ADVANCE RESEARCH JOURNAL OF MEDICAL AND CLINICAL SCIENCE

**ONLINE ISSN: 2455-3549**

**Journal homepage:** http://arjmcs.in/index.php/arjmcs

**Research Article,**

# Platelet Rich Plasma in the treatment of Androgenic Alopecia: A Follow-up study

**Dr. Tauhida Rahman Ereen[1] Dr. Burhanuddin Ahmed Sadiq[2] Dr. Kamrun Nahar Choudhury*[3] Dr. A.K.M. Mohiuddin[4] Dr. Peter Lewis[5] Dr. Raihan Anwar[6]**

**Name of organization:**

1. Surecell Medical (BD) Ltd[1, 2, 3, 4&6]

2. Surecell Medical International, Australia[5]

**Corresponding Author:** Dr. Kamrun Nahar Choudhury*

Consultant, Research and Analysis, Surecell Medical (BD) Ltd. Dhaka, Bangladesh

E-mail: c.kamrun2014@gmail.com

Mobile: +8801711359459

**Accepted: 16 February 2020| Published: 19 February 2020**

**Abstract:**

**Background:** Platelet-rich plasma (PRP) is defined as an autologus concentration of plasma with a greater count of platelets than that of whole blood. Its action depends on the released growth factors from platelets. It has been investigated and used in numerous fields of medicine. Recently, PRP has received growing attention as a potential therapeutic tool for hair loss.

**Objective:** The present study evaluated the clinical outcome of platelet-rich plasma injection in patients of Androgenic Alopecia.

**Material and Methods:** a prospective follow up study for six month with 60 patients of androgenic alopecia. The stage of alopecia was evaluated according to the Hamilton- Norwood for men and Ludwig scale for women. Exclusion and inclusion criteria were applied. Physical examination, dermatological examination and investigations were recorded. Preparation of PRP for intervention and technique of injection were applied according to our plan. Patients received five injections at weeks 0, 2, 4, 6, 8 and were observed for 12 weeks (3months) and 24 weeks (6 months). In our study, we evaluated hair loss, hair density (hair/cm2), and patient's satisfaction. The results were evaluated by digital camera and dermoscopy (digital microscopy) comparing pre and post-improvement photographs taken at 1st session (before PRP) 3 and 6 months from the 1st session. Final data before and after the intervention were imported and analyzed by SPSS 21 version and $P < 0.05$ was considered to indicate a statistically significant difference.

**Results:** Mean age of the study subject was 35.4±11.4 years with ages ranged from 20 to 68 years. Mean hairs count were 35.46 ± 6.89, 43.68 ± 8.23 and 55.54 ± 11.11 $1cm^2$ before PRP, after 3 months and 6 months respectively and statistically significant (($p < 0.005$). Digital images and dermoscopic images showed improvement of AGA patients both in male and female.

**Conclusion:** In conclusion, PRP injections appeared to be effective in the treatment of androgenetic alopecia in both male and female, without remarkable adverse effects and high patient's satisfaction rate.

**Keywords:** Androgenic alopecia, Hair loss, Platelet rich Plasma, Regenerative medicine

## Introduction:

Androgenic Alopecia (AGA) is a chronic, progressive condition affecting millions of individuals worldwide. It is characterized by progressive hair loss, affecting both sexes. The population frequency of AGA varies with ethnicity but as a rough generalization up to 70% of men and 40% of women will experience some degree of AGA in their life time. Its frequency increase with age, despite the fact that it may start at puberty[1, 2]. Independent of age and gender, patients diagnosed with AGA may undergo significant impairment of quality of life since hair is considered to be an important feature of self- image[3]. Hair loss affects self-esteem, personal attractiveness and may lead to depression and other negative effects of life, especially in women[4].

In most men AGA develops with a distinctive "patterned" hairline recession. In women the presentation may be less clear, typically women will develop a diffuse thinning over the top of the scalp yielding a "Christmas tree" pattern with more thinning towards the front though the frontal hairline is maintained[5].

The long-term treatment of AGA with the FDA approved topical minoxidil and oral finasteride therapy reported several side effects including scalp irritation, facial hypertrichosis and loss of libido. So the use of a newer modality of Platelet- Rich Plasma has attracted in the treatment of AGA because of its beneficial effect with minimal or even no side effects[6, 7].

A number of products have been proposed as hair loss therapies. Drug therapies specifically approved by Food and Drug Administration (FDA) for treating AGA are limited to minoxidil and finasteride[8, 9]. Both can be used alone or combined. Despite the therapeutic options available, low patient compliance and satisfaction rate as well as the plethora of topical and often important systematic adverse effects lead to the search of new treatment options for AGA[10, 11, 12].

Path physiological features include an alteration in the hair cycle via reduction of the anagen (growth) phase, inflammation and follicular miniaturization. AGA is determined by genetics and influenced by hormones. The key hormone is dihydrotestosterone (DHT), a metabolite of testosterone, which activates androgen receptors. In men, testosterone is converted to DHT by 5alha-reductase, while dehydroepiandrosterone and other weaker androgens are the precursors of DHT in women. Hair follicles in the scalp vertex and frontotemporal areas have an increased density of androgen receptors; hence, they exhibit a greater response to DHT and experience increased hair loss in AGN[13, 14].

Platelet-Rich Plasma (PRP), a new biotechnology, is the product of a heighted interest in cell based therapy and tissue engineering. This therapy is defined as an autologous preparation of plasma with concentrated platelets. Platelets house a myriad of growth factors including, but not limited to, fibroblast growth factors (FGF), platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-beta), and vascular endothelial growth factor (VEGF). The growth factors serve to promote angiogenesis, epitheliazation, initiation of cell division, and macrophage attraction; hence the expanded range of applications for which PRP has been used may, in part be secondary to the accompanying growth factors that are present[15,16,17].

The use of Platelet concentrates has spread worldwide, fueling a large clinical interest in regenerative medicine, in which it has been directed to many diverse conditions in several specialties such as orthopedics, sport medicine, plastic and aesthetic surgery and in the treatment of diabetic ulcers. In fact, it is so widespread that terms such as PRP have rapidly become effective treatment among doctors and patients[18, 19, 20].

## Material and Methods:

**Study design**: A prospective follow up study for six months.

**Objective:** The present study evaluated the clinical outcome of platelet-rich plasma injection in patients of Androgenic Alopecia.

**Ethics statement**: Our research was conducted in accordance with the principal of the Declaration of Helsinki. All patients were required to review trail protocols and subsequently provided their informed consent. All the participants who signed the consent form they were included in the study.

**Study participants**: A total 60 patients with androgenic alopecia, aged 20-68 years were enrolled in the present study. The stage of alopecia was evaluated according to the Hamilton- Norwood

for men and Ludwig scale for women. Exclusion criteria included immunosuppression (malignancy, chemotherapy and steroid therapy), autoimmune disorders, hematology disorders, platelet dysfunction syndrome, critical thrombocytopenia, sepsis, acute and chronic infections, chronic liver disease, uncontrolled diabetes mellitus. Anticoagulant therapy or aspirin should be stopped at least 3 days before the procedure. Systemic use of corticosteroid injection at the scalp should be stopped within one month before the study.

**History taking/ examination:** Personal history (including lifestyle), present history, family history and history of drug treatment.

**Dermatological Examination:** Scalp quality, hair density to assess the grade of AGA, signs of acne, eyebrows, eyelashes, facial and body hair.

**Investigations:** CBC, Serum iron, Vit-D, HbA1c, testosterone (for male), T3, T4, TSH (for female). Laboratory tests were assessed in order to exclude other hair loss causes, such as anaemia, poor nutrition, and thyroid dysfunction or poly cystic ovary syndrome.

**Preparation of PRP for intervention:** PRP was prepared using a single spin method. The patient was first sent to a clinical pathology laboratory where 16 ml to 24 ml of venous blood was aspirated from the patient by venipuncture of the median cubital forearm vein using a 21 gauge butterfly needle.

The blood was collected in 2/3 special 8 ml sterile vacutainer tubes containing an anticoagulant Na Citrate 3.9%. The citrated blood was centrifuged at 2500 rpm for 20 minutes at room temperature separates red blood cells from plasma which contains "buffy coat" (white blood cells and platelets).

The plasma was gently aspirated from each test tube into a syringe and prepared for photo activation. Approximately 8 ml to 12ml of PRP was produced this PRP was then injected intradermally through a 31 gauge needle.

**Technique of injection:** The injection was applied intradermally using insulin syringe with 31 gauge needle. Anatomical injection sites are on the scalp frontal, parietal and vertex areas. Prior to injection the target scalp surface was cleaned thoroughly with alcohol pads. Patients received five injections at weeks 0, 2, 4, 6, 8 and were observed for 12 weeks and 24 weeks. Less than 0.1 ml is injected per site and approximately 1 cm between injection sites in the selected areas of scalp. When the injection was finished it was necessary to compress the points, which bleed within a few seconds. Gentle massaging of scalp was done after the procedure.

Micro-needling is a minimally invasive dermatological procedure in which fine needles are rolled over the skin to puncture the stratum corneum. It consists of 30 needles ranging between 0.25 and 3 millimeters long. It is rolled over the scalp for 10-15 times to ensure adequate coverage and proper absorption of PRP.

No serious or persistent side effects were detected. The patients experienced only temporary pain and swelling at the injection sites and these symptoms disappeared with in a day but no side effects with either injection such as hematoma or injection.

**Outcome measures:** In our study, we evaluated hair loss, hair density (hair/cm2), and patient's satisfaction. We also noted any reported adverse effects. The results were evaluated by digital camera and dermoscopy (digital microscopy) comparing pre and post-improvement photographs taken at 1st session (before start PRP) 3 and 6 months from the 1st session.

**Statistical analysis:** Final data before and after the intervention were imported and analyzed by SPSS 21 version. Continuous variables were reported as the mean±SD and $P < 0.05$ was considered to indicate a statistically significant difference. For comparing variables with normal distribution, Chi square, Fisher's exact test and ANOVA test were done. Qualitative variable were expressed with frequency and percent.

**Results and observations:**

**Table I. Distribution of the study subjects by scalp types (n=60).**

| Scale types | Male (n= 30) | | Female (n=30 ) | | p value |
|---|---|---|---|---|---|
| | Number | % | Number | % | |
| I | 3 | 10 | 14 | 46.7 | **0.002$^{s}$** |
| II | 5 | 16.7 | 14 | 46.7 | **0.01$^{s}$** |
| IIa | 9 | 30 | 0 | 0 | **0.001$^{s}$** |
| III | 6 | 20 | 2 | 6.7 | 0.25$^{ns}$ |
| IIIa | 5 | 16.7 | 0 | 0 | **0.01$^{s}$** |
| IV | 1 | 3.3 | 0 | 0 | 1.00$^{ns}$ |
| V | 1 | 3.3 | 0 | 0 | 1.00$^{ns}$ |

The study subjects had Norwood-Hamilton scale types 1 to V for men and Ludwig scale types 1 to III for women. The table exhibits that scalp types I and II had significantly more in female than male with p values 0.002 and 0.01 respectively. On the contrary, scale types IIa and IIIa had more in male than female with p values 0.001 and 0.01 respectively. Chi-square and Fisher's exact test were applied to find out the level of significance.

**Table II. Hair count before 3 months and after 6 months PRP administration (n=60).**

| Hair count ($1cm^2$) | Mean ± SD | F value | P value |
|---|---|---|---|
| Before PRP | 35.46 ± 6.89 | 3.49 | **0.004**[s] |
| After 3 months | 43.68 ± 8.23 | | |
| After 6 months | 55.54 ± 11.11 | | |

The above table shows that mean number of hairs were 35.46 ± 6.89, 43.68 ± 8.23 and 55.54 ± 11.11 $1cm^2$ in before PRP, after 3 and 6 months respectively. It means that after 3 and 6 months later mean number of hairs higher in numbers than before PRP intervention with significant differences by ANOVA test.

**Table III. Biochemical status of study subjects (n = 60).**

| Characteristics | Mean ± SD | Normal range |
|---|---|---|
| Hb (%) | 12.5±1.5 | 13.5-17.5 |
| Vitamin D (ng/ml) | 13.2±8.7 | 30-100 |
| TSH (mU/L) | 1.5±0.6 | 0.4-4.0 |
| Testosterone (ng/ml) | 238.7±201.9 | 240-950 |

The table indicates that above all characteristics were found below than normal range, except TSH with in reference level.

**Table IV. Photographic assessment of the study subjects (n = 60).**

| Assessment | Frequency | Percentage |
|---|---|---|
| Mild improvement | 7 | 11.7 |
| Good improvement | 20 | 33.3 |
| Very good improvement | 23 | 38.3 |
| Excellent improvement | 10 | 16.7 |

Patient showed photographic assessment in category of mild improvement, good improvement, very good improvement and excellent improvement were 7 (11.7%), 20 (33.3%), 23 (38.3%) and 10 (16.7%), respectively.

**Table V. Pain level of the study subjects (n = 60).**

| Pain level | Frequency | Percentage |
|---|---|---|
| Mild | 42 | 70 |
| Moderate | 18 | 30 |

Mild pain was observed in 42 (70%) persons and the rest 18 (30%) had moderate pain.

**Male patient:**

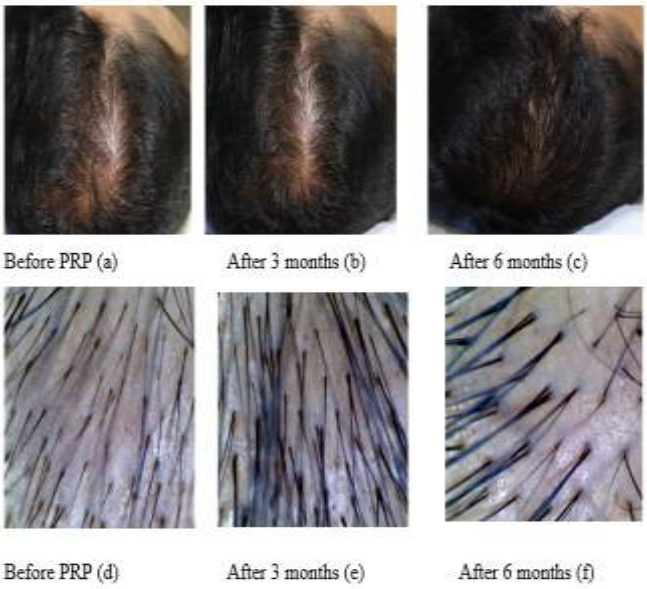


**Figure I: Male patient grade I AGA showed improvement (a-c) digital images (d-f) dermoscopic images (a-d) before (b-e) 3 months after and (c-f) 6 months after PRP injection.**

**Female patient:**


**Figure II: Female patient grade II AGA showed improvement (a-c) digital images (d-f) dermoscopic images (a-d) before (b-e) 3 months after and (c-f) 6 months after PRP injection.**

**Discussion:**

The present study was conducted to evaluate the efficacy and safety of intradermal injection of PRP treatment of androgenic alopecia. The study included 60 patients divided into two groups (male and female) and each included 30 patients complaining of AGA. Both the group were treated by intradermal injection of Platelet rich plasma.

The present study revealed result about using platelet rich plasma injection. Our result showed significant improvement in hair count. The Mean numbers and mean cross-sections of hairs were Greco.et.al and Lopez et.al [21, 22] observed a significant increase in hair diameter and hair density respectively.

Patients filled in the patients' satisfaction questionnaire and reported any adverse effects. They were satisfied with Photographic assessment reported an improvement in hair quality and thickness, while 11.7% , 33.3%, 38.3% and 16.7% reported mild, good, very good and excellent improvement, respectively. Our result showed similar result like Gkini.et.al. PRP in androgenetic alopecia[1, 2,4,14].

Regarding PRP safety profile in the satisfaction questionnaire patient's reported any adverse effects. During intervention of PRP, 70% of them felt mild pain and 30% moderate pain[1, 2].

Regarding photographic assessment our result showed good improvement in digital and dermoscopic images both in male and female[1, 2, 23, 24].

Finally, sample size was small, despite the fact that we had statistical significant results.

**Limitation of Study:** Nevertheless, our study was not a randomized, doubled blind, controlled trail and potent bias might be present. Drug history, smoking habit and other lifestyle were not evaluated in details or compared. Drug, smoking as well as other factors affecting microcirculation may play a role in trail result. Nevertheless, more randomized, controlled, double-blind studies with approved devices for PRP with larger sample size, longer follow-up and objective evaluation methods are needed. The questions are whether PRP will provide as much benefit as existing treatment options such as Minoxidil and finasteride to be used as monotherapy or in combination with other treatments. Without regression analysis dose response relationship would not establish.

**Conclusion:** In conclusion, PRP injections appeared to be effective in the treatment of androgenetic alopecia in both males and females, without remarkable adverse effects, while they were accompanied by a high patient's satisfaction rate. More rigorous study designs, including large samples, quantitative measurements of effect and longer follow-up periods are needed to solidify the utility of PRP for treating androgenic alopecia.

**References:**

1. Maria-Angelik Gkini, Alexandrous Efstration Kouskoukis, Gregory tripsianis ET. Al. Study of Platelet-Rich Plasma injections in the treatment of Androgenetic Alopecia through a One-year period. Journal of Cutaneous and Aesthetic surgery 2014:7(4):213-219. http://www.jcasonline.com
2. Mc Elwee KJ, Shapiro JS. Promising therapies for treating and /or preventing androgenic alopecia. Skin therapy let 2012; 17:17-14.
3. Jessica Cervantes, Mrina Perper et al. Effectiveness of Platelet-Rich Plasma for Androgenetic Alopecia: A review of the literature. Skin Appendage Disord 2018; 4:1-11. www.karger.com
4. Leavitt M Understanding and management of female pattern alopecia. Facial plast surg 2008; 24:414-27.
5. Mohamed A Toama, ElsayedM Khater and Mohamed I Soliman et.al. Platelet Rich Plasma Treatment of Androgenetic Alopecia in men and women. Journal of Clinical and Investigation Dermatology 2017; 5(2):5
6. Raghavendral L Girinjala, BS Ryan R Riahi et al. Platelet-rich plasma for androgenic alopecia treatment: A comprehensive review. Dermatology online Journal. Vol. 24 No. 7 July 2018, 24 (7):1.
7. A.K. Gupta and J.L. Carviel et al. Meta-analysis of efficacy of platelet –rich plasma therapy for androgenetic alopecia. J D Treatment, 2017. Vol. 28, No. 1 55-28. http://dx.dol.org/10.1080/09546637.2106.1179712
8. Elite M. Ferneini, DMD, MD, MHS, MBA et al. Platelet-rich Plasma in Androgenic Alopecia: Indications, Technique, and Potential

Benifits. J Oral Maxillofac Surgeons: 1-8, 2016. http://dx.doi.org/101016/i.jams.2016.10.040
9. Betsi E, Germain E, Kalbermatten Df et. Al. Platet-Rich Plasma injection is effective and safe for the treatment of alopecia. Eur J Plast Surg 2014; 36: 407-412.
10. Cervelli V, Gracovich S, Bielli A et.al. The effect of autologous activated Platelet-Rich Plasma injection on pattern hair loss. Clinical and histomorphometric evaluation. Biomed Res int 2014; 760709.
11. Alfonso M, Richter Appelt H, Tosti A, Viera MS, Gracia M. The psychosocial impact of hair loss among men: A multinational European Study. Curr Med Res Opin 2005; 21:1829-36.
12. Cash TF, Price VH. Savin RC. Psychological effects of androgenetic alopera on women: Comparisons with balding men and with female control subjects. J Am Acad Dermatol 1993; 29: 568-75.
13. Blumeyer A, Tosti A, Messenger A, Reygagne P, Del Marmol V, Spuls PI, et al.: European Dermatology Forum (EDF). Evidence-based (S3) guideline for the treatment of androgenetic alopecia in women and in men. J Dtsch Dermatol Ges 2011; 9 (Suppl 6): S1-57.
14. Sanchez-Gonzalez DJ, Mendez-Bolaina E, Trejo-Bahena NI. Platelet-rich plasma peptides: Key for regeneration. Int J Pept 2012: 2012: 532519.
15. Kamp H, Geilen CC, Sommer C, Blume-Peytavi U. Regulation of PDGF receptor in cultured dermal papilla cells and follicular keratinocytes of human hair follicle.Exp Dermatol 2003; 12: 662-72.
16. Burooj Mohammad Razooqui Al-aajem, Khudhair Khalaf Al-Kayalli et al. Evaluation of efficacy and safety of platelet rich plasma (PRP) in the treatment of androgenic alopecia and bacterial ulcerative lesion. Int. Res. J. Pharma, 2018, 9 (10). www.irjponline.com
17. Chaudhari ND, Sharma YK, Dash K, Deshmukh P, et al. (2012) Role of platelet-rich plasma in the management of androgenetic alopecia. Int. J Trichology 4: 291-292.
18. Greco V, Chen T, Rendl M, Schober M, Pasolli HA, et al. A two-step mechanism for stem cell activation during hair regeneration. Cell Stem Cell 4: 155-169.
19. Lopez V, Vaya A, Bautista D, Ricart JM (2013) Autologus platelet-rich plasma as a potential therapeutic tool in androgenetic alopecia. J Am Acad Dermatol 68: AB103.
20. Anitus E, Pino A, Martinez N, Orive G et.al. The effeft of Plasma rich in growth factors on pattern hair loss; a pilot studty,
21. GrecoV, Chen T, Rendi M et.al. A two-step mechanism for stem cell activation during hair regeneration. Cell Stem cell 2009; 4: 155-169.
22. Lopez V, Vaya A, Bautisia et.al. Autologous platelet-rich plasma as a potential therapeutic tool in androgenetic alopecia 2013. J Am Acad Dermatol; 68; AB 103
23. Takikawa m, Nakamura S, Nakamura et.al. Enhanced effect of platelet-rich plasma containing a new carrier on hair growth Dermatol Surg: 1721-1729.
24. Park K, Kim H.Kim BJ et.al Letter: Platelet-rich plasma for treating male pattern baldness. Dermatol Surg 38:2042-2044.