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Original Research Article

Effect of intralesional injection of autologous platelet rich plasma in patterned hair loss

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ABSTRACT

Background: Regenerative effects of platelet-rich plasma's (PRP) are utilized in treating various dermatological conditions. The present study compared the efficacy of intradermal autologous PRP in various grades of patterned hair loss with topical minoxidil and finasteride.
Methods: Patients with patterned hair loss were randomized to receive either minoxidil 5% in (male), 2% in (female) and finasteride 1 mg (only in male) or PRP in addition to the above treatment. A total of 6 sittings were given to PRP group patients at interval of 21 days each over a total period of 4 months. All patients were followed up for the first time after 21 days of initiating the treatment and then after four months of starting the treatment.
Results: Baseline demographic and clinical characteristics were similar in both the treatment groups. When assessed at the second follow up, hair wash test, hair pull test, V/T ratio, yellow dot test, mean hair diameter and global photographic assessment were favourable in significantly higher proportion of patients in the PRP group as compared to non-PRP group. Five non-PRP patients (6.7%) perceived no change in hair fall as compared to none in the PRP group. None of the cases reported increase in hair fall. Adverse effects reported (itching, erectile dysfunction, decreased libido and dizziness) were similarly distributed among the patients in both the treatment groups.
Conclusions: Minoxidil and finasteride form the backbone of patterned hair loss treatment; adding PRP can achieve clinically better results with minimal side effects.

Keywords: Alopecia, Androgenic alopecia, Platelet-rich plasma

INTRODUCTION

Androgenetic alopecia is common not only among males but is also a common form of non-scarring hair loss in adult women. It can alter the physical appearance of the affected individual and can result in depression and anxiety.[1] There are numerous treatment options available for treating alopecia. Conventional therapies for alopecia require lifelong compliance and still may not be effective in reducing hair loss.[2] They are sometimes associated with sexual dysfunction as well. Platelet-rich plasma (PRP) originally was developed to treat chronic non-healing wounds. Over the next few years, PRP has been used extensively in the fields of reconstructive surgery, dentistry, ophthalmology, and dermatology. Now, evidence is emerging about the use of PRP for treating numerous dermatological conditions like leprosy, melasma, and hair loss.[3] Though the mechanism by which PRP stimulates folliculogenesis is not completely understood, previous investigators have shown that by injecting PRP in the micro-environment of the hair follicle through multiple intradermal injections, it can prove to be a an efficacious option for mesotherapy for hair loss. Despite several reports and many randomized trials of small populations assessing the use of PRP for hair loss treatment, the results have not been consistent and thus

require more investigation.[4] The present study aimed at comparing the efficacy of intradermal autologous PRP in various grades of patterned hair loss and to compare the results with standard treatment (topical minoxidil and finasteride).

METHODS

Study design and sampling

This open label randomized comparative trial was conducted in the Department of Dermatology, Venereology and Leprology of Muzaffarnagar Medical College, Meerut in which patients between the ages of 18 to 45 years with diagnosis of patterned hair loss, attending the outpatient clinic of our department were enrolled. The sample size was calculated to be 150, of which half were randomly assigned to receive PRP in addition to minoxidil 5% in (male), 2% in (female) and finasteride 1 mg (only in male) and other half were randomly assigned to receive only minoxidil 5% in (male), 2% in (female) and finasteride 1 mg (only in male). These patients were followed up for the first time after 21 days of initiating the treatment and then after four months of starting the treatment. Inclusion criteria for the study was those aged 18 to 45 years with patterned hair loss, not taking any treatment for last 6 months, with androgenetic alopecia stage III-V Hamilton-Norwood classification in male and stage I-III Ludwig scale grades in female. Alopecia patients having other dermatological conditions were excluded from the study. Also patients with alopecia other than androgenetic alopecia, with history of bleeding disorders or on anticoagulant medications, with active infection at the local site, keloidal tendency, and with low pain threshold were excluded as well.

Autologous PRP preparation procedure

PRP was prepared using double spin method (soft spin at 2000 rpm for 7 minutes followed by hard spin at 4000 rpm for 5 minutes), after receiving blood samples collected in sterile 8 ml test tubes containing acid-citrate-dextrose solution formula (1:4 vol/vol). The pellet which accumulated at the bottom contained platelets and the plasma devoid of platelets surfaced on the top. The plasma supernatant was used as PPP and PRP was made from the thrombocyte pellet in 1 ml of plasma. Calcium chloride was added as an activator. Each patient underwent 6 such sittings at interval of 21 days each over a total period of 4 months.

Data collection and data analysis

Using a predesigned semi-structured questionnaire, demographic information of the patients was noted from the medical records. Patients were enquired about their disease and treatment history. General examination of the patients was done and the extent of hair loss was graded as per the Norwood Hamilton scale in males and Ludwig scale in females.[5,6] Results of routine laboratory investigations were noted for all patients. All patients underwent hair pull test, trichosan and global photographic hair assessment. Patient perception about the treatment they received and any adverse effects experienced were noted as well. The data were imported in Statistical Package for the Social Sciences (SPSS, version 23, BM) for statistical analysis. Quantitative data was represented as their mean ± standard deviation (SD) and qualitative data as frequency distribution. Student's t-test was used for comparing means, while categorical data was analyzed by using chi-square test. A p value of <0.05 was considered as statistically significant.

RESULTS

The mean age of the patients, age of onset and duration of hair loss were comparable between the patients of the two study groups (Table 1). Both the groups had equal male to female distribution i.e. 66.7% males to 33.3% females and marital status, diet and personal history were also similar between the two patient group. Most common pattern of baldness was fronto-temporal in both study groups followed by generalized (Table 2). Slow course of hair loss was observed in majority of subjects. History of rapid hair loss was observed in approximately one third of patients. Half of all male patients were in Hamilton Norwood stage II, 13% in stage III, 8% in stage IV, 18% in stage V and 10% in stage VI. Ludwig's staging revealed that 74% of the female patients were in stage I. More than one third of the patients had a positive family history and had taken treatment for hair loss previously. All these variables were similarly distributed among the patients of both the treatment groups. Furthermore, patients in both the treatment groups were similar with respect to the findings of general examination parameters, and laboratory investigations ($p>0.05$).

Table 3 compares the findings of patients in the two treatment groups with respect to various investigations. Percentage of vellus hair (<3 cm) was comparable between both groups at baseline (60% versus 58.7%; $p=0.7$). By the end of study period, the percentage of vellus hair reduced significantly in cases treated with PRP (4%) as compared to treated without PRP (12%). At baseline, the hair pull test was positive in 85.3% and 86.7% cases of PRP and non-PRP group respectively. Hair pull test was positive in significantly lower proportion of patients in the PRP group as compared to the non-PRP group. During the final follow up, patients in the PRP group had significantly higher proportion of patients with V/T ratio of higher than 1/4 as compared to those in the non-PRP group. This was not the case at baseline and first follow up assessments. Also, significantly higher percentage of patients in the PRP group had three or less yellow dots during the first and second follow up assessments. Mean hair diameter was comparable in study groups at baseline ($p=0.2$). By the end of 6 months, mean hair diameter was significantly more in PRP group subjects as compared to non-PRP group (0.0662 versus 0.0543; $p<0.05$). Lastly, marked improvement was observed in significantly higher

proportion of patients in the PRP group as compared to those in the non-PRP group during both the follow ups. By the end of study period, only one case of non PRP group was labelled as non-responder to the treatment (Table 4). Five non-PRP patients (6.7%) perceived no change in hair fall as compared to none in the PRP group. None of the cases reported increase in hair fall. Adverse effects reported (itching, erectile dysfunction, decreased libido and dizziness) were similarly distributed among the patients in both the treatment groups.

Table 1: Baseline characteristics of the patients included in the study.

Variables	Study group		P value
	PRP (n=75)	Non-PRP (n=75)	
Age related distribution (in years)			
Mean age	39.8±8.2	34.5±7.5	0.08
Mean age of onset	36.7±7	33.7±5.7	0.14
Mean duration of alopecia	3.1±2.1	2.7±2.3	0.69
Gender distribution			
Males	50	50	1.0
Females	25	25	
Marital status			
Married	62	65	0.49
Unmarried	12	13	
Widowed/divorced	1	2	
Diet			
Vegetarian	31	34	0.79
Mixed	44	41	
Personal history			
Smoking	12	14	0.51
Alcohol	13	9	
Both smoking and alcohol	11	15	
None	39	37	

Table 2: Distribution of patients according to the characteristics of their baldness.

Variables	Study group		P value
	PRP (n=75)	Non-PRP (n=75)	
Pattern of hair loss			
Fronto-temporal	35	46	0.54
Central	15	10	
Generalized	25	19	
Course of hair loss			
Fast	24	20	0.59
Slow	51	55	
Hamilton Norwood staging (only in males; n=50)			
II	22	29	0.72
III	6	7	
IV	5	3	
V	10	8	
VI	7	3	
Ludwig Staging (only in females; n = 25)			
I	17	20	0.53
II	5	4	
III	3	1	
Treatment history			
Yes	57	45	0.06
No	18	30	
Family history of hair loss			
Yes	48	50	1.0
No	27	25	

Table 3: Distribution of patients according to the various investigations done.

Test	Baseline		1st follow up		2nd follow up	
	PRP	Non-PRP	PRP	Non-PRP	PRP	Non-PRP
Hair wash test						
>5 cm	2	4	21	13	43	29
3 to 5 cm	28	27	41	35	29	37
<3 cm	45	44	13	27	3	9
p value	0.7		0.27		<0.05	
Hair pull test						
Positive	64	65	49	54	17	34
Negative	11	10	26	21	58	41
p value	0.7		0.48		<0.05	
V/T ratio						
1/2	5	10	0	0	0	0
1/3	15	25	0	10	0	1
1/4	31	20	10	24	3	4
1/5	15	10	20	21	12	18
1/6	9	10	24	15	22	25
1/7	0	0	11	5	23	11
1/8	0	0	10	0	15	6
p value	0.83		<0.05		<0.01	
Yellow dots test						
≤3	30	30	63	41	71	60
4 to 6	39	36	12	25	4	13
>6	6	9	0	9	0	2
p value	0.81		<0.05		<0.05	
Mean hair diameter	0.048±0.008	0.045±0.004	0.056±0.007	0.050±0.004	0.066±0.007	0.054±0.004
p value	0.2		<0.05		<0.05	
Improvement on photographic assessment						
Marked	Not done	Not done	45	15	56	39
Moderate	Not done	Not done	19	31	17	21
Slight	Not done	Not done	11	19	2	9
None	Not done	Not done	0	10	0	1
p value			<0.05		<0.05	

Table 4: Patient perception and adverse effects reported by the patients.

	PRP group	Non-PRP group	P value
Response to treatment			
Responders	75	74	1.0
Non-responders	0	1	
Patient perception			
Hair fall stopped	60	42	<0.05
Hair fall reduced	15	28	
No change in hairfall	0	5	
Hair fall increased	0	0	
Adverse effects			
Itching/burning	9	8	1.0
Erectile dysfunction	2	2	1.0
Decreased libido	3	2	1.0
Dizziness	2	1	1.0

DISCUSSION

PRP therapy is a promising therapeutic modality which has been shown to enhance tissue healing. PRP, when tested in vitro, has been shown to consist of several growth factors and cytokines, which physiologically are known to promote tissue healing through the various mechanisms of regenerative chemotaxis, angiogenesis, formation of extra-cellular matrix, and synthesis of collagen.[5] In our study, we observed a significant improvement in patients treated with PRP with respect to hair pull test, hair wash test, V/T ratio, yellow dots test, hair diameter and photographic assessment. Besti et al treated alopecia patients with PRP, over a period of 2 months and demonstrated an improvement in hair pulling test and a high overall patient satisfaction.[6] Schiavone et al studied 64 male patients with androgenetic alopecia who were treated with PRP enriched with leukocytes in addition to concentrated plasma proteins.[7] The authors evaluated patients on the basis of global assessment of before and after treatment by investigators who were blinded to the treatment. An

improved appearance was demonstrated in 96% of the patients. Similarly, Khatu et al demonstrated a significant reduction in hair loss with a smaller regimen of only 4 injections of PRP.[8] Singhal et al studied a smaller sample of 20 patients, who were treated with 4 sessions of injections of PRP.[9] At the end of the treatment regimen, traction test result was negative for all patients. Gkini et al performed a segmental approach, in which first three injections were at an interval of three weeks and the last session was done at 6 months.[10] The authors reported significant improvement after the third injection. However the traction test became positive again three months after the last PRP injection session, though it improved later.

In our study, the mean hair diameter was significantly more in patients who received PRP during the first and subsequent follow up. Similar results were shown by Kang et al, who demonstrated that the hair diameter increased on an average of 31.3% three months after the first injection session and 46.4 three months after the second injection session.[11] Patient satisfaction is another important aspect of treatment, which is often ignored by the clinicians and is difficult to quantify. Additionally, in our study, all patients receiving PRP responded to the treatment with 80% perceiving that hair fall stopped and rest 20% perceiving that hair fall reduced. High patient satisfaction score was shown in the studies by Gkini et al and Khatu et al as well.[8,10] Similarly, Navarro et al found 100% satisfaction rate at the end of the 3 month follow-up, while Betsi et al also reported a satisfaction rate of 7 on a 10-point scale. However, it should be noted that satisfaction may not always correlate with efficacy. Marwah et al reported improvement in only 20% of the study patients, still all were satisfied with their treatment and outcome.[12]

Patients in both the treatment groups in our study reported similar adverse reaction profile. In the PRP group 12% reported itching and burning of the scalp, which subsided with symptomatic treatment. Singhal et al, Kang et al and many other investigators have reported rare instances of pain at the site of injection, redness and swelling post-injections, but none reported a case of infection. Singhal et al additionally reported a few cases of post-injection headache, which was treated by paracetamol.

CONCLUSION

Recent evidence on the efficacy of PRP in the treatment of patterned hair loss is encouraging. Minoxidil and finasteride form the backbone of patterned hair loss treatment; adding PRP can achieve clinically better results. Accumulating literature also suggests that the side effects are minimal without any major safety issues. However, varying injection schedules, dosages and PRP preparation techniques at different centres is still a point of concern which needs to be addressed by developing a consensus among the experts.

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