Successful Treatment of a Chronic Atrophic Dog-Bite Scar with the 1450-nm Diode Laser

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BACKGROUND. **Atrophic scars can be revised with surgical methods and more recently with newer ablative and nonablative laser techniques. Nonablative laser technology offers the advantage of improving the appearance of atrophic scars without the risks associated with traditional surgery or ablative lasers.**

METHODS. **A case of a large linear atrophic dog-bite scar on the chin of greater than 2-year duration treated for three sessions at 4- to 6-week intervals with the 1450-nm diode laser is presented.**

RESULTS. **Fifty to seventy-five percent improvement in the appearance of the scar resulted after three treatments with the 1450-nm diode laser. No adverse effects were noted from the treatment. The patient subjective rating of scar improvement was more than 50%.**

CONCLUSION. **The 1450-nm diode laser may provide a noninvasive and effective alternative for the treatment of atrophic traumatic scars. This method appears to be potentially effective even for treatment of very mature scars and warrants additional studies.**

MING H. JIH, MD, PHD, PAUL M. FRIEDMAN, MD, ARASH KIMYAI-ASADI, MD, AND LEONARD H. GOLDBERG, MD HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

SCARS RESULT from inflammatory or physical injury to the reticular dermis. Despite some improvement over time, scars persist indefinitely and can become a source of great distress for patients, particularly when present on visible or cosmetically sensitive areas.[1] Surgical scar revision was traditionally achieved through fusiform or punch excision of the scar, with subsequent closure using various straight- and broken-line techniques or Z-plasty.[2,3] Dermabrasion has been used either alone or after surgical excision to improve the contour of scars.[4] These methods result in the formation of a new wound, which requires significant time for healing and scar maturation. In addition, the surgical wounds require patient compliance with wound care regimens and are at risk of infection, abnormal scar formation, and chronic pigmentary alteration. These techniques typically result in increased length or size of a treated scar.

Initially, the use of lasers for scar revision employed ablative carbon dioxide and erbium:YAG lasers, which typically resulted in the formation of a new, improved scar.[5,6] These ablative lasers, however, are associated with risks similar to that seen with surgical scar revision. Recently developed nonablative laser techniques have been shown to improve the quality and appearance of scars. In particular, pulsed dye lasers, which target the vascular proliferation seen in association with scar formation, have been shown to improve the appearance of both early and hypertrophic surgical scars and to reduce the pruritus associated with scar maturation.[7–11] Mature scars are primarily characterized by dermal fibrosis, which can be targeted by nonablative infrared lasers, resulting in deposition of new collagen.[12] Recent clinical evidence suggests that these lasers can result in improvement in the appearance of chronic acne scarring.[13]

We present a patient with a large, linear, depressed scar resulting from a dog-bite injury to the chin, which was successfully treated with the 1450-nm diode laser. To our knowledge, this is the first reported case of a traumatic depressed scar treated with nonablative laser surgery.

Case Report

A 29-year-old woman presented with a 20-year history of a depressed linear scar on the left chin resulting from a dog bite. The patient had been previously treated with silicone injections with only minimal improvement. The patient was given the options of surgical excision, ablative laser resurfacing, nonablative laser treatment, and soft tissue augmentation to improve the appearance of the scar. The patient elected to have treatment with the nonablative 1450-nm diode laser given the noninvasive nature of the procedure.

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ISSN: 1076-0512/04/$15.00/0 • Dermatol Surg 2004;30:1161–1163

Topical anesthesia was applied under occlusion 1 hr before laser treatment (L.M.X.4 [formerly known as Ela-Max] lidocaine 4% [Ferndale Labs, Inc., Ferndale, MI]). Treatment was performed with the 1450-nm diode laser (Smoothbeam, Candela Corporation, Wayland, MA) at fluences of 10 to 14 J/cm^2 using a 6-mm spot size. The laser employs a dynamic cooling device (DCD) for 40 msec to protect the epidermis. A total of three treatments were performed at 4- to 6-week intervals. This resulted in approximately 50%–75% improvement in the appearance of the scar with clinically marked flattening of the edges and softening of the contours of the depressed scar (Figure 1). The patient was highly satisfied with the treatment results and also reported an approximately 50% subjective improvement in the appearance of the scar. Transient erythema and edema and mild pain at the time of laser treatment were noted. No long-term adverse events were seen after the treatment.

Discussion

Depressed scars typically result from second intention healing of deep wounds. They may develop following inflammatory acne, varicella, traumatic injuries, deep shave biopsies, curettage and electrodesiccation, or surgical wounds complicated by the formation of hematomas or infections.[3,14] Because the abnormal contour of these scars makes them particularly notable, depressed scars are a common reason for patients seeking scar revision.

A number of therapeutic options are available for depressed scars. Most can be treated with punch or fusiform excision with subsequent two-layered closure providing adequate dermal eversion.[3] Ice-pick scars may improve after "subcision," which is accomplished by insertion of a hypodermic needle into the dermis followed by creation of radial subcuticular cuts using the sharp edges of the needle tip.[15] Laser resurfacing using erbium:YAG or carbon dioxide lasers have been reported to be effective for ice-pick acne scarring.[6,16] Soft tissue augmentation employing injectable collagen, autologous fat grafts, or autologous dermal fibroblast cell lines have also been reported to successfully treat these scars.[17–19] These treatments, however, may require frequent reinjection and are costly.

Nonablative laser treatment is a recently developed modality, which uses lasers or light source to heat the upper dermis to induce dermal fibrosis and to alter and improve the clinical appearance.[20] Unlike conventional laser resurfacing or dermabrasion, the epidermis is protected by cooling thus avoiding epidermal damage and the problems that can be associated with open wounds and reepithelialization.[20] These lasers result in dermal fibrosis, increased dermal thickness, and decreased cutaneous anisotropy.[21,22] Despite difficulties in developing a standard to quantify the improvement seen with these lasers,[23,24] nonablative laser treatment has been used successfully for the treatment of acne scarring and facial rhytides.[13,25,26] Although not as effective as surgical and ablative laser techniques, these lasers offer the advantages of minimal postoperative downtime and associated surgical risks.

In our patient, we used the 1450-nm diode laser, which has been shown to specifically target thermal damage to the middermis, with the concurrent use of its cryogen spray device which protects the epidermis from thermal damage.[27] This laser has been shown in previous studies to result in dermal fibrosis and remodeling of dermal collagen.[27,28]

In our patient, nonablative laser treatment using the 1450-nm diode laser was clearly associated with dramatic clinical improvement. The fact that the scar had been present for more than 20 years demonstrates that this laser can be effective for mature atrophic scars. Because this is a single case report, the results obtained may not represent what one would expect from all treated patients and additional studies are needed to further establish the efficacy of this treatment. Although a number of treatment modalities should be considered in any patient seeking scar revision,

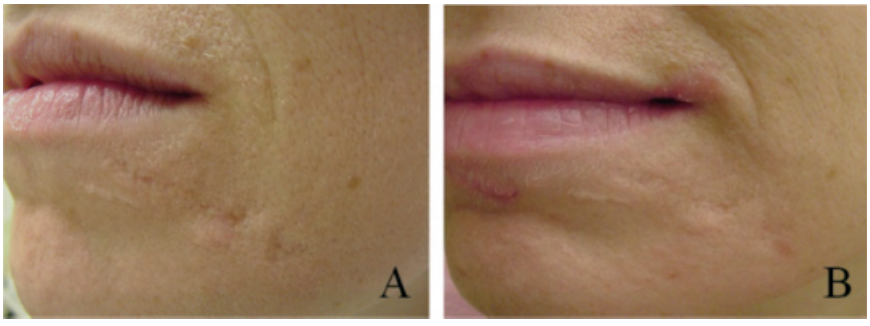

Figure 1. The depressed dog-bite scar (A) demonstrated dramatic improvement in contour and appearance after treatment with the 1450-nm diode laser (B).

nonablative treatment using the 1450-nm diode laser can provide a noninvasive and potentially very safe and effective alternative to the treatment of depressed traumatic scars.

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