Case series evaluating the efficacy and safety of platelet-rich plasma for androgenetic alopecia in pediatric patients

Catherine Tawfik, BS,[a] Christina I. Tejeda, MD,[b] and Adrienne M. Haughton, MD[b]

Key words: alopecia; androgenetic alopecia; efficacy; female pattern hair loss; genetic hair loss; hair loss; male pattern hair loss; pediatrics; platelet rich plasma; PRP; regenerative medicine; safety.

INTRODUCTION

Androgenetic alopecia (AGA) is a form of hair loss commonly referred to as male or female pattern hair loss. It is traditionally diagnosed by clinical examination with no further testing needed. Although prevalence varies based on the population, it commonly occurs between the fourth and seventh decades of life in both sexes.[1] AGA can also be seen in children with an average onset age of 14.8 years but can be seen as young as 6 years old.[2,3] Pediatric AGA is the most common cause of hair loss in adolescence.[2] Many treatments including minoxidil, spironolactone finasteride, dutasteride, lasers, and platelet- rich plasma (PRP) have been studied in adult AGA, but not pediatrics. This is a retrospective clinical review of efficacy and safety in 4 cases of pediatric AGA treated with PRP injections (Table I).

Abbreviations used:

AGA: androgenetic alopecia
PRP: platelet rich plasma

CASE SERIES

Case 1

A 17-year-old male with a past medical history of attention deficit hyperactivity disorder and tic disorder, presented with a 1-year history of frontoparietal hair loss. The patient noted gradual hair loss and denied any prescriptions or over the counter treatments for hair loss. Family history was significant for a father with AGA. The patient presented with Hamilton Norwood Scale II alopecia (Fig 1, *A*). Patient completed 8 treatments with PRP injections over the span of 11 months. The first 4 treatments were spaced 1 month apart. With continual treatments, patient experienced stabilization of his hair loss and new hair growth. After treatment number 8, he showed significant clinical improvement (Fig 1, *B*). This patient tolerated PRP treatments well, noting 2 to 3/10 initial injection site pain and 1/10 injection site pain 4 hours after the procedure (Table II).

Case 2

A healthy 16-year-old female with no significant past medical history presented with a 10-month history of diffuse scalp pruritus and Ludwig Scale Grade I. She previously took biotin 10 mg daily with no improvement. Family history was significant for a father with AGA. (Fig 2, *A*). A 4 mm punch biopsy was taken from the right anterior scalp which showed decreased terminal folliculosebaceous units and few vellus hair follicles, consistent with AGA. Thyroid-stimulating hormone and K+ levels were within normal limits, ferritin 46 ng/ml. She was started on ferrous sulfate/gluconate 325 mg daily for 1 week, and increased to 3 times daily, spironolactone 50 mg twice daily and a topical combination foam (minoxidil 12%, levocetirizine 1%, finasteride

From the Liberty University College of Osteopathic Medicine, Lynchburg, Virginia[a]; and Department of Dermatology, Stony Brook University Hospital, Stony Brook, New York.[b]

Funding sources: None.

IRB approval status: Not applicable.

Patient consent: Consent for the publication of all patient photographs and medical information was provided by the authors at the time of article submission to the journal stating that all patients gave consent for their photographs and medical information to be published in print and online and with the understanding that this information may be publicly available.

Correspondence to: Christina I. Tejeda, MD, Department of Dermatology, Stony Brook University Hospital, 500 Commack Rd, Suite 102, Commack, NY 11725. E-mail: christina.tejeda@stonybrookmedicine.edu.

JAAD Case Reports 2023;37:8-12.

2352-5126

https://doi.org/10.1016/j.jdcr.2023.04.027

Table I. Patient demographics and clinical characteristics

Case number	Sex	Age at hair loss onset	Age at presentation for treatment	Duration of follow- up (mo)	Family history of AGA
1	Male	16 y old	17 y old	11 mo	Father
2	Female	15 y old	16 y old	12 mo	Father
3	Male	16 y old	17 y old	18 mo	Father
4	Female	13.5 y old	15 y old	36 mo	Unknown

AGA, Androgenetic alopecia.

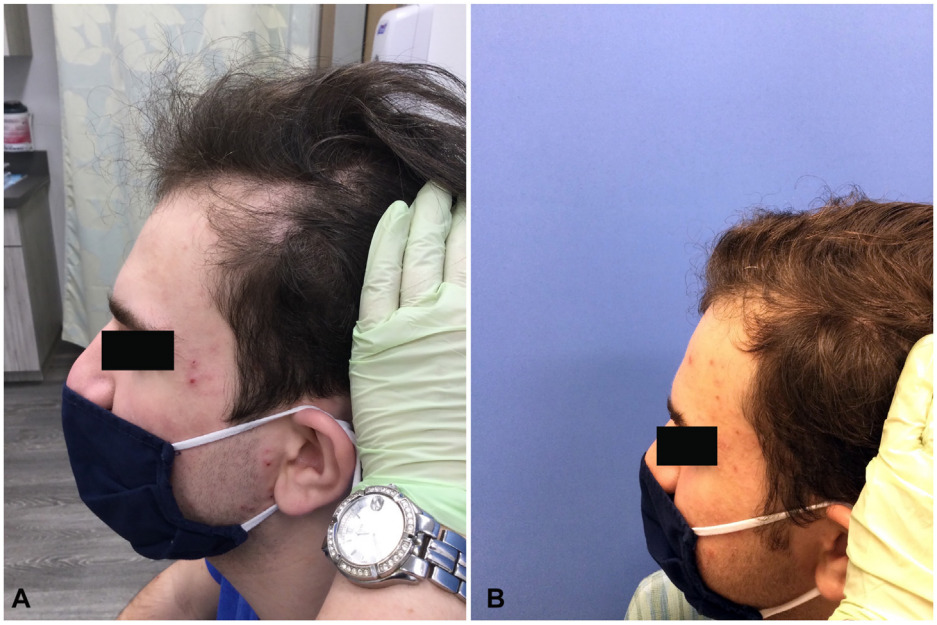

Fig 1. Case 1: *Left* temporal scalp response to platelet-rich plasma injections at baseline (**A**) treatment number 8 (**B**).

Table II. Questionnaire regarding safety and side effects of platelet-rich plasma injections

Questions on a scale of 1-10	Case 1	Case 2	Case 3	Case 4
Initial injection site discomfort	2-3	5	5	5
Injection site discomfort 4 h after the procedure	1	5	0	0
Injection site discomfort 24 h after the procedure	0	3	0	2
Headaches	0	0	0	0
Pruritus of the scalp	0	0	0	0
Ecchymoses	0	0	0	0
Infection	0	0	0	0
Increased hair loss	0	0	0	0
Increased shedding	0	0	0	0
Keloids	0	0	0	0
Orthostatic hypotension	0 h	0 h	0 h	2 d
Time to return to regular activities	0 h	3 h	0 h	2 d

0.25%) applied once daily to scalp. After 3 weeks of this regimen, it was augmented with PRP treatments. Patient completed monthly PRP injections for 4 consecutive months. By treatment 4, the patient had overall improved hair density attributed to PRP, topical and oral medications (Fig 2, *B*). This patient tolerated PRP treatments well, experiencing 5/10 initial injection site pain, 5/10 injection site pain 4 hours after, and 3/10 injection site pain 24 hours after the procedure (Table II).

Case 3

A healthy 17-year-old male with no significant past medical history, presented with an 8-month history of hair loss. Patient denied any prescription or over the counter treatments. Family history was significant for a father with AGA. On physical exam he had Hamilton Norwood Scale II-III vertex pattern hair loss (Fig 3, *A*). Patient completed 5 PRP treatments over 5 months spaced at 1-month intervals, leading to therapeutically increased hair growth at the left temporal scalp (Fig 3, *B*). This patient tolerated PRP treatments well, noting 5/10 initial injection site pain and no further side effects afterward. (Table II).

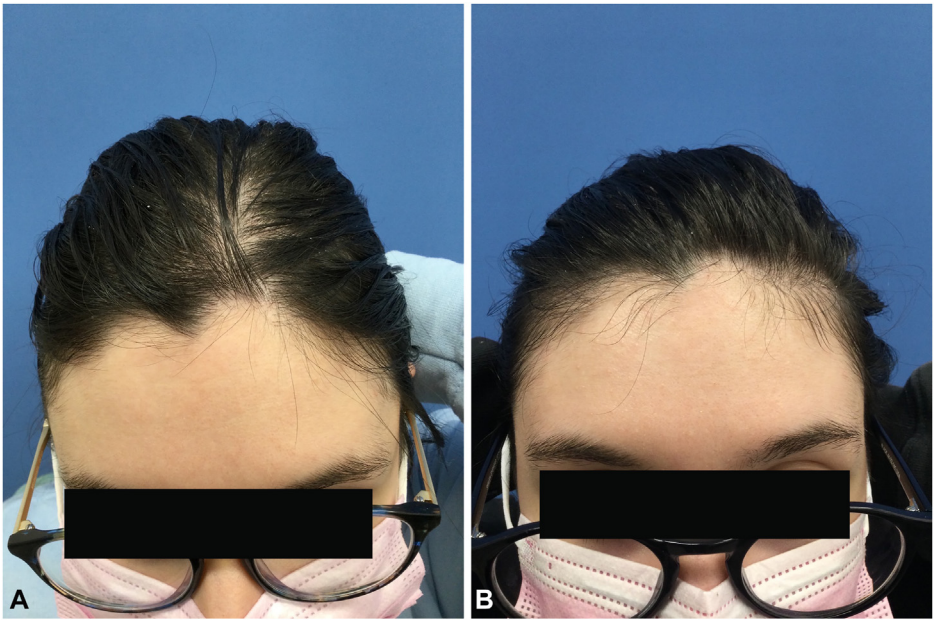

Fig 2. Case 2: Frontal scalp response to platelet-rich plasma injections at baseline (**A**) treatment number 4 (**B**).

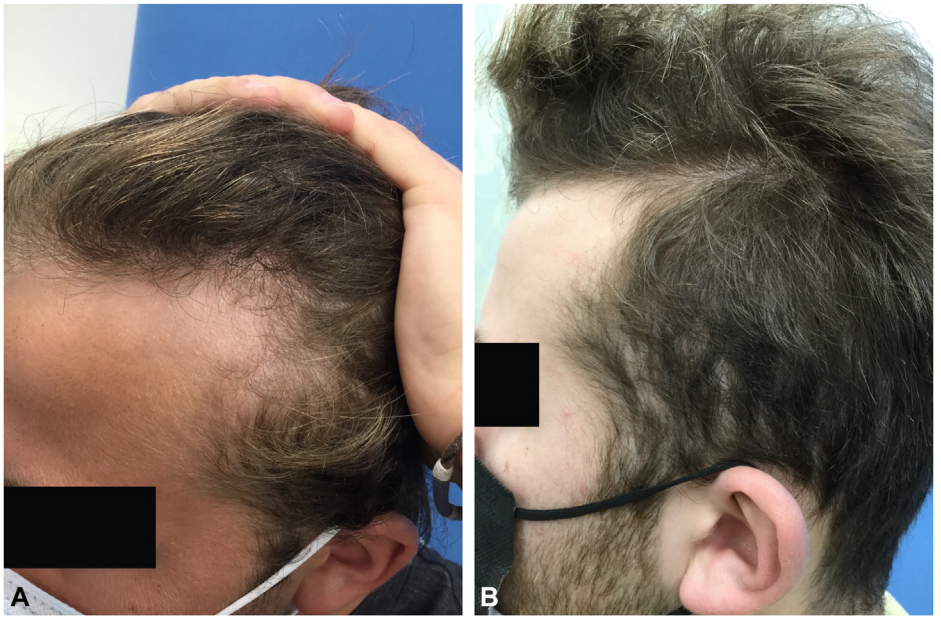

Fig 3. Case 3: *Left* temporal scalp response to platelet-rich plasma injections at (**A**) baseline (**B**) treatment number 4 (after 4 months of treatment).

Case 4

A healthy 15-year-old female with no significant past medical history, presented with a 1.5-year history of thinning hair. She previously tried an unknown dose of over-the-counter biotin for 1 year without improvement, she discontinued the biotin 4 months prior to starting PRP injections. Prior to presenting to dermatology, the patient had an extensive endocrine work up, including a bilateral ovarian ultrasound due to elevated estrogen levels. After a negative work up, including normal ferritin levels, the patient was placed on oral contraceptive pills by her gynecologist 4 months prior to starting PRP injections. Family history is unknown. Physical examination showed Ludwig Scale Grade 2 alopecia (Fig 4, *A*). Patient completed 13 PRP treatments over

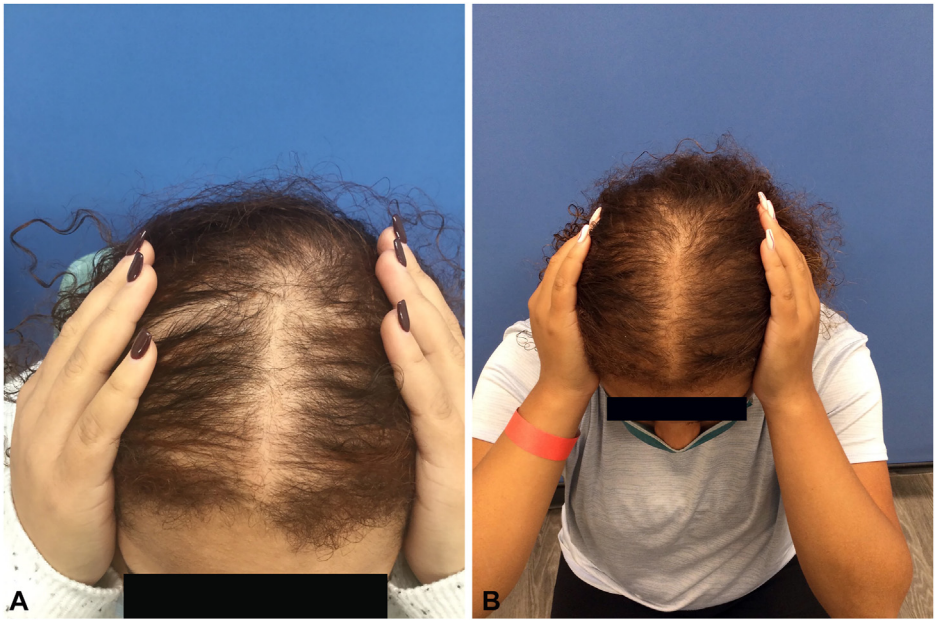

Fig 4. Case 4: Central part line response to platelet-rich plasma injections at baseline (**A**) treatment number 13 (**B**).

the span of 2 years. Initial injections were 1 month apart for 4 consecutive months. Patient first noticed improvement after PRP treatment number 2. With continued maintenance therapy, clinically improved hair growth, hair density, and less thinning are noted at the central part line (Fig 4, *B*). This patient tolerated PRP treatments well. She reported orthostatic hypotension for 2 days following each PRP treatment (Table II).

Safety and side effects of the PRP injections was assessed via a 12-question questionnaire (Table II). The initial questions were based on a scale of 0 to 10. 0 meaning this side effect was not experienced at all and 10 being the side effect was the worst they had ever experienced. The final 2 questions were based on the duration of time the symptom was experienced for. All patients received ethyl chloride topical anesthetic spray during the sessions for pain control.

DISCUSSION

ACA is a common form of hair loss experienced by both adults and adolescents.[1,2] Genetic predisposition likely plays a big role in pediatric AGA, as one study noted 83% percent of patients had a positive family history.[2] Several genes including androgen receptor gene, aldolase gene and ectodysplasin A2 gene may play a role in pediatric androgenic alopecia.[4,5] In both adult and pediatric populations, males are affected more than females in a 2:1 ratio.[1,2]

AGA is typically diagnosed by clinical exam which may include trichoscopy showing hair miniaturization with nonscarring appearance.[6] A biopsy is not necessary but can be useful when diagnosis is not clear; histology consistent with AGA shows decreased terminal hair units, along with increased density of vellus and telogen hairs.[7,8]

A normal hair follicle life cycle has 3 phases: anagen (growing), catagen (involution), and telogen (resting) phase. At any given time 85% to 90% of our hair follicles should be in the anagen phase; this is not the case for patients with AGA, as the duration of the anagen phase is decreased along with an increased telogen phase.[9]

The first line treatment in AGA adults is oral finasteride/dutasteride and topical minoxidil.[10] PRP injections is a treatment for AGA that is gaining more popularity due to promising results. The process involves drawing patient's blood to extract the PRP is injected into numerous locations on the patient's scalp. PRP was first used for musculoskeletal injuries due to production of vascular endothelial growth factor, platelet-derived growth factor, and transforming growth factor-beta causing angiogenesis and regenerative properties.[11] PRP contains a number of growth factors (epidermal growth factor, fibroblast growth factor, hepatocyte growth factor, insulin-like growth factor-1, platelet-derived growth factor, transforming growth factor-beta, vascular endothelial growth factor) that contribute to follicular differentiation, hair follicle elongation, anagen phase induction, angiogenesis, extracellular matrix synthesis, hair folliculogenesis and maturation, all leading to increased hair growth and positive results for patients with AGA.[12,13] Successful results have

been shown in varying hair loss conditions in adults, but not children.[12] Currently no treatments are well studied, or Food and Drug Administration approved for AGA in pediatric patients.

In this case series, we presented 4 cases (2 male, 2 female) of pediatric ACA treated with PRP injections. Outcomes were measured qualitatively by global photographic assessment during the progression of the treatment course. Via this qualitative assessment, we found a positive response using PRP injections for pediatric AGA. All 4 patients experienced stabilization of hair loss, as well as regrowth. All patients also tolerated the procedures well with minimal pain during and after the procedures, further showing the safety profile of PRP. Future quantitative studies could assess efficacy through hair density, hair diameter, and punch biopsies indicating increased terminal hair follicle numbers.

This series was conducted to assess the efficacy and safety of PRP in the treatment of pediatric AGA. As described in the individual case summaries, all 4 patients had significant improvement in their hair loss, and none experienced major adverse effects.

Conflicts of interest

None disclosed.

REFERENCES

1. Paik JH, Yoon JB, Sim WY, Kim BS, Kim NI. The prevalence and types of androgenetic alopecia in Korean men and women. *Br J Dermatol*. 2001;145(1):95-99. https://doi.org/10.1046/j.1365-2133.2001.04289.x
2. Gonzalez ME, Cantatore-Francis J, Orlow SJ. Androgenetic alopecia in the pediatric population: a retrospective review of 57 patients [published online ahead of print March 23, 2010]. *Br J Dermatol*. 2010;163:378-385.
3. Tosti A, Iorizzo M, Piraccini BM. Androgenetic alopecia in children: report of 20 cases. *Br J Dermatol*. 2005;152:556-559.
4. Hillmer AM, Hanneken S, Ritzmann S, et al. Genetic variation in the human androgen receptor gene is the major determinant of common early-onset androgenetic alopecia [published online ahead of print May 18, 2005]. *Am J Hum Genet*. 2005; 77:140-148.
5. Prodi DA, Pirastu N, Maninchedda G, et al. EDA2R is associated with androgenetic alopecia [published online ahead of print April 3, 2008]. *J Invest Dermatol*. 2008;128:2268-2270.
6. De Lacharrière O, Deloche C, Misciali C, et al. Hair diameter diversity: a clinical sign reflecting the follicle miniaturization. *Arch Dermatol*. 2001;137:641-646.
7. El-Domyati M, Attia S, Saleh F, et al. Androgenetic alopecia in males: a histopathological and ultrastructural study. *J Cosmet Dermatol*. 2009;8:83-91.
8. Sperling LC, Lupton GP. Histopathology of non-scarring alopecia. *J Cutan Pathol*. 1995;22:97-114.
9. Paus R, Cotsarelis G. The biology of hair follicles. *N Engl J Med*. 1999;341:491-497.
10. Kaufman KD, Olsen EA, Whiting D, et al. Finasteride in the treatment of men with androgenetic alopecia. finasteride male pattern hair loss study group. *J Am Acad Dermatol*. 1998;39(4 Pt 1):578-589.
11. Alves R, Grimalt R. A review of platelet-rich plasma: history, biology, mechanism of action, and classification. *Skin Appendage Disord*. 2018;4:18-24.
12. Girijala RL, Riahi RR, Cohen PR. Platelet-rich plasma for androgenic alopecia treatment: a comprehensive review. *Dermatol Online J*. 2018;24(7):13030/qt8s43026c.
13. Dubin D, Lin M, Leight H, et al. The effect of platelet-rich plasma on female androgenetic alopecia: a randomized control trial. *J Am Acad Dermatol*. 2020;83:1294-1297.