

Original Article

Evaluation of efficacy and safety of platelet rich plasma (PRP) and microneedling (radiofrequency) in the treatment of atrophic acne scars

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Abstract

Background: Acne Vulgaris is a self-limiting, chronic skin lesion, which may heal with squally of different types of scars (ice pitted, boxcar, rolling, and keloid). Different options used to deal with scars such as laser dermabrasion, surgical excision, and chemical peeling. This study aims to assess the safety and effectiveness of using a combination of radiofrequency (RF) microneedling and platelet-rich plasma (PRP) in managing the atrophic acne scars among a sample of Iraqi patients.

Methods: An interventional study conducted from January 2017 to December 2018 at a private dermatological clinic in Kalar City, Al-Sulaymman Province, Iraq. Patients with the atrophic scar and willing to participate are adequately assessed and treated by RF and PRP. A different number of sessions of therapy used, and patients followed for three months after the last meeting.

Results: Thirty-one patients were involved in the study. The majority of them (27, 87.0%) were females with a mean age of 26.41±8 years. Twenty patients (64.5%) had opened mouth (boxcar and rolling) scars, and eleven (35.5%) had ice pitted scars. Ten patients (32.25%) showed an excellent response to RF and PRP therapy with two grade improvement, fifteen patients (48.38%) showed good response with one-grade improvement and six patients (19.6%) of ice pitted scars showed poor response without improvement in grades. There was a direct relationship between the number of sessions and the response to therapy. Three patients developed folliculitis at sites of puncturing with the isolation of staphylococcus auras bacteria, which cleared by topical and systemic antibiotics.

Conclusion: Although ice pitted scars showed an inadequate response to therapy, however, the reaction of the boxcar and rolling scars to RF and PRP was excellent, indicating that combination procedure is a safe, efficient and satisfactory option for the treatment of atrophic acne scars.

Keywords: Acne scars, PRP, RF, grading of scars, atrophic, keloid, Iraq.

Background

The chronic inflammation of the hair follicles and the sebaceous gland clinically described as Acne Vulgaris. The familiar pictures of Acne vulgaris related skin lesions are papules, pustules, nodules, and cysts. Unfortunately, most of the acne lesions heal with scars formation [1]. Literature indicated that early and sufficient treatment is crucial to reduce the complications, especially scarring [2,3]. However, even with the excellent treatment options available, and regardless of the lesion size, scarring could happen, but it is more prominent in

cystic acne [4]. Scars that result from increased tissue production are called hypertrophic and keloid scars. While the wounds that result from damage or loss of tissue are called atrophic [4]. Rivera [5] summarized the ways to treat atrophic scars into medical and surgical procedures. The use of oral and local retinoids is the most effective medical choice to treat atrophic scars. Surgical options include "punch excision, elliptical excision, punch elevation, or subcision". Recently, a combination of platelet-rich plasma (PRP) and microneedling technique used in the treatment of many dermatological disorders, including acne scarring [6,7]. Microneedling cause skin trauma, breakdown the scars, and facilitating skin revascularization. At the same time, microneedling causing collagen release, growth factors, and growth-promoting substance [8]. The way the PRP work depends on the presence

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of protein, which enhances collagen synthesis and elastic fibers causing improvement in the scar tissue and appearance of the skin [9,10]. The present study aimed to evaluate the efficacy and safety of PRP and RF microneedling in the treatment of atrophic acne scars among a sample of Iraqi patients.

Methods

A prospective, interventional study conducted at the private outpatient clinic in Kalar City, Al-Sulaymmania Province, North of Iraq. Thirty-one patients with atrophic acne scars on their faces included from January 2017 to December 2018.

Inclusion criteria

All patients underwent digital photography and clinically assessed for the morphology of the scarring. Study participants graded according to Goodman and Baron scale [11] defined in Table 1. Patients with a grade of 2,3 and 4 included in the study.

Table 1. Goodman and Baron qualitative grading of acne scars [11]

Grade	Severity	Clinical features
1.	Macular	These scars can be erythematous, hyper- or hypopigmented flat marks
2.	Mild	Mild atrophy or hypertrophy scars that might not be obvious at social distances of 50cm or greater and can be covered adequately by makeup
3.	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and which is not covered easily by makeup, but is still able to be flattened by manual stretching of the skin
4.	Severe	Severe atrophic or hypertrophic scarring that is evident at social distances greater than 50cm and is not covered easily by makeup, nor able to be flattened by manual stretching of the skin

Exclusion criteria

The exclusion criteria were the presence of active acne lesions, any active infectious diseases, like herpes simplex, HI, bacterial infections, wart, HVC-AB, HVB-Ag, actinic keratosis, skin cancers, systemic retinoid intake in the previous six months, severe systemic illness, Hb<10g/dl or platelet <105mic/L, diabetes mellitus, keloidal tendency, bleeding disorders, anticoagulant therapy, oral steroid therapy, pregnancy, and lactation.

Study procedure

At the time of the study, the eligible patients signed the consent form and informed about the radiofrequency RF, PRP therapy, and the possible side effects and prognosis of treatment. The first step was to local anesthetize the area of a scare for 30-45min using EMLA emulsion (Eutectic Mixture of Local

Anesthetics), which is a "eutectic mixture of lidocaine 2.5% and prilocaine 2.5%". In the second step, the patient exposed to radiofrequency laser with a handpiece of number-49 (contain 49 needles). The third step is to inject the PRP preparation. PRP was prepared by taking 10ml of autologous whole blood from the patients and collected into tubes containing acid citrate dextrose (ACD), and centrifuged at 3700rpm for 10min, to obtain the supernatant at the top, which included PRP, calcium gluconate added as an activator (1:9), i.e., 1ml gluconate and 9 ml PRP. Each patient received a different number of sessions ranged from 3-7, with a period of 3-4 weeks apart. Both the clinical findings and the photographs were taken before and after treatment recruited by a blinded dermatologist to assess the progress of treatment three months after the last session of therapy. Moreover, the predetermined Goodman and Baron grade of each scar compared to the final results. Researchers evaluated the response to treatment as excellent when the improvement is 75–100%, very good when the improvement is 50–74%, good when the improvement is 25–49%, and poor when the improvement is 0–24%.

Statistical analysis

Data analyzed by SPSS version 16. Descriptive statistics (mean and standard deviation) and Chi-square test used as an analytical method. P-value of <0.05 regarded as significant.

Results

Descriptive analyses

A total of 31 patients who completed the study, 27 (87.0%) were females, and 4 (13.0%) males with an age range of 18 to 40 years and a mean age of (26.41±8.0) years.

At the beginning of treatment, 11(35.5%) patients had ice pitted scars (V shape, and 20 (64.5%) patients had opened mouth depressed scars (boxcar-U shape and rolling-W shape) (Table 2). Furthermore, according to the Goodman and Baron scale, 20 (64.5%) of patients had Grade 4 acne scars, 6(19.4%) of patients had Grade 3 acne scars, and 5(16.1%) of patients had Grade 2 acne scars.

Table2. Number of patients according to the type of scar (n=31)

Type of scar	N	%
Boxcar and rolling	20	64.5
Ice pitted	11	35.5
Total	31	100

Table 3 shows the response to PRP and microneedling RF. Ten patients (32.25%) showed an excellent response with an improvement of 2 grades according to Goodman and Baron scale, fifteen patients (48.38%) showed good response, with one grade improvement and six patients (19.61%) with a poor response without any grade improvement, all of them had ice pitted scars. There was a direct proportion between the number of sessions and response to therapy, so those who received more sessions (5-7sessions) showed excellent response, and those who received 3-4 sessions showed good to poor response. The type of scars also impacts the outcome of the therapy, so those with ice pitted scars showed an inadequate response.

Table 3. Number of patients in relation to the type of response and number of sessions

Type of response	Grade of improvement	Number of patients	%	Number of sessions
Excellent	2	10	32.25	5-7
Good	1	15	48.38	3-4
Poor	Zero	6	19.61%	3-4

**Figure-1** boxcar acne scar before treatment by RF and PRP**Figure-2** Boxcar acne scar after treatment by RF and PRP with 2 Grade improvement**Figure-3** Rolling scar before treatment**Figure-4** Rolling scar after treatment by RF and PRP with 2 Grade improvement

Discussion

Recently, platelet-rich plasma (PRP) served alone or in combination with microneedling as a good option for the treatment of atrophic acne scars. Several dermatologists and plastic surgeons used and evaluated such procedure, but results vary from one center to another. In a systematic review study, Hesseler and Shyam [12] concluded that adding platelet-rich plasma in the treatment regime significantly improved acne scars, increased patient satisfaction, and reduced postoperative surgery downtime. Ibrahim et al. [13] concluded that the treatment of acne scars was satisfactory, whether using combined microneedling and PRP or microneedling alone. However, El-Domyati et al. [14], Porwal et al. [15], and Simran [16] found that outcome treatment of acne scars with the combination of "dermaroller and PRP" produced better results than "dermaroller alone. Similarly, our study showed that the combined therapy of microneedling RP and PRP gave satisfactory responses.

Moreover, our findings reported about eighty percent (80.63%) improvement in acne scar compared to 58.58% improvement in an Indian study [15]. In this study, the excellent response appeared among 32.25% of the studied sample which is similar to findings (32.0%) reported by randomized control trial study conducted in Egypt by El-Taieb et al. [17] to "assess the efficacy of combined treatment of fractional erbium-YAG 2940 nm laser and platelet-rich plasma". However, our findings appeared higher than other studies conducted by Simran [16], which gave excellent results in only 18.5%, and no excellent response in the study of Gulanikar and Vidholkar [18] respectively.

Furthermore, we found that the number of sessions was related to the prognosis of cases; patients who underwent more than five sessions were excellent results compared to those who had fewer sessions. To the best of our knowledge, there is no independent study discussing the number of PRP and RF sessions and the possible relationship to the progression of treatment of the acne scare. Moreover, the suggested protocol to treat acne scar is four sessions in fifteen days apart, however, some cases need a maintenance protocol of one to four sessions annually.

Previous studies [18,19] indicated that the PRP procedure is safe. However, this procedure is not without side effects such as "bruising, swelling, infection, mild scarring, pigment changes, and delayed healing". In our study, some pain reported with topical anesthesia. Although all precautions are taken to prepare patients by using a topical antiseptic before puncturing, topical antibiotics (fusidic acid cream for seven days) used after the procedure and applying sunscreen; however, three patients developed folliculitis at the site of puncturing by the PRP or RF needles. Folliculitis consisted of small papules or pustules with the isolation of staphylococcus auras bacteria cleared by using topical and systemic anti staphylococcus antibiotics.

Conclusion

Platelet-rich plasma (PRP) and radiofrequency (RF) microneedling were a useful option in the treatment of atrophic acne scars and giving excellent and good results in more than eighty percent of patients with a minimal side effect. Moreover, the number of sessions is directly proportional to the appearance of satisfactory results.

Abbreviations

PRP: Platelet Rich Plasma RF: radiofrequency ACD: Acid Citrate Dextrose

Declarations

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Availability of data and materials

Data will be available by emailing khudair.derma@yahoo.com

Authors' contributions

All authors participated equally in the study concept, design, writing, reviewing, editing and approving the manuscript in its final form. All authors read and approved the final manuscript.

Ethics approval and consent to participate

We conducted the research following the Declaration of Helsinki, and the protocol was approved by the Ethic Committee of the College of Medicine, University of Diyala and Baquba Teaching Hospital, Diyala, Iraq. (Ref: MD48 October 2016 BMR). Moreover, written informed consent was obtained from patient willing to participate after explanation of the study objectives and guarantee of secrecy.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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