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ORIGINAL ARTICLE

Comparative Study between Follicular Unit Extraction Technique with or without Platelet Rich Plasma in Non-Androgenic Alopecia

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ABSTRACT

Background: Not only do damaged tissues exhibit reduced vascularity and degenerative changes, but cicatricial alopecia makes hair transplantation an extremely difficult process. Regenerating damaged tissue may be possible with platelet-rich plasma (PRP) because of its effects on angiogenesis, tissue remodeling, and regeneration. The present work aimed to determine if PRP has a role in improving the result of follicular unit extraction (FUE) in non-androgenic alopecia.

Methods: In a prospective clinical study, twenty-four patients with non-androgenic alopecia, were split into two equal groups (n=12): Group A: patients were administered two injections of local intradermal PRP one week before hair transplantation and again two weeks and four weeks after the hair transplantation. Group B: (Control group): No local injections of any type were administered to individuals undergoing hair transplantation. Applying a trichoscope to manually tally the transplanted follicular units per cm2, digital photography, and patients' satisfaction were assessed 6 to 12 months after hair transplantation.

Results: Non-significant differences were found between the two groups as regards patient satisfaction, hair survival rate, as well as blind evaluation by the other surgeons. In group A, there were 3 patients (25%) with mild satisfaction, 6 patients (50%) with moderate satisfaction and 3 patients (25%) with high satisfaction. In group B, there were 6 patients (50%) with mild satisfaction, 4 patients (33.3%) with moderate satisfaction and 2 patients (16.7%) with high satisfaction.

Conclusions: Incorporating platelet-rich plasma (PRP) into FUE improves scar tissue texture and quality more than FUE alone, however there is no significant difference in the clinical results of hair restoration in terms of density of newly grown hair.

Keywords: Follicular Unit Extraction; Non-Androgenic Alopecia; Platelet Rich Plasma

INTRODUCTION

In addition to affecting men and women equally, hair loss has a significant effect on many people's psychological health and ability to operate socially [1]. There is a strong relationship between low self-esteem and low self-worth and a few other physical indicators of aging. Individual hairstyles frame the faces and convey information about distinct personalities; hair has long been linked to youth, vigor, and health. Because of both our cognitive and unconscious views of hair, it's no wonder that sudden, unexpected hair loss can cause a lot of emotional distress [2]. Thankfully, there are medical and surgical alternatives that can halt hair loss and, in many cases, even reverse its visible symptoms for our patients. The modern techniques of follicular unit extraction and follicular unit transplantation (FUT) offer the surgeon a great deal of leeway in deciding where and how to put the grafts, which in turn produces consistent and realistic esthetic outcomes.

Improvements to the procedure have been made in recent years, allowing for the removal of individual follicular units using small punch excisions instead of the single-strip method. Nowadays, the most advanced method of hair transplantation is follicular unit extraction, a minimally invasive technique that produces remarkable aesthetic outcomes with almost invisible scarring [3].

Both the intradermal activation of latent hair follicles and an adjuvant therapy for FUE technique have recently seen the emergence of an autologous alternative [4]. The principle behind Platelet high Plasma (PRP) involves drawing a little amount of blood from the patient, spinning it in a centrifuge, and then activating it to create an autologous formulation that is high in growth factors and proteins [5]. So, we aimed at this study to determine if PRP has a role in improving the result of follicular unit extraction in non-androgenic alopecia.

METHODS

We conducted this prospective clinical study on twenty-four patients with non-androgenic alopecia. During the study period between January 2023 and January 2024; Consent was collected from all patients. The approval for the study was obtained from Zagazig University Hospitals after obtaining approval from the Institutional Review Board (#10359) and the research was conducted in accordance with the Helsinki Declaration.

We included patients between 18 and 50 years of age with cicatricial alopecia, scarring alopecia, facial alopecia, and women pattern alopecia. We excluded all patients who had any of the following conditions, patients with active infection at the site of alopecia, autoimmune disease, active vascular disease or bleeding disorder, history of keloid, Persons with impaired immune systems due to HIV, hepatitis B or C, aspirin, warfarin, heparin, or another anticoagulant medicine, and those suffering from body dysmorphic disorder.

All patients were subjected to the following: History taking: Medications, particularly antipsychotics, past surgeries, and unique behaviors like smoking were all part of the

package. Checkups on the heart, lungs, and nervous system were all part of the general physic. The local examination covered the following areas: the donor area, which was evaluated for hair density and hair direction; the alopecic area, which was evaluated for its location, size, form, scar maturity, and tissue pliability. Every case was photographed digitally.

Laboratory investigations were done to all patients such as hepatitis indicators, HIV antibodies, kidney and liver functions, coagulation profile, and complete blood count (CBC).

Using the envelope method, patients were randomly divided into two groups, with 12 patients in each: Group A: Prior to hair transplantation, patients in this group got two injections of local intradermal PRP; two weeks and four weeks after the procedure, they got two further injections. Group B, the control group, consisted of patients who got hair transplants but did not get any local injections.

Surgical techniques:

Follicular Unit Extraction Procedure:

The length of the patient's hair was trimmed to 1-2 mm. The patient's vital signs (pulse, blood pressure, etc.) were recorded one hour before surgery during pre-operative photography. Sitting with his head flexed to a comfortable position, the patient was helped to find his ideal position. Complete asepsis was maintained while 0.25% bupivacaine hydrochloride was used to block the occipital and postauricular nerves. A solution containing 70 ml of normal saline 0.9%, 30 ml of 0.1% lidocaine hydrochloride, and 1 ml of adrenalin (1 mg/ml) was used for infiltration anesthesia.

Graft harvesting began once the adrenaline rush had worn off. A micro motor running at 1500-3000 rpm, a micro punch ranging from 0.8 to 1 mm attached to the handpiece, and 2.5 x magnification were all used in the process. The occipital scalp was the primary source for grafts. According to the density of follicular units, a punch size between 0.8 and 1 mm was selected.

Using an extraction jeweler's forceps, the liberated grafts were collected by hand. In order to ensure that there is no transaction, ten to twenty follicular units were harvested at the beginning of the harvesting process and evaluated for ease of collection. It was continued to collect grafts until there were enough viable follicles. The occipital and postauricular nerves were reblocked after the harvesting step to reduce the anticipated donor area pain during the transplant procedure. The patient was turned supine after sterile gauze was applied to the donor area.

Steps to prepare the recipient area and place the graft

Marking the recipient area allowed for the administration of infiltration anesthesia in the same manner as the donor area. To provide the most realistic appearance, the recipient site was then prepared using microblades ranging in size from 1 to 1.3 mm, with the natural hair angles taken into consideration. At a density of 20-30 FU per cm^2, grafts were implanted using an implantation jeweler's forceps.

Protocol for the production of platelet-rich plasma:

Under strict aseptic circumstances, PRP was produced in the following manner: For every patient, we took 20 ml of their venous blood. The obtained blood was then added to the PRP kit, which also included separation gel and anticoagulant sodium citrate. The centrifugation process lasted for 10 minutes at 1000 rpm. Two plain tubes were used to disperse the total plasma, buffy coat (including WBCs), and superficial RBCs that had been sucked from all the tubes using a 5 ml syringe. After that, the centrifugation process was repeated for 10 more minutes at 2000 rpm. A syringe was used to remove the lowest quarter of the plasma. Two injections were administered two and four weeks after the operation using the collected PRP that had been injected intradermally into the alopecic area a week prior to the procedure.

Post-operative measures:

The antibiotic ointment-soaked non-adhesive bandage was removed five days after surgery. Everyone who had surgery was given medication to alleviate pain and swelling after the procedure.

Post-operative follow-up and evaluation:

Follicular unit per square centimeter counts were performed manually with a trichoscope (Dermlite 2 Pro HR Dermatoscope) immediately before transplantation and again throughout the follow-up period.

Digital photography:

We used a specific scale based on hair growth to take serial images before the operation and again 6 to 12 months after the procedure. Then we evaluated each one and averaged the results. Here's what we found: Nothing has changed (no new hair growth) = 0 points. One point for mild to moderate improvement, (defined as hair growth that is similar to the condition it was in before surgery). Considerable progress (new hair development in close proximity to existing hair-bearing tissue) = 2 points.

Patient satisfaction:

Using a scale from 0 to 4, where 4 indicates a very satisfied patient, 3 a moderately satisfied patient, 2 a mildly satisfied patient, 1 an unhappy patient, and 0 an extremely dissatisfied patient, we may measure the degree of patient satisfaction. Each of the following questions serves as a foundation: The art of concealment, whether intentionally implemented or not. Decided whether or not hair density increased. Intraoperative comfort referred to how relaxed the patient felt while the surgery was underway. Consider undergoing surgery on a different scar site, if desired. Six to twelve months following hair transplantation, patients were asked to rate their level of satisfaction.

Statistical Analysis:

Data was analyzed statistically using SPSS version 28 (IBM Co., Armonk, NY, USA). Mean, standard deviation, and range were used to display quantitative parametric data. A Chi-square test or independent t-test was used to assess categorical variables, which were shown as percentages and frequencies; a P-value less than 0.05 was deemed statistically significant.

RESULTS

No statistically significant difference (p-value = 0.429) was revealed between both studied groups as regards age and sex. In group A, the mean age was 24.5±9.7 with a range of 11 –

39 while in group B, the mean age was 27.8±10.6 with a range of 15 – 45, there were ten males (83.3%) and two females (16.7%). (Table 1).

No statistically significant difference (p-value = 0.250)was revealed between both studied groups as regard size. In group A, the mean size was 4.95±4.55 with a range of 0.75 – 15. whilein group B, the mean size was 8.88±10.6 with a range of 0.5 – 36. Also, no statistically significant difference (p-value = 0.847) between the studied groups as regards affected site. In group A, the scalp was affected in 5 patients (41.7%), the beard was affected in 4 patients (33.3%), the eyebrow was affected in 1 patient (8.3%) and the mustache was affected in 2 patients (16.7%). In group B, the scalp was affected in 7 patients (58.3%), the beard was affected in 3 patients (25%), the eyebrow was affected in 1 patient (8.3%), and the mustache was affected in 1 patient (8.3%) (Table 2).

Table (3) shows no statistically significant difference (p-value = 1.0) between the 2 studied groups as regards etiology or operative time. In both studied groups, there were 10 patients (83.3%) due to trauma and 2 patients (16.7%) due to burn. In group A, the mean operative time was 162.5±95.1 with a range of 60 – 360 while in group B, the mean operative time was 179.2±88.2 with a range of 60 – 300. In group A, the mean relapsed time was 5.58±3.29 with a range of 2 – 14 while in group B, the mean relapsed time was 6.92±2.64 with a range of 4 – 12.

There was no statistically significant difference (p-value = 0.725) between the studied groups (as regards immediate post-operative approximate FUE No. and as regards -month post-operative approximate FUE. In group A, the mean immediate post-operative approximate FUE No was 27.8±9.1 with a range of 15 – 45 while in group B, the mean immediate post-operative approximate FUE No was 26.8±5.3 with a range of 20 – 36, In group A, the mean 1-month post-operative approximate FUE No was 23.3±8.5 with a range of 14 – 44 while in group B, the mean 1-month post-operative approximate FUE No was 23.3±4.8 with a range of 15 – 30 (Table 4).

Table (5) shows no statistically significant difference (p-value = 0.841) between the 2 studied groups as regards follow-up period or patient satisfaction. In group A, the mean follow-up period was 8.75±2.05 with a range of 6 – 12 while in group B, the mean follow-up period was 8.58±1.98 with a range of 6 – 12. In group A, there were 3 patients (25%) with mild satisfaction, 6 patients (50%) with moderate satisfaction, and 3 patients (25%) with high satisfaction. In group B, there were 6 patients (50%) with mild satisfaction, 4 patients (33.3%) with moderate satisfaction, and 2 patients (16.7%) with high satisfaction.

A male patient 36 years old with a post-traumatic scar in the left temporal region was managed by hair transplantation using the FUE technique combined with PRP injection (Group A) (Figure 1).

A male patient 16 years old with a post-traumatic scar on the scalp was managed by hair transplantation using the FUE technique without PRP injection (Group B) (Figure 2).

Table 1: Comparison of demographic data between the studied groups.

		Group A (N = 12)		Group B (N = 12)		Stat. test	P-value
Age(years)	**Mean ±SD**	24.5±9.7		27.8±10.6		T = 0.8	0.429 NS
	Range	11 - 39		15 - 45			
Sex	**Male**	10	83.3 %	10	83.3 %	X^2 = 0.0	1.0 NS
	Female	2	16.7 %	2	16.7 %		

T:Independent sample T-test.
X^2: Chi-square test. NS: p-value > 0.05 is considered non-significant

Table 2: Comparison of clinical data between the studied groups.

		Group A (N = 12)		Group B (N = 12)		Stat. test	P-value
Size(cm)	**Mean ±SD**	4.95±4.55		8.88±10.6		T = 1.18	0.250 NS
	Range	0.75 - 15		0.5 - 36			
Site	**Scalp**	5	41.7 %	7	58.3 %	X^2 = 0.81	0.847 NS
	Beard	4	33.3 %	3	25%		
	Eyebrow	1	8.3 %	1	8.3 %		
	Mustache	2	16.7 %	1	8.3 %		

T:Independent sample T-test.
X^2: Chi-square test. NS: p-value > 0.05 is considered non-significant.

Table 3: Comparison of etiology, operative time, and relapsed time between studied groups.

		Group A (N = 12)		Group B (N = 12)		Stat. test	P-value
Etiology	**Trauma**	10	83.3%	10	83.3%	X^2 = 0.0	1.0 NS
	Burn	2	16.7%	2	16.7%		
		Group A (N = 12)		**Group B (N = 12)**		**Stat. test**	**P-value**
Operative time(min)	**Mean ±SD**	162.5±95.1		179.2±88.2		T = 0.44	0.660 NS

		Group A (N = 12)	Group B (N = 12)	Stat. test	P-value
	Range	60 - 360	60 - 300		
		Group A (N = 12)	Group B (N = 12)	Stat. test	P-value
Relapsed time(years)	Mean ±SD	5.58±3.29	6.92±2.64	T = 1.09	0.286 NS
	Range	2 - 14	4 - 12		

X^2: Chi-square test.
NS: p-value > 0.05 is considered non-significant

Table 4: Comparison of the follow-up period and patients satisfaction between the studied groups.

		Group A (N = 12)		Group B (N = 12)		Stat. test	P-value
Follow-up period(months)	Mean ±SD	8.75±2.05		8.58±1.98		T = 0.2	0.841 NS
	Range	6 - 12		6 - 12			
		Group A (N = 12)		Group B (N = 12)		Stat. test	P-value
Satisfaction	Mild	3	25%	6	50%	X^2 = 1.6	0.449 NS
	Moderate	6	50%	4	33.3%		
	High	3	25%	2	16.7%		

T:Independent sample T-test.
NS: p-value > 0.05 is considered non-significant.

Table 5: Comparison of Approximate FUE No. between studied group**.**

Approximate FUE No.		Group A (N = 12)	Group B (N = 12)	Stat. test	P-value
Immediate	Mean ±SD	27.8±9.1	26.8±5.3	T = 0.35	0.725 NS
	Range	15 - 45	20 - 36		
Post 1 month	Mean ±SD	23.3±8.5	23.3±4.8	T = 0.03	0.977 NS
	Range	14 - 44	15 - 30		

T:Independent sample T-test.
NS: p-value > 0.05 is considered non-significant.

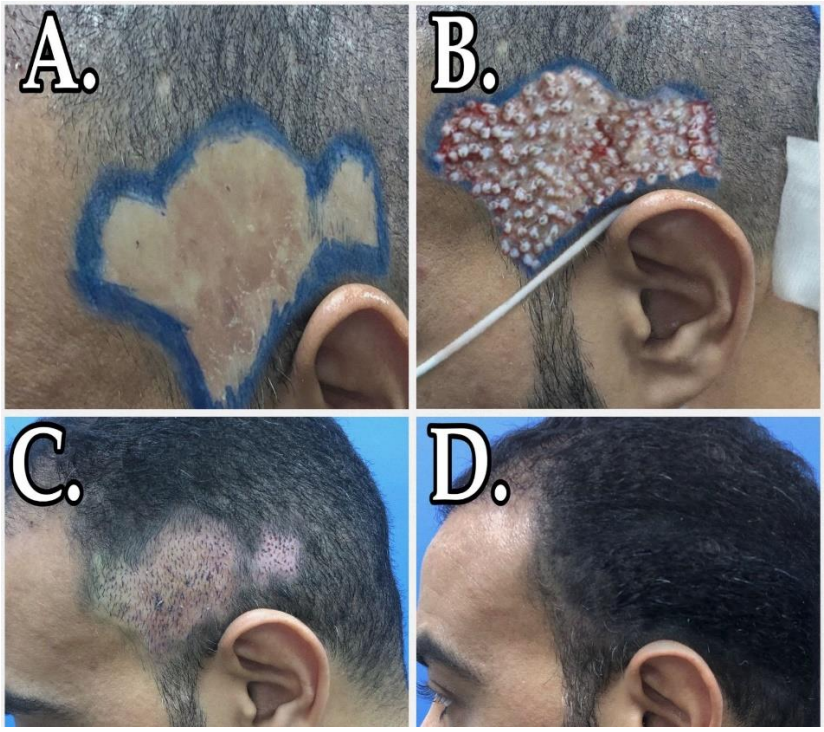

Figure 1: Case 1 from Group A: (A) preoperative (B) immediately after graft insertion (C) one week postoperative (D) 6 months postoperative

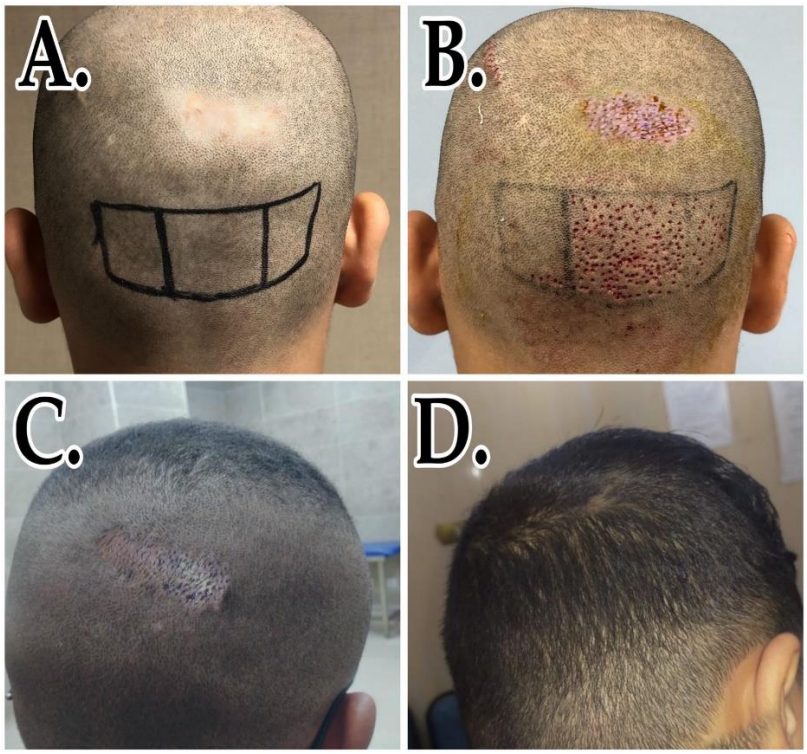

Figure 2: Case 2 from Group B: (A) preoperative (B) immediately after graft insertion (C) 3 weeks postoperative (D) 6 months postoperative

DISCUSSION

For those for whom medication is not an option, the most cosmetically significant therapy now available is hair transplantation surgery, which can permanently restore naturally-looking scalp hair. The patient's factors (such as age, graft availability, and

anticipated alopecia progression) and the surgeon's method have a significant impact on the outcome quality. While there is a lot of variation in the specifics of how transplant surgeons carry out the procedure, two main approaches are available; follicular unit transplantation and follicular unit extraction. Both involve obtaining grafts from intact follicular units [6].

For cell proliferation and differentiation, platelet-rich plasma (PRP) is an important source of growth and regulatory factors. PRP's anti-apoptotic properties not only promote cell growth but also increase cell survival. Activated PRP stimulates mesenchymal cell activation in the dermal papilla as well as the growth and differentiation of stem cells in the hair follicle bulge. PRP increases the levels of Bcl-2 regulatory proteins, which have anti-apoptotic properties and increase the longevity of dermal papilla cells [7].

In this study, non-significant differences were revealed between both groups as regards age in group A, the mean age was 24.5 ± 9.7 while in group B, the mean age was 27.8 ± 10.6 P value >0.05. and sex as in both studied groups, there were 10 males (83.3%) and 2 females (16.7%) with a P value>0.05. which is consistent with Elariny et al. [8] who found that Participants in the study were either male or female; the average age was 23.3 years for group A and 26.3 years for group B; however, there was no statistically significant difference between the sexes.Abdelkader et al. [4] found that The age range of the patients in the PRP group was 27–51 years (mean 36), while in the saline group it was 22–48 years (mean 33). The standard deviations for the two groups were 6 and 7, respectively, with no significant differences between the 2 groups regarding age (P = 0.136), or sex distribution (P = 0.640).

Rabie et al. [9] found that the mean age of the patients treated with FUE with PRP was 32.50±8.45 years, 3 patients (37.5%) were HTN,1 patient (12.5%) was diabetic and 2 patients (25%) were smokers. The mean age of the patients treated with FUE without PRP was 33.17±9.35 years, 2 (25%) were HTN and 1 patient (12.5%) was a smoker with no significant differences between the 2 groups.

Also, we found no statistically significant difference (p-value = 0.250) between the 2 studied groups as regards size and the site of alopecia, as in group A the scalp was affected in 5 patients (41.7%), the beard was affected in 4 patients (33.3%), the eyebrow was affected in 1 patient (8.3%) and the mustache was affected in 2 patients (16.7%). In group B, the scalp was affected in 7 patients (58.3%), the beard was affected in 3 patients (25%), the eyebrow was affected in 1 patient (8.3%) and the mustache was affected in 1 patient (8.3%).Elariny et al. [8] foundthat various locations were encompassed, including seven eyebrows, seven scalps, and six beards. Group A had a CA surface area of 5.70 cm^2, while Group B had a substantially larger CA surface area of 10.20 cm^2 (p = 0.043). The mean length was the same in both groups (6 years for group A and 7 years for group B), with no significant differences between the 2 groups.

In this study, non-significant differences were found between both groups as regards the etiology of alopecia, or operative time. In both studied groups, there were 10 patients (83.3%) due to trauma and 2 patients (16.7%) due to burn. In group A, the mean operative time was 162.5 ± 95.1 minutes while in group B, the mean operative time was 179.2 ± 88.2.Elariny et al. [8] foundthat secondary

scarring alopecia was always caused by trauma.

In this study, non-significant differences were revealed between both groups regarding relapsed time, and immediate post-operative approximate FUE, which is consistent with Elariny et al. [8] who found Following immediate post-operative FUE, there was no statistically significant difference between group A and group B in terms of the mean density of transplanted FU, which was 24.90 FU/cm2 and 24.7 FU/cm2, respectively. There was no statistically significant difference between groups A and B after 3 months.However, group A had a mean surviving FU of 7.40 FU/cm2 and group B had 6.80 FU/cm2. After 6 months, Group A density reached 16.10 FU/cm2 and Group B reached 13.40 FU/cm2. After 12 months, there was an even more noticeable rise, reaching 19.05 FU/cm2 in group A and 16.20 FU/cm2 in group B. Compared to group B, group A had a considerably higher density at 6 and 12 months.

Abdelkader et al. [4] found that While the PRP group transplanted 3000-5000 hairs per session, the saline group transplanted 3500-4500 hairs, and there was no statistically significant difference between the two groups (P = 0.234). Neither the pre-treatment hair quantity (cm2) nor the hair thickness (%) differed statistically between the two groups.

Garg et al. [7] found that forty individuals undergoing FUE hair transplants participated in a prospective randomized trial with a single blind. The patients were split into two groups: one that received platelet-rich plasma (PRP) intraoperatively after slits were made over the recipient area, and another that received normal saline. In FUE transplant patients, intra-operative PRP therapy was shown to be beneficial in a number of ways, including a marked improvement in hair density and quality, a decrease in catagen loss, accelerated skin repair, and the development of new anagen hair at a faster rate.

Abdelkader et al. [4] found that When comparing the two groups at the 1-month follow-up, no statistical difference was seen in the percentage of hair graft uptake. Conversely, at the 3-, 6-, and 12-month follow-ups, there was a notable disparity (P < 0.001) in the proportion of hair graft uptake between the two groups thereafter. At the1,3,6, and 12-month follow-ups, there was a notable variation in hair thickness as well.

In contrast to Alshahat et al. [10] whoreported that at 6 months, the PRP group showed significantly different results compared to the non-PRP group in terms of cicatrical alopecia density, rate of regrowth, and length (p-value < 0.05). In contrast, the PRP group showed highly significant results (p-value < 0.001) in terms of androgenic alopecia density and length (p-value < 0.001).

In this study, we found no statistically significant difference (p-value = 0.449) between the studied groups as regardspatient satisfaction. Thisis consistent with Alshahat et al. [10] whoreported that PRP and non-PRP groups showed no statistically significant difference (p > 0.001) in 6 months' time for cicatrix alopecia in terms of redness, patient satisfaction, or problems. In terms of androgenic alopecia at 6 months, there was no statistically significant difference (p-value > 0.05) between the PRP group and the non-PRP group with respect to redness, patient satisfaction, complications, and regrowth rate.

Elariny et al. [8] found that eight patients in group A had good or excellent results, two had fair results, and one had poor results at the 12-month follow-up.Similarly, six patients in group B had excellent or good results, three

had fair results, and one had poor results.

Rabie et al. [9] found that regarding the PRP group, 2 patients (25%) were excellent, 3 patients (37.5%) were good and 3 patients (37.5%) were fair. Regarding the non-PRP group, 3 patients (25%) were excellent,4 patients (50%) were good, and one patient (12.5%) was poor. There was no significant difference between the two studied groups as regards satisfaction.

Subjects with AGA androgenic alopecia showed a marked improvement in hair density after receiving PRP injection, according to a meta-analysis of ten randomized controlled trials involving 318 participants and 555 treatment units (95% confidence interval 9.03-41.15, p = 0.002). The effect was even more noticeable in males [11].

This study has several limitations, The small number of patients studied in our research is an important limitation, also this is an unicenter study, and multi-center studies with a larger sample size are recommended to verify our results. Also,the short time offollow-up after 1 month is defective in defining the role of PRP in improving FUE in non-androgenic alopecia.

CONCLUSIONS

The clinical results of hair restoration in terms of hair growth density are not significantly different when PRP is added to FUE, while the scarred tissues' texture and quality are much improved compared to instances that underwent FUE alone. The surgical strategy is affected by various aspects, including the patient's age, gender, occupation, size, and location of the alopecia, and the duration since the alopecia began. In most cases, the best solution to this problem requires more than one session.

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Financialdisclosure: None

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