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**Case Series**

# Growth factor concentrate therapy for management of hair loss: a prospective, real-world study

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## ABSTRACT

The present pilot study was conducted to determine the role of growth factor concentrate (GFC) therapy, a modified platelet-rich plasma (PRP) technique for the management of androgenetic alopecia. In this study, patients diagnosed with androgenic alopecia were treated with subcutaneous injections of GFC in the scalp. A total of 3 injections were administered 4 weeks apart, and the patients were followed up for 24 weeks. The treatment outcomes were assessed by taking global macroscopic photographs, trichoscopic photomicrographs, and by performing a hair pull test after 24 weeks of therapy and compared to the baseline. To determine the safety of the treatment, the incidence of any adverse event was recorded throughout the study period. The patient's self-satisfaction was assessed using a survey-based questionnaire at the end of the study period. The global macroscopic photographs showed a significant improvement in hair growth post-GFC therapy in all 5 patients. These findings were supported by trichoscopic photomicrographs, in which a pronounced improvement in hair density along with a decrease in the shaft diameter variability and number of yellow dots were observed. Hair pull test was found to be negative in 100% of patients 4 months post-therapy. The therapy was found to be well tolerated with high patient satisfaction (80%). GFC therapy was found to have a promising role in the management of androgenetic alopecia in both male and female patients.

**Keywords:** Androgenetic alopecia, Growth factor concentrate, Platelet-rich plasma technique, Global macroscopic photographs, Trichoscopic photomicrographs, Hair pull test

## INTRODUCTION

Alopecia (hair loss) is often distressing and can significantly impact patients' quality of life. The pattern of hair loss may be noticeable, such as the bald patches, or more subtle, such as the diffuse hair loss.[1] It can be subdivided into two main categories: scarring and non-scarring (or androgenetic), the latter being the most common type of alopecia.[2]

Alopecia is considered a normal part of aging. The epidemiology is variable depending on the cause and the type of alopecia; androgenetic alopecia is reported to affect 50% of men and 15% of women, particularly postmenopausal women.[3] In India, the prevalence rate of androgenetic alopecia is reported to be as high as 58% among males aged 30-50 years.[4] The majority of men begin to have their hair loss in the early age of twenties, while women begin to lose their hair in their forties or fifties. The difference between male hair loss and female hair loss is the pattern. In men, there is a receding frontal hairline with bitemporal hair loss, while in women, the anterior hairline is preserved and they tend to lose hair from the central area of the scalp. Hair loss advances to complete baldness in males, while it is rare in the case of females.[5] Genetic variations associated with the androgen

receptor gene are believed to be responsible for triggering androgenetic alopecia in males. Genetically variable sensitivity of hair follicles towards the normal levels of androgen, dihydrotestosterone, and metabolite testosterone is found to be associated with male-pattern baldness (causing gradual miniaturization of the hair follicle). However, the available information regarding the pathogenesis of female androgenetic alopecia is sparse, but evidence shows genetic predisposition to play a major role.[6]

Currently, only two drugs, minoxidil, and finasteride are recognized by the United States (US) Food and Drug Administration as treatments for androgenetic alopecia.[7] The drugs must be used regularly for benefits to persist and patients experience a relapse in hair loss if and when the treatment is halted. Additionally, the prolonged usage of these medications is often accompanied by undesirable side effects like redness and scaling of the scalp, contact dermatitis and hypertrichosis (in women) with minoxidil and reversible loss of libido and erectile dysfunction as well as an incidence of gynecomastia with finasteride.[6]

Platelet-rich plasma (PRP) injections have emerged as a promising regenerative therapy for androgenetic alopecia as it possesses minimal chances of side effects, owing to its autologous nature. Recent studies have evidenced a promising role of growth factor concentrate (GFC) therapy, which is a modification of the PRP technique, in hair restoration and treatment for androgenetic alopecia.[8,9] However, there is a dearth of studies evaluating the role of GFC therapy in the management of androgenetic alopecia among the Indian population. Therefore, the present study has been conceptualized to determine the potential effect of GFC therapy for the treatment of androgenetic alopecia.

## CASE SERIES

Patients aged ≥18 years, diagnosed with androgenic alopecia, and who have not taken any other treatment or any other topical or systemic medication for hair fall in last the 6 months were included in the study. However, patients with uncontrolled diabetes mellitus or thyroid dysfunction; anemia, bleeding disorders or platelet disorders; human immuno-deficiency virus (HIV), hepatitis B or C positive or otherwise immunocompromised; history of malignancies; active skin disease or infection at the time of treatment or with active keloid formation were excluded from the study.

### *Study procedure*

GFC was prepared using the single spin method, 15 ml of blood from each patient was drawn into 4 vacuum blood collection tubes. The contents were gently mixed with the activator, provided in the tube by inverting them 8-10 times and then keeping them upright for 30 minutes, so as to activate the platelets and release growth factors. The tubes were then centrifuged at 3400 rpm for 10 min, followed by the extraction of GFC from the uppermost layer.

Before the GFC injection, anesthesia (lidocaine plus prilocaine) was applied for 40 min to block supraorbital and supratrochlear nerves followed by cleansing with sterile saline. The collected GFC (about 6-8 ml) was injected intradermally using a 30–31gauge needle and with the patient seated in the inclined position. About 0.1–0.2 ml of GFC was injected per injection over the affected area of the scalp and injection sites were spaced out from each other by approximately 0.8 to 1 cm. A total of three sessions of GFC therapy were given at 30 days (one month) intervals and follow-up of patients was done till 24 weeks (6 months) for the final clinical assessment.

### *Study outcomes*

Hair status was assessed at different follow-up visits (6 weeks after the previous visit till 24 weeks) and compared with the baseline visit (visit-1) with the use of the same hairstyle and photographic position for each patient. The treatment outcomes were assessed by taking global macroscopic photographs, trichoscopic photomicrographs [using a dermatoscope (DL4 E0430; Dermlite, San Juan Capistrano, CA) for measuring the hair count], as well as by performing the hair pull test. To perform the hair-pull test, a bundle of 20–60 hairs was gently pulled between the thumb and forefinger from several locations. The test was considered positive if more than 10% of hairs were released.[10] To evaluate the safety of the treatment, the occurrence of any adverse event was recorded along with their severity and relationship to the treatment from baseline to 24 weeks. Additionally, patients' self-satisfaction was assessed using a survey-based questionnaire at the end of the study period (24 weeks).

Data obtained from each subject's case record form were entered in a Microsoft spreadsheet. Categorical variables were presented as frequency and percentages, while continuous data were presented as mean and standard deviation and compared using paired t-test. Statistical significance was considered at p value $<0.05$. The patients were monitored for the following parameters:

### *Baseline characteristics*

The present study included 5 patients (3 males, and 2 females), with a mean age of 31.4±1.82 years. The history of hair loss among the patients was from 1-10 years. The chief complaints of the patients included receding of hairline, visible baldness, and progressive thinning of hair. The males were observed to have Hamilton-Norwood II, III, VI androgenic alopecia, while females were found to have Ludwig stage I and II alopecia. The baseline characteristics of patients are summarized in Table 1. Further, topical minoxidil (5%) hair serum and a combination of minoxidil (5%) and finasteride (0.1%) were reported to be used concomitantly in 40.0% and 60.0% of patients, respectively (Table 2). The personal

history of patients revealed that 60.0% of patients had a family history of androgenic alopecia.

**Table 1: Baseline characteristics (N=5).**

| Parameter | Variable |
|---|---|
| **Mean age (years±SD)** | 31.4±1.82 |
| **Gender** | |
| Male (n, %) | 3 (60.0) |
| Females (n, %) | 2 (40.0) |
| **Mean height (cm)** | 170.6±9.4 |
| **Mean weight (kg)** | 72.6±8.1 |
| **Location** | |
| Karnataka | 5 (100) |

***Effectiveness***

On comparing the global macroscopic photographs taken before and after 24 weeks of treatment, GFC therapy was observed to markedly improve the hair appearances in all the patients. The hair photomicrographs showed an evident regrowth of hair in the balding area and improved hair density after 24 weeks of GFC therapy as compared to the baseline. Figures 1 and 2 are case representatives of the effectiveness of GFC therapy in restoring hair growth after three sessions of therapy.

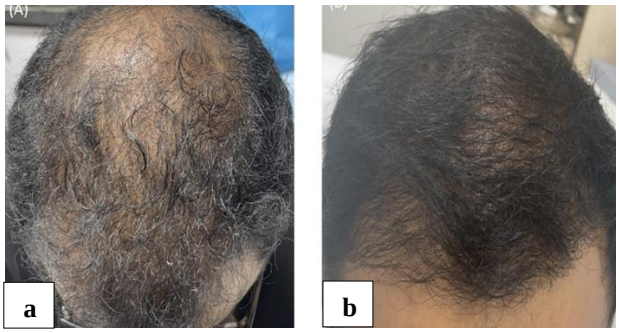


**Figure 1: Case representative 1: a 33-year-old male with Hamilton-Norwood VI androgenic alopecia (a) before treatment, and (b) after 24 weeks of GFC therapy.**

**Table 2: Concomitant medications used and personal history of patients.**

| Number of patients | Gender | Concomitant medicine used | Route of administration | Family member suffering from past medical history of hair fall | Type of alopecia |
|---|---|---|---|---|---|
| **1** | Female | Minoxidil 5% hair serum | Topical | None | Not applicable |
| **2** | Male | Minoxidil 5% + finasteride 0.1% | Topical | Father | Androgenic alopecia |
| **3** | Female | Minoxidil 5% hair serum | Topical | None | Not applicable |
| **4** | Male | Minoxidil 5% + finasteride 0.1% | Topical | Father | Androgenic alopecia |
| **5** | Male | Minoxidil 5% + finasteride 0.1% | Topical | Father | Androgenic alopecia |

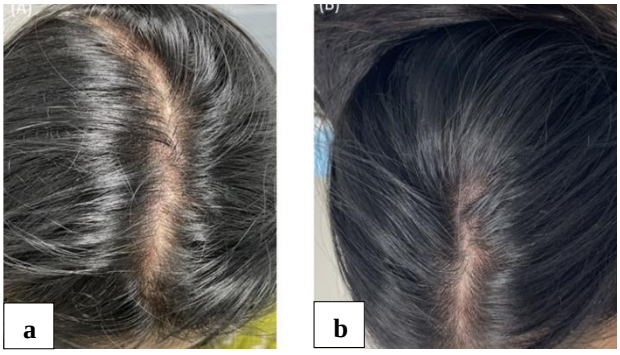


**Figure 2: Case representative 2: a 32-year-old female with Ludwig II androgenic alopecia (a) before treatment, and (b) after 24 weeks of GFC therapy.**

Further, the observations of trichoscopy images also demonstrated a pronounced improvement in hair density along with a decrease in the shaft diameter variability and number of yellow dots after 24 weeks of GFC therapy as compared to the baseline in all the patients. One such example is illustrated in Figure 3, wherein the terminal hair ratio was observed to be markedly increased after 24 weeks post-treatment compared to the baseline.

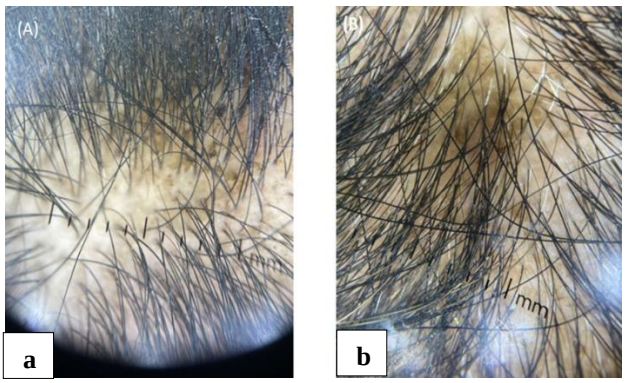


**Figure 3: Trichoscopic image of a patient (a) before treatment, and (b) 24 weeks after treatment.**

Hair-pull test, which was found to be positive in 60.0% (3 out of 5) of patients at baseline, implying active hair shredding; was observed to be negative in 100% of these patients after 4 months of treatment, indicating hair restoration in all the patients' post-GFC therapy.

### *Safety*

All adverse events reported by the patients were mild such as scalp pain at the injection site (mild in 80% and moderate in 20% of patients), erythema (60%), and scalp irritation during the healing process (40%). However, all these adverse events were reported to be resolved spontaneously within a few hours to a few days of onset.

### *Patients' satisfaction*

In the survey-based questionnaire, used to determine patients' self-satisfaction, when asked about whether their bald spot is getting smaller, the majority of them (80%) strongly agreed. When questioned about the improvement in hair growth after therapy, 80% of the patients reported a moderate increase in hair growth. Further, the patients were inquired about the effectiveness of the treatment in slowing down their hair loss, 60% of patients perceived it to be very effective. Regarding self-satisfaction about the treatment, 80% of patients reported being very satisfied. Lastly, patients' self-satisfaction score was evaluated using a Likert scale (1=very unsatisfied, 2=unsatisfied, 3=indifferent, 4=satisfied, or 5=very satisfied), to which the majority of patients (80%) scored 5, indicating that they were very satisfied with the GFC therapy.

## DISCUSSION

Though androgenic alopecia is frequently encountered by practicing dermatologists and hair specialists, it is one of the most challenging conditions to confront, as treatment selection often involves a multifaceted consideration of different factors and ethical decision-making.

The results of the present study demonstrated the potential role of GFC therapy in hair restoration and improvement in hair growth. This superior follicular regeneration using GFC therapy is attributed to the modified PRP technique, which degranulates the intracellular alpha-granules of the platelets to release a relatively high concentration of growth factors like platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), and insulin growth factor (IGF).[11] These growth factors are believed to act on the stem cells in the bulge area of the follicles, stimulating the growth of new follicles, and promoting neovascularization.[12] Literature evidenced that growth factors like PDGF plays a role in hair canal formation, VEGF facilitates angiogenesis around the hair root, EGF promotes the proliferation and migration of outer root sheath cells, which plays an essential role in the development and maintenance of the hair follicle and the growth of the hair shaft, and IGF involves in follicular proliferation, and the hair growth cycle.[13-16]

Further, the findings of the present study are in concurrence with the observations of recently conducted studies, wherein, Tan et al who used GFC for the treatment of androgenic alopecia for the first time among the Asian population observed a significant improvement in hair appearance and hair density after 6 months of therapy.[17] Similarly, in another study, marked visible changes were reported in clinical photographs and dermoscopy after injectable-platelet rich fibrin (analogous to GFC therapy) among Indian patients with androgenetic alopecia by the end of 2 months post-therapy.[18]

The hair pull test also showed a pronounced improvement as compared to the baseline result of the same which is comparable to the study performed by Steward and coworkers, in which only one (5%) out of 20 patients had an increase in hair fall in the hair pull test as compared to the results of the hair pull test done preoperatively.[19]

Scalp pain during injections was the most common adverse event reported in the present study, which was related to injection pricks, followed by erythema and scalp irritation during healing. All these adverse events were found to be mild and well tolerated by the patients. These findings are similar to those reported in the previous studies, wherein minimal pain, redness at the time of injections, and pinpoint bleeding have been reported to be associated with this technique.[20]

Patient satisfaction regarding their treatment for androgenic alopecia is of utmost importance as it can affect psychological and social experiences as well as the quality of life. In the present study, 80% of patients were found to be very satisfied; which is in agreement with the previous studies, wherein, 73.33% of patients reported being satisfied with the overall result.[18]

### *Limitations*

The present study is a single-arm study that enrolled only a limited number of subjects. To confirm the findings of this study, larger randomized control studies should be warranted. The forthcoming investigations with a greater number of GFC sessions and longer-multiple follow-ups are required to assess the long-term effect of GFC.

## CONCLUSION

The present study demonstrated a significant improvement in hair growth following GFC therapy among both males and female patients with androgenetic alopecia. The therapy was found to be well tolerated with high patient satisfaction. Hence, the present study supports GFC therapy as a safe, effective, and new option in the armamentarium in the management of androgenetic alopecia.

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## REFERENCES

1. Phillips TG, Slomiany WP, Allison R. Hair Loss: Common Causes and Treatment. Am Fam Physician. 2017;96(6):371-8.
2. Al Aboud AM ZP. Alopecia. In: StatPearls [Internet] Treasure Island (FL): StatPearls Publishing. 2022. Available at: https://wwwncbinlmnihgov/books/NBK538178/. Accessed on 12 October 2022.
3. Rinaldi F, Marzani B, Pinto D, Sorbellini E. Randomized controlled trial on a PRP-like cosmetic, biomimetic peptides based, for the treatment of alopecia areata. J Dermatolog Treat. 2019;30(6):588-93.
4. Mysore V, Parthasaradhi A, Kharkar RD, Ghoshal AK, Ganjoo A, Ravichandran G, et al. Expert consensus on the management of Androgenetic Alopecia in India. Int J Trichol. 2019;11(3):101-6.
5. Qi J, Garza LA. An overview of alopecias. Cold Spring Harb Perspect Med. 2014;4(3).
6. Wolff H, Fischer TW, Blume-Peytavi U. The Diagnosis and Treatment of Hair and Scalp Diseases. Dtsch Arztebl Int. 2016;113(21):377-86.
7. Adil A, Godwin M. The effectiveness of treatments for androgenetic alopecia: A systematic review and meta-analysis. J Am Acad Dermatol. 2017;77(1):136-41.
8. Gentile P, Cole JP, Cole MA, Garcovich S, Bielli A, Scioli MG, et al. Evaluation of Not-Activated and Activated PRP in Hair Loss Treatment: Role of Growth Factor and Cytokine Concentrations Obtained by Different Collection Systems. Int J Mol Sci. 2017;18(2).
9. Cervelli V, Garcovich S, Bielli A, Cervelli G, Curcio BC, Scioli MG, et al. The effect of autologous activated platelet rich plasma (AA-PRP) injection on pattern hair loss: clinical and histomorphometric evaluation. Biomed Res Int. 2014;760709.
10. Xu L, Liu KX, Senna MM. A Practical Approach to the Diagnosis and Management of Hair Loss in Children and Adolescents. Front Med (Lausanne). 2017;4:112.
11. Kobayashi E, Flückiger L, Fujioka-Kobayashi M, Sawada K, Sculean A, Schaller B, et al. Comparative release of growth factors from PRP, PRF, and advanced-PRF. Clin Oral Investig. 2016;20(9):2353-60.
12. de Boer HC, van Oeveren-Rietdijk AM, Rotmans JI, Dekkers OM, Rabelink TJ, van Zonneveld AJ. Activated platelets correlate with mobilization of naïve CD34(+) cells and generation of CD34(+) /KDR(+) cells in the circulation. A meta-regression analysis. J Thromb Haemost. 2013;11(8):1583-92.
13. Takakura N, Yoshida H, Kunisada T, Nishikawa S, Nishikawa SI. Involvement of platelet-derived growth factor receptor-alpha in hair canal formation. J Invest Dermatol. 1996;107(5):770-7.
14. Hou C, Miao Y, Wang J, Wang X, Chen CY, Hu ZQ. Collagenase IV plays an important role in regulating hair cycle by inducing VEGF, IGF-1, and TGF-β expression. Drug Des Devel Ther. 2015;9:5373-83.
15. Zhang H, Nan W, Wang S, Zhang T, Si H, Yang F, et al. Epidermal Growth Factor Promotes Proliferation and Migration of Follicular Outer Root Sheath Cells via Wnt/β-Catenin Signaling. Cellular Physiology and Biochemistry. 2016;39(1):360-70.
16. Trüeb RM. Further Clinical Evidence for the Effect of IGF-1 on Hair Growth and Alopecia. Skin Appendage Disorders. 2018;4(2):90-5.
17. Tan P-C, Xie Y, Wu W, Zhang P, Gao Y, Liu K, et al. Concentrated Growth Factor from Autologous Platelet Promotes Hair Growth in Androgenetic Alopecia. J Biomed Sci Eng. 2019;12(03):201-11.
18. Bhoite KS CS, Mishra SN, Kharkar VD. Injectable platelet rich fibrin therapy for androgenetic alopecia: a series of 15 cases. Int J Res Dermatol. 2022;8:398-402.
19. Steward EN, Patel H, Pandya H, Dewan H, Bhavsar B, Shah U, et al. Efficacy of Platelet-Rich Plasma and Concentrated Growth Factor in Treating Androgenetic Alopecia - A Retrospective Study. Ann Maxillofac Surg. 2020;10(2):409-16.
20. Khatu SS, More YE, Gokhale NR, Chavhan DC, Bendsure N. Platelet-rich plasma in androgenic alopecia: myth or an effective tool. J Cutan Aesthet Surg. 2014;7(2):107-10.

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