Treatment of Acne Scar Using Automated Microneedling Device of 2.5 Mm versus 1.5 Mm. A Split Face Study

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ABSTRACT:

BACKGROUND:

Treatment of acne scarring is always a challenge. Microneedling therapy (dermapen) or percutaneous collagen induction is a new addition to the treatment modalities for atrophic acne scars and has been reported to be simple and effective with fewer side effect than other modalities.

OBJECTIVE:

To assess and compare the therapeutic response of microneedling (dermapen) in the treatment of moderate and severe types of post-acne scar by using two different depth (2.5 mm on the right side) and (1.5mm on the left side) and to evaluate the adverse effects of this therapy.

PATIENTS AND METHODS:

Thirty seven patients were included in the study, only 21 patients completed full treatment course 13 males and 8 females, ages ranged from 19 to 35 years. With different types of atrophic acne scars were subjected to three months of skin microneedling (dermapen) treatment (six sessions at two-week intervals), by using two different lengths (2.5 mm on the right side) and (1.5mm on the left side).

RESULTS:

Clinical evaluation of patients showed statistically significant (p-value <0.0001) overall improvement of post-acne atrophic scars after 12 weeks (after 6 sessions). patients showed good enhancement of scar appearance and moderate improvement in skin texture. Meanwhile, patient satisfaction was good when compared to the baseline.

CONCLUSION:

Skin microneedling is a simple, inexpensive office modality of treatment for the management of post-acne atrophic scars especially mild and moderate types.

KEYWORDS: Atrophic acne scars, Microneedling, Dermapen

INTRODUCTION:

Definition and Prevalence :Scar is defined as the fibrous tissue that replaces normal tissue destroyed by injury or disease[1]. Causes of acne scar formation can be broadly categorized as either the result of increased tissue formation or, more commonly, loss or damage of local tissue. Acne has a prevalence of over 90% among adolescents. and persists into adulthood in approximately 12%–14% of cases with psychological and social implications of high gravity[2]. The prevalence and severity of acne scarring in the population has not been well studied, although the available literature is usually correlated to the severity of acne. 2133 volunteers aged 18 to 70 from the general population showed that nearly 1% of people had acne scars[3].

Pathogenesis: Different studies reported that skin microneedling induces normal wound healing developing in three consecutive stages. Stage 1, the inflammation stage, stage 2 proliferation stage, Stage 3 the remodeling stage[4].

Morphological Types of Acne Scars[5]. Acne scars can be broadly divided into three categories: Macular, Atrophic and Elevated.

Treatment[6]. Chemical Peels, Dermabrasion/ Microdermabrasion, Laser, Subcision, Tissue Augmenting Agents, needling and Combined Therapy.

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Microneedling (Dermapen): Is an automated microneedling device which looks like a pen. This ergonomic device makes use of disposable needles and guides to adjust needle length for fractional mechanical resurfacing. The tip has 9-36 needles arranged in rows. It makes use of rechargeable battery to operate in five mode of speeds, the highest speed mode (700cycle/min) and the lowest speed mode (412cycle/min) in avibating stamp like manner. It has advantage of being reusable in different patients as the needles are disposable, safe as the needle tips is hidden inside the guide, and more convenient to treat narrow areas such as the nose, around the eyes and lips. It makes the procedure less painful and more economical. This technology has been designed to overcome the issues of varying pressure application and the subsequent depth of penetration achieved. Depth of needle range from(0.25mm to 2.5mm) [7].

PATIENTS, MATERIALS, AND METHODS:

This clinical, interventional, therapeutic split-face study was carried out at the center of Dermatology and Venereology—Medical City during the period from March 2017 to August 2018. The nature and target of this study were explained for each patient with a full explanation about the disease, course, the procedure of treatment, possible side effects, follow up, prognosis and the need for pretreatment photographs.

Patients: Thirty seven patients were included in the study, ages ranged from 19 to 35 years, with Fitzpatrick skin type III and IV. Patients with moderate and severe atrophic acne scars were included in the study. Patients with keloidal tendency, active inflammatory lesions, herpes labialis, on systemic isotretinoin in the last 3 months, treated with laser, dermabrasion or chemical peeling during the last year were excluded from the study.

Patients assessment: At the first session the scars assessment was done according to Leeds acne scar grading score system[8]. and Goodman's qualitative global scarring grading system[9]. In subsequent sessions, patient's satisfaction was reported at each visit and recorded on a scale system ranged from (1-10) in which 1 represented the minimal response while 10 maximal response.

Photography was done at each visit by Huawei mate 7. Each patient had six sessions at two-week intervals. During each visit , female patients were asked about camouflage whether the amount has stopped or decreased. Visual analogue score was calculated by another dermatologist by showing him photos of each patient, one at the first visit before starting the treatment and one after 6 weeks and the other after the last session (12 weeks) with a scoring system ranging from (1-10) in which 1 represents minimal severity and 10 maximal severity of the scars**.**

Materials: Microneedling device "dermapen" (Dr. pen Ultima A6 produced by Shenzhen Yanyi Technology Co), with five levels of Speed, five adjustment of needle depth (0.25mm, 0.5mm, 1.0mm, 1.5mm, 2.0mm, 2.5 mm depth) and needle tip (each tip contain 12 needles with 33 gauge thickness, surgical grade stainless steel 316), with 2.5mm needle length.

Method: Patients were subjected to three months of treatment (6 sessions at 2-weeks intervals). At each visit the face was washed with soap and water followed by cleaning with alcohol swab then topical anesthetic cream Emla cream was applied to the treatment area as a thick coating and left for 60 minutes under occlusion and then the cream was gently removed. The patient was asked to lie down, microneedling was done by using dermapen. One hand stretched the skin to be treated, the other hand gripped the dermapen like a pen and rolled it over the skin. Rolling the instrument was done backward and forward many times in all directions horizontally, vertically, and diagonally right and left to cover all scared areas until uniform pinpoint bleeding was seen which is taken as the clinical endpoint. Two different depth of dermapen was used for each side of the face (2.5mm for the right side and 1.5mm for the left side). After finishing, the patient was got a rest for about 10 minutes then the face was washed with normal saline and alcohol swab.

All patients were instructed to apply topical antibiotic "fusidic acid" for 48 hours, to guard against secondary infection, then moisturizing cream until the erythema resolves.

Also, sun exposure was avoided by using sunscreens with a sun protection factor (SPF) value of 30 or more during the day.

RESULTS:

Thirty seven patients were included in the study, 16 patients defaulted from the study for unknown reasons, 9 patients after the first session, 2 after second session, 5 after fourth session. Only 21 patients completed full treatment course 13 (62%) males and 8 (38%) females, ages ranged from 19 to 35 years with mean age and SD (25.09±4.03) of years. 15 (72%) patients had Fitzpatrick skin type III while 6 (28%) had type IV.

Results (Right side)

Patients' scars number: Scars were graded according to Leeds acne scar grading score system. In which 1, 5, 9, 6 patients had scores 3, 4, 5, 6 respectively before starting the study, with mean and SD 4.86 ±0.79. At 6 weeks 2, 4, 11, 4 patients had score 3, 4, 5, 6 respectively, with mean and SD 4.81±0.87. At 12 weeks 6, 9, 6, 0 patients had score 3, 4, 5, 6 respectively, with mean and SD 4.05±0.74. P-value between 0 and 12 weeks is 0.0001(Figure1).

Patients' Qualitative scars assessment: Patients Qualitative scars assessment was done according to Goodman and Baron Qualitative scar grading system. In which 0, 13, 8 patients had grade 2, 3, 4 respectively before starting treatment, with mean and SD 3.43±0.51. At 6 weeks 4, 8, 9 patients had grades 2, 3, 4 respectively, with mean and SD 3.24±0.77. At 12 weeks 12, 7, 2 patients had grade 2, 3, 4 respectively, with mean and SD 2.62±0.80. P value between 0 and 12 weeks is 0.0001(Figure 2)

Visual analogue score: The visual analogue score of scar severity was done in which 0, 0, 1, 5,5, 3, 7) patients had score 3, 4, 5, 6, 7, 8, 9 respectively ,with mean and SD 7.67±1.24. At 6 weeks 0, 3, 5, 3, 5, 3, 2 patients had scores 3, 4, 5, 6, 7, 8,9 respectively with mean and SD 6.29 ± 1.59. At 12 weeks 5, 5, 4, 1, 5, 1, 0 patients had scores 3, 4, 5, 6, 7, 8, 9 respectively with mean and SD 5.10±1.64. P-value between 0 and 12 weeks is 0.0001 (Figure 3).

Patients satisfaction: At 6 weeks patients' satisfaction was reported as following: 1, 4, 7, 6, 2, 1, 0 patients had degree 1, 2, 3, 4, 5, 6, 7 respectively, with mean and SD 3.33±1.20. At 12 weeks patient's satisfaction were reported as following: 0, 4, 6, 5, 4, 2 patients had degree 1, 2, 3, 4, 5, 6, 7 respectively ,with mean and SD 5.24±1.45.

Results(Left side)

Patients' scars numbers: Scars were graded according to Leeds acne scar grading score system. In which 1, 6 ,8 ,6 patients had score 3, 4, 5, 6 respectively before starting the study, with mean and SD 4.95 ±0.86. At 6 weeks 2, 7, 9, 3 patients had score 2, 7, 9, 3 respectively, with mean and SD 4.62±0.86. At 12 weeks 4, 7, 9, 1, patients had scores 3, 4, 5, 6 respectively, with mean and SD 4.19±0.87. P value between 0 and 12 weeks is 0.0001(Figure 4).

Patients' Qualitative scars assessment: Patients Qualitative scars assessment was done according to Goodman and Baron Qualitative scar grading system. In which 0, 12, 9 patients had grade 2, 3, 4 respectively before starting treatment, with mean and SD 3.48±0.51. At 6 weeks 3, 9, 9 patients had grade 2, 3, 4 respectively, with mean and SD 3.38±0.67. At 12 weeks 8, 5, 8 patients had grade 2, 3, 4 respectively, with mean and SD 2.86±0.91. P value between 0 and 12 weeks is 0.0001 (Figure 5).

Visual analogue score: Visual analogue score of scar severity was done in which 0, 0, 2, 3, 4, 4, 8 patients had score 3, 4, 5, 6, 7, 8, 9 respectively, with mean and SD 7.62±1.36. At 6 weeks 1, 1, 4, 3, 2, 7, 3 patients had score 3, 4, 5, 6, 7, 8, 9 respectively with mean and SD 6.38 ± 1.66. At 12 weeks 3, 4 ,5 ,2, 4, 2, 1, patients had score 3, 4, 5, 6, 7, 8, 9 respectively with mean and SD 5.52±1.86. P value between 0 and 12 weeks is 0.0001 (Figure 6).

Patients satisfaction :At 6 weeks patients' satisfaction was reported as following: 0, 6, 9, 5, 1, 0, 0 patients had degree 1, 2, 3, 4, 5, 6, 7 respectively, with mean and SD 3.05±1.20. At 12 weeks patient's satisfaction was reported as following: 3, 5, 5, 6, 0, 2 patients had degree 1, 2, 3, 4, 5, 6, 7 respectively, with mean and SD 4.76±1.22 .

In the present study, clinical evaluation of patients showed statistically significant ($p<0.0001$) overall improvement of post-acne atrophic scars, skin texture in response to skin microneedling treatment when compared to baseline. Patients showed mild clinical improvement in post-acne scars and skin texture after six weeks of treatment (3 sessions) and reported mild satisfaction. Meanwhile, clinical assessment at 12 weeks post-treatment (after 6 sessions) showed good enhancement of scar appearance and a moderate improvement in skin texture, meanwhile patient satisfaction was good when compared to the baseline). Good response was seen in rolling and boxcar scars, while mild response was seen in icepick scars, also most female patients stated that they were using less amount of camouflage than before.

After dermapen sessions, the patients reported transient erythema and edema, which resolved two days later, slight desquamation occur after that and completely resolved at the end of the first week, while no patient had post inflammatory hyperpigmentation. The difference in result between the right and the left side show in (Table 1). After the study was finished the patient satisfaction of the right side was 52% while the patient satisfaction of the left side was 47%. Patients with severe types of atrophic acne scar are less responsive to the treatment than other types. In conclusion, the difference between the two sides was not statistically significant.

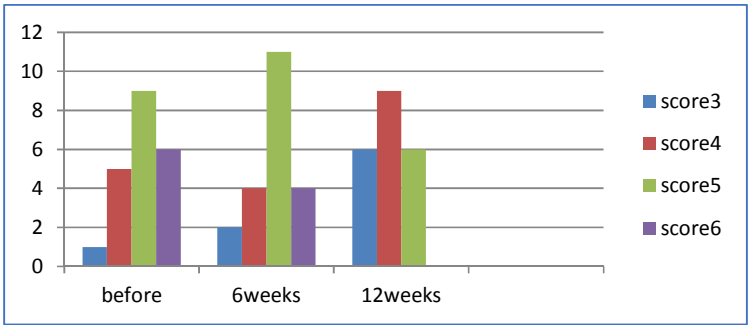

Figure 1: Numbers of patients according to Leeds score /Right Side

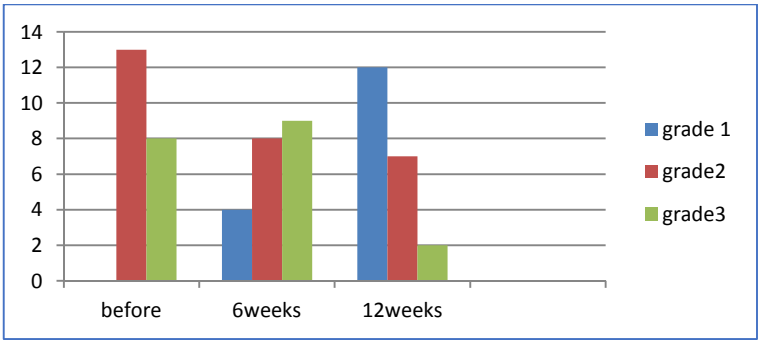

Figure 2: Numbers of patients according to Goodman grading scale /Right Side

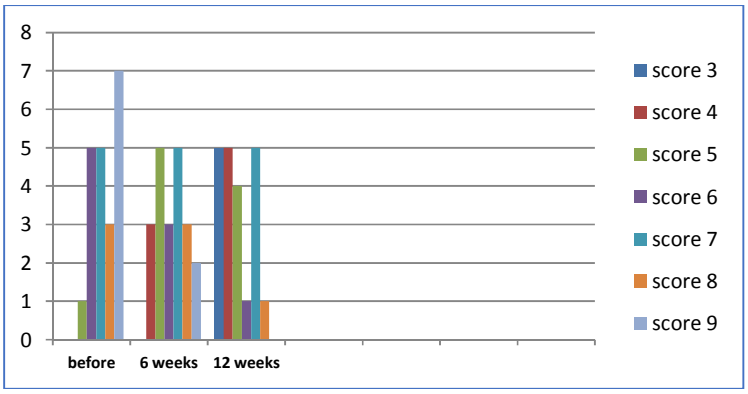

Figure 3: Visual analogue score/Right Side

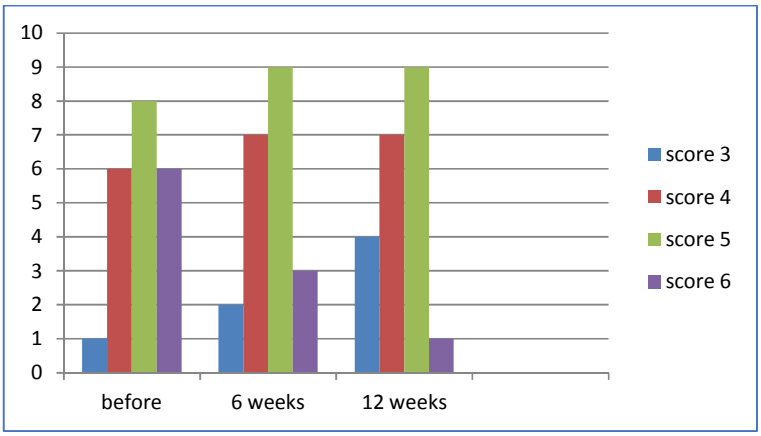

Figure 4: Numbers of patients according to Leeds score/Left Side.

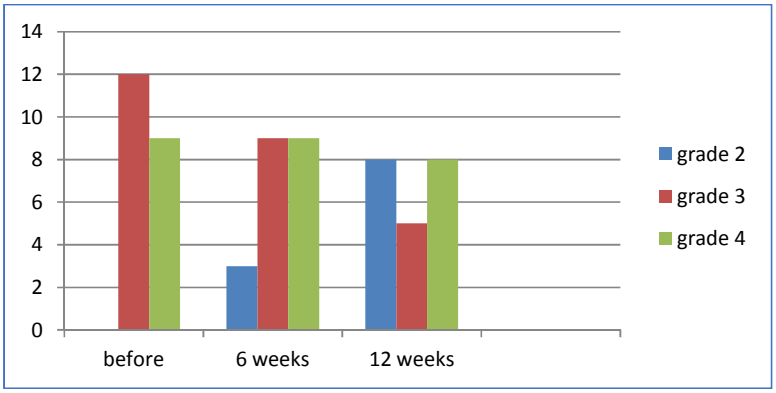

Figure 5: Numbers of patients according to Goodman grading scale /Left Side

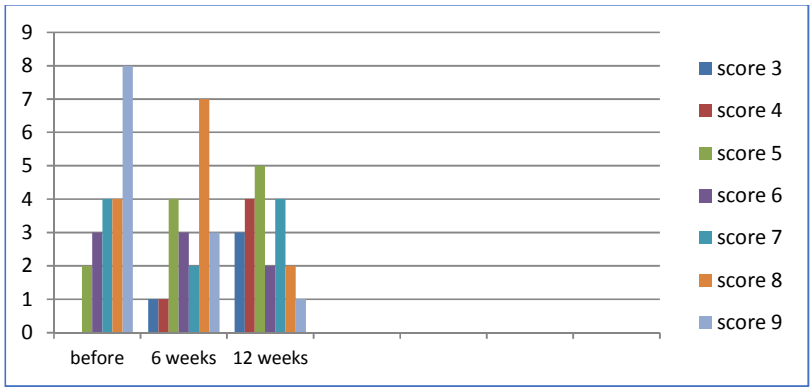

Figure 6: Visual analogue score/Left Side

Table 1: Comparison between right and left side

Scoring system	Right side		Left side	
	Before	**After 12 weeks**	**Before**	**After 12 weeks**
Leeds acne scar grading score system	mean and SD 4.68±0.79	mean and SD 4.05±0.74	mean and SD 4.95±0.86	mean and SD 4.19±0.87
	P value 0.0001		P value 0.0001	
Goodman's qualitative global scarring grading system	mean and SD 3.43±0.51	mean and SD 2.62±0.80	mean and SD 3.48±0.51	mean and SD 2.86±0.91
	P value 0.0001		P value 0.0001	
visual analogue score	mean and SD 7.67±1.24	mean and SD 5.10±1.64	mean and SD 7.62±1.36	mean and SD 5.52±1.86
	P value 0.0001		P value 0.0001	

Figure 7: Twenty-six years old man with grade 4 acne scar, A/Right side: Before the treatment and after 12 weeks

Figure 7: B/Left side: Before the treatment and after 12 weeks

Figure 8: Twenty-five years old female with grade 4 acne scar,
A /Right side: Before the treatment and after 12 weeks

Figure 8: B/Left side: Before the treatment and after 12 weeks

DISCUSSION:

Acne scarring impacts an individual's life both physically and emotionally. A variety of therapies have been tried with varying amounts of success[10].

The studies that used demapen are:

The first one is an Egyptian study[11]. This study included treatment 90 patients with atrophic acne scars and was classified randomly into three groups: with dermapen alone, PRP alone and combination of both. There was a statistically insignificant improvement in the appearance of atrophic scars with the group treated by dermapen (P-value 0.23).While in the present study there was a statistically significant improvement in the appearance of atrophic scars, with (P value 0.0001).

The second one was an Egyptian study[12]. Thirty patients were randomly divided into three groups: with dermapen alone, with glycolic acid 35% peel alone and dermapen combined with glycolic acid 35% peel. The three groups showed statistically significant improvement in the degree of acne scars after six sessions with two weeks interval between the sessions ($P< 0.05$).

The present study agreed with **Amr et al.** In that, there was a significant improvement in rolling and boxcar compared to icepick scar which showed only mild improvement, but statistically significant was higher in the present study (p-vale 0.0001).

An Indian study[13], two groups were compared: Group A used Microneedling among 15 patients and Group B used Dermabrasion among also 15 patients. The percentage improvement of scars in group A who underwent microneedling was 93% and that in group B which underwent dermabrasion was 80%.

Finally, one study[14]. looked at the combination CO_2 laser and skin needling to laser alone included 60 patients. Patients were assessed by three independent observers blinded to the treatment using the quantitative Goodman and Baron grading system. After treatment there was a statistically significant improvement in scores in both groups with no statistically significant difference between them.

CONCLUSION:

Skin microneedling (dermapen) is a simple, inexpensive ,office modality of treatment for the management of post-acne atrophic scars (icepick, boxcar and rolling scar) especially mild and moderate types. It has favorable advantages as the epidermis remains intact, decreasing most of the risks and negative side effects of other invasive modalities for the treatment of post-acne scars.

REFERENCES:

1. Fabbrocini G, Annunziata MC, D'ArcoV. Acne scars: pathogenesis and treatment. Dermatol Res Pract. 2010;2010:1-18.
2. Williams C and Layton AM. Persistent acne in women: implications for the patient and for therapy, American Journal of Clinical Dermatology. 2006; 7 (5), 281–290.
3. Ghodsi Z, Orawa H and Zouboulis CC. Prevalence, severity, andeverity risk factors of acne in high school pupils:a community-based study , J Invest Dermatol. 2009;129(9), 2136–2141.
4. Kurokawa I, Danby FW, ju Q. et al. New developments in our understanding of acne pathogenesis and treatment, Experimental Dermatology. 2009; 18(10), 821–832.
5. Jacob CI, Dover JS, Kaminer MS. Acne scarring: A classification system and review of treatment options. J Am Acad Dermatol. 2001;45:109-17.
6. Al-Waiz MM and Al-Sharqi AI. Medium-depth chemical peels in the treatment of acne scars in dark-skinned individuals, Dermatologic Surgery. 2002;28(5),383–387.
7. Kim YC, Park JH and Prausnitz MR. Microneedle applications in improving skin appearance. Adv Drug Del Rev. 2016; 64: 1547–1568.
8. Layton AM, Henderson CA, Cunliffe WJ. A clinical evaluation of acne scarring and its incidence. Clin Exper Dermatol. 1994;19:303-8.
9. Goodman GJ, Baron JA. Postacne scarring: a qualitative global scarring grading system. Dermatol Surg. 2006;32:1458-66.
10. El-Domyati M, El-Ammawi TS, Medhat W, et al. Multiple minimally invasive Erbium:YAg laser mini-peels for skin rejuvenation: an objective assessment. J Cosmet Dermatol. 2012;11:122–13.
11. Ibrahim ZA, El-Ashmawy A. A and Shora O. A. Therapeutic effect of microneedling and autologous platelet rich plasma in the treatment of atrophic scars: A randomized study. J Cosmet Dermatol. 2017; 311–8.
12. Amr NS, Abdallah ME and Walaa EM. Microneedling and Glycolic Acid Peel for Treatment of Acne Scar; Comparative Study JAm Cosmet Dermatol. 2018;15: 44-54.
13. Pahwa M, Pahwa P, Zaheer A. "Tram track effect" after treatment of acne scars using a microneedling device. Dermatol Surg.2016; 38 (12),1107-1108
14. Mohammed G. Randomized clinical trial of CO2 laser pinpoint irradiation technique with/without needling for ice pick acne scar. J Cosmet Laser Ther.2016; 15, 177-18.