

Successful Treatment of Keloid With Fractionated Carbon Dioxide (CO_2) Laser and Laser-Assisted Drug Delivery of Triamcinolone Acetonide Ointment in an African-American Man

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ABSTRACT

Keloids are fibrous growths that occur as a result of abnormal response to dermal injury. Keloids are cosmetically disfiguring and may impair function, often resulting in decreased patient quality-of-life. Treatment of keloids remains challenging, and rate of recurrence is high. We present a case of a 39-year-old African-American man (Fitzpatrick VI) with a 10-year history of keloid, who was successfully treated with eight sessions of fractionated carbon dioxide (CO_2) laser immediately followed by laser-assisted drug delivery (LADD) of topical triamcinolone acetonide (TAC) ointment and review the medical literature on fractionated CO_2 laser treatment of keloids. To the best of our knowledge, this is the first report of successful treatment of a keloid using combination therapy of fractionated CO_2 laser and LADD with topical TAC ointment in an African-American man (Fitzpatrick VI) with excellent cosmetic results sustained at 22 months post-treatment. We believe that this combination treatment modality may be safe and efficacious for keloids in skin of color (Fitzpatrick IV-VI) and other patients. This case highlights the ability of laser surgeons to safely use fractionated CO_2 lasers in patients of all skin colors.

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INTRODUCTION

Keloids are fibrous growths that occur as a result of abnormal response to dermal injury, typically affecting individuals in their second and third decades of life.[1] Clinically, keloids present as nodular, firm lesions that extend beyond the area of original injury and do not spontaneously regress, often continuing to grow over time.[1] The prevalence is high in the skin of color population, with an estimated incidence of 5-16% of Hispanic and African-American individuals being affected.[1] Although keloids are benign, they are cosmetically disfiguring and may impair function, often resulting in decreased patient quality-of-life.[2] Reported symptoms of keloids may include pain, pruritus, and burning.[1]

Treatment of keloids remains challenging, despite a variety of therapeutic options that may be available.[3] Current treatment modalities include compression and silicon sheeting; pharmacotherapies using topical imiquimod, topical or intralesional steroids, intralesional bleomycin, 5-fluorouracil, interferon, and surgery.[4] Treatment success rates vary; however, recurrence rates are high (estimated 50-80%) even with combination therapies.[3,4]

There are limited published data on treatment of keloids using fractionated carbon dioxide (CO_2) laser in combination with topical triamcinolone acetonide (TAC). CO_2 laser emits light at wavelength of 10600 nm, which is absorbed by water and results in tissue vaporization.[5] Fractionated CO_2 laser creates discreet columns of ablated tissue surrounded by intact skin, known as microthermal zones (MTZs), that can assist with tissue regeneration and elicit a rapid wound healing response.[6,7]

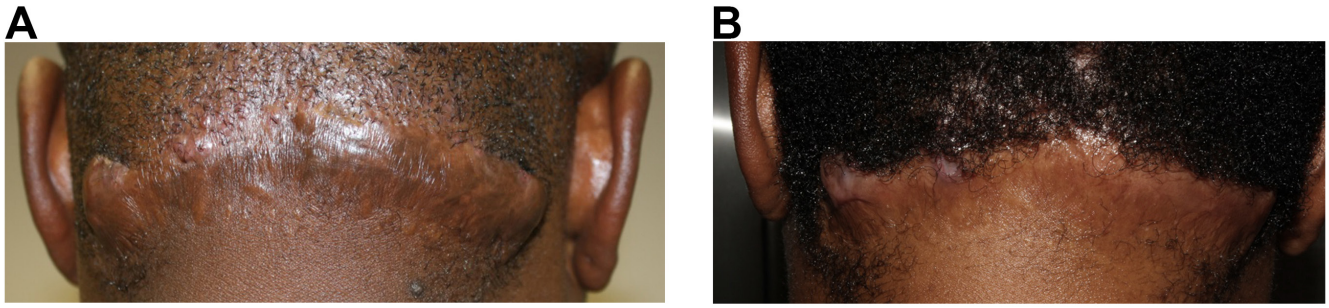
We present a case of an African-American man with a 10-year history of keloid, who was successfully treated with eight sessions of fractionated CO_2 laser immediately followed by laser-assisted drug delivery (LADD) of topical TAC ointment and review the medical literature on fractionated CO_2 laser treatment of keloids.

CASE REPORT

A 39-year-old African-American man (Fitzpatrick VI) presented to the dermatology clinic for treatment of a keloid on the posterior scalp status post-excision of acne keloidalis nuchae approximately 10 years prior. The patient complained of the aesthetically displeasing appearance of thickened skin on the posterior scalp and neck (Figure 1A). Other medical history was non-contributory.

The patient underwent eight treatments of SmartXide DOT HP fractional CO_2 laser (DEKA Medical Inc., San Francisco, CA) to the lateral poles and center of the keloid 6 to 8 weeks apart

FIGURE 1. (A) 39-year-old African-American man (Fitzpatrick VI) presented to the dermatology clinic for treatment of keloid on the posterior scalp status post-excision of acne keloidalis nuchae approximately 10 years prior. The patient complained of the aesthetically displeasing appearance of thickened skin on the posterior scalp and neck. (B) Seventeen months following the first treatment, our patient's keloid demonstrated significant reduction in thickness, improvement in texture, and overall aesthetic appearance, resulting in high patient satisfaction.



over the course of 17 months. Treatment settings are detailed in Table 1. Additionally, he received LADD of topical TAC 0.1% ointment (Perrigo Company plc, Bronx, NY) to the area immediately post-treatment.

Seventeen months following the first treatment, our patient's keloid demonstrated significant reduction in thickness, improvement in texture, and overall aesthetic appearance, resulting in high patient satisfaction (Figure 1B). He reported subjective "flattening of the scar" and was "happy" with results. This clinical improvement was sustained at 22 months post-initial treatment with no complications or adverse events.

Search Strategy

A review of the published literature was performed on July 28, 2016 searching medical bibliographic databases PubMed, EMBASE, Cochrane, and Web of Science. The search terms were: "keloid", "carbon dioxide", and "laser". Clinical studies in patients with keloids using fractionated CO_2 lasers were included. Non-English articles and conference posters/abstracts were excluded.

RESULTS

The search returned 269 articles. After removal of duplicates, 194 articles were screened. Five articles on fractionated CO_2 laser treatment of keloids were identified. Three studies utilized single treatment modality with fractionated CO_2 laser and reported mixed clinical improvement.[8-10] Two case series reported clinical improvement following a minimum of six sessions with fractionated CO_2 laser in Italian patients (Fitzpatrick II-IV) with no recurrence at 12-month follow-up.[9,10] An open-label, split-scar study reported no significant improvement following seven sessions of fractionated CO_2 laser in patients (Fitzpatrick II-IV) with keloids and hypertrophic scars, however, histopathology showed marked decrease in collagen density and a change from haphazard to a more aligned horizontal arrangement of collagen fibers.[8]

TABLE 1.

Fractionated CO_2 Laser Treatment Parameters for Keloid	
Eight treatments of fractionated CO_2 laser (SmartXide DOT HP laser, DEKA Medical, Inc., San Francisco, CA) over the course of 17 months	
Power (watt)	17
Dot mode spacing (microns)	600
Dwell time (microseconds)	500
Stack	Lateral poles: 5
	Center: 2
Number of passes	2

A 15-patient (Fitzpatrick II-V) case series utilized combination therapy of fractionated CO_2 laser immediately followed by TAC suspension applied topically and achieved good cosmesis after 3 to 5 sessions and no recurrence observed at 6-month follow-up.[11] Martin and Collawn reported successful treatment of refractory keloids in a Caucasian patient (Fitzpatrick type not specified) following seven sessions of combination therapy of fractionated CO_2 laser, pulsed-dye laser (PDL), and TAC without recurrence at 6 months post-initial treatment.[12] TAC solution (0.5 ml, 40 mg/ml) was administered intralesionally immediately before laser treatment during sessions 1-5.[12] No adverse events were reported in all reviewed studies.[8-12]

DISCUSSION AND FUTURE DIRECTIONS

Keloids may have a significant negative psychosocial impact on patients due to their aesthetically displeasing appearance and associated functional impairment, resulting in decreased patient quality-of-life.[2] Early published studies of keloid treatment using non-fractionated CO_2 laser dated back to the 1980s.[13-17] These studies achieved good clinical outcomes initially, however, almost all patients had keloid recurrence at 6-24 months post-treatment.[13-17] Published evidence suggests that non-fractionated CO_2 laser is not optimal for treatment of keloid due to high risk of keloid recurrence.[3]

Fractionated CO_2 laser is widely employed by dermatologists and other physicians today and has significant advantages compared

to non-fractionated CO_2 laser, including: minimal downtime; decreased risk of infection, bleeding, and dyschromia; and reduced patient discomfort.[6] This case report and review highlights that fractionated CO_2 laser therapy may be efficacious for treatment of keloids, however, several sessions may be necessary to achieve clinical improvement.[8-10] Due to a paucity of published evidence, we recommend additional research on fractionated CO_2 laser treatment of keloids.

Combination therapy with fractionated CO_2 laser and LADD of topical TAC ointment may yield excellent cosmetic results without recurrence or significant side effects in patients with keloids.[11,12] To the best of our knowledge, this is the first report of successful treatment of keloid using combination therapy of fractionated CO_2 laser and LADD with topical TAC ointment in an African-American man (Fitzpatrick VI) with excellent cosmetic results sustained at 22 months post-treatment. We believe that this combination treatment modality may be safe and efficacious for keloids in skin of color (Fitzpatrick IV-VI) and other patients. Application of topical TAC ointment immediately following fractionated CO_2 laser treatment may be an efficacious, non-invasive alternative to intralesional steroids. Fractionated CO_2 laser allows for penetration of topical drugs into the dermis, after generation of MTZs, and enhances drug delivery to target tissue, while forgoing the need for painful and invasive injections compared to the commonly performed intralesional corticosteroids. We propose that LADD with topical steroids has the following benefits: (1) decreases the risk of dyschromia following treatment; (2) attenuates local inflammatory response; and (3) decreases fibrosis associated with keloids.

This case highlights the ability of laser surgeons to safely use fractionated CO_2 lasers in patients of all skin colors. Additional randomized controlled trials and split-scar studies are needed to optimize fractionated CO_2 laser settings and treatment regimen for strong recommendation of keloid treatment using fractionated CO_2 laser and LADD with topical TAC ointment in skin of color patients.

DISCLOSURES

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