Role of microneedling in treatment of patients with striae distensae

Magda M. Hagag[a], Rehab M. Samaka[b], Hanan A.E. Mahmoud[a]

Departments of [a]Dermatology, Andrology and STDs, [b]Pathology, Faculty of Medicine, Menoufia University, Shebeen El-Kom, Egypt

Correspondence to Hanan A.E. Mahmoud, MBBCh, Department of Dermatology, Andrology and STDs, Faculty of Medicine, Menoufia University, Shebeen El-Kom, Egypt, Tel: +20 100 711 8512; Fax no: 0482326810 Postal code: 32511 e-mail: dr.hanankader87@gmail.com

Received 16 January 2018
Accepted 24 April 2018

Menoufia Medical Journal 2019, 32:756–762

Objective
The aim of this work was to elucidate the efficacy and safety of microneedling in the treatment of striae distensae (SD).

Background
SD is a common form of dermal scarring that appears on the skin as violaceous, erythematous, or hypopigmented linear striations. Microneedling therapy or collagen induction therapy is a minimally invasive, nonsurgical, and nonablative procedure that involves the use of a microneedling device to create controlled skin injury.

Data sources
Medline databases such as PubMed, Medscape, Science Direct, and EMF-Portal and all materials available on the Internet from 2010 to 2017 were searched.

Study selection
The initial search presented seven articles that have studied the role of microneedling in the treatment of SD.

Data extraction
If the studies did not fulfill the inclusion criteria, they were excluded. Study quality assessment included whether ethical approval was gained, eligibility criteria specified, appropriate controls mentioned, adequate information provided, and assessment measures defined.

Data synthesis
Comparisons were made by structured review with the results tabulated.

Findings
The use of skin microneedling is found to be effective in the treatment of SD.

Conclusion
This study concluded that the use of skin microneedling is effective as a new modality for the treatment of SD.

Keywords:
microneedling, striae alba, striae distensae, striae rubra, therapy

Menoufia Med J 32:756–762

1110-2098

Introduction

Striae distensae (SD), also known as stretch marks, represent a cosmetically undesirable and a very common problem present in most healthy women. These dermal scars are usually located on the thighs, buttocks, breasts, and lower back [1]. Striae initially appear erythematous with red to pink color and are named striae rubra; over time, the lesions become atrophic and hypopigmented and receive the name striae alba [2]. Although the precise etiology of SD is not still understood, cellular and extracellular matrix alterations are present. Damages to collagen bundles and elastic fibers are some of the various alterations present in all stages of SD [3]. The treatment of SD has included many therapeutic modalities. A variety of treatment modalities have been used for the treatment of SD, but there is not a simple and definitive treatment. Topical treatments such as tretinoin cream and a combination of tretinoin and glycolic acid or ascorbic acid and glycolic acid have some effects in the early stages [4]. Recently, several lights and laser modalities such as intense pulsed light, which stimulates the growth of new collagen and elastin fibers in the skin [5]; pulsed dye laser; copper bromide laser; fractional laser; radiofrequency device; and excimer laser have been demonstrated to achieve some effects in treating SD [6]. 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 [7]. Thus, they hypothesized that skin needling would also be useful in SD treatment because they seemed to be dermal scars with epidermal atrophy [8]. The aim of this work was to elucidate the efficacy and safety of microneedling in the treatment of SD.

Materials and methods

The guideline for conducting this review was according to guidance developed by the center for review and dissemination. It was used to assess the methodology and outcome of the studies.

Search strategy

Papers on the role of microneedling were reviewed in the treatment of SD from Medline databases such as PubMed, Medscape, and Science Direct and also some available materials on the Internet. We used SD and microneedling as searching terms. In addition, we examined references from the specialist databases EMF-Portal (*http://www.emf-portal.de*) and reference lists in relevant publications; the search was performed in the electronic databases from 2010 to 2017.

Study selection

All the studies were independently assessed for inclusion. They were included if they fulfilled the following criteria:

Inclusion criteria

The following were the inclusion criteria of the published studies:

Published in English language.

Published in peer-reviewed journals.

Focused on the role of microneedling in the treatment of SD.

Data extraction

Data from each eligible study was independently abstracted in duplicated using a data collection form to capture information on study characteristics, interventions, and quantitative results reported for each outcome of interest. Conclusion and comments on each study were made.

There was heterogeneity in the collected data. It was not possible to perform meta-analysis. Significant data were collected. Thus, a structured review was performed with the result tabulated.

The analyzed publications were evaluated according to evidence-based medicine (EBM) criteria using the classification of the US Preventive Services Task Force and UK National Health Service protocol for EBM in addition to the Evidence Pyramid.

US preventive services task force

The US preventive services task force classification is as follows:

Level I: evidence obtained from at least one properly designed randomized controlled trial.

Level II-1: evidence obtained from well-designed controlled trials without randomization.

Level II-2: evidence obtained from well-designed cohort or case–control analytic studies, preferably from more than one center or research group.

Level II-3: evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled trials might also be regarded as this type of evidence.

Level III: opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Quality assessment

The quality of all the studies was assessed. Important factors such as study design, attainment of ethical approval, evidence of a power calculation, specified eligibility criteria, appropriate controls, adequate information, and specified assessment measures were included. It was expected that confounding factors would be reported and controlled for, appropriate data analysis made, in addition to an explanation of missing data.

Data synthesis

A structured systematic review was performed, with the results tabulated.

Results

Study selection and characteristics

Of the 156 potentially relevant publications that were identified concerning the role of microneedling in the skin, 149 articles were excluded as they did not focus on the role of microneedling in the treatment of SD.

All of the remaining seven studies were included in the review as they were deemed eligible by fulfilling the inclusion criteria. All these studies were human, case–control studies and examined the effect of microneedling on SD. These studies were analyzed with respect to the study design using the classification of the US Preventive Services Task

Force and UK National Health Service protocol for EBM.

All of the included studies showed clinical improvement of patients with SD after microneedling therapy (Table 1).

Park *et al.* [9] conducted a study on 16 patients with SD using a disk microneedle therapy system. 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. Patients received three treatments using a disk microneedle therapy system at 4-week intervals. Three months after the last treatment, improved skin texture, tightness, and color were observed in all patients. It was marked that excellent improvement was noted in seven patients and minimal to moderate improvement in the remaining nine (43.8%). None of the patients reported a lack of change in or worsening of their SD. The mean improvement score was 2.4 (Table 2).

Additionally, Khater *et al.* [11] conducted a study on 20 patients with SD, and 10 of them were treated with microneedling using a microneedle dermaroller (disk needle therapy). 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. The other 10 patients were treated with carbon dioxide (CO_2) fractional laser. Of all the patients who were assessed, nine (90%) patients in the microneedle-treated group demonstrated overall clinical improvement, which was greater than the five (50%) patients in the (CO_2) fractional laser-treated group. The difference between the two modalities was statistically significant ($P < 0.001$).

Nassar *et al.* [10] conducted a study on 40 female patients with SD, and 20 of them were treated with microneedling using a microneedle dermaroller (disk needle therapy). 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. Considering all the patients who were assessed, 18 (90%) patients in the microneedle-treated group demonstrated overall clinical improvement, which was greater than the 10 (50%) patients in the microdermabrasion with sonophoresis-treated group. The difference between the two modalities was statistically significant ($P < 0.001$).

Ali *et al.* [12] conducted a study on 15 patients who were treated with microneedling as group I. The microneedle used had a width of 2 cm, and was studded with a fine needle of medical-grade stainless steel. The needle length was 1.5 mm. According to the pressure applied, the needle penetrated the skin from 0.1 to 1.3 mm. Group II included 15 patients who were treated with microdermabrasion. In terms of the degree of improvement of SD, in group I, three (20%) patients showed minimal improvement, two (13.3%) patients showed moderate improvement, four (26.7%) patients showed marked improvement, and six (40%) patients showed excellent improvement. In group II, two (13.3%) patients showed no improvement, six (40%) patients showed minimal improvement, four (26.7%) patients showed moderate improvement, and three (20%) patients showed marked improvement. There was a statistically significant clinical improvement in microneedling than microdermabrasion ($P = 0.005$).

The clinical trial by Sanad *et al.* [13] included 30 female patients with abdominal striae rubra treated with microneedling alone on the left side of the abdomen (group I) and with microneedling +15–30% tricholoroacetic acid on the right side of the abdomen (group II). The dermaroller used possesses 24 circular arrays of eight needles each (total 192 needles of 2 mm length) in a cylindrical assembly. Patients were treated for six sessions at 3-week intervals. A comparison between group I and group II at the follow-up session revealed statistically significant differences in length ($P = 0.002$), width ($P < 0.001$), color, and texture ($P = 0.049$ and 0.041, respectively). More improvements in the striae were noted in group II, as 19 (63.3%) patients showed a good to an excellent improvement compared with 10 (33.3%) patients in group of microneedling alone (group I).

Agamia *et al.* [14] conducted a study done on 20 patients with SD who underwent four sessions with a 2-week interval by microneedling alone on the right side of the body and by microneedling with platelet-rich plasma on the left side. The roller needles measured 3 mm in length and were 300 in number.

The results of microneedling alone were as follows: 20% showed marked improvement, 40% showed moderate improvement, and 40% showed minimal improvement with significant increase in collagen in microneedling with platelet-rich plasma groups.

Aust *et al.* [15] conducted a clinical trial on 22 patients with SD by microneedling alone in one session, and the results revealed improvement in skin texture, tightening, and dermal neovascularization.

Table 1 Summary of percutaneous collagen induction therapy in treatment of striae distensae

References	Intervention	Dosage regimen	Striae type	Sample size	Outcome measures	Results	Adverse effects	Type of study	Level of evidence
Park *et al*. [9]	PCT	Three sessions with 4-week intervals	SR and SA	16	Clinical improvement No change (0%) Minimal (25%) Moderate (26-50%) Marked (51-75%) Patient satisfaction: unsatisfied, somewhat satisfied, and highly satisfied	No change in pigmentation Increased collagen I and elastin No change in collagen III. Marked to excellent Improvement in 43.8% with minimal to moderate in the remaining patients 37.5% were highly satisfied, 50% somewhat satisfied, and 12.5% unsatisfied Increased dermal elastin and collagen	Pain Erythema Spotty bleeding	A case series cross-sectional study	4
Nassar *et al*. [10]	PCT vs. microdermabrasion 1 sonophoresis	PCT: three sessions with 4-week intervals Microdermabrasion: 10 sessions over 5 months	SR and SA	40 (20 PCT and 20 microdermabrasion)	Clinical improvement: no improvement Mild (25%) Moderate (26-50%) Good (51-75%) Excellent (76%) Patient satisfaction: not satisfied, slightly satisfied, satisfied, very satisfied, and extremely satisfied. Histologic analysis	Clinical improvements in 90% of PCT-treated group vs. 50% in microdermabrasion 1 sonophoresis-treated group. Significantly higher satisfaction scores with PCT Epidermal thickness, number of fibroblasts, and collagen levels were increased in 90 and 50% of the PCT and microdermabrasion one sonophoresis-treated groups, respectively	Erythema, PIH (more common in microdermabrasion one sonophoresis-treated group)	Nonrandomized, controlled trial. Prospective, comparative cohort trial	2
Khater *et al*. [11]	PCT vs. fractional ablative CO2	PCT: three sessions with 4-week intervals Laser: 10 600 nm at 100 W; three sessions with 4-week intervals	SR and SA	20 (10 PCT and 10 laser)	Clinical improvement None, mild (25%) Moderate (26-50%) Good (51-75%) Excellent (76%) Patient satisfaction: not satisfied, slightly satisfied, satisfied, very satisfied, and extremely satisfied	Clinical improvements: 90% of PCT-treated group vs. 50% in laser- treated group Significantly higher satisfaction scores with PCT	Erythema, PIH (postinflammatory hyperpigmentation) (more common in laser-treated group)	Nonrandomized, controlled trial. Prospective, comparative cohort trial	2
Ali *et al*. [12]	PCT vs. microdermabrasion	Six sessions with a 2-week interval. Follow-up was for 3 months in both groups	SR and SA	30 (15 PCT and 15 microdermabrasion)	Clinical improvement Excellent (75-100%) Marked (50-75%) Minimal or none (<25%) Patient satisfaction: not satisfied, somewhat satisfied, or highly satisfied	In group I: 40% excellent improvement 26.7% marked improvement 13.3% moderate improvement 20% minimal improvement. In group II: 20% marked improvement	Pain Erythema Pruritus	Nonrandomized, controlled trial Prospective, comparative cohort trial	2

Contd...

Table 1 Contd...

References	Intervention	Dosage regimen	Striae type	Sample size	Outcome measures	Results	Adverse effects	Type of study	Level of evidence
						26.7% moderate improvement 40% minimal improvement Statistically significant improvement in group I than group II			
Sand *et al*. [13]	PCT vs. PCT with TCA	Six sessions at 3-week interval	SR	30 (15 PCT, 15 PCT with TCA)	Clinical improvement Mild (25%) Moderate (25-50%) Good (50-75%) Excellent (75%) Patient satisfaction: highly satisfied, somewhat satisfied, or unsatisfied Clinical feature (length, width, color, and texture)	Greater improvement was noted in PCT with TCA as 19 (63.3%) showed good to excellent improvement vs. 10 (33.3%) in PCT only	Pain Erythema PIH	Nonrandomized, controlled trial. Prospective, comparative cohort trial	2
Agamia *et al*. [14]	PCT vs. PCT 1 PRP	Four sessions with 2-week intervals PCT alone on right side of the body, with left side receiving PCT+PRP	Not stated	20	Clinical improvement: None, minimal, moderate, and marked	PCT alone: 20% showed marked improvement, 40% showed moderate, improvement, 40% showed minimal Improvement. PCT+PRP: 50% marked improvement, 35% moderate improvement, and 15% minimal improvement Significant increase in collagen in PCT + PRP group	None stated	Nonrandomized controlled trial. Prospective, comparative cohort trial	2
Aust *et al*. [15]	PCT	One session	Not stated	22	Skin texture, tightness, and pigmentation	Improved skin texture, tightening, and dermal neovascularization	None stated	Case series cross-sectional study	4

PCT, percutaneous collagen induction therapy; PIH, postinflammatory hyperpigmentation; PRP, platelet-rich plasma; SA, striae alba; SR, striae rubra; TCA, tricholoroacetic acid.

Table 2 Quality rating scheme modified from the Oxford Centre for Evidence-Based Medicine for ratings of individual studies

Level of evidence	Study design
1	Randomized, controlled trial systematic review with meta-analysis
2	Nonrandomized, controlled trial prospective, comparative cohort trial
3	Case-control study retrospective cohort study
4	Case series cross-sectional study
5	Expert opinion case reports

Discussion

Needling therapy can be safely performed on striae of all skin colors and types without the risk of depigmentation that makes it a promising treatment of SD [16].

SD (stretch marks) are a common skin problem. SD has no medical consequences, but they are frequently distressing to those affected.

A variety of treatment modalities have been used for striae, but there is no definitive treatment [4,17]. Needling therapy uses microneedles that penetrate a maximum of 2 mm and causes localized damage and minor bleeding by rupturing fine blood vessels [18]. A day after needling therapy, keratinocytes begin to proliferate and release growth factors to promote collagen deposition by the fibroblasts and elastin deposition [19].

A study was done by Park *et al.* [9] on patients with SD treated with a microneedling, and assessment of the results revealed better skin texture, tightness, and color. The treatment was well tolerated, and no serious adverse effects were observed. This is in agreement with the study conducted by Sanad *et al.* [13], where in group I, which was treated with microneedling alone, there were statistically significant differences between the first and follow-up sessions with respect to length, width, color, and texture of the striae in all patients. Another study done by Ali *et al.* [12] showed a statistically significant clinical improvement of microneedling than microdermabrasion in the treatment of SD. Moreover, there was a statistically significant increase in clinical efficacy and improvement in striae rubrae than striae alba, which disagreed with the study by Park *et al.* [9].

Kim *et al.* [20] showed that a microneedle therapy system induced larger increases in collagen deposition than intense pulsed light. Ryu *et al.* [21] found that treatment of SD with a combination of microneedle and fractional CO2 laser was well tolerated. It has been postulated that needles have their own electrical potential that triggers the proliferation of fibroblasts [22].

Conclusion

The study concluded that skin microneedling appears to be a promising, safe, and effective treatment for SD.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Nigam PK. Striae cutis distensae. Int J Dermatol 1989; **28**:426–428.

2 Hermmans JF, Pierard GE. High-resolution: epiluminescence colorimetry of striae distensae. J Eur Acad Dermatol Venereol 2006; **20**:282–287.

3 Stamatas GN, Lopes-DaCunha A, Nkengne A, Bertin C. Biophysical properties of striae distensae evaluated *in vivo* using non-invasive assays. Skin Res Technol 2015; **21**:254–258.

4 Rangel O, Arias I, García E, Lopez-Padilla S. Topical tretinoin 0.1% for pregnancy-related abdominal striae: an open-label, multicenter, prospective study. Adv Ther 2001; **18**:181–186.

5 Hamam MA, Tabana ES. The role of laser and intense pulsed light in the treatment of hyperpigmentation disorders. Med Men J 2016; 29:17–21.

6 Suh DH, Chang KY, Son HC, Ryu JH, Lee SJ, Song KY. Radiofrequency and 585-nm pulsed dye laser treatment of striae distensae: a report of 37 Asian patients. Dermatol Surg 2007; **33**:29–34.

7 Fabbrocini G, Fardella N, Monfrecola A, Proietti I, Innocenzi D. Acne scarring treatment using skin needling. Clin Exp Dermatol 2009; **34**:874–879.

8 Aust MC, Fernandes D, Kolokythas P, Kaplan HM, Vogt PM. Percutaneous collagen induction therapy: an alternative treatment for scars, wrinkles, and skin laxity. Plast Reconstr Surg 2008; **121**:1421–1429.

9 Park KY, Kim HK, Kim SE, Kim BJ, Kim MN. Treatment of striae distensae using needling therapy: a pilot study. Dermatol Surg 2012; **38**:1823–1828.

10 Nassar A, Ghomey S, El Gohary Y, El-Desoky F. Treatment of striae distensae with needling therapy versus microdermabrasion with sonophoresis. J Cosmet Laser Ther 2016; **18**:330–334.

11 Khater MH, Khattab FM, Abdelhaleem MR. Treatment of striae distensae with needling therapy versus CO_2 fractional laser. J Cosmet Laser Ther 2016; **18**:75–79.

12 Ali BMM, El-Tatawy RA, Elfar NN, Ali DAM. A comparative clinical and histopathological study of micro needling versus microdermabrasion (aluminum oxide crystals) in the treatment of striae distensae. J Egypt Women Dermatol Soc 2017; **14**:92–99.

13 Sanad EM, Aginaa HA, Sorour NE. Micro needling system alone versus microneedling system with trichloroacetic acid in the management of abdominal striae rubra: a clinical and histopathological study. J Egypt Women Dermatol Soc 2015; **12**:96–101.

14 Agamia NF, Embaby MH, El-Sheikh DS. Comparative study between micro needling alone and microneedling combined with platelet-rich plasma in the treatment of striae distensae using clinical and histopathological assessment. J Egypt Women Dermatol Soc 2016; **13**:187–193.

15 Aust MC, Knobloch K, Vogt PM. Percutaneous collagen induction therapy as a novel therapeutic option for striae distensae. Plast Reconstr Surg 2010; **126**:219e–220e.

16 Hackam DJ, Ford HR. Cellular, biochemical, and clinical aspects of wound healing. Surg Infect (Larchmt) 2002; **3**:S23–S35.

17 Ash K, Lord J, Zukowski M, McDaniel DH. Comparison of topical therapy for striae alba (20% glycolic acid/0.05% tretinoin versus 20% glycolic acid/10% L-ascorbic acid). Dermatol Surg 1998; **24**:849–856.

18 Fernandes D, Signorini M. Combating photoaging with percutaneous collagen induction. Clin Dermatol 2008; **26**:192–199.

19 Aust MC, Reimers K, Kaplan HM, Stahl F, Repenning C, Scheper T *et al.* Percutaneous collagen induction-regeneration in place of cicatrisation? J Plast Reconstr Aesthet Surg 2011; **64**:97–107.

20 Kim SE, Lee JH, Kwon HB, Ahn BJ, Lee AY. Greater collagen deposition with the microneedle therapy system than with intense pulsed light. Dermatol Surg 2011; **37**:336–341.

21 Ryu HW, Kim HK, Jung HR, Ryoo YW, Lee KS, Cho JW. Clinical improvement of striae distensae in Korean patients using a combination of fractionated microneedle radiofrequency and fractional carbon dioxide laser. Dermatol Surg 2013; **39**:1452–1458.

22 Kim ST, Lee KH, Sim HJ, Suh KS, Jang MS. Treatment of acne vulgaris with fractional radiofrequency microneedling. J Dermatol 2014; **41**:586–591.