



OUTCOME OF IMMEDIATE POST-OPERATIVE INJECTED PLATELET-RICH PLASMA THERAPY AFTER FOLLICULAR UNIT EXTRACTION HAIR TRANSPLANT: A PROSPECTIVE RANDOMISED STUDY IN FIFTY PATIENTS

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ABSTRACT

Aims and Objectives: The objective of this study was to study efficacy of injectable PRP therapy in follicular unit extraction (FUE) hair transplant. **Method:** It is a prospective randomised study on 50 FUE hair transplant subjects, allocated in two groups (PRP and non-PRP) alternately. PRP was injected immediately post-operatively over the recipient area in PRP group; and normal saline in non-PRP group. Two groups were evaluated at 3, 6 and 9 weeks, 3 and 6 months of the procedure.

Statistical analysis: It was done using Chi-square test and test of significance was set as $P < 0.05$.

Results: In PRP group, all subjects had $>75\%$ hair regrowth at 6 months, density of $>75\%$ grafts was noticed in 15 patients at 6 weeks meaning reduced fall of transplanted hair during catagen phase. New hair growth started at 8 weeks in 12 patients and redness over recipient area completely disappeared in 20 patients at 3 months of surgery and activity in dormant follicles as fine thread like hair was noticed besides the thick transplanted hair in all subjects. In non-PRP group, five patients had $>75\%$ hair regrowth at 6 months and none showed $>75\%$ graft density at 4 weeks.

Conclusion: Intra-operative PRP therapy is beneficial in giving faster density, reducing the catagen loss of transplanted hair, recovering the skin faster and activating dormant follicles in FUE transplant subjects.

KEYWORDS

INTRODUCTION:

Androgenic alopecia is a genetic condition that can affect both men and women. Men with this condition, called male pattern baldness, can begin suffering hair loss as early as their teens or early 20s. It is characterized by a receding hairline and gradual disappearance of hair from the crown and frontal scalp. In hair follicles, reduction in the anagen phase of hair cycle leads to the entry of hair earlier into the telogen phase.[1,2] Platelet-rich plasma (PRP) helps in tissue augmentation by activating platelets and releasing large amounts of platelet-derived growth factors (PDGFs) which act on stem cells of the follicles, stimulating the development of new follicles and promoting neovascularisation.[3,4,5] By taking this clinical significance of PRP, this study was planned for evaluation of PRP in growing and healing hair immediately after follicular unit extraction (FUE) hair transplant.

MATERIALS & METHODS:

Patient Selection:

A total of fifty patients were randomised alternately into two groups of twenty five patients each which were enrolled on the basis of inclusion and exclusion criteria.

Inclusion Criteria

- Male patients in the age group of 18–55 years willing to give informed consent
- Patients with androgenic alopecia (AGA) Stage III–VII Hamilton–Norwood classification
- Patients who had not taken any form of treatment for AGA, at least in the past 3 months.

Exclusion Criteria

- Patients with alopecia other than AGA such as alopecia areata, alopecia totalis and acquired cicatricial alopecia.
- Patients with history of autoimmune disorders, bleeding disorders, psoriasis or lichen planus.
- Patients on anticoagulant medications-aspirin, warfarin, heparin.
- Patients with active scalp infections.
- Known HIV, hepatitis B or C positive or otherwise immune-compromised patients.

Technical Information:

While conducting study treatment, one of the two groups received injectable PRP immediately after the transplantation, and other group of the subjects received normal saline. [6]

Platelet-rich plasma application procedure:

PRP was freshly prepared while the grafts were being implanted. After implanting was over, 0.3–0.4 ml PRP was injected through insulin

syringe at a gap of 1 cm each to the depth of dermis and subcutis in recipient areas of freshly transplanted patients. In comparison, non-PRP group received normal saline instead of PRP.

Efficacy evaluation criteria:

Efficacy of PRP was evaluated in terms of change in hair density (percentage of number of grafts at a given time $<25\%$, $25\text{--}50\%$, $50\text{--}75\%$ and $>75\%$), type of grafts, impact of healing process by appearance and recovery from scalp redness, texture and thickness of hair at the end of 3 weeks, 6 weeks, 9 weeks, 3 months and 6 months.

Each patient was photographed with clinical images and videos, keeping identity confidential and data were evaluated independently.

Pre-operative evaluation:

All the enrolled patients were evaluated for laboratory parameters such as fasting plasma sugar, liver function tests, renal function tests, HbA1c, complete haemogram including platelet count, along with anti-HIV, anti-hepatitis C virus and anti-HBsAg before the initiation of transplant procedure.

METHODOLOGY:

All the patients were given detailed pre- and post-operative instructions. Only scalp hairs were harvested. Transaction rate during harvesting was 7–9%. While doing implantation, only the grafts with intact roots were implanted.

The follicles were kept moist in chilled normal saline and stored inside refrigerator at $5\text{--}8^\circ$ centigrade till implantation. The follicles were implanted within 5 hours of harvesting in both the groups and the roots were not fiddled with while implantation. The density of implantation was kept at $35\text{--}40$ grafts/cm² in both groups using multipronged slitter [disposable 18G needles and wire holding forceps.]

Statistical analysis was done through Chi-square tests and test of significance were set as $P < 0.05$ significant and <0.01 as highly significant.

RESULTS

A total of fifty male patients befitting the inclusion and exclusion criteria of the study were enrolled and evaluated. All the patients were suffering from male pattern of alopecia. (Table 1)

Table 1

Hamilton-Norwood classification of alopecia

PRP Group (n=25)	Non-PRP Group (n=25)
Grade III – 6	Grade III – 10

Grade IV – 8	Grade IV – 8
Grade V – 5	Grade V – 5
Grade VI – 5	Grade VI – 2
Grade VII – 1	Grade VII – 0

PRP: Platelet-rich plasma

None of the enrolled patients had undergone hair transplant previously or was on any kind of hair regrowth therapy for last 3 months. The impact of PRP treatment on follicle growth, type of grafts, activity of dormant follicles and redness on scalp were evaluated [Table 2]

Table 2

Master chart with variables and result

	PRP Group (n=25)				Non-PRP Group (n=25)			
	6 weeks	9 weeks	3 months	6 months	6 weeks	9 weeks	3 months	6 months
Transplanted follicles in growing phase (%)								
>75	15	2	3	25	0	2	2	5
50-75	4	8	21	0	7	1	8	20
25-50	3	12	0	0	9	9	10	0
<25	3	3	0	0	9	13	5	0
Number of grafts								
Multiple	19	18	25	25	10	7	15	5
Single	6	7	0	0	15	18	10	20
Texture of hair								
Straight	25	25	25	25	25	25	25	25
Curl	0	0	0	0	0	0	0	0
Thickness								
Coarse	25	25	25	25	24	24	24	24
Fine	0	0	0	0	1	1	1	1
Redness								
Yes	25	17	5	0	23	19	10	5
No	0	8	20	25	2	6	15	20

PRP: Platelet-rich plasma

Follicle growth

Follicle growth means percentage of grafts in actively growing phase at the time of inspection. Clinical images at 3 weeks post-transplant served as 100% reference density as the transplanted follicles were actively growing at 3 weeks. This is succeeded by catagen or dystrophic phase where there is fall of transplanted follicles leading to reduced density followed by gradual restoration of density over next few months. Various densities at interval of 6 weeks, 9 weeks, 3 months and 6 months were evaluated and compared clinically and using photographs with this 3 week baseline image and assessed as <25%, 25–50%, 50–75% and >75% accordingly. In PRP treated group, after 1 month 60% of the patients ($n = 15$) showed >75% density in comparison to none in non-PRP group. The difference was statistically highly significant with $P < 0.001$. After 6 months of hair transplant, all the patients ($n = 25$) had more than 75% follicle growth, wherein non-PRP group only 20% ($n = 5$) of patients showed more than 75% growth and rest 80% of the patients had follicle growth in the range on 50–75%.

Types of Grafts

In PRP-treated group, the number of patients having multiple grafts was significantly higher as compared to non-PRP treated group. After 3 months of hair transplant, in PRP group, all the twenty five patients had multiple grafts erupting out in areas compared to the ones at 3 weeks baseline images. Whereas in non-PRP group, only 60% of patients had multiple grafts which increased to 80% at 6 months when compared with 3 weeks baseline images. The difference at 3 months was statistically highly significant ($P = 0.001$).

Impact on scalp redness

At 6 weeks, all the patients in PRP group showed scalp redness over recipient area in comparison to 70% in non-PRP group. In PRP-treated group, after 3 months of hair transplant, only 5% of patients had scalp redness whereas, in non-PRP treated group, 30% of patient had scalp redness.

After 6 months, in PRP-treated group, no patient had scalp redness whereas, in the case of non-PRP group, 20% of patients still reported scalp redness.

DISCUSSION:

Male androgenic alopecia is one of the most prevalent dermal disorders in males. [7] It is also referred to as male pattern baldness as it happens in specific pattern and it impacts adolescents as well as adults. Polygenic heredity is considered to be its cause; in addition male, hormone testosterone plays a major role. Hormone binds to androgenic receptor on hair follicle leading to early entry to telogen phase and inducing hair fall. [8] PRP is rich in many growth factors and proteins. It is very rich in PDGF, epidermal growth factor, transforming growth factor, fibroblast growth factor (FGF), vascular endothelial growth factor (VEGF) and various pro and anti-inflammatory cytokines such as interleukin 4 (IL-4), IL-8, IL-13, IL-17, tumour necrosis factor alpha and interferon alpha.[8] These growth factors may induce an internal signal-transduction pathway, unlocking the expression of a normal gene sequence of a cell thereby initiating and improving tissue regeneration process.[5,6,7,8]

Data present in this manuscript clearly suggests that PRP treatment during the hair transplant plays a significant role in hair re-growth, and it remarkably improves density and quality of hair growth. All patients in PRP-treated group had more than 75% follicle growth whereas in non-PRP treated group only 20% of the patient showed more than 75% follicle growth. The catagen loss in transplanted hair reduced significantly at 1 month interval though there was a delayed fall but not as severe as in non-PRP group. [5]

The quality of hair was better in PRP-treated group as compared to non-PRP group. In PRP group, multiple erupting roots from the graft as early as 3 months clearly suggest the role of growth factors in PRP in stimulating as well as nourishing transplanted follicular unit grafts.

PRP is the source of various growth and regulatory factors involved in cells growth and differentiation. [9,10,11] PRP not only induces growth but also improves cell survival by its anti-apoptotic activity. Activated PRP stimulates growth and differentiation of stem cells in hair follicle bulge along with activation of mesenchymal cells in dermal papilla. It stimulates transcriptional activity of B-catenin responsible for differentiation of stem cells to hair follicle cells. PRP is reported to stimulate bcl-2 regulatory protein levels, which possess anti-apoptotic activity and prolongs survival of dermal papilla cells.[11] This effect was clearly observed *in vivo* and *in vitro* study by Rinaldi *et al.* where they observed prolongation of the anagen and shortening of the catagen and telogen phase due to the effect of PRP released growth factors.[12] PRP is also reported to activate AKT and ERK signalling pathways to protective dermal papilla cells from apoptosis. PRP up-regulates FGF-7 growth factors, which are known to stimulate hair growth.[13] VEGFs and platelet-derived growth factors contribute in increasing peri-follicular vasculature thus, improving the blood supply and nourishment to the transplanted grafts.[14,15,16] This was also evident in our 1-month results where redness was more marked in PRP group due to new vessel formation but after 3 months, most of the patients had recovered from scalp redness whereas in non-PRP group 40% of the patient still reported scalp redness. PRP has already been reported to augment tissue repair and regeneration process. Activity in dormant hair follicles was significantly high in PRP group which can again be explained by normalisation of scalp milieu with reduced fibrosis and neovascularisation secondary to the action of FGF and VEGF, which facilitated significantly higher activity in PRP group.

Overall, PRP therapy improves the skin milieu of grafted area by cell growth and differentiation, anti-apoptotic activity and neovascularisation making grafted area more receptive and fertile for newly transplanted hair. It also helps in providing conducive environment for dormant hair follicles leading to their activity and appearance of new anagen hair as early as 3 months.

CONCLUSION:

This study evidently demonstrated impact of PRP treatment immediately after FUE hair transplant and its beneficial effect on quantity and quality of hair re-growth. Immediate post-operative injectable PRP therapy is beneficial in giving faster density, reducing the catagen loss of transplanted hair, early recovery of the skin, faster appearance of new anagen hair in FUE transplant subjects and also activating existing dormant follicles.

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