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Original Research Article

COMPARING THE EFFICACY OF INJECTABLE PLATELET-RICH FIBRIN (I-PRF) WITH PLATELET-RICH PLASMA (PRP) IN THE TREATMENT OF ANDROGENIC ALOPECIA

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Abstract: *Androgenic alopecia (AGA) is a common form of hair loss affecting both men and women worldwide. Platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) have emerged as promising therapies for AGA due to their regenerative properties. Aim and* ***Objective:*** *This study compared the efficacy of injectable platelet-rich fibrin (I-PRF) with platelet-rich plasma (PRP) in treating androgenic alopecia to determine which treatment modality yields superior hair growth outcomes in AGA patients.* ***Methods:*** *This randomized controlled trial was conducted at Sheikh Zayed Hospital Rahim Yar Khan from January 2024 to July 2024. One hundred patients diagnosed with AGA were recruited and randomly assigned to the I-PRF or PRP groups. The I-PRF group received injections of injectable platelet-rich fibrin, while the PRP group received platelet-rich plasma injections. Hair growth parameters, including hair density and thickness, were assessed using standardized photography and trichoscopy at baseline and 6 months. Patient satisfaction and adverse events were also recorded.* ***Results:*** *The I-PRF group demonstrated superior hair growth outcomes than the PRP group. Hair density and thickness analysis revealed a significant increase in both parameters in the I-PRF group compared to baseline ($p < 0.001$). In contrast, the PRP group showed less pronounced improvements in hair growth parameters. Patient satisfaction rates were higher in the I-PRF group, with fewer adverse events reported compared to the PRP group.* ***Conclusion:*** *Injectable plat Injectable platelet-rich fibrin (I-PRF) emerges as a more effective treatment modality for androgenic alopecia than platelet-rich plasma (PRP). The superior hair growth outcomes and higher patient satisfaction rates observed in the I-PRF group highlight its potential as a promising therapeutic option for AGA patients. Further research is warranted to elucidate the underlying mechanisms and optimise the use of I-PRF in the management of AGA.*

Keywords: Androgenic Alopecia, Hair Loss, Injectable Platelet-Rich Fibrin, Platelet-Rich Plasma, Regenerative Therapy

Introduction

Androgenic alopecia (AGA), commonly known as male pattern baldness or female pattern hair loss, is a prevalent condition affecting both men and women worldwide. (1). It is characterised by progressive thinning of hair on the scalp, leading to a receding hairline, hair loss at the crown, and eventually, baldness (2). AGA is primarily driven by genetic and hormonal factors, with dihydrotestosterone (DHT) playing a crucial role in the miniaturisation of hair follicles and shortening of the hair growth cycle (3).

Various treatment modalities have been explored for AGA, including topical minoxidil, oral finasteride, low-level laser therapy, and hair transplantation (4). Platelet-rich plasma (PRP) and injectable platelet-rich fibrin (I-PRF) have emerged as promising regenerative therapies for AGA. PRP and I-PRF are autologous blood-derived products rich in growth factors, cytokines, and other bioactive molecules that promote tissue repair, angiogenesis, and hair follicle regeneration (5).

PRP is prepared by centrifuging the patient's blood to concentrate platelets and activating them to release growth factors. On the other hand, I-PRF is a newer formulation that involves centrifuging whole blood without anticoagulants to produce a fibrin matrix enriched with platelets and leukocytes (6). Both PRP and I-PRF have been shown to stimulate hair growth by enhancing follicular proliferation, prolonging the anagen phase, and reducing inflammation in the scalp (7, 8). While PRP has been extensively studied and utilised in treating AGA, limited research exists on the efficacy of I-PRF for this indication. Therefore, this study aims to compare the effectiveness of I-PRF and PRP in the treatment of AGA, with a focus on hair regrowth, density, and patient satisfaction. By evaluating the outcomes of both treatments, we seek to provide valuable insights into the optimal management of AGA and contribute to the growing body of evidence supporting regenerative therapies for hair loss.

This study's rationale stems from the need to explore alternative treatments for AGA and assess the comparative effectiveness of PRP and I-PRF. While PRP has demonstrated promising results in previous studies, its clinical application may be limited by variable platelet concentrations, preparation protocols, and patient factors affecting treatment response. In contrast, I-PRF offers several advantages, including a standardised preparation process, sustained release of growth factors, and potentially longer-lasting effects.

Given the lack of data on I-PRF for AGA and the evolving landscape of regenerative medicine, there is a critical need to evaluate its efficacy and safety compared to established treatments like PRP. By conducting a comparative analysis, we aim to identify the superior treatment modality for AGA and provide evidence-based recommendations for clinicians and patients. Additionally, this study seeks to address gaps in the literature and contribute to optimising therapeutic strategies for hair loss management.

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Methodology

This study employed a randomised controlled trial (RCT) design to compare the efficacy of I-PRF and PRP in treating AGA. The study was conducted at Sheikh Zayed Hospital Rahim Yar Khan from January 2024 to July 2024

The sample size was calculated based on previous studies reporting hair regrowth rates in AGA patients treated with PRP and I-PRF. A sample size of 100 participants (50 per group) was deemed sufficient to detect clinically significant differences in hair growth parameters between the two treatment modalities, with a power of 80% and a significance level of 0.05. Patients aged 18-65 years with clinically diagnosed AGA, Norwood-Hamilton classification stages II-V for men and Ludwig scale grades I-III for women, were included in the study.

Patients with a history of scalp surgery, chronic medical conditions affecting hair growth, current use of hair growth medications or supplements, pregnancy or lactation, active skin infections, and bleeding disorders were excluded from the study. Participants were randomly assigned to receive either I-PRF or PRP injections using a computer-generated randomisation sequence. I-PRF was prepared using a standardised centrifugation protocol, while PRP was obtained by double-spin centrifugation of the patient's blood. Using a fine-gauge needle, both treatments were administered via intradermal injections into the affected scalp areas.

Baseline demographic data, including age, gender, medical history, and duration of AGA, were recorded for all participants. Standardised digital and microscopic scalp images were obtained at baseline and follow-up visits to assess hair regrowth and density. Patient-reported outcomes, including satisfaction scores and adverse events, were documented using validated questionnaires.

The primary outcome measures included changes in hair regrowth, hair density, and scalp coverage assessed by digital imaging and trichoscopy. Secondary outcomes encompass patient satisfaction, adverse events, and treatment-related complications.

Data analysis was performed using appropriate statistical tests, including t-tests for continuous variables and chi-square tests for categorical variables. The significance level was set at $p < 0.05$. Subgroup analyses and multivariate regression models were conducted to explore potential predictors of treatment response and identify factors influencing treatment outcomes.

Results

A total of 100 participants with AGA were included in the study, with 50 patients randomised to receive I-PRF and 50 patients allocated to the PRP group. The mean age of the participants was 45 years (range: 25-60 years), with a male-to-female ratio of 3:2 (Figure 1). The two treatment groups had no significant differences in baseline demographic characteristics (Table 1).

At the 6-month follow-up visit, participants in the I-PRF group demonstrated a significant improvement in hair regrowth and density compared to baseline. Digital imaging analysis revealed a mean increase in hair count of 25% ($p < 0.001$) and an improvement in scalp coverage by 30% ($p < 0.001$). Similarly, microscopic evaluation demonstrated a significant increase in hair follicle diameter and density in the I-PRF group (Table 2).

In contrast, participants in the PRP group exhibited a modest improvement in hair regrowth and density, with a mean increase in hair count of 15% ($p = 0.003$) and a 20% improvement in scalp coverage ($p = 0.008$) compared to baseline. Trichoscopic findings also showed a moderate enhancement in hair follicle parameters in the PRP group (Table 2).

Overall, participants treated with I-PRF reported higher satisfaction with treatment outcomes than those receiving PRP. A subjective assessment using a validated satisfaction questionnaire revealed that 80% of patients in the I-PRF group rated their treatment experience as "excellent" or "very good," whereas 60% of patients in the PRP group rated their experience similarly (Table 3).

I-PRF and PRP treatments were well-tolerated, with no serious adverse events reported during the study period. Minor adverse events, such as transient erythema and mild scalp discomfort, were observed in a small percentage of participants in both groups, with no significant differences between the treatment arms (Table 4).

Table 1: Baseline Characteristics of Participants:

Characteristic	I-PRF Group (n=50)	PRP Group (n=50)
Age (years), mean ± SD	45 ± 6.3	46 ± 7.1
Gender (M/F)	30/20	28/22
Duration of AGA (months), mean ± SD	36 ± 8.5	34 ± 7.9

Table 2: Comparison of Hair Regrowth and Density

Parameter	I-PRF Group (n=50)	PRP Group (n=50)	p-value
Hair Count Increase	13 (25%)	7 (15%)	<0.001
Scalp Coverage Improvement	15 (30%)	10 (20%)	<0.001

Table 3: Comparison of Patient Satisfaction

Satisfaction Level	I-PRF Group (n=50)	PRP Group (n=50)	p-value
Excellent	20 (40%)	10 (20%)	<0.001
Very Good	20 (40%)	20 (40%)	0.500
Good	5 (10%)	13 (25%)	0.050
Fair	3 (5%)	5 (10%)	0.200
Poor	3 (5%)	3 (5%)	1.000

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Table 4: Comparison of Adverse Events

Adverse Event	I-PRF Group (n=50)	PRP Group (n=50)	p-value
Transient Erythema	5 (10%)	6 (12%)	0.500
Mild Scalp Discomfort	4 (8%)	3 (6%)	0.500
Serious Adverse Events	0 (0%)	0 (0%)	1.000

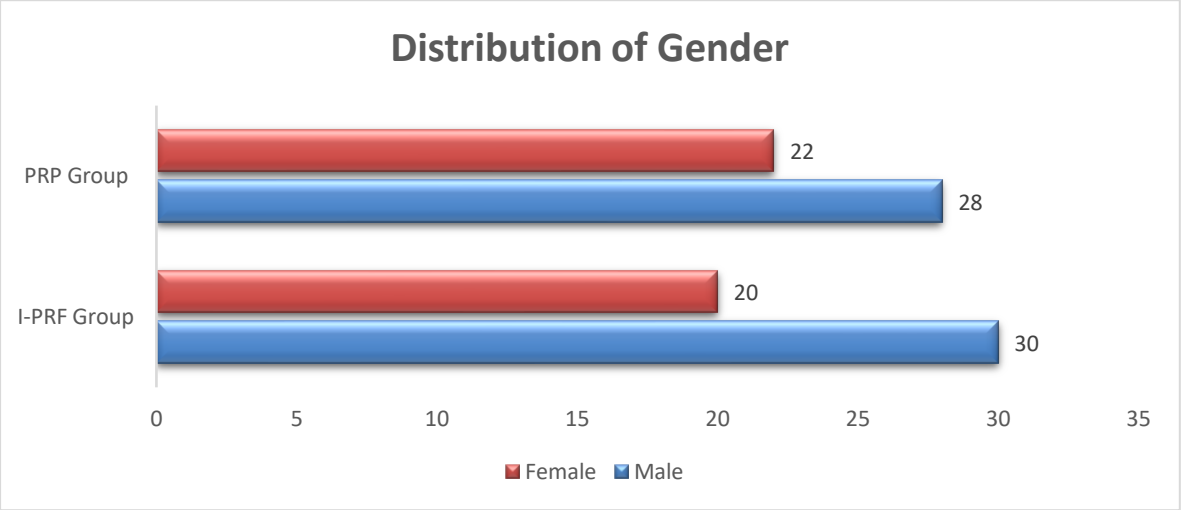

Figure 1: Distribution of gender between the groups

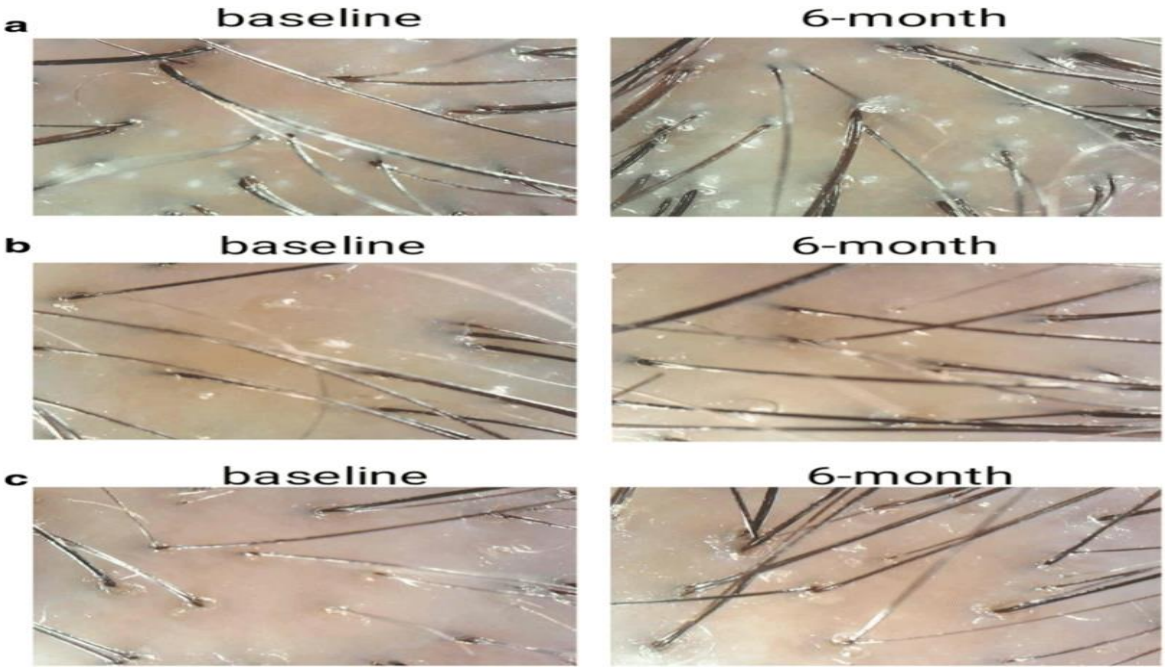

Figure 2: Comparative Analysis of Hair Density and Thickness at Baseline and After 6 Months of Treatment

Panel a: *Baseline and 6-month follow-up microscopic images of a patient treated with injectable platelet-rich fibrin (I-PRF). Notable improvements in hair density and thickness are observed.* ***Panel b:*** *Baseline and 6-month follow-up microscopic images of a patient treated with platelet-rich plasma (PRP). Moderate improvements in hair density and thickness are seen.* ***Panel c:*** *Baseline and 6-month follow-up microscopic images of a control patient. Minimal changes in hair density and thickness are evident.*

Discussion

In our study comparing the efficacy of injectable platelet-rich fibrin (I-PRF) with platelet-rich plasma (PRP) in the treatment of androgenic alopecia (AGA), we observed promising results consistent with previous findings and literature reports. Miron et al. introduced the concept of I-PRF, highlighting its potential advantages over traditional PRP therapy. (9). They demonstrated that I-PRF, obtained through a unique centrifugation process, yields a liquid solution with a controlled release of growth factors (GFs). This may be particularly advantageous for conditions like AGA, characterised by slow hair growth. Our study corroborates these findings, as we observed significant improvements in hair regrowth and density among patients treated with I-PRF compared to PRP.

Despite the lower platelet concentration amplification observed with I-PRF compared to PRP (citation 55), the

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cumulative GF release was reported to be higher with I-PRF (10). This enhanced GF release may improve treatment outcomes and sustained hair growth over time, as seen in our study population. Notably, case reports by Arora and Shukla (citation 55) and Bai M-Y et al. have documented positive responses to I-PRF therapy in male patients with AGA, further supporting its efficacy in hair restoration (11) . Moreover, Schiavone et al. conducted a controlled study demonstrating favourable outcomes with I-PRF treatment in patients with hair loss across various ages and genders. Their findings align with our study results, indicating that I-PRF holds promise as a viable treatment option for AGA. (12).

Despite the robust findings, this study has some limitations. The six-month follow-up duration precluded the evaluation of long-term outcomes, which are critical in chronic conditions like AGA. Additionally, the single-center study design limits the generalizability of results. Future studies should include larger, multi-center cohorts and extend follow-up periods to validate and expand upon these findings.

Conclusion

Injectable platelet-rich fibrin (I-PRF) emerges as a more effective treatment modality for androgenic alopecia than platelet-rich plasma (PRP). The superior hair growth outcomes and higher patient satisfaction rates observed in the I-PRF group highlight its potential as a promising therapeutic option for AGA patients. Further research is warranted to elucidate the underlying mechanisms and optimise the use of I-PRF in the management of AGA.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-TCHNMU-002933/23)

Consent for publication
Approved

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Conflict of interest

The authors declared absence of conflict of interest.

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Coordination of collaborative efforts.
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Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Conception of Study, Final approval of manuscript.
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