Journal of Pakistan Association of Dermatologists. 2026;**36(3)**:426-432.

Original Article

Comparison of the efficacy of 70% glycolic acid and 30% trichloroacetic acid peel in the treatment of facial atrophic acne scars

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Abstract

Background Acne scars are the outcome of acne vulgaris that may considerably influence the quality of life of a person. Treatment of these scars with chemical peels, especially those containing glycolic acid (GA) and trichloroacetic acid (TCA), is common.

Objective To compare the efficacy of 70% glycolic acid (GA) and 30% trichloroacetic acid (TCA) peels in treating atrophic acne scars.

Methods A total of 60 patients fulfilling the inclusion criteria were enrolled. Patients were split into two groups: Group A (30% TCA) and Group B (70% GA). There were four chemical peel treatments that were conducted after every 4 weeks. The efficacy was measured in terms of scar appearance improvement using Goodman's Qualitative Acne Scarring Grading System. The Chi-square test was applied to compare treatment efficacy between the TCA and glycolic acid groups. A *P*-value ≤.05 was considered statistically significant.

Results Statistically significant difference was observed in treatment response, where patients treated with 30% TCA showed higher improvement compared with those treated with 70% glycolic acid (66.7% vs. 46.7%, *P*=.038). The efficacy of treatment was significantly higher in the TCA group compared with the glycolic acid group. Overall improvement was achieved in 66.7% of patients receiving 30% TCA compared with 46.7% receiving 70% glycolic acid (*P*=.038).

Conclusion TCA is more effective than glycolic acid for treating deep atrophic acne scars, while glycolic acid remains a good option for mild scars, especially in individuals with darker skin types. Additional research work is required on bigger sample sizes and long-term results.

Keywords Acne scars; Glycolic acid; Trichloroacetic acid; Chemical peels; Atrophic acne scars; Skin pigmentation.

Article Received on 09.07.2026

Revised on 27.08.2026

Accepted on 06.09.2026

Published on 30.09.2026

Citation: Anjum M, Ahsan U, Ahsan MB. Comparison of the efficacy of 70% glycolic acid and 30% trichloroacetic acid peel in the treatment of facial atrophic acne scars. *J Pak Assoc Dermatol*. 2026;**36(3)**:426-432.

Doi: https://doi.org/10.66344/jpad.v36i3.3487

Introduction

Acne is a common skin condition that affects about 9.4% of the global population with 85% of the adolescents and young adults aged 12-24 years having some acne condition.[1,2] Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit characterized by comedones, papules, pustules, and nodules resulting from follicular hyper keratinization, increased sebum production, microbial colonization, and inflammatory processes.[3] The lesions can lead to further inflammation, altering the skin texture and in the untreated cases, cause scars permanently. The

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disfigurements of acne are not only aesthetically displeasing but they have severe psychological implications as well. They are capable of causing emotional distress, such as anxiety, depression, and poor quality of life.[4] Research indicates that 12 to 14% of people who experience acne scars encounter social and psychological effects, which underscores the deep-seated effects that such scars have on the emotional health of a person.[5] The importance of treating active acne and its scars cannot be overestimated as it can help to enhance the physical appearance and promote the mental health of individuals who have it.

Acne scars are classified into two main types: atrophic and hypertrophic.[6] Atrophic scars are the most common type of acne scars and develop due to inadequate collagen deposition and dermal tissue loss following inflammatory damage. These scars are further classified as ice pick, boxcar, and rolling scars. Icepick scars are deep and small, boxcar scars are round with sharp edges and rolling scars give the skin a wave like effect.[7] Excessive collagen production leads to hypertrophic scars that are elevated and are more prevalent in people with darker skin. Although hypertrophic scars are less common in facial acne, they represent excessive collagen deposition and may cause cosmetic concerns due to their raised appearance.[8] Acne scars have a strong emotional effect, which results in low self-esteem and withdrawal. Studies have depicted that individuals with acne scars are more anxious and refrain from social interactions.[9,10] The treatment should be effective not only to treat physical scars but also to enhance the emotional and social quality of life.

There are both surgical and non-invasive treatment options for acne scar. Chemical peels are commonly used minimally invasive procedures for improving atrophic acne scars. Glycolic acid produces superficial exfoliation and promotes epidermal renewal, whereas trichloroacetic acid penetrates deeper into the dermis and stimulates collagen remodelling. However, comparative evidence regarding the effectiveness of 70% glycolic acid and 30% TCA specifically for facial atrophic acne scars remains limited. Deep scars can be removed by surgical procedures like punch excision and skin grafts that are invasive but slow to heal.[3,4] In less severe scars, non-invasive procedures such as chemical peels, microdermabrasion, and laser resurfacing are well established treatment options.[6] Chemical peels provide a less invasive alternative to surgical procedures, with shorter recovery periods and lower procedural costs.

Data regarding the comparison of these two peeling agents in acne scarring is limited in the local context.[5] The results of this study will contribute to improving the understanding of acne scar treatment options and will enable the dermatologists to offer evidence-based recommendations, thereby helping to improve the quality of life of patients with acne scars.

Methods

A quasi-experimental study was carried out from June 2025 to December 2025. It compared the efficacy of 70% glycolic acid (GA) and 30% trichloroacetic acid (TCA) peels in the treatment of atrophic scars of acne. The study protocol was approved by the Institutional Ethical Review Committee of Sharif Medical and Dental College/ Sharif Medical City Hospital, Lahore (No.SMDC/SMRC/369-25 dated 09.05.2025). Written informed consent was obtained from all participants before participation in the study. The sample size of the study was calculated by use of OpenEpi sample size calculator and 60 patients (30 in each arm) were selected, with 5% level of significance and 80% study power.[11]

The study inclusion criteria included both males and females aged 15-50 years with a history of facial atrophic acne scars. The study did not include patients with active acne, pregnant women, individuals with hypersensitivity to glycolic acid or trichloroacetic acid, bleeding conditions, HIV or HBV infection. Also, people who have had

hypertrophic scarring or keloids or persons who have herpes or recurrent herpes were excluded. This would guarantee a homogeneous sample that would be eligible to the study.

The data collection procedure entailed the selection of 60 patients who fitted the eligibility criteria and those who visited the Dermatology OPD in Sharif Medical City Hospital. Following verbal informed consent and signing written consent forms, the patients were randomly divided into two groups. Group A was treated with TCA, and Group B with GA. Simple randomization was performed using the lottery method. Sixty sealed opaque slips were prepared, with thirty slips labeled as Group A (30% TCA) and thirty slips labeled as Group B (70% glycolic acid). Each participant selected one sealed slip before treatment allocation and, all the patients were instructed to prepare their skin by applying 0.025% tretinoin cream nightly for 2 weeks before the procedure and discontinuing it 3 days before peeling, along with daily sunscreen use (SPF 30). On the day of the procedure, patients' faces were degreased with 99.8% acetone, and the appropriate chemical peel was applied. To treat TCA, 30% solution was used until consistent frosting was visible, after which the patients were instructed to wash their face with regular water. In the case of GA treatment, it was applied in 70% solution and neutralized with the normal saline when erythema was observed. The therapies were carried out four times separated by four weeks. Simple randomization was performed using the lottery method. Potential selection bias was minimized by applying predefined inclusion and exclusion criteria and enrolling consecutive eligible patients. Allocation bias was reduced through lottery-based randomization. Assessment bias was minimized by using Goodman's Qualitative Acne Scarring Grading System for standardized evaluation. However, the study was limited by the relatively small sample size and short follow-up duration.

Goodman's Qualitative Acne Scarring Grading System was used for standardized assessment of acne scar severity. Grade 1 (macular) was defined as erythematous, hyperpigmented, or hypopigmented flat marks without a contour abnormality. Grade 2 (mild) was defined as mild atrophic or hypertrophic scarring that may not be obvious at a social distance of 50 cm or greater and may be adequately concealed by makeup or facial hair. Grade 3 (moderate) was defined as moderate atrophic or hypertrophic scarring that is obvious at a social distance of 50 cm or greater, is not easily concealed, but can be flattened by manual stretching of the skin in atrophic scars. Grade 4 (severe) was defined as severe atrophic or hypertrophic scarring that is evident at a social distance greater than 50 cm, is not easily concealed, and cannot be flattened by manual stretching of the skin.

For the statistical analysis, SPSS version 25.0 was used. Quantitative variables (e.g., age, duration of acnes scarring, and scar size) were analyzed using descriptive statistics (means and standard deviation). Frequency and percentage distributions were used to evaluate categorical variables, such as gender, scar type, and scar grade. The chi-square test was used to compare the two treatment groups (30% TCA and 70% glycolic acid) with a significance level of p 0.05. Efficacy was assessed by assigning a pre-treatment grade before the first treatment session using Goodman's Qualitative Acne Scarring Grading System, and a post-treatment grade four months after the last treatment session. Excellent improvement was defined as a reduction of three grades, moderate improvement as a reduction of two grades, mild improvement as a reduction of one grade, and no improvement as zero or no reduction in grade. Excellent and moderate improvement were considered as efficacy. Stratification was done on the basis of variables such as age and gender. The impact of these aspects on the effectiveness of the treatments was assessed using the Chi-square tests. This was done to identify the relative efficacy of TCA and glycolic acid peels in the treatment of atrophic facial acnes scars.

Result

A total of 60 patients aged between 15 and 50 years

Table 1 Descriptive Statistics.

Parameter	*Group A (30% TCA)*	*Group B (70% GA)*	*Total (All Patients)*
Age (Years)	28±8.0	30±7.0	29±7.0
Duration of Acne Scarring (Months)	24±6.0	22±5.0	23±5.0
Scar Size (mm)	5.5±1.2	5.8±1.1	5.65±1.15

Table 2 Pre- and Post-Treatment Atrophic Acne Scar Grades and Improvement Levels.

Scar Grade/Improvement	Group A (30% TCA)	Group B (70% GA)	*P*-value
Grade 1 (Pre)	10 (33.3%)	10 (33.3%)	1.000
Grade 2 (Pre)	10 (33.3%)	10 (33.3%)	1.000
Grade 3 (Pre)	5 (16.7%)	5 (16.7%)	1.000
Grade 4 (Pre)	5 (16.7%)	5 (16.7%)	1.000
Excellent Improvement	12 (40%)	4 (13.3%)	0.015*
Moderate Improvement	12 (40%)	18 (60%)	0.038*
Mild Improvement	4 (13.3%)	6 (20%)	0.055
No Improvement	2 (6.7%)	2 (6.7%)	1.000

*$P \leq 0.05$ was considered statistically significant

with atrophic acne scars on the face were used to gather the data. The patients were separated into two groups, Group A in which 30% trichloroacetic acid (TCA) was used and Group B in which 70% glycolic acid (GA) was used. The therapy was given in 4 sessions with intervals of four weeks. They were relevant variables (age, gender, scar type (icepick, boxcar, rolling), scar grade (1-4), improvement level (excellent, moderate, mild, or none) etc.). The outcome of the treatments was gauged on scar improvement after the treatment.

Baseline characteristics of the study participants, including age, duration of acne scarring, and scar size, are presented in **Table 1**. The comparison between the two treatment groups demonstrated that both groups were comparable at baseline, with no statistically significant differences observed in demographic and clinical characteristics.

Table 1 shows the descriptive statistics for the quantitative data including age, duration of acne scarring, and scar size. The *P*-values for age, duration, and scar size were all >0.05, indicating no significant differences between Group A (30% TCA) and Group B (70% GA). These results suggest that the two groups were comparable in these baseline characteristics.

The distribution of pre-treatment scar grades and post-treatment improvement levels according to Goodman's Qualitative Acne Scarring Grading System is summarized in **Table 2**. The pre-treatment and post-treatment scar grades as well as the improvement levels in both groups. Group A (30% TCA) also improved more with a higher percentage of patients attaining Grade 1 (50%) than Group B (40%). The *P*-value of .015 implies that there is a statistically significant change in Group A, which shows that TCA is more effective in treating atrophic acne scars. Also, Group A showed a greater proportion of patients who made excellent improvement (40) than Group B (13.3).

The overall efficacy of the treatments is summarized in **Table 3** and indicates that 66.7% of the patients in Group A (30% TCA) had improved, as compared to 46.7% in Group B (70% GA). The *P*-value of .038 indicates that the difference in the efficacy of the two groups is statistically significant. This proves TCA is more effective than glycolic acid as far as atrophic acne scars are concerned. The higher performance in Group A is compared to those of **Table 2**, which favours the higher efficacy of TCA.

Table 4 demonstrates stratified results based on age and gender and their influence on the effectiveness of treatment. The younger patients (15-25 years old) had better results, particularly in Group A (TCA), and the *P*-value of 0.045 shows that age had a significant influence on the effectiveness of the treatment. The gender stratification showed that males of Group A showed better results in comparison to females, which had a *P*-value of .043. These results indicate that age and gender are important factors that dictate the effectiveness of chemical peel on acne scars.

Table 3 Comparison of the Efficacy of 30% Trichloroacetic Acid and 70% Glycolic Acid Peels in the Treatment of Facial Atrophic Acne Scars.

Group	*Efficacy*		*P-value*
	Yes n (%)	*No n (%)*	
Group A (30% TCA)	20 (66.7%)	10 (33.3%)	0.038*
Group B (70% GA)	14 46.7%	16 (53.3%)	

**P* ≤0.05 was considered statistically significant.

Table 4 Stratification by Age and Gender.

Stratification	*Efficacy*		*P-value*
	Yes (%)	*No (%)*	
15-25 Age (Male)	33.3%	66.7%	0.045*
15-25 Age (Female)	50.0%	50.0%	0.043*
26-35 Age (Male)	53.3%	46.7%	0.280
26-35 Age (Female)	61.1%	38.9%	0.043*
36-45 Age (Male)	50.0%	50.0%	0.125

*P ≤ 0.05 was considered statistically significant.

Figure 1 Group A (30% TCA).

Figure 2 Group B (70% GA).

Discussion

These results are in line with past reports that demonstrate TCA effectiveness is more effective in deep acnes scars. As an illustration, Bharati *et al*.[12] compared the effectiveness of 15% TCA and 35% glycolic acid peels in the treatment of acanthosis nigricans. Though their research was done on another condition, it was in line with the assumption that TCA is more effective on deeper skin conditions and this is also the same with the present study where TCA demonstrated greater effectiveness in the treatment of deeper acne scars. On the same note, Roy *et al*.[13] compared 50% glycolic acid and 65% TCA during the treatment of atrophic acne scars using CROSS technique. They discovered that TCA gave a better outcome, particularly in deep acne scars, and this is identical to the results of this study where TCA also gave a better outcome in severe acne scars.

Conversely, Dayal *et al*.[14] examined the effects of microneedling with 35% glycolic acid peels compared to microneedling with 15% TCA peels in treating atrophic acne scars. They reported that deep scars in microneedling with TCA were more effective, which supports our conclusions that TCA was best in treating deep acnes scars. Moreover, Garg *et al*.[15] also examined the use of glycolic acid with TCA in the treatment of melasma and concluded that an interaction between TCA and glycolic acid yielded improved outcomes especially with more stubborn skin conditions. This means that glycolic acid may not work as effectively as TCA in the deep acne scars but when it is combined with TCA or any other agent, better results may be achieved.

The better efficacy of TCA in deeper scars could be explained by the fact that TCA penetrates more deeply and promotes collagen. Horovitz *et al*.[16] also found that TCA causes controlled dermal injury, which enhances collagen remodelling and results in improved scar healing. In this research, the post-treatment scar grade distribution indicated that half

of the patients in Group A attained Grade 1 scars, whereas 40% of the patients in Group B attained Grade 1, and the *P*-value was significant at .005. This underscores the fact that TCA can offer greater enhancements on deeper scars of acne, ice pick and boxcar scars.

The age stratification of this study showed improved results in younger patients (15-25 years) who had better repercussions in Group A (TCA), with a *P*-value of .045. This is in line with Memon *et al*.[17] who discovered that younger patients reacted positively to treatments of chemical peel because of higher levels of collagen synthesis and skin regeneration capacity. In this experiment, males in Group A performed better than females a *P*-value=0.043.

The limitation of this research is that the participants (60 patients) are not representative of a population because they are quite small. This study took a relatively short time span of four months that may not be reflective of the long-term effect of the interventions. Also, the study only examined atrophic acne scars and thus the results might not be generalized to hypertrophic scars and to other skin diseases. Finally, the study did not take into account the possible confounding variables such as lifestyle or other interventions to ascertain the results.

Conclusion

TCA (30%) was more effective than glycolic acid (70%) in treating atrophic acne scars, particularly deep scars such as icepick and boxcar types. Glycolic acid remained a safer and useful option for milder scars and darker skin types due to a lower risk of hyperpigmentation.

Declaration of patient consent Authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship None.

Conflict of interest No conflict of interest.

Author's contribution

MA: Substantial contribution to the study design, acquisition and interpretation of data, manuscript writing.

UA: Substantial contribution acquisition of data, revising the manuscript critically to be published.

MBA: Substantial contribution to acquisition, analysis of data, writing the manuscript.

Every author has given final approval of the manuscript version to be published and agreed to be accountable for all aspects of the work.

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