

# Treatment of Striae Distensae Using Needling Therapy: A Pilot Study

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**BACKGROUND** Striae distensae are dermal scars characterized by flattening and atrophy of the epidermis. Although many treatment modalities have been attempted with variable results, there is no criterion standard treatment modality for striae distensae.

**OBJECTIVES** To evaluate the effectiveness and safety of a disk microneedle therapy system (DTS) in the treatment of striae distensae.

**MATERIALS AND METHODS** Sixteen Korean volunteers with striae distensae alba or rubra were enrolled. Patients received three treatments using a DTS at 4-week intervals. Clinical response to treatment was assessed by comparing pre- and post-treatment clinical photographs, skin biopsies, and patient satisfaction scores. Clinical improvement was assessed using the quartile grading scale.

**RESULTS** Marked to excellent improvement was noted in seven (43.8%) patients, with minimal to moderate improvement in the remaining nine. Patient satisfaction scores showed that six (37.5%) patients were highly satisfied, eight (50.0%) were somewhat satisfied, and two (12.5%) were unsatisfied. There were no significant side effects except mild pain, erythema, and spotty bleeding.

**CONCLUSION** Disk microneedle therapy system (DTS) can be effectively and safely used in the treatment of striae distensae.

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Striae distensae are dermal atrophic scars with overlying epidermal flattening and atrophy.<sup>1</sup> Although striae distensae are common, satisfactory therapeutic interventions have been disappointing. Skin needling is an effective way to treat scars and wrinkles.<sup>2</sup> Although the needling technique was developed for transdermal drug delivery,<sup>3,4</sup> skin needling also improves scar condition.<sup>5</sup> Treatment with skin needling might be able to promote the removal of old damaged collagen and induce more collagen growth beneath the epidermis. Puncturing the skin multiple times in acne scars increases the amount of collagen and elastin deposition.<sup>6,7</sup> Thus, we hypothesized that skin needling would also be useful in striae distensae because these seem to be

dermal scars with epidermal atrophy. We assessed the effectiveness and safety of a disk microneedle therapy system (DTS) in the treatment of striae distensae.

## Materials and Methods

Sixteen Korean subjects (14 female, 2 male) aged 19 to 44 (mean age of 31.7) with skin types III and IV with striae distensae (5 striae rubra, 11 striae alba) were enrolled. The baseline characteristics of the subjects are presented in Table 1.

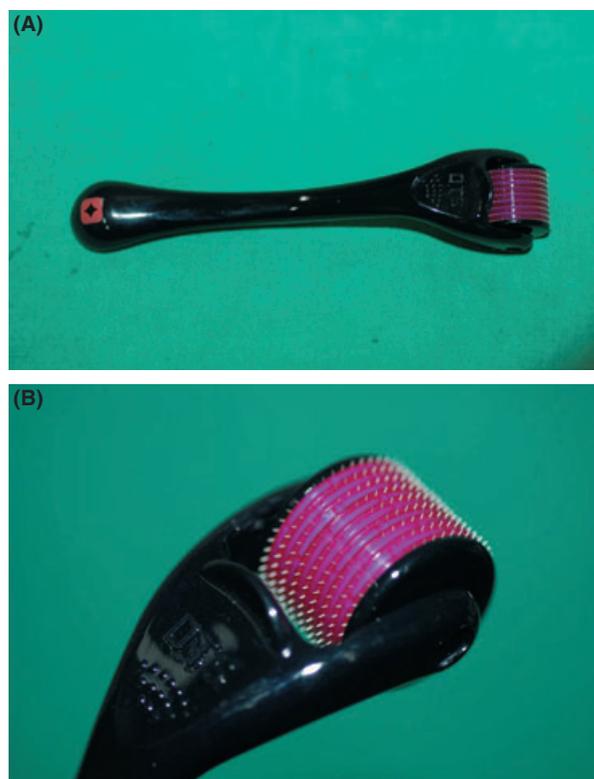
The Institutional Review Board of Chung-Ang University Hospital approved this clinical study. All

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**TABLE 1. Summary of Demographic and Baseline Characteristics**

Case	Sex	Age	Fitzpatrick Skin Type	Type of Striae Distensae	Site	Duration of Disease, Years
1	Female	19	III	Striae rubra	Thighs, both	5
2	Female	44	III	Striae alba	Thighs, both	12
3	Female	35	III	Striae rubra	Abdomen	6
4	Female	27	IV	Striae alba	Buttocks, both	10
5	Male	23	III	Striae rubra	Buttocks, both	5
6	Female	31	IV	Striae alba	Buttocks, both	15
7	Female	33	III	Striae rubra	Thighs, both	12
8	Female	38	IV	Striae alba	Abdomen	20
9	Female	41	IV	Striae alba	Abdomen	17
10	Female	29	III	Striae alba	Abdomen	10
11	Female	25	IV	Striae alba	Abdomen	4
12	Female	35	III	Striae alba	Buttocks, both	8
13	Female	26	III	Striae alba	Thighs, both	10
14	Female	31	IV	Striae rubra	Buttocks, both	15
15	Female	41	III	Striae alba	Abdomen	13
16	Male	29	IV	Striae alba	Buttocks, both	11

subjects were informed of the purpose and possible risks and expectations of the study, and written consent was obtained from each subject. Exclusion criteria included a history of keloids, any skin infections, history of malignant diseases, any other systemic medication, any known systemic diseases, and pregnancy. Patients were instructed to avoid the use of any therapeutic agents during the course of treatment. Patients received three treatments using a DTS at 4-week intervals. The abdomen (6 subjects), buttocks (6 subjects), and thighs (4 subjects) were treated. Topical anesthetic cream (eutectic mixture of local anesthetics, AstraZeneca, Wilmington, DE) was applied to the treatment area under occlusion for 1 hour and then completely removed using water-soaked gauze before treatment. DTS Lab, Inc. supplied the microneedle rollers used in this study (DTS roller; DTS-MG, Inc., Seoul, Korea). The device consists of a plastic body and head part. The head is a sterile plastic cylinder with 540 needles protruding 1.5 mm from the surface (Figure 1). The treatment was performed by rolling the needling tool over the areas of striae distensae four times in four directions: horizontally, vertically, and diagonally right and left, ensuring an even density of approximately 600 to 750 dots/cm<sup>2</sup>. Patients were instructed to use a moisturizer



**Figure 1.** The disk needle therapy system (A) and close view of the head part (B).

(Cicaplast, La Roche-Posay, Paris, France) three times daily for 2 weeks after treatment to promote wound healing and prevent dryness.

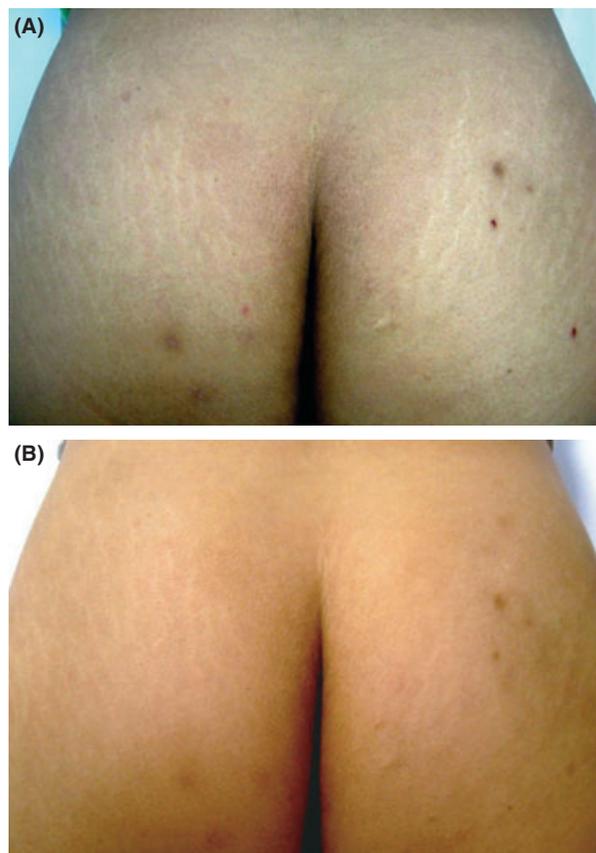
Photographs using identical camera settings, lighting, and positioning were taken before and after each visit and 3 months after the last treatment. Two independent dermatologists evaluated and compared the photographs using a quartile grading system (0 = no change [0%], 1 = minimal improvement [ $<25\%$ ], 2 = moderate improvement [26–50%], 3 = marked improvement [51–75%], 4 = excellent improvement [76–100%]). Patients rated their satisfaction after treatment completion (A = unsatisfied, B = somewhat satisfied, C = highly satisfied). To evaluate the histologic effects of DTS treatment, 3-mm punch biopsies were taken from the same lesional sites before treatment and 3 months after the last treatment in five patients. Any instances of adverse effects throughout the study period were recorded.

## Results

All 16 patients completed the study. Three months after the last treatment, improved skin texture, tightness, and color were observed in all patients. Marked to excellent improvement was noted in seven (43.8%) patients (Figures 2 and 3) and minimal to moderate improvement in the remaining nine (Figure 4). None of the patients reported a lack of change in or worsening of their striae distensae. The mean improvement score was 2.4 (Figure 5). Patient satisfaction scores revealed that six (37.5%) patients were highly satisfied, eight (50.0%) were somewhat satisfied, and two (12.5%) were unsatisfied (Figure 6). The general histopathologic features of the lesional specimens collected before treatment showed epidermal thinning with fine dermal collagen bundles arranged in straight lines. After treatment, the epidermis was thickened, and the amounts of dermal collagen and elastic fibers were increased (Figures 7–9). The treatments were well tolerated, with only minor side effects during and after the treatments, including pain, erythema, spotty bleeding, and pruritus. These resolved within several days without any treatment.

## Discussion

Striae distensae, also known as stretch marks, are a common skin problem. Striae distensae are dermal



**Figure 2.** Photographs of a representative patient's buttocks with striae alba (A) before treatment and (B) 3 months after the final treatment with the microneedle therapy system. Improvement was graded as 4; the patient was highly satisfied (Patient 4).

scars with epidermal atrophy. Histologic findings show thinner thickness and fewer collagen components in the upper dermis. The collagen bundles are thinned and lie parallel to the epidermis, and dermal elastin can be fragmented and markedly decreased.

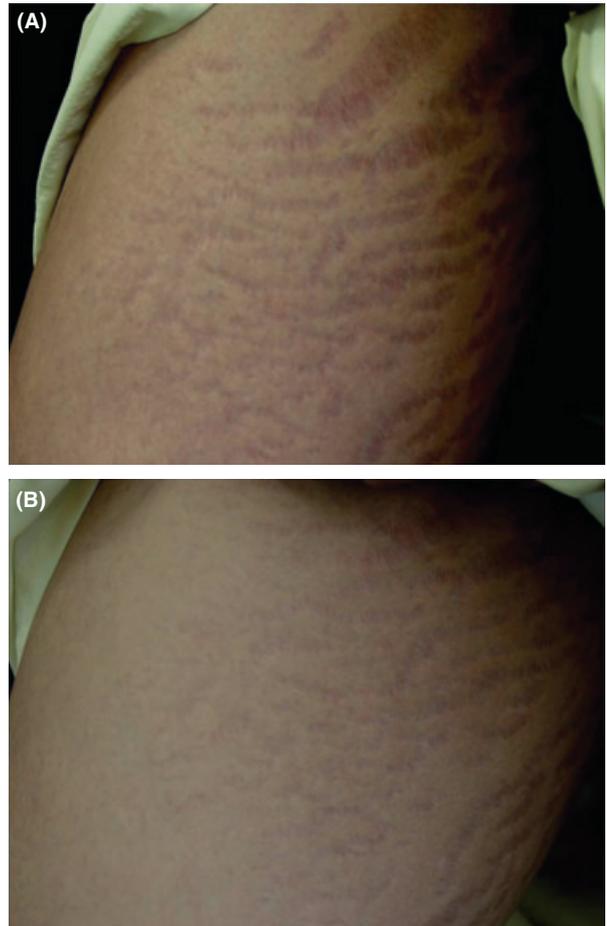
Striae distensae have no medical consequences, but they are frequently distressing to those affected. A variety of treatment modalities have been used for the treatment of striae distensae, but there is no simple and definitive treatment. Topical treatments such as tretinoin cream,<sup>8</sup> a combination of tretinoin and glycolic acid or ascorbic acid and glycolic acid<sup>9</sup> have some effect in the early stages. Recently, several light and laser modalities such as intense pulsed light,<sup>10</sup> pulsed dye laser,<sup>11</sup> copper bromide laser,<sup>12</sup>



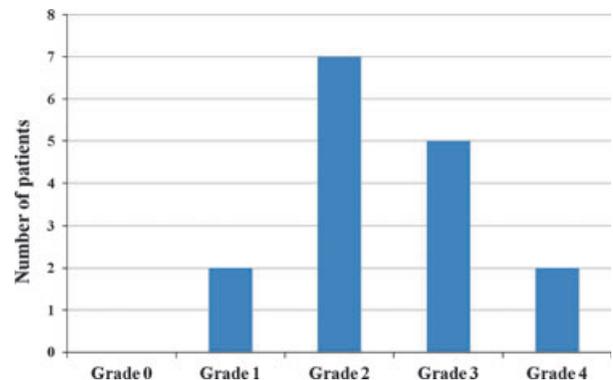
**Figure 3.** Photographs of a representative patient's abdomen with striae alba (A) before treatment and (B) 3 months after the final treatment with the microneedle therapy system. Improvement was graded as 3; the patient was highly satisfied (Patient 11).

fractional laser,<sup>13</sup> radiofrequency device,<sup>11</sup> and excimer laser<sup>14</sup> have been demonstrated to achieve some effect in treating striae distensae.

Needling therapy uses microneedles that penetrate to a maximum of 1.5 mm, and it causes virtually no bruising and minimal swelling. It produces hundreds of tiny dermal injuries that produce dermal collagen and elastin. A needle therapy system has been introduced to treat wrinkles and depressed scars.<sup>7,15</sup> When a needle penetrates the skin, the injury causes localized damage and minor bleeding by rupturing fine blood vessels. A day after needling therapy, keratinocytes begin to proliferate and release growth factors to promote collagen deposition by the

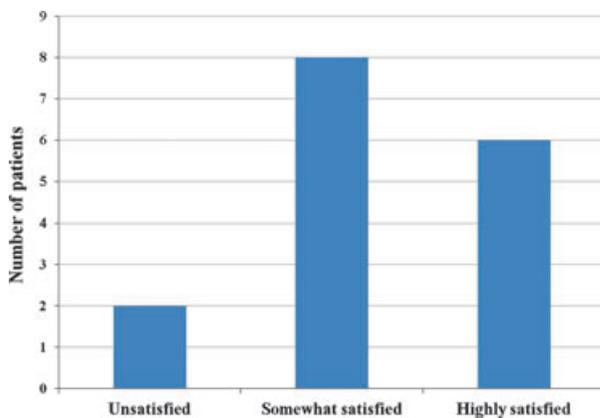


**Figure 4.** Photographs of representative patient's thigh with striae rubra (A) before treatment and (B) 3 months after the final treatment with the microneedle therapy system. Improvement was graded as 2; the patient was somewhat satisfied (Patient 7).



**Figure 5.** Quartile grading scale used by two independent dermatologists after treatment.

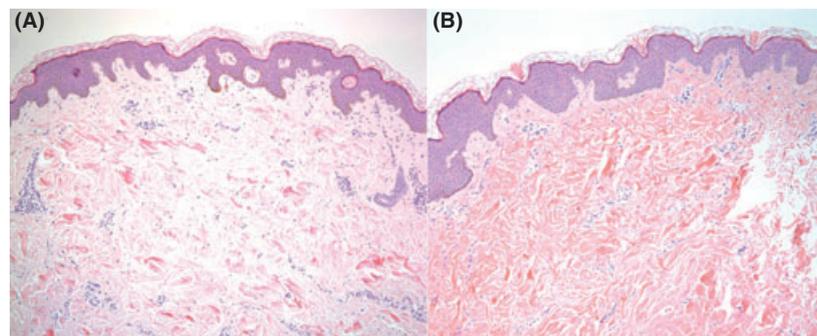
fibroblasts. Needling therapy modulates the expression of several genes in the skin (vascular endothelial growth factor, fibroblast growth factor, epidermal growth factor, collagen type I and III) that promote extracellular matrix remodeling.<sup>6,16,17</sup> Needling therapy can be safely performed on all skin colors and types without the risk of dyspigmentation,



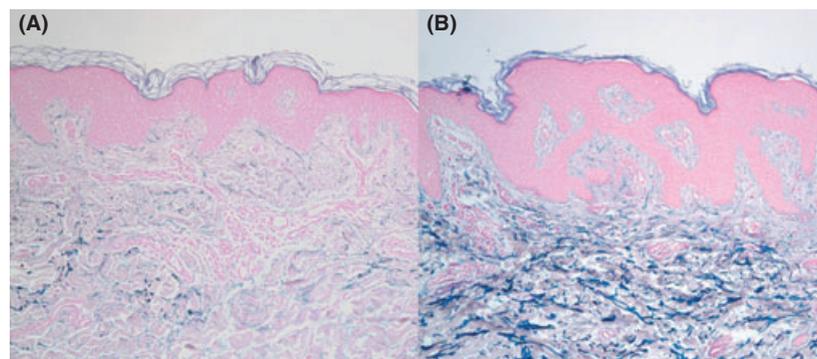
**Figure 6.** Patient satisfaction score.

which is the major safety feature distinguishing it from other invasive procedures used to treat wrinkles and depressed scars, such as laser resurfacing, deep chemical peels, and dermabrasion.<sup>7,18</sup> A recent study found a marked increase in collagen and elastin deposition 6 months after needling therapy, and 40% thickening of the stratum spinosum and normal rete ridges was noted 1 year after treatment.<sup>7</sup> Another study showed that a microneedle therapy system induced larger increases in collagen deposition than intense pulsed light, although both treatments were effective.<sup>19</sup>

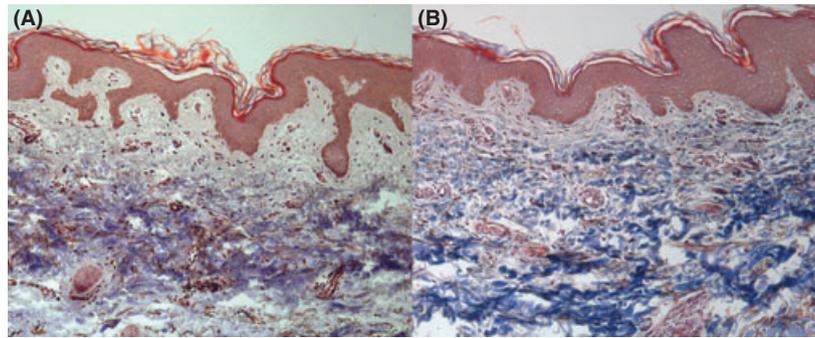
We treated 16 patients aged 19 to 44 with DTS. All patients were treated three times. The duration of the procedure was approximately 20 minutes. Assessment of the results revealed better skin texture, tightness, and color. The treatment was well tolerated, and no serious side effects were observed. Needling therapies are easily accessible to patients



**Figure 7.** Skin biopsies of (A) untreated striae distensae on the buttocks and (B) the same site 3 months after last treatment. Note the increased collagen in dermis (hematoxylin and eosin,  $\times 100$ ).



**Figure 8.** (A) Elastic stain of pretreatment skin biopsy and (B) in the same patient 3 months after last treatment. Note the diminished and fragmented dermal elastic fibers changed to normalized pattern (Verhoeff-van Gieson,  $\times 200$ ).



**Figure 9.** Skin biopsies of (A) untreated striae distensae and (B) the same striae 3 months after last treatment. Note slightly increased collagen in dermis (Masson trichrome,  $\times 200$ ).

because of their simplicity, low cost, and ease of use. No single optimal treatment has been indicated for striae distensae, so needling therapy may be considered a reasonable therapeutic option for the treatment of striae lesions. Further randomized controlled trials comparing DTS with existing treatments are needed.

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