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Role of Spironolactone in the Treatment of Female Patterns Hair Loss With Polycystic Ovarian Syndrome[1]

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ABSTRACT

Hair loss is a common progressive continuous condition affecting both males and females with limited availability of effective therapy. The following study aimed to evaluate the difference between the outcomes of three distinct methods which included plasma of the patient, spironolactone with the plasma of the patient, and lastly, spironolactone in a female with the polycystic ovarian syndrome (PCOS). Further, the study aimed to evaluate the comparison between the results to find the best method of treatment. In the following study, the target population includes ninety PCOS patients who are divided into three groups which are as follows. Spironolactone patients' group (n=30), spironolactone + plasma product(n=30), and thirty patients in the plasma product group (n=30). To exclude the bias of age-related hair loss and hair loss due to other systematic diseases, the targeted population includes healthy individuals who are between 20 years old to 40 years old. The results of the experiment indicated that the differences between all three treatment methods were statistically significant, and all three methods were beneficial. However, the best outcome was shown by spironolactone with a marked reduction of the area of baldness which was around 50% reduction.

Keywords: *Hair loss; Spironolactone; Platelet-rich plasma; Baldness; PCOS.*

INTRODUCTION

Pattern hair loss often referred to as androgenetic alopecia, is a condition that is often attributed to genetic traits and high androgen levels (1). A predictable, repetitive pattern of hair thinning/loss occurs when the number of hormone-susceptible hair follicles decreases. Most men and 40% of women will experience male-pattern hair loss, which is the most common type of hair loss (2). The standard limit for hair loss is 100 hairs per day, therefore, gradual hair loss and an increase in hair loss are typical signs of androgenetic alopecia in both men and women (3). It also has a unique hair loss pattern. Men may experience a receding hairline and thinning of the vertex scalp, while women may experience thinning of the crown and enlargement of the area.

The anagen phase, recession phase and resting phase are the three stages of hair development. Over 2-4 years, the hair shaft increases in length and diameter during the anagen phase (4). During the anagen phase, the hair shaft slowly leaves the follicle for two to three weeks. The loss of hair from the follicle is characteristic of the stationary phase, also known as the resting phase, which lasts approximately two to three months. The term "androgenetic alopecia" refers to a condition that is both genetically predisposed and androgen dependent. Androgens are hormones that, when elevated, accelerate the contraction of the hair shaft (5). Examples of androgens include testosterone and dihydrotestosterone (DHT).

Hair loss can lead to severe psychological and emotional distress, as well as a reduced quality of life. Therefore, patients in dermatology can benefit greatly from the development of safe and effective treatments (6). Minoxidil, finasteride, spironolactone, dietary supplements, low-level phototherapy, and hair transplant surgery are some of the treatments currently available. Although topical minoxidil and oral finasteride have been approved by the FDA, they have limitations, such as limited clinical improvement in some individuals (7,8). The effectiveness of existing FDA-approved drugs to stimulate new hair growth may be substandard, and no significant benefit is usually seen. Therefore, platelet-rich plasma (PRP) become a good candidate for this indication because it is an autologous sample with minimum side effects at a low cost compared to other approaches (9-11). The androgen believed to be directly responsible for this accelerated shedding is dihydrotestosterone (DHT). An enzyme called

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5-alpha reductase converts testosterone to DHT (12). Patients with a genetic predisposition to androgenetic alopecia exhibit higher 5-alpha reductase activity, which raises blood levels of DHT.

Minoxidil (13) and Finasteride (14) are the only FDA-approved drugs for alopecia. The extended blood flow immediately extends the time needed for hair growth. Minoxidil may not have a noticeable effect for up to 4 months, so it is very important to stick with it. This medication should be started when thinning hair is noticed. It is highly recommended that both men and women use the 5% solution as it will produce the best results (15). Minoxidil may cause women using the product to grow more facial hair, which is not desirable. Many people believe that all new hair growth will disappear once the medication is stopped. To maximize the percentage of hair in the anagen phase and minimize the amount of hair in the resting phase, Minoxidil should be used consistently for as long as possible. incorporate the product into your routine to help reduce hair loss (16). White blood cells and platelets, which are abundant in tissue factors, are present in plasma. Signalling molecules essentially operate as mediators, expressing the stimulation of skin cells (17). In reality, they have been employed in medicine to treat a variety of ailments, including arthritis and ageing symptoms(17). Creation factors have the potential to promote follicular circulation and encourage the formation of new hair, which is good news for anyone who has receding hair. It has demonstrated effectiveness in boosting the number of hairs, the density of the hair, and the growth phase of the hair cycle(18).

Spironolactone (SPL) is a potassium-sparing diuretic; its metabolism in the body yield canrenone which has aldosterone-blocking effects; an action responsible for their diuretic effects. Moreover, spironolactone has antiandrogenic effects and is thereby used in females with PCOS at childbearing age(19). The following study aimed to evaluate the difference between the outcomes of three distinct methods which included plasma of the patient, spironolactone with a plasma of the patients with polycystic ovarian syndrome (PCOS) patient, and lastly, spironolactone. Further, the study aimed to evaluate the comparison between the results to find the best method of treatment.

METHODS

In the following study, the population includes ninety women with polycystic ovarian syndrome who were divided into three groups (n=30 for each group) which are as follows. Spironolactone patients' group, spironolactone + plasma product, and thirty patients in the plasma product group. To exclude the bias of age-related hair loss and hair loss due to other systematic diseases, the targeted population includes individuals who are between 20 years old to 40 years old. The duration of the study is a year (01.06.2021-01.06.2022). PCOS patients with coexisted chronic diseases were excluded from the study, such as diabetes, metabolic syndrome, hypertension, myocardial infarction, heart failure, arrhythmia, and thyroid diseases. The participants were recruited in a private clinic and the participants were given spironolactone 100mg/day for 3 months with or without PRP product. The PRP was given (5-5.5ml per session) every month for up to 3 months period.

To analyze the difference between the treatment methods and the outcomes which are associated with the treatment results of each group, pictures were captured of each individual before the treatment and in the last session which was based on the status of the patient. To highlight the hair density, ImageJ was used to analyze the results (Figure 1).

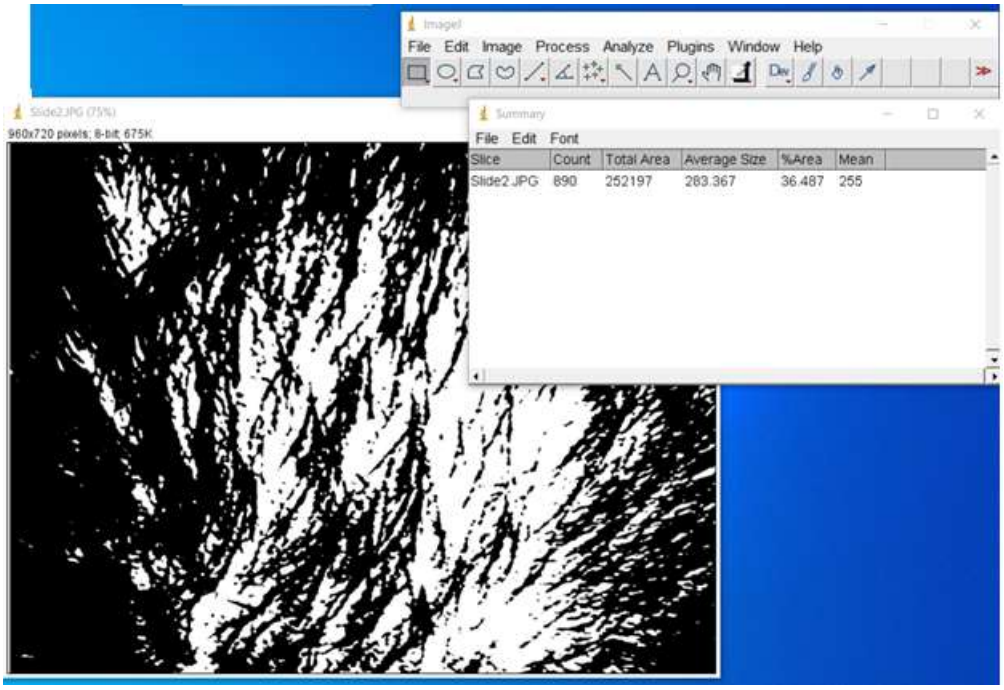

Figure 1. ImageJ analysis of the whole screen of the taken images of the baldness area. The percentage area calculated by the software is shown in the summary box.

The results of each group were analyzed using SPSS version 24. The statistical analysis included the descriptive analysis of each participant, and the calculation of mean, standard deviations, and percentages. The study has further used student t-tests. The analyzed parameters included the percentage area in the selected image. P-values ≤ 0.05 were considered statistically significant throughout data analysis., and a confidence interval of 95%.

RESULTS

The demographic parameters were outlined in table 1. No significant differences (P>0.05) exist between the studied groups regarding age and body mass index(BMI).

Table 3.1. Demography of studied groups.

Parameters mean±SD	PRP(n=50)	SPL (n=28)	PRP+SPL(n=28)
Age (years)	33±6	32±7	35±5
BMI (kg/m^2)	26±0.8	27±0.7	27±1.1
SPL=spironolactone, PRP=platelet rich plasma			

The results of the following experimental study represented that the evaluation of outcomes after the treatment with respect to the percentage of area covered was as follows (Figure 2 and Figure 3). In the case of the plasma of the patient, the results of the experiments amongst 30 individuals showed that before the treatment the area of baldness was around 40% and after the treatment, it was reduced to below 10%. Furthermore, in the case of spironolactone and plasma of the patient, the results of the experiments amongst 30 individuals showed that before the treatment the area of baldness was around 60% and after the treatment, it was reduced to 10%. Lastly, in the third group of 30 participants who underwent spironolactone, the % of the area was 50% before the treatment which was reduced to less than 5%.

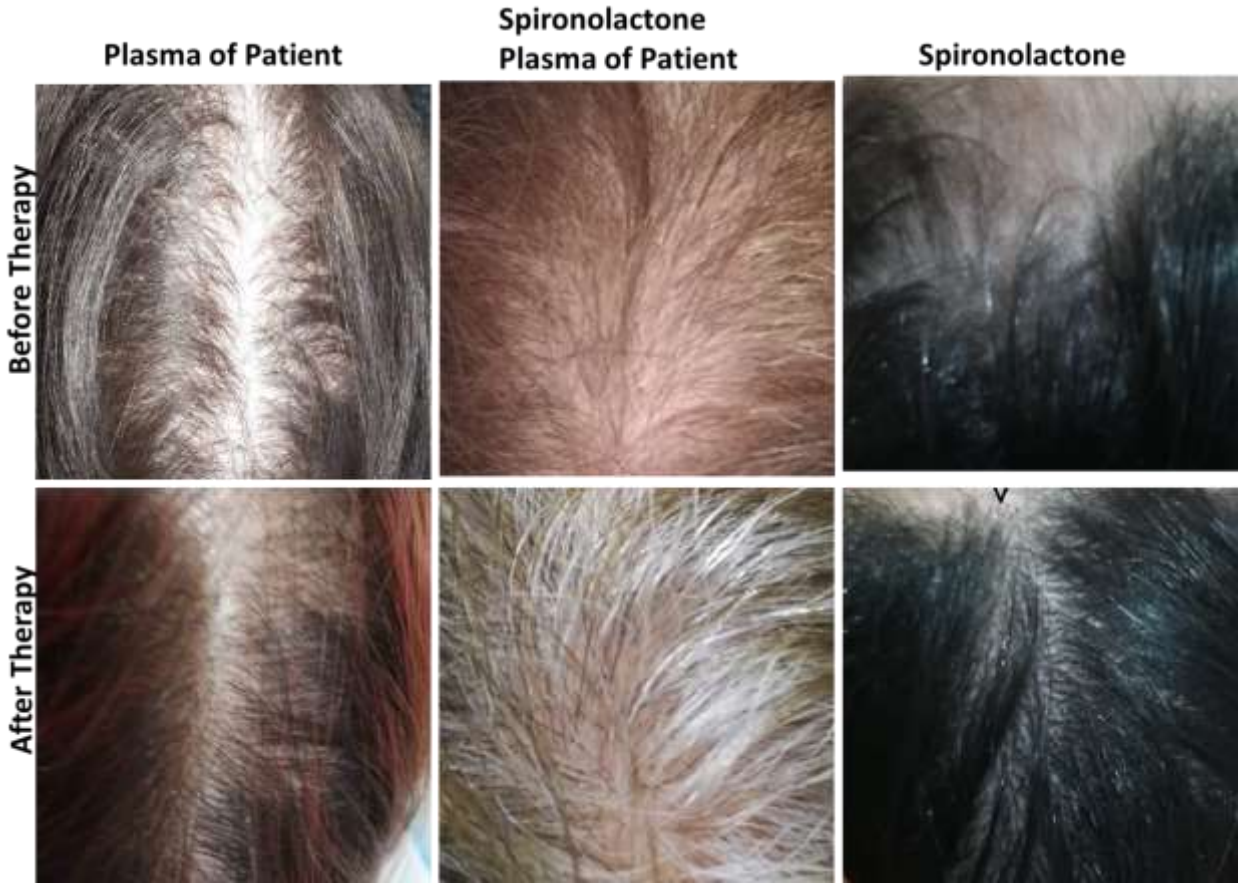

Figure 2. Representative images for participants of the study before and after exposure to patients' plasma or spironolactone.

The results of the experiment indicated that the differences between all three treatment methods were statistically significant, and all three methods were beneficial. However, the best outcome was shown by spironolactone with a marked reduction of the area of baldness which was around 50% reduction (Figure 3).

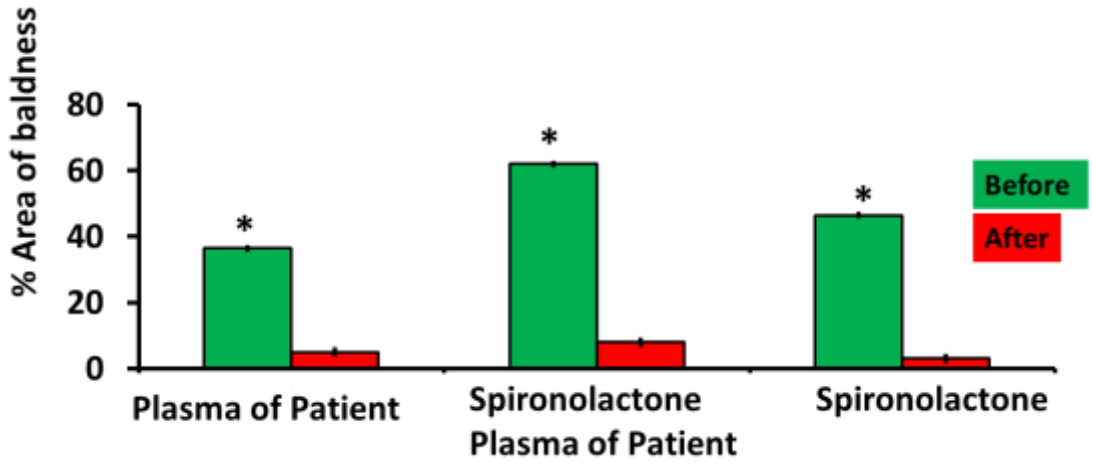

Figure 3. Spironolactone and plasma have reduced the percentage of the area of baldness in participants enrolled in the present study. Data expressed as mean±SD for three spots. Variables compared based on t-test. *p<0.001. Analysis used ImageJ.

DISCUSSION

The present study confirmed that PRP and SPL induced beneficial hair gain and reduced hair loss in PCOS women. However, the efficacy of PRP was strengthened by the addition of SPL. These findings agreed with the results of the meta-analysis, PRP injections significantly improved hair density in patients with androgenic alopecia (AGA). Several AGA investigations found PRP-induced improvements in hair volume, terminal hair density, hair loss and hair diameter, in addition to improvements in overall hair density (20). Other previously published results and clinical experience support the effectiveness of PRP as a hair restoration treatment, and this improvement is consistent with those findings. In a brief but careful trial, the addition of PRP to the follicular unit extraction technique increased hair density compared to a control group (saline) (21).

In our study, monthly sessions were based on the administration of PRP. The activation, injection technique, a number of sessions, frequency, and patient characteristics used in the preparation and administration of PRP have varied widely in the included hair loss studies. Despite being widely used, it is still not known how activation affects outcomes, as large changes in growth factor concentrations are not always seen (22). Unfortunately, the small number of studies did not allow for a meta-analysis to compare the effects of monthly PRP injections with other injection frequencies, such as weekly PRP injections. However, a recently published study found that monthly injections produced more hair volume than quarterly injections (23). Based on this data, it may be necessary to start with a monthly PRP treatment to optimize certain hair regrowth metrics (e.g., hair volume and hair density). Depending on the disease being treated, the PRP regimen should be modified because disease characteristics (e.g., severity) can affect efficacy. Based on the evidence collected, monthly injections of PRP (3x baseline platelet count) (24,25).

The combination of PRP with finasteride, spironolactone and minoxidil has been considered for optimization of the effects of PRP(26,27). Spironolactone has improved hair gain and reduced female pattern hair loss, these findings were in agreement with the study conducted on a combination of minoxidil and spironolactone or with finasteride (28-30).

CONCLUSION

The results of the experiment indicated that the differences between all three treatment methods were statistically significant, and all three methods were beneficial. However, the best outcome was shown by spironolactone with a marked reduction of the area of baldness which was around 50% reduction.

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