Original Article

Treatment Of Post Acne Atrophic Scars With Local Application Of 35% Trichloroacetic Acid (Tca)

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Abstract

Introduction: Post acne scarring affects nearly half of acne patients at one point in their lifetime and may cause permanent cosmetic deformity.

Methods and Materials: This case series was conducted at the department of dermatology, Abbasi Shaheed Hospital, Karachi**,** Pakistan for a period of 07 months from June 2011 to January 2012. A total of sixty five patients having facial post acne scarring were included in the study. This study was conducted to evaluate the efficacy of local application of 35% trichloroacetic acid (TCA) for the treatment of post acne atrophic scars.

Results: A total of 65 patients from both genders were included in this study. Majority of the subjects were females. The mean age of our subject was 26.5 years In our study there were 49.2% Icepick scars, 18.5% boxcar scars and 32.3% rolling scars. Forty percent of post acne scars were 2 to 3 mm found in, 32% 3 to 5 mm 18% scars were more than 5 mm. The PASASI score reduced more than 50% after treatment in 61% of our subjects.

Conclusion: Local application of trichloroacetic acid at 35% concentration is safe and effective in treatment of acne scars.

KEY WORDS: Trichloroacetic acid, atrophic, acne, scars,

INTRODUCTION

Acne vulgaris is a chronic inflammation of the pilo-sebaceous gland which may be due to either increase sebum production, modified keratinization or infection with Propionibacterium acnes. The chronic inflammatory reaction leads to development of a lesion that is progressive. It is most commonly seen at puberty, as hormonal changes affect pilo-sebaceous secretions, but can affect any age group. Scar contraction occurs during the maturation. The surface layers of dermis are pulled which leads to skin indentation, which causes the formation of atrophic scars. Atrophic scars are the most frequently seen form of post acne scarring.[1]

Scarring secondary to acne vulgaris is frequently seen in clinical practice.[2] About half of the patients with acne develop permanent acne scars before the age of 45 years.[3] This scarring reduces patient's self esteem and has a severe impact in social life of the patient. [4] The European acne group (ECCA) has classified post-acne scarring into 3 distinct categories;[5]

1. V-shaped (icepick)
2. U-shaped (boxcar)
3. W-shaped (rolling)

Treatment of post acne scarring is challenging and treatment needs to be tailored to individual's needs. With the advancement of scientific knowledge, there has been significant advances in the understanding of the pathophysiology of post-acne scarring has led to the development of different treatment techniques like surgical techniques, resurfacing techniques, microderm-abrasion, lasers and fillers etc.[6-7] Resurfacing techniques are Chemical Reconstruction of Skin Scars (CROSS) , Intense Pulsed Light (IPL), non-ablative lasers, pulse dye laser, blue light therapy, nd YAG laser, Photodynamic Therapy (PDT) and micro needling therapy that are using recently for the treatment of postacne scaring.[8-10] These treatments induce neocollagenosis, which restores the to restore the normal skin contour.[9] The CROSS is a novel method in which one can use various topical agents such as trichloroacetic acid, glycolic acid, and phenol in different concentrations on post acne scarring for treatment.

Trichloroacetic acid (TCA) application to the affected dermal region leads to necrosis of the epidermis, on a cellular level. In addition to this, it causes degradation of collagen in the reticular and papillary Brodland et al reported that application of TCA to porcine skin lead to dermal necrosis in upto 80% of skin depth. [11] There is a lack of regional literature with regards to the histologic effects of acne scars treated with high-concentration TCA and CROSS using TCA. So, we are unable to know the response of TCA on skin of Pakistani people. Outside of Pakistan, most of the dermatologists have used TCA in CROSS because it produces increased dermal thickening and collagen volume and got satisfactory results with the CROSS method in a study published outside Pakistan.[14-15]

Risk of complications becomes increase with higher concentrations of TCA.[16-17] So, we used lower concentration of TCA that is 35% and that has been used in another study on treatment of facial post acne scarring and the efficacy was found to be 60%.[18] If it is found to be effective then this cheap technique can be used in cases of post acne atrophic scarring in future.

MATERIAL AND METHODS

It is was a quasi-experimental study conducted at Department of Dermatology, Abbasi Shaheed Hospital, Karachi**,** from 10-06-2011 to 09-01-2012

Sample Size:

The sample size was calculated using OpenEpi sample size calculator, with the forumula mentioned below;

Sample Size for Frequency in a Population

Population size(for finite population correction factor or fpc)(N): 1000000

Hypothesized % frequency of outcome factor in the population (p): 60%+/-12

Confidence limits as % of 100(absolute +/- %)(d): 12%

Design effect (for cluster surveys-DEFF): 1

Sample Size(n) for Various Confidence Levels

Confidence Level(%)	Sample Size
95%	65
80%	28
90%	46
97%	79
99%	111
99.9%	181
99.99%	253

Equation

Sample size $\mathbf{n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]}$

The sample size came out to be 65. We used non-probability consecutive sampling technique for recruitment of study participants.

Sample Selection

Inclusion Criteria:

1. Patients of either gender irrespective of age.
2. Patients having atrophic acne scars of >2mm in size on face for the last 1 year in duration.
3. Patients having no active acne lesion.

Exclusion Criteria:

1. Patients having history of hypertrophic scarring, keloids, skin allergies, or herpes simplex infection.
2. Patients having active acne lesions.
3. Patients having hypertrophic type of acne scarring.
4. Patients having history of skin burn.
5. Patients allergic to Tri chloroacetic acid.

Operational Definitions

Efficacy of the treatments was be assessed by calculating pre and post treatment Post-Acne Scarring Area Severity Index (PASASI) score as follows.
Table 1: Scoring method of the severity of the lesions in terms of nature and size of the scars.

Criterion	**Score**		
	1	2	3
Nature	Icepick (V shaped)	Boxcar (U shaped)	Rolling (W shaped)
Size	<2 mm	2-5 mm	>5 mm

The **individual lesion score** was defined as the score of the lesion for nature multiplied by its score for size, while the total score for any particular case is the sum of the individual scores of all the lesions in this patient.[14]

Improvement is calculated as (PASASI score):

$$\text{Patient's total initial score} - \frac{\text{Patient's total score after treatment}}{\text{Patient's total initial score}} \times 100 = \text{PASASI Score}$$

The degree of improvement was defined as follows:

No response	0%
Weak response	<15%
Fair response	15-30%
Satisfactory	31-50%
Very good response	>50% from the base line

So, improvement in post acne scarring was assessed by PASASI score. Very good response was considered > 50% and then treatment was taken as effective.

Conduct of Procedure and Intervention:

After permission from institutional ethical committee, the study was carried out. Patients were selected from Out Patient Department (OPD) of Dermatology Department of Abbasi Shaheed Hospital, Karachi. Patients having facial post acne scarring were included in the study. After briefing the merits and demerits of the treatments to the patient, a formal informed consent was taken and proforma was filled by the patient for the collection of baseline data. All patients underwent a facial wash with soap and cleansing of face with alcohol swabs. Then 30% TCA was focally applied by using a sharpened wooden applicator. After chemical reconstruction of skin scars (CROSS), we applied a topical antibiotic ointment. All the patients were advised to use a sunscreen daily. CROSS was repeated after every months on out-patient basis. This treatment was continued for a period of seven months and final outcome was measured after last session.

Proforma was used to documents the response of post acne scarring after completion of the treatment. Initial clinical evaluation was carried out by PASASI score before and after treatment for the purpose of comparison and objective evaluation of the outcomes.

Data Analysis:

We used SPSS version 10 for data analysis. Descriptive statistics like frequency and percentage was computed for gender, severity and efficacy of the treatment. Mean and standard deviation was computed for quantitative variable like age and duration of disease. Effect modifiers were controlled through stratification age, gender, duration and severity of disease.

RESULTS

In this study there were sixty five patients between 18 to 65 years of age, with a mean age of 26.56±5.09 years. There were 6 (9.2%), 42 (64.6%) and 17 (26.2%) patients in the age groups of less than 20 years, 20 to 30 years and more than 30 years.

Out of sixty five patients there 34 (52.3%) females and 31 (47.7%) males. As for the type of post acne scars, 49.2% (n=32) were icepick scars, 18.5% (n= 12) were boxcar scars and 32.3% (n=21) were rolling scars respectively.

Post-acne scar size was 2 to 3 mm in 40% (n=26), 3 to 5 mm in 32.3% (n=21) and greater than 5 mm in 27.7% (n=18) subjects. The mean duration of post-acne scarring was 2.29 ± 1.36 years with the minimum duration of one year and the maximum duration was of 5 years.

Pre and post acne scarring PASASI sores were 43.07±20.90 and 22.10±12.07 respectively. On comparison there was a significant difference between the two ($p< 0.001$). There was a significant reduction in PASASI score post treatment in 61.10% (n=40) subjects. The efficacy among various type of post acne scars was observed in 21 (52.5%), 4 (10%) and 15 (37.5%) in icepick, boxcar and rolling respectively.

In patients with duration of post acne scarring of ≤1 years the efficacy was observed in 25 (62.5%), in patients with duration of disease between 2 to 3 years the efficacy was observed in 10 (25%) and in patients with duration of disease 4 to 5 years the efficacy was observed in 5 (12.5%).

In patients with size of post acne scarring of <2 mm, 2 to 5 mm and more than 5 mm the efficacy was noted in 17 (42.5%), 13 (32.5%) and 10 (25%) respectively.

In patients with PASASI scores of <30, 30 to 60 and 61 to 90, the efficacy was observed in 22 (55%), 12 (30%) and 6 (15%) patients respectively.

DISCUSSION

Acne's most common complication is the atrophic scars which have been recognized as a persistent, disfiguring problem. Successful treatment of post-acne scarring requires a greater understanding of the pathogenic mechanisms, variations amongst the affected patients, the mediators of the inflammatory response and the immune mechanism leading to formation of scars. The treatment of post-acne scars has evolved over the years and varies from invasive to noninvasive techniques. The noninvasive techniques include peeling, skin fillers and topical tretinoins. The invasive techniques include dermabrasion, punch grafting, subcision, surgical excision, laser skin resurfacing and punch elevation.

The TCA has been used to render histological and cosmetic improvement in the skin and is very effective in medium depth scars.[12, 21-23] TCA application precipitates the proteins and cause coagulative necrosis of the collagen in papillary and reticular dermis.[12,13] It takes a few days for the necrotic layer to slough off and re-epithelization of the skin.[22] The collagen remodeling of the dermis requires several months.

TCA acts by increasing the dermal volume by increasing collagen content and reorganization of the dermal structural elements.[11,24,25] Reticular dermis in acne heals with scarring and peeling with higher doses of TCA is not recommended as it can cause permanent scarring.[26] The effect of TCA for acne scar treatment in dark skinned population has not been studied in detail and our experience is limited in this regard.[27,28] Hyperpigmentation is commonly seen in dark skinned population after any invasive dermatological procedure.[27] Focal application of higher concentration of TCA with help of wooden spatula, using a "pressure application" method can minimize the incidence of post procedural scarring and hyperpigmentation.[18]

Chemical reconstruction of skin scars (CROSS) produces "frosted white spots" on acne scars. CROSS method with 65-100% TCAs can reconstruct acne scars by dermal regeneration and collagen production. This effect disappears at TCA concentration below 65%.[25] The helaing is swift and has a significantly lower rate of complications than conventional technique because it spares the adjacent normal structures. This technique has limitations as it can't be used for classical "full face chemical reconstruction" but is only effective for focal scars treatment. The authors have been successfully using this technique for last few years with excellent results.

The present study was conducted for the evaluation of the efficacy of a local application of 35% TCA for the treatment of atrophic acne scars. Most of the dermatologists prefer a higher concentration of TCA as it increase collagen volume and leads to dermal thickening at higher concentrations.[25] Higher concentration TCA causes severe scarring because of resurfacing issue and damages the normal skin tissue. Lower concentrations of TCA's avoid this complication, because the hair follicles and adjacent normal tissues are spared from chemical damage. Peeling with higher TCA concentrations is not recommended due to these potential complications.[30] a

In our study 65 patients were included in the study and the response rate was very good in 61.5% of cases. Our results are in agreement with Hanan et al, who treated 10 patients with 35% TCA and found out that 35% TCA was associated with excellent outcome in 60% patients (60%) and had a poor to moderate response in 40% of the patients.[16] They performed four to ten peeling sessions. There was no difference in the efficacy between icepick, rolling and boxcar. [16] The efficacy of the above study is close to the results of our study but again the sample was very small.

Treatment with 35% TCA is directly related to number of sessions. Increasing number of sessions improved the final outcome. Minimum four sessions is required to reach optimal goals.[14,19] Increasing the number of sessions increases the chances of deeper penetration of TCA and reduces scarring.[19] Interestingly, shallower scars are associated with earlier improvement and require lesser sessions. [19] Fabbrocini et al studied the efficacy of 50% TCA with CROSS technique and found significant cosmetic improvements in both depth and appearance of skin scars.[15]

Yug et al found that use of 95% TCA corresponded with the excellent cosmetic outcome. There were no complications, such as persistent erythema, hyperpigmentation, hypopigmentation, herpes simplex flare, additional scarring, or keloid formation.[20]

To sum up, the improvement of the atrophic acne scarring depends on its nature, size, depth, distensibility, and exact modality of treatment. Moreover, distensibility of acne scars is an important factor in determining the response to treatment. However, further studies on larger scale of patients are needed to confirm our results.

CONCLUSION

In our study the efficacy of a local application of 35% trichloroacetic acid for the treatment of atrophic acne scars was found to be satisfactory.

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