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A Comparative Study Between Effect of Follicular Unit Extraction Alone and Combined with Platelet Riched Plasma in Treatment of Androgeneitc Alopecia (A Trichoscopic Evaluation)

Hassan Mamdouh Abdelaziz
Dermatology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Abdelraouf Mohamed Almohsen
Dermatology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Yahya Zakarya Elsayed
Dermatology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt, yahyaragab1@gmail.com

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ORIGINAL ARTICLE

A Comparative Study Between Effect of Follicular Unit Extraction Alone and Combined with Platelet Riched Plasma in Treatment of Androgeneitc Alopecia (A Trichoscopic Evaluation)

Hassan M. Abdelaziz, Abdelraouf M. Almohsen, Yahya Z. Elsayed *

Department of Dermatology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Abstract

Background: ***Follicle unit extraction (FUE) is the minimally invasive process that has recently become the gold-standard procedure for hair transplantation, with excellent esthetic results. According to recent research, PRGF (plasma rich in growth factors) may promote tissue regeneration and the creation of new hair by releasing bioactive chemicals upon platelet activation.***

Aim: ***This study examines the efficaciousness of FUE transplantation of hair alone and in conjunction with platelet-rich plasma (PRP) to manage androgenetic alopecia.***

Patients and methods: ***Forty individuals with clinically confirmed androgenic alopecia were included in the study; of these, twenty underwent FUE hair transplantation alone. Twenty more patients underwent FUE with PRP following surgery. This study's outcomes were assessed utilizing trichoscopy assessment at various points during the investigation, including after 10 days, every three months, and after six and nine months.***

Results: ***The study showed a significant improvement while using PRP in the form of early increases in length and density and a reduction in the period needed for wound and soft tissue recovery following surgery.***

Conclusion: ***Following hair transplantation, PRP therapy improves the amount and quality of newly growing hair. Furthermore, it expedites skin repair and lessens catagen loss in hair transplants.***

Keywords: Follicular Unit Extraction; Platelet-Rich Plasma; Androgenetic Alopecia; Trichoscopy

1. Introduction

The scientific literature on androgenetic alopecia (AGA) frequently discusses newly developed treatments and pharmaceutical research. Nevertheless, the only FDA-approved medications that are now available are oral finasteride and topical minoxidil. Sadly, people stop complying because of adverse effects and a lack of willpower, necessitating the development of novel therapeutic drugs to encourage follicular growth and reduce hair loss.[1,2]

The foundation of hair restoration surgery is hair transplantation. This procedure, sometimes known as follicle unit strips surgery, or FUSS, was first introduced in the middle of the 1990s. It involves excising just one elliptical strip from the posterior occipital region of the scalp and then suturing the wound.[3]

Thanks to tiny punch excisions rather than the single strip method, individual follicular unit removal has been introduced in the last few years, improving the technique. These days, (FUE), a minimally invasive procedure that produces excellent cosmetic results with a hardly noticeable surgical scar, is the gold standard for hair transplantation.[4]

However, there are certain disadvantages to this approach. Extreme trauma, ischemia-reperfusion loss (IRI), graft dehydration, inadequate follicular storage solutions, and rapid transaction rates are a few examples of physiological impairment.[5]

A new advancement is an autologous replacement that can stimulate dormant hair follicles intradermally and as an additional treatment for the FUE technique.[6]

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* Corresponding author at: Dermatology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt.
E-mail address: yahyaragab1@gmail.com (Y. Z. Elsayed).

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The technique known as platelet-rich plasma(PRP-PRGF) stems from the recovery of a small volume of a patient's blood, which is subsequently activated and processed to create an autologous formulation with a higher concentration of proteins and growth factors. According to recent research, PRGF's bioactive molecules- produced during platelet activation- may encourage the growth of new hair and tissue renewal, offering a treatment alternative for hair follicle regeneration. The activation of extracellular signal-related kinase (ERK) and protein kinase B signaling occurs in response to the activation of platelet-derived growth factor (PDGF) and endothelial growth factor (EGF) in platelet-rich plasma (PRP). This activation leads to an upregulation of the ERK pathway and an increase in the transcription of genes involved in cellular proliferation and differentiation. It has been documented that this procedure stimulates the growth of dermal papilla (DP) cells.[7]

This study aims to comparecompare the effects of (PRP) and FUE hair transplantation alone and in combination for treating androgenetic alopecia.

2. Patients and methods

The time frame for this prospective study's execution was June 2019–March 2023. Forty patients ranging in age from 25 to 60 were eligible for FUE hair transplantation due to Androgenetic Alopecia (AGA) were included in the study. Every patient was chosen randomly from the dermatology and venereology department's outpatient clinics at Al-Azhar University Hospitals. After explaining the study's procedures, each subject provided permission to participate in the research. The study received approval from Al-Azhar University's scientific ethics committee.

2.1.Exclusion criteria: Patients younger than 25 years of age. Although they frequently seek advice, those with donor hair density <40 follicular units/cm2 are considered poor candidates; the tendency of scar formation, Uncontrolled systemic disorder (hypertension and diabetes mellitus), Bleeding tendency, Patients who were exposed to previous surgical procedures for hair transplantation, Patients with any associated local scalp infections, Patients with psychological trouble.

Two primary groups of patients were identified: Group 1: Hair transplantation using follicular unit extraction was the only method used to treat 20 patients. Group 2: Twenty patients underwent hair transplantation using follicular unit extraction and a 0.1cc PRP injection for each square centimeter of the recipient's scalp. The patients were followed up at 10, 1, 2, 3, and 6 months following surgery.

2.2.Methods:

Patients underwent a thorough history taking, a meticulous clinical examination, an assessment of their hair's color, texture, degree of curliness, and scalp laxity, as well as measurements of the donor and recipient surfaces. Photographic documentation was also provided.

Investigation: A CBC, coagulation profile, glucose level, liver function tests, renal function tests, ECG, hepatitis B, C, and HIV indicators.

2.3.Evaluation:

The post-operative evaluation was done using a bronchoscope and through patient questionnaires. Trichoscopic assessment of transplanted hair for detection of hair density, length, redness, and regrowth rate. Also, complications were recorded for proper evaluation of results, such as infection, no growth of grafts, and necrosis of the scalp at the donor or recipient.

2.4.Operative Technique:

The Turkish businesses Scarf & Ertip are our tools' primary source, including micro motors, straight handpieces, sharp punches, Jeweler's Micro Forceps (for extraction and implantation), needle holders, slitters, and blade knives No. 11.

A precise distance, ranging from 7 to 9 cm from the glabella, was chosen for the new hairline based on the patient's preoperative consultation and evaluation .Figure 1

Figure 1. Creation of hairline.

In order to obtain a post-operative natural aspect and appearance, the temple angles were preserved and the hairline was designed irregularly in both marking and overall steps of the operations.

Donor site: It should have a suitable density of hair on the back and sides of the scalp, and we avoided extraction of a higher level from the back of the scalp or a lower level on the nape for fear of future loss if implanted to the recipient areas which is called safe donor area.

2.5.Preparation of the patient:

The whole back of the head was shaved to a length of 1-2 mm on the day of the procedure. Washing of the scalp with betadine shampoo prior to surgical procedures. An intravenous line was maintained for every patient for emergencies and fluid administration during the procedure.

2.6.Anesthesia type:

Donor site anesthesia:

We made a 30 ml xylocaine 2% solution with 30 milliliters of normal saline containing adrenaline added (1:1000). We used an insulin syringe (30 G) needle with a gradual infiltration of injection for a painless procedure for the donor site's ring block. For a posterior occipital nerve probe block, we injected at the posterior hairline, reaching every layer of the scalp.

2.7.Recipient site anesthesia:

In order to administer the ring block at the recipient site, we produced an identical solution and injected it 3 cm on both sides of the supraorbital notch. This notch serves as the anatomical landmark for the exit of the supraorbital nerve, located around the pupil's midpoint. In addition, we dispersed the solution medially and laterally to the supraorbital notch when administering the injection to provide a thorough blockade of the supraorbital and supratrochlear nerves. We administered a hairline injection in the temporal region to obstruct the zygomaticotemporal nerve, achieving a comprehensive ringed block of the recipient location.

2.8.Procedure:

We used 0.85 mm diameter punches to harvest hair grafts to collect follicular units with sharp edges. First, we used an extraction jeweler, micromotor, straight hand piece, and punch. Then, after injecting the tumescent solution, we applied counter traction on the scalp with gauze during extraction to reduce the transaction rate.

During the operation, hair follicle grafts are stored in a storage solution (cold saline) and placed on gauze to keep them wet during the entire treatment. We marked the start of extracted grafts for starting with them at the start of implantation. We saved at least 25 grafts per 1 cm of the remaining capacity in the donor area. After finishing the extraction, we put the dressing in the donor area to keep it clean during the rest of the procedure.

Making recipient sites in the recipient region using a scalpel knife No. 11 on a needle holder or a blade width of around 1.1 mm. Recipient sites were created at a relatively acute angle at the line and then turned with a right angle when going back. Grafts are inserted using insertion jewelers.

Dressing: Depending on the location and their level of tolerance, their dressing was either concealed or revealed. The occlusive dressing was removed within 2-4 days following the surgical procedure.

Post-operative medication includes antibiotics, analgesics, and anti-edematous medications. Patients were instructed to avoid exercise in the first 10 days post-operatively. After 8 days, instructions were given for hair care and washing, and during this period, light saline sprays were used. To avoid itching at the donor site, antihistaminics were used if needed.

Starting of post-operative PRP injection regimen:

2.9.PRP preparation:

A blood sample from the patient is obtained at the time of therapy to make the PRP. Initially, 1 milliliter of sodium citrate for every 10 milliliters of blood was used to pull the sample into tubes holding anticoagulants. The entire plasma was separated from the RBCs during the first spin phase, which lasted for four to five minutes at 2500 rpm. Pure PRP (P-PRP) removes the outermost layer and the superficial buffy coat into an empty sterile tube. For 20 to 25 minutes at 3500 to 4000 rpm, the buffy coat was allowed to sediment during the second spin cycle, which generated PRP. The upper portion of the volume, mainly composed of platelet-poor plasma (PPP), is removed. Following a double centrifugation process, a 30-cc venous blood draw would provide 3-5 cc of PRP.

2.9.Statistical analysis: Version 24.0 of the Statistical Package for Social Science (SPSS) was used for the statistical analysis.

3. Results

Table 1. An explanation of each patient's demographic information under study.

		STUDIED PATIENTS (N = 40)	
AGE (YEARS)	Mean ±SD	32.7 ± 5.5	
	Min - Max	24 – 42	
AGA GRADE	Grade IV	8	20%
	Grade V	18	45%
	Grade VI	10	25%
	Grade VII	4	10%
DONOR AREA DENSITY BY TRICHOSCOPE	50 / cm²	4	10%
	70 / cm²	12	30%
	75 / cm²	8	20%
	>80 / cm²	16	40%
NUMBER OF GRAFTS	Mean ±SD	2295 ± 559.5	
	Min - Max	1600 – 3800	

With a minimum age of 24 years and a maximum age of 42 years, the mean age of all the patients under study was 32.7 ± 5.5 years. As regards AGA grade, there were 4 patients (20%) of grade IV, 9 patients (45%) of grade V, 5 patients (25%) of grade VI and 2 patients (10%) of grade VII in all studied patients. As regard donor area density by trichoscope, there were 2 patients (10%) of 50 cm2 density, 6 patients (30%) of 70 cm2

density, 4 patients (20%) of 75 cm2 density and 8 patients (40%) of >80 cm2 density in all studied patients. As regards number of grafts, the mean number in all studied patients was 2295 ± 559.5 with minimum number of 1600 and maximum number of 3800.

Table 2. Comparisons of 1st month assessment in studied patients.

1ST MONTH		ANDROGENIC ALOPECIA AGA				X^2	P-VALUE
		PRP (N = 20)		Non-PRP (N = 20)			
DENSITY	(1)	20	100%	20	100%	----	-----
LENGTH	(No)	2	10%	0	0%	1.05	0.304
	(1)	18	90%	20	100%		NS
REDNESS	(Yes)	20	100%	20	100%	----	-----
PATIENT SATISFACTION	Fair	20	100%	20	100%	----	-----
SURGEON SATISFACTION	Fair	2	10%	4	20%	17.3	< 0.001
	Good	0	0%	16	80%		HS
	Very good	18	90%	0	0%		
RATE OF REGROWTH		No	0%	No	0%	---	----
COMPLICATION (AT DONOR OR RECIPIENT)	No	16	80%	20	100%	2.2	0.136
	Yes	4	20%	0	0%		NS

We used an indicative grading system that went from 1 (less or poor) to 5 (full length or density) to assess hair density. Length ranged from 1 at the start of growing to 5 at the end. Less than 25 hair follicles per cm2, 25–30 hair follicles per cm2, 30-35 hair follicles per cm2, 35–40 hair follicles per cm2, and 4045 hair follicles per cm2 are the values observed in the first five cases. length and density, which were measured with a trichoscope or a surgeon's assessment.

As regard 1st month assessment, no statistically significant difference between PRP treated area and PRP not treated area as regard 1st month density, length, erythema, regrowth rate and patient's satisfaction. There was a highly statistically significant difference in surgeon satisfaction (p-value < 0.001) between the treated locations. extremely significant statistically (p-value < 0.001) lowered first-month problem rate (4 patients, 20%) in PRP-treated area compared to non-PRP-treated area (18 patients, 90%).

Table 3. Comparisons of 6th month assessment in studied patients.

6TH MONTH		ANDROGENIC ALOPECIA AGA				X^2	P-VALUE
		PRP (N = 20)		Non-PRP (N = 20)			
DENSITY	(2)	2	10%	2	10%	18	< 0.001
	(3)	0	0%	2	10%		HS
	(4)	0	0%	16	80%		
	(5)	18	90%	0	0%		
LENGTH	(2)	2	10%	2	10%	18	< 0.001
	(4)	0	0%	18	90%		HS
	(5)	18	90%	0	0%		
REDNESS	No	20	100%	20	100%	----	----
PATIENT SATISFACTION	Fair	2	10%	4	20%	0.392	0.531
	Very good	18	90%	16	80%		NS
SURGEON SATISFACTION	Good	2	10%	4	20%	17.3	< 0.001
	Very good	0	0%	16	80%		HS
	Excellent	18	90%	0	0%		
RATE OF REGROWTH		Yes 20	100%	Yes 20	100%	----	----
COMPLICATION (AT DONOR OR RECIPIENT)	No	18	90%	20	100%	1.05	0.305
	Yes	2	10%	0	0%		NS

When it came to the sixth month assessment, the group receiving PRP overall the non-PRP group in androgenic hair loss showed an extremely significant differential (p-value < 0.001) in terms of weight, length, and surgeon satisfaction.

Between the PRP group and the non-PRP group with androgenic alopecia at six months, there was no statistically significant difference (p-value>0.05) in redness, patient satisfaction, complications, or rate of regrowth.

Table 4. Comparisons of 9th month assessment in studied patients.

9TH MONTH		ANDROGENIC ALOPECIA AGA				X^2	P-VALUE
		PRP (N = 20)		Non-PRP (N = 20)			
DENSITY	(2)	0	0%	2	10%	18	< 0.001
	(3)	2	10%	2	10%		HS
	(4)	0	0%	16	80%		
	(5)	18	90%	0	0%		
LENGTH	(2)	0	0%	2	10%	18	< 0.001
	(4)	2	10%	18	90%		HS
	(5)	18	90%	0	0%		
REDNESS	No	20	100%	20	100%	----	----
PATIENT SATISFACTION	Fair	2	10%	4	20%	0.392	0.531
	Very good	18	90%	16	80%		NS
SURGEON SATISFACTION	Good	2	10%	4	20%	17.3	< 0.001
	Very good	0	0%	16	80%		HS
	Excellent	18	90%	0	0%		
RATE OF REGROWTH		Yes 20	100%	Yes 20	100%	----	----
COMPLICATION (AT DONOR OR RECIPIENT)	No	20	100%	20	100%	1.05	0.305
	Yes	0	0%	0	0%		NS

At nine months, there was a highly significant difference (p-value<0.001) between the PRP group and the non-PRP group in terms of androgenic alopecia density, length, and surgeon satisfaction.

Between the PRP group and the non-PRP group with androgenic alopecia at nine months, there was no statistically significant difference (p-value>0.05) in redness, patient satisfaction, complications, or rate of regrowth.

Trichoscopy assessment was used to examine the study's outcomes, which showed that after androgenic alopecia, patients' conditions significantly improved early on. One of the improvements was a reduction in the amount of time required for wound and soft tissue healing after surgery. Additionally, the PRP therapy group saw a considerable rise in length and density .Figure 2

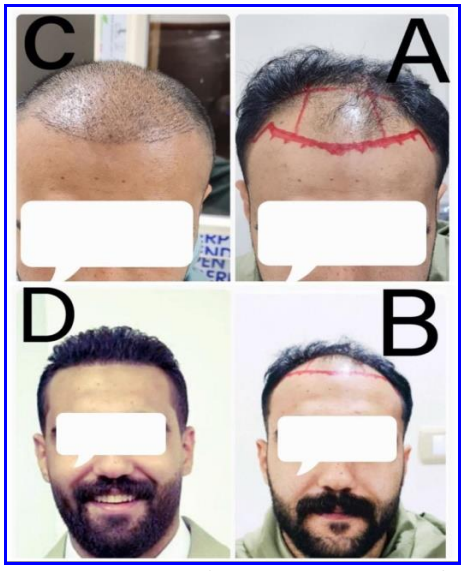

Figure 2. A, B: Before FUE. C, Ten days after FUE. D, Nine months after FUE.

Table 5. Post-operative complications of FUE hair transplantation of androgenic alopecia.

	ANDROGENIC ALOPECIA				
	PRP (N = 20)		Non-PRP (N = 20)		p-value
INGROWING HAIR	2	10%	2	10%	< 0.001 HS
NO GROWTH OF HAIR FOLLICLE	0	0%	0	0%	
ALOPECIA OR DECREASED DENSITY AT DONOR	2	10%	2	10%	< 0.001 HS
INFECTION AT DONOR OR RECIPIENT	0	0%	2	10%	< 0.001 HS

Compared to other groups, PRP starts growing hair earlier, and by the sixth month, there is no statistically significant difference. However, a year's worth of noteworthy follow-up data shows that there is no difference in androgenic alopecia between those who received PRP treatment and those who did not.

Issues were noted. At the sixth and ninth months of androgenic alopecia, there was no statistically significant difference (p-value > 0.05) observed in the growth of hair between the PRP group and the non-PRP group. No hair follicle growth, alopecia or decreased density at the donor, and infection at the recipient or donor.

4. Discussion

Our study confirms the findings of the earlier research on the learning curve of newly hired surgeons at Al-Azhar University Hospitals, which was published by Rassman et al. reducing the total amount of time needed for either extraction or implantation and guaranteeing the quality of the grafts obtained were the main obstacles.

Furthermore, handling grafts is a severe challenge to getting better results since it can increase the risk of overheating and transaction rate, both of which can damage the tissue.[8]

FUE mega sessions are characterized by FUE graft counts exceeding 2000 in a Caucasian individual with average hair density. Accordingly, an average FUE mega session for an Asian would involve 1600 grafts, whereas an average session for an African would have 1200 grafts. Many physicians discover that they are laboring in the "non-permanent zone" of the donor region when the frequency of extractions rises to obtain the number of grafts that the recipient area needs.[9]

We noticed that to achieve a good result, mainly in patients with androgenic alopecia, we should harvest grafts with mega sessions. More than 1500 grafts would be enough to get a good density with 45 to 50 hair follicles in 1 cm2.

In order to harvest the hair follicles without causing harm to the follicular capsule or the hairs within it, it is necessary to employ highly sharp punches. These punches should only dissect the upper portion of the follicular unit (FU) within the first 3-4 mm before the graft splay becomes a concern. Furthermore, the angle should deviate by no more than 5% from the actual upper 3-4 mm graft shaft angle. If a sharp punch is inserted below the top 3-4 mm follicular unit, some dispersed follicles will be severed. The lower portion of the follicular unit is extracted using a gentle pulling force, causing the lower hairs to come closer together.[10]

Accuracy and speed are the two critical components of FUE success, and they are via practice and time. Since graft harvesting in FUE is a blind process, unlike the strip method (FUT), graft damage during punching is frequent.[11]

In agreement with Saxena et al., An observer reported a reduction in skin atrophy in the areas with scar tissue and an improvement in the

quality of the scarred tissue after transplantation, thanks to the inclusion of PRP treatment. This can be attributed to the activity of the PRP, as well as the neovascularization and dermal remodeling of the transplanted hair itself.[12]

PRP treatment following hair transplantation helps restore density more quickly and shorten the recovery time following cicatricial alopecia; however, FUE hair transplantation is ineffective in cases of androgenic alopecia.[13]

Compared to other groups that did not get PRP therapy, our study's findings show that adding PRP therapy to a patient's regimen resulted in early increases in patient satisfaction regarding hair density and length.

After a year of follow-up, we found that PRP injections alone are not enough to provide the best results from FUE hair transplantation for scalp baldness. Other factors that also matter include handling, storing, harvesting procedures, and the overall duration of the procedure.

4. Conclusion

Following hair transplantation, PRP therapy improves the amount and quality of newly growing hair. Furthermore, it expedites skin repair and lessens catagen loss in hair transplants.

Disclosure

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