

Treatment of hesitation marks on the forearm by the pinhole method

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Abstract Scars from self-inflicted wounds, referred to as “hesitation marks,” are usually linear, flat, poorly oriented, white in color, and often located on the forearm. Many patients do not undergo treatment for these due to limited available modalities. The aim of this study was to evaluate the efficacy and safety of the pinhole method using a 10,600 nm carbon dioxide (CO₂) laser for treating hesitation marks on the forearm. We conducted a retrospective chart review of patients with hesitation marks treated by the pinhole method from March 2010 to April 2014. Eleven patients with hesitation marks (mean age 37.8 years; range, 23–67 years) were treated with the pinhole method over the 4-year study period. Subjects were treated via the pinhole method in one to six treatment sessions at 4- to 8-week intervals. Two blinded observers evaluated photographs taken at baseline and 3 months after the final treatment and assessed improvement using a quartile grading scale. Compared with baseline, there was mild to moderate improvement in all patients (mean score 3.0). The patient satisfaction survey revealed a mean improvement score of 2.82. The pinhole method using a CO₂ laser may be an effective treatment option in patients with hesitation marks on the forearm.

Keywords Hesitation mark · Pinhole method · CO₂ laser

Introduction

Scars from self-inflicted wounds, known as “hesitation marks,” are usually linear, flat, poorly oriented, white in color, and often located on the forearm. These are challenging to treat and may cause various complications including damaging patients’ self-esteem and quality of life. Because of their unique characteristics and location, people easily recognize that these scars are the result of suicide attempts, and they are therefore associated with social stigma [1].

Poorly oriented scars like hesitation marks can be treated with various surgical and non-surgical scar revisions. Scar revision procedures are aimed at optimizing the scar appearance and improving skin texture. The use of laser devices as a non-surgical scar revision method allows many scars to be treated early. We recently reported the efficacy and safety of the pinhole method for burn scars [2]. In this study, we retrospectively reviewed our clinical experience with hesitation marks on the forearms treated by the pinhole method using a CO₂ laser.

Patients and methods

Patients

We conducted a retrospective review of pinhole treatments performed between March 2010 and April 2014 on patients with hesitation marks on their forearms. Informed consent was obtained from all patients, and the study was approved by our hospital’s medical ethics committee. The study protocol conformed to the guidelines of the 1975 Declaration of Helsinki.

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Treatment

A total of 11 patients (24 scars) who were treated with pinhole method in our clinic between March 2010 and April 2014 were included. Patient clinical characteristics are shown in Table 1. All were treated with the pinhole method using a CO₂ laser (Model 40C, 40WA, Sharplan Lasers Inc., Tel Aviv, Israel) in superpulse mode, 2.0 W. The pinhole method was repeated for one to six sessions at 4- to 8-week intervals. Topical application of EMLA cream (AstraZeneca AB, Södertälje, Sweden) was used for local anesthesia 1 h prior to the procedure. Then, multiple holes were made at intervals of 1–3 mm with the CO₂ laser on the scar.

Evaluation

A clinical photograph of the self-inflicted scar was taken using the same camera at every visit. The responses to laser treatment were objectively assessed by two independent dermatologists using side-by-side comparisons of clinical photographs taken before the first laser treatment and 3 months after the last treatment for all patients. Patients as well as dermatologists used a quartile grading scale (grade 1, <25 % improvement; grade 2, 25–50 % improvement; grade 3, 51–75 % improvement; and grade 4, >75 % improvement).

Results

All 11 patients in this study were Korean, five were male and six were female. The age at presentation ranged from 23 to

67 years (mean age, 37.8 years). The lesions were on the hands, wrists, and forearms. The two independent dermatologists' comparisons of the baseline and post-treatment photographs showed that there was a mild to moderate improvement for all patients (grades 1–4; mean score 3.0). Three patients (27 %) showed a grade 4 improvement; six (55 %) a grade 3; one (9 %) a grade 2 improvement; and one (9 %) a grade 1 improvement. The patient satisfaction survey at the end of treatment revealed a mean improvement score of 2.82. Four patients reported a satisfaction rating of grade 4, three a grade 3, two a grade 2 improvement, and two a grade 1 (Table 1).

All patients tolerated the laser treatment well, and in some patients, excellent improvement of the appearance of hesitation marks was achieved. In other patients, although some visible irregularities remained, the improvement was consistently so great that there was no longer any indication for scar reconstruction. No complications such as ulceration or infection were observed during the clinical course. But we could observe some post-inflammatory hyperpigmentation after procedure (Fig. 1).

Representative cases

Case 1

A 39-year-old woman presented with a profound, irregular, hypochromic scar on her wrist that developed after a self-inflicted wound 5 years prior (Fig. 2). She underwent one pinhole treatment. After 3 months, her scar was subtle and inconspicuous.

Table 1 Patients analysis and response of treatment

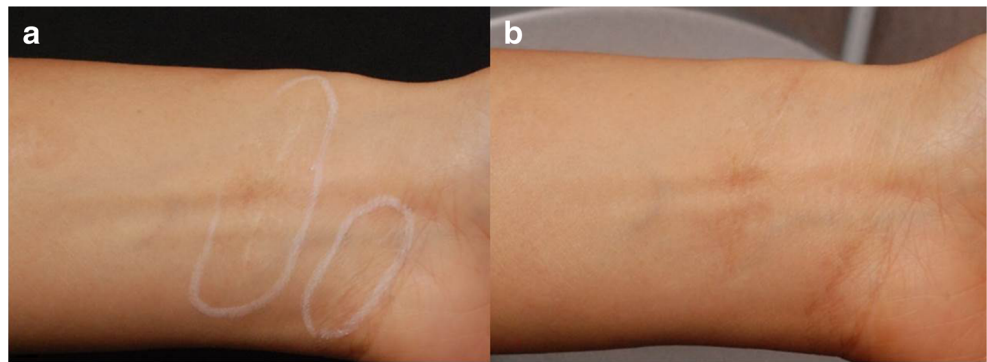
Patients	Sex/age	Location	Number of treatments	Improvement ^a	Patient satisfaction ^b	Adverse events
1	M/32	Wrist	2	3	4	N
2	F/46	Wrist	2	4	4	N
3	F/34	Wrist	6	3	2	PIH
4	M/31	Wrist, hand, finger	1	3	3	N
5	F/23	Forearm	2	1	1	N
6	F/39	Wrist	1	3	3	N
7	M/43	Forearm	3	2	1	PIH
8	M/67	Forearm	1	3	2	N
9	F/33	Forearm	3	4	4	N
10	M/36	Wrist	2	4	4	N
11	F/32	Wrist, forearm	1	3	3	N

N none, PIH post-inflammatory hyperpigmentation

^a Improvement was evaluated using a quartile grading scale; grade 1, less than 25 % = minimal to no improvement; grade 2, 26 to 50 % = moderate improvement; grade 3, 51 to 75 % = marked improvement; and grade 4, more than 75 % = near total improvement

^b Patients were surveyed 3 months after treatment about their overall level of satisfaction as follows: 4-very satisfied, 3-satisfied, 2-slightly satisfied, and 1-unsatisfied

Fig. 1 Photographs of patient 3 **a** before and **b** 6 months after six pinhole treatment session on wrist



Case 2

A 32-year-old woman was first seen 4 years after a self-inflicted injury that resulted in irregular linear scars on her forearm and wrist (Fig. 3). She underwent a surgical scar revision, but it had little effect on the scar appearance. She received one pinhole treatment. The hypochromic scars resolved, resulting in regular re-pigmented scars.

Discussion

Self-inflicted scars often consist of multiple, poorly oriented white lines on the forearms. Such scars induce feelings of shame in the person who inflicted the wounds from both within and due to the reactions of others who see the physical scars that remain. Although various treatment options are available for self-inflicted scars, such as elliptical excision of the lesion in a single session, dermabrasion, tattooing over the scarred area, and various types of lasers including pulsed dye laser (PDL) and the non-ablative fractional laser, these conventional scar correction techniques and treatment modalities may not effectively change the unique scar pattern [3].

The pinhole method is a CO₂ laser treatment technique that has proved effective in various dermatologic diseases such as sebaceous hyperplasia, anetoderma, and elastosis perforans serpiginosa [4–6]. The pinhole method could be an option to treat linear scars, and we previously reported mild to moderate improvement of scar appearance with the pinhole method [7].

The pinhole method involves making multiple small holes that penetrate from the epidermis to the deeper dermis using a CO₂ laser [8]. Because the pinhole method can induce regeneration and realignment of collagen bundles, improvement of dermal thickness and scar texture is an additional benefit that is normally observed. The therapeutic mechanism of the pinhole method is similar to that of the fractional laser. However, compared with the CO₂ fractional laser, the pinhole method has advantages with respect to convenience since penetration depth and intervals could be altered by the practitioner according to the characteristics of each scar. In contrast to the pinhole method, CO₂ fractional laser devices produce fine microscopic treatment zones that have equivalent depth, and its beam sizes are restricted [2]. These advantages of the pinhole method are useful in the treatment of disoriented scars such as hesitation marks in this study. In addition, CO₂ lasers are usually available in most dermatology clinics.

When trying to treat linear scars that are a result of suicide attempts, surgical options have the potential to cause aesthetic results worse than the initial situation and require skillful techniques. Z-plasty helps to realign scars in more favorable directions within relaxed skin tension lines [9]. However, shortening a scar in one direction will result in lengthening in the perpendicular direction. Therefore, dividing a linear scar into parts and inducing skin resurfacing by puncturing with a CO₂ laser may yield cosmetically preferable results.

There are potential sources of error in this retrospective study spread over several years due to the limited number of patients with hesitation marks. However, in this study, we

Fig. 2 Photographs of patient 6 **a** before and **b** 3 months after one pinhole treatment session on wrist

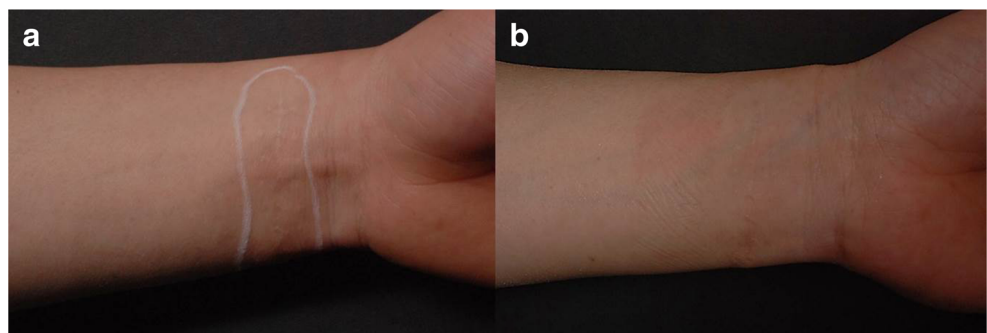
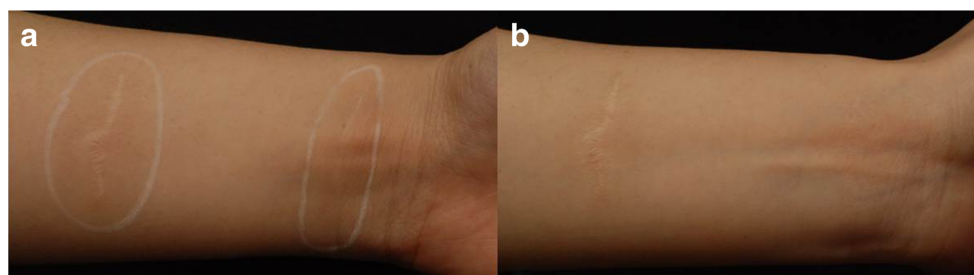


Fig. 3 Photographs of patient 11 **a** before and **b** 3 months after one pinhole treatment session on wrist and forearm



found mild to moderate improvement in the appearance of hesitation marks after treatment with the pinhole method without severe complications. These results are concordant with other studies that used CO₂ laser to treat various scars. We suggest that the pinhole method could be a convenient and safe option for the treatment of hesitation marks.

Compliance with ethical standards Informed consent was obtained from all patients, and the study was approved by our hospital's medical ethics committee. The study protocol conformed to the guidelines of the 1975 Declaration of Helsinki.

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