IJMA

International Journal of Medical Arts

Volume 7, Issue 2 (February 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780

Available online at Journal Website
https://ijma.journals.ekb.eg/
Main Subject [Dermatology]

Original Article

Efficacy and Safety of Punch Elevation with Microneedling in the Treatment of Atrophic Acne Scars

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Article information

Received: 11-11-2023

Accepted: 08-01-2025

DOI: 10.21608/ijma.2024.248016.1864

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Citation: Mahmoud M, Mohamed RR, Abdel-Aleem HL, Mohammed MM. Efficacy and Safety of Punch Elevation with Microneedling in the Treatment of Atrophic Acne Scars. IJMA 2025 Feb; 7 [2]: 5337-5341. DOI: 10.21608/ijma.2024.248016.1864

ABSTRACT

Background: Approximately 95% of people with a history of acne may have post-acne scars, which are challenging to treat and diminish their quality of life.

The aim of the work: We aimed to compare the efficacy and safety of two treatments for atrophic acne scars: punch elevation with microneedling and platelet rich plasma (P/M/P) versus microneedling and platelet rich plasma (M/P) in a split face prospective study.

Patients and Methods: This is prospective comparative research conducted on 15 patients between the ages of 19 and 32 with post acne boxcar and icepick scars. Fourteen patients have boxcar scars on the right and left side, while seven patients have icepick scars on the left side and six patients have icepick scars on right side. Left side of face of each patient was treated by punch elevation. After four weeks, both sides were treated with microneedling and platelets rich plasma (PRP). Three sessions of microneedling and PRP on both sides were done with a 4-week interval.

Results: There was a significant reduction in Goodman score of boxcar and icepick scar after treatment by punch elevation plus microneedling and PRP on the left side, however there was no significant difference on the right side before and after treatment. On the other hand, Punch treated side show a statistically significant difference when compared to right side. Most of patients were satisfied after treatment. Micro-needling with PRP and punch elevation were well tolerated with no major adverse events were observed.

Conclusions: Punch elevation is simple, a safe and cost effective procedure for facial box and icepick scars atrophic acne scars and combination of punch elevation procedure with other procedures like microneedling and PRP offer better results in treatment of post acne scars than microneedling with PRP only.

Keywords: Platelets Rich Plasma; Punch-Elevation; Icepick; Boxcar.

INTRODUCTION

Acne vulgaris is a chronic inflammatory condition affecting the pilosebaceous units, which can cause inflammatory lesions like papules, pustules, and nodules as well as non-inflammatory lesions like open and closed comedones with variable degrees of scarring [1].

Scarring could occur if the skin is damaged. Atrophic and hypertrophic scars are the two basic forms of scars, depending on whether there is a net loss or growth in collagen. Eighty to ninety percent of acne scarring patients have atrophic scars: rolling, boxcar, and ice pick scars [2].

Surgical resection and non-surgical therapies like medication, laser, radiation, and chemotherapy have been used to treat acne scars [3].

One method of treating acne scars is punch elevation, which has an economic advantage over laser, microneedling, and PRP and fewer side effects like burns, skin infections, or reactivation of acne [4].

Punch elevation technique involves removing the scar's base using the same instrument used for punch excisions. The scar base is elevated when the scar tissue base has been sufficiently punched until the scar base is parallel to the surrounding outline. For deep boxcar and icepick scars, punch techniques are still the most effective [5].

Microneedling is a minimally invasive cosmetic technique that employs tiny needles with 0.25mm to 2.5mm to puncture the skin with erythema or pinpoint bleeding as endpoint in order to produce collagen and cure various skin issues. it's simple procedure that does not require special training. Alternatively, it is referred to as collagen induction therapy [6].

THE AIM OF THE WORK

We aimed to compare the efficacy and safety of two treatments for atrophic acne scars: punch elevation with microneedling and platelet rich plasma (P/M/P) versus microneedling and platelet rich plasma (M/P) in a split face prospective study.

PATIENTS AND METHODS

This research was approved by the local Ethics Committee of Al-Azhar University's Faculty of Medicine in Assiut, Egypt, with registration number MSc/AZ.AST./DVA021/12/194/4/2021. This is a pilot comparative split face study conducted on 15 patients with post-acne facial boxcar and icepick scars between April 2021 and March 2022.

Clinical evaluation of the patients included: a full medical history, which includes: name, age, sex, occupation, and place of residence; Current history as the onset, course, and duration of facial acne scars; History of past treatments, including systemic steroids or systemic retinoid, as well as family history of acne, post-acne facial scarring, bleeding disorders, or anticoagulant drugs. Every patient underwent a dermatological evaluation to determine their skin phototype, scar distribution, and the exclusion of any other skin problems, such as a susceptibility for keloid formation and skin infections. Laboratory tests were also performed to rule out any additional issues, including bleeding tendency.

We evaluated the severity of scars with Goodman and Baron's quantitative scale for acne scars.

Fourteen patients have boxcar scars on the right and left side, while seven patients have icepick scars on the left side and six patients have icepick scars on the right side. The mean baseline number of boxcar or icepick scars was almost equal and show no statistically significant difference on the right and left sides, as follows: 5±2.32 and 4.29±2.58 boxcars on the left and right sides, respectively, and 3.71±2.68 and 4±2.68 icepicks on the left and right sides, respectively.

Regarding the treatment protocol, the left side of the face of each patient was treated by punch elevation, and after four weeks, both sides were treated with 3 sessions of microneedling and platelets rich plasma (PRP) every 4 weeks.

Topical anesthesia was applied to the treatment area during each session and was removed after 20 minutes. Additional subcutaneous infiltration of anesthesia into the subcutaneous layer of the selected scar was applied as needed. Punch knives of equal (or different) size to the scar were used to reach subcutaneous fat. The tissue is carefully raised until it rises slightly above the surrounding skin.

A small amount of beta-sitosterol was applied to the tissue's surface as well as a sterile dressing. Patients were instructed to leave the dressing in place for 5 to 7 days to prevent scars from moving.

The first session of microneedling with PRP under topical anesthesia (lidocaine and prilocaine) was performed 3 weeks after dressing removal and every 4 weeks for 3 times total. Microneedling was done on both sides of their faces in a stamp-like manner.

The endpoint of the microneedling process was pinpoint bleeding. 2 ml of PRP were applied to the face. Three sessions of microneedling were performed at 4-week intervals. After ten minutes, the face was cleansed with pure water, and sunscreen cream was applied. Patients were advised to take precautions against sun exposure.

For each session, platelet-rich plasma was made using the double-spin method. A 10-mL syringe prefilled with acid-citrate-dextrose anti-coagulant was used to take out ten milliliters of autologous whole blood. The first centrifugation (soft spin) was run for five minutes at 1500 rpm.

The plasma layer and buffy coat were removed for additional centrifugation, and the red cell sediments were disposed of. A second centrifugation was run for ten minutes (hard spin) at 3000 rpm. After removing and discarding platelet-poor plasma (PPP), 1-2 mL of PRP solution was left behind [7].

Patients were followed up with clinical examination and photography, and evaluation of clinical response included extent of improvement and possible adverse effects. Clinical improvement assessed by Goodman and Baron's quantitative scale for acne scars, Number of boxcar and icepick scars on both sides, and patients' satisfaction utilizing a quartile rating system as follows: poor (less than 25% improvement), fair (25–50%), good (51–75% improvement), and excellent (more than 75% improvement) [8].

Statistical methods:

Statistical analysis was performed using GraphPad Prism version 8.0.2 (GraphPad Software, La Jolla, CA). Descriptive statistics for quantitative data were expressed in tables as the mean ± SD, while qualitative data were expressed as number and percentage. We checked the normality of continuous data using Shapiro Walk test. We used unpaired Student's t-test to compare between both sides, while Wilcoxon Signed-Rank Test was used to compare the result before and after treatment in each side. Chi square test was used to examine the differences between categorical variables. P-value was considered significant if < 0.05.

RESULTS

Mean age was 23.53 ± 3.85 years, with a range between 19 and 32 years. 46.7% of patients were females. The duration of the acne scar ranged between one to seven years with mean duration 3.07 ± 1.62 years (Table 1).

The mean baseline number of scars was almost equal and shows no statistically significant difference on the right and left sides, as follows: 5±2.32 and 4.29 ± 2.58 boxcars on the left and right sides, respectively, and 3.71±2.68 and 4±2.68 icepicks on the left and right sides, respectively. The left side showed a highly statistically significant difference when the endpoint treatment was compared to the baseline, with p-value = 0.002 (Table 2).

There was no statistically significant difference between before and after on the right side. In comparison, the left side has a statistically significant reduction in the number of scars (p-value = 0.039), as shown in (Table 2).

We found that there was a significant reduction in Goodman score of boxcar and icepick scars after treatment by punch elevation plus micro-needling on the left side, with p-value=0.002 and 0.0004 respectively; however, there was no significant difference on the right side before and after treatment. On the other hand, the punch-treated side shows a statistically significant difference when compared to the right side, with p-value = 0.002 as shown in (Table 3).

At baseline of treatment, regarding the boxcar scar, almost all patients had a Goodman score (3) on both sides, however after the endpoint of treatment, 12 (86 %) of patients shifted to Goodman score (1 and 2) on the side treated with punch elevation, however only 4 patients (28.6 %) right sided improved and shifted to grade (2) with significant p- value = 0.021 as shown in (Table 3).

As regarding to icepick scar, neither side's baseline grade of the Goodman score showed a statistically significant difference. At the start of treatment, nearly all patients with icepick scars had a Goodman score of (6), but 7 (100%) of them changed to Goodman scores of (1 and 2) on the side treated with punch elevation. Only 3 patients (50%) on the right improved and changed to grade (3) with a significant p-value of 0.017, as shown in (Table 4).

Patients expressed a higher rating and satisfaction for left side treated with punch elevation plus microneedling, with a significant p-value=0.009 as shown in (Table 5).

Transient early side effects such as erythema, edema, and bruises were noted equally after both techniques in all subjects with no significant difference; however, crusting was more on the left side and hyper-pigmentation was mostly on the right side, with significant p-value <0.001 and 0.004 respectively as shown in (Table 6). Figures (1 to 3) presented three of our cases.

Table (1): Demographic data of the patients.

Variables		Values (statistics measures)
Age (years)	Mean ± SD Range	23.53 ± 3.85 19-32
Sex (n,%)	Female	7 (46.7)
	Male	8 (53.3)
Duration of the scar (years)	Mean ± SD Range	3.07 ± 1.62 1-7
Skin photo type	II	3 (20.0)
	III	7 (46.7)
	IV	4 (26.7)
	V	1 (6.7)
Residence	Urban	5 (33.3)
	Rural	10 (66.7)

Data expressed as mean ± SD (range), frequency (percentage).

Table (2): Number of boxcar and icepick scars at baseline and after treatment.

		Left side	Right side	P- value
Boxcar scar	**Before**	5 ± 2.32	4.29 ± 2.58	0.449**
	After	2.43 ± 1.74	4.14 ± 2.38	**0.039****
	Mean difference	2.57 ± 2.53	0.14 ± 0.36	
	P-value	**0.002***	0.164*	
Icepick Scar	**Before**	3.7 1 ± 2.68	4 ± 2.68	0.855**
	After	1.43 ± 1.40	3.83 ± 2.32	**0.041****
	Mean difference	2.23 ± 1.60	0.17 ± 0.41	
	P-value	**0.009***	0.363*	

Data expressed as means ± SD. Student T test was used to compare the result between both sides, paired T-test was used to compare the result before and after treatment. * P. value between baseline and after treatment; ** P. value between right and left side

Table (3): Goodman score of boxcar and icepick scar at baseline and after treatment.

		Left side	Right side	P -value
Boxcar scar	Before	3.14 ± 0.86	3.07 ± 0.92	0.834**
	After	2.07 ± 0.47	2.93 ± 1.00	**0.007****
	Mean difference	1.07 ± 0.99	0.14 ± 0.36	
	P-value	**0.002***	0.165*	
Icepick Scar	Before	2.71 ±0.49	2.67 ±0.52	0.867**
	After	1.29 ± 0.49	2.50 ± 0.55	**0.001****
	Mean difference	1.43 ± 0.53	0.17 ± 0.41	
	P-value	**0.0004***	0.363*	

Data expressed as means ± SD. Student T test was used to compare the result between both sides, Marginal Homogeneity test (Stuart-Maxwell test) was used to compare the result before and after treatment. * P. value between baseline and after treatment; ** P. value between right and left side

Table (4): Comparison of Goodman score of boxcar and icepick scars on both sides.

			Left side	Right side	P- Value
Boxcar Scar	Baseline	(2)	1 (7.1)	2 (14.3)	0.828
		(3)	12 (85.7)	11 (78.6)	
		(6)	1 (7.1)	1 (7.1)	
	After	(1)	1 (7.1)	0 (0.0)	0.021*
		(2)	11 (78.6)	4 (28.6)	
		(3)	2 (14.3)	9 (64.3)	
		(6)	0 (0.0)	1 (7.1)	
Icepick Scar	Baseline	(3)	2 (28.6)	2 (33.3)	1.000
		(6)	5 (71.4)	4 (66.7)	
	After	(2)	5 (71.4)	0 (0.0)	0.017*
		(3)	2 (28.6)	3 (50.0)	
		(6)	0 (0.0)	3 (50.0)	

Data expressed as frequency (percentage). *p-value <0.05 was considered statistically significant

Table (5): Punch elevation versus microneedling plus PRP according to patients' satisfaction.

Patients' satisfaction	Left side	Right side	
Poor	0 (0.0)	6 (40.0)	0.009*
Fair	4 (26.7)	5 (33.3)	
Good	6 (40.0)	4 (26.7)	
excellent	5 (33.3)	0 (0.0)	

Data expressed as frequency (percentage). *p-value <0.05 was considered statistically significant

Table (6): Complication of punch elevation technique versus microneedling.

Complications	Punch elevation	Microneedling	P value
Edema	2 (13.3)	1 (6.7)	1.000
Erythema	4 (26.7)	1 (6.7)	0.327
Cobblestone	4 (26.7)	0(0.0)	0.172
Crusting	13 (86.7)	0 (0.0)	<0.001*
Hyperpigmentation	0 (0.0)	8 (53.3)	0.004*
Active acne	0 (0.0)	3 (20.0)	0.224

Data expressed as frequency (percentage). *p-value <0.05 was considered statistically significant.

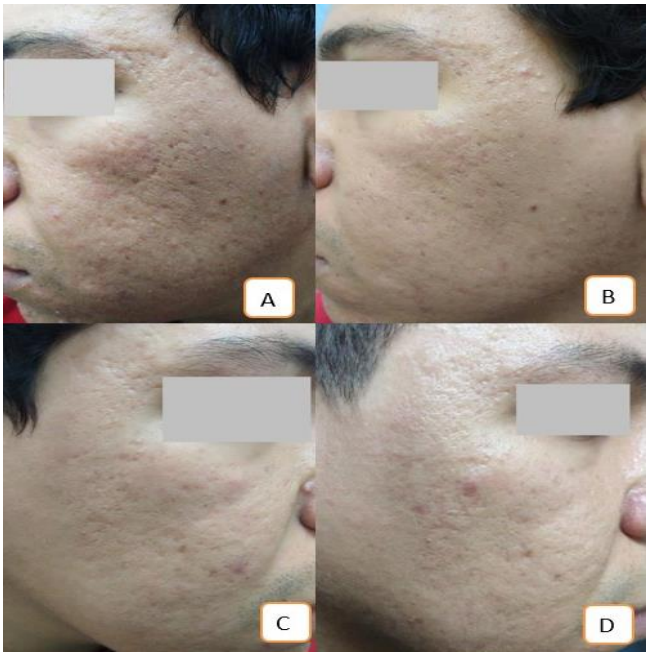

Figure (1): 30-year-old male patient presented with acne scars. The left side was treated by punch elevation and microneedling with PRP (A) at baseline, (B) after treatment), and the right side was treated by microneedling with PRP (C) at baseline, (D) after treatment).

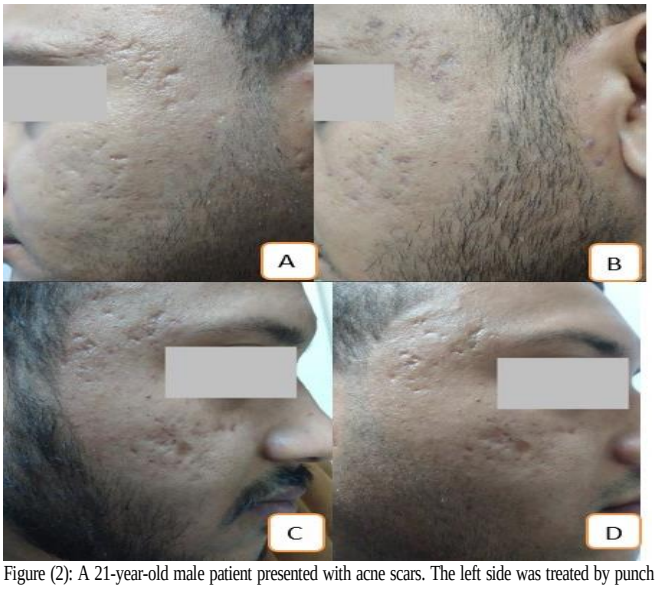

Figure (2): A 21-year-old male patient presented with acne scars. The left side was treated by punch elevation and microneedling with PRP [A] at baseline, [B] after treatment), and the right side was treated by microneedling with PRP [C] at baseline, [D] after treatment).

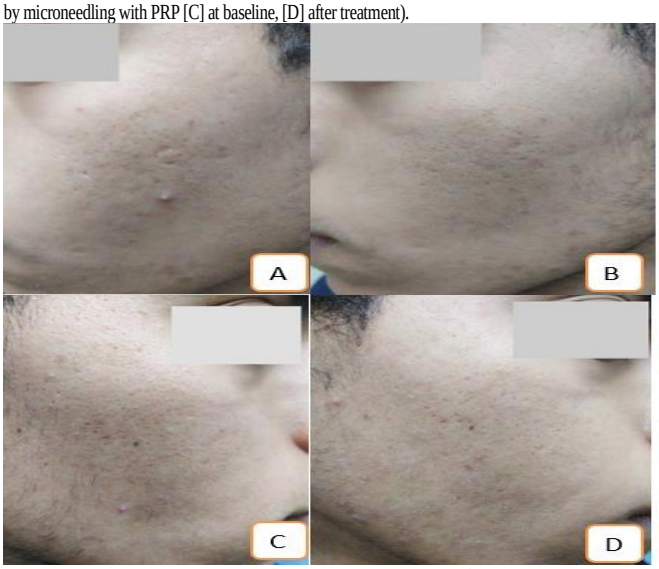

Figure (3): 22-year-old male patient presented with acne scars. The left side was treated by punch elevation and microneedling with PRP [A] at baseline, [B] after treatment), and the right side was treated by microneedling with PRP [C] at baseline, [D] after treatment).

DISCUSSION

In the current study, there were signs of improvement on the left side after the procedure. By comparing (punch elevation and microneedling and PRP vs. microneedling and PRP) there was a better improvement in the side treated with punch elevation and microneedling with PRP. We found that there was a significant reduction in Goodman score of boxcar and icepick scars after treatment by punch elevation plus microneedling on the left side.

As regards the efficacy of punch elevation, **Pereira *et al.*** conducted a clinical trial on two patients, a 16-year-old male patient and a 45-year-old female patient. Even though this kind of therapy is frequently difficult, the outcomes are good. Scar satisfaction was measured by patients only, not by a scar scoring system, and the study was assessed by comparing photos of the treated scar to the pretreatment scar. Our study shows satisfaction results based on Goodman score and a significantly larger number of cases [9]. **Khan *et al.*** evaluate the effectiveness of platelet rich plasma (PRP) and microneedling (MN) versus microneedling alone for the treatment of atrophic acne scars. Patients were divided into two groups: those in Group A got just microneedling therapy, while those in Group B also got PRP treatments in addition to microneedling. 45 (49.5%) patients in group A and 73 (80%) patients in group B showed improvement at the final follow-up appointment. After all follow-up was completed, 13 (52%) patients in Group A

with grade 3 and 4 scarring had changed one grade, while 12 (48%) patients showed no change. After four months in Group B, 18 (72%) of the patients with grade 3 and 4 scarring showed improvement of one grade, while 7 (28%) of the patients showed no change at all. Because we employed punch elevation in addition to microneedling and PRP rather than just microneedling and PRP, our results were higher than these results [10]. When **Nilforoushzadeh *et al.*** combined subcision with the Endolift, almost 90% of patients showed good to very good improvement, and the patients expressed good to very good satisfaction. Evaluation of the photographic data showed a 100% improvement in the topography, depth, and overall appearance of the acne scar. Prior to therapy, the average number of lesions was 25.5±12.1, however after treatment, it was down to 11.4±2.1. This study and ours are comparable, but ours has lower material and financial costs [11]. **Ishfaq *et al.*** conducted a comparative study that evaluated the improvement between microneedling and 35% chemical peeling with glycolic acid. Thirty patients were randomly assigned to one of two groups: Group A had microneedling every two weeks for a total of twelve weeks, whereas Group B had chemical peels every two weeks for the same duration. Two weeks following the last treatment session, the Goodman and Baron Scarring Grading System was used to determine the efficacy of acne scar treatment. In Group A, 73.33% of patients experienced treatment efficacy, compared to 33.33% in Group B. Besides saving time by using punch elevation before microneedling and adding PRP, our results were better than these two and also had less side effects, such as skin burn after chemical peeling [12]. Furthermore, ten patients with post-acne atrophic scars participated in a cross-sectional clinical study conducted by **Nada *et al.*** The patients received six microneedling sessions with topical Vitamin C spaced four weeks apart, along with topical vitamin C application every day in between the sessions. At the conclusion of the trial, two patients (20%) and six patients (60%) respectively achieved two grade reductions and one grade reduction in their Goodman and Baron qualitative grading scores [13]. Our results were higher than these two results because we used combined punch elevation with microneedling and PRP

Non-ablative laser therapy of acne scars produced positive outcomes. According to **Li B *et al.***, 121 patients underwent 206 fractional CO2 laser therapy sessions, with an average of 1.7 sessions. 50.4% of participants saw moderate to excellent improvement following the first session. Fractional CO2 laser treatment was found to be more effective in treating rolling scars than icepick scars [14]. Even though a skilled operator can control a laser to exact depth, the cost is high. Our study shows similar results and is less expensive.

The results of our study showed some adverse effects after punch elevation, such as immediate erythema, perilesional edema which was revealed within 3–7 days, crusting that lasted for 2–3 weeks, and cobblestone appearance. With the exception of temporary erythema, edema, and PIH, microneedling with PRP was well tolerated and did not appear to have any serious side effects. These findings corroborated those of **Saleh and Alkhayer,** who noted that patients receiving microneedling experienced transient erythema, bleeding, edema, or a serous oozing that resolved with crusting [15]**.**

Because of the small sample size and brief follow-up duration in our study, our findings might be limited. If the sample size is larger and the follow-up period is longer, the observed results can differ. It is recommended to monitor patients for an extended period of time in order to determine the highest rate of progress and perhaps any depressed scars have reappeared. It is also advised to carry out this procedure on a wide number of patients with various types of scars, including boxcar, icepick, and rolling scars.

Conclusion: The study's findings indicate that punch elevation is a simple, safe, and affordable procedure for treating post atrophic facial boxcar and icepick acne scars. When combined punch elevation with other procedures, such as microneedling and PRP, it yields better acne scar treatment outcomes than microneedling with PRP alone.

Clinical trial registration number: MSc/AZ.AST./DVA021/12/194/4/2021.

Funding support: We did not obtain any funding support for our work.

Conflicts of interest: We confirm that there is no conflict of interest.

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IJMA

International Journal of Medical Arts

Volume 7, Issue 2 (February 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780