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A systematic review of the efficacy of chemical peeling in active acne and acne scars

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Abstract

Chemical peeling is a widely used dermatological procedure for managing acne and acne scars. This article evaluates existing studies on the efficacy and safety of chemical peels in treating active acne and post-acne scarring. A systematic search was conducted on PubMed and other databases for clinical trials from 2000 to 2025 using the keywords "chemical peels, acne, acne scars." A total of 18 studies were identified, out of which 10 prospective clinical trials were included. Studies involving animal models or other facial dermatoses and those without prospective clinical trials were excluded. The results of the reviewed studies suggest that chemical peels are a safe and effective treatment option for acne and post-acne scars. Different types of peels, including glycolic acid, salicylic-mandelic acid, Jessner's solution, lactic acid, and trichloroacetic acid, have demonstrated varying degrees of success in reducing active acne, post-inflammatory hyperpigmentation, and superficial scarring. Combination therapies and higher-concentration peels show promise for deeper scars, though they require careful application to minimize adverse effects such as erythema and post-inflammatory hyperpigmentation.

Keyword: Acne; Acne scars; Chemical peel; Glycolic acid; Salicylic acid; Trichloroacetic acid.

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Introduction

Chemical peels are a widely used, minimally invasive dermatological procedure[1,6] that helps improve the appearance of acne scars by promoting skin renewal and collagen remodeling. The procedure involves the controlled application of chemical agents to exfoliate the damaged outer layers of the skin, stimulating regeneration and improving skin texture. Depending on the depth of penetration; superficial, medium, or deep; chemical peels can effectively target different types of acne scars, especially atrophic scars. Agents such as glycolic acid (GA), salicylic acid (SA), Jessner's solution, and trichloroacetic acid (TCA) are commonly used based on the scar severity and skin type. Chemical peels not only enhance the appearance of skin surface but also help reduce post-inflammatory hyperpigmentation, making them a valuable option in acne scar management.

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Methods

We conducted a search on "PubMed" using the keywords, 'chemical peels, acne, acne scars. All clinical trials from 2000 to 2025 were included. A total of 18 articles were searched out of which 10 articles

were included for the review in this study. Studies selected were prospective clinical trials with acne and acne scars however studies involving animal models or other facial dermatoses and those without prospective clinical trials were excluded.

Results

In a study conducted in 2009, Grag *et al.*[1] compared glycolic acid (GA) peels with a combination of salicylic and mandelic acid (SMP) peels in 44 Indian patients with Fitzpatrick skin types IV–VI, One group received 35% GA peels, and the other received 20% salicylic-10% mandelic acid peels (SMPs), every two weeks for six sessions. Assessment was conducted at multiple intervals up to 24 weeks, considering changes in active acne, scarring, and hyperpigmentation based on physician evaluations, patient feedback, and independent observer ratings. SMPs were significantly more effective in reducing active acne lesions, showing greater improvements in comedones (45.7% reduction vs. 20.9% with GA), papules (47.7% vs. 27.3%), and pustules (58.4% vs. 34.7%). Both peels provided modest improvement in icepick and boxcar scars, though neither had a significant effect on rolling scars. In terms of post-acne hyperpigmentation, both treatments were effective, but SMPs showed superior results, with a 59.8% reduction compared to 46.3% with GA. SMPs were also better tolerated, with fewer cases of burning, dryness, or visible desquamation

How KN *et al.*[2] in 2020 conducted as a randomized, double-blinded, split-face trial with 36 participants (Fitzpatrick skin types IV-V), comparing Jessner's solution with 30% salicylic acid peel administered every two weeks for three sessions. Both treatments effectively reduced inflammatory and non-inflammatory acne lesions; however, salicylic acid achieved faster improvement in inflammatory lesions while Jessner's solution showed an earlier effect on hyperpigmentation. Mild side effects such as burning and exfoliation were noted, with patient satisfaction slightly favoring salicylic acid.

Ali *et al.*[3] conducted a study with a comparison of micro needling, Jessner's solution peeling, and their combination in 60 patients with atrophic acne scars. Each patient received one session every two weeks, with a maximum of eight sessions, and clinical outcomes were assessed using the Goodman and Baron scarring grading system. Patient satisfaction and adverse effects were also recorded. This study revealed that while each method improved scar appearance, the combination treatment was most effective, especially for boxcar scars. The combined approach required fewer sessions (3–6) and resulted in higher patient satisfaction, with only mild adverse effects like pain and erythema were observed.

A study conducted by Agarwal *et al.*[4] evaluated the efficacy and safety of 70% trichloroacetic acid (TCA) using the Chemical Reconstruction of Skin Scars (CROSS) technique for treating atrophic acne scars. Fifty-three patients with post-acne atrophic scars were treated with focal applications of 70% TCA every two weeks. After a 3-month follow-up, assessments were made based on physician evaluation, patient self-assessment, and patient satisfaction. 66% of patients exhibited good to excellent improvement (more than 50%) in both physician and patient assessments. Additionally, 81.1% of patients reported being very satisfied or satisfied with the treatment outcomes. Patients with predominantly boxcar scars and higher pre-treatment scar severity showed better treatment responses. Age, sex, duration of scars, and skin type did not significantly influence treatment outcomes or adverse effects. The study concludes that 70% TCA is a safe and effective treatment option for all types of atrophic acne scars, particularly severe boxcar scars.

The study by Khunger *et al.*[5] and colleagues evaluated the effectiveness and safety of the CROSS technique using 100% trichloroacetic acid (TCA) for treating ice pick acne scars in individuals with darker skin types (Fitzpatrick IV and V). 30 patients underwent four treatment sessions spaced two weeks apart, with each session involving the focal application of 100% TCA

using a wooden toothpick. Prior to treatment, patients followed a priming regimen that included hydroquinone and tretinoin, along with sunscreen, to reduce the risk of post-inflammatory hyperpigmentation. The outcomes were assessed through physician evaluation, independent photographic review, and patient feedback. The results showed significant improvement in the appearance of ice pick scars with minimal adverse effects. The procedure was well-tolerated and considered safe and cost-effective for this patient population, especially when proper priming and post-treatment care were applied. This study supports the CROSS technique with 100% TCA as a promising treatment for deep acne scars in darker skin types, helping to minimize pigmentation issues often seen with other therapies.

A pilot study conducted by Gupta *et al.*[6] evaluated glycolic acid peels at three different concentrations (35%, 52.5%, and 70%) and varied application times in 37 patients. Results showed that 52.5% GA applied for 3 minutes significantly improved melasma, while 70% GA for 2 minutes was effective in post-acne scarring. However, 35% glycolic acid for 4 minutes had no significant effect on melasma, and 70% glycolic acid did not improve epidermal naevus. Minimal side effects, such as erythema and burning, were observed, particularly with the 52.5% concentration. The study highlights that peel effectiveness depends on concentration, application time, and skin type. GA peels, when used with proper pre- and post-care, serve as a valuable addition to cosmetic dermatology. Minimal side effects emphasize the importance of customizing concentration and duration to the specific skin condition.

Grover *et al.*[7] evaluated glycolic acid (GA) peels in 41 Indian patients aged 16–46 years. Patients were primed with tretinoin (0.025%) for two weeks before undergoing biweekly peels, starting at 10% GA and increasing to 30% based on tolerance. Peels were performed up to the stratum granulosum level, and sun protection was advised. Among patients with acne (39%), 75% showed good to fair improvement, though nodulocystic acne responded poorly. In melasma cases (15 patients), over 90% improved, with better results in epidermal melasma. Post-inflammatory hyperpigmentation (5 cases) showed a 40% improvement, but results were less promising. For superficial scarring (5 cases), 80% had good to fair improvement. Overall, 80% of patients reported smoother, brighter skin. Side effects (26.5%) included irritation, PIH, herpes labialis, and hypopigmentation, but no dropouts occurred. GA peels effectively treat acne, melasma, and superficial scarring, though less so for deep melasma and PIH, emphasizing proper patient selection and care.

Research into medium-depth chemical peels for dark-skinned individuals conducted by Al-Waiz MM and Al-Sharqi AI[8] combined Jessner's solution with 35% TCA in 15 patients with atrophic acne scars. Jessner's solution was applied first, ensuring uniform penetration of 35% TCA, layered every 2 minutes until frosting appeared. Deep scars were further treated with 50% TCA in later sessions. Post-treatment care included topical steroids, hydroquinone (2%), and strict sun protection. Improvement was observed in all but one patient. Significant improvement occurred in 6.6%, moderate in 50%, mild in 25%, minimal in 8.3%, and no response in 8.3%. Patient satisfaction increased after each session: 33.3% after the first, 73.3% after the second, and 80% after the third. Two patients with minimal or no response remained unsatisfied. Erythema lasting over a month occurred in two patients, and 73.4% experienced transient PIH, which resolved within three months. Those without PIH had lighter skin tones. Patients had a mix of atrophic and pitted scars; 26.6% had primarily pitted/deep atrophic scars with moderate to no response. Patients with atrophic scars showed significantly better improvement ($P<0.01$; $P<0.05$). The mean response score was 7.4 ± 8.78, with a median of 8.

In a research letter by Sachdeva S[9] a study on full strength lactic acid (LA) peels for superficial acne scarring in Indian skin involved seven patients undergoing four sessions at two-week intervals,

starting from 46 % LA for 2-3 min. Next session was done 2 weeks later with a full strength i.e., 92% Lactic acid peel for 3 min and 3rd and 4th sessions were done with 92% LA peel for 4 and 5 min respectively. The results showed noticeable improvements in scar appearance, pigmentation, and overall skin texture, with one patient achieving over 75% clearance, while side effects were minimal, limited to mild erythema and stinging, and one case of transient hyperpigmentation that resolved with topical treatment.

Al-Hamamy *et al.*[10] found 25% TCA peels alone versus TCA peels followed by manual dermasanding in 13 patients with mild to moderate atrophic acne scars, the sequential treatment showed significantly enhanced scar reduction. Patient satisfaction increased from 77% with TCA alone to over 90% after combining it with dermasanding, with side effects being transient and resolving within one to three months.

In our study in 2022, Mubashar *et al.*,[11] we compared the effectiveness of 30% glycolic acid peeling and microdermabrasion in treating acne vulgaris among patients aged 15 to 30 years. The quasi-experimental trial enrolled 150 patients who were randomly assigned to receive either glycolic acid peel (Group A) or microdermabrasion (Group B). The results showed that microdermabrasion was significantly more effective, with 18.7% of patients responding compared to only 4% in the glycolic acid group (p=0.005). However, the findings are limited by the short follow-up period and lack of control over external factors such as diet and environment. This research provides valuable localized evidence for optimizing acne treatment protocols.

Table 1 shows summary of literature review highlighting the results of different studies conducted.

Discussion

After going through the literature review of all the above mentioned study, following facts can be concluded:

1. The maximum improvement was around 75% in the appearance of acne scars while using any of the peels in isolation from 4 to 8 sessions at the space of 2 weeks. These effects are really amazing showing that even in the presence of so many advanced machines, the very basic and inexpensive procedure, if done properly can give very good results.
2. In combination treatment, Jessner's with TCA an improvement around 93% was documented. In our experience this much improvement is not possible even after combining different peels. However combining energy based devices with peels can achieve similar results.
3. Side effects noted were mainly erythema, post-inflammatory hyperpigmentation, dryness and burning. None of these effects were permanent and were not disturbing for the patients. The key to this result was proper priming of the skin and post peel care. In our experience the priming and post peel care is important not only for better results but also for minimizing the side effects.
4. Another interesting aspect of all these studies was that the study population were having Fitzpatrick skin types III to V. This is also stressing the point that it is not at all risky to use high concentration of peels in dark skin types if you perform the procedure properly.
5. Now let us discuss a few effective peels and combinations. It was found that a combination of 20% salicylic acid and 10% mandelic acid was better than 35% Glycolic acid in treating active acne lesions of all type but modest improvement in scars.
6. While comparing Jessner's peel and 30% salicylic acid it was concluded that both peels work well on inflammatory and non-inflammatory acne, but SA have a little edge. However if you have PIH lesions as well then Jessner's peel may be preferred as it works better on hyperpigmentation.
7. In another study a combination of Micro needling with Jessner's peel was found better than the peel alone. This observation is not new but significant.

Table 1 Comparative Review of different studies conducted on Chemical peeling for acne and acne scars.

Study	*Peeling agent*	*Population*	*Intervention*	*Outcome*	*Side effects*
Vijay Kumar Garg *et al*.	Glycolic Acid (GA) vs. Salicylic-Mandelic Acid (SMP)	44 Indian patients (Fitzpatrick skin types IV-VI)	35% GA or 20% salicylic–10% mandelic acid peels, every 2 weeks for 6 sessions	SMP more effective for acne lesions and hyperpigmentation ($p<0.001$)	Burning, dryness, visible desquamation (less with SMP)
How KN *et al*.	Jessner's Solution (JS) vs. 30% Salicylic Acid (SA)	36 patients (Fitzpatrick skin types IV-V)	Split-face trial with JS or SA every 2 weeks for 3 sessions	No major differences in acne reduction, JS showed earlier hyperpigmentation improvement ($p<0.001$)	Burning, stinging, exfoliation, rare post-inflammatory hyperpigmentation (JS)
Ali B *et al*.	Microneedling (Dermapen) vs. Jessner's Solution (JS) vs combined therapy	60 patients with atrophic acne scars	Microneedling, JS peel, or combination every 2 weeks, max 8 sessions	Best results with combined therapy for boxcar scars, fewer sessions for improvement ($p=0.002$)	Mild pain, erythema, exfoliation, more exfoliation with JS
Agarwal *et al.*	Trichloracetic acid (TCA)	53 patients of post acne scarring	70% TCA using the Chemical Reconstruction of Skin Scars (CROSS) technique	At the end of 3 months 22.6 % excellent response (>75% improvement) 23% good response (51 to 75% improvement) 10% fair response (26% to 50 % improvement	Post inflammatory hyperpigmentation specially in dark skin type
Khunger *et al.*	Trichloracetic acid (TCA)	30 patients with ice pick scars	100% TCA using CROSS technique, 4 treatment sessions, 2 weeks apart	Response 73.3 % excellent (>70% improvement) 20% good response (51 to 70% improvement) 6.7% fair (26% to 50 % improvement	Transient post inflammatory pigmentation
Gupta *et al*.	Gylcolic acid (GA) peel in variable concentration	37 patients out of which 4 of post acne scarring	GA peel at concentration: 35% for 4 min, 52.5% for 3 min, 70% for 2 min.	70% GA peel for 2 min produced significant improvement in post acne scarring	Mild erythema and burning
Grover *et al.*	Glycolic acid (GA) peel	41 Indian patients (Fitzpatrick skin types III-V)	Maximum 8 sessions at 2 weekly interval with serial increase in GA conc. (up to 30%)	75% patients with acne show good to fair response (>60% improvement = good 31% - 60% improvement = fair) No response in nodulocystic acne	Mild discomfort and irritation of skin in 26.5% patients. Post inflammatory hyper pigmentation and herpes labialis
Al-Waiz MM & Al-Sharqi AI	Jessner's Solution + 35% TCA	15 patients (Fitzpatrick IV) with atrophic scars	Jessner's + 35% TCA peel with 3 sessions, 3-month follow-up	93.3% improvement, better for atrophic scars ($p=0.05$)	PIH in 73.4% of patients, erythema, no permanent hyperpigmentation or scarring
Sachdeva S	Lactic Acid (LA)	7 Indian patients (Fitzpatrick skin types IV-V)	4 sessions of LA peel at 2-week intervals, starting with 46% LA to maximum strength i.e 92 %	Clearance of acne scars in all patients. >75% in 1 patient 51-75% in 3 patients 26-50% in 2 patients 1-25% in 1 patients	Mild erythema, stinging, transient post-inflammatory hyperpigmentation
Al-Hamamy *et al*.	TCA vs. Dermasanding	13 patients with atrophic acne scars	1 session of 25% TCA, with dermasanding (1-3 sessions)	Significant scar reduction, more with dermasanding ($p<0.05$)	Erythema, post-inflammatory hyperpigmentation, resolved in 1-3 months
Mubashar *et al.*	GA peel vs. microdermabrassion. 3 x monthly sessions	150 patients with acne	75 patients treated with 30% GA peel, 75 patients treated with microdermabrassion	More than 50% improvement Microdermabrasion 18.7% , GA peel 4 % (good results in patients with low GAG score)	Mild erythema

8. Another combination used was 25% TCA with Derma sanding was better as far as the results and less side effects, for mild to moderate acne scars, as compared to TCA alone.
9. In two studies 70% and 100% TCA cross was shown to be effective in all kinds of acne scars. This is one of the techniques that is being ignored due to the fear of PIH. If done properly it is a very useful procedure for resistant kind of boxcar and icepick scars.
10. Among the different concentrations of Glycolic acid (35%, 52.5%, and 70%), 70% was found working better on acne scars.
11. Although Lactic acid is not considered an appropriate peel for acne scar but in one study 92% LA was used in superficial acne scars with good results in 4 sessions.

Conclusion

It is concluded by stressing upon the use of chemical peel as an adjuvant therapy for inflammatory and non-inflammatory acne and mild to moderate acne scars. Chemical peeling is a relatively inexpensive procedure that does not require any sophisticated equipment. However a thorough knowledge of the procedure with pre and post procedure care is necessary. In addition selection of right peeling agents, knowing well of its application time, follow up instructions and timely repetition, are all essential to satisfactory results.

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Author's contribution

HM,AAM,SK,AR: Have made substantial contributions to conception and design, acquisition of data, analysis and interpretation of data. Have been involved in drafting the manuscript and revising it critically for important intellectual content.

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