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Comparison between Monofilament Threads and Platelet Rich Plasma in Treatment of Androgenetic Alopecia

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Abstract

Background: Androgenetic alopecia is a leading dermatology clinic complaint. Perceptions by others can have a major psychological impact on sufferers. The disease causes hair follicle shrinking. In this complex disease, androgens, genes, and environment contribute. **Objectives:** This study compares monofilament threads versus platelet-rich plasma intradermal injection for AGA therapy efficacy and safety. **Method:** in this randomized clinical trial, we enrolled 15 male and 15 female patients diagnosed androgenetic alopecia. Left and right sides of each patient's head were cleaned with 70% alcohol without local anesthesia. In three 30-day intervals, 0.2 mL·cm−2 interfollicular A-PRP injections were administered to the left side of the scalp at a depth of 5 mm, the patient received right-sided monofilament threads. **Results:** Male participants averaged 21–36 years old. Onset averaged 17–32 years old. All instances had positive family histories and progressive illness onset. PRP significantly increased hair density and diameter after intervention compared to monofilament. PRP considerably increased hair diameter and density more than monofilament. Sex had no significant effect on follow-up hair density, diameter, or percent increase in

monofilament or PRP groups. After 3 months, PRP monofilament group patients' age and hair density correlated linearly negatively. **Conclusion:** In terms of facilitating hair repair, PRP and PDO seem to be a risk-free therapy with great promise. When comparing the two treatments, PRP dramatically improved hair density and thickness compared to PDO thread implantation.

1. Introduction:

Chemical, genetic, and androgenetic factors are among the many potential causes of alopecia, a common chronic skin condition. The most prevalent type of AGA is the one caused by androgen metabolism. We are currently searching for a safe and effective anti-AGA drug to address the high frequency of AGA and the lack of a cure [1]. For both sexes, the most common cause of hair thinning is androgenetic alopecia. As hair follicles gradually decrease, the terminal follicles transform into hair that resembles vellus. Anagen length and the ratio of anagen to telogen are both decreased by follicle shrinking [2]. While dealing with AGA, two primary goals should be met. Stop more hair loss before anything else. Second, there is noticeable hair growth once again. They can get thicker hair by making each hair follicle bigger [3]. Although it may record unwanted side effects, the FDA, USA has only authorized finistride and minoxidil [4]. This highlights the importance of exploring additional, equally effective, and safer treatments for AGA [5]. Finistride, Alfa Estradiol, Cyproterone Acetate, Spironolactone, flutamide, minimal supplements, surgical therapy, platelet-rich plasma, and low-level laser therapy are all potential treatments for AGA [6]. Androgenetic alopecia (AGA) can now be treated using platelet-rich plasma (PRP), a novel, office-based procedure that is both effective and safe. Platelet-rich plasma (PRP) is a type of growth factor made from autologous blood acquired through venipuncture. The areas of hair loss can be stimulated to produce new hair by injecting this concentrated combination of growth factors [7]. As an alternative to surgical face and body lifts, thread lifts are utilized in aesthetic dermatology. In TET, threads are embedded in skin imperfections during a dermal needling treatment. In 2017, Bharti et al. [8] introduced Polydioxanone (PDO) scalp threading as a novel, secure, and successful method for hair restoration. A synthetic suture that can be absorbed is made of polyester and poly(p-dioxanone) filament. Very malleable, strong retention, hypoallergenic, and slowly absorbed (6-8 months). Contamination by bacteria or disease is not an issue. For non-invasive face lifts, threads produce

neocollagenosis in two to three weeks, and the results last for two to three years. There are threads that are barbed or screwed, but we went with monofilament [9]. There is currently no recognized mechanism by which PDO threads promote hair growth. It has the potential to stimulate stem cells directly in the hair bulge area, release growth factors like PDGF, and enhance gene expression relevant to hair, much as microneedling [10].

It has been discovered that AGA can benefit from combining threads with PRP [11]. Persistent foreign body reaction causes threads and sutures to produce neocollagenosis and enhance microcirculation. Hair can grow on any of these systems. A sustained-release GF paradigm is provided by threads, which operate as a natural scaffold for autologous growth factors (GFs) in PRP [8]. This can reduce the frequency of PRP injection to every three to six months rather than monthly, and the two treatments work together effectively. Although it may be essential to repeat the procedure at 6 months for the combination to be effective, this could lead to fibrosis and affect the patient's chances of getting a hair transplant in the future [12]. This study aimed to assess the efficacy and safety of intradermal injections of platelet-rich plasma vs monofilament threads (PDO) in the treatment of AGA.

2. Patients & Methodology:

2.1. Ethical Consideration: The ethical committee of FM-BSU REC gave its approval to conduct the current study on 1st of February 2023, approval number: (FMBSUREC/01022022/Hassan). Every patient gave written informed consent before participating in this study after the goals were explained. Database confidentiality was maintained.

2.2. Patients:

This study was a randomized clinical trial**,** enrolled 30 patients 15 male and 15 female patients clinically diagnosed by trichoscopy examination with androgenetic alopecia. Patients with mild to severe AGA (Male patients according to Hamilton Norwood Scale and Female patients according to Lawdig Scale) were included in the study while those with positive history of bleeding or platelet disorder, with positive history of surgery for alopecia (hair transplantation), with presence of any acute infection such as respiratory tract infection, urinary tract infection, with HIV, HBsAg, or any chronic illness and pregnant females were excluded.

2.3. Methods:

Symptoms manifest gradually after adolescence when there is a history of mental illness, sadness, or baldness in the family. When trying to diagnose androgenetic alopecia or other forms of hair loss, it is important to look into the patient's medical history, current

medications, and any systemic or topical treatments they may be taking. We recorded the dosage, duration, and rationale for each medication. Various laboratory tests, including thyroid, complete blood count, screening for iron deficiency, and dermoscopy and dermatological evaluations.

Productive red blood cell (PRC) therapy begins with a blood sample. From 30 cc of venous blood, three to five cc of platelet-rich plasma (PRP) can be extracted, depending on the patient's initial platelet count, the apparatus used, and the specific operation. In order to avoid platelet activation prior to blood drawing, an anticoagulant such as citrate dextrose A is used. A specialist "table top cold centrifuge" is utilized by the writers. Compared to commercial kits, there are much lower preparation expenses.

After dividing the skulls of each patient in half, we rinsed them with 70% alcohol (no local anesthetic) to remove any debris. An Ultim cannon (Anti-Aging Medical Systems, Montrodat, France) with a 30-gauge, 10 mL Luer lock syringe was used to inject 0.2 mL·cm−2 of interfollicular A-PRP into the left side of the scalp at a depth of 5 mm over the course of three 30-day intervals. Injections of A-PRP were administered to the frontal scalp of patients experiencing frontal and parietal hair loss, whereas injections of physiological saline, a placebo, were administered to the parietal regions. Similarly, patients experiencing hair loss in both the parietal and vertex regions were given APRP to treat the parietal area and a placebo to treat the vertex area. The dosages of A-PRP and placebo were administered in an equal proportion [13].

Using PDO Threads: The patient's skull would be divided in half lengthwise. Monofilament threads with the correct side facing the patient would be administered. Polydioxanone threads (PDO) were radially injected in the intradermal plane with equal spacing after a local lidocaine injection was administered at the needle entrance position. The dermatologist used their non-dominant hand to pull the scalp skin taut, and then they used their dominant hand to insert the needle into the medium to deep dermis at the specified place. Once the needles were extracted, the PDO threads were left intact [14]. The number of threads given to each patient ranged from five to nine, based on the size of the vertex or front of the scalp afflicted by androgenetic alopecia. It was a three-session program. Korean polydioxane monofilament. This is a 27GX50MM/5-0 lens with an 80MM lens. Code: GMP-YRN27-02-G. For every patient's scalp, a different thread treatment was selected. Five days of oral antibiotics and a gentle wash after 48 hours were recommended **[14].**

2.4. Trichoscopic Evaluation, Assessment and follow-up

The patient's diagnosis, evaluation, and assessment were carried out using a dermoscopy (Dermlite Hud) attached to a phone, which has a 10x magnification. Key

criteria included more than four yellow patches in the frontal region, a lower hair thickness in the frontal region compared to the occipital region (where at least 50 hairs per area were assessed), and more than 10% of thin hairs (<0.03 mm). As long as the ratio of isolated hairs per follicular unit in the frontal and occipital areas is greater than 2:1, minor criteria were considered. The ratio of fine hair on the front and sides of the head is greater than 1.5:1. The ratio of hyperpigmented follicles in the front and the occipital regions is greater than 3:1.

Three times a month, one session was conducted. For three months, there was a trichoscopic evaluation and follow-up at each visit. We shifted Kang's point to the right and left by 5 cm, where the mid-sagittal line and the coronal line connecting the tragus points meet. Severe side effects such as redness, swelling, infection, dryness, and itching were monitored on a monthly basis. Three months after scalp threading, a blinded dermatologist compared baseline photos to dermoscopy images taken three months later. Hair shaft diameter (hair thickness), diversity, quantity of hairs arising from follicular units, dermoscopy changes, and other similar metrics are used for evaluation.

2.5. Analysis and statistics:

Statistical Package for the Social Sciences, Version 25, was used to review, code, tabulate, and import the data acquired into a personal computer. Each parameter's data type informed the presentation and analysis of the resulting data.

3. Results:

Baseline data:

Table (1) demonstrates the baseline sociodemographic and clinical data. This study included 30 cases with androgenetic alopecia. All cases had positive family history of androgenetic alopecia and all cases had no comorbidities such as diabetes and hypertension. All cases had gradual onset of the disease, study participants' age was 29.2±4.8 years and ranged from 21 to 36 years. Half of the participants were males and half of them were females.

Participants' age of disease onset was 26.6±4.5 years and ranged from 17 to 32 years. Most of cases had a frontal distribution (70%) and only 30% of cases had fronto-occipital distributions. The mean hair density before the intervention was 108.8±4.6 /cm2 and ranged from 100 to 115. The mean hair diameter before the intervention was 43.5±1.7 micrometer and ranged from 40 to 46.

Table (1) demonstrates the baseline sociodemographic and clinical data; (N= 30):

	Item	Statistics
Age (Years)	Mean ±SD	29.2±4.8
	Median (Min-Max)	30(21-36)
Sex	Male	15 50.0
	Female	15 50.0
Age At Onset	Mean ±SD	23.6±4.5
	Median (Min-Max)	23(17-32)
Distribution	Fronto-Occipital	9 30.0
	Frontal	21 70.0
Hair Density	Mean ±SD	108.8±4.6
	Median (Min-Max)	110(100-115)
Hair Diameter	Mean ±SD	43.5±1.7
	Median (Min-Max)	43.5(40-46)

Effect of the monofilaments and PRP on the studied patients

Table (2) demonstrates a comparison between monofilaments and PRP after the intervention. The mean hair density after the intervention was significantly higher in the PRP group than the monofilament group (Figure-1). The mean hair diameter after the intervention was significantly higher in the PRP group than the monofilament group (Figure-2). The mean hair diameter and hair density percentage of increase was significantly higher in the PRP group than the monofilament group (Figures-3 and 4).

Table (2): Comparison between monofilaments and PRP after the intervention; (N= 30):

	Number/cm^2	Monofilaments (no=30)	PRP (no=30)	P-value
Hair density	Mean ±SD	130.3±6.3	141.6±6.2	<0.001*
	Range (min-max)	120-140	130-150	
Hair diameter	Mean ±SD	57.9±6.4	90.0±4.5	<0.001*
	Range (min-max)	45-65	85-100	
Hair density Percent of increase (%)	Mean ±SD	19.8±2.4	30.2±3.7	<0.001*
	Range (min-max)	12.6-23.5	22.5-36.1	
Hair diameter Percent of increase (%)	Mean ±SD	32.7±11.24	106.8±8.0	<0.001*
	Range (min-max)	6.9-48.8	93.2-127.9	

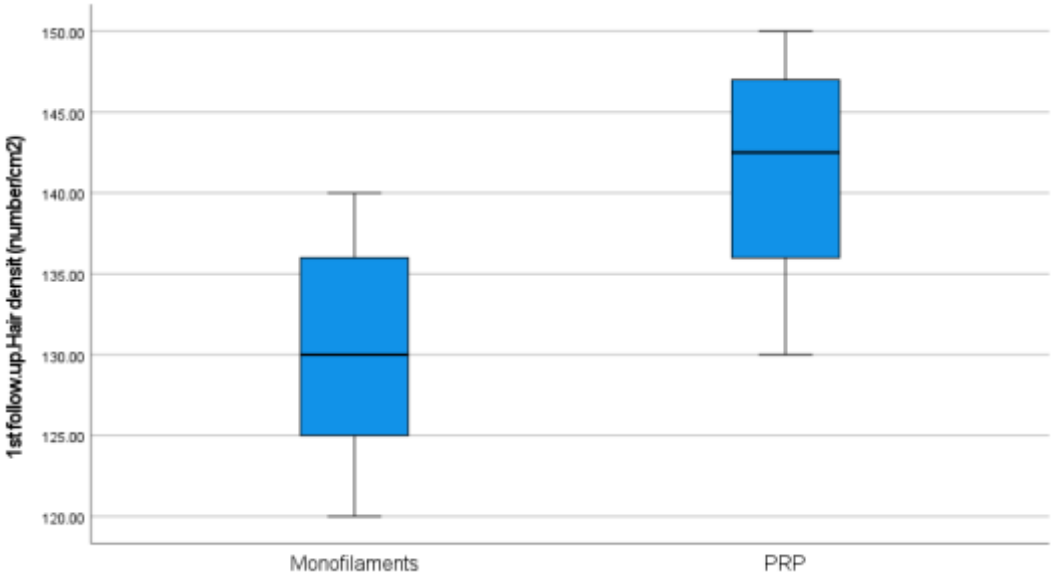

Figure (1): Comparison between monofilaments and PRP on Hair density during follow up

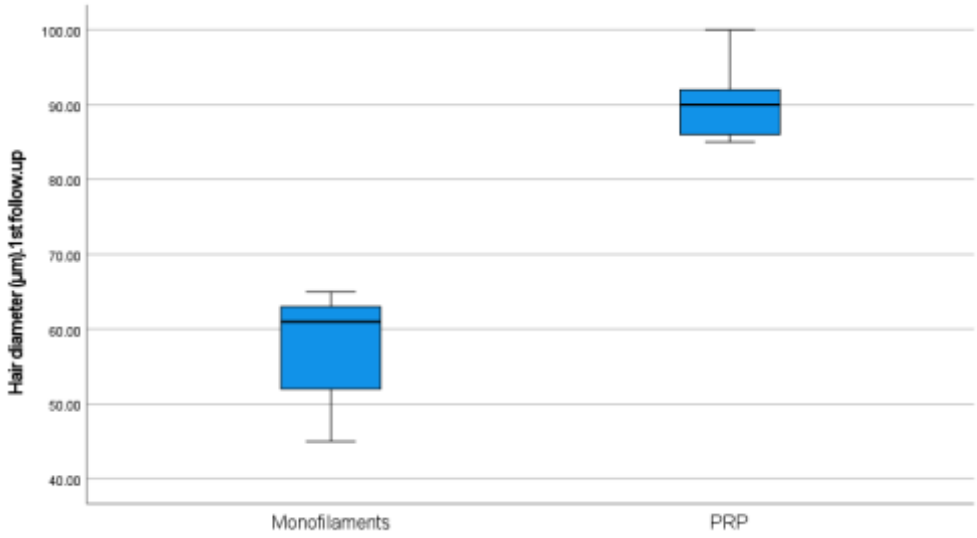

Figure (2) Comparison between monofilaments and PRP on Hair diameter during follow up

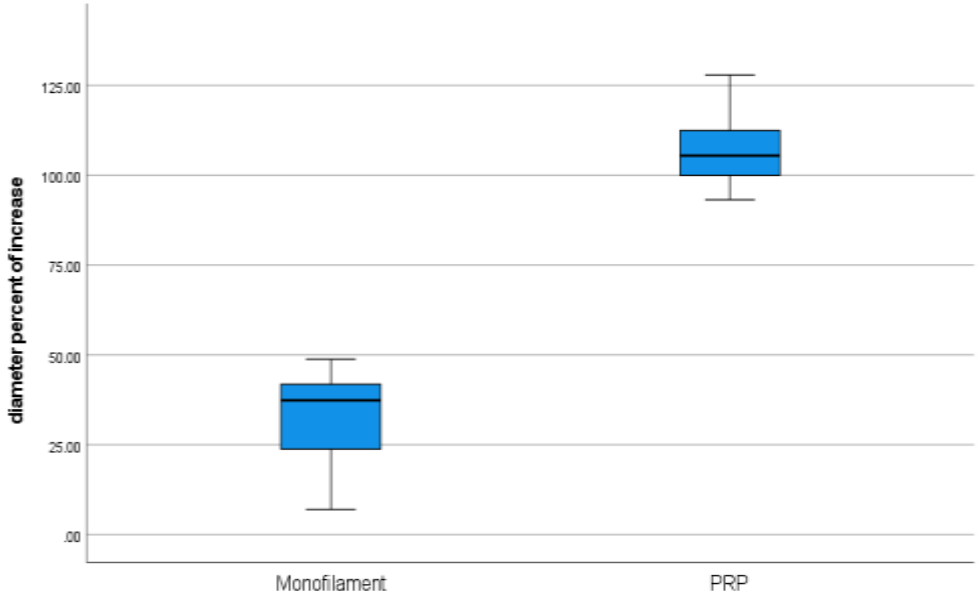

Figure (3) Percent of increase of hair diameter in both groups

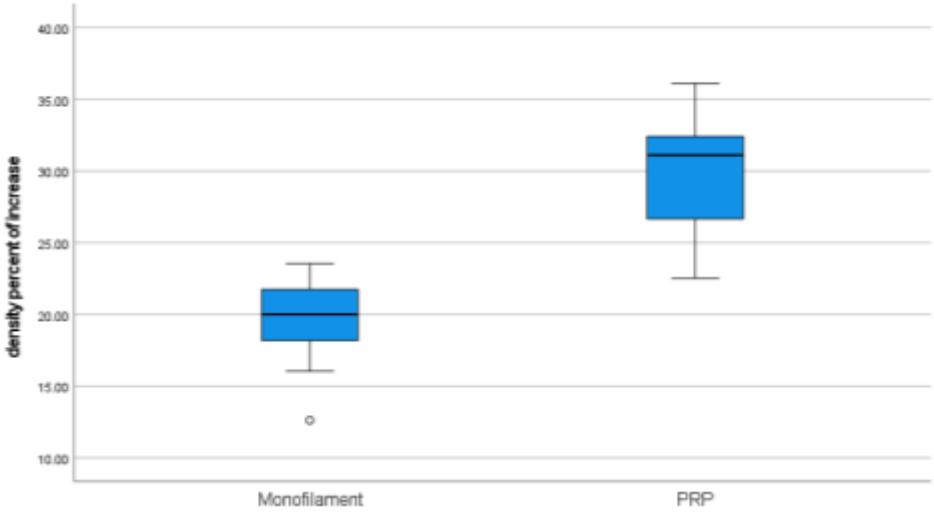

Figure (4) Percent of increase of hair density in both groups

Relation between sex with hair density and hair diameter at follow up and their percent of increase in both studied groups showed non-statistically significant associations (p-values >0.05).

Table (3) illustrates the correlation between age & age of onset with hair density and hair diameter at follow up and their percent of increase in both groups. There was a significant linear negative correlation between patients age and hair density after 3 months of follow up in monofilament group. At the same time, there was a significant linear negative correlation between patients age and hair diameter after 3 months of follow up in PRP group. Other parameters showed non-statistically significant correlations.

Table (3): correlation between age & age of onset with hair density and hair diameter at follow up and their percent of increase in both groups.

	Monofilament Group			PRP Group		
		Age	**Onset**		**Age**	**Onset**
Hair density after 3 months (number/cm2)	r	-0.362*	-0.140	r	-0.160	0.999
	P-value	0.049	0.463	P-value	0.399	0.999
Hair diameter (µm) after 3 months	r	-0.310	-0.170	r	-0.475**	-0.320
	P-value	0.093	0.375	P-value	0.008	0.090
Density % of increase	r	-0.180	-0.060	r	0.256	0.210
	P-value	0.355	0.769	P-value	0.171	0.266
Diameter % of increase	r	-0.290	-0.160	r	-0.338	-0.270
	P-value	0.115	0.397	P-value	0.068	0.156

4. Discussion:

Androgenetic alopecia is a common condition in modern dermatology, affecting a large number of young men. This condition can cause worry and despair since it distorts their perception of their body. The elderly are not immune to these behavioral problems. So, dermatology necessitates further research, particularly the creation of new medications [15].

Plasma rich in platelets (PRP) is the result of platlet concentration from whole blood.Regeneration of tissues, bones, and wounds is facilitated [16], [17]. Hair cycle anagen extension, cell survival and proliferation, and hair growth may all be improved with PRP.Platelet-rich plasma has the potential to treat androgenetic alopecia (AGA) by nourishing the scalp and hair follicles with concentrated growth factors [18]. The application of dissolvable sutures made of polydioxanone (PDO) threads can renew and lift skin that has sagged. Androgenetic alopecia is a form of hair loss that has recently been treated with PDO threads for both men and women. Those who did not see results from FDA-approved treatments (such as finasteride or minoxidil) were able to stimulate hair growth through scalp threading [14]. The researchers Cervantes et al. and Gentile et al. discovered that compared to placebo-treated people, patients treated with PRP experienced a significantly greater average change in hair density ($p < .0001$) [19], [13]. Per Surowiecka et al., PRP treatment for androgenetic alopecia significantly increased hair density at 6 and 12 weeks post-injection ($p = 0.013$ and $p < 0.001$, respectively) [20]. Another noncontrolled study of 22 patients found that after 3 months of PRP treatment, total hair density had increased from 143.1 to 170.7 hairs/cm2 [21]. Navarro et al. [22] recently discovered enhanced hair density. Our findings are in line with those of Alves et al., who investigated the efficacy of platelet-rich plasma (PRP) in the treatment of alopecia areata (AGA) and found that PRP had a beneficial impact on the disease, suggesting that it could be used as an adjuvant therapy for AGA [23]. Another Italian investigation by Starace et al. corroborated our findings. This study's findings demonstrated that platelet-rich plasma (PRP) injection improved hair density and diameter [24]. Pakistan was the site of Butt et al.'s 2018 research. Thirty AGA patients participated in the study by receiving PRP. The duration of patient monitoring was 6 months. The initial visit, which was before treatment, revealed a hair density of 34.18 ± 14.36/cm. The result increased to 50.20 ± 15.91/cm2 ($P < 0.05$) following 6 months of treatment [25]. Our findings are at odds with those of Wong et al., who found that platelet-rich plasma (PRP) injections are a contentious method of treating alopecia. Despite claims of thicker hair follicles and denser hair, the majority of research have failed to find any statistically significant

results. Even today, this method of hair regeneration is divisive [26]. Additionally, 25 male patients with AGA were treated with PRP or placebo in a randomized placebo-controlled crossover trial conducted by Dicle et al. Baseline, 4th, and 9th month TrichoScan measures were taken. The follow-up exams in group 1 did not reveal any statistically significant increase in hair growth [27]. It is worth noting that patient satisfaction was observed even in the three randomized controlled PRP trials that did not find any improvement after PRP injections [28-30]. Also, men suffering from AGA will not see an improvement in hair growth after receiving PRP alone, according to Gressenberger et al. The observed difference in PRP results could be attributed to several factors [31]. It is difficult to assess the therapeutic effectiveness of PRP due to study design, although it seems to help at least some AGA patients. There is yet no workable clinical protocol. Some areas that could use some improvement are PRP preparation, the technique of distribution, the treatment schedule, and the efficacy of combination therapy. The concentration of white blood cells, neutrophils, and red blood cells are all impacted by separation systems, in addition to platelets [18]. Given the present paucity of evidence, it is imperative that PRP and a standardized treatment regimen for its administration undergo additional evaluation in a sizable, randomized, placebo-controlled, multicenter trial [31]. End result: The range of mean hair diameters was 40 to 46 mm, while the range of mean hair densities was 100 to 115 mm, with a standard deviation of 4.6 cm2. The average hair density after the monofilament intervention was 130.3±6.3 (range 120-140), according to the results. With a range of 45-65, the average hair diameter after monofilament intervention was 57.9±6.4. Androgenetic alopecia patients report an increase in hair density after "threading" their scalps with absorbable polydioxanone (PDO) filament grids, which is consistent with our results [26]. Twelve weeks of using polydioxanone resulted in a statistically significant increase in hair density and thickness, according to Bharti et al. According to investigator-evaluated GPI (40%-75%; average 57%), trichoscopic hair count increment (48-93 HFU/cm2), and VAS ranging from 4 to 8 patient satisfaction, all patients witnessed considerable increases in hair count [8].

Furthermore, Metwalli et al. found that hair mass index and hair count were both significantly improved using monofilament threads [11], [32]. As a last point, Sliwa et al. [15] noted that threading the scalp with PDO threads can increase the overall hair count. The percentage increase in hair density and mean hair diameter in the PRP group was much greater than in the monofilament group. As far as we are aware, this is the initial investigation to compare intradermal injections of platelet-rich plasma with monofilament treatment for

AGA. That rust is a very important symptom. After three months, older individuals in the monofilament & PRP group had a linearly negative correlation with hair density. We think this is the first study to examine the age and hair density of people treated with monofilament and PRP three months later. Our research shows that the effectiveness of both treatments declines with age. This may be because the platelet concentration in PRP is three to eight times higher than that in normal peripheral blood (range 150.000-350.000 uL), which could account for our findings. Platelets secrete several growth factors from their Alpha-granuli25 after activation, a process that can continue for days.27 Platelet-rich plasma (PRP) comprises plasma and more than 20 growth factors, such as thrombin—a protein with biological and adhesive characteristics—, PDGF, TGFb, FGF-2, VEFG, EGF, IGF-1, and many more.28 PRP also elevates levels of growth factors [33].

5. Conclusions:

With few side effects, platelet-rich plasma injection for local hair restoration in androgenetic alopecia patients increases hair number and thickness. PRP looks to be safe and effective for hair restoration. Increasing hair density and thickness using PDO threads therapy improved androgenetic alopecia patients. For hair thickness and density, PRP was much more successful than PDO thread implantation.

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Availability Of Data And Materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request .

Declarations:

Ethics approval and consent to participate. The Research Ethical Committee of Faculty of Medicine, Beni-Sueif University, has given the approval on conducting the present research.

Consent For Publication:

The written informed consent was obtained from all patients prior to the study.

Competing Interests:

The authors declare that they have no competing interests.

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