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Efficacy of Platelet-Rich Plasma vs. Platelet-Rich Fibrin Matrix in Hair Transplantation: A Randomized Clinical Trial

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ABSTRACT

Background: Androgenic alopecia (AGA) is a common condition affecting mental health and quality of life. Platelet-rich plasma (PRP) and platelet-rich fibrin matrix (PRFM) are emerging regenerative therapies with potential benefits in hair restoration.

Objective: This study aimed to compare the efficacy of PRP versus PRFM in enhancing outcomes of follicular unit extraction (FUE) in patients with AGA.

Patients and methods: This prospective, randomized clinical trial included 20 patients with grades 2–6 AGA and aged 20–50 years. This study was conducted at Cairo University and Shaalan Surgical Center from June 2017 to March 2018. Patients were randomly assigned into two groups: Group 1 received intradermal PRP injections, and group 2 received intradermal PRFM injections combined with FUE.

Results: Both treatment groups experienced notable improvements in hair density following the procedures. However, patients receiving PRFM showed a more substantial increase in hair density compared to those treated with PRP with statistical significance indicated by a p-value of 0.02. Additionally, the follicle survival rate was significantly higher in the PRFM group (p=0.03) suggesting better integration and growth of transplanted follicles. Patient satisfaction scores were also greater for the PRFM group with a p-value of 0.04 reflecting a more favorable aesthetic outcome. No adverse effects or complications were observed in either group throughout the study duration.

Conclusion: PRFM appeared to be more effective than PRP in promoting hair regeneration when combined with FUE, likely due to its fibrin scaffold facilitating sustained growth factor release. Larger studies are recommended to confirm these findings.

Keywords: Platelet-rich plasma, Follicular unit extraction, Androgenic alopecia, Platelet-rich fibrin matrix.

INTRODUCTION

Alopecia, particularly androgenic alopecia (AGA), is common, especially among Caucasian males, and can significantly impact mental well-being, sometimes leading to depression. Its complex causes include chronic perifollicular microinflammation that raises pro-inflammatory cytokines and oxidative stress. This environment, influenced by elevated androgens, genetic predispositions, and stress, affects the corticotropin-releasing hormone pathway and cortisol levels, contributing to the progression of alopecia [1].

Platelet-rich plasma (PRP) is a blood-derived product from the patient's own blood, rich in platelets. It is extracted using various systems and contains inflammatory cells like monocytes and neutrophils, along with key proteins such as platelet-derived growth factor and vascular endothelial growth factor. These components play important roles in cell recruitment, proliferation, angiogenesis, and are vital in tissue regeneration and healing processes [2]. PRP is a promising treatment for conditions like tissue regeneration, scar revision, wound healing and certain types of alopecia including androgenetic alopecia (AGA) and alopecia areata (AA). For hair restoration, PRP is administered via intradermal injections in affected areas, though it is not approved in the USA or EU. Current treatments for patterned hair loss include topical minoxidil, finasteride, dutasteride, topical ketoconazole, anti-androgens and oestrogens for female hair loss, as well as bonding of hair follicle units [3].

Platelets are easily collected from blood and concentrated into platelet-rich plasma (PRP) using anticoagulants. The process involves two steps: First, separating the platelet concentrate from platelet-poor plasma and blood cells. Second, adding an activator like calcium gluconate to form a fibrin network by converting fibrinogen to fibrin. PRP is a short-term, less effective method compared to platelet-rich fibrin matrix (PRFM) [4, 5].

PRP is a promising treatment for conditions like tissue regeneration, scar revision, wound healing, and certain types of alopecia, including androgenetic alopecia (AGA) and alopecia areata (AA). For hair restoration, PRP is administered via intradermal injections in affected areas, though it is not approved in the USA or EU. Current treatments for patterned hair loss include topical minoxidil, finasteride, dutasteride, topical ketoconazole, anti-androgens, and oestrogens for female hair loss, as well as bonding of hair follicle units. Surgical options such as follicular unit transplantation and follicular unit extraction are outpatient procedures that have shown excellent results in restoring hair. However, the clinical evidence supporting the efficacy of platelet-rich plasma (PRP) for treating pattern hair loss remains controversial, with some studies reporting positive outcomes while others show inconsistent or inconclusive results [6-8].

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Unlike PRP, platelet-rich fibrin matrix (PRFM) isolates platelets and plasma after a single centrifugation without additives, making it more suitable for hair treatments. Recent use of PRFM in follicular unit transplantation (FUT) aims to enhance hair density and stimulate follicle growth. Developed in 2001, PRFM involves collecting natural blood and centrifuging quickly without anticoagulants, simplifying the process and improving efficacy. Its ability to deliver growth factors directly into the scalp offers a promising advancement in hair restoration therapies.

PATIENTS AND METHODS

This study included 20 male patients. It was carried out at the clinic of Prof. Dr. Ibrahium Naguib and the Shaalan Surgical Center from June 2017 to March 2018. It was a prospective randomized comparative study involving twenty patients, all of whom were diagnosed with androgenic alopecia and underwent follicular unit extraction for hair transplantation.

Inclusion criteria: Individuals aged between 20 and 50 years, with grades 2 through 6 of androgenic alopecia according to the Norwood scale.

Exclusion criteria: Individuals younger than 20 or older than 50 years and those with grades 1 and 7 of androgenic alopecia on the Norwood scale. Patients with thyroid disorders, bleeding disorders, or diabetes, smokers and those on immunosuppressive drugs or steroids.

Randomization and allocation: Simple randomization using a randomization table created by a computer software program was used. Allocation was done using sealed opaque envelopes, and no masking was used. Our patients were divided into two groups, each containing 10 patients. The first group consisted of ten patients who received intradermal autologous platelet-rich plasma injections along with hair transplantation. While, the second group comprised ten patients who received intradermal injections of autologous platelet-rich fibrin matrix (PRFM) in conjunction with hair transplantation.

Preoperative assessment: History including patient demographics such as age, occupation, and marital status. Evaluation of alopecia onset, medication history, surgical history, and previous hair restoration procedures. Clinical examination included patient photographs from various angles, and assessment of hair using a digital trichoscope.

Trichoscopy (Figure 1) is a method for diagnosing hair and scalp conditions by visualizing structures at high magnification. After excluding diseases, a trichoscope evaluates hair density by measuring the number of hairs in a 1/2 cm² area. This helps estimate the total number of available hairs for grafting and the size of the bald area requiring treatment. Additionally, trichoscopy assesses hair thickness to guide pre-transplantation estimates.

Figure (1): Trichoscopy device.

Routine assessments included a complete blood count, coagulation profile, liver function tests, and fasting blood sugar levels. Additionally, preoperative photographs were taken and reviewed with the patients.

Preoperative markings (figure 2): The rule of thirds was applied to define the central anterior point, where the distance from the trichion to the glabella was equal to the distance from the glabella to the base of the nose, which in turn was equal to the distance from the base of the nose to the menton. Another guideline for determining the central anterior point indicated that the lowest acceptable point should intersect the horizontal and vertical planes of the scalp. The lateral extent of the hairline was established by four points—two on each side of the central anterior line, which ran flat across the forehead before curving to meet the temporal hairline. Two imaginary lines drawn through the mid-pupils represented these lateral anterior points. The lateral extension of the hairline ends at an imaginary line drawn through the lateral canthus while standing behind the patient, ensuring that the distance from the fronto-temporal point to the anterior central hair point is equal. There are two types of hairlines: The first, a bell-shaped hairline, is suited for narrower heads. Typically, a distance of about 8 cm from a horizontal line above the eyebrows to the hairline at the midline is effective. However, this distance may vary slightly for some patients depending on their unique facial features, head shape and size and the abundance of donor hair. The crown area is outlined and defined for transplantation, with lines drawn at a 45-degree angle to create a crisscross pattern that minimizes trauma to any existing native hair. By transplanting hair in this cross-hatching technique, the new hair grows towards one another, resulting in reduced separation and enhanced density.

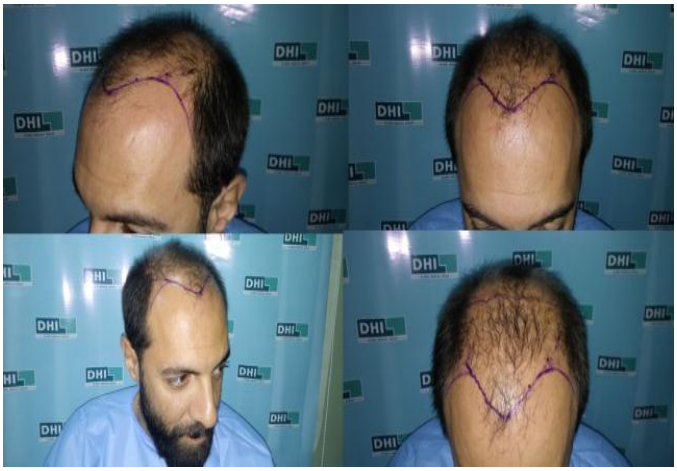

Figure (2): Showed hairlines markings of a narrow head patient.

Surgical technique: Patients were instructed to fast for 6 to 8 hours before the procedure and arrive early in the morning. All patients had their hair cut to a length of 1-2 mm, as this short hair is necessary for graft harvesting via the Follicular Unit Extraction (FUE) technique; longer hair complicates the harvesting process. Once the patients were supine, an intravenous line was established, and 2 mg of midazolam was administered to assess their response while ensuring optimal oxygen saturation. Local anesthesia was then applied, followed by an occipital nerve block using 0.5% bupivacaine hydrochloride with epinephrine (1:200,000), injected bilaterally just medial and lateral to the midpoint between the occipital protuberance and mastoid process. The patients were subsequently positioned prone for graft collection. Donor areas in the occipital and temporal regions were marked and divided into three sections. Tumescence infiltration was performed by injecting a saline solution to create scalp ballooning, minimize bleeding, and enhance anesthesia. The solution consisted of 120 ml of 0.9% saline, 20 ml of 2% lidocaine hydrochloride, and 1 ml of epinephrine with sodium bicarbonate to reduce the burning sensation. Infiltration was carried out from the subgaleal to the subcutaneous region until the "white marbling phenomenon" appeared, with repeat tumescence every 30 minutes as needed. Graft harvesting began in the occipital region, as it is the easiest area for extraction. Both 9-mm and 1-mm manual punches were utilized for graft collection. The punch was inserted into the skin approximately 3-4 mm deep, cutting through the dermis and epidermis around the hair follicle, which allowed the follicles to be released. The resistance decrease determined the punch's depth felt when applying force. Released hair follicles were then manually collected using forceps. Initially, 10 to 20 grafts were harvested to assess the ease of collection. The punch was advanced at the same angle and depth if the grafts were obtained without loss. If difficulties arose, adjustments in the angle and depth were made to optimize graft harvest and minimize transection rates.

After dissecting approximately 200-300 follicles, they were placed on gauze soaked in saline. While the surgeon continued the graft dissection, the assistant organized the harvested grafts into 10 lines, each containing 10 grafts, distinguishing between micro and minigrafts for 100 grafts. Additionally, single hair grafts were aligned explicitly to restore the hairline's first and second rows.

The donor area was covered with sterile gauze, and the patient and surgeon took a half-hour break between the extraction and implantation procedures. During this break, a 20 ml blood sample was drawn via venipuncture from the median cubital vein into acid citrate dextrose (ACD) or sodium citrate vacutainer tubes, maintaining a ratio of 1 ml of anticoagulant to 7-8 ml of whole blood. The aspirated blood was then agitated to ensure thorough mixing of the anticoagulant. The blood was centrifuged at a low speed (soft spin) at 500 revolutions per minute to prevent the platelets from sedimenting, allowing them to remain suspended in the supernatant plasma. The resulting supernatant plasma containing the platelets was transferred into another sterile tube. This tube was centrifuged at a higher speed (hard spin) at 2500 revolutions per minute to create a platelet pellet at the bottom and upper platelet-poor plasma (PPP).

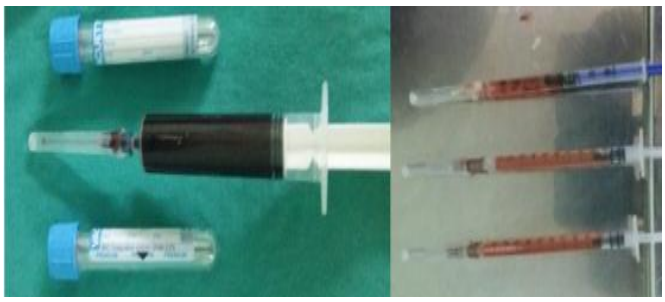

Figure (3): Preparation of PRP.

Following the preparation of PRP (figure 3), calcium chloride was mixed with the platelets to activate the platelet-rich fibrin matrix (PRFM). The patient then returned to the operating room, where the occipital and postauricular nerves were reblocked to minimize pain in the donor area during transplantation. The patient was positioned supine. If the frontal region was designated as the recipient area, the supraorbital nerves were blocked approximately 1 cm above the supraorbital foramen, above the eyebrows, to reduce pain during infiltration. The recipient area was marked, and infiltration anesthesia was applied. Subsequently, the skin was expanded with tumescent fluid, and the transplantation area was shaved. After preparing the PRP and PRFM, the patient received intradermal injections of either PRP or PRFM at a volume of 1 ml per cm^2 in the bald areas requiring transplantation. The natural hairline was drawn irregularly during this process to achieve a more natural appearance.

The frontal hairline requires single hair grafts during transplantation to avoid an artificial appearance. Grafts were implanted using a 9 mm implanter and an implanter needle, carefully following the scalp's topography and the natural direction of hair growth. The transplantation procedure was performed by a single operator, who could graft between 500 and 700 grafts per hour. 3,000 grafts could be implanted in a single session lasting 6 to 7 hours. After the implantation, the donor area was redressed with sterile gauze and adhesive, ensuring the transplant area remained uncovered.

Postoperative management: Patients were instructed to rest for the first 72 hours after surgery while keeping their head elevated at a 45-degree angle. Getting up and walking around, starting the day after the procedure, was essential, with assistance if needed. Patients were warned about potential swelling of the eyelids and forehead, which typically occurs on the second or third day due to the saline solution and local anesthetic injected during the procedure. This swelling usually resolves by the seventh postoperative day, and cold compresses can be applied to alleviate discomfort. Proper analgesia was provided in the immediate postoperative period. Prophylactic antibiotics were administered for 48-72 hours post-surgery. Low-dose corticosteroids were given to reduce forehead edema and relieve itching and burning sensations. The bandage (figure 4) on the donor area was removed on the second day, and patients were advised to wash their hair daily with mild shampoo and room temperature water without applying pressure.

Figure (4): Showing the bandage application postoperative.

After the surgery, patients were advised to shower daily using a mild shampoo and to wash the recipient area gently. They were encouraged to wear a wide hat or cap to protect the recipient area, especially when going outside. Specific instructions included avoiding driving for the first day post-surgery until eyelid swelling subsided, refraining from touching or sleeping on the recipient area for at least a week to prevent altering hair direction, and avoiding smoking. Additionally, patients were instructed to abstain from strenuous exercise or sports for the first two weeks, refrain from using hot water while showering, and limit sun and excessive heat exposure for at least three weeks.

Patients were informed that trim crusts would form around the micrografts in the transplanted area and would naturally fall off within ten days post-surgery. They were cautioned that although the grafted hair would grow well for the first week to ten days, approximately half to two-thirds of the hair might temporarily shed as the grafts transition into the telogen (rest) phase. Patients were reassured that hair growth typically begins 3-4 months after surgery, with significant improvement expected by six months, while the final results might take up to a year to develop fully.

Follow-Up: Patients were scheduled for follow-ups on the second, fifth, and end of the first week after surgery. They were also asked to return one, two, and three months after surgery for intradermal injections of platelet-rich plasma or fibrin matrix according to the group, and Trichoscopy imaging.

Ethical approval: The study received approval from The Ethical Committee of the Faculty of Medicine at Cairo University and is part of the third author's master's thesis. It was registered with the Pan African Clinical Trial Registry. All procedures followed the Declaration of Helsinki. Participants provided written informed consents after thoroughly explaining potential benefits and risks before joining the study.

Statistical analysis

All analyses were performed using IBM SPSS Statistics version 22 for Windows. Data were summarized using mean ± SD, median and range, or frequencies (number of cases) as appropriate. Numerical variables were compared between groups of 10 or more using the Student t-test for independent samples. The Chi-square test was employed for categorical data, and the exact test was used when expected frequencies were less than 5. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

In this study, 20 patients (100%) were males, all seeking hair transplantation. Patients were prospectively divided into two groups: 50% received intradermal PRP injections, while the other 50% received intradermal PRFM injections alongside hair transplantation with similar mean ages. Similarly, the grade of alopecia was comparable between groups (p=0.580), with no statistically significant differences. Overall, the groups were well-matched in demographic and alopecia severity variables, indicating comparability for further analysis.

Table (1): General characteristics between the research groups

	PRP group (number = 10)		**(PFRM) group (number = 10)**		**P-value**
	number	**%**	**N**	**%**	
Age (years)					
Mean ± SD.	32.5 ± 7.99		30.5 ± 4.332		0.662
Range (Min-Max)	23-48		20-35		
Grade of alopecia					
Mean ± SD.	3.6 ± 1.031		3.8 ± 1.04		0.580
Range (Min-Max)	1.265-2		0.789-3		

SD: standard deviation, $\chi 2$: chi-square test, t: independent T test, P-value > 0.05: non-significant; P-value < 0.001: highly significant.

The comparison between the two groups showed no significant difference in hair follicle density per cm² (p=0.446), transplanted grafts per session (p=0.940) and number of grafts taken (p=0.762).

However, there was a significant difference in recipient hair density percentage, with a p-value of 0.001, indicating higher recipient density in the PFRM group [Table 2].

Table (2): Outcomes of the study

	PRP group (number = 10)	**(PFRM) group (number = 10)**	**P-value**
Density of transplanted hair follicles per cm 2			
Mean ± SD.	95.80± 13.677	96.10 ± 4.280	0.446
Range	70-120	88 - 104	
Number of transplanted hair grafts per session			
Mean ± SD.	1766.40± 643.64	1930±530.614	0.940
Range (Min-Max)	778-2606	1230-3213	
Number of hair grafts taken			
Mean ± SD.	1654.10± 609.001	1930±530.614	0.762
Range (Min-Max)	551-2441	1150-3114	
Density of recipient hair in percentage			
	93.32±1.422	96 ±0.966	0.001

SD: standard deviation, t: independent T test, p: p value for comparing among the examined groups P-value < 0.05: Significant; P-value > 0.05: non-significant; P-value < 0.001: highly significant.

Table (3) compared hair thickness and percentage change between the PRP and PRFM groups. Pre-operative hair thickness was similar in both groups, with a p-value of 0.865 indicating no significant difference. Post-operative hair thickness was significantly higher in the PRFM group (mean 0.09) compared to the PRP group (mean 0.07) with a p-value of 0.004 showing statistical significance.

The percentage of change in hair thickness was also significantly greater in the PRFM group (mean 95.75%) versus the PRP group (47.71%), with a p-value of 0.001. These results suggest that PRFM leads to a more substantial increase in hair thickness post-treatment.

Table (3): Showing P-value of hair thickness and percentage of change

Group	values	Hair thickness pre-operatively	Hair thickness post-operative	Percentage of change in hair thickness
PRP	Mean	0.05	0.07	47.71
	Std. Deviation	0.009	0.016	7.444
PFRM	Mean	0.05	0.09	95.75
	Std. Deviation	0.005	0.013	26.248
Significance	P Value	0.865	0.004	0.001

In both groups, three patients (15%) experienced inflammation at the donor site, while four patients (20%) reported itching at the donor site after surgery. No cases of bleeding, infection, or visible scarring were observed at the donor or recipient sites post-transplantation (0%). Additionally, six patients (30%) developed moderate crusting at the recipient site and two patients (10%) with folliculitis in the recipient area showed that their condition resolved with conservative treatment (Figure 5).

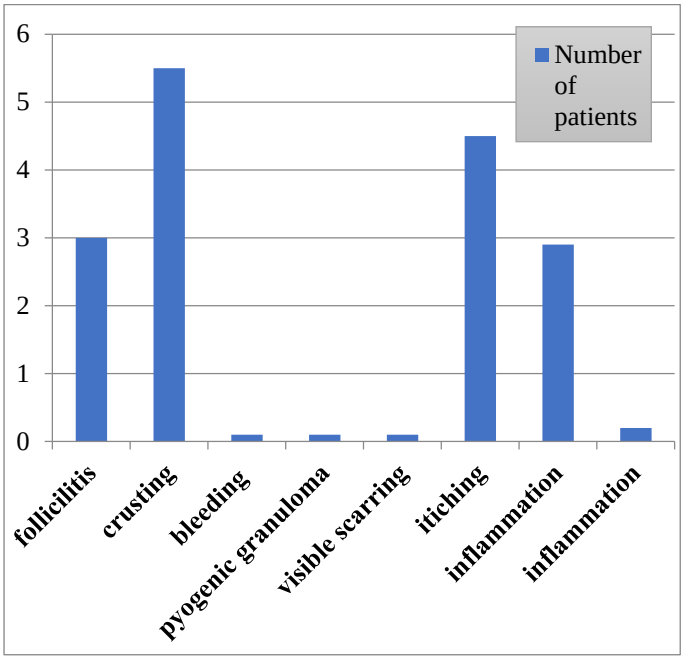

Figure (5): Showing complications post-operatively.

DISCUSSION

This prospective randomized study assessed the effectiveness of platelet-rich plasma (PRP) compared to platelet-rich fibrin matrix (PRFM) in improving hair transplant results for 20 individuals suffering from androgenic alopecia. The participants, aged 20 to 50 years and were classified under Norwood grades 2 to 6, were evenly split into two groups: One receiving PRP and the other PRFM. The study was designed with a focus on strict randomization, consistent surgical procedures and trichoscopic evaluations to guarantee reliable outcomes.

Our findings indicated that the baseline demographics between the PRP and PRFM groups were well-balanced with no significant differences age (p=0.662), or severity of alopecia (p=0.580). Both groups showed similar baseline characteristics (age, gender & alopecia grade), procedural metrics (graft density & number of sessions) and graft harvesting efficiency with no statistically significant differences (p>0.05). This consistency highlighted the effectiveness of randomization and procedural standardization, which helped minimize confounding variables. However, post-transplant hair density was significantly better in the PRFM group (96% vs. 93.32%, p=0.001) indicating improved graft survival or integration.

PRFM showed similar procedural outcomes (graft density & session counts) but significantly improved recipient hair density (p=0.001), post-operative hair thickness (p=0.004), and thickness change (p=0.001). Its thickness improvement of 95.75% compared to 47.71% indicated its superior effectiveness, likely due to its fibrin scaffold aiding in growth factor retention. This significant difference suggests that the fibrin matrix in PRFM could prolong the release of growth factors, enhancing regenerative benefits. Although the number of grafts used was comparable, the structural benefits of PRFM likely led to better aesthetic results.

PRP has limitations such as longer preparation time, potential allergic reactions from anticoagulants, and increased pain during preparation. However, its advantages included reduced preparation time, minimal allergic risk, and sustainable growth factor release. In contrast, platelet-rich fibrin (PRF) offers several benefits over PRP including quicker preparation, purely autologous properties, less pain during administration and enhanced sustained release of growth factors. These features make PRF a more favorable option for clinical applications, providing longer-lasting therapeutic effects compared to PRP [10].

Comparison of our results to similar studies

The study of **Aldor *et al.*** [11] evaluated the safety and effectiveness of combining platelet-rich plasma (PRP) with follicular unit extraction (FUE) in 15 men with androgenetic alopecia. PRP treatment was administered weekly for three sessions after transplantation. Trichoscopic analysis showed significant improvements in hair density and length at six months, with no prolonged scalp redness beyond the first month. PRP enhanced graft survival, minimized shedding, and promoted faster regrowth, leading to better aesthetic outcomes. Despite promising findings, the small sample size and absence of a control group highlighted the need for larger comparative studies for further validation. These results are in line with our findings on PRP's role in hair transplantation, focusing on follicular density and graft survival.

A meta-analysis conducted by **Georgescu *et al.*** [12] reviewed 15 clinical trials (17 treatment groups) and found that PRP therapy significantly enhances hair density in individuals with androgenic alopecia (AGA). The mean hair counts increased from 141.9 ± 108.2 to 177.5 ± 129.7 hairs/cm² ($p = 0.0004$). The efficacy of PRP was found to correlate positively with treatment frequency ($r = 0.5$, $p = 0.03$) and negatively with the age of patients ($r = -0.56$, $p = 0.016$). Although, the methods for preparing PRP and additional metrics (like hair diameter) varied among studies, the combined data support its effectiveness in promoting follicular regeneration, likely through growth factor-induced angiogenesis and anti-inflammatory properties. The findings endorse PRP as a viable treatment for AGA in both men and women, though variations in treatment protocols suggest a need for standardization to achieve the best results. Careful selection of patients may also improve treatment outcomes.

The study conducted by **Mahapatra *et al.*** [9] examined the effectiveness of using platelet-rich fibrin matrix (PRFM) in combination with follicular unit transplantation (FUT) to address male androgenetic alopecia (MAA). PRFM, which is an autologous platelet concentrate high in growth factors like TGF, EGF, and FGF, was applied to the right side of the scalp of ten male participants aged 18 to 50 with Norwood Alopecia grades 4 to 6 during the FUT procedure. Unlike platelet-rich plasma (PRP), PRFM does not need anticoagulants and is produced through a single centrifugation step. The findings indicated a gradual growth of hair follicles on the treated side, with notable improvements seen six months after the treatment.

Several studies evaluated the role of PRFP, supporting our results. **Arora and Shukla** [13] reported satisfactory results in three cases (ages 35-40) with grades ranging from 1 to 7 after treatment at 700 RPM for 4 minutes. **Bhoite *et al.*** [14] further demonstrated significant improvement, with 73% of 15 patients showing noticeable hair growth after 6 minutes at 700 RPM, and trichoscopy revealing an increase in hairs per follicular unit. **Schiavone *et al.*** [15] expanded on these findings with a larger cohort of 168 patients, reporting that those in the treatment group showed greater improvements in hair density compared to the control group after treatment at 1500 RPM for 5 minutes. Their assessment utilized a 15-point scale evaluated by experts, indicating significant efficacy. **Mahapatra *et al.*** [9] also contributed to the evidence by comparing hair retention in a treated region versus a non-treated region, finding better outcomes in the PRF-treated area at 3000 RPM for 10 minutes. Collectively, these studies highlight the potential of PRF in enhancing hair density and patient satisfaction across various treatment protocols and demographic groups.

Clinical implications of the study: This research indicated that PRFM may be more effective than PRP in promoting hair restoration, showing greater improvements in hair thickness (95.75% compared to 47.71%) and recipient density ($p=0.001$). Clinicians might consider prioritizing PRFM for better aesthetic results, although further large-scale studies are necessary to establish its long-term effectiveness, cost-efficiency and wider applicability due to the limited sample size.

Strengths and limitations of the study: our strength is the use of prospective randomization, which reduced selection bias, created comparable groups and controlled for confounding factors. The study had several limitations: The small sample size (n=10 per group) restricted statistical power and generalizability. The absence of blinding due to a single operator introduces potential bias. Additionally, the short follow-up period limited the evaluation of long-term effectiveness. Important subjective measures, such as patient satisfaction, were not included, and the cost-effectiveness of PRFM compared to PRP was not explored, which is essential for its clinical implementation despite better thickness improvement.

Future studies should focus on larger, multicenter trials with longer follow-ups to confirm the lasting benefits of PRFM. Including patient-reported outcomes, cost-effectiveness evaluations and blinded designs would enhance the clinical significance of the findings.

CONCLUSION

Our study showed that while PRP and PRFM groups had similar baseline characteristics, PRFM significantly outperformed PRP in hair density and thickness post-transplant. The fibrin matrix likely improved graft survival and growth factor retention, resulting in better aesthetic outcomes in hair restoration.

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