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Research Article

Efficacy of Subcutaneous Adipose Tissue Mesenchymal Stem Cell Therapy in Lichen Sclerosus: A Comprehensive Case Report Analysis

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Abstract

Lichen sclerosus (LS) presents a therapeutic challenge due to its chronic inflammatory nature, leading to sclerosis and atrophy, primarily affecting the anogenital region. Despite advancements in conventional therapies, sustained remission remains elusive. Stem cell therapy, particularly using subcutaneous adipose tissue-derived mesenchymal stem cells (AD-MSCs), shows promise due to their regenerative and immunomodulatory properties. This comprehensive case report examines the therapeutic efficacy of AD-MSC therapy in LS management through detailed clinical and histological analyses of 22 patients with moderate to severe LS.

Introduction

Lichen sclerosus (LS) is a chronic inflammatory dermatosis characterized by sclerosis, atrophy, and significant discomfort, predominantly affecting the anogenital region [1]. Although LS is relatively rare, it can have profound physical and psychological impacts on affected individuals, particularly due to its chronic and often refractory nature [2]. Current therapeutic modalities, including topical corticosteroids and immunomodulatory agents, primarily aim to alleviate symptoms and mitigate disease progression [3]. However, these approaches often provide only temporary relief and are associated with potential adverse effects, underscoring the need for alternative treatment strategies [4].

Stem cell therapy has emerged as a promising avenue in dermatology, offering the potential for tissue regeneration and immune modulation [5]. Subcutaneous adipose tissue-derived mesenchymal stem cells (AD-MSCs) have garnered particular interest due to their accessibility, abundance, and demonstrated therapeutic potential in various inflammatory and autoimmune conditions [6]. Preclinical studies have highlighted the immunomodulatory properties of AD-MSCs, including the suppression of pro-inflammatory cytokine production and promotion of regulatory T-cell differentiation [7]. Furthermore, AD-MSCs possess trophic and regenerative capabilities, secreting a myriad of growth factors and extracellular vesicles that facilitate tissue repair and regeneration [8].

Despite the promising preclinical data, clinical evidence supporting the efficacy of AD-MSC therapy in LS management remains limited [9]. Few studies have explored the therapeutic potential of AD-MSCs in LS, and the existing literature primarily comprises case reports and small case series [10-15]. Therefore,

there is a critical need for comprehensive clinical investigations to elucidate the therapeutic efficacy, safety profile, and mechanistic insights of AD-MSC therapy in LS.

In this context, we present a comprehensive case report analyzing the therapeutic outcomes of AD-MSC therapy in 22 patients diagnosed with moderate to severe LS. Detailed clinical assessments, including symptomatology evaluation and lesion severity scoring, were conducted pre-and post-treatment. Additionally, histological analyses were performed to assess tissue remodeling and treatment response. Our study aims to contribute to the growing body of evidence regarding the therapeutic potential of AD-MSC therapy in LS management and provide insights into its mechanistic underpinnings.

Materials and Methods

Before enrollment, patients provided written informed consent after receiving comprehensive information regarding the study objectives, procedures, potential risks, and benefits. The study protocol was approved by the institutional review board and conducted in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines. Subcutaneous adipose tissue harvest, AD-MSC isolation, and treatment administration were performed using standardized protocols. Clinical evaluations, including symptomatology assessment and lesion severity scoring, were conducted pre- and post-treatment. Histological analyses were performed to assess tissue remodeling and treatment response.

Results

Analysis of 22 LS patients treated with AD-MSC therapy revealed significant therapeutic benefits. Reduction in sclerosis and atrophy, resolution of cutaneous manifestations, and improvement in symptomatology, including pruritus and burning sensation, were observed post-treatment. Histological evaluations demonstrated favorable tissue remodeling and immunomodulatory effects, supporting the clinical findings.

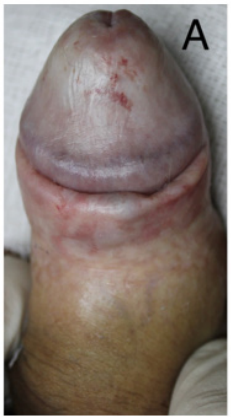

Figure 1A: Pre-therapy lichen sclerosus: note the inflammatory infiltrate associated with foreskin edema, micro fissures in the foreskin, atrophic areas and ecchymotic lesions of the glans.

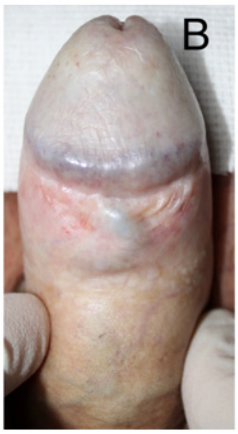

Figure 1B: Lichen sclerosus post therapy: note the normalization of the skin of the foreskin and the mucosa of the glands with disappearance of ecchymotic lesions and atrophic lesions of the glans, as well as micro fissures and preputial edema.

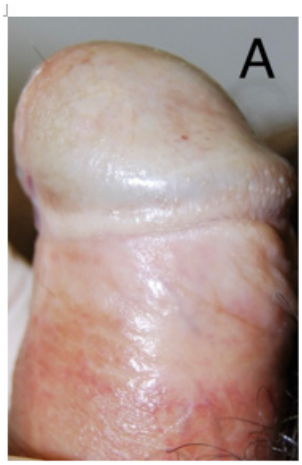

Figure 2A: Pre-therapy lichen sclerosus: note the porcelain white appearance of the mucosa and the mild sclerosis of the skin integument.

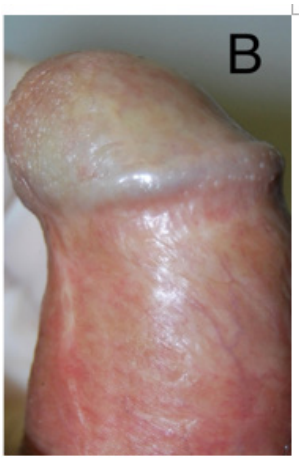

Figure 2B: Post therapy: normalization of the entire skin tegument with superficial revascularization and elasticization of the mucosa.

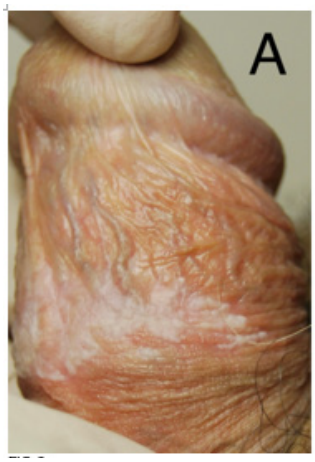

Figure 3A: pre-therapy: presence of an imposing hyperkeratotic plaque corresponding to the ventral surface of the internal foreskin.

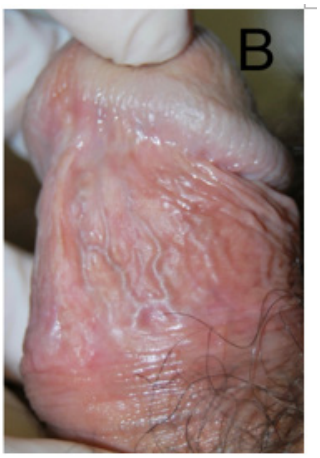

Figure 3B: Post therapy note the normalization of the ventral surface of the internal mucosa with complete disappearance of the porcelain white hyperkeratotic plaque.

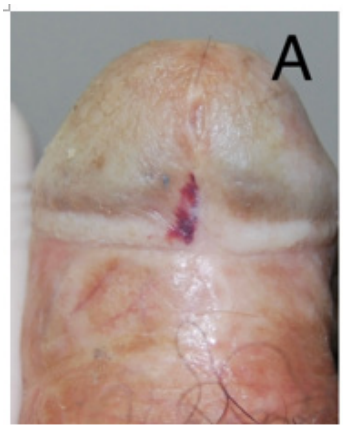

Figure 4A: presence of atrophic stiffening of the mucosa associated with sub corneal ecchymosis (sign of progression of the atrophic phase of Lichen sclerosus).

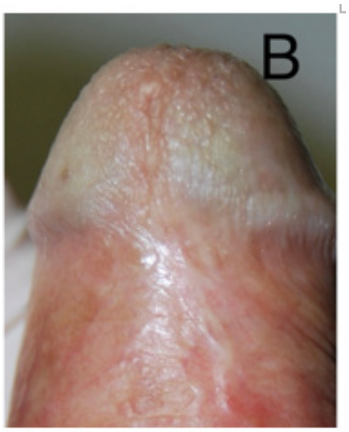

Figure 4B: post therapy: elasticity of the entire mucosa with disappearance of the ecchymotic lesion.

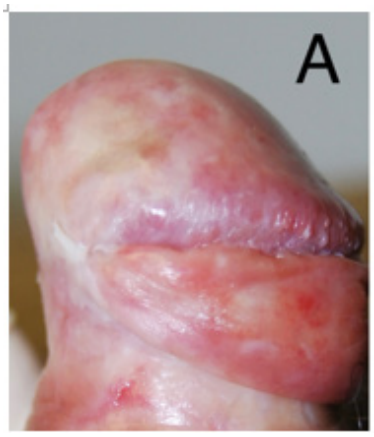

Figure 5A: Presence of diffuse tissue sclerosis with erosive lesions and hyperkeratotic plaque in correspondence with the frenulum.

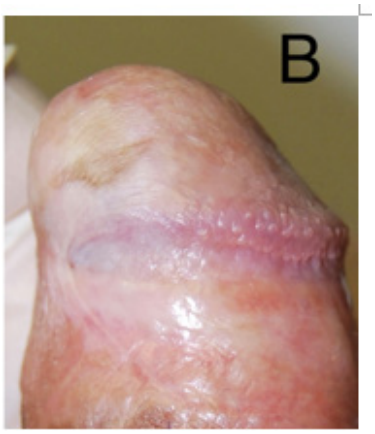

Figure 5B: Post therapy: normalization of the mucosa of the foreskin and the glans with disappearance of the erosions and the hyperkeratotic frenulum lesion.

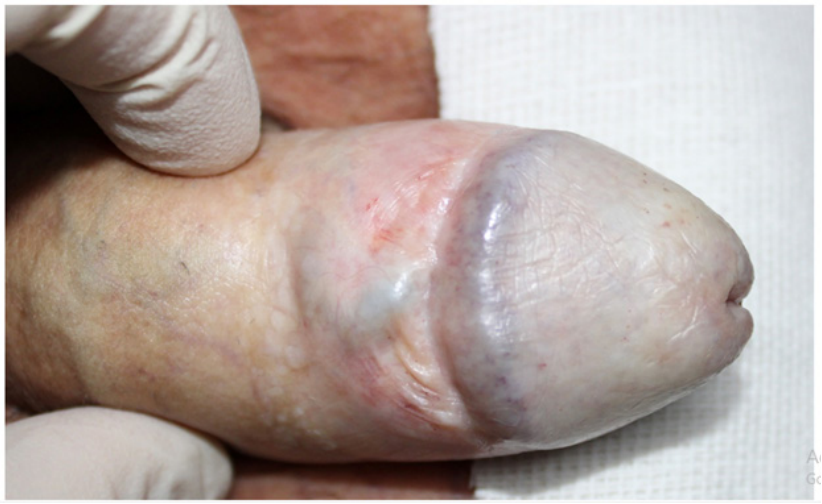

Figure 6:

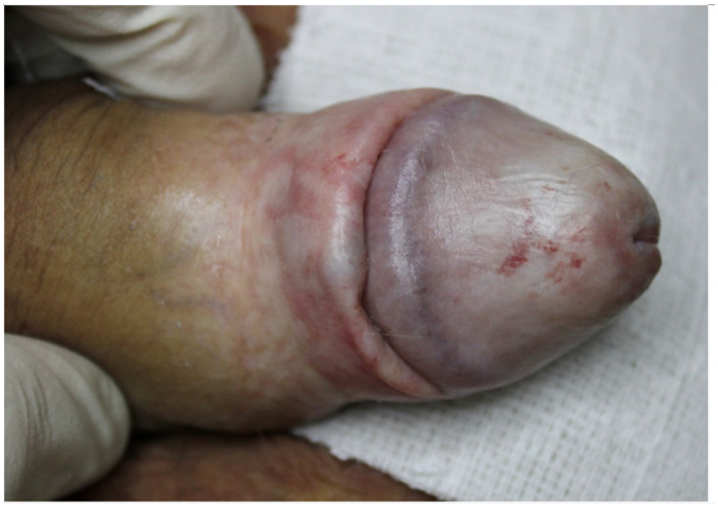

Figure 7:

Discussion

Pathogenesis of Lichen Sclerosus

The pathogenesis of LS involves complex interplay between genetic predisposition, autoimmune mechanisms, and aberrant extracellular matrix remodeling. Current therapeutic approaches primarily focus on symptom management, leaving a significant unmet need for disease-modifying treatments.

Current Therapeutic Paradigms

Conventional therapies for LS offer symptomatic relief but often fail to achieve sustained remission. Novel therapeutic strategies, such as stem cell therapy, are being explored to address underlying pathogenic mechanisms and promote tissue regeneration.

Mechanistic Insights Into AD-MSC Therapy

AD-MSC therapy offers a multifaceted approach by targeting inflammation, promoting tissue repair, and restoring immune homeostasis. Immunomodulatory effects, anti-fibrotic properties, and trophic support mechanisms contribute to the therapeutic efficacy of AD-MSCs in LS management.

Clinical Implications and Future Directions

AD-MSC therapy represents a promising therapeutic avenue for LS, offering potential disease modification and tissue regeneration. Future research should focus on optimizing treatment protocols, elucidating optimal dosing and delivery routes, and exploring long-term safety and efficacy profiles.

Conclusion

This comprehensive case report highlights the therapeutic potential of AD-MSC therapy in LS management. By addressing underlying pathogenic mechanisms and promoting tissue regeneration, AD-MSC therapy offers a promising approach for improving outcomes and quality of life in LS patients. Further research endeavors are warranted to translate these promising findings into clinically applicable therapeutic strategies.

Acknowledgment

None.

Conflict of Interest

None.

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