

Combined 308-nm Excimer Lamp and Tacrolimus Therapy for Linear Morphea Evaluated by Clinical Assessment and Ultrasound (USG): A Case Report of a 38-Year-Old Woman

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ABSTRACT: Morphea is a chronic inflammatory disease characterised by skin sclerosis. The disease has several proposed classifications, one of which is linear morphea, characterised by lesions that may follow Blaschko lines and can involve the dermis, subcutaneous tissue, muscle, and underlying bones. Various treatments have been explored for linear morphea, including phototherapy, immunomodulators, and topical treatments like tacrolimus and imiquimod. This case report presents a novel treatment approach using 308-nm excimer lamp therapy in combination with tacrolimus 0.1% ointment for a 38-year-old woman diagnosed with linear morphea. The patient had a linear depressed plaque on her forehead that evolved over four years. After 20 weeks of combined treatment, significant improvement was observed, including a reduction in lesion length, improved dermal thickness and complete resolution of pruritus. The treatment was well tolerated with no major adverse effects, suggesting that this combination may represent a promising alternative to traditional therapies for linear morphea.

Keywords: Linear morphea, Excimer lamp therapy, Tacrolimus, Phototherapy

INTRODUCTION

Linear morphea is a subtype of localised scleroderma, characterised by band-like, linear lesions that can involve the dermis, subcutaneous tissue, muscles, and even underlying bones. It is the most common form of localised morphea in children and adolescents, typically presenting as a unilateral lesion on the extremities, face, or scalp, often following the lines of Blaschko [1]. When it affects the head and neck, the condition can result in skin atrophy, growth retardation, muscle atrophy, and may resemble a “cut of the sword”, known as “en coup de sabre” [1]. The etiology of morphea remains poorly understood and is thought to involve an interplay between genetic susceptibility and environmental triggers. Its pathogenesis is believed to be autoimmune-mediated, progressing from an initial inflammatory phase to fibrosis and cutaneous sclerosis [1].

Various treatment options have been explored for linear morphea, including phototherapy (especially narrowband UVB and UVA), as well as oral and topical therapies such as Vitamin D derivatives and immunomodulators like methotrexate with or without corticosteroids [1]. Additionally, case reports have

suggested other therapeutic options, including topical treatments like tacrolimus and imiquimod, as well as oral agents such as mycophenolate mofetil, cyclosporine, hydroxychloroquine, azathioprine, retinoids, intravenous immunoglobulin (IVIG), rituximab, and infliximab. Other approaches, including anti-fibrotic drugs, JAK inhibitors, autologous stem cell transplantation, and supportive therapies like physiotherapy and massage, have also been proposed [2].

Excimer lamp therapy is a targeted phototherapy modality that delivers high-intensity monochromatic UVB light at 308-nm directly to affected skin, thereby limiting irradiation of uninvolved tissue. Given its anti-inflammatory and immunomodulatory effects, as well as its ability to provide localised treatment with minimal exposure to surrounding healthy skin, excimer lamp therapy may represent a promising therapeutic option for localised forms of morphea such as en coup de sabre [3]. However, to our knowledge, the combined use of 308-nm excimer lamp therapy and topical tacrolimus for the treatment of linear morphea has not been previously reported. Herein, we report the use of this combination therapy in a 38-year-old woman with linear morphea.

CASE PRESENTATION

A 38-year-old woman presented with a solitary, hyperpigmented, linear depressed plaque on her forehead that had gradually developed over four years. The lesion initially appeared as an erythematous, asymptomatic patch and subsequently evolved into an intermittently pruritic (Visual Analogue Scale (VAS) score: 3/10), hyperpigmented, linear depressed plaque that with progressive extension. The lesion was non-painful, and no other associated symptoms were reported. Prior to presentation at our institution, the patient had sought consultation elsewhere and received topical antifungal therapy as well as three sessions of unspecified laser treatment at an aesthetic clinic, without clinical improvement. There was no history of preceding trauma, infection, radiation exposure, or other identifiable triggering factors. The patient had no known comorbidities and no family history of autoimmune or connective tissue disorders. On examination, the lesion was consistent with linear morphea (en coup de sabre), with no signs of systemic involvement.

MANAGEMENT

A 4-mm skin punch biopsy was performed from the active border of the lesion. Histopathological examination revealed early dermal sclerosis characterised by thickened collagen bundles, reduced spacing between collagen fibres, and a mild superficial and periadnexal lymphohistiocytic infiltrate. The presence of preserved adnexal structures surrounded by thickened collagen fibres supported a diagnosis of early-stage morphea. Although similar histopathological findings may occur in systemic sclerosis, the diagnosis of linear morphea was established based on the characteristic linear morphology of the lesion and the absence of clinical features suggestive of systemic

sclerosis, including Raynaud phenomenon, sclerodactyly, or internal organ involvement (**Figure 1**). Following clinicopathological correlation, a diagnosis of linear morphea (en coup de sabre) was established.

Given the location of the lesion, a skull radiograph was performed to assess potential underlying osseous involvement, which demonstrated no evidence of bony abnormalities. Laboratory investigations for connective tissue diseases were not performed due to financial constraints. Prior to treatment initiation, high-frequency ultrasonography (LOGIQ P9, GE HealthCare, USA) of the affected area was performed using a 12-MHz linear transducer to assess the extent of cutaneous involvement and measure dermal thickness.

The patient was initiated on 308-nm excimer lamp therapy at an initial dose of 100 mJ/cm² administered twice weekly. The dose was increased by 50 mJ/cm² per session for the first four sessions, followed by increments of 10 mJ/cm² per session for the subsequent 35 sessions. In addition, tacrolimus 0.1% ointment, a topical calcineurin inhibitor, was applied to the lesion twice daily for its anti-inflammatory and immunomodulatory effects. The patient completed 40 sessions of excimer lamp therapy over 20 weeks, with a cumulative dose of 17,800 mJ/cm² while continuing topical tacrolimus 0.1% ointment throughout the treatment period.

Treatment response was assessed using both subjective and objective measures. Subjective symptoms, including tightness and pruritus, were evaluated using the VAS. Objective clinical evaluation included serial measurements of lesion dimensions, while dermal thickness and echogenicity were assessed using high-frequency ultrasonography to monitor tissue remodelling. Serial measurements were obtained at the centre of the lesion using the same anatomical site, standardised patient positioning, and a single operator

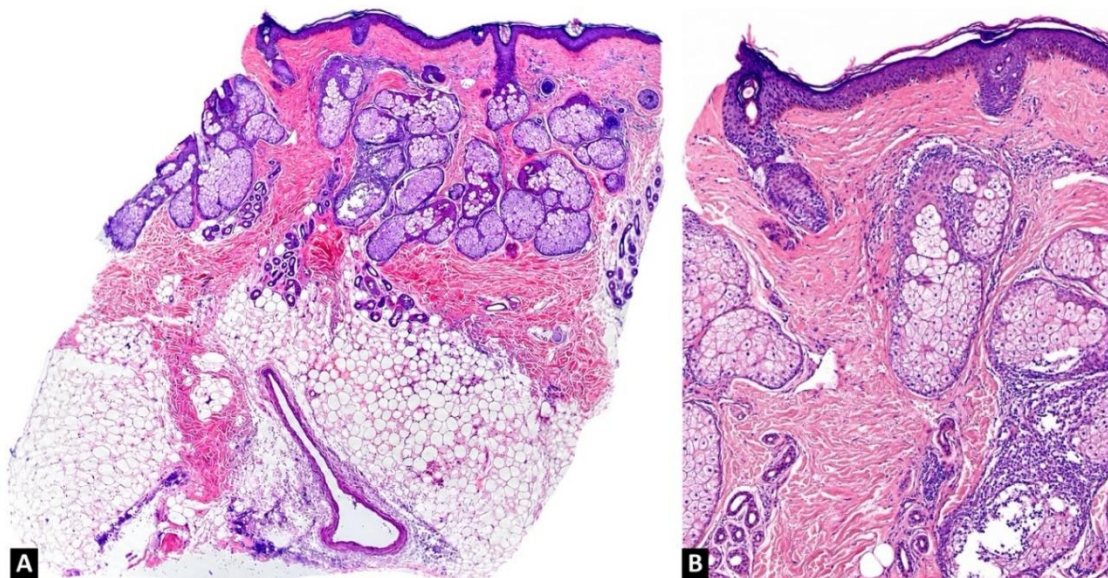


Figure 1. Hematoxylin and eosin (H&E) staining demonstrates a squared silhouette with mild spongiosis and prominent basal layer hyperpigmentation of the epidermis. Dermal changes are characterised by a mild superficial lymphohistiocytic infiltrate and reduced spacing between thickened collagen bundles. (A) $\times 4$ magnification; (B) $\times 10$ magnification.

to ensure measurement consistency. Disease activity and damage were further assessed using the Localised Scleroderma Cutaneous Assessment Tool (LoSCAT) [4]. All assessments were performed at baseline and after every 10 sessions of excimer lamp therapy.

CLINICAL OUTCOME

Following initiation of therapy, the patient demonstrated progressive clinical improvement throughout the treatment course. After 20 weeks, high-frequency ultrasonography revealed evidence of dermal remodelling with increased dermal thickness and improved sonographic appearance. Subjective symptoms improved significantly, with complete resolution of pruritus (VAS score: 0/10) and absence of residual tightness. Clinically, the lesion length decreased from 4.4 cm at baseline to 3.4 cm after treatment, representing a 22.73% reduction in lesion size (**Figure 2**). No new lesions developed during the treatment period.

Assessment using the LoSCAT demonstrated complete resolution of disease activity (**Table 1**), with the modified Localized Scleroderma Skin Severity Index (mLoSSI) score improving from 3 at baseline to 0 after treatment. The Localized Scleroderma Skin Damage Index (LoSDI) remained stable at 3, indicating persistent

but non-progressive cutaneous damage, with improvement in dermal atrophy and residual dyspigmentation. Both therapies were well tolerated, and no notable adverse effects were observed during the treatment period.

Table 1. Disease activity and damage assessed using the Localised Scleroderma Cutaneous Assessment Tool (LoSCAT).

LoSCAT component	Baseline	Post-treatment
mLoSSI		
Erythema	0	0
Skin thickness	0	0
New lesion extension	3	0
Total mLoSSI	3	0
LoSDI		
Dermal atrophy	2	1
Subcutaneous atrophy	0	0
Dyspigmentation	1	2
Total LoSDI	3	3

Scores were assigned as follows: 0=absent, 1=mild, 2=moderate, and 3=severe.

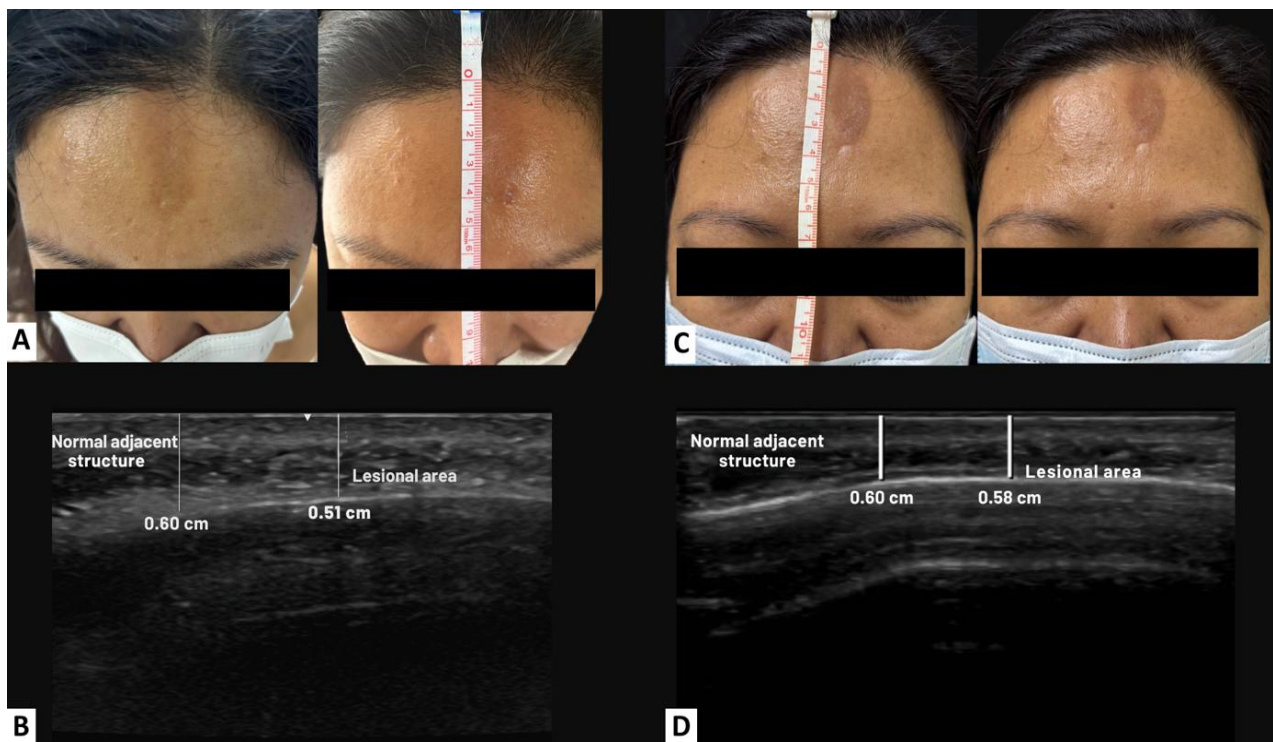


Figure 2. Clinical and ultrasonographic findings before and after treatment. **(A)** Clinical photograph showing a solitary, ill-defined, irregularly shaped hyperpigmented linear depressed plaque on the forehead at baseline (lesion length, 4.4 cm); **(B)** Baseline high-frequency ultrasonography demonstrating reduced dermal thickness; **(C)** Clinical photograph after 40 treatment sessions, showing a reduction in lesion length to 3.4 cm; **(D)** Follow-up ultrasonography after 40 treatment sessions demonstrating increased dermal thickness, consistent with dermal remodelling.

DISCUSSION

This case demonstrates a favorable clinical response to the combined use of 308-nm excimer lamp therapy and topical tacrolimus in a patient with linear morphea, highlighting the potential role of targeted localised treatment approaches. Morphea is a chronic autoimmune condition characterised by inflammation-driven fibrosis and excessive collagen deposition in the dermis and subcutaneous tissues [2], which may explain the reduction in dermal thickness observed in this patient.

Most studies have described narrowband UVB and UVA1 as effective phototherapy options for morphea. A local case series by Frez et al. demonstrated favorable clinical outcomes with narrowband UVB in patients with morphea, further supporting the utility of phototherapy in disease management [5]. However, conventional phototherapy involves irradiation of both affected lesions and surrounding normal skin [6]. In contrast, targeted modalities such as excimer light deliver high-intensity UVB directly to affected areas, potentially enhancing treatment efficacy while minimising unnecessary exposure to uninvolved skin [6,7]. These findings suggest that targeted excimer phototherapy may represent an effective tissue-sparing alternative for localised facial morphea.

Previous reports have described the use of 308-nm excimer light in localised scleroderma, with improvements in skin texture observed in most treated lesions [7]. Subsequent reviews have highlighted 308-nm excimer lamp phototherapy as a targeted UVB modality that selectively delivers high-dose irradiation to affected skin while sparing surrounding healthy tissue, supporting its potential role in the management of superficial morphea [3,8]. Consistent with these findings, our patient demonstrated marked clinical improvement, including complete resolution of pruritus, reduction in lesion length, ultrasonographic evidence of dermal remodelling, and complete resolution of disease activity based on LoSCAT assessment following combined excimer lamp and topical tacrolimus therapy.

Early treatment remains important in morphea to minimise disease progression and prevent irreversible damage [9]. As this patient presented during the active sclerotic phase, and excimer phototherapy has been suggested as a potential treatment option for early, localised sclerotic lesions [10], timely intervention was considered appropriate. The treatment regimen was well tolerated, with only minimal, transient erythema following excimer therapy sessions that resolved within 24 hours, and no significant adverse effects associated with either modality. This favourable safety profile is consistent with previous reports indicating that phototherapy and topical immunomodulators are generally well tolerated in localised morphea [2].

The combination therapy may exert complementary therapeutic effects. Phototherapy

induces immunomodulatory effects in lesional skin, including modulation of cytokines involved in fibrogenesis, alteration of immune cell activity through mechanisms such as apoptosis of pathogenic T lymphocytes, and regulation of pro-fibrotic mediators, including transforming growth factor- β and matrix metalloproteinases, thereby reducing inflammation and fibrosis [11]. Tacrolimus, meanwhile, suppresses calcineurin-mediated T-cell activation, reducing immune-driven inflammation [12]. Given that morphea involves both immune dysregulation and fibroblast activation, targeting these inflammatory and fibrotic pathways concurrently may contribute to the favourable clinical response observed in this case.

Despite the favourable outcome, several limitations should be acknowledged. As a single-case report, the findings cannot be generalised and lack comparative analysis. Furthermore, because topical tacrolimus was administered concomitantly with excimer lamp therapy, the individual contribution of each treatment modality to the observed clinical response cannot be definitively determined. Additionally, the absence of long-term follow-up limits assessment of disease recurrence, which may occur due to the chronic and relapsing nature of morphea [13]. This consideration is particularly relevant, as retrospective data in adults with linear morphea have shown that although approximately 70% of patients achieve disease improvement or stabilisation following treatment, recurrence may occur in up to 40% of cases after treatment completion [14]. Further studies involving larger cohorts, controlled designs, and extended follow-up are warranted to validate these observations and establish standardised treatment approaches.

CONCLUSION

This case highlights the potential benefit of combining 308-nm excimer lamp therapy with topical tacrolimus in the management of linear morphea. Early intervention remains important to minimise disease progression and irreversible tissue damage. The combination of targeted UVB therapy and topical immunomodulation was associated with a favourable clinical response in this patient. Further studies involving larger cohorts, comparative designs, and extended follow-up are warranted to further evaluate the efficacy and long-term safety of this combined therapeutic approach.

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None.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest.

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