

“A Comparative Analysis of Microneedling and TCA CROSS For Management of Atrophic Acne Scars”

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Abstract

Original Research Article

Title -“A comparative analysis of microneedling and TCA CROSS for management of atrophic acne scars”

Background: Acne is a disorder of pilosebaceous unit which can lead to scarring, commonly seen on face. It is emotionally and psychologically distressing to the patients. Both microneedling and TCA CROSS are commonly used office procedures to treat acne scars and both work on principle of collagen remodelling. While microneedling and TCA cross is widely being performed on Indian skin for various indications, there is a paucity of published literature comparing the safety and effectiveness of these two techniques specifically for acne scars in Indian patients. **Objective:** To compare the safety and effectiveness of microneedling and TCA CROSS (trichloroacetic acid chemical reconstruction of skin scars) in atrophic acne scar in Indian subjects. **Materials and method:** Fifty participants were randomly divided using closed envelope method in two equal groups of 25 patients each; group A underwent three sessions of microneedling (at 4 week interval) and group B underwent three sessions of TCA CROSS (at 4 week interval). **Results:** On quantitative assessment there was a constant per cent decrease in mean acne scar score (Goodman and baron) in both the groups but the decrease in group B was more as compared to group A. On qualitative assessment group B was found to be better than group A. However, subjective satisfaction in group A patients was more compared to group B. **Conclusions:** Microneedling and TCA CROSS were safe and effective in treatment of acne scars.

Keywords: Microneedling, TCA CROSS, comparison, effectiveness, atrophic acne scars.

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INTRODUCTION

Acne is a polymorphic disorder which presents with a series of diverse lesions such as comedones, pustules, papules, nodules, cysts, sinuses and scars [1]. A scar is a fibrous tissue replacement that develops as a consequence of healing at the site of a prior injury [2]. Scarring is the most concerning unremitting sequelae of acne that can be emotionally and psychologically distressing to patients [3, 4]. Two types of acne scars are broadly categorized either as a result of increased tissue formation (keloids and hypertrophic scars) or due to loss or damage of tissue (atrophic scars) [5]. Atrophic scars are further classified on the basis of their appearance as ice-pick, boxcar and rolled-over scars. Rather than fading with time, the appearance of scars often worsens with normal aging or photodamage[6].

There are a number of procedures for improving and correcting acne scars ranging from

simpler and cheaper to tedious and expensive treatment methods. These include surgical techniques, resurfacing techniques and soft tissue augmentation each is best suited to a particular type of acne scar, and has its own risks and benefits. The effective treatment of facial acne scarring at low costs presents a major challenge.

Adityan *et al.* [7] found that there was a high incidence of acne scarring (39.5%) in India [7]. This generates our interest in studying two widely known cost effective procedures micro-needling and TCA cross (trichloroacetic acid) in Indian patients. So in this study we are comparing the effectiveness and safety of both above mentioned procedures in Indian population.

PATIENTS AND METHOD

This was a prospective, randomized, interventional study comparing the effectiveness of Microneedling and 100% concentrated TCA CROSS in the treatment of atrophic acne scars. The study was

conducted in Department of Dermatology, Venereology and Leprology, SMS Medical College and Attached Hospitals, Jaipur during 1 year period, after the approval by the institutional research board and ethical committee.

Fifty patients with moderate to severe type of acne scars were enrolled in the study. Exclusion criteria were systemic retinoid or immunosuppressive drug intake during the previous 6 months, coagulation defects, evidence or history of keloid scars, pregnancy or lactation, unrealistic expectations, active infection, pre-existing inflammatory dermatoses, moderate to severe active acne lesions, allergy to local anaesthetics and history of photosensitivity.

Participants were randomly allocated into two treatment groups using sealed envelope method. Group A (25 patients) underwent Microneedling and group B (25 patients) underwent TCA CROSS. Each patient received three sessions of treatment at 4-week intervals. Blinding could not be possible in our study as both procedures were different and easily noticeable.

Group A (Microneedling)

After cleaning the face, local anaesthetic cream (eutectic mixture of prilocaine and lignocaine) was applied under occlusion for 1 hour before the procedure. Patients were treated using the sterilised needling tool (DNS Microneedling Biogenesis London) which consists of total 192 needles of 1.5mm length and 0.25mm diameter in a cylindrical assembly. The treatment was then performed by rolling the needling tool with moderate pressure over the areas affected by acne scars five times in the four directions (vertical, horizontal, and diagonal). In patients with deep scars, skin was stretched perpendicular to the Microneedling movement to reach the base of the scar. After achieving pin point bleeding wet gauze swabs were used to soak up any oozing. Ice packs were used throughout the procedure to minimize pain.

Group B (100% TCA CROSS)

First the skin was cleaned well and degreased with acetone. Skin was stretched to reach the bottom of the scar and 100% unbuffered TCA weight/volume was focally applied by pressing hard on the entire depressed area of atrophic acne scars using a pointed applicator. Skin was kept stretched and monitored carefully until a 'frosted' appearance was seen. After each session, all patients were instructed to minimize sun exposure and to apply sunscreen daily with a sun protection factor of 15 or more. Patients were asked to avoid disturbing the crusts formed after the procedure.

The main outcome measures were overall acne scar severity score (using Goodman and baron's [8, 9] qualitative and quantitative scarring score), subjective response to treatment and side effects. Digital colour facial photographs were taken using a Sony Cyber-shot

digital camera (DSC-W50, Sony Corp, Tokyo, Japan). Left and right profile views were obtained at baseline, during follow-up at each visit, and at the end of follow-up (4 weeks after the last session). Independent observer evaluated clinical response to treatment for each patient 4 weeks after the last session by comparing pre-treatment and post-treatment photographs. Any side effects observed were recorded at each treatment session and follow-up visit.

STATISTICAL ANALYSIS

Statistical analysis was performed using Microsoft excel and premier software. The Categorical data were presented as proportions and were compared among groups using Chi square test. Groups compared for demographic data were presented as mean and standard deviation and compared by using student t-test. Probability P value <0.05 was considered statistically significant.

RESULTS

Both the Groups were comparable on baseline demographic characteristics (Table 1). Prior to the treatment Mean acne scar score in group A was 19.56 ± 7.177 and in group B was 20.24 ± 6.359 (P-value 0.7245). There was no significant difference in the pre-treatment scores between two groups (P >0.05) thus confirming that the groups were comparable.

On quantitative assessment both groups showed a constant decrease in the mean scar score as compared to the baseline scores (Figure 1). After 2nd and 3rd sitting there was statistically significant percentage mean decrease in acne scar score in group B as compared to group A (Table 2).

On qualitative assessment there was improvement in grades in both the groups after 1st and 2nd session but, it was statistically insignificant (Table 3). However, at final follow up group B (TCA cross) showed more improvement in grades as compared to group A (micro needling) with a significant P value of 0.041.

On comparing pre and post treatment photographs by an independent observer, marked i.e. > 75 % improvement to treatment was noted in 16% patients in group A (microneedling) and 24% patients in group B (TCA cross). Moderate i.e. 50-75% degree of improvement was found in 48% patients in group A (Microneedling) and 60% patients in group B (TCA cross) while mild i.e. 25-50% improvement was found in 36% patient in group A (microneedling) and 16% in group B (TCA cross) (Figure-2,3,4).

Subjective response of patients was moderate (50- 75%) in 60% cases of Group A and 52% cases of Group B at the end of treatment, whereas marked improvement (> 75%) was reported by 24% patients in

Group A and 16% patients in Group B. None of the patients reported no change or worsening from baseline status.

Pain during the procedure was noted in all patients in group B. Also, erythema and edema was observed in all patients in both group A and group B immediately after treatment which subsided within few days. Post procedure hyperpigmentation was observed

in 17 (68%) subjects of group B (TCA cross) and 2(8%) subjects of group A (microneedling). In group B (TCA cross) hyperpigmentation was focal (Figure5) while in micro-needling group diffuse pigmentation was seen. Also, 2(8%) subjects in group B (TCA cross) were seen to have hypopigmentation at final follow up. Group A subjects reported mean downtime of 3.04 ± 0.735 days while, group B patients reported mean downtime of 8.04 ± 1.72 days.

Table-1: Baseline characteristics of two groups with no significant difference on P value showing groups were comparable.

	Group A	Group B	P-value
Mean age	24.52 ± 4.283	23.96 ± 4.267	>0.05
Sex			
Female	6	7	>0.05
Male	19	18	
Mean duration of scars	2.56 ± 1.7	2.40 ± 1.68	>0.05
Fitzpatrick skin type			
Type 3	3	4	>0.05
Type 4	17	17	
Type 5	5	4	
Baseline acne scar score	19.56 ± 7.177	20.24 ± 6.359	>0.05

Table-2: % improvement in mean decrease in acne scar score according to quantitative scale (Goodman and Baron)

Percentage improvement	GROUP A (MICRONEEDLING)			GROUP B (TCA CROSS)			P-Value
	N	Mean	SD	N	Mean	SD	
% improvement after 1st session	25	-11.66	10.24	25	-13.34	8.31	0.526 NS
% improvement after 2 nd session	25	-19.28	9.93	25	-24.94	7.99	0.03 S
% improvement after 3 rd session	25	-22	9.95	25	-32.68	9.59	<0.001S

Table-3: Qualitative assessment of improvement (using Goodman and Baron qualitative scaling) of acne scars in both the group.

QUALITATIVE SCORING	GROUP A		GROUP B		GROUP A		GROUP B		GROUP A		GROUP B		GROUP A		GROUP B	
	AT BASELINE				AFTER 1 ST SESSION				AFTER 2 ND SESSION				AFTER 3 RD SESSION			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2	0	0	0	0	2	8	3	12	3	12	8	32	4	16	10	40
3	6	24	9	36	6	24	9	36	10	40	11	44	11	44	12	48
4	19	76	16	64	17	68	13	52	12	48	6	24	10	40	3	12
Total	25	100	25	100	25	100	25	100	25	100	25	100	25	100	25	100
P Value	0.53NS				0.513NS				0.115NS				0.041S			

DISCUSSION

Acne is caused and characterized by multiple factors including Propionibacterium acnes activity, increased sebum production, androgenic stimulation, follicular hypercornification, cellular inflammatory response, and cytokine activation. Acne scars originate at the site of tissue injury and progresses through three stages of Inflammation, Granulation tissue formation and Matrix remodelling [10].

Skin microneedling also known as percutaneous collagen induction, is a procedure in which thousands of microclefs are created through the

epidermis into the papillary dermis via a needling tool. These tiny wounds in the papillary dermis create a confluent zone of superficial bleeding stimulating a normal process of wound healing with release of several growth factors that stimulate the migration and proliferation of fibroblast and promote collagen deposition [11].

Chemical reconstruction of skin scars (CROSS) is a technique consisting of focal application of high concentration trichloroacetic acid (TCA) on acne scars. Many investigators have observed that the clinical effects of TCA were due to both a re-

organization in dermal structural elements and an increase in dermal volume as a result of an increase in collagen content, glycosaminoglycan, and elastin [12]. Dermal collagen remodelling after TCA CROSS may continue for several months [13].

While microneedling and TCA cross is widely being performed on Indian skin for various indications, there is a paucity of published literature comparing the safety and effectiveness of these two techniques specifically for acne scars in Indian patients.

In our study, each patient in both the groups showed a constant decrease in the mean scar score as compared to the baseline scores which indicated that repeated collagen induction may improve the scars further with more sittings. On comparing both the groups in our study greater decrease in mean acne scar score was seen in group B (TCA CROSS) as compared to group A (microneedling).

On qualitative assessment we observed that number of patients with severe grade scars at baseline decreased on final follow up in both the groups (Table 3). However, the decrease was more in group B (TCA CROSS). This was in accordance with the previous study conducted by Lee *et al.* [14] who reported that TCA CROSS was very effective in treating severe acne scars (ice-pick scars).

Puri *et al.* [15] on photographic assessment reported, marked improvement in 40% patients in the microneedling group and in 60% patients in the CROSS group. Moderate improvement was seen in 40% patients in microneedling group and in 26.6% patients in the CROSS group and mild improvement was seen in 20% patients in microneedling group and 13.3% patients in the CROSS group, after four sessions of microneedling and TCA CROSS each. Photographic assessment by independent observers in our study also showed significantly better improvement in group B (TCA CROSS). None of the patient in our study reported poor response to treatment.

Though scar score and photographic assessment showed significantly better results in group B (TCA CROSS) but paradoxically patient satisfaction was more in microneedling group. This could be well explained by the fact that along with decrease in acne scar of lesser severity (rolling and boxcars as described by Leheta *et al.* [16]), microneedling also rejuvenate the facial skin which increased the satisfaction level of patients. While in group B (TCA CROSS) trichloroacetic acid was focally applied on acne scars, in microneedling the procedure was uniformly performed over all the areas affected with scarring. This leads to a significant improvement in overall skin texture and tone. Also post procedural pigmentation was seen more in TCA CROSS group. Hence, group A (microneedling) patient's perceived greater

improvement than group B (TCA CROSS) patients. Neither the patients nor the observer graded the response as No change (0% improvement) or Worsening of pre- intervention status after final session.

Leheta *et al.* [16] reported post-inflammatory hyperpigmentation in 6 (50%) patients out of 12 patient in TCA cross group. Of these three patients belonged to skin type III and rest to skin type IV. In our study, in group B (TCA CROSS) 17 (68%) out of 25 patients had focal hyperpigmentation as post procedure side effect. Of these 14 (56%) patients had skin type ≥ 4 . More number of patients in our study developed hyperpigmentation. This could be due to the fact that patients of skin type IV and V has higher chances of developing hyperpigmentation as compared to type III.

The observation of significantly higher downtime in TCA CROSS group were similar to Leheta *et al.* [16] study where the mean downtime of TCA CROSS and microneedling was 9.6 ± 3.1 and 3.77 ± 1.0 days respectively. Group B (TCA CROSS) patient remain in cosmetic discomfort for longer duration post procedure due to crusting after TCA application.

CONCLUSION

Thus to conclude both microneedling and TCA CROSS are safe and effective in the treatment of post acne scarring. TCA CROSS was more effective in decreasing acne scar score both qualitative and quantitative compared to microneedling while patient satisfaction was found to be better in microneedling group. Microneedling was associated with discomfort during the procedure due to pain while, post procedural hyperpigmentation was more with TCA CROSS.

RECOMMENDATION

Advantage of TCA CROSS is that it works better in severe grade of acne scars while microneedling leads to complete facial rejuvenation along with improvement in mild to moderate grade of acne scars. Disadvantage of TCA CROSS is the pigmentary abnormalities while microneedling is relatively free of side effects except pain during the procedure which relatively subsided with use of local anaesthesia before the procedure. So, we suggest microneedling should be done first to cover the less severe scars and for facial rejuvenation and later, TCA CROSS should be done for left out severe scars. Combining both the procedures may lead to better results with lesser side effects. Hence, further studies are required to assess the effectiveness of Microneedling-TCA CROSS as combination modality for acne scars.

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