

Subcision with and without suction for acne scars: A split-faced, rater-blinded randomized control trial

Victoria J. Shi

Northwestern University

Melissa S. Ma

Northwestern University

Eric Koza

Northwestern University

Misha Haq

Northwestern University

Areeba Ahmed

Northwestern University

Michael D. Yi

Northwestern University

McKenzie A. Dirr

Northwestern University

Noor Anvery

Northwestern University

Rachel E. Christensen

Northwestern University

Kapila Pagdhal

Northwestern University

Amelia Geisler

Northwestern University

Michael Nodzenski

Northwestern University

Wanjarus Roongpisuthipong

Northwestern University

Joaquin C. Brieva

Northwestern University

Brian A. Cahn

University of Illinois-Chicago College of Medicine

Simon S. Yoo

Northwestern University

Jennifer Lucas

Cleveland Clinic

Emily Poon

Northwestern University

Dennis P. West

Northwestern University

Douglas Fife

Vivida Dermatology

Murad Alam

m-alam@northwestern.edu

Northwestern University

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Abstract

Objectives: Therapeutic options for acne scars include subcision and suction with microdermabrasion, but these treatment modalities have not been studied in conjunction.

To compare effectiveness of subcision alone versus subcision with suction for the treatment of facial acne scars.

Methods: Randomized, split-faced, evaluator-blinded control trial. Participants underwent one subcision treatment on both sides of the face followed by 10 sessions of suction to one side. Photographs at baseline, 1-month, and 4-months were assessed. Primary outcome measures were the validated Acne Scar Severity Scale (ASSS) (0=no acne scarring, 4=severe), Acne Scar Improvement Grading Scale (ASIGS) (-100% to 100%), and modified Quantitative Global Scarring Grades (QGSG) (point-based questionnaire instrument), as well as subject preference.

Results: Twenty-eight treatment areas and 154 treatments were analyzed. Dermatologist raters found no differences between subcision alone and subcision-suction at 1-month or 4-months. Mean subject-assessed percent improvement for subcision-suction was higher than that for subcision alone at 1-month (37% versus 24%, $p=0.04$) but not at 4-months ($p=0.37$). Subjects preferred combination therapy to monotherapy at 1 month (50% vs 21%) and 4 months (43%, 21%).

Conclusions: While blinded raters did not detect significant differences, subjects perceived combination treatment as working more quickly than monotherapy, and preferred combination treatment at all time points.

Clinical trial registration: NCT01696513 on Clinicaltrials.gov

INTRODUCTION

Cutaneous scarring is an unwanted sequela of acne, more commonly seen in subjects with skin of color, particularly in those of Hispanic heritage [1, 2, 3]. Acne is typically classified on the basis of appearance and etiology. A proposed classification system by Jacob et al. stratifies the various acne scar types into three main groups: boxcar, ice-pick, and rolling acne [4]. Rolling scars are described as small depressions, typically up to 5mm in width, with a swelling appearance and superficial borders [4, 5]. They resemble minute gently undulating hills and valleys, without sharp or abrupt edges. Rolling scars are thought to result from abnormal fixation of the epidermis to the subcutis by fibrous band adhesions [5].

Currently, there are many treatment modalities available for rolling acne scars. Subcision is considered the standard of care for this specific acne scar type, and includes the insertion of a needle or blade into the subcutis to undermine and release the dermal and subdermal fibrous bands pulling scars down [5, 6]. Subcision has been proven to be efficacious, safe, and convenient, often requiring only a single treatment [5, 7]. Studies have also investigated the effects of subcision when used in combination with other therapeutic options, including injection of autologous fibroblasts [8], CO₂ laser [9], and suction by microdermabrasion [5]. From a mechanistic standpoint, suction is believed to mechanically shift the indented rolling scar, which has already been released from its moorings by prior subcision, so that it remodels in a more elevated plane.

Repeated suction treatments are thus potentially helpful in repeatedly repositioning the freed rolling scar, which gradually moves higher and higher, close to the level of the unscarred skin. One study done by Harandi et al. investigated the effects of suction on several types of acne scars, including rolling acne scars, beginning three days after subcision, and found great benefit [10]. Indeed, it is now believed that while subcision and suction may be particularly effective for treatment of rolling acne scars, they are also useful for the improvement of other types of acne scars.

While subcision and suction have been shown to be effective individually, and to some extent together, there are no randomized control trials that compare the benefits of combination therapy to monotherapy. Our pilot study compared the benefits of subcision with suction versus subcision alone on acne scar outcomes. We hypothesized that suction may modify skin healing after subcision, elevating depressed scars during remodeling to create a smoother skin contour.

MATERIALS AND METHODS

A parallel assignment, 1:1 split-faced, randomized evaluator-blinded trial was performed at Northwestern University, an urban academic center. This study was approved by the Northwestern University IRB (NU STU00066710) and registered with Clinicaltrials.gov (NCT01696513). Eligible participants were adults with bilateral acne scars. Excluded were those with oral isotretinoin use within 6 months and a history of hypertrophic scar or keloid formation. One staff-person consented patients (AG) and two elicited data at follow-up visits (EP, JS). Two study personnel (KP, DWh) administered treatments.

Subjects were randomized using a computerized random number generator to either: subcision alone to the left side of the face and subcision + suction to the right; or subcision alone to the right and subcision + suction to the left. Each subject received an initial subcision treatment to their bilateral facial acne scars: After local anesthetic injection, an 18-gauge needle with a flat sharp edge at its distal tip (NoKor, Becton Dickinson, Franklin Lakes, NJ) was inserted adjacent to each scar and rotated such that the blade was parallel to the skin surface with its sharp edge in the horizontal plane. Then the blade was moved back and forth, and side to side, immediately subdermally, scraping the underside of the dermis. On the same day, participants received an additional suction treatment to the side allocated to combination treatment, which was performed by passing a dermabrasion device back and forth across each scar multiple times.

Baseline digital photographs were taken prior to and immediately following subcision treatment. Subjects returned to receive daily suction treatments for two weeks, excluding weekends, for a total of 10 suction treatments. At follow-up on day 12, 1 month and 4 months from the initial visit, additional photographs as well as subject live-ratings of treatment areas were obtained.

Primary outcomes included patient and blinded dermatologist assessments, respectively, of scar treatment areas at baseline; and subject preference regarding which side they were happier with at 1 and 4 months. The two blinded dermatologist raters (WR, MN) based their assessments on photographs after the completion of the study while patient assessments were made live, in real time, with photographs from prior visits available to augment recall of previous acne scar appearance. Patients and both dermatology raters completed the 5-point Acne Scar Severity Scale (ASSS) [11] (0 = no acne scarring, 4 = severe acne scarring) at baseline, 1

month, and 4 months, and the Acne Scar Improvement Grading Scale (ASIGS), a scale from – 100% (representing 100% worsened) to 100% (representing 100% improved), at 1 month and 4 months. At baseline, 1 month, and 4 months, raters also completed the modified Quantitative Global Scarring Grades (QGSG) [12], a point-based questionnaire which accounts for number of lesions and severity of scarring (moderate or severe), with higher scores representing more severe acne scarring. Secondary outcomes included actively elicited adverse effects as reported by subjects, including induration, bruising, or edema at day 1, day 5, day 12, 1 month, and 4 months.

Statistical analysis was performed by study personnel at Northwestern University. Scores on the ASSS were analyzed using the Wilcoxon Signed-Rank test. Scores on the ASIGS and the modified QGSG were analyzed using paired t-tests. To identify a reduction in acne scarring from moderate (3) to mild (2) with a two-sided test, assuming a standard deviation of 1, a minimum of 18 subjects was required to be enrolled in the study, given an alpha of 0.05 and a power of 0.8.

RESULTS

154 treatments at 28 treatment sites were analyzed. A total of 18 patients were enrolled and 14 subjects completed the study (two were lost to follow up, one to non-compliance, and one to withdrawal). The majority of patients identified as female (64%), white (71%), and Hispanic or Latino (64%) (**Table 1**).

Among dermatologist raters, there were no differences between subcision alone and subcision-suction in percent improvement scores on the ASIGS, ASSS, or modified QGSG at 1-month or 4-months. On the ASIGS, dermatologist raters noted 16% improvement for subcision-suction treatment (95% CI [4.2, 27.9]) versus 24% improvement for subcision alone (95% CI [8.3, 38.9], $p = 0.07$) at 4 months (**Table 2**). Conversely, the mean patient-assessed percent improvement for subcision-suction on the ASIGS was significantly higher than that for subcision alone at 1-month (37% versus 23%, $p = 0.04$) but not at 4-months (42% versus 33%, $p = 0.37$; **Table 2**).

Both treatment arms were improved from baseline as assessed by mean dermatologist ASSS scores at 1-month and 4-months: at 4-months, there was a -0.64 difference in severity compared to baseline with subcision-suction treatment ($p = 0.03$) versus a -0.85 difference with subcision alone ($p = 0.02$, **Table 3**). Compared to baseline, mean patient-assessed ASSS scores were significantly improved at 1-month (-0.61, $p = 0.02$) and 4-months (-0.80, $p = 0.005$) for subcision alone, and 1-month (-0.89, $p = 0.004$) and 4-months (-0.96, $p = 0.002$) for subcision with suction.

The percentage of patients reporting induration, bruising, and edema at day 1, day 5, day 12, 1 month, and 4 months are reported in **Table 4**. The proportion of patients noting these adverse events was similar between the combination and monotherapy treatment groups. All adverse events resolved by 1 month, and resolution persisted at 4 months for both subcision alone and subcision with suction. Subjects preferred combination therapy to monotherapy at 12 days (36% preferred subcision-suction vs 7% preferred subcision alone), 1 month (50% vs 21%) and 4 months (43% vs 21%, **Table 5**).

DISCUSSION

According to both patients and dermatologist raters, although subcision and subcision with suction both led to improvement in the appearance of acne scars at 1 and 4-months compared to baseline, subcision with suction does not appear to provide a persistent improvement over that attainable by subcision alone. Patients, however, noted greater satisfaction with and preference for combination treatment at 1 and 4-months.

The proposed mechanism of the suction, which was thought to be useful to the extent that the repeated temporary lifting of the scar by negative pressure could facilitate remodeling of the scar in this position, appeared not to have a long-term effect. This may be because suctioning provided only a temporary benefit, which continued as long as the suction was ongoing but then regressed shortly after suctioning ended. For instance, it is possible that suction merely induces temporary edema through mechanical manipulation, and this swelling obscures acne scars for a brief interval. Alternatively, it is possible that suctioning may have indeed induced longer-term improvement in acne scars, but that this difference was not detectable after a period due to the growing effect of the subcision treatment. Specifically, once the scar elevating effects of subcision began to be evident a month or two after treatment, due to remodeling triggered by direct targeting of adhesions and organization of the serous fluid collection from needle trauma, the greater degree of improvement associated with subcision may have rendered the lesser improvement from suction no longer discernible. This interpretation assumes that subcision is markedly more effective than suction, that the scar reduction benefits of subcision manifest with a substantial delay, and that subcision alone provides most of the therapeutic effect. Indeed, Harandi et al. demonstrated the efficacy of combination treatment in those receiving suction treatments 3 days after subcision [10], which may suggest that suction's benefits precede those of subcision, although this study did not include a monotherapy comparator [10].

While only patients noted an improvement associated with suction, this should not be viewed as an indictment of that treatment, or as an indication that the noted difference was not real. Increasingly, it is evident that the paternalistic model of medicine, in which physicians decide whether and to what extent the patient is improved, is obsolete. Apart from being dismissive of patients' concerns, beliefs, and values, this approach overlooks that patients are generally highly motivated to preserve their own health and highly attuned to their bodies. To the extent that acne scars are visible and socially stigmatizing, this is even more true than it may be for other medical conditions. Unlike pathologic states that may be buried deep in other organ systems, acne scars are easy for patients to observe and monitor. It is highly unlikely that a rater who observed a photograph or a patient for a few moments would be as aware of therapy-induced minor changes in scarring as the patient themselves, who are bothered by their scars and see these in the mirror every morning. Of course, it is also possible that patients reported an improvement with suctioning due to an unconscious bias, such as a desire to please the investigator or an expectation that two treatments would work better than one [13]. A related issue is whether a short-term perceived improvement in the appearance of acne scars has value for patients even if the improvement, as in this case, is not perceived as persistent. This study was not designed to assess values, but it certainly seems possible that some patients may consider an incremental, transient improvement to nonetheless be of substantial benefit. Patient satisfaction has been shown to be multifactorial [14]. Future research may focus on whether this patient-perceived benefit is of sufficient magnitude that providers should consider combination treatment.

According to the literature, combination subcision-suction can mitigate various depressed scar types [10]. Additionally, subcision and suction are reported to be safe as both individual and combination treatments [5, 15]. In our study, both subcision alone and subcision-suction were associated with only transient unwanted effects, like erythema and edema, and both treatments showed detectable improvement in the appearance of scars within 1 month. As such, our findings confirm prior research, and demonstrate that combination treatment does not pose an increased risk for sustained adverse effects relative to monotherapy.

Limitations of our study include the modest sample size, although a split-face approach doubled the number of treatments to over a hundred. Since the majority of patients identified as white, generalizability may be limited. Another limitation is the inherently subjective nature of assessing improvement, although we attempted to mitigate rater bias with blinding.

CONCLUSION

While our study showed no significant lasting difference in improvement of acne scars between subcision alone as compared to subcision with suction, a temporary incremental benefit with the combined treatment was detected by patients. The study results may be useful for informing realistic patient expectations, thereby potentially also allowing patients to participate in decisions about their care. Those interested only in longer-term reduction of acne scars may prefer to receive subcision without suction.

Declarations

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Conflict of interest: The authors declare that they have no conflict of interest.

Ethics approval: All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was reviewed and approved by the Northwestern IRB (STU00066710).

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Tables

Table 1. Demographic factors of patients completing the study

Total patients	14
Age, Mean (SD)	33 (7.96)
Sex, No. (%)	
Male	5 (36)
Female	9 (64)
Race, No. (%)	
Asian	1 (7)
Black/African American	1 (7)
White/Caucasian	10 (71)
Other	2 (14)
Ethnicity, No. (%)	
Hispanic or Latino	9 (64)
Not Hispanic or Latino	3 (21)
Other	2 (14)

Table 2. Dermatologist and/or patient scores on ASIGS, ASSS, and Modified QGSG associated with subcision and subcision-suction at baseline, 1-month and 4-months.

Percent Improvement Scores from Acne Scar Improvement Grading Scale						
Rater	Treatment	Mean Baseline (SD) [†]	Mean % improvement, (SD) 1-month	p-value 1-month [‡]	Mean % improvement, (SD) 4-month	p-value 4-month [‡]
Dermatologists	Subcision	-	17.50 (19.39)	0.81	23.57 (29.18)	0.07
	Subcision-suction	-	16.43 (17.48)		16.07 (22.63)	
Patients	Subcision	-	23.30 (29.65)	0.04	33.04 (29.26)	0.37
	Subcision-suction	-	37.05 (23.32)		42.32 (24.09)	
Acne Scarring Severity Scores						
Dermatologists	Subcision	2.64 (0.75)	2.21 (0.89)	1.0	1.79 (0.98)	0.57
	Subcision-suction	2.57 (1.02)	2.14 (0.77)		1.93 (1.0)	
Patients	Subcision	2.82 (0.67)	2.21 (0.67)	0.73	2.02 (0.56)	1.0
	Subcision-suction	3.00 (0.68)	2.11 (0.63)		2.04 (0.69)	
Modified Quantitative Global Scarring Scores						
Dermatologists	Subcision	6.71 (1.86)	6.43 (2.59)	0.64	6.43 (2.56)	0.21
	Subcision-suction	6.50 (1.91)	6.21 (2.01)		5.86 (2.28)	

[†]Percent Improvement Scores did not collect baseline mean improvement

[‡]p-value compares subcision vs subcision-suction

Table 3. Dermatologist and/or patient scores on ASSS and Modified QGSG associated with subcision and subcision-suction at baseline, 1-month and 4-months, and difference between 1-month and 4-month scores compared to baseline.

Acne Scar Severity Scores								
Rater	Treatment	Mean, (SD)	Mean, (SD)	Δ,	p- value [†]	Mean, (SD)	Δ,	p- value [†]
		Baseline	1- Month	Baseline to 1- Month	1- Month	4- Months	Baseline to 4- Months	4- Months
Dermatologist	Subcision	2.64 (0.75)	2.21 (0.89)	-0.43	0.07	1.79 (0.98)	-0.85	0.02
	Subcision- suction	2.57 (1.02)	2.14 (0.77)	-0.43	0.07	1.93 (1.00)	-0.64	0.03
Patients	Subcision	2.82 (0.67)	2.21 (0.67)	-0.61	0.02	2.02 (0.56)	-0.80	0.005
	Subcision- suction	3.00 (0.68)	2.11 (0.63)	-0.89	0.004	2.04 (0.69)	-0.96	0.002
Modified Quantitative Global Scarring Scores								
Dermatologist	Subcision	6.71 (1.86)	6.43 (2.59)	-0.28	0.34	6.43 (2.56)	-0.28	0.51
	Subcision- suction	6.50 (1.91)	6.21 (2.01)	-0.29	0.04	5.86 (2.28)	-0.64	0.06

[†]p-values are compared to baseline mean scores.

Table 4. Patient reported side effects of subcision and subcision-suction at various time points.

Side Effects		Day 1		Day 5		Day 12		1-Month		4-Months	
		No.	%	No.	%	No.	%	No.	%	No.	%
Induration	Subcision	13	93	5	36	1	7	0	0	0	0
	Subcision + Suction	13	93	6	43	2	14	0	0	0	0
Bruising	Subcision	12	86	14	100	5	36	0	0	0	0
	Subcision + Suction	13	93	14	100	5	36	0	0	0	0
Edema	Subcision	14	100	10	71	0	0	0	0	0	0
	Subcision + Suction	14	100	10	71	1	7	0	0	0	0

Table 5. Percentage of patients preferring subcision, subcision-suction, both equally, or neither at 12 days, 1-month, and 4-months.

Subject Preference	Day 12		1-Month		4-Months	
	No.	%	No.	%	No.	%
Subcision	1	7	3	21	3	21
Subcision + Suction	5	36	7	50	6	43
Both [†]	3	21	3	21	5	36
Neither [‡]	1	7	1	7	0	0
Did Not Answer	4	29	0	0	0	0

[†]Percentage of patients equally satisfied with monotherapy and combination therapy

[‡]Percentage of patients not satisfied with either monotherapy or combination therapy