

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article. No outside funding was required.

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A Prospective Controlled Assessment of Microneedling with the Dermaroller Device

Sir:

Eleven patients with posttraumatic or acne scars were treated by microneedling therapy with the Dermaroller device (Horst Liebl, Co., France). This device is available with different needle lengths. The model used was MF8. The device has a 12-cm handle that holds a drum-shaped cylinder at the end—similar to a small paint roller—2 cm in diameter and 2 cm in width. The surface of the cylinder holds 192 stainless steel needles in eight rows. Each needle has a diameter of 0.25 mm and is 1.5 mm long. They have a radial arrangement of 15 degrees in relation to the roller center. The needles of the Dermaroller create minuscule holes. These microchannels are closed within minutes after the treatment without any visible traces in the epidermis or stratum corneum. Eleven patients were selected with scars that normally would be treated by dermabrasion or laser resurfacing.

Five male and six female Caucasian patients aged 22 to 51 years participated in this study. The areas treated were mostly in the face (four patients), lower extremity (three patients), trunk area (three patients), and on the upper leg in a patient with stretch marks (striae distensae). One patient failed to come for the second punch biopsy. Altogether, 10 subjects completed the entire study protocol. Before treatment, a punch biopsy (3 mm) on one side of the area to be treated was performed. The microneedling was performed under local anesthesia in a cross manner until an even pattern of punctures and microbleeding could be observed under the spectacle loupe (Fig. 1). All patients were treated by one and the same operator. No other internal or external medications or dressings were used.

Six to 8 weeks later, another punch biopsy specimen was taken just 2 cm from the first biopsy site in

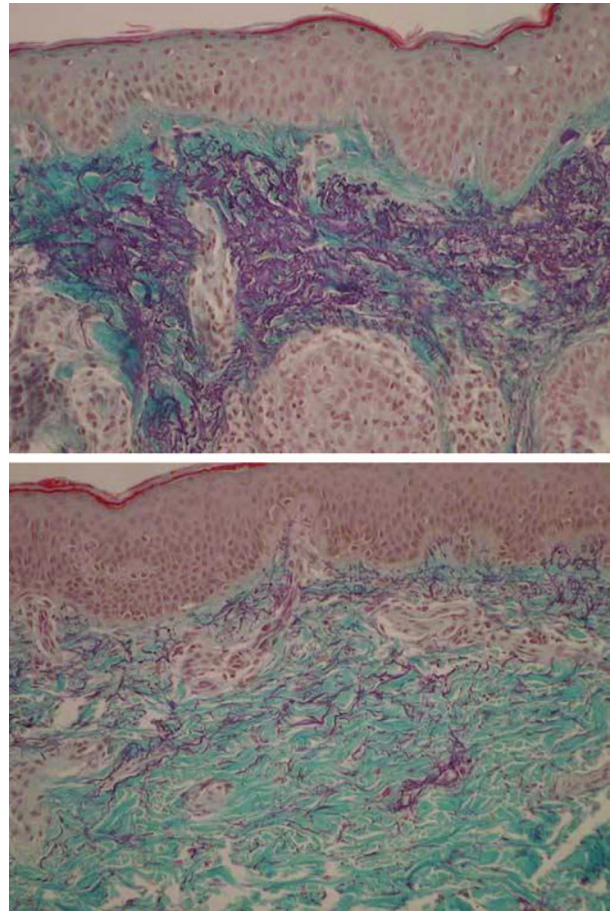


Fig. 1. A patient with acne scarring in the forehead before (above) and 6 weeks after (below) microneedling.

the treated area. Skin samples were fixed in formaldehyde and embedded in paraffin. The biopsy specimens were dyed by elastic-van Gieson and hematoxylin stain. All samples were numerated by random and, at the end of the study, were evaluated for histologic characteristics by an independent dermatologist and pathologist in a blinded study. Slides were analyzed for epidermal thickness, total collagen staining area, and gross organization (Fig. 2). The slides were analyzed by color measurement, and the relative amount of black pixels corresponding to the stained elastic fibers was calculated in a 2560 1920-pixel picture (24 bits per pixel at 20 magnification). The epidermal thickness was also measured.

Ten patients underwent the two punch biopsies and completed the protocol. All subjects were pleased with the results and acknowledged that they would undergo another Dermaroller treatment (Fig. 1). The procedure was very well tolerated. No side effects were reported. None had to interrupt his or her daily routine or leave work. The needled areas showed small bruising and mild redness for 1 or 2 days; occasionally, a slight hematoma was seen on



Fig. 2. Histologic sample before (*above*) and 6 weeks after (*below*) microneedling.

bony areas such as the dorsum of the nose or the malar eminences. All areas healed primarily. Histologic examination of these specimens showed a noticeable increase in elastic fibers in the treated biopsy specimens. Seven of the patients had their elastic fibers increased to a noticeable amount. The increase in elastin formation was between 1.1-fold and 2-fold (Table 1), although three patients showed no effect or a slight decrease in the amount of elastin. The reason for this is not clear, although correspondence to the clinical outcome was good.

One patient had a 10-fold increase in elastin and responded especially well to the treatment. Measuring the epidermal thickness showed no change that was statistically relevant.

Very astonishing was the effect that the most newly built elastin fibers could be noted just subepidermally at a depth of 0.6 mm. There were no changes to be seen deeper than 0.6 mm or in the epidermis itself. The needle would be penetrating approximately 1 mm in depth, so its effect is well correlated to that.

Several methods have been introduced into plastic surgery to enhance collagen formation and scar im-

Table 1. Relative Number of Black Pixels at 20 Magnification

Location	Before	After	Relative Response
Forehead	0.18	0.2	1.11
Forehead	0.02	0.18	10
Breast	0.12	0.07	0.58
Cheek	0.16	0.35	2.19
Striae, upper leg	0.08	0.13	1.63
Buttock	0.12	0.13	1.08
Lip	0.06	0.04	0.67
Buttock	0.1	0.14	1.4
Upper leg	0.14	0.16	1.14
Lower leg	0.18	0.14	0.78

provement. Histologic changes after dermabrasion are well known, and the effect of carbon dioxide laser has also been investigated.⁹

Our clinical data indicate that microneedling can increase dermal thickness and collagen formation. All treated subjects reported an improvement in hyperchromia and other skin characteristics such as smoothness and texture. It was evident that the amount of newly built elastin fiber was in one depth of the skin, depending on the thickness of the epidermis itself. This suggests that the tip of the needle or the depth of penetration is an important point and may vary the results.^{10,11}

The technique is operator-dependent and therefore depth of penetration is different. Theoretically, round arranged needles at an angle of 15 degrees and 1.5 mm in length penetrate the skin with 1.2 mm. Effective treatment requires examination of these variables. A good clinical judgment is the microbleeding visible under a spectacle-loupe with 2.3 magnification. No high pressure needs to be applied on the Dermaroller device. The needles are extremely sharp and penetrate the skin easily. The surface of the roller head determines the depth of penetration, regardless of the pressure. Especially when the Dermaroller is rolled over the forehead, nose, and cheeks, pressure must be adjusted to prevent the needles from touching the bones underneath. Also, around the orbital area, pressure should be minimized to avoid severe hematoma. In my experience, it is not the pressure but the number of needles on the roller head and the number of roller movements over the same skin area that are the decisive factors for a good result. Theoretically, 15 Dermaroller movements create 250 pricks per square centimeter. The force applied to the device is not very high, theoretically 3 N for the MF8 device and even less for the MF4.

A very new indication is the treatment of stretch marks by microneedling. Clinically, the results were encouraging and, by theory, the newly built elastin fibers can minimize the gap in the singular stretch mark. At the moment, this is the goal of another running study.

This controlled trauma to the dermis causes an optimal natural collagen production and deposition of collagen on the epidermal/dermal junction. Combination with topical agents that enhance collagen production may boost this effect. The external substance applied must be considered for this biocompatibility, as the effect of enhancing penetration through the epidermis is already proven.

DOI: 10.1097/PRS.0b013e3182131e0f

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The authors have no financial interest to declare in relation to the content of this article.

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Staged Nipple Reconstruction with Vascularized SurgiMend Acellular Dermal Matrix

Sir:

Nipple reconstruction is often the final stage of breast reconstruction for postmastectomy patients. However, the local flaps most commonly used have a loss of projection of up to 70 percent. Consequently, flattening is the central point of dissatisfaction among these women. This is particularly true when reconstruction is undertaken in the thinned dermis seen after tissue expansion.

Several authors have described the use of acellular dermal matrix to augment nipple projection.^{1,2} The matrix has been placed at the time of nipple reconstruction or as a filler for the deficient nipple. We have developed a technique to be used where we know that the dermis will be thin in the region of nipple reconstruction. This staged technique is designed to allow the matrix to become vascularized, increasing the safety of nipple creation without adding additional steps.

In a patient requiring bilateral breast reconstruction after full expansion at the time of expander exchange, a 5-cm circular space was undermined deep to the dermis but superficial to the capsule after implant placement. This was at the site of future nipple reconstruction. Into this pocket was placed a 5-cm disk of SurgiMend (TEI Biosciences, Boston, Mass.) bovine collagen, 2 mm thick. No sutures were required for fixation. When the patient returned for nipple reconstruction 4 months later, a skate flap was designed on each breast, at the site where the SurgiMend had been placed. The flap was performed with the elevated nipple volume including the SurgiMend in addition to the dermis and subcutaneous tissue. The SurgiMend was noted to be well vascularized, bleeding from the cut

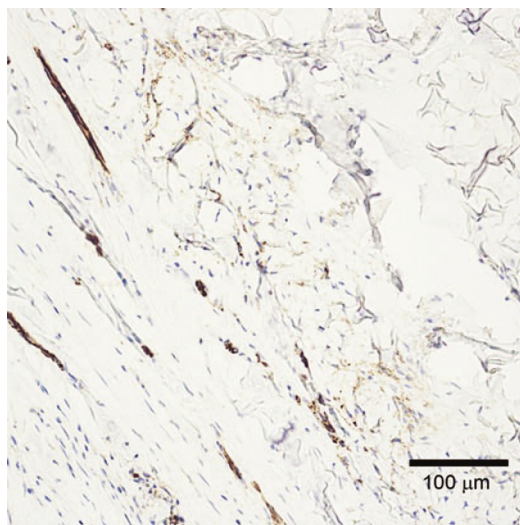


Fig. 1. Histologic evaluation at the time of nipple creation reveals positive immunohistochemical staining for CD31, a commonly used endothelial cell marker, demonstrating avascular supply in the SurgiMend sample approximately 4 months after initial implantation.