Medica Hospitalia
Journal of Clinical Medicine
Med Hosp 2023; vol 10 (1) : 118–123

Case Report

Platelet-Rich Plasma (PRP) as A New Approach and Promising Therapy in Patients with Alopecia Areata

Holy Ametati[1], Elva Kadarhadi[1], Imelda Gunawan[1], Diah Adriani Malik[1], Muji Rahayu[2]

[1]Department of Dermatology, Venereology, and Aesthetic Medical Faculty of Diponegoro University / Dr. Kariadi General Hospital Semarang, Indonesia
[2]Department of Clinical Pathology Medical Faculty of Diponegoro University / Dr. Kariadi General Hospital Semarang, Indonesia

p-ISSN: 2301-4369 e-ISSN: 2685-7898
https://doi.org/10.36408/mhjcm.v10i1.818

Accepted: September 08th, 2022
Approved: March 27th, 2023

Author Affiliation:
Department of Dermatology, Venereology, and Aesthetic Medical Faculty of Diponegoro University/ Dr. Kariadi General Hospital Semarang, Indonesia

Author Correspondence:
Elva Kadarhadi
Dr. Sutomo Street No. 16 Semarang, Central Java 50244, Indonesia

E-mail:
elva.kadarhadi@gmail.com

Abstract

Background : Alopecia areata (AA) is a non-scarring, autoimmune, inflammatory condition that causes well-defined areas of hair loss on the scalp and/or body. A new biotechnology called platelet-rich plasma (PRP) was developed as a result of increased interest in tissue engineering and cell-based therapies. This therapy is defined as an autologous, non-allergic preparation of platelets in concentrated plasma. Study aimed to evaluate the effect of PRP treatment in alopecia areata.
Case : This study included 3 patients complaining of multiple patchy alopecia areata. They were treated with combination of PRP therapy, topical fluocinolone acetonide 0.025% cream, minoxidil 2 and 5%, and ketoconazole 2% scalp solution. One patient was also treated with intralesional triamcinolone acetonide injections. PRP was injected intradermally every 4 weeks and final monitoring was conducted after 4–6 sessions. Evaluation and follow up results were determined using photographic monitoring as well as patient's satisfaction.
Results : Administration of autologous PRP had significance hair regrowth in all three patients in this study. PRP treatment sessions varied from 3 to 6 sessions. However, significance outcomes in these patients were established after 3 sessions of PRP treatment, while the best results were obtained after 4-6 sessions of PRP treatment. No major side effects was reported.
Conclusion : PRP is effective in promoting hair growth. PRP treatment for alopecia areata is safe, easy to perform, and can achieve patient's satisfaction, without any major adverse effects. However, further research on standardized protocol of PRP methods are needed.

Keywords : platelet-rich plasma, alopecia areata, hair loss

INTRODUCTION

Alopecia areata (AA) is a non-scarring, autoimmune, inflammatory condition that causes well-defined areas of hair loss on the scalp and/or body. It is still unclear how AA develops from a pathogenic standpoint. Recently, the pathomechanism of AA has been thought to be an organ-specific autoimmune disease and it can cause inflammation that induce hair loss. In severe situations, hair loss can lead to total body baldness (alopecia universalis) or full loss of hair from the scalp (alopecia totalis). The majority of therapy for AA are immunosuppressive because it is thought of as an organ-specific autoimmune disease, yet up until now, AA has been difficult to treat.[1,2] A new biotechnology called platelet-rich plasma (PRP) was developed as a result of increased interest in tissue engineering and cell-based therapies.[3] This therapy is defined as an autologous, non-allergic preparation of platelets in concentrated plasma from the patient's own blood.[1] PRP contains a variety of cytokines and growth factors that improve the body's ability to repair and regenerate.[3] PRP has been beneficial in dermatology, particularly in acne scars, hair regrowth, wound healing, and fat grafting.[3]

Typical blood sample consists of 93% red blood cells (RBCs), 6% platelet, and 1% white blood cells (WBCs), but in PRP, the platelet concentration is enriched through centrifugation. The concentration of platelets is 94% and the concentration of RBCs is 5%.[3] Thus, the concentration of platelets is 4-7 times above baseline values.[2] PRP contains high concentrations of over 20 different growth factors, that can enhance recruitment of reparative cells in hair loss although the exact mechanisms are still unknown. The aim of this study is to evaluate the efficacy and safety of PRP treatment in alopecia areata.[2]

CASE REPORTS

In this study, we evaluated the effectiveness of PRP treatment for alopecia in 3 patients. This study was conducted from October 2020 until April 2021 at Gardenia Clinic, Dr. Kariadi General Hospital, Semarang. All patients gave a written informed consent. One session of PRP treatment was repeated every 4 weeks and final monitoring lasted after 5–6 sessions. Evaluation on subject's hair growth was performed in every session of treatment by photographic monitoring. The patient's satisfaction and evaluation of clinical improvement, including hair counts/density, hair thickness, and general alopecia photographic monitoring, are made easier with a follow-up period that is sufficient.

The production and delivery of PRP followed a very wide range of methods. In this investigation, we prepared PRP using a double-spin centrifugation procedure. In the laboratory, 30 mL of patient's blood was taken. We used 3 sterile 15 mL conical falcon tubes, each containing 1.4 mL citrate phosphate dextrose (CPD), and then we added 10 mL of the patient's venous blood to each sterile conical falcon tubes and homogenized them. Double-spin centrifugation involved first spin being at 100 g for 6–10 minutes and the second spin being at 400 g for 10–15 minutes. Three layers were formed after the first spin, namely the top layer was acellular plasma (platelet-poor plasma), the middle layer was buffy coat, and the bottom layer was red blood cells. We transferred the platelet-poor plasma and buffy coat into a new sterile conical falcon tube without anticoagulant. Two layers were formed after the second spin, namely the upper layer was platelet-poor plasma and the lower layer was platelet-rich plasma (PRP) (1 mL). Platelets would be activated to produce growth factors and cytokines with the application of an activator called calcium gluconate. A

Figure 1. (a) An average volume of pure PRP obtained after double-spin centrifugation, **(b)** Intradermal PRP injections in scalp areas using the nappage technique.

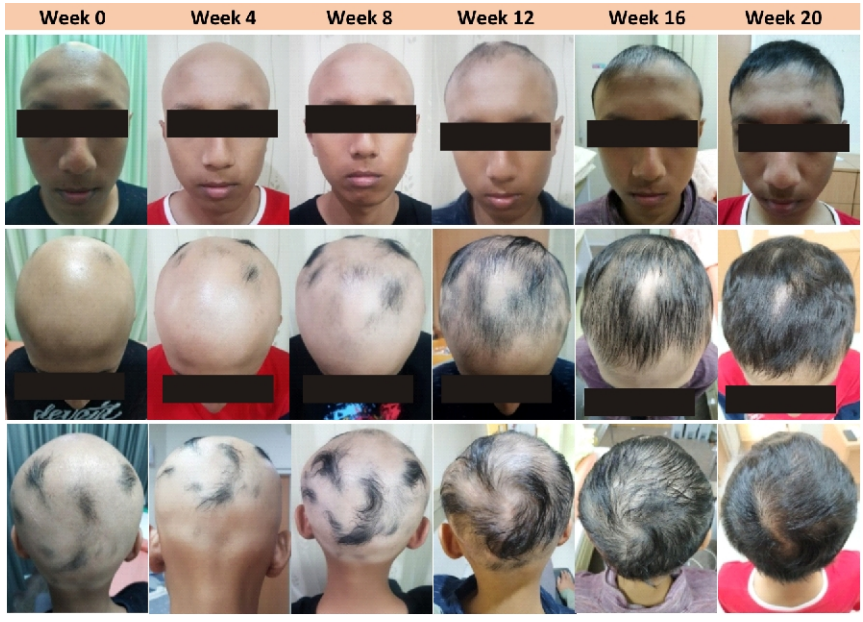

Figure 2. Progress of PRP treatment in patient with alopecia totalis.
The patient improved markedly within 5 sessions of treatment

typical volume of 2 ml of pure PRP was used for the entire amount of PRP injected (Figure 1a).

Before injection, topical anesthetic was needed for 30 to 60 minutes using topical lidocaine 2%. A linear pattern of numerous tiny injections spaced 1 cm apart should be used to apply intradermal injections at a rate of roughly 0.1 ml/cm^2 to specific scalp locations. The depth should be between 1.5 and 2.5 mm (Figure 1b).

Case 1

The main complaint of a 17-year-old male patient was asymptomatic scalp hair loss for the previous five years. The baldness on his head began as a small patch of hair loss that steadily grew larger until it covered his entire scalp. There was no familial history of the condition, no drug use history, and no signs of a systemic illness. Examining the region revealed a large and well-defined balding patch. The area was smooth and showed no signs of skin alterations. The patient was diagnosed with alopecia totalis and treated with a combination of PRP and intralesional triamcinolone acetonide injections (5 mg/ml) every 4 weeks, alongside daily application of topical fluocinolone acetonide 0.025% cream twice daily, minoxidil 5% spray twice daily, and ketoconazole 2% scalp solution once every two days. The patient improved markedly within 5 sessions of treatment (Figure 2).

Case 2

The main complaint of a 18-year-old female patient was asymptomatic scalp hair loss for two years. There was no family history of the illness, nor was there any drug use or trauma. Upon investigation, there was no evidence of autoimmune illness. At the parietal and occipital regions of the scalp, there was alopecia without scarring. Systemic analysis was normal. The patient was diagnosed with alopecia areata. PRP injections was conducted every 4 weeks alongside daily application of topical fluocinolone acetonide 0.025% cream twice daily, minoxidil 2% spray twice daily, and ketoconazole 2% scalp solution once every two days. Remarkable improvement was shown after 12 weeks, while the best result was obtained after 4 sessions of treatment (Figure 3).

Case 3

The main complaint of a 19-year-old female patient was asymptomatic scalp hair loss since the beginning of October 2019. The patient made the decision to cut all of her hair after the hair loss progressed from a little spot on the right and left sides of the scalp to bald patches on both sides. Additionally, the patient reported suffering from shoulder joint pain. There was no family history of the condition. On physical examination, there was non-scarring alopecia at frontoparietal, both temporal, and occipital regions of scalp, there was no malar rash, there was pain and limited range of motion of the shoulder joints, and the other organ systems were within normal limits. On laboratory examination, anti-PM Scl100 in ANA profile was borderline positive, antinuclear antibody (ANA), and anti DsDNA were negative. There was vitamin D deficiency. The patient was diagnosed with alopecia areata and rheumatoid arthritis. The patient was treated with a combination of PRP injection every 4 weeks, application of topical fluocinolone acetonide 0.025% cream twice daily, minoxidil 2% spray twice daily, and ketoconazole 2% scalp solution once

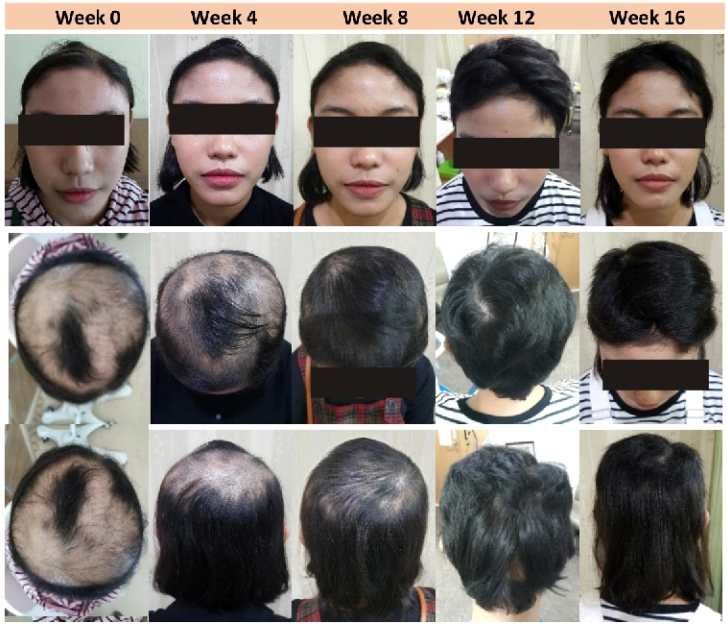

Figure 3. Progress of PRP treatment in patient with alopecia areata.
Remarkable improvement was shown after 12 weeks, while the best result was obtained after 4 sessions of treatment

every two days. Patient was also treated by internal medicine specialist with oral prednisone 5 mg/12 hours, cyclosporine 25 mg/day, and calcitriol 1 tablet/day for rheumatoid arthritis. Remarkable improvement was shown after 3 sesions of treatment, which was 12 weeks (Figure 4).

DISCUSSION

Alopecia areata (AA) is a chronic organ-specific disease that affects hair follicles and sometimes nails. According to statistics, 0.2% of population have an AA episode at some point in their lives, and 1.7% of population will have one overall. Although the exact etiopathogenesis is unknown, autoreactive T lymphocytes that target the hair follicles are likely to be a mediator.[4]

Alopecia areata (AA) can develop into alopecia totalis, which affects the entire scalp, and alopecia universalis, which affects the hair on all other body parts. The treatment suggestions are primarily based on case series and clinical experience because there are so few randomized trials and available data for treatment methods. Patient counseling regarding the nature of the disease is crucial. Alopecia areata is frequently treated with topical corticosteroids, as well as occasionally with occlusion. Other therapeutic options include oral corticosteroids, intralesional triamcinolone acetonide (5–10 mg/ml), and hydrocortisone acetate (25 mg/ml). For wider areas, contact immunotherapy using dinitrochlorobenzene, squaric acid dibutylester, and diphenylcyclopropenone has been suggested with varying degrees of success. Other treatment options include photochemotherapy, topical minoxidil administration, and use of dithranol. [4]

Because of the inflammatory process in alopecia areata, corticosteroids have been the most commonly used treatment modality and have good efficacy in hair regrowth. Several forms of topical corticosteroids have been used in AA, such as fluocinolone acetonide gel, fluocinolone scalp cream, betamethasone valerate lotion, and clobetasol propionate ointment.[5] They are painless and safe. Folliculitis is a frequent adverse reaction to corticosteroid therapy.[5,6] In this patient, we used fluocinolon acetonide 0.025% cream twice daily.

The local impact of topical corticosteroids is the strongest, and systemic adverse effects are the least. Immunosuppression and a decrease in local inflammation near the dermal papilla are the key mechanisms of action. Additionally, corticosteroids block the T-cell-mediated immune response that affects the hair follicles.[7] Corticosteroids administered intralesionally are frequently used to treat AA. When diseases are localized and affect less than 50% of the scalp, they are the primary line of treatment. Commonly used steroids include triamcinolone acetonide (5–10 mg/ml) and hydrocortisone acetate (25 mg/ml). We used triamcinolone acetonide 5 mg/ml intradermally to this patient. Typically, a 30-gauge needle and a 1 ml syringe are used to give triamcinolone acetonide at a dosage of 5 mg/ml through a series of 0.1 ml injections spaced 1 cm apart. A maximum of 3 ml of the solution is injected intradermally on the scalp during a single visit, in or just

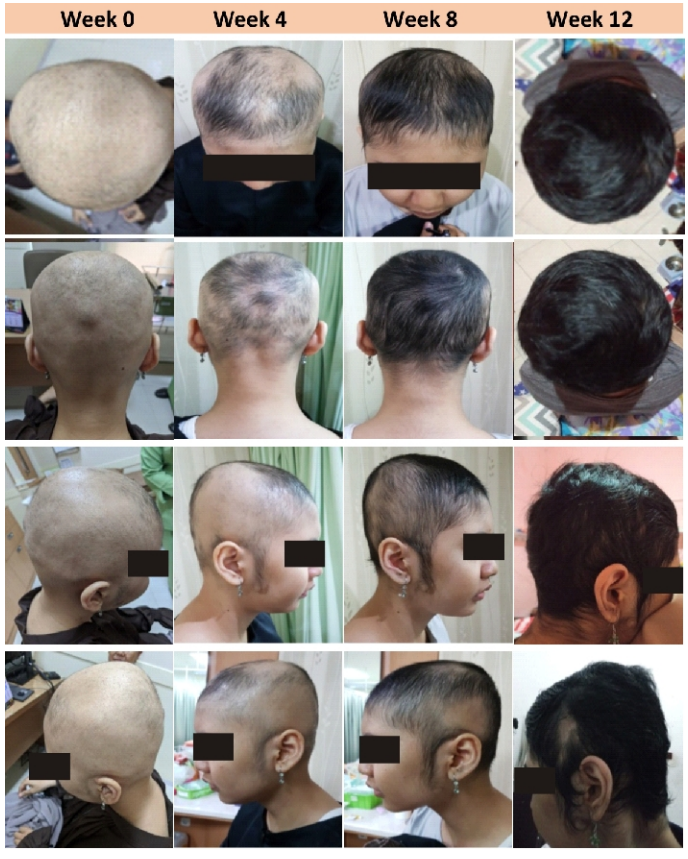

Figure 4. Progress of PRP treatment in patient with alopecia areata.
Remarkable improvement was shown after 12 weeks (after 3 sessions of treatment)

beneath the dermis. In responding patients, hair regrowth often appears within 4–6 weeks.[6]

Minoxidil was originally made as an antihypertensive medication and hypertrichosis was one of its most common side effects.[8] Minoxidil then was developed to treat male and female pattern alopecia, which can stimulate hair growth and reduce hair loss. In addition to vasodilatation, dermal papilla and follicular cells are stimulated by minoxidil, directly promoting hair growth.[9] Additionally, minoxidil can accelerate the transition to the anagen phase and also shorten the telogen phase to 1 to 2 days by increasing DNA synthesis in anagen bulbs, stimulating follicular proliferation and differentiation, and causes a rapid shift to the anagen phase by inducing β-catenin activity. Minoxidil also stimulates the production of prostaglandin E2, the most upregulated target gene in the β-catenin pathway in dermal papilla cells, to keep hair follicles growing continuously and maintaining the anagen phase.[8] In conclusion, the vasodilatation, potassium channel opening, anti-androgen, angiogenesis, the release of growth factors, stimulation of dermal papilla, and immunosuppression are the postulated mechanisms of action for minoxidil. Topical minoxidil comes in two concentrations, 2% for women and 5% for men, and is available as a spray and a foam. For best effects, apply it twice daily for at least 4 hours.[7]

Ketoconazole is an imidazole antifungal. Topical ketoconazole stimulates hair growth significantly. Actually, topical ketoconazole has more effects on androgenic alopecia because of its antiandrogenic properties. However, topical ketoconazole also has anti-inflammatory properties, so it can also be used in alopecia areata.[7,10]

A novel medical procedure called platelet-rich plasma (PRP) therapy is frequently used to regrow hair, especially in cases of androgenic alopecia and alopecia areata.[7] An autologous preparation of concentrated platelets in plasma is called platelet-rich plasma (PRP). Over 20 distinct growth factors have been found in PRP.[2] Multiple growth factors, including platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), insulin-like growth factor (IGF), and interleukin-1 are released by platelet alpha-granules after activation.[2,7,11] These growth factors are widely known for causing the proliferative phase, transdifferentiation, and creation of new follicular units in hair and stem cells.[2] PRP increases the creation of new follicles, neo-vascularization, and angiogenesis by acting on stem cells

in the bulge area.[7]

Our research demonstrated that PRP had a strong local effect on AA regardless of gender or the length or course of the disease. Given the significant inflammatory process that distinguishes AA, it's feasible that PRP's anti-inflammatory properties could be helpful in this condition.[2]

None of the aforementioned trials found any significant negative effects, such as scarring, gradual deterioration, or infections. Notably, the side effects observed were negligible. The pain was bearable. After treatment or the end of the sessions, no analgesics were required. After receiving PRP treatment, no patients reported any erythema or soreness. PRP is risk-free, simple to execute, has few side effects, and causes no downtime at all.[1]

The use of autologous PRP as a therapy option for AA is possible. It is risk-free and very effective at regrowing hair.[2] The number of treatment sessions ranged from three to six. After three PRP therapy sessions, however, meaningful outcomes in these participants were determined. In order to monitor hair loss and determine whether further PRP treatments are necessary, it's crucial to follow patients for at least 12 months.

Because hair loss in men and women can have different symptoms and different mechanisms, it may be inappropriate to extrapolate the results to both genders in studies investigating only one gender. Our study has some limitations, including the relatively small sample size and the absence of more impartial methods of evaluation (videomicroscopy or trichoscopy).

CONCLUSION

Based on our evaluation of the therapeutic efficacy of PRP treatment for alopecia in three subjects, we draw the conclusion that PRP was successful in promoting hair growth. Before PRP is widely used as a therapy option in the clinical setting, a number of research design issues need to be resolved, even if our work shows PRP as a possible treatment option for alopecia. The requirement for repeat treatments, consistent objective data documentation and evaluation, physician and subject assessment, and isolating the effects of PRP in various grades and types of alopecia should all be determined through further research. Although 3–4 treatments of PRP injections with 4 weeks apart showed positive benefits in this study, a minimum of 5 sessions of therapy are advised for optimal results.

Documenting patient satisfaction and self-reported results might be helpful in identifying PRP treatments that are successful as well as those that will lead to high compliance because patient satisfaction is currently a key focus in health systems.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

REFERENCES

1. Fayed HA, Elsaied MA, Faraj MR. Evaluation of Platelet-Rich Plasma in Treatment of Alopecia Areata: A Placebo-Controlled Study. J Egypt Women Dermatol Soc. 2018;15:100–5.
2. Ciptasari NEW. Role of PRP (platelet-rich plasma) in alopecia areata: A literature review. Bali Med J. 2020;9(3):731–6.
3. Cervantes J, Perper M, Wong LL, *et al*. Effectiveness of Platelet-Rich Plasma for Androgenetic Alopecia: A Review of the Literature. Skin Appendage Diord. 2018;4:1–11.
4. Elsayed M, Al Otaibi L, Quraishy N, Yusufali A. A Novel Hope for Alopecia Totalis Patients: Case Report. Dubai Med J. 2020;3:150–3.
5. Elshafy RAA, Khalifa NA, Besher RM, Ebrahim HM, Mawla MYMA. Alopecia Areata: An Overview of the Disease and its Genetic Basis: Review Article. Egypt J Hosp Med. 2022;88: 2897–903.
6. Ramos PM, Anzai A, Duque-Estrada B, Melo DF, Sternberg F, Santos LDN, Alves LD. Consensus on the treatment of alopecia areata Brazilian Society of Dermatology. An Bras Dermatol. 2020;95(S1):39–52.
7. Khalid AA. Medical Treatment of Alopecia. In: Ahmad M. Alopecia. IntechOpen. 2018:55-72. Available from: https://www.intechopen.com/books/alopecia/medical-treatment-of-alopecia
8. Suchonwanit P, Thammarucha S, Leerunyakul K. Minoxidil and Its Use in Hair Disorders: A Review. Drug Des Devel Ther. 2019;13:2777–86.
9. Choi N, Shin S, Song SU, *et al*. Minoxidil Promotes Hair Growth Through Stimulation od Growth Factor Release from Adipose-Derived Stem Cells. Int J Mol Sci. 2018;19(691):1–15.
10. El-Garf, Mohie M, Salah E. Trichogenic effect of topical ketoconazole versus minoxidil 2% in female pattern hair loss: a clinical and trichoscopic evaluation. Biomed Dermatol. 2019;3:1–8.
11. Singh GK, Pathania V, Beniwal NS, *et al*. Platelet Rich Plasma, 5% Minoxidil Lotion and Oral Dutasteride Versus 5% Minoxidil Lotion and Oral Dutasteride in Male Androgenetic Alopecia: A Pilot Study in Routine Clinical Setting. Indian J Clin Dermatol. 2019;2(3):78–83.