Exosome therapy for chronic severe seborrheic dermatitis: A case report

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Key words: adipose-derived mesenchymal stem cells; exosome therapy; extracellular vesicles; seborrheic dermatitis.

INTRODUCTION

Seborrheic dermatitis (SD) is a common inflammatory skin condition marked by scaly, red lesions, typically in areas with high sebum production, such as the scalp, face, trunk, and skin folds.[1] SD is a chronic, recurrent disease that can be well-controlled with available therapies but has no definitive cure. Initial treatments often include topical antifungals and corticosteroids; however, these frequently relapse and present adherence challenges, especially in severe or resistant cases. Prolonged corticosteroid use can also cause complications like skin thinning, perioral dermatitis, and telangiectasia. These issues drive the need for alternative therapies, with treatment typically based on SD severity. Mild-to-moderate cases are managed with topical corticosteroids, antifungals (eg, ciclopirox and ketoconazole), and keratolytics like propylene glycol.[2] For facial and body areas, additional options include calcineurin inhibitors, clotrimazole, and lithium succinate.[3] Severe or resistant cases may require systemic antifungals like terbinafine or itraconazole, and UV-B phototherapy.[4]

Recent advancements such as exosome-based therapy have gained significant attention due to the natural, cell-derived characteristics of extracellular vesicles, particularly exosomes, which are lipid bilayer vesicles of 40-150 nm in size.[5,6] Exosomes carry a range of biomolecules, such as proteins, lipids, RNA, and DNA, reflective of their parent cells, and play a crucial role in disease pathogenesis through intercellular signaling. It can be administered either topically or via injection, utilizing natural, engineered defense mechanisms to target diseases at the cellular level.[7] It has shown effectiveness in managing chronic inflammatory skin conditions like bullous pemphigoid, systemic lupus erythematosus, and atopic dermatitis.[8] This case report investigated the efficacy of adipose-derived mesenchymal stem cell exosome (ASCE) exosome therapy for treating SD.

Abbreviations used:

ASCE:	adipose-derived mesenchymal stem cell exosome
SD:	seborrheic dermatitis
TaST:	topical and systemic treatment
TP:	topical therapy
USD:	US dollars

CASE REPORT

A male patient, aged 34 years, presented with chronic, severe SD that had been left untreated for 6 months prior to the hospital visit. He had previously received various treatments such as topical steroids (hydrocortisone 1%), antifungal creams (ketoconazole 2%), and antifungal shampoos. The treatment only showed partial response and recurrence. His SD was debilitating, both socially and emotionally, with frequent dry dandruff on his shoulders and clothing, which significantly affected his quality of life.

To alleviate SD symptoms, a total of 4 sessions each for the face and scalp of ASCE exosome therapy was conducted, each with an interval of 2 weeks. The exosome was administered using a Derma pen with a depth of 2 mm, and a total of 5 mL of ASCE was administered per session. The depth of injection was intradermal, and the same volume was maintained throughout the treatment course. During treatment, the patient experienced an SD flare-up after the

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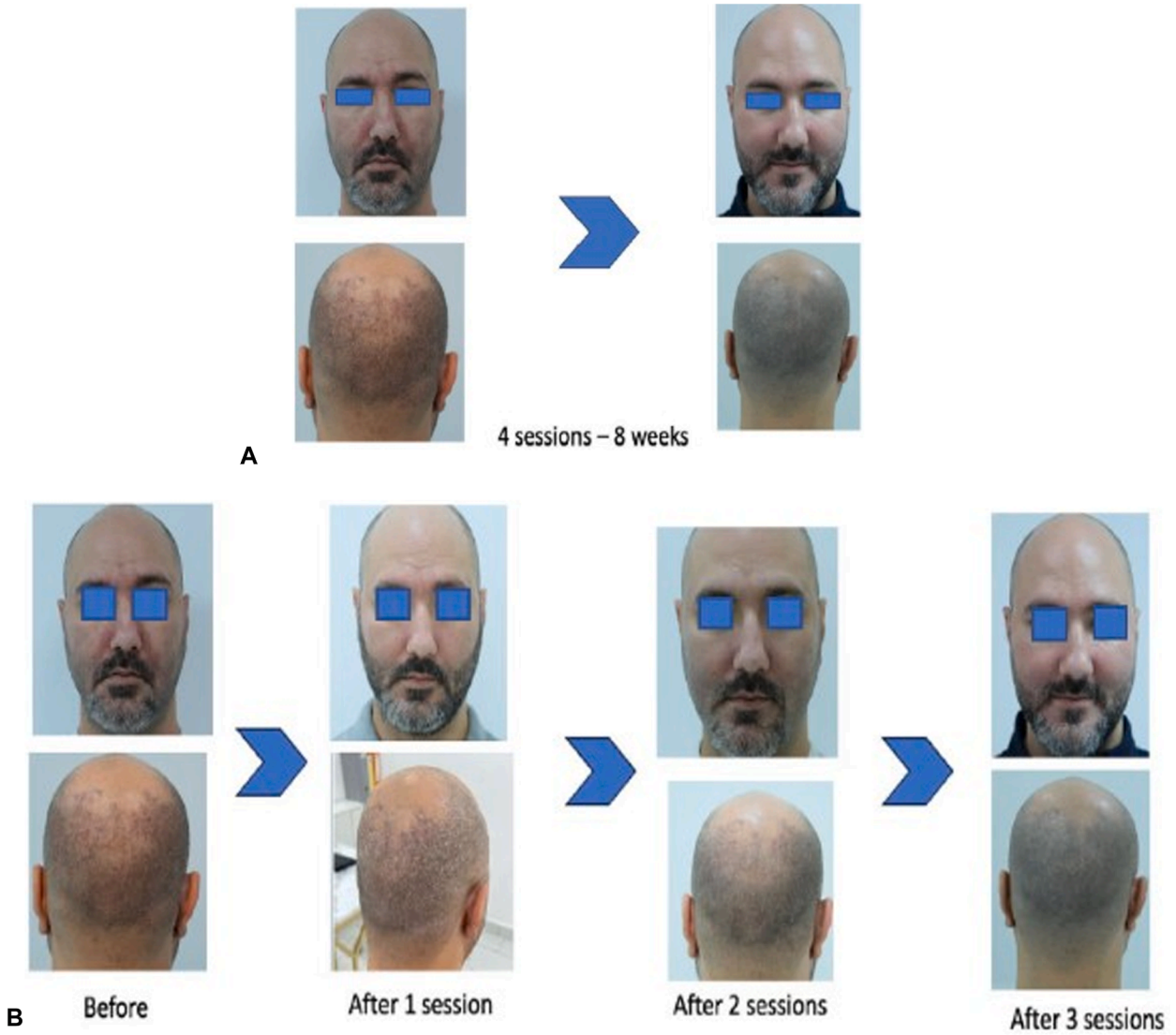

Fig 1. A, B Preoperative and postoperative photographs. Severe seborrheic dermatitis in a 34-year-old man before and after 4 sessions of each of ASCE exosome therapy **(A)**. The treatment resulted in complete remission of SD on both the face and scalp, with sustained improvement at the 4-month follow-up **(B)**.

second session, affecting both the face and scalp, for which a brief course of mild topical steroids (hydrocortisone 1%) used for 5 days was introduced as adjunctive treatment. ASCE plus balm was also applied topically to the face to aid in skin healing.

The treatment efficacy was assessed using the Physician's Global Assessment and Investigator's Global Assessment scales, both employing a 5-point scale ranging from 0 (clear) to 4 (severe) to rate disease severity, with higher scores indicating more severe conditions. Scaling was evaluated on a 4-point scale from 0 (none: no visible scaling on lesions) to 3 (severe: thick, flaky scales shedding onto clothing or skin). Erythema was assessed on a 4-point scale from 0 (none: no erythema present) to 3 (severe: bright, fiery red erythema), with higher scores reflecting more intense erythema.[9]

On completing the 4-session of each treatment regimen, the patient achieved complete remission of SD, with noticeable improvement in both the facial and scalp regions. He expressed satisfaction with the outcomes, reporting significant relief from symptoms. A 4-month follow-up showed that the patient experienced significant improvement in symptoms, remained disease-free, and did not require any further treatments., as depicted in Fig 1.

DISCUSSION

ASCE therapies have both shown remarkable potential in treating inflammatory and degenerative conditions due to their ability to modulate immune responses and deliver targeted bioactive molecules. Exosomes, nano-sized vesicles that facilitate cell communication, are rich in proteins, lipids, and nucleic acids. This composition enables them to influence cellular behavior and regulate inflammatory processes effectively. In diseases such as rheumatoid arthritis, psoriasis, atopic dermatitis, and SD, ASCE has demonstrated significant therapeutic effects. These include reducing inflammation, promoting tissue repair, and restoring cellular balance through the delivery of anti-inflammatory cytokines and microRNAs. Particularly in SD, which involves immune dysregulation and compromised skin barrier function, exosomes can deliver anti-inflammatory molecules directly to affected skin cells, helping reduce inflammation and restore the skin's natural defense.[10]

ASCE has also demonstrated efficacy in scalp disorders, offering a cell-free approach to rejuvenate the scalp and combat hair loss. By reducing cellular aging in dermal papilla cells and improving hair follicle health, ASCE therapy has been shown to increase hair density and downregulate inflammatory markers for a healthier scalp.[11] Clinical studies have revealed an increase of 9 hair strands per cm^2 over 6 months and 10 sessions, surpassing traditional treatments such as minoxidil in in vivo studies.[11] Although the response to ASCE may vary among individuals, necessitating further research for standardized protocols, its versatility extends to conditions like scleroderma and amyotrophic lateral sclerosis, broadening its therapeutic applications.[12]

A study on the topical application of human adipose tissue-derived mesenchymal stem cell-derived exosomes demonstrated effective treatment of dupilumab-related facial redness in patients with atopic dermatitis, showing shorter recovery times with fewer side effects.[13] Another study used a proprietary extracellular vesicle isolation technology to isolate exosome-like nanoparticles from rose stem cell culture media, creating rose stem cell exosomes that demonstrated skin-enhancing effects. Rose stem cell exosomes were found to contain microRNAs and proteins supporting fibroblast growth, melanin modulation, and anti-inflammatory functions, while also stimulating mesenchymal stem cell activity to improve skin quality.[5] Although promising, further randomized clinical trials are needed to validate these effects and determine standardized protocols.

Patients from Bogotá spent an average of US dollars (USD) $428.04 annually on topical therapy (TP) and USD $623.08 on both topical and systemic treatment (TaST). Those from nearby regions spent at least USD $587.41 per year on TP and USD $777.21 on TaST, while patients from other departments spent USD $595.80 annually on TP and USD $785.60 on TaST.[14] These figures include both direct and indirect costs. When comparing the costs of ASCE therapy to standard SD treatments, it is evident that ASCE therapy offers a potentially cost-effective alternative, especially for recalcitrant cases. Although traditional treatments involve significant annual costs for patients, exosome therapy could provide a targeted, efficient option, reducing long-term expenses and improving outcomes for difficult-to-treat conditions.

In conclusion, the successful treatment of chronic severe SD using ASCE therapy highlights its potential as an effective alternative for cases resistant to conventional therapies. Through targeted sessions combining ASCE with microneedling and topical applications, significant improvements were observed, achieving sustained remission over 2 months post-treatment without relapse.

Conflicts of interest

None disclosed.

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