

Rejuvenation of severe acne scars by microneedling

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Abstract

Objectives: To find the effect of microneedling dermapen© on dark skin individuals and severe form of atrophic acne scar.

Patients and methods: The study was conducted as open clinical trial in dermatology clinic at Ibn-Sina Teaching Hospital in Mosul, Iraq. Twenty-five patients were included in the study. The severity of acne scars was determined by using Goodman and Baron global quantitative acne scar grading system (GBGQASGS). Patients with grade 3 and 4 were eligible for the study. All patients underwent 4sessions of dermapen microneedling treatment at six-week intervals.

Results: The studied individuals consisted of 15 (60%) patients with Grade 3, and 10 (40%) patients with Grade 4 acne scars. The results revealed that 12% of the patients had minimal improvement, 48% had a moderate improvement, 40% had good improvement and no patients showed excellent improvement according to GBGQASGS. The mean \pm SD of GBGQASGS was reduced from 16.39 ± 3.43 to 7.78 ± 2.79 at the end of sessions (p -value < 0.0001). The results showed an inverse relationship between the baseline severity score and the degree of improvement of acne scars. The effect of dermapen© on acne scars showed the largest effect on the depth of scar (Cohen $d = 1.53$), then on number of scar (Cohen $d = 1.37$), and lastly on size of the scar (Cohen $d = 1.26$). No serious post treatment complications were reported.

Conclusion: Dermapen© microneedling therapy can be used for the treatment of atrophic acne scars, but it is not the treatment of choice in severe form of acne scars.

Introduction

Acne is a common skin disorder seen in about 80 percent of young people (1). In some patients unfortunately has severe form of acne with severe inflammatory changes in the superficial and deep dermis, leading to post-acne scars (2). Many patients with acne scar develop psychological upset and they suffer from low self-esteem and many other mental health disorders because of this condition (3).

There are many types of acne scars, and can be classified into icepick, boxcar, rolling scars, hypertrophic and keloidal form (2). More than one type might be seen on the same patient (2).

There are several methods of treatment developed to reduce the severity and intensity of post acne scar including topical treatment (4), dermabrasion (5), chemical peeling (6), ablative and non-ablative lasers (7), microneedling (8,9) and several other modality of treatment (10). Many methods have been proposed and practiced to induce minute injuries at the site of acne

scar (11). Unfortunately they produced uncontrolled micro-injuries with variable elastin and collagen synthesis (11).

Recently, the principal of microneedling as a method for remodeling acne scar was improved by the introduction of automated electrical device dermapen© (12). The device induced fast, adjustable microneedling and hence controlled elastin and collagen synthesis.

Different guidelines of treatment of acne scar were used, resulted in different success rate. Two studies of micro-needling technique aided in standardizing the dermapen© micro-needling therapy. First, a serial histopathological study which determined the best frequency and depth of applying needling to induce proper amount of elastin and collagen (11). Second, the introduction of reliable objective Goodman and Baron method to assess and grade acne scar and its response to treatment (13).

Most workers on microneedling studied treatment of mild and moderate form of acne scars with variable scoring system (8,9,10,14). Most of those workers used derma rollers microneedling that had limited control in the depth of the needle insertions in the skin and has limited movement in narrow anatomical areas in the face (8,9).

The objective of this study is to find the effect of microneedling dermapen© on remodeling acne scars of dark skin individuals and severe form of atrophic acne scar.

Patients and methods

Twenty five patients suffering from different kinds of acne scars (box scar, ice pick scar, atrophic and rolling atrophic scar) were asked voluntarily to participate in the current study. Their skin colors were Fitzpatrick skin type III and IV. The patient's age ranged from 18 to 45 years (mean \pm SD: 29 ± 8.04 years). The study was conducted as open trial in dermatology clinic at Ibn Sina Teaching Hospital in Mosul, Iraq from 1st of April, 2019 to end of March, 2020.

The severity of acne scars was determined by using Goodman and Baron global quantitative acne scar grading system (GBGQASGS) (13). Patients with grade 3 and 4 (GBGQASGS) were eligible for the study. Those with bleeding tendencies, pregnant, autoimmune diseases, abnormal wound healing and history of using topical or systemic retinoid therapy in past 3 months were excluded from the study.

All patients underwent 4 sessions of Dermapen© microneedling treatment at six weeks interval. Each session started by anesthetizing the sites using thick layer topical application of eutectic cream (a mixture of prilocaine and lidocaine) about one hour prior to the procedure and sterilizing it using povidone iodine. The session of microneedling was performed using Dermapen© microneedling with disposable 36 needle tips. The depth of dermapen© microneedling tips was adjusted to 0.5-1.5 mm on forehead and temple areas. Patients with predominantly ice pick scars and boxcar scarring were given a needle depth of 3.5 mm on the cheek areas. The treated area was soothed by topical anti-biotic cream at the end of the procedure. The patients used broad spectrum sun blockers before they left the clinic.

The baseline and follow up assessment was performed using Goodman and Baron global quantitative acne scar grading system (GBGQASGS). The improvement in acne scar was graded as mild (<5 degree reduction in GBGQASGS), moderate (5-10 degree reduction in GBGQASGS), good (11-15 degree reduction in GBGQASGS) and very good (>15 degree reduction in GBGGS). A standardized photograph of the lesions was taken at beginning and the end of the study.

Friedman test was used to determine the serial differences in GBGQASGS scores across multiple treatment sessions. Paired t-test was used to study the significance of reduction in

number, size, and depth of scars at the end of the study compared with baseline scores. The effect size of treatment was further assessed using Cohen *d* effect size (difference between two means divided by pooled standard deviation) and classified as small ($d = 0.2$), medium ($d = 0.5$), large ($d = 0.8$) and very large ($d = 1.2$). *p* value < 0.5 was considered statistically significant. The data was processed using statistical package SPSS version 23.

Results

The baseline assessment of the studied individuals revealed that they were consisted of 15 (60%) patients with Grade 3, and 10 (40%) patients with Grade 4 acne scars. Their mean number of lesions was 22.71 ± 8.59 scar lesions. The average size of the scars was 3.64 ± 1.54 mm, and the depth of the lesions was on average 2.21 ± 1.18 mm. Their pretreatment global GBGQASGS scores ranged from 10-24 points with mean \pm SD: 16.39 ± 3.43 . Table 1 shows the change in GBGQASGS after each session which was significantly reduced each time. The mean \pm SD of GBGQASGS score was reduced to 12.95 ± 3.67 after the first session. The score was further reduced to 10.04 ± 3.43 after the second session. The score reach its lowest level at the end of the study with a mean \pm SD: 7.78 ± 2.79 . A serial comparison of score at each treatment revealed a significant lower level in compared with the score of the preceding session (*p*-value < 0.0001). Table 1 depicted a marked reduction in GBGQASGS scores in the first two sessions then slow down after that.

Table 1. Comparison of differences in scores of Goodman and Baron global quantitative acne scar grading system (GBGQASGS) after each session of dermapen© microneedling

Session	GBGQASGS score of acne scar			P-value
	Min-Max	Mean \pm SD	95% CI of mean	
Baseline score	10-24	16.39 ± 3.43	15.19-18.00	-
1st session score	8-20	12.95 ± 3.67	11.64-14.67	<0.0001
2nd session score	4-16	10.04 ± 3.43	8.80-11.59	<0.0001
Last session score	3-11	7.78 ± 2.79	6.57-8.99	<0.0001

Based on grading system of GBGQASGS, the results revealed that 12% of the patients had minimal improvement (<5 reduction in GBGQASGS score), 48% had a moderate improvement (5-10 reduction in GBGQASGS score), and 40% had good improvement (11-15 reduction in GBGQASGS score). No patients showed very good improvement. (Figure 1 and 2) The results show an inverse relationship between the baseline severity score and the degree of improvement of acne scars. Furthermore, rolling and box scars had a better response compared to ice-pick scars.

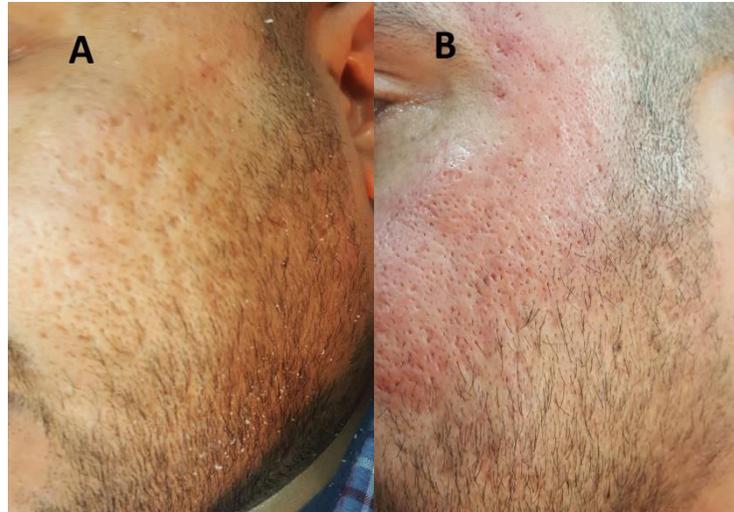


Figure 1. (A) Grade 3 according to GBGQASGS before treatment. (B) Reduction in acne scar after treatment.

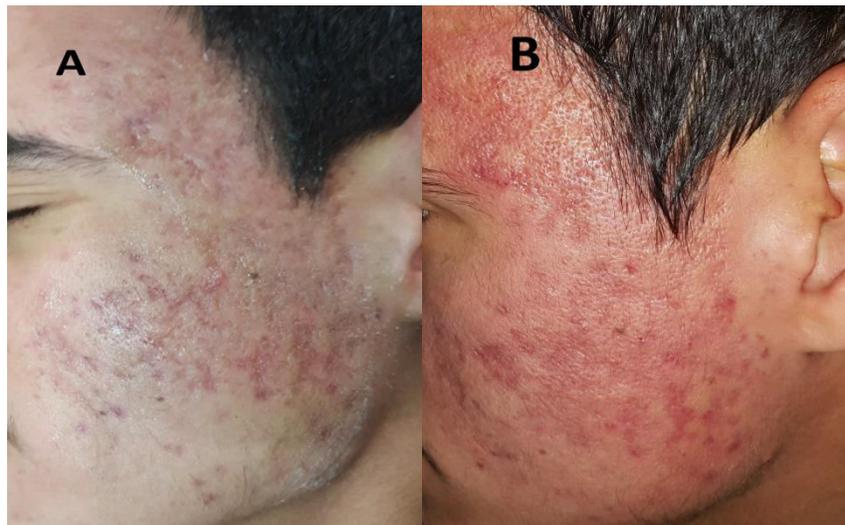


Figure 2. (A) Grade 4 according to GBGQASGS before treatment. (B) Reduction in acne scar after treatment

The detailed assessment of scars and their responses to dermapen© micro-needling is shown in Table 2. The result revealed the number of the acne scars was reduced significantly at the end of the study ($p < 0.0001$). The size of the lesions was minimized ($p < 0.0001$). In addition, the depth of the lesions was declined significantly ($p < 0.0001$). Table 2 also shows the effect of dermapen© micro-needling on acne scars was classified as large effect size (Cohen $d < 1.2$). The largest effect was noted on the depth of scar (Cohen $d = 1.53$), then on number of scar (Cohen $d = 1.37$), and lastly on size of the scar (Cohen $d = 1.26$).

Table 2. Changes in number, size, and depth of acne scar after 4 sessions of dermapen© microneedling

Acne scar	Pre-treatment Mean± SD	Post-treatment Mean± SD	Difference Mean± SD	Effect size (cohen d)	P-value
Number	22.71±8.59	9.92±5.32	12.78±5.57	1.37	<0.0001
Size	3.64±1.54	1.73±0.86	1.90±0.98	1.26	<0.0001
Depth	2.21±1.18	1.17±0.74	1.03±0.60	1.53	<0.0001

The treatment was generally well tolerated, with topical anesthesia. The patients suffered from tolerable pain. All patients reported mild erythema and edema for three days and ecchymosis was noted in 3 patients especially in the forehead which last for two weeks. Social activity could commence as early as one day after treatment. (Figure 3)

**Figure 3.** (A) Before sitting. (B) Mild erythema and edema after treatment. (C) Bruises on the forehead after sitting.

Discussion

Dermapen© microneedling became very popular device in the treatment of acne scars and rejuvenation of the skin in the last years; it is cost effective, minimum complication and short healing time. Dermapen© induced collagen and elastic tissue synthesis with minimum epidermal

injuries which in turn enhance acne scar remodeling (11). Many studies were conducted to evaluate the effectiveness of dermapen© microneedling treatment (8-11), but fewer of them spot the light on the effectiveness of dermapen© in sever form of atrophic acne scar and dark skin individuals.

In the current study, the sessions were done every six weeks, since maximum synthesis of collagen type I, III, VII, and other collagen occurred within six weeks after the sitting (11,12). However, total elastin was remarkably decreased during this period (11).

The improvement of acne scars, in this study, did not show very good response to dermapen© microneedling. These results are consistent with other workers (9), since about two third of the patients had good response and twenty percent had poor response although they used a different scoring system (VAS score). However, about half of the patients showed excellent response (8). This may be due to different scoring system (Goodman and Baron scaring grading system (13), and Lipper and Perez score) (15), with less severe form of atrophic acne scars and more number of sessions.

In this study, dermapen© microneedling treatment revealed marked reduction in the number, size and depth of the scar which is not assessed as far as we know in previous studies. However, majority of the patients had moderate to good improvement after sessions according to Goodman and Baron scaring grading system and none of them showed excellent response, due to the severity of patient`s acne scars and limitation of dermapen© microneedling device to produce more collagen and elastic fibers to rejuvenate the skin.

The studied dermapen© microneedling technique had satisfactory results in atrophic acne scars. Similar results for the microneedling technique were obtained by other associates (8,9,16). Other methods of treatments were used for acne scars such as fractional carbon dioxide (CO₂) laser resurfacing unites (17), and radiofrequency microneedling (10). Ochi et al. (7) treated 107, about two third of the patients with fractional carbon dioxide (CO₂) laser treatment reported poor improvement, about one third of the patients had moderate improvement, four percent had good improvement, and less than one percent had very good improvement. Recently, Elawar et al. (10) treated nineteen patients by using non insulated radiofrequencies microneedling (10). About half of the patients had moderate improvement in their acne scars and one third of the patients had good improvement.

Most of the present patients suffered from erythema and edema which subsided after 3 days from the sitting, ecchymosis was noted in 3 patients especially in the forehead which last for two weeks. Dogra et al. (9) found one patient suffered from tram trek scaring using derma roller, such complication was not appeared in our study. Post inflammatory hyperpigmentation and infection were not a side effect in this research; this may be due insufficient inflammation and damage induced by dermapen© microneedling to the epidermis that stimulate melanocyte to synthesis melanin, and the emphasis on the protective measure used by the patients of sun blocker and topical antibiotics .

In conclusion, dermapen© microneedling therapy had a moderate to good response in sever form of acne scars, but not excellent results which needs further studies.

Limitation of this study

This study lacked histological assessment before and after the end of sittings, limited number of sessions for each patient and relative small sample of patients with severe acne scars.

Future studies

We suggest further studies which includes detailed histological assessment, adjuvant topical treatment during sessions and combination of other modalities of treatment to enhance the effectiveness of Dermapen© in treatment of severe acne scars.

Ethical Issues

The present study was approved by Medical Research Ethics Committee, College of Medicine, University of Mosul (Ethical approval code: UOM.COM.MEREC. 20-21(7)). Additionally, written informed consent was obtained from all patients before treatment.

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References

1. Lynn DD, Umari T, Dunnick CA, Dellavalle RP. The epidemiology of acne vulgaris in late adolescence. *Adolesc Health Med Ther.* 2016;7:13-25. Published 2016 Jan 19. doi:10.2147/AHMT.S55832
2. Fabbrocini G, Annunziata MC, D'Arco V, et al. Acne scars: pathogenesis, classification and treatment. *Dermatol Res Pract.* 2010;2010:893080. doi:10.1155/2010/893080
3. Coşkun Öztekin, Aynure Öztekin. The association of depression, loneliness and internet addiction levels in patients with acne vulgaris. *Biopsychosoc Med.* 2020; 14: 17. Published online 2020 Aug 5. doi: 10.1186/s13030-020-00190-y
4. Levy LL, Zeichner JA. Management of acne scarring, part II: a comparative review of non-laser-based, minimally invasive approaches. *Am J Clin Dermatol.* 2012;13(5):331-340. doi:10.2165/11631410-000000000-00000
5. Kravvas G, Al-Niimi F. A systematic review of treatments for acne scarring. Part 1: Non-energy-based techniques. *Scars Burn Heal.* 2017;3:2059513117695312. Published 2017 Mar 30. doi:10.1177/2059513117695312
6. Basta-Juzbašić A. Current therapeutic approach to acne scars. *Acta Dermatovenerol Croat.* 2010;18(3):171-175.
7. Ochi H, Tan L, Tan WP, Goh CL. Treatment of Facial Acne Scarring With Fractional Carbon Dioxide Laser in Asians, a Retrospective Analysis of Efficacy and Complications. *Dermatologic Surgery : Official Publication for American Society for Dermatologic Surgery [et al.].* 2017 Sep;43(9):1137-1143. DOI: 10.1097/dss.0000000000001219.
8. Minh PPT, Bich DD, Hai VNT, et al. Microneedling Therapy for Atrophic Acne Scar: Effectiveness and Safety in Vietnamese Patients. *Open Access Maced J Med Sci.* 2019;7(2):293-297. Published 2019 Jan 29. doi:10.3889/oamjms.2019.098
9. Dogra S, Yadav S, Sarangal R. Microneedling for acne scars in Asian skin type: an effective low cost treatment modality. *J Cosmet Dermatol.* 2014;13(3):180–187
10. Elawar A, Dahan S. Non-insulated Fractional Microneedle Radiofrequency Treatment with Smooth Motor Insertion for Reduction of Depressed Acne Scars, Pore Size, and Skin Texture Improvement: A Preliminary Study. *J Clin Aesthet Dermatol.* 2018;11(8):41-44

11. El-Domyati M, Barakat M, Awad S, Medhat W, El-Fakahany H, Farag H. Microneedling Therapy for Atrophic Acne Scars: An Objective Evaluation. *J Clin Aesthet Dermatol.* 2015;8(7):36-42
12. Arora, S. & Gupta, P.. (2012). Automated microneedling device - A new tool in dermatologist's kit - A review. *Journal of Pakistan Association of Dermatologists.* 22. 354-357
13. Goodman GJ, Baron JA. Postacne scarring: a qualitative global scarring grading system. *Dermatologic Surgery.* 2006;32(12):1458–1466.
14. Majid I. Microneedling therapy in atrophic facial scars: an objective assessment. *J Cutan Aesthet Surg.* 2009;2(1):26-30. doi:10.4103/0974-2077.53096
15. Lipper GM, Perez M. Nonablative acne scar reduction after a series of treatments with a short-pulsed 1,064-nm neodymium:YAG laser. *Dermatologic surgery.* 2006;32(8):998–1006. PMID:16918561
16. Fabbrocini G, Fardella N, Monfrecola A, Proietti I, Innocenzi D. Acne scarring treatment using skin needling. *Clinical and Experimental Dermatology:Experimental dermatology.* 2009;34(8):874–9
17. Petrov A, Pljakovska V. Fractional Carbon Dioxide Laser in Treatment of Acne Scars. *Open Access Maced J Med Sci.* 2016;4(1):38-42. doi:10.3889/oamjms.2016.004