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Evaluation of Platelet-Rich Plasma (PRP) Versus Topical Minoxidil (5%) in Combination with Oral Finasteride for the Treatment of Androgenic Alopecia

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ABSTRACT

Androgenic alopecia was an inherited condition leading to gradual thinning and loss of hair on the crown and frontal scalp. **Objective:** To compare efficacy of PRP and topical minoxidil (5%) when used in addition to oral finasteride for treating androgenic alopecia. **Methods:** This quasi experimental study was conducted at Dermatology Department of Akhtar Saeed Medical and Dental College Rawalpindi from March 2023 to August 2023. Total 80 patients of both genders (40 in each group) aged 18 to 65 years diagnosed with androgenic alopecia. Participants were divided into two treatment groups: Group A received monthly PRP injections oral finasteride and 1 mg daily, while Group B applied topical minoxidil (5%) twice daily oral finasteride 1 mg daily. Efficacy was labeled as a statistically significant increase in mean hair density of at least 20 hair/cm^2 from pre-treatment to post-treatment using a trichometer. All participants had baseline demographic factors and clinical data. Data were analyzed using IBM SPSS 27.0. **Results:** The comparison of mean hair density between Group A (PRP and Finasteride) and Group B (Minoxidil and Finasteride) showed that Group A had a significantly higher mean hair density compared to Group B (101.6 ± 11.2 hair/cm^2 versus 87.0 ± 9.0 hair/cm^2, $p < 0.001$), indicating that the treatment in Group A was more effective. **Conclusions:** This study found that platelet-rich plasma (PRP) as an addition to oral finasteride improves hair regrowth, density, and patient satisfaction more than PRP combined with topical minoxidil.

INTRODUCTION

Androgenic alopecia, often known as male pattern baldness or female pattern hair loss, affects men and women worldwide [1]. It is characterized by gradual, non-scarring hair loss in men's frontal and vertex regions and diffuse central scalp thinning in women [2]. Globally prevalence of androgenic alopecia is 50% in men and 30% in women [3]. The pathogenesis of androgenic alopecia is multifactorial, involving both genetic and hormonal factors. Genetic predisposition plays a key role, with inheritance patterns suggesting polygenic and multifactorial inheritance [4]. Hormonal factors, particularly androgens such as Dihydrotestosterone (DHT), are also implicated in the development of androgenic alopecia. DHT, a potent derivative of testosterone, binds to androgen receptors in susceptible hair follicles, leading to miniaturization of follicles, shortened anagen (growth) phase, and progressive hair thinning [5, 6]. Various risk factors have been associated with the development and progression of androgenic alopecia. Advancing age is a significant risk factor, with prevalence increasing with age

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in both men and women. Additionally, a positive family history of androgenic alopecia, particularly in first-degree relatives, increases the likelihood of developing the condition [7]. For male pattern baldness, the Norwood-Hamilton scale is used to grade hair loss amount and progression, while the Ludwig scale is employed to evaluate female pattern hair loss. Hair pull tests, trichoscopy, and scalp biopsies may be needed to confirm the diagnosis and rule out alternative hair loss reasons [8]. Treatment modalities include both pharmacological and non-pharmacological approaches. In its treatment landscape, combining therapies to enhance efficacy is an emerging approach. PRP therapy harnesses the regenerative properties of platelets to stimulate hair growth, minoxidil used topically dilates blood vessels, which in turn improves blood flow to the scalp's hair follicles. The most common therapy for androgenic alopecia is the 5-alpha-reductase inhibitor finasteride, taken orally. This medicine prevents testosterone from being converted to dihydrotestosterone, or DHT [9, 10]. Despite the availability of various treatment options, managing androgenic alopecia can be challenging, and outcomes may vary among individuals. While the condition is primarily cosmetic, its impact on psychological well-being should not be underestimated. This study addresses the need for evidence-based guidance on optimal treatment strategies for androgenic alopecia. Additionally, by evaluating these therapies in the context of Pakistan, where specific research on combination treatments for androgenic alopecia is limited, this study fills a crucial gap in the literature and provides valuable data for clinical practice in the region.

To evaluate the effectiveness of Platelet-Rich Plasma(PRP) compared to topical minoxidil (5%) when both are used in combination with oral finasteride for the treatment of androgenic alopecia.

METHODS

This quasi-experimental study was conducted at Dermatology Department of Akhtar Saeed Medical and Dental College Rawalpindi from March 2023 to August 2023. The study protocol received clearance from the Institutional Review Board (Ref No: ERC/120/AMDC). Written consent was taken from the patients. The sample size of 80 (40 in each group) was estimated using the WHO calculator (www.openepi.com), with 90% power of test and a two-sided alpha of 0.05. This estimation was based on a treatment efficacy of 77% in the PRP group and 40% in the topical Minoxidil group [17]. Male and female patients aged 18 to 65 years diagnosed with androgenic alopecia (Norwood-Hamilton scale grades II-V in men and Ludwig scale grades I-III in women) and receiving oral finasteride therapy for a minimum of 6 months were eligible for inclusion. Patients with a history of hypersensitivity or adverse reactions to PRP or topical minoxidil, pregnant or lactating women, individuals with concomitant medical conditions affecting hair growth, and those undergoing concurrent treatments for hair loss were excluded from the study. Participants were distributed into two treatment groups by lottery method: Group A received monthly PRP injections, while Group B applied topical minoxidil (5%) twice daily. Both groups were administered oral finasteride at a daily dose of 1 mg. Both treatments were administered in conjunction with oral finasteride therapy for duration of 6 months. Platelet Rich Plasma (PRP) was prepared using a standard protocol. Whole blood was collected from each participant into tubes containing an anticoagulant, followed by centrifugation at 1500 rpm for 10 minutes to separate the PRP. The resulting PRP was then activated using calcium chloride before injection. PRP injections were administered using a sterile technique, with 1 mL injected monthly into the scalp using a mesotherapy technique. Patients were given commercially available 5% topical minoxidil solution to apply 1 ml twice daily to the affected scalp areas. Patients were instructed to spread the solution evenly and allow it to dry completely before covering the scalp. Follow-up visits were scheduled on a monthly basis to administer PRP. Additionally, a comprehensive follow-up assessment was conducted six months after initiating treatment during which outcomes including changes in hair density and thickness were assessed using standardized phototrichograms. Efficacy was defined as the improvement in mean hair density, measured in hairs per square centimeter (hair/cm^2), from pre-treatment to post-treatment using a trichometer. Treatments were labeled as effective if there was an increase in mean hair density of at least 20 hair/cm^2. Patient satisfaction was evaluated using a self-assessment hair growth questionnaire, categorizing responses as worsening from baseline, not improving from baseline, or improving from baseline. The primary outcome measure was the change in hair density, assessed using standardized phototrichograms at baseline and at six months. Secondary outcome measures included changes in hair thickness and patient satisfaction with treatment. Treatment efficacy assessments were conducted by trained evaluators blinded to treatment assignment. IBM SPSS, version 27.0 was used to analysed the data. Chi-square test was applied to compare the categorical variables, which were given as percentages and frequencies. Means and Standard Deviations (SD) were used to compare continuous variables, and the Independent sample t-test was applied, p-value <0.05 was considered to be statistically significant.

RESULTS

The demographic details of patients in both groups were summarized in table 1. In both groups, males constituted the majority, comprising 70.0% in Group A and 77.5% in

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Group B, while females accounted for 30.0% and 22.5%, respectively. The mean age of patients in Group A was 29.30 ± 7.13 years and 31.25 ± 5.41 years in Group B, showing no significant difference (p = 0.172). Similarly, the duration of baldness showed comparable means between Group A (8.40 ± 3.17) and Group B (7.80 ± 3.11), with no statistically significant distinction (p = 0.396). 26 (65%) patients in Group A and 27 (67.5%) patients (65.7%) in Group B had family history of baldness. Among males, according to Norwood–Hamilton grades of baldness, Grade II (42.5% versus 40%) was most common, followed by Grade IV (35% versus 37.5%) alopecia with no significant difference. Similarly, among females, based on Ludwig scale, Grade I (72.5% versus 65%) followed by Grade II (27.5% versus 35%) with statistically insignificant difference, p=0.469. Group A had 17 smokers (42.5%) and Group B 15 (37.5%).

Table 1: Demographics of Patients of both Groups

Variables	Group A N (%) / Mean ± SD	Group B N (%) / Mean ± SD	p-Value
Gender			
Female	12 (30.0%)	9 (22.5%)	0.446 [a]
Male	28 (70.0%)	31 (77.5%)	
Age (Years)	29.30 ± 7.13	31.25 ± 5.4	0.172 [c]
Duration of Baldness (Months)	8.40 ± 3.17	17.80 ± 3.11	0.396 [c]
Family History of Baldness			
Yes	26 (65.0%)	27 (67.5%)	0.813 [a]
Norwood–Hamilton Grades of Baldness (Male)			
Grade II	17 (42.5%)	16 (40.0%)	1.000 [b]
Grade III	7 (17.5%)	6 (15.0%)	
Grade IV	14 (35.0%)	15 (37.5%)	
Grade V	2 (5.0%)	3 (7.5%)	
Ludwig Grades of Baldness (Female)			
Grade I	29 (72.5%)	26 (65%)	0.469 [a]
Grade II	11 (27.5%)	14 (35%)	
Smokers			
Yes	17 (42.5%)	15 (37.5%)	0.648 [a]
No	23 (57.5%)	25 (62.5%)	

a Chi-square test; b Fisher exact test; c Independent sample t test.

The pre-treatment means of hair shaft diameters for males and females were similar (p values = 0.135). While post-treatment means of hair shift diameters in both the groups increased which were statistically significant. For males these were (77.0 ± 2.5 µm versus 72.5 ± 3.2 µm) with p values < 0.001; while for females these were (73.0 ± 2.5 µm versus 69.5 ± 3.0) with p values < 0.001 given in table 2.

Table 1: Demographics of Patients of both Groups

Diameter of Hair Shaft (µm)	Group A Mean ± SD	Group B Mean ± SD	p-Value*
Male			
Pre-Treatment	69.0 ± 4.2	67.5 ± 3.8	0.135
Post-Treatment	77.0 ± 2.5	72.5 ± 3.2	< 0.001
Female			
Pre-Treatment	63.5 ± 3.8	62.0 ± 3.2	0.240
Post-Treatment	73.0 ± 2.5	69.5 ± 3.0	< 0.001

*Independent Sample t-Test

Table 3 showed that Group A had more hair post-treatment than Group B. Group A as well as Group B hair pull tests showed significant differences. Group A had a much higher rate of negative hair pull tests than Group B.

Table 3: Mean Hair Density (Hair/cm2)

Hair Density (Hair/cm^2)	Group A Mean ± SD	Group B Mean ± SD	p-Value [a]
Pre-Treatment	73.6 ± 8.2	76.9 ± 9.2	0.091
Post-Treatment	101.6 ± 11.28	7.0 ± 9.0	< 0.001

a Independent Sample t-Test

In table 4, Group A exhibited a significant increase in negative hair pull test results post-treatment (77.5%) compared to pre-treatment (37.5%), and also significantly higher compared to Group B (40.0%) post-treatment (p < 0.001). Group B showed a smaller increase in negative results from pre-treatment (35.0%) to post-treatment (40.0%) with a p-value of 0.035.

Table 4: Hair Pull Text (Negative Results)

Patient Satisfaction Score	Group A N (%)	Group B N (%)	p-Value [a]
Pre-Treatment	73.6 ± 8.2	76.9 ± 9.2	0.091
Post-Treatment	101.6 ± 11.28	7.0 ± 9.0	< 0.001

*Chi-Square Test

Pre- and post-treatment photographs in figure 1 illustrated enhanced hair shaft diameter and overall hair quality improvement with Platelet-Rich Plasma (PRP) therapy.

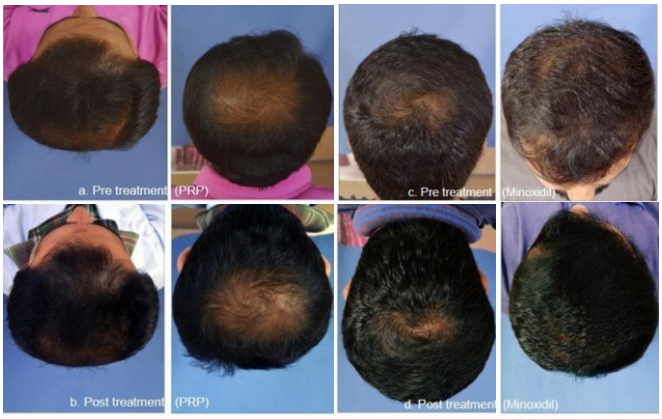

Figure 1: Pre and Post Treatment Photographic Assessment Showing Better Results with PRP

Table 5 showed a substantial difference in patient satisfaction scores between Groups A (6.9 ± 1.15) versus Group B (5.1 ± 1.62), p < 0.001.

Table 5: Comparison of Patient Satisfaction Regarding Growth of Hair between Group A and Group B

Patient Satisfaction Score	Group A Mean ± SD	Group B Mean ± SD	p-Value [a]
Pre-Treatment	6.9 ± 1.15	5.1 ± 1.62	< 0.001 [a]

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DISCUSSION

Among available treatments, topical minoxidil remains widely utilized, while PRP therapy, particularly when combined with Finasteride, was an emerging approach showing promising outcomes. Recent investigations have explored the efficacy of both agents, either individually or in combination therapy, with encouraging results [11, 12]. In current study, all participants fell within the age range of 18 to 60 years. The average age recorded was 29.30 ± 7.13 years in Group A and 31.25 ± 5.41 years in Group B. Shah KB *et al.*, also reported mean age similar to current study which was 31.12 versus 30.04 years [12]. In another study carried out by Verma K *et al.*, the mean age was 25.7 ± 3.8 years and 25.07 ± 4.5 years in Group A and Group B respectively which contrast with current study [13]. There was a slightly higher proportion of male with 70% in group A and 77.5% in group B patients compared to female 30% and 22.5% in both groups in current study. Afzal G *et al.*, showed slightly lower proportion of males (65.7%) in Group A, while proportion of males in Group B (77%) was comparable with current study [14]. In current study, the hair pull test was negative in 77.5% patients of Group A and 40% patients of Group B. Similarly, Afzal G *et al.*, found 77% negative hair pull tests in Group A versus 40% in Group B [14]. The average hair loss time in this study was 8.40 ± 3.17 months in Group A versus 7.80 ± 3.11 months in Group B. This observation aligns with Afzal G *et al.*, who found shorter hair loss duration in both groups (7 ± 5 versus 6.9 ± 5.8 months) [14]. The average hair loss time in Hajheydari Z *et al.*, was 23.10 months, unlike this study [15]. Among males, according to Norwood–Hamilton grades of baldness, Grade II (42.5% versus 40%) and Grade IV (35% versus 37.5%) alopecia was more common, followed by Grade III (17.5% versus 15%) and Grade V (5% versus 7.5%) in current study. Grade II alopecia affected 27.27% of patients, Grade I alopecia 22.12%, Grade III 21.78 %, Grade IV 10.8% and Grade V 6.6% of patients in the study by Krupa Shankar DK *et al* [16]. Among females, based on Ludwig scale, Grade I (72.5% versus 65%) followed by Grade II (27.5.5 versus 35%) in current study. The results were in line with what Afzal G *et al.*, found: in Group A, 75% of patients had Grade I alopecia and 25% had Grade II alopecia; in Group B, 62.5% had Grade I alopecia and 37.5% had Grade II alopecia [14]. For both males and females, Group A had a significantly larger hair shaft diameter post-treatment compared to Group B (males: 77.0 ± 2.5 µm versus 72.5 ± 3.2 µm, $p < 0.001$; females: 73.0 ± 2.5 µm versus 69.5 ± 3.0 µm, $p < 0.001$). Study conducted by Ruthvik S *et al.*, showed high proportion of increase in hair shaft diameter in Group A (15.3%) as well as Group B (10%) compared to current study [17]. Elena EP *et al.*, demonstrated that mean diameter of hair increased by 11.6% (39.8 to 44.4 µm) and by 1.8% (39.3 to 40 µm) in Group A and Group B respectively, which contrast with current study. In current study, the mean hair density increased by 38% (73.6 to 101.6 /cm^2) in Group A and by 13.1% (76.9 to 87 /cm2) in Group B [18]. Wu S *et al.*, showed less increase in hair density in Group A (26.5%) and Group B (8.9%) compared to current study [19]. The average satisfaction score for patients in Group A was 6.9 ± 1.15, whereas for patients in Group B it was 5.1 ± 1.62, according to study. In a study conducted by Verma K et al., the average satisfaction score was 6.56 ± 1.09 in Group A and 4.85 ± 1.46 in Group B. y. In contrast to this findings, Shah R *et al.*, found a significantly larger proportion of subjects in Group A who tested negative for hair pull (91.7% versus 69.4%) [13, 20]. Current study faced limitations due to its unblinded design, limited sample size, absence of a placebo control, and a brief follow-up duration. Moreover, factors like hair washing and brushing frequency could potentially impact the outcomes of the hair pull test. Consequently, future research endeavors should prioritize larger sample sizes, extended follow-up periods, and inclusion of control groups to address these limitations effectively.

CONCLUSIONS

Current study found that Platelet-Rich Plasma (PRP) as an addition to oral finasteride improves hair regrowth, density, and patient satisfaction more than topical minoxidil.

Authors Contribution

Conceptualization: SS
Methodology: ME, SS, SA, AA
Formal analysis: AH, MR
Writing, review and editing: SA, AA, ME

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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