platelet Rich Plasma Prepared Recipient Site Over Conventional Technique for Hair Transplantation in Patients with Androgenetic Alopecia: A Prospective Study

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### KEYWORDS

Innovative Practice, Novel Technique, Androgenetic Alopecia, Hair Growth, Platelet Rich Plasma

### ABSTRACT:

**Background:** Androgenetic alopecia is genetic condition called "male pattern baldness" characterized by a receding hairline and gradual progressive hair thinning and hair loss from the frontal scalp and crown. Multiple options have been advocated for the treatment of hair loss, including low-level laser therapy, FDA-approved medications such as Topical minoxidil, finasteride given orally and surgical hair transplantation techniques along with PRP as monotherapy in hair loss reduction and regeneration of new hair. This study aimed to assess the effect of Pre operatively administered PRP over post operatively administered PRP in the treatment of hair transplantation.

**Materials and methods:** This study was conducted by department of Oral and maxillofacial surgery, Saveetha institute of medical and technological sciences, chennai in the time period of 6 months starting from November 2023 to November 2024. The study consisted of 40 participants based on the G\* power calculation and has 20 per each group. One group received PRP at the recipient site 15 days prior to surgery and intra operatively before transplantation, another group of patients who directly undergone hair transplantation with PRP postoperatively that is activated follicular transplantation. 3 months follow up was done and hair follicle density was measured using a trichometer and hair shaft diameter was measured using a scanning electron microscope. Data analysis was done with the help of SPSS, with P-values less than 0.05 considered statistically significant. The Mann-Whitney U test was used to compare the two groups for measurement of hair shaft diameter, and for comparison between hair follicle density, an unpaired t-test was used.

**Results:** It was found that the mean hair shaft diameter in the group of patients receiving PRP at recipient site preoperatively was higher than that of the group of patients who directly undergone hair transplantation with PRP postoperatively that is activated follicular transplantation for which the results were statistically significant on one month (P = 0.036), two months (P = 0.001), and three months (P = 0.001) postoperative periods, and Hair follicle density was higher in the group of patients receiving PRP at recipient site preoperatively for which results were statistically non significant on one month (P = 0.1), two months (P = 0.45) post operative period. While mean hair density was shown to be higher on three months (P = 0.001)



postoperative periods, the results were statistically significant only at the three-month postoperative period.

**Conclusion:** It can be concluded that PRP administration before hair transplantation has shown better result for the improvement of both hair quality (hair shaft diameter) and hair quantity (hair follicle density) compared to activated follicular transplantation.

**Categories:** Dentistry, Dermatology, Therapeutics, Esthetics

## Background

Androgenetic alopecia is genetic condition cause by Dihydrotestosterone hormone that change strong hair to weak hair.[1] It's characterized by a receding hairline and gradual progressive hair thinning and hair loss from the frontal scalp and crown that is mediated by systemic androgens and genetic factors. Factors like haphazard lifestyles and increased stress in both working and personal lives due to urbanization are considered aggravating factors for the early symptoms of AGA.[2] Multiple options have been advocated for the treatment of hair loss, including low-level laser therapy, along with FDA-approved medications, minoxidil administered topically, and finasteride given orally. [3]

Surgical techniques for the correction of AGA include hair follicular unit transplantation and hair follicular unit extraction techniques. Follicular unit transplant is a procedure done as a part of treatment for androgenetic / non androgenetic alopecia.[4] Over the period of time it has emerged as a most popular procedure for regrowth of lost hair, especially for people with androgenic alopecia. Even after following proper surgical protocols and techniques there are reported cases of graft failure or limited graft takeup. However, despite advancements, optimizing graft survival and enhancing hair density remain critical challenges.[5]

In the existing literature, Platelet rich plasma has gained popularity due to its enhancing effect on follicular unit survival, improve vascularization, and accelerate the healing process.[6] In vitro studies have demonstrated that after PRP therapy, there is an increase in the expression of betacatenin, which is a key molecule in the signaling pathway that regulates hair follicle growth and hair matrix cell proliferation.[7] Hence it has become a better treatment modality for AGA, which includes autologous PRP after hair transplantation known as activated follicular transplantation.

This study is aimed to assess the recipient site which was treated with PRP 15 days before and on day of surgery with PRP over conventionally followed unprepared recipient site for patients with AGA in the reduction of hair loss and regeneration of new hair.

## 1. Materials and methods

### Design of the study

This was an in vivo study that was conducted in the Department of Maxillofacial Surgery, Saveetha Dental College and Hospital, Saveetha Institute of Medical Technological Sciences, Chennai. This study was conducted in the time frame of November 2023 to November 2024. Institutional Ethical Committee clearance was obtained (IHEC/SDC/OMFS-2306/23/063). The total sample size was calculated to be 20 per group, and considering dropouts from the study and loss of follow up the total sample size was determined to be 40 based on the G\* power calculation (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) and 95% confidence interval. Informed consent forms were obtained from the patients before the commencement of the study and patients were allocated into respective groups by a simple random allocation technique. Allocation was followed by using a non transparent envelope system. PRP treatment for the participants were performed by the same surgeon and assessment was carried out by the same principal investigator in both the groups on consecutive follow up periods. Double blinding was followed to prevent bias.

### Inclusion and exclusion criteria

AGA condition is categorized under the Hamilton Norwood classification from types 1 to 8 [2]. It is based on the recession patterns (frontoparietal, frontotemporal, and frontal recessions) of hair loss occurring in the scalp. All male participants with AGA (stages 1-4 of the Hamilton Norwood scale), aged 20-40 years, were included in the study. Patients who were categorized under stages 5-7 of the Hamilton Norwood scale were



excluded from the study. Patients with autoimmune alopecia and systemic conditions like uncontrolled diabetes, hypertension, existing coagulopathies, anemia, malnutrition, and thyroid dysfunction were not enrolled in the study.

## Procedure

PRP was prepared from the autologous venous blood collected from the patient. A total of 20 ml of blood was collected in two tubes coated with anticoagulant. The tubes were immediately centrifuged at a speed of 1,000 rpm for 10 minutes. Slow speed was chosen in the beginning to prevent the displacement of platelets to the bottom layer. The plasma was collected in a single tube and again centrifuged at 3,500 rpm for 10 minutes. The principle behind the centrifugation was to separate the collected blood into three layers: RBCs at the bottom, a platelet-rich buffy coat layer in the middle and acellular plasma (platelet-poor plasma) at the top. The plasma near and above the central buffy coat was collected into insulin syringes. Preoperatively, the following stable landmarks were marked: the glabella (soft tissue midpoint between the eyebrows), theinion (highest point on the occipital protuberance), and the upper tragal points. The line joining from the glabella to theinion and the line extending from both the tragal points intersect at a point, forming a junction. This area was considered the study area for future sample collection and trichometer analysis. PRP collected in the insulin syringes was injected into the areas of hair loss. Small amounts of PRP were injected into the subcutaneous layer of the scalp. Although local anesthesia can be administered, it was not preferred, and alternatively, ice packs were used for pain relief and vasoconstriction. Interventions group received PRP at the recipient site 15 days prior to surgery and intraoperatively before transplantation, another group of patients who directly underwent hair transplantation with PRP postoperatively that is activated follicular transplantation. The two parameters that were assessed in the follow-up period were hair follicle density and hair shaft diameter. Hair shaft diameter was measured with the help of a scanning electron microscope (JEOL FE-SEM Version 2, JEOL, Ltd., Tokyo, Japan), Hair follicle density was assessed with the help of a cross-section trichometer, Parameters were measured preoperatively and at the first, second, and third postoperative months.

## 2. Statistical analysis

Statistical data analysis was done using Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, IBM Corp., Version 26.0, Armonk, NY), with P-values less than 0.05 considered statistically significant. The independent sample t test was used to compare the two groups for measurement of hair shaft diameter, and for comparison between hair follicle density, an unpaired t-test was used. Shapiro-Wilk test was used for normality testing.

## 3. Results

Our study consisted of 40 participants with a mean age of  $35 \pm 5.5$  years. The present study had two groups: Group 1 - PRP group (N = 20) in which patients have received PRP at recipient site 15 days preoperatively and intraoperatively before hair transplantation and Group 2 - control group (N = 20) in which patients have directly undergone hair transplantation with PRP administered postoperatively that is activated follicular transplantation(AFT). Hair follicle density and hair shaft diameter were measured at regular follow-up intervals postoperatively for 3 months.

### Hair shaft diameter

It was found that the mean hair shaft diameter of the PRP group (66.5) was more than the control group (64.4). This mean difference in hair diameter between the groups was found to be statistically significant (P = 0.042). After 1 Month It was found that the mean hair shaft diameter of the control group (66.3) was less than the hair diameter of the PRP group (68.44). This mean difference in hair shaft diameter between the groups was found to be statistically significant (P = 0.036). After 2 months It was found that the mean hair shaft diameter of the control group (68.1) was less than the hair shaft diameter of the PRP group (71.8). This mean difference in hair shaft diameter between the groups was found to be statistically significant (P = 0.001). After 3 months It was found that the mean hair shaft diameter of the control group (71.9) was less than the hair shaft diameter of the PRP group (76.2). This mean difference in hair shaft diameter between the groups was found to be statistically significant (P = 0.001).



**Table 1 : Comparison of the mean hair diameter between the PRP group and the control group as assessed using the scanning electron microscope .**

Hair Diameter		Number	Mean	SD	t	P value
At Preoperative	PRP	20	66.5	3.45	-2.1	P = 0.042*
	Control	20	64.4	2.6		
After 1 Month	PRP	20	68.44	3.58	-2.1	P = 0.036*
	Control	20	66.3	2.43		
After 2 Months	PRP	20	71.8	2.8	-4.6	P = 0.001**
	Control	20	68.1	2.2		
After 3 Months	PRP	20	76.2	3.1	-4.3	P = 0.001**
	Control	20	71.9	3.2		

Statistically significant at \* $P < 0.05$  using an unpaired t-test

NS, not significant; PRP, platelet-rich plasma; control, SD, standard deviation

### Hair density (Quantity of hair)

It was found that the density of hair in the PRP group (76.8) was more than the density of hair in the control group (73.7) preoperatively. This mean difference in density of hair between the groups was not statistically significant ( $P = 0.32$ ). After 1 Month, It was found that the density of hair in the PRP group (78.7) was more than the density of hair in the control group (73.6). This mean difference in density of hair between the groups was not

statistically significant ( $P = 0.1$ ). After 2 Months, It was found that the density of hair in the PRP group (84.6) was more than the density of hair in the control group (82.5). This mean difference in density of hair between the groups was not statistically significant ( $P = 0.45$ ). After 3 months, It was found that the density of hair in the PRP group (98.7) was more than the density of hair in the control group (87.7). This mean difference in density of hair between the groups was statistically significant ( $P = 0.001$ ).

**TABLE 2: Comparison of the mean quantity of hair between the PRP group and the control group as assessed using a trichometer.**

Mean Density		Number	Mean	SD	t	P value
At Preoperative	PRP	20	76.8	10.05	0.993	P = 0.32
	Control	20	73.7	10		
After 1 Month	PRP	20	78.7	9.5	1.68	P = 0.1
	Control	20	73.6	9.58		
After 2 Months	PRP	20	84.6	7.19	-0.76	P = 0.45
	Control	20	82.5	10.02		
After 3 Months	PRP	20	98.7	9.7	-3.67	P = 0.001**
	Control	20	87.7	9.03		

Statistically significant at \* $P < 0.05$  using an unpaired t-test

NS, not significant; PRP, platelet-rich plasma; control, SD, standard deviation

### Discussion

Hair follicles undergo repetitive regenerative cycles. Each of these cycles consists of three stages such as anagen (rapid growth, active stage), catagen (apoptosis-driven regression, physiological involution stage, telogen (resting stage). [1] former two phases encompass hair follicle regression and shedding while the latter represents the formation and growth of new hair. [8] Hair growth is a highly regulated process that is directly dependent on the  $\beta$ -catenin signaling pathway, which is

activated by Wnt ligands. Specifically, the crosstalk between the  $\beta$ -catenin pathway and the androgen signaling pathway represents a significant mechanism through which androgens such as DHT (dihydrotestosterone) can induce AGA (androgenetic alopecia), also known as male pattern baldness. Several growth factor families are involved in Hair follicle cycling, namely, fibroblast growth factor, Epidermal growth factor, hepatocyte growth factor, IGF-I, and TGF- $\beta$ . [9] [10]



Existing literature suggest that, Although initially studied for its potential in promoting wound healing, PRP (platelet rich plasma) has been extensively studied in many recent clinical trials for its potential to promote hair growth and to reverse the signs of AGA.[11] For both men and women worldwide, androgenetic alopecia brings significant social and psychological stress. Although standard of care treatments (namely topical minoxidil and oral finasteride) can halt or even reverse the signs of AGA; novel, more effective, and faster-acting therapeutic strategies are needed.[12] PRP has been heavily investigated in recent years as a possible treatment for AGA due to its vast yet understudied therapeutic effects.

In our study time of administration of PRP into recipients site is one particular interest. As there are literature evidence on use of PRP postoperatively as a part of activated follicular transplantation but administration of PRP Pre operatively into recipients site to make the recipient bed viable and strong enough for receiving follicular unit which may have potential growth factors to give effective results which is a novel approach. The evaluation of individual hair shaft diameter is an indirect indicator for the assessment of hair follicle health. The hair shafts were collected from the same site at every follow-up visit, and the lower third of the hair shaft diameter was measured using the latest generation of scanning electron microscopes.[13]

Most of the published literature has used a similar measuring strategy,[15] whereas in our study, the latest version of the scanning electron microscope was used to evaluate the hair shaft diameter, which is a novel approach.[9] Not only the significant improvement in the hair density but also the individual hair shaft diameter increment was also noted in the groups.

The study findings suggest that administering Platelet-Rich Plasma (PRP) before hair transplantation significantly improves both hair shaft diameter and hair follicle density compared to the control group at all assessed intervals. PRP treatment consistently led to a statistically significant increase in hair shaft diameter at one, two, and three months post-surgery. Furthermore, although hair follicle density showed a tendency to improve in the PRP group, this difference only reached statistical significance by the third month postoperatively. These findings suggest that PRP, when

used preoperatively, offers a more effective strategy for improving hair quality and promoting hair regeneration following hair transplantation.

#### 4. Limitation of the study

Though the results were statistically significant but more number of sample size can help to improve reliability and validity of the findings. Long term follow up is also necessary in order to determine definitive results.

#### 5. Conclusion

It can be concluded from the study that preoperative PRP application may be a more effective approach for enhancing hair quality (hair shaft diameter) and promoting hair quantity (hair follicle density) for hair growth following hair transplantation.

#### 6. Future scope

Further studies with a larger sample size and a longer followup period are necessary to obtain more accurate results and formulate a better treatment protocol for the management of AGA.

#### Conflicts of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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