

Combination of Exosomes and Microneedling in the Treatment of Androgenetic Alopecia: A Case Report

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Abstract

Introduction: Androgenetic alopecia (AGA), commonly known as baldness, is a genetically determined condition characterized by progressive miniaturization of hair follicles. It frequently causes significant psychological distress related to self-esteem, prompting patients to seek effective treatments. Advances in regenerative medicine have introduced exosome-based therapies as a promising approach to hair loss management.

Case Report: A 36-year-old male patient with a confirmed diagnosis of androgenetic alopecia underwent three monthly sessions of microneedling combined with topical delivery of 1 mL of exosomes as a drug delivery agent, without any oral supplementation. Trichoscopic evaluation and photographic documentation were performed before treatment and 30 days after the final session. A clinically visible improvement in hair density was observed, with reduced scalp visibility in the frontal and vertex regions.

Conclusion: The combination of microneedling and exosome application produced encouraging results in this case, suggesting potential as an adjunct or alternative treatment for androgenetic alopecia. However, given the limitations inherent to a single case report, larger randomized controlled trials are warranted to confirm long-term efficacy, safety, and optimal treatment protocols.

Keywords: Androgenetic Alopecia; Exosomes; Drug Delivery; Microneedling; Hair Regeneration.

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1. Introduction

Hair and scalp health represent significant functional and aesthetic concerns. Beyond their protective role against solar radiation, thermal regulation, and cutaneous friction, hair follicles carry profound social and psychological meaning for most individuals [1].

Hair follicles originate embryologically around the ninth gestational week, with full follicular maturation occurring by the twenty-second week, determining the total follicular count for life. In adults, the human scalp contains approximately 100,000 follicles, and daily physiological shedding of 100–200 hairs is considered normal [2]. Abnormal hair loss may result from genetic predisposition, hormonal dysregulation, immune dysfunction, gastrointestinal disturbances, nutritional deficiencies, and psychosocial stress [3].

Androgenetic alopecia is the most prevalent form of non-scarring hair loss in both sexes. Its pathophysiology involves genetically determined sensitivity of follicular dermal papilla cells to dihydrotestosterone (DHT), a potent androgen produced by the enzymatic conversion of testosterone via 5 α -reductase. Sustained DHT exposure leads to progressive follicular miniaturization, shortening of the anagen phase, and eventual replacement of terminal hairs by fine vellus hairs [4]. According to 2022 data from the International Society of Hair Restoration Surgery (ISHRS), approximately 42 million Brazilians are affected by this condition [5].

Current first-line therapies include topical minoxidil and oral finasteride, each with well-documented but incomplete efficacy and non-negligible adverse effect profiles. The search for novel, safe, and effective alternatives has intensified in recent years. Among emerging modalities, the combination of exosome-based topical agents with microneedling has

attracted considerable interest due to its regenerative and pro-proliferative mechanisms [6]. The present study reports the clinical outcome of a male patient with androgenetic alopecia treated with this combined approach as a standalone intervention, without oral pharmacological supplementation.

2. Case Report

The present case report describes a 36-year-old male patient referred to a specialized aesthetic medicine clinic with a chief complaint of progressive hair thinning and hair loss. The patient had no history of systemic disease, autoimmune conditions, or continuous pharmacological treatment, and denied the use of hair loss medications prior to enrolment. A clinical diagnosis of androgenetic alopecia was confirmed by digital trichoscopy (Dino-Lite® dermoscope) and photographic documentation obtained with a Samsung Galaxy S7 tablet.

Trichoscopic examination revealed follicular miniaturization, anisotrichosis (hair shaft diameter variability), and peripilar signs consistent with the diagnosis of androgenetic alopecia. Based on the Norwood–Hamilton classification, the patient presented a pattern compatible with grade III vertex.

The patient provided written informed consent for data use and image publication in a scientific manuscript, in accordance with the study protocol approved by the Research Ethics Committee of the Centro Universitário da Serra Gaúcha (CEP-FSG), under CAAE no. 81082124.9.0000.5668 (Opinion no. 7.160.429, approved 15 October 2024).

The therapeutic protocol consisted of three monthly sessions of scalp microneedling with immediate topical exosome delivery. Each session was preceded by antiseptic preparation using 0.2% aqueous chlorhexidine. Microneedling was performed with an electric automated device fitted with a 36-needle cartridge, set at a needle penetration depth of 0.75 mm, targeting the frontal and vertex regions until a uniform fine pinpoint bleeding response was achieved. Immediately thereafter, 1 mL of a commercially available topical exosome formulation was applied to the treated area as a drug delivery agent (Drug Delivery technique). Post-session care consisted of gentle cleansing with neutral shampoo, initiated six hours after the procedure.

No oral pharmacological supplementation (finasteride, dutasteride, or minoxidil) was prescribed or used during the treatment period. Photographic and trichoscopic reassessment was performed 30 days after the third and final session (Figure 1).

Clinical evaluation at follow-up demonstrated a visible increase in hair density in the frontal and vertex regions, with reduced scalp transparency and increased hair shaft caliber on trichoscopy. The patient reported satisfactory tolerance of all three procedures, with no adverse events recorded.



Figure 1: A. Non-polarized trichoscopy; B. Polarized trichoscopy; C. Before initiation of treatment; D. Thirty days after treatment initiation following three microneedling sessions associated with 1 mL of exosomes used as a drug delivery system.

3. Discussion

The positive clinical outcome observed in this case is consistent with the growing body of evidence supporting the use of exosomes as a biologically active agent in hair regeneration. Exosomes are nanoscale extracellular vesicles (30–150 nm) released by various cell types, including mesenchymal stem cells (MSC), adipose-derived stem cells, and placental stromal cells. They carry a bioactive cargo of proteins, lipids, messenger RNA, and microRNA that modulates gene expression and cellular behavior in recipient cells [7,8].

In the context of hair biology, exosomes have been shown to promote the transition of follicles from the telogen (resting) phase to the anagen (growth) phase, stimulate dermal papilla cell proliferation, and upregulate growth factors including vascular endothelial growth factor (VEGF), keratinocyte growth factor (KGF), and insulin-like growth factor-1 (IGF-1). Activation of the Wnt/ β -catenin signaling pathway, which is central to follicular cycling and regeneration, has also been reported following exosome treatment [8,9].

The adjuvant role of microneedling in this protocol is mechanistically relevant. By creating controlled microchannels in the epidermis and papillary dermis, microneedling enhances the transdermal penetration of topically applied macromolecules that would not otherwise cross the stratum corneum barrier. This drug delivery function directly amplifies exosome bioavailability at the level of the follicular bulge and dermal papilla. In addition, microneedling independently stimulates platelet activation and local release of growth factors through the Wnt3a and Wnt10b signaling pathways, contributing to the pro-regenerative microenvironment [7].

The clinical improvement observed—increased follicular density, reduced scalp visibility, and improved hair shaft caliber—is in line with results reported in recent systematic reviews and retrospective analyses of exosome-based treatments in AGA [10,11]. Notably, the absence of oral pharmacological supplementation in this case isolates the contribution of the combined topical approach, which is clinically relevant for patients who are unable or unwilling to use systemic agents.

Despite the encouraging findings, several limitations must be acknowledged. As a single case report, the results cannot be generalized and must be interpreted with caution. The absence of a control condition, blinded assessment, or standardized quantitative trichometric analysis (e.g., phototrichogram or TrichoScan®) limits the objectivity of the outcome evaluation. Furthermore, significant heterogeneity exists in the literature regarding exosome source, concentration, preparation method, and delivery protocol, which hinders cross-study comparability [12]. The cost of exosome-based therapies also represents a practical barrier to broad clinical adoption. Long-term durability of the observed improvement cannot be ascertained from the current 30-day follow-up, and the need for maintenance sessions remains undefined [10,13].

Future research should prioritize prospective randomized controlled trials with objective trichometric endpoints, standardized protocols, longer follow-up periods, and comparisons against established treatments such as minoxidil and platelet-rich plasma (PRP), for which substantially more evidence exists.

3. Conclusion

This case report documents a clinically meaningful improvement in hair density and shaft caliber following three monthly sessions of microneedling combined with topical exosome delivery in a male patient with androgenetic alopecia, achieved without oral pharmacological supplementation. The results support the hypothesis that this combined approach constitutes a promising, well-tolerated therapeutic modality for AGA.

Nevertheless, the inherent limitations of a single case report, including the absence of a control condition and short follow-up duration, preclude definitive conclusions regarding efficacy and safety. Robust clinical evidence from randomized controlled trials with larger samples, validated outcome measures, and standardized protocols is essential to consolidate this approach as a reliable alternative in the management of androgenetic alopecia. Continued scientific investigation in this area is urgently warranted, given the high prevalence of the condition and its considerable impact on patients' quality of life and psychological well-being.

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References

1. Sociedade Brasileira de Dermatologia (SBD). Conheça os cabelos. Available at: <https://www.sbd.org.br/cuidados/conheca-os-cabelos/>. Accessed: 22 March 2024.
2. Souza J. A utilização de finasterida e minoxidil no tratamento da alopecia androgenética. *Revista Vita et Sanitas*. 2017;11(2):72.
3. Sousa JL. Tratamentos da alopecia androgenética [monograph]. Universidade de Brasília; 2020. Available at: <https://bdm.unb.br/handle/10483/34554>.
4. Contin LA. Alopecia androgenética masculina tratada com microagulhamento isolado e associado a minoxidil injetável pela técnica de microinfusão de medicamentos pela pele. *Surg Cosmet Dermatol*. 2016;8(2):158-161.
5. International Society of Hair Restoration Surgery (ISHRS). 2022 Practice Census Results. Chicago: Relevant Research, Inc.; April 2022.
6. Kost Y, Muskat A, Mhaimeed N, Nazarian RS, Kobets K. Exosome therapy in hair regeneration: a literature review of the evidence, challenges, and future opportunities. *J Cosmet Dermatol*. 2022;21(8):3226-3231. doi: 10.1111/jocd.15008.
7. Ferreira AS, Aita DL, Muneratto MA. Microagulhamento: uma revisão. *Rev Bras Cir Plást*. 2020;35(2):228-234.
8. Zhou Y, Seo J, Tu S, Nanmo A, Kageyama T, Fukuda J. Exosomes for hair growth and regeneration. *J Biosci Bioeng*. 2024;137(1):1-8. doi: 10.1016/j.jbiosc.2023.11.001.
9. Kim H, Jang Y, Kim EH, Jang H, Cho H, Han G, et al. Potential of colostrum-derived exosomes for promoting hair regeneration through the transition from telogen to anagen phase. *Front Cell Dev Biol*. 2022;10:815205. doi: 10.3389/fcell.2022.815205.
10. Gupta AK, Wang T, Rapaport JA. Systematic review of exosome treatment in hair restoration: preliminary evidence, safety, and future directions. *J Cosmet Dermatol*. 2023;22(9):2424-2433. doi: 10.1111/jocd.15869.
11. Wu J, Yang Q, Wu S, Yuan R, Zhao X, Li Y, et al. Adipose-derived stem cell exosomes promoted hair regeneration. *Tissue Eng Regen Med*. 2021;18(4):685-691. doi: 10.1007/s13770-021-00347-y.
12. Cheng M, Ma C, Chen HD, Wu Y, Xu XG. The roles of exosomes in regulating hair follicle growth. *Clin Cosmet Investig Dermatol*. 2024;17:1603-1612. doi: 10.2147/CCID.S465963.
13. Park BS, Choi HI, Huh G, Kim WS. Effects of exosome from adipose-derived stem cell on hair loss: a retrospective analysis of 39 patients. *J Cosmet Dermatol*. 2022;21(5):2282-2284. doi: 10.1111/jocd.14846.