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Platelet Rich Plasma- A Study for Treating Androgenetic Alopecia in both Males and Females

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ABSTRACT:
Androgenetic alopecia is a genetically predetermined disorder due to an excessive response to androgens. This condition affects up to 50 percent of males and females and is characterized by progressive loss of terminal hair of the scalp any time after puberty. It follows a characteristic distribution in both males and females. In males, hair loss is most prominent in the vertex and fronto temporal regions, while in women the frontal hairline is typically spared with diffuse hair loss at the crown and top of head, with loss often marked by a wider center part. The potential of platelet-rich plasma in promoting hair growth is known since long. This study was conducted to determine the effect of platelet-rich plasma in the management of androgenetic alopecia, mainly in terms of improvement in hair density and diameter and assess the variation in response among the different grades of androgenetic alopecia.

KEYWORDS: Androgenetic alopecia, female pattern hair loss, platelet-rich plasma

I. INTRODUCTION

Androgenetic alopecia, commonly known as male pattern baldness, is the most common type of progressive hair loss disorder in men. The occurrence and development of androgenetic alopecia depends on the interaction of endocrine factors and genetic predisposition. Androgenetic alopecia is characterized by progressive hair follicular miniaturization, caused by the actions of androgens on the epithelial cells of genetically susceptible hair follicles in androgen-dependent areas. Although the exact pathogenesis of androgenetic alopecia remains to be clarified, research has shown that it is a polygenetic condition. Numerous studies have unequivocally identified two major genetic risk loci for androgenetic alopecia, on the X-chromosome AR⁄EDA2R locus and the chromosome 20p11 locus.

The Norwood scale (or Hamilton-Norwood scale) is the leading classification system used to measure the extent of male pattern baldness. Men typically lose their hair in one of several common patterns over the course of many decades. The Norwood scale provides easy-to-reference images that indicate different stages of balding.

The Norwood scale has seven stages. Each stage measures the severity and pattern of hair loss.

- **Stage 1.** No significant hair loss or recession of the hairline.
- **Stage 2.** There is a slight recession of the hairline around the temples. This is also known as an adult or mature hairline.
- **Stage 3.** The first signs of clinically significant balding appear. The hairline becomes deeply recessed at both temples, resembling an M, U, or V shape. The recessed spots are completely bare or sparsely covered in hair.
- **Stage 3 vertex** The hairline stays at stage 2, but there is significant hair loss on the top of the scalp (the vertex).
- **Stage 4.** The hairline recession is more severe than in stage 2, and there is sparse hair or no hair on the vertex. The two areas of hair loss are separated by a band of hair that connects to the hair remaining on the sides of the scalp.
- **Stage 5.** The two areas of hair loss are larger than in stage 4. They are still separated, but the band of hair between them is narrower and sparser.
- **Stage 6.** The balding areas at the temples join with the balding area at the vertex. The band of hair across the top of the head is gone or sparse.
- **Stage 7.** The most severe stage of hair loss, only a band of hair going around the sides of the head remains. This hair is usually not dense and may be fine.
- **Norwood class A.** The class A variation of the Norwood scale is a slightly different and less common progression of hair loss. The main differences are that the hairline recedes back

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uniformly, without leaving an island of hair in the middle, and there is no bald area at the vertex. Instead, the hairline progresses directly from front to back.

Female pattern hair loss (FPHL) is the most common form of alopecia in women. Female pattern hair loss (FPHL) has emerged as the preferred term for androgenetic alopecia (AGA) in women due to the uncertain relationship between androgens and this entity. FPHL is the most common hair loss disorder in women. Initial symptoms may develop during the teenage years and lead to progressive hair loss with a characteristic pattern distribution (Vujovic and Del Marmol, 2014). FPHL is characterized as a non scarring diffuse alopecia that evolves from the progressive miniaturization of hair follicles and subsequent reduction in the number of hairs, especially in the central, frontal, and parietal scalp regions.

The Ludwig scale is a method of classifying female pattern baldness (androgenic alopecia), and **ranges from stages I to III**.

Ludwig scale for female pattern baldness.

- Grade I: Perceptible thinning of the hair on the crown, limited in the front by a line situated 1-3 cm behind the frontal hairline
- Grade II: Pronounced rarefaction of the hair on the crown within the area seen in Grade I.
- Grade III: Full baldness (total denudation) within the area seen in Grades I and II

Androgenetic alopecia is a type of progressive patterned hair loss, where there is androgen-mediated conversion of susceptible terminal hairs into vellus hairs in genetically predisposed individuals. It is known that transforming growth factor-β, an inhibitory factor secreted by hair follicles, plays an important role in the pathogenesis of androgenic alopecia. The potential of platelet-rich plasma in promoting hair growth is known since long. This study was conducted to determine the effect of platelet-rich plasma in the management of androgenetic alopecia, mainly in terms of improvement in hair density and diameter and assess the variation in response among the different grades of androgenetic alopecia. Activation of the androgen receptor shortens the anagen or growth phase in the normal hair growth cycle. In androgenetic alopecia, excessive activation leads to follicular miniaturization through a progressively shorter anagen phase, resulting in thinner and shorter hair follicles which in the end may not even penetrate through the epidermis. Pathological specimens will show a decreased 5:0 ratio of anagen to telogen hair where the norm is 12:1.Androgenetic alopecia patients have higher production of di hydro testosterone, and higher levels of 5 alpha- reductase and androgen receptors in balding scalp.

FPHL and male AGA share a final common pathway that causes follicular regression but current knowledge suggests that the etiology is not necessarily the same in both sexes. Although the role of androgens in the pathogenesis of male hair loss has been clearly established, the role of androgens in FPHL is less clear. In fact, FPHL may develop even in the absence of androgens. However, it is likely that other non androgenic factors that are currently unidentified may play a role in the pathogenesis of FPHL (Redler et al., 2017). Therefore, the involvement of these genes in the etiopathogenesis of FPHL cannot be completely excluded

II. MATERIALS AND METHODS

Source of the data:

A pilot study on hair loss in 10 patients was carried out of which 7 were male and 3 were females in the age group of 20-50 years, was conducted in AnuSukh Dermacare & Aesthetics (Skin, Hair, Laser clinic) Jammu. Informed consent was taken from all the subjects for participation in the study as well as for relevant pictures.

INCLUSION CRITERIA:

- Patients with androgenetic alopecia Grade III-VII (Hamilton–Norwood classification)

EXCLUSION CRITERIA:

- Patients with alopecia other than androgenetic alopecia
- Those on any other treatment modalities for androgenetic alopecia
- History of bleeding disorders and active infection at the local site.

METHODOLOGY:

- All clinically diagnosed cases of androgenetic alopecia were enrolled and clinically examined for hair loss.
- Details of characteristic distribution in both males and females were taken
- In males, hair loss is most prominent in the vertex and fronto temporal regions, while in women the frontal hairline is typically spared with diffuse hair loss at the crown and top of head, with loss often marked by a wider center part.
- Blood samples were taken for each patient for the preparation of platelet rich plasma.
- Platelet-rich plasma was prepared by the double spin method.

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- A total of six sittings were administered in each patient at an interval of 15 days.
- Digital photographs were taken before starting the treatment and periodically thereafter.

III. RESULTS

Platelet-rich plasma was prepared by the double spin method. A total of six sittings were administered in each patient at an interval of 15 days. Digital photographs were taken before starting the treatment and periodically thereafter. Results were assessed at the end of 6 months on the basis of an independent observer evaluation of global photographs and patient's self-satisfaction. Data analysis was done with the help of Epidemiological Information Package (2010) developed by the Centre for Disease Control, Atlanta.

The age of participants ranged from 20 to 50 years with a mean age of 35 ± 3.1 years. The age at onset of androgenetic alopecia ranged between 25 and 38 years with the mean age being 25 ± 2.3 years. The duration of hair loss varied from 1 to 11 years with the mean duration being 5.5 ± 2.6 years. Patients with a lower grade of alopecia responded better to the therapy [Table - 1]. The response to platelet-rich plasma was found to be inversely proportional to the duration of alopecia [Table - 2]

Table 1: Efficacy of platelet rich plasma with respect to grade of androgenetic alopecia

Androgenetic alopecia grade	6 months increase in(meant ±SD) Hair diameter (in mm)	6 months increase in(meant ±SD) Hair density(in/10mm^2)
3	0.022 ± 0.006	3.0 ± 0
3V	0.027 ± 0.008	3.23 ±1.43
4	0.025 ± 0.007	3.3 ± 0.51
4A	0.03 ± 0	3.0 ± 1.41
5	0.03 ± 0.01	2.45 ± 0.38
5A	0.026 ± 0.008	1.86 ± 0.69
6	0.013 ± 0.007	1.73 ± 0.47
P	0.0425(Significant)	0.0189(Significant)

SD- STANDARD DEVIATION

Table 2: Efficacy of platelet rich plasma with respect to duration of androgenetic alopecia

Duration of alopecia	6 months increase in(meant ±SD) Hair diameter (in mm)	6 months increase in(meant ±SD) Hair density(in/10mm^2)
Upto 5 years	0.022 ± 0.007	2.58 ± 1.0
6-10 years	0.016± 0.008	1.4± 0.55
>10 years	0.02± 0	2.0 ± 0
P	0.0477(Significant)	0.0094(Significant)

SD- STANDARD DEVIATION

Fig 1: Pre and Post treatment (after 6 sittings) of patient 1

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Fig 2: Pre and Post treatment (after 6 sittings) of patient 2

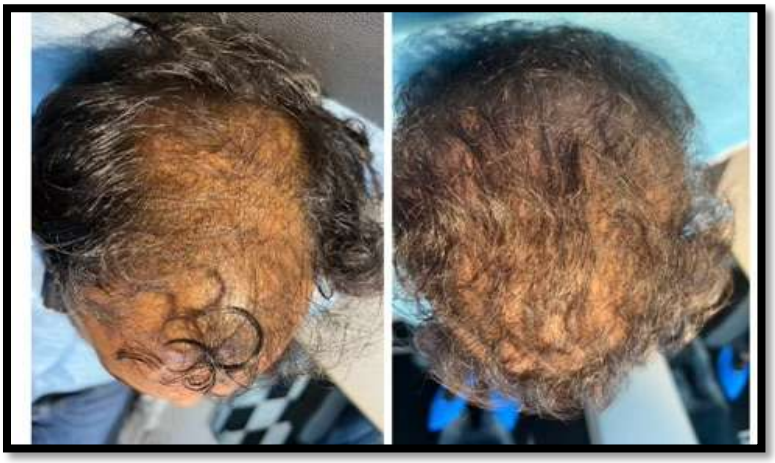

Fig 3: Pre and Post treatment (after 6 sittings) of patient 3

IV. DISCUSSION

Androgenetic alopecia is the most common cause of hair loss. Platelet-rich plasma contains a large array of growth factors such as platelet-derived growth factors, vascular endothelial growth factors, epidermal growth factors, fibroblast growth factor-2 and insulin-like growth factors which promote hair growth by inducing the follicular stem cells to shift from a dormant to an active state. Vascular endothelial growth factor-8 and platelet-derived growth factor-4 also facilitate angiogenesis around the hair follicle. Rinaldi et al. found that growth factors from platelet-rich plasma could prevent dermal papilla apoptosis, prolong anagen phase and delay catagen and telogen phase. The findings from our study also support the beneficial role of platelet rich plasma in androgenetic alopecia; the improvement in length and density of hair was objectively measured and confirmed. Complete cessation of hair fall was seen as early as following 3–4 sittings. Another interesting fact noticed was that the response to platelet-rich plasma depended significantly on the grade of androgenetic alopecia and on duration of hair loss.

V. CONCLUSION

The use of PRP to treat AGA is promising based on the results of the reviewed clinical studies. Safety issues, side effects, and downtime seem to be minimal. Although PRP does appear to be beneficial, the preparation, dosage, number, and interval of treatment sessions, as well as injection technique, vary between the studies due to a lack of standardization of PRP preparation. This makes inferring conclusions about its clinical efficacy difficult. The optimal PRP preparation for AGA is still unknown, and requires further investigation where PRP variables are reported. In contrary to all this mentioned PRP still proves to be beneficial for treatment of androgenetic alopecia in both males and females and requires more and more studies to be done to prove its efficacy and results.

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