Plant-Based Exosomes for Nonscarring Alopecia: *A Case-Series*

Arash Babadjouni, DO, MS,[a] Toussaint Battley III, MD, DNP,[a] Kanthi Bommareddy, MD,[b] Shino Bay Aguilera, DO[c]

[a] Larkin Health System, Department of Dermatology, Miami, FL
[b] Cosmetic Laser Dermatology, San Diego, CA
[c] Shino Bay Cosmetic Dermatology & Laser Institute, Fort Lauderdale, FL

Corresponding Author:
Shino Bay Aguilera, DO
Shino Bay Cosmetic Dermatology & Laser Institute
350 E Las Olas Blvd. #110
Fort Lauderdale, FL 33301
Email: shinobay@yahoo.com

Funding sources: None.

Conflicts of Interest: None declared.

Competing interests' statement: The authors have no competing interests to declare.

Patient Consent: We attest to having obtained patient consent for publication.

Keywords: *Plant-based exosomes, androgenetic alopecia, microneedling, hair growth*

Abstract

Introduction: Androgenetic alopecia (AGA) and traction alopecia (TA) are common forms of hair loss with distinct etiologies that may result in progressive follicular changes. Microneedling and exosome-based therapies have emerged as potential regenerative approaches for promoting hair growth.

Methods: Two patients (1M, 1F), one with AGA and one with TA, underwent three monthly treatments combining scalp microneedling with topical plant-derived exosome application, supplemented by daily at-home topical exosome use. Treatment response was evaluated using standardized clinical photography, patient-reported outcomes, and physician assessment one month after the final treatment.

Discussion: Both patients demonstrated reduced hair shedding and increased vellus hair growth following treatment. Physician assessment identified clinically evident improvements in hair density, growth, and scalp coverage within affected frontal, parietal, frontotemporal, bitemporal, and central part regions. No adverse events were reported. Microneedling may facilitate exosome delivery while stimulating wound-healing pathways, potentially providing complementary mechanisms for follicular regeneration.

Conclusion: Combined microneedling and topical plant-derived exosome therapy was well tolerated and associated with clinically evident improvement in patients with AGA and TA. These findings suggest a potential role for this combined approach across distinct forms of alopecia; however, larger controlled studies are needed to establish efficacy, optimal treatment protocols, and long-term safety.

Introduction

Alopecia is a common presenting concern with significant impacts among patients seeking care from dermatologists. Androgenetic alopecia (AGA), the most common form of hair loss in both men and women, is a progressive, non-scarring alopecia characterized by follicular miniaturization and shortening of successive anagen cycles.(1) Its pathogenesis is multifactorial, with genetic predisposition and androgen signaling playing central roles.(1) Traction alopecia (TA) is another form of alopecia resulting from repetitive or prolonged mechanical tension on the hair follicle, most commonly affecting the frontal and temporal scalp.(2) In its early stages, TA is nonscarring and potentially reversible; however, persistent traction may lead to permanent follicular damage and scarring alopecia.(2)

The limited availability of established medical therapies, variable treatment response, the need for long-term therapy, and potential adverse effects have driven interest in novel regenerative approaches for AGA. Plant-derived exosomes have emerged as a potential therapeutic modality due to their role in intercellular communication and their ability to transport bioactive molecules, including proteins, lipids, and nucleic acids.(3) These properties have generated interest in their potential to modulate the follicular microenvironment and promote hair growth across different forms of alopecia.

Microneedling represents another increasingly utilized approach for AGA. Controlled microinjury to the scalp may stimulate wound-healing pathways and the release of growth factors while also creating transient microchannels that may enhance the delivery of topically applied agents.(4) The combination of microneedling and plant-derived topical exosome therapy may therefore provide complementary mechanisms for promoting follicular activity and hair growth. In this case series, we describe the clinical response to combined microneedling and topical exosome therapy in two patients with distinct forms of alopecia: AGA and TA.

Case Description

Two patients (1M, 1F) one with AGA and one with TA, underwent a series of three-monthly treatments combining scalp microneedling with topical plant-derived exosome therapy. At baseline, each patient underwent clinical evaluation, including age, duration of hair loss, prior/current treatments, relevant medical history, clinical examination, and standardized photography. Patients were screened for a history of hair transplantation; significant stressful events within the preceding 6 months; initiation or modification of hormone replacement therapy within the preceding 3 months; use of light-based therapy for hair loss, regular use of minoxidil, finasteride, or other hair-growth treatments, or medications known to affect the hair growth cycle within the preceding 3 months; or the presence of another hair loss disorder.

At each treatment visit, microneedling was performed over the frontal hairline and frontal, parietal, and occipital scalp using the **Collagen P.I.N.** microneedling device at a depth of 0.5 mm with 10–12 passes. During and immediately following microneedling, **Induction Therapies PRX8 TRU Plant-Exosome** was topically applied to the treated areas, with 10 mL applied to the patient with AGA and 5 mL applied to the patient with TA. Treatments were performed at one-month intervals for a total of three sessions. In addition to the in-office treatments, patients were provided with the topical plant-derived exosome formulation and instructed to apply it once daily to the treated areas of the scalp between treatment sessions, using 10 mL daily for the patient with AGA and 5 mL daily for the patient with TA.

Patients were clinically evaluated at each treatment visit to assess treatment response, tolerability, and adverse events. A final follow-up evaluation was performed approximately one month after the third treatment to assess changes in hair growth. Treatment response was evaluated using standardized clinical photographs, patient-reported outcomes and physician assessment.

Case 1

A 29- year-old male presented with a 7 year history of female and male pattern AGA involving diffuse thinning of frontal and parietal scalp with mild temporal recession bilaterally. His previous treatments included finasteride 1mg po qd, minoxidil 2.5mg po bid, topical finasteride/minoxidil qhs and at the time of enrollment he was taking all of those treatments. Baseline examination demonstrated diffuse thinning of frontal and parietal scalp with mild temporal recession bilaterally. Following three monthly microneedling and topical plant-derived exosome treatments, a decrease in hair shedding was noted at the frontal and parietal scalp. At one-month follow-up after the final treatment, the patient reported decreased shedding and increase in vellus hairs in the frontal scalp. On physician assessment, the patient demonstrated clinically evident improvement in frontal, parietal, and frontotemporal scalp hair growth compared with baseline, characterized by increased hair density and improved scalp coverage. (Fig 1). No adverse events were reported.

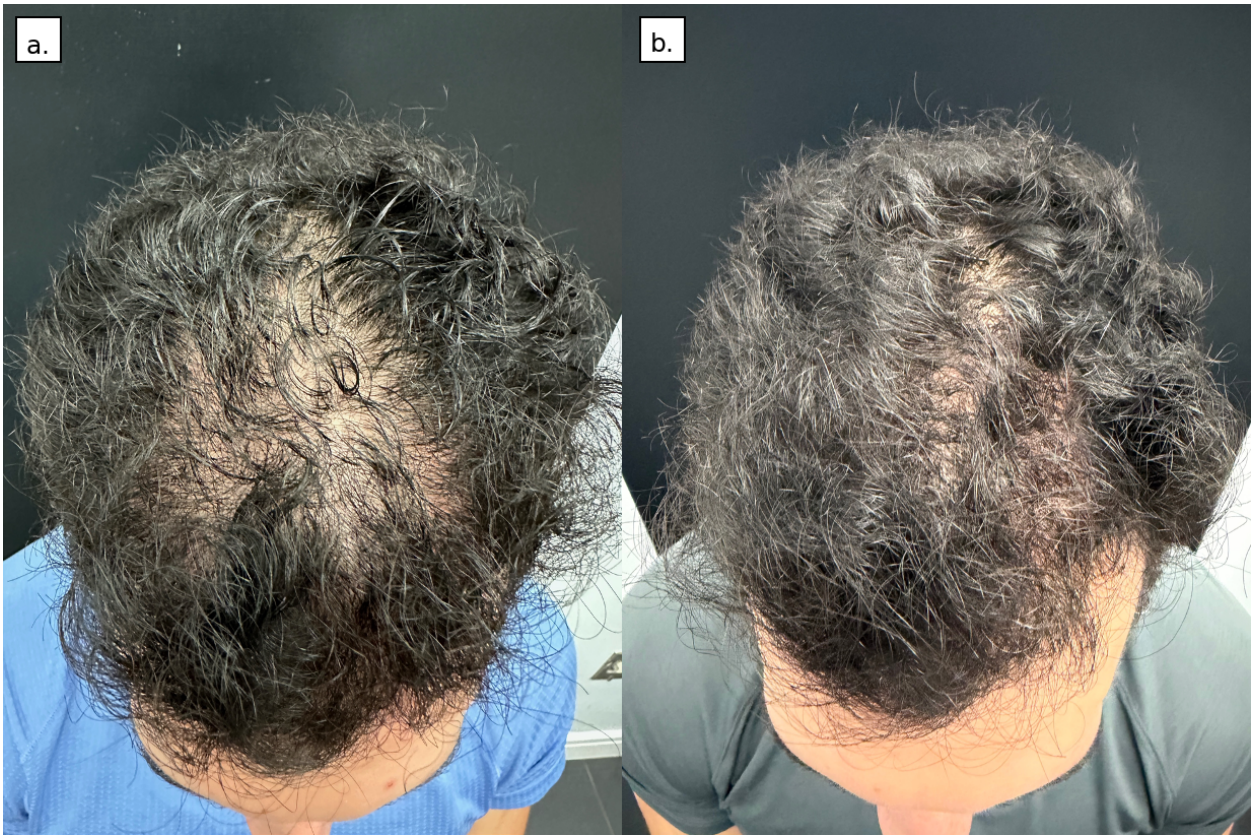


Fig 1. A 29-year-old male with a 7-year history of androgenetic alopecia characterized by diffuse thinning of the frontal and parietal scalp with mild bilateral temporal recession. (a) Baseline appearance before treatment with combined microneedling and topical exosome therapy. (b) Clinical appearance one month after the third monthly treatment, demonstrating improvement in hair growth and density within the affected frontal and parietal scalp.

Case 2

A 29-year-old female presented with 5 years of early TA involving the bitemporal region as well as the distal part line. Her previous treatments included topical minoxidil, and at the time of enrollment she was not utilizing minoxidil. Baseline examination demonstrated moderate thinning of the hair located at the bitemporal region, worse on the right side, as well as mild to moderate thinning of the distal part line with preservation of the proximal part line. Following three monthly microneedling and topical plant-derived exosome treatments, patients reported reduced shedding along the distal part line and increased vellus hair count along the bitemporal region. At one-month follow-up after the final treatment, the patient found there to be continual improvement along the distal part line and bitemporal scalp. On physician assessment, the patient demonstrated overall improvement in hair growth along the distal part line and bitemporal region compared with baseline, characterized by visible increases in hair growth, density, and coverage of the affected scalp (Fig 2). No adverse events were reported.



Fig 2. A 29-year-old female with a 5-year history of early traction alopecia involving the bitemporal region. (a) Baseline appearance before treatment with combined microneedling and topical exosome therapy. (b) Clinical appearance one month after the third monthly treatment, demonstrating improvement in hair growth and density within the affected bitemporal region.

Discussion

AGA, while historically thought to be androgen-dependent, is now better understood to be a representation of the interactions involving genetic susceptibility, overactive androgen receptor signaling pathway, weakened hair follicles, and a limited anagen phase (5). As a result, affected hair follicles, while remaining intact, become thinner and shorter transitioning from terminal vellus hairs. Maintenance of the follicular unit

is a key feature of AGA, distinguishing it as a miniaturization disorder as opposed to a scarring alopecia. Standard AGA therapies, such as minoxidil and 5-alpha-reductase inhibitors, are rooted in evidence-based data supporting their effectiveness (5).

TA is a type of mechanically induced hair loss due to continual tension at the follicular hair base often causing scarring. TA typically affects the hairline along the frontal and temporal scalp as these areas bear the most tension in relation to pulling-type hairstyles (i.e. braids, ponytails, cornrows, extensions, weaves, and dreadlocks) often worn consistently over long periods of time (2). Treatments traditionally comprise cessation of mechanical traction, topical/intralesional corticosteroids, and minoxidil.

Yet, for both AGA and TA, more recent treatment modalities consisting of microneedling, platelet-rich plasma (PRP) injections, and exosomes are gaining attraction. These therapies are intended to enhance the follicular environment making it more conducive to prolonging the anagen phase, decreasing follicular androgen hypersensitivity, and improving hair miniaturization. Specifically, microneedling creates intentional microscopic wounds to the superficial scalp via small needles, in which the healing phase promotes growth factor and cytokine release. Also, exosomes, which are small extracellular vesicles released by cells, provide proteins, lipids, micro-/messenger RNA, and various signaling molecules that are thought to positively enhance the follicular environment through paracrine signaling (6). The combination of microneedling with exosomes would allow for a portal of entry for exosomes to reach the hair follicle to produce a synergistic effect on follicular stimulation and hair growth (7).

Although large-scale randomized controlled trials are lacking, recent systematic reviews and meta-analyses have demonstrated that exosomes are consistently associated with improvements in hair loss including increased hair density and shaft thickness (6). In this case series, hair loss with bitemporal thinning across gender lines served as the precipice for treating AGA and TA with microneedling and exosomes. Microneedling may cause transient inflammation and erythema with or without pinpoint bleeding (7). Exosomes do carry the concern of not being a standardized pharmaceutical product causing variability in composition and efficacy.

This case series demonstrates clinically evident improvements in vellus hair formation following three monthly treatments combining microneedling with topical exosome therapy. The first case of male-pattern AGA revealed decreased shedding and vellus hair formation to the frontal, parietal and bitemporal scalp after three monthly microneedling sessions with exosome treatments. The second case depicting a female with TA revealed decreased shedding along the distal hairline with increased vellus hairs to the bitemporal regions. For both cases, the physician assessment was that there was increased hair growth and density leading to improved scalp coverage overall.

Conclusion

> This case series highlights a presentation of both sexes dominated by bitemporal hair thinning with AGA and TA, respectively, despite prior treatments with topical/oral Minoxidil and Finasteride for both AGA and TA, as well as corticosteroids with changing hair practices for TA specifically. Recognition of these features were essential for appropriate clinical diagnosis guiding ongoing management options. Microneedling provides mechanical stimulation and activates regenerative pathways, while exosomes are proposed to increase follicular stimulation through paracrine-mediated effects. Although this combination is promising, the evidence remains limited when compared to conventional treatments like minoxidil and

finasteride/dutasteride. Exosomes with microneedling portray emerging strategies for treating AGA & TA, yet further well-designed clinical trials are needed before their therapeutic efficacy and safety can be established.

References

1. Ntshingila S, Oputu O, Arowolo AT, Khumalo NP. Androgenetic alopecia: An update. *JAAD Int*. 2023;13:150-158. doi:10.1016/j.jdin.2023.07.005
2. Billero, V & Miteva, M. Traction alopecia: the root of the problem. *Clinical Cosmetic Investigational Dermatology*. 2018;611:149-159.doi:10.2147/CCID.S137296
3. Kalluri R, LeBleu VS. The biology, function, and biomedical applications of exosomes. *Science*. 2020;367(6478):eaau6977. doi:10.1126/science.aau6977
4. Jia L, Xiong J, Guo R, Li Y, Jiang H. A Comprehensive Review of Microneedling as a Potential Treatment Option for Androgenetic Alopecia. *Aesthetic Plast Surg*. 2022;46(6):2979-2994. doi:10.1007/s00266-022-03042-y
5. Ho C, Sood T, & Zito P. Androgenic alopecia. *NIH*. 2024
6. Al Ameer M, Alnajim A, Al Ameer A, Alsalman Z, Al Ameer G, Alnajim S, Alghamdi A, Moideen R, & Al Hadi E. Exosomes and hair regeneration: A systematic review of clinical evidence across alopecia types and exosomes sources. *NIH*. 2025; 18:2215-2227.doi:10.2147/CCID.S543451
7. Dahliwal N, Moothathamby T, Sokhal B, & Gkini M. The use of microneedling with exosomes in dermatology: A systematic review. *NIH*. 2026;25:e70881. doi: 10.1111/jocd.70881