

Case Report

Successful Microablative Fractional Carbon Dioxide Laser Therapy for Vulvar Lichen Sclerosus: A Case Report and Mini-review

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Abstract

Vulvar lichen sclerosus (VLS) is a chronic inflammatory skin disorder affecting the vulvar region. VLS predominantly affects women, and most cases occur after menopause. Common symptoms include itching, skin-whitening, pain, discomfort, fissures, and scarring. Treatment options include topical steroids, emollients, lifestyle modifications, regular follow-up, and surgical interventions. Carbon dioxide (CO₂) laser treatment is a therapeutic option for managing lichen sclerosus. We report a case of VLS successfully treated with a fractional microablative CO₂ laser. A 72-year-old female presented with a dry vagina and vulvar itching for 6 months. She visited a local medical clinic, and oral anti-itching medication and topical anti-itching ointment were administered. However, the condition did not improve, and she felt itching. She visited our outpatient department, and a pelvic examination showed bilateral labia minor, revealing a white skin color change and a hardening sensation. The patient was diagnosed with VLS. Microablative fractional CO₂ laser therapy was subsequently administered. The treatment course comprised three laser therapy sessions (treatment day, 1 month, and 2 months after the first therapy). The vulvovaginal symptoms questionnaire-21 scores were 14, 6, and 2 for the first, second, and third courses of treatment, respectively. Vulvar itching improved significantly after laser treatment – no more steroid treatment needed. After 10 months of follow-up, the condition of the vulva was maintained well. Although the treatment protocol requires further exploration, CO₂ laser treatment could be considered for VLS if topical steroids are ineffective.

Keywords: Carbon dioxide laser, corticosteroid, itching, lichen sclerosus, microablative laser

INTRODUCTION

Vulvar lichen sclerosus (VLS) is a chronic inflammatory skin disorder affecting the vulvar regions.^[1] VLS predominantly affects women, and most cases occur after menopause. Although its exact prevalence is not well documented, it is a relatively rare condition.^[2] Common symptoms include itching, skin-whitening, pain, discomfort, fissures, and scarring. A diagnosis includes clinical examination and biopsy.^[3]

The management of VLS aims to alleviate symptoms and prevent complications. The treatment options include

topical steroids, emollients, lifestyle modifications, regular follow-up, and surgical intervention.^[4] Carbon dioxide (CO₂) laser treatment is one of the therapeutic options used for managing lichen sclerosus,^[5] particularly in cases where traditional treatments, such as topical corticosteroids, have been ineffective or when the condition causes significant scarring, discomfort, or structural changes in the vulvar region.

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Here, we report the case of a woman with VLS who was treated with a fractional microablative CO₂ laser.

CASE REPORT

A 72-year-old female presented with dry vagina and vulvar itching for 6 months. The patient had experienced dry vagina and vulvar itching for 6 months. Dyspareunia was not observed. She visited a local medical clinic, and oral anti-itching medication and topical anti-itching ointment (steroid) were administered; however, the condition did not improve, and she experienced vulvar itching off and on. The patient visited our outpatient department for further management.

Her mammography revealed a Breast Imaging Reporting and Data System (BI-RADS) category of 0, and the patient was referred to the general surgery department for further evaluation. Multinodularity was observed in both breasts. Left buttock pain had been noted for 4 months. She visited the orthopedic department and was found to have radiculopathy at the fifth lumbar spine and spondylolisthesis between the fourth and fifth lumbar spine.

She had delivered three children vaginally. Her menarche occurred at the age of 13 years and menopause at the age of 55 years. She did not undergo menopausal hormone therapy. The patient had no family history of breast cancer.

Pelvic examination showed bilateral labia minor, revealing a white skin color change and a hardening sensation. Her height and weight were 153 cm and 53 kg, respectively.

Her creatinine was 0.77 mg/dL, and her estimated glomerular filtration rate was 78.32 mL/min.

No image examination related to the vulva region was taken.

VLS was diagnosed.

Microablative fractional CO₂ laser therapy was administered. The patient was positioned in the lithotomy posture without anesthesia. A speculum was used to disinfect the vaginal area. Before the treatment, 2% xylocaine (lidocaine HCl) jelly was topically applied to whiten the labia minor, vestibule, and introitus.

The microablative fractional CO₂ laser treatment protocol using the Mona Lisa Touch system (DEKA) consists of two sequential steps. Initially, a 360° applicator was used to administer the laser therapy to the entire vaginal wall. This process entailed conducting three passes in the d-pulse mode, employing a dot power of 30 W, a dwell time of 1000 μs, and a dot spacing of 1000 μm. The d-pulse mode utilizes a pulse pattern involving a series of ultrashort pulses of high laser energy, each lasting only a few microseconds, followed by a longer lower energy pulse. The MonaLisa Touch system uses a scanning technique to dispense laser energy to the vaginal tissue. Throughout the procedure, the laser probe was moved

in a sweeping motion across the vaginal tissue to ensure comprehensive coverage of the entire vaginal area.

In the second phase, a noncontact applicator was applied to the white labia minor. This was one time using the d-pulse mode, with a dot power of 20 W, a dwell time of 1000 μs, and a dot spacing of 1000 μm.

Following each laser application, patients were instructed to refrain from engaging in sexual intercourse or swimming during the initial 3 days following the treatment. The treatment course consisted of three laser therapy sessions (day 1, 1, and 2 months after the first therapy) [Figure 1].

The changes in scores over the three treatment courses were as follows: Urinary Distress Inventory-6 (3, 0, 2), Incontinence Impact Questionnaire-7 (1, 0, 1), and Overactive Bladder Symptom Score (1, 2, 1). The vulvovaginal symptoms questionnaire (VSQ)-21 scores were 14, 6, and 2 for the first, second, and third courses of treatment, respectively. This indicates that vulvar itching improved significantly after laser treatment.

After 10 months of follow-up, the condition of the vulva was maintained well.

DISCUSSION

Lichen sclerosus is a chronic inflammatory skin disease that primarily affects the genital and anal areas.^[6] It can also occur in other body regions, and untreated lichen sclerosus can increase the risk of vulvar cancer. Lichen sclerosus affects individuals of all ages and sexes. However, it is more common in women, especially postmenopausal women; nearly half of the affected women experience it before menopause, with an average delay of approximately 5 years in diagnosis.^[7] The exact cause of lichen sclerosus is poorly understood.

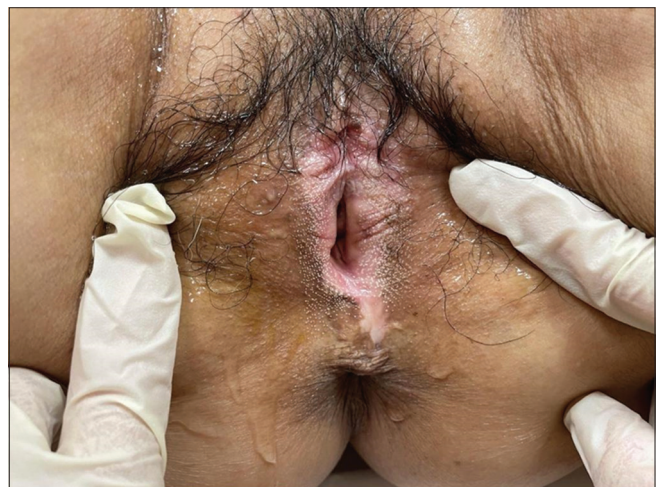


Figure 1: Vulva lichen sclerosus post the third session of carbon dioxide laser therapy. The numerous white spots are laser treatment dots

Its pathogenesis is thought to be multifactorial and involves genetic, autoimmune, hormonal, and environmental factors.^[6]

Lichen sclerosis is characterized by specific clinical features, including flat, ivory-colored, wax-textured lesions that may form thin, crinkly, or hyperkeratotic patches.^[6] Erythema and Koebner phenomena are common alongside ecchymosis, excoriations, and fissures. In females, lichen sclerosis initially presents with nonspecific symptoms in the anogenital area, including itching, burning sensation, mild redness, and swelling around the periclitoral region. As the disease progresses, the skin becomes fragile, leading to atrophic (thinning) lesions, fissures, and erosions.^[8] Fissures are commonly found between the clitoris and urethra and in the interlabial sulci, often resulting in painful urination. Severe itching can also lead to hyperkeratosis and ecchymosis. The affected areas typically include the clitoral hood, labia minora, inner labia majora, perineum, and perianal region.^[9] As the disease advances, scarring is often observed in most adult female patients and in a significant number of girls, which can lead to fusion or complete resorption of the labia minora and loss of the clitoral hood. In addition, narrowing of the vaginal introitus can result in dyspareunia, significantly impacting the patient's sexual life.

For the experienced examiner, the clinical picture is often sufficient for diagnosis, and histological evidence is only sometimes necessary.^[3] Whitish skin alterations in the anogenital area, accompanied by itching, suggest lichen sclerosis.^[3] However, a biopsy from a typical lesion should be performed if the clinical presentation needs to be clarified or the physician is unfamiliar with the disease.^[3]

Traditional therapy for VLS typically involves a combination of medical treatments aimed at reducing symptoms and managing the condition. High-potency topical corticosteroid creams or ointments are the first-line treatment for VLS.^[4] Applying emollients or moisturizers to the affected area can help keep the skin hydrated and reduce dryness and itching.^[10] Our patient also received 6 months of topical corticosteroid treatment but was unsuccessful.

The combination of surgical techniques along with concurrent topical therapy to address clitoral phimosis, introital stenosis, and vulvar granuloma fissuratum has been shown to enhance the quality of life and sexual function, as reported in previous studies.^[11] However, long-term outcome data for these interventions are lacking. Another treatment approach explored for lichen sclerosis involves platelet-rich plasma therapy, which promotes the release of cytokines and growth factors and stimulates tissue regeneration.^[12] While initial small-scale studies on platelet-rich plasma therapy for lichen sclerosis have demonstrated improvement over 2 years, randomized controlled trials are necessary to establish its long-term safety and efficacy.^[13]

The therapeutic principle of the CO₂ laser is that microablation triggers the reconfiguration of connective tissue by inducing the production of heat shock protein 47, leading to the generation of new collagen, fibroblasts, and the ground matrix.^[5] A previous study showed that fractional CO₂ treatment of lichen sclerosis failed;^[5] in five treatment sessions in 24 weeks, the power ranged from 18 to 26 W, dwell time ranged from 800 to 1000 μ s, and spacing ranged from 1000 to 1200 μ m. They found that histopathological scores improved but did not reach statistical significance. In our study, we conducted three treatment sessions at 0, 1, and 2 months. The power was 20 W, dwell time was 1000 μ s, and spacing was 1000 μ m. The VSQ-21 scores gradually improved. The variation in the results could be attributed to variations in the treatment protocols. Another study explored nonablative laser therapy for lichen sclerosis and showed better efficacy and significant symptom improvement for 6 months.^[14] Different types of lasers may have different effects on VLS. However, the effects of the different laser therapies require further investigation.

Table 1 summarizes the currently available studies ($n = 11$), including randomized controlled trials (RCT), non-RCTs, single-arm trials, and case series. Most studies used a CO₂ laser (9/11).^[5,14-23] The treatment sessions ranged from two to five. The treatment interval ranged from 4 to 6 weeks. Only one study did not demonstrate any improvement.^[5] A previous meta-analysis suggested that there is insufficient evidence to substantiate the efficacy of laser therapy for treating genital lichen sclerosis.^[24] The effectiveness of laser treatment warrants thorough investigation through well-executed RCTs.

Our case report involved only laser treatment for lichen sclerosis in a single case, limiting our findings' generalizability. We anticipate that future research with larger sample sizes or more extensive trials will provide a better understanding of the efficacy of this treatment.

In conclusion, VLS caused vulvar itching, which improved significantly after CO₂ laser treatment. If topical steroid treatment is not effective for VLS, CO₂ laser treatment may be an alternative treatment choice. However, this treatment protocol requires further investigation.

Ethics Statement

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and its amendments. The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Table 1: Summary of the previous studies

Year	Trial types	Numbers	Laser types	Treatment protocols	Results
Bizjak Ogrinc <i>et al.</i> , 2019 ^[14]	RCT, 1:1, laser: Steroid	40	Nd: YAG	3 sessions every 14 days	Improved
Mitchell <i>et al.</i> , 2021 ^[5]	RCT, 1:1, laser: Sham	40	CO ₂	5 sessions in 24 weeks	Not improved
Zhang <i>et al.</i> , 2020 ^[15]	RCT, laser versus HIFU	12	CO ₂	3–4 sessions in one treatment	Improved
Li, 2018 ^[16]	Non-RCT, laser versus triamcinolone acetonide cream	63	CO ₂	3 sessions	Improved
Baggish, 2016 ^[17]	Single arm trial	27	CO ₂	3–4 sessions at 4–6 weeks interval	Improved
Ferrara <i>et al.</i> , 2022 ^[18]	Single arm trial	10	CO ₂	3 sessions	Improved
Gómez-Frieiro and Laynez-Herrero, 2019 ^[19]	Single arm trial	28	Er: YAG laser	3 sessions every 4 weeks	Improved
Pagano <i>et al.</i> , 2020 ^[20]	Single arm trial	40	CO ₂	2 sessions every 30–40 days	Improved
Balchander and Nyirjesy, 2020 ^[21]	Case series	40	CO ₂	2 or more sessions at 4-week intervals	Improved
Gardner and Aschkenazi, 2021 ^[22]	Case series	31	CO ₂	3 sessions at 6-week intervals	Improved
Teodoro <i>et al.</i> , 2019 ^[23]	Case series	10	CO ₂	3 sessions at 1-month interval	Improved
Current case	Case	1	CO ₂	3 sessions at 1-month interval	Improved

RCT: Randomized controlled trial, CO₂: Carbon dioxide, Nd: neodymium, YAG: yttrium aluminum garnet, Er: erbium, HIFU: high intensity focused ultrasound

Author contributions

Dah-Ching Ding contributed to conceptualization, methodology, formal analysis, Writing-original draft preparation, and writing review and editing. Wen-Lin Hsieh contributed to data curation and writing-original draft preparation. All authors have read and agreed to the published version of the manuscript.

Data availability statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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Conflicts of interest

Dr. Dah-Ching Ding, an editorial board member at *Gynecology and Minimally Invasive Therapy*, had no role in the peer review process of or decision to publish this article. The other author declared no conflicts of interest in writing this paper.

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