

Case Report

Microneedle Radiofrequency Combined with Human Fibroblast Conditioned Media for Acne Scars and Skin Rejuvenation

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Abstract

Background: Acne vulgaris is one of the most common dermatology problems in the world. Acne scar can cause stress for sufferers. Microneedle Radiofrequency (MR) clinically has an effectiveness treating acne, acne scars and skin aging. MR acting as electrodes and directly deliver radiofrequency energy deep into the skin to induce new collagen production, dermal thickening and re epitelization.

Cases: Seventeen patients (12 acne scar and 5 aging patients, 25-50 years old, Fitzpatrick skin type III-IV) with acne scars and aging skin who received three sessions of microneedle radiofrequency treatment for 2 months at 3 weeks interval per session.

Discussion: We use Goodman and Baron's Global Acne Scarring System to assess the improvement of acne scars. It showed that by qualitative grading system from 12 patients (grade 3 and grade 4 acne scars), 58% patients showed 2 grade improvement, 33% showed 1 grade improvement and 8.3% showed 3 grade improvement. Quantitative assessment showed that 58,3% of the patients had moderate improvement, 25% had good improvement and 16,6% had very good improvement. Global Aesthetic Improvement Scale (GAIS) are used to assess the improvement in skin texture, wrinkles graded by physician. It showed 60 % patients has 51 to 75% improvement and 40% patients has 26 to 50% improvement

Conclusion: Microneedle radiofrequency is an effective therapy in treating moderate and severe acne scars and skin rejuvenation.

Keywords: Acne scars; Microneedle radiofrequency; Pigmentation; Skin texture; Skin rejuvenation, Wrinkles

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Citation: Edwin T (2020) Microneedle Radiofrequency Combined with Human Fibroblast Conditioned Media for Acne Scars and Skin Rejuvenation. J Clin Dermatol Ther 6: 056.

Received: August 18, 2020; **Accepted:** August 25, 2020; **Published:** September 01, 2020

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Introduction

Acne is a chronic inflammatory disease of the pilosebaceous unit [1]. It is the most frequent skin lesion which affects >80% of world's population during some periods of their life and 85% of adolescents in the developed countries [2]. Sitohang S, Virgayanti P, et al. reported that the prevalence of acne vulgaris in Indonesia is not known with certainty, because surveillance for this disease is rarely carried out. CiptoMangunkusumo Hospital from 2008 to 2010 reported 6.612 acne vulgaris outpatient patients [3].

Scar is defined as "the fibrous tissue that replaces normal tissue destroyed by injury or disease" [4]. In acne, atrophic scars are much more common than hypertrophic scars. They most commonly involve the dermis, but can also involve the underlying fat. The phases of healing include inflammation (in the infrainfidibular region of the pilosebaceous structure), granulation tissue formation with fibroplasia and neovascularization, wound contracture and tissue remodeling [5]. Acne scars are associated with decreased self-confidence, including perception of decreases employability and embarrassment, and are negatively perceived by society [6].

Aging is a process perhaps best defined as decreased maximal function and reserve capacity in all body organs, resulting in an increased likelihood of disease and death. Like all other tissues, skin unavoidably ages, a process than affect the function and appearance of the skin [7]. Skin aging is degenerative process whereby alteration from the passage of time (chronological/intrinsic aging) are superimposed with effect produced by environmental factors (e.g sun, heat, pollution, smoking) [8].

Microneedle Radiofrequency (MR) is widely used for acne scar without epidermal injury [9]. Insulated microneedle radiofrequency works by delivering radiofrequency energy only at the tip of the needles so can minimize epidermal disruption by only 5%, comparing with factional ablative laser around 10-70% [10]. Recent research shows the effectiveness of MR for skin tightening, wrinkle reduction and acne scarring [11].

Methods

We did a case report to 17 patients (12 acne scar patients and 5 aging skin patients) with skin type III to IV. The inclusion criteria were healthy patients from 25 to 50 years old with depressed acne scars, aging skin patients who agreed and signed the informed consent letter. The exclusion criteria were patients who have blood disorder, taking blood thinner medicine, ginko biloba, vitamin e, history of keloids, pregnancy or breast feeding, skin allergy or dermatitis on the face, autoimmune disorder and refuse informed consent letter. We used microneedle radiofrequency device (ENSEMBLE, BISON Medical, Seoul, South Korea) with insulated needles to minimized the down time and deeper penetration.

The purpose of doing this case report was to improve the conditions of atrophic scars, skin texture, wrinkles using different grading system. All participants were asked to fill out an informed consent letter and take a photo session before and after each treatment.

Every patient received 3 treatments with 3 weeks interval between treatment. They were treated with certain parameters based on their facial condition. Topical anesthesia was applied to all participant around 20 minutes before treatment. Facial areas were treated with insulated needle using 1.75mm to 2.5mm penetration depth, power 40 W, out time 100ms.

Before we start the treatment, we applied QT cell serum (QT cell, S.THEPHARM, Co.,Ltd, Seoul, South Korea) that contain Human Fibroblast Conditioned Media (hDF-CM) in the skin target area, then did microneedle radiofrequency treatment and apply the serum again. After treatment we applied antibiotic cream and soothing cream all over the treated area. We evaluate the degree of the acne scar improvement using Goodman and Baron's quantitative and qualitative acne scar grading system (Table 1, 2a & 2b).

Grade	Level of Disease	Characteristic	Examples
1	Macular disease	Erythematous, hyper or hypopigmented flat marks visible to patient or observer irrespective of distance	Erythematous, hyper or hypopigmented flat marks
2	Mild disease	Mild atrophy or hypertrophy that may not be obvious at social distances of 50cm or greater and may be covered adequately by make up or the normal shadow of shaved beard hair in males or normal body hair if extrafacial	Mild rolling, small soft papular
3	Moderate disease	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by make up or the normal shadow of shaved beard hair but is still able to be flattened by manual stretching of the skin	More significant rolling, shadow "boxscar", mild to moderate hypertrophic or opular scars
4	Severe disease	Severe atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by make up or the normal shadow of shaved beard hair in males or body hair (if extrafacial is not able to be flattened by manual stretching of the skin	Punch out atrophic (deep "box scar"), "ice pick", bridges and tunnels, gross atrophy, dystrophic scars significant hypertrophy or keloid

Table 1: Goodman and Baron's qualitative acne scar grading system [12,13].

Grade or Type	Number of Lesions 1 (1-10)	Number of Lesions 2 (11-20)	Number of Lesions 3 (>20)
Milder scarring (1 point each) Macular erythematous pigmented Mildly atrophic dish like	1 points	2 points	3 points
Moderate scarring (2 point each) Moderate atrophic, dish like Punched out with shallow bases small cars (<5mm)	2 points	4 points	6 points
Shallow but broad atrophic areas Severe scarring (3 points each) Punched out with deep but normal bases, small scars (<5mm) Punched out with deep but abnormal bases, small scars (<5mm)	3 points	6 points	9 points
Linear or troughed dermal scarring Deep, broad atrophic areas Hyperplastic Popular scars Keloidal/hypertrophic scars	2 points Area < 5mm 6 points	4 points Area 5-20 mm ² 12 points	6 points Area > 20 cm ² 18 points

Table 2: (a) Goodman and Baron's quantitative scar grading system [12,13].

Grade	Improvement status
0-5	Minimal reduction in GSGS scores
5-10	Moderate reduction in GSGS scores
10-15	Good reduction in GSGS scores
>15	Very good reduction in GSGS scores

Table 2: (b) Assessment of improvement using Goodman and Baron's quantitative acne scar grading system [12,13].

Beside that acne scar grading system, the attending physician also evaluated the degree of improvement in skin texture, wrinkles and pigmentation, according to the Global Aesthetic Improvement Scale (GAIS):

- 0=No Improvement
- 1= \leq 25% mild improvement
- 2=26–50% moderate improvement
- 3=51–75% good improvement
- 4=76–100% excellent improvement

Discussion

Acne scar therapy is still a challenge in various medical literature. Several therapy modalities are widely used in the treatment of atrophic scars, such as peels (chemical peels and tca peels), dermabrasion, laser, microneedle, microneedle radiofrequency, derma filler, and surgery [14,15].

Aging skin occurs naturally and affects the quality of epidermis and dermis layer of the skin. In aging skin there is an increase in matrix metalloproteinase levels which causes a decrease in collagen and elastin skin [16].

Microneedle radiofrequency device has been widely used for the treatment of various skin disorders, such as wrinkles, atrophic scars, acne vulgaris, and rosacea. It has a thermotherapy mechanism, specifically the ability to reduce the activity of the sebaceous glands through a thermal stimulation [17].

Microneedle radiofrequency releases thermal energy in the dermis layer, so thereby preventing damage to the epidermis. The radiofrequency energy stimulates the formation of collagen and growth factors in the skin, resulting in dermal thickening [18]. Moreover, it has a lower downtime than ablative laser in treating acne scars [19]. Radiofrequency has a chromophore dependent properties, so it can be applied to all skin types and has less side effect of pigmentation than laser [20]. The microneedle itself also has another function as various drug delivery agent to penetrate through the skin barrier and bring the drug directly into the dermis [21].

Results

All participants completed 3 treatment session at 3 week intervals. Most patients have various scar acne problem, such as ice pick, rolling scar, and box scar. Beside that, they also had acne vulgaris, and aging skin condition like wrinkles, dull skin and deep nasolabial fold. Microneedle radiofrequency can improve the appearance of scar acne, acne vulgaris, skin texture in aging skin.

The physician combine microneedle radiofrequency treatment with human fibroblast conditioned media which can help to release growth factors to stimulate angiogenesis, modulate inflammation, collagen formation and promote wound healing process.

The assessment of acne scar improvement using Goodman and Baron's quantitative scale are listed in table 3. Participant with grade 4 acne scar, 7 participants showed improvement by 2 grade (70%), 2 participants showed improvement by 1 grade (20%), and 1 participants showed by 3 grade (10%). In participants who had grade 3 acne scars, 2 participants (100%) improved by 2 grade. Based on the assessment the improvement of acne scar from Goodman and Baron's quantitative grading system, we found 58,3% of participants had a moderate improvement, 25% had a good improvement and 16,6% had a very good improvement. The assessment of acne scar improvement using Goodman and Baron's qualitative scale, from 12 participants, 10 participants had grade 4 and 2 participants had grade 2.

Previous to Treatment Grade of Acne Scar	No of Patients	Post Treatment Reduction of Scars by 3 Grades (%)	Post treatment Reduction of Scars by 2 Grades (%)	Post Treatment Reduction of Scars by 1 Grades (%)
Grade 3	2	0 (0)	1 (100%)	0 (0)
Grade 4	10	1 (10%)	7 (70%)	2 (20%)

Table 3: Physician assessment response based on Goodman and Baron's qualitative acne scar grading.

We assessed the improvement in skin texture, and wrinkles using Global Aesthetic Improvement Scale (GAIS) and obtained 51-75% improvement in 60% participants and 26 to 50% improvement in 40% participants.

This therapy has varied pain relief and can be tolerated by all participants. All participants reported mild erythema for 2 to 3 days pasca treatment (Figures 1-6).

Conclusion

In addition to microneedle radiofrequency function in delivering drugs right into the dermis layer, release the growth factors and stimulate collagen formation, MR also has a higher level of precision than laser, because it can be adjusted according to the depth of skin layer we need.



Figure 2: (a) Grade 4 acne scars, (b) Significant improvement in acne scars after 3 treatment (grade 4 to grade 1).



Figure 3: (a) Grade 4 acne scars, (b) Significant improvement in acne vulgaris and acne scars after 3x treatment (grade 4 to grade 3).



Figure 1: (a) Grade 4 acne scars, (b) Significant improvement in acne scars after 3x treatment (grade 4 to grade 2).



Figure 4: (a) Grade 3 acne scars, (b) Significant improvement in acne scars after 3x treatment (grade 3 to grade 2).



Figure 5: (a) Before treatment, (b) After treatment, the treatment has shown a significant improvement in nasolabial lines, skin texture, and acne scars.



Figure 6: (a) Before treatment, (b) After treatment the treatment has shown a significant improvement in lines, wrinkles, nasolabial lines, skin texture and has a skin lightening effect and deep lines.

Combination between microneedle radiofrequency with human fibroblast conditioned media into scar acne and aging skin will enhance the satisfactory result. MR can be considered as an effective therapeutic option in the case of acne scar, and skin rejuvenation with minimal downtime and satisfactory result.

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