Section: DVL

Original Research Article

COMPARATIVE EFFICACY AND DOWNTIME OF 40% PYRUVIC ACID VERSUS 30% SALICYLIC ACID PEELS IN MILD-TO-MODERATE INFLAMMATORY ACNE VULGARIS: A RANDOMIZED STUDY

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ABSTRACT

Background: Acne vulgaris is one of the most prevalent inflammatory dermatological disorders affecting adolescents and young adults. Chemical peeling has emerged as an effective adjunctive treatment modality for inflammatory acne by reducing follicular hyperkeratinization, controlling sebum production, and improving post-acne sequelae. Salicylic acid is widely regarded as a standard peeling agent for acne, whereas pyruvic acid has gained attention due to its sebostatic, keratolytic, antimicrobial, and collagen-stimulating properties. Comparative evidence evaluating their efficacy, post-procedure downtime, and patient selection criteria remains limited. The aim is to compare the efficacy and social downtime associated with 40% pyruvic acid and 30% salicylic acid peels in patients with mild-to-moderate inflammatory acne vulgaris and to establish objective clinical criteria for selecting the most appropriate peeling agent.

Materials and Methods: A randomized, single-blind, active-controlled comparative study was conducted among 20 patients aged 18–35 years with mild-to-moderate inflammatory acne vulgaris and Fitzpatrick skin types III–V. Patients were randomly allocated into two equal groups. Group A received 30% salicylic acid peels, while Group B received 40% pyruvic acid peels at 15-day intervals for a total of four treatment sessions. Patients underwent a standardized priming regimen before treatment. The primary outcome measure was percentage reduction in inflammatory lesion count. Secondary outcome measures included post-procedure downtime, improvement in early atrophic scarring, and patient-reported social discomfort.

Results: Both treatment groups demonstrated substantial improvement in inflammatory acne lesions. The mean reduction in inflammatory lesion count was 71.2% in the salicylic acid group and 74.5% in the pyruvic acid group. Although pyruvic acid demonstrated a marginally greater reduction in lesion count, the difference was not statistically significant. Improvement in early atrophic scarring was observed in 80% of patients treated with pyruvic acid, whereas comparable improvement was not noted in the salicylic acid group. A significant difference was observed in post-procedure downtime. Patients treated with salicylic acid experienced visible epidermal desquamation for a mean duration of 4.8 days, while those treated with pyruvic acid demonstrated transient erythema with a mean downtime of 1.4 days. The reduction in downtime associated with pyruvic acid was statistically significant ($P < 0.01$).

Conclusion: Both 30% salicylic acid and 40% pyruvic acid peels are effective treatment modalities for mild-to-moderate inflammatory acne vulgaris. Pyruvic acid offers comparable efficacy with significantly shorter post-procedure downtime and additional benefits in improving early atrophic scarring. Careful patient selection based on seborrhea severity, scar burden, pigmentary concerns, and downtime requirements may optimize treatment outcomes and patient satisfaction.
Keywords: Acne vulgaris, Chemical peeling, Pyruvic acid, Salicylic acid, Inflammatory acne, Atrophic scars, Post-inflammatory hyperpigmentation; Downtime, Seborrhea, Dermatologic procedures.

INTRODUCTION

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit characterized by the development of comedones, papules, pustules, nodules, and, in severe cases, permanent scarring.[1] It is among the most common dermatological conditions worldwide, affecting approximately 80–90% of adolescents and young adults at some stage of life. Although acne is not associated with significant mortality, it frequently results in considerable psychological distress, diminished self-esteem, social withdrawal, and impaired quality of life.[2]

The pathogenesis of acne is multifactorial and involves follicular hyperkeratinization, excessive sebum production, proliferation of Cutibacterium acnes, and complex inflammatory mechanisms within the pilosebaceous unit.[3]

Conventional management strategies for acne vulgaris include topical retinoids, benzoyl peroxide, antibiotics, hormonal therapy, and systemic isotretinoin. While these therapies remain effective, prolonged treatment duration, adverse effects, antibiotic resistance, and variable patient compliance have stimulated interest in adjunctive procedural interventions.[4]

Chemical peeling has emerged as a valuable therapeutic modality capable of addressing both active inflammatory lesions and post-acne sequelae. By inducing controlled chemical exfoliation of the epidermis and superficial dermis, chemical peels promote comedolysis, reduce sebaceous activity, improve epidermal turnover, and enhance overall skin texture.[5]

Salicylic acid is one of the most extensively utilized peeling agents in acne management. As a lipophilic beta-hydroxy acid, it preferentially penetrates the pilosebaceous unit, dissolves intercellular adhesions within the stratum corneum, and exerts anti-inflammatory as well as antimicrobial effects.[6] Owing to its affinity for sebaceous follicles, salicylic acid is considered particularly effective in patients with active inflammatory and comedonal acne. However, treatment is frequently associated with visible epidermal desquamation that may contribute to temporary cosmetic concerns and social downtime following the procedure.[7]

Pyruvic acid is an alpha-keto acid with potent keratolytic, sebostatic, antimicrobial, and anti-inflammatory properties. Following topical application, pyruvic acid is converted physiologically into lactic acid, enabling deeper penetration into the epidermis and papillary dermis.[8]

In addition to reducing inflammatory lesions, pyruvic acid stimulates fibroblast activity and collagen synthesis, thereby improving early atrophic acne scars, post-inflammatory pigmentation, and textural irregularities. These characteristics make pyruvic acid an attractive alternative for patients requiring both acne control and skin remodelling.[9]

Several studies have demonstrated favorable outcomes with both salicylic acid and pyruvic acid peels in acne vulgaris. Nevertheless, direct comparative evidence evaluating not only clinical efficacy but also post-procedure downtime and practical patient-selection criteria remains limited.[10]

In contemporary aesthetic dermatology, rapid recovery and minimal interruption of social and professional activities have become increasingly important determinants of treatment acceptance and patient satisfaction. Therefore, understanding the relative advantages of different peeling agents is essential for individualized treatment planning.[11]

The present randomized comparative study was undertaken to evaluate the efficacy of 40% pyruvic acid and 30% salicylic acid peels in patients with mild-to-moderate inflammatory acne vulgaris. Additionally, the study aimed to compare treatment-associated downtime and formulate objective clinical criteria for selecting the most appropriate peeling agent based on individual patient characteristics and therapeutic requirements

MATERIALS AND METHODS

Study Design and Setting: This randomized, single-blind, active-controlled comparative study was conducted to evaluate and compare the efficacy, post-procedure downtime, and clinical utility of 40% pyruvic acid and 30% salicylic acid chemical peels in the treatment of mild-to-moderate inflammatory acne vulgaris. The study was designed to assess both therapeutic outcomes and practical patient-selection criteria for optimizing clinical results.

Study Population: A total of 20 patients aged between 18 and 35 years with mild-to-moderate inflammatory acne vulgaris were enrolled in the

study. All participants belonged to Fitzpatrick skin types III–V and presented with clinically evident inflammatory acne lesions suitable for chemical peeling therapy.

Inclusion Criteria

- Patients aged 18–35 years.
- Mild-to-moderate inflammatory acne vulgaris.
- Fitzpatrick skin types III–V.
- Willingness to comply with treatment and follow-up schedules.
- Provision of informed consent for participation and clinical photography.

Exclusion Criteria

- Active cutaneous infection at the treatment site.
- History of hypersensitivity to salicylic acid, pyruvic acid, or peel constituents.
- Recent use of systemic retinoids.
- Active dermatoses likely to interfere with study evaluation.
- Pregnancy or lactation.
- History of keloidal tendency or abnormal wound healing.
- Patients unwilling to comply with study procedures.

Randomization and Allocation

The enrolled patients were randomized into two equal treatment groups comprising 10 patients each.

- Group A (n = 10): Treated with 30% Salicylic Acid (SA).
- Group B (n = 10): Treated with 40% Pyruvic Acid (PA).

Pre-Peel Priming Protocol

All participants underwent a standardized skin-priming regimen for two weeks before the first treatment session. The regimen consisted of a gentle cleanser, non-comedogenic moisturizer, and a mild topical retinoid applied at night. All active topical agents were discontinued three days before each peeling procedure to minimize irritation and ensure uniform peel penetration.

Peeling Procedure

Skin Preparation

Before each treatment session, the skin was thoroughly cleansed to remove surface contaminants and excess sebum. Degreasing was performed using an alcohol- or acetone-based solution to facilitate uniform penetration of the peeling agent. Sensitive anatomical regions, including the inner canthi, nasolabial folds, and oral commissures, were protected with petroleum jelly.

Salicylic Acid Peel Protocol (Group A)

A 30% salicylic acid solution was applied uniformly using gauze or a cotton applicator. The procedural endpoint was the appearance of a characteristic white pseudo-frost resulting from salicylic acid crystallization. This endpoint was generally achieved within 1–3 minutes of application. Following endpoint achievement, the treated area was rinsed with cold water to remove residual precipitate.

Pyruvic Acid Peel Protocol (Group B)

A 40% pyruvic acid solution was carefully applied over the treatment area. Uniform erythema served as the desired clinical endpoint and was typically observed within 2–4 minutes. Following attainment of the endpoint, active neutralization was performed using a 10% sodium bicarbonate solution, followed by thorough rinsing with cold water to prevent excessive penetration and epidermolysis.

Treatment Schedule: Both groups received four treatment sessions at intervals of approximately 15 days. Patients were followed throughout the treatment period and evaluated at each visit for clinical response and adverse effects.

Post-Peel Care: Immediately after each procedure, a ceramide-based barrier repair moisturizer and broad-spectrum sunscreen (SPF 50+) were prescribed. Participants were instructed to avoid excessive sun exposure, heat exposure, and physical exfoliation for at least 72 hours after treatment.

Outcome Measures

Primary Outcome Measure

The primary efficacy endpoint was the percentage reduction in inflammatory acne lesion count from baseline to the completion of four treatment sessions.

Secondary Outcome Measures

Secondary outcome measures included:

- Duration of post-procedure downtime.
- Degree of visible erythema and epidermal desquamation.
- Improvement in early atrophic acne scarring.
- Reduction in social discomfort associated with treatment.
- Clinical improvement in skin texture and appearance.

Assessment of Downtime: Participants maintained daily self-assessment records documenting facial redness, skin flaking, and social discomfort following each treatment session. Downtime was defined as the number of days during which visible treatment-related changes interfered with normal social activities.

Safety Monitoring: All patients were monitored for procedure-related adverse events including excessive erythema, epidermal frosting, irritation, pigmentary alteration, post-inflammatory hyperpigmentation, and acne flare. Appropriate management measures were implemented whenever required.

Statistical Analysis

Data obtained from both treatment groups were analyzed comparatively. Continuous variables were expressed as mean values and percentage changes where appropriate. Statistical significance was determined using standard comparative statistical methods, with a p-value of less than 0.05 considered statistically significant. A p-value of less than 0.01 was considered highly significant for intergroup differences in downtime.

RESULTS

A total of 20 patients with mild-to-moderate inflammatory acne vulgaris completed the study and were included in the final analysis. Ten patients received 30% salicylic acid peels (Group A), while ten patients received 40% pyruvic acid peels (Group B). Both treatment modalities demonstrated substantial clinical improvement in inflammatory acne lesions following four treatment sessions. Comparative analysis revealed similar efficacy in lesion reduction; however, marked differences were observed in post-procedure downtime and improvement in early atrophic scarring.

Table 1: Shows the Allocation of Study Participants Into the Two Treatment Groups.

Treatment Group	Peeling Agent	Number of Patients (n)	Percentage (%)
Group A	30% Salicylic Acid	10	50.0
Group B	40% Pyruvic Acid	10	50.0
Total	—	20	100.0

[Table 1] demonstrates that the study population consisted of 20 patients, with 10 patients (50.0%) allocated to the 30% salicylic acid group and 10 patients (50.0%) allocated to the 40% pyruvic acid group. Equal distribution ensured balanced comparison between the two treatment modalities and minimized allocation-related bias.

[Table 2] compares the percentage reduction in inflammatory lesion counts between the two treatment groups after completion of therapy.

Table 2: Comparison of Reduction in Inflammatory Acne Lesions

Treatment Group	Mean Reduction in Inflammatory Lesions (%)
30% Salicylic Acid	71.2
40% Pyruvic Acid	74.5

Table 2 shows that patients treated with 30% salicylic acid achieved a mean inflammatory lesion reduction of 71.2%, whereas those treated with 40% pyruvic acid achieved a slightly higher reduction of 74.5%. Both treatments demonstrated substantial clinical efficacy in controlling inflammatory acne lesions. Although pyruvic acid showed numerically greater improvement, the difference was reported to be clinically comparable without a statistically significant advantage.

[Table 3] presents the observed improvement in early atrophic acne scars following treatment.

Table 3: Comparison of Improvement in Early Atrophic Acne Scarring

Treatment Group	Patients Showing Scar Improvement	Percentage (%)
30% Salicylic Acid	Not observed	Not reported
40% Pyruvic Acid	8	80.0

[Table 3] demonstrates that improvement in early atrophic acne scarring was observed in 8 patients (80.0%) treated with 40% pyruvic acid. In contrast, comparable scar improvement was not reported among patients receiving salicylic acid peels. These findings suggest that pyruvic acid may provide additional dermal remodeling benefits beyond acne lesion reduction due to its deeper penetration and collagen-stimulating properties.

[Table 4] compares the mean duration of treatment-related social downtime in both groups.

Table 4: Comparison of Post-Procedure Downtime between Treatment Groups

Treatment Group	Mean Downtime (Days)
30% Salicylic Acid	4.8
40% Pyruvic Acid	1.4

[Table 4] reveals a substantial difference in post-procedure downtime between the two treatment modalities. Patients treated with salicylic acid experienced a mean downtime of 4.8 days characterized primarily by visible epidermal scaling and desquamation. In contrast, patients receiving pyruvic acid demonstrated a markedly shorter mean downtime of 1.4 days, largely attributable to transient erythema. This finding highlights the superior recovery profile of pyruvic acid peels.

[Table 5] summarizes the predominant post-treatment clinical reactions observed following chemical peeling.

Table 5: Post-Peel Clinical Reactions Observed in the Study Groups

Treatment Group	Predominant Post-Peel Reaction	Duration
30% Salicylic Acid	Visible epidermal desquamation and scaling	Approximately 4.8 days
40% Pyruvic Acid	Mild-to-moderate transient erythema	Approximately 12–24 hours

[Table 5] shows that visible epidermal desquamation and scaling constituted the principal post-peel reaction among patients treated with salicylic acid. Conversely, pyruvic acid treatment was associated predominantly with transient erythema that resolved within 12–24 hours. These observations indicate better cosmetic acceptability and faster return to routine activities following pyruvic acid therapy.

[Table 6] summarizes the principal clinical outcomes observed following treatment.

Table 6: Comparison of Key Clinical Outcomes between the Two Treatment Modalities

Outcome Parameter	30% Salicylic Acid	40% Pyruvic Acid
Reduction in inflammatory lesions	71.2%	74.5%
Improvement in early atrophic scars	Not reported	80.0%
Mean downtime	4.8 days	1.4 days
Visible epidermal scaling	Present	Minimal or absent
Immediate post-peel erythema	Mild	Mild-to-moderate
Overall recovery profile	Slower	Faster

[Table 6] demonstrates that both treatment modalities effectively reduced inflammatory acne lesions, with pyruvic acid producing a slightly higher lesion reduction (74.5%) than salicylic acid (71.2%). Improvement in early atrophic scarring was observed in 80.0% of patients receiving pyruvic acid, whereas such improvement was not reported with salicylic acid. The mean downtime was substantially lower with pyruvic acid (1.4 days) compared with salicylic acid (4.8 days). Furthermore, visible epidermal scaling was predominantly associated with salicylic acid treatment, whereas pyruvic acid was characterized by transient erythema and faster recovery. These findings collectively suggest that pyruvic acid provides comparable acne control with superior cosmetic recovery and additional scar remodeling benefits.

Tables Summary

[Table 1] shows that 10 patients (50.0%) each were allocated to the salicylic acid and pyruvic acid groups, ensuring equal representation and balanced comparison between the treatment arms. [Table 2] demonstrates that inflammatory acne lesions were reduced by 71.2% in the salicylic acid group and 74.5% in the pyruvic acid group, indicating substantial efficacy with both peeling agents. [Table 3] reveals that 8 patients (80.0%) treated with pyruvic acid experienced visible improvement in early atrophic acne scarring, whereas comparable improvement was not reported in the salicylic acid group. [Table 4] highlights a marked difference in social downtime, with salicylic acid-treated patients experiencing an average downtime of 4.8 days compared with only 1.4 days among pyruvic acid-treated patients. [Table 5] demonstrates that salicylic acid was associated predominantly with visible epidermal desquamation and scaling, while pyruvic acid produced mainly transient erythema resolving within 12–24 hours. [Table 6] provides an overall comparison of clinical outcomes, showing that pyruvic acid offered comparable efficacy in acne lesion reduction, superior improvement in early atrophic scarring, reduced visible scaling, and significantly shorter recovery time. Collectively, these findings suggest that both peeling agents are effective in the management of inflammatory acne vulgaris; however, pyruvic acid appears to provide additional advantages in terms of scar remodeling and minimization of post-procedure downtime, thereby enhancing patient convenience and treatment acceptability.

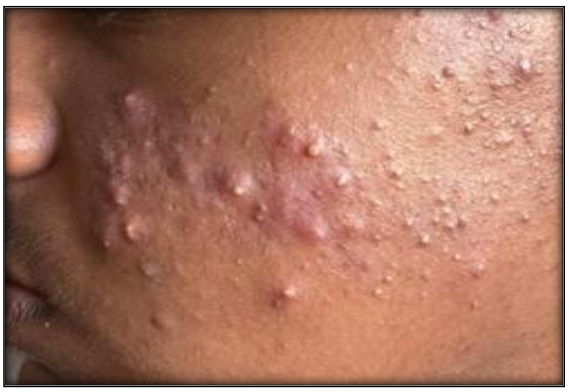

Figure 1: Baseline Clinical Presentation of Inflammatory Acne with Early Atrophic Scarring

The clinical [Figure 1] demonstrates multiple inflammatory acne lesions characterized by papules and pustules involving the facial skin. Early atrophic scarring and surface textural irregularities are also appreciable. Such patients represent an important therapeutic subgroup in whom simultaneous control of active inflammation and prevention of progressive scar formation are desirable treatment goals. The image illustrates the baseline disease characteristics commonly encountered among patients suitable for chemical peeling interventions.

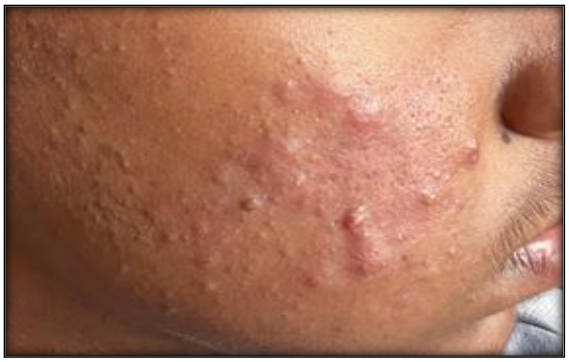

Figure 2: Clinical Appearance of Active Papulopustular Acne Vulgaris

[Figure 2] depicts active inflammatory acne vulgaris with multiple papules and pustules distributed predominantly over the facial region. The visible inflammatory burden highlights the need for therapies capable of reducing follicular obstruction, sebaceous activity, and inflammation. Such presentations are appropriate candidates for both salicylic acid and pyruvic acid peeling procedures as evaluated in the present study.

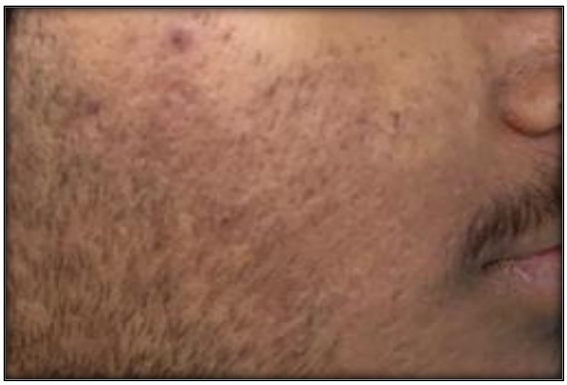

Figure 3: Representative Clinical Improvement Following Chemical Peel Therapy

[Figure 3] demonstrates visible reduction in inflammatory lesions together with improvement in overall skin texture following treatment. Decreased erythematous inflammatory lesions and smoother cutaneous surface appearance indicate a favorable therapeutic response. The photograph supports the clinical efficacy of chemical peeling as an adjunctive treatment modality for inflammatory acne vulgaris.

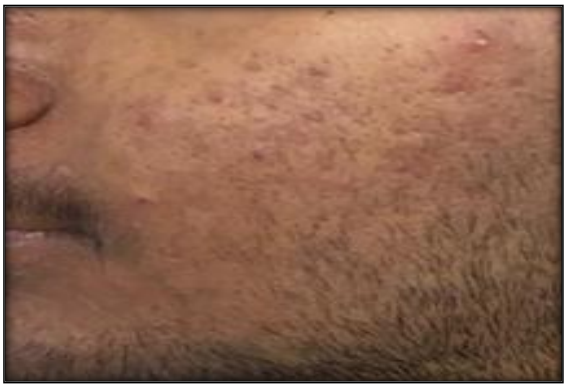

Figure 4: Post-Treatment Reduction in Inflammatory Acne Lesions

The clinical [Figure 4] demonstrates a noticeable reduction in the number and severity of inflammatory acne lesions following chemical peel therapy. A decrease in erythematous papules and pustules is evident, indicating effective suppression of active inflammation and improvement in disease activity. The image highlights the therapeutic efficacy of chemical peeling in achieving visible clinical improvement in patients with mild-to-moderate inflammatory acne vulgaris.

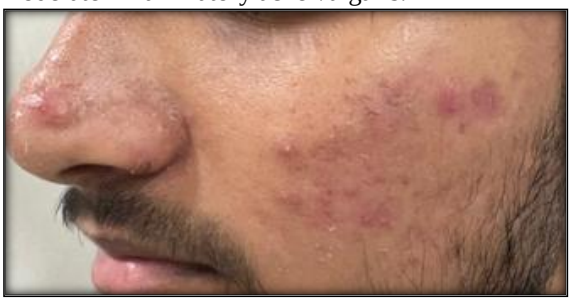

Figure 5: Improvement in Acne-Associated Textural Irregularities Following Treatment

[Figure 5] demonstrates improvement in overall skin texture with reduction in surface irregularities associated with inflammatory acne. Smoother skin contours and a more uniform cutaneous appearance are appreciable following treatment. These findings support the role of chemical peeling in promoting epidermal renewal and improving the aesthetic appearance of acne-affected skin.

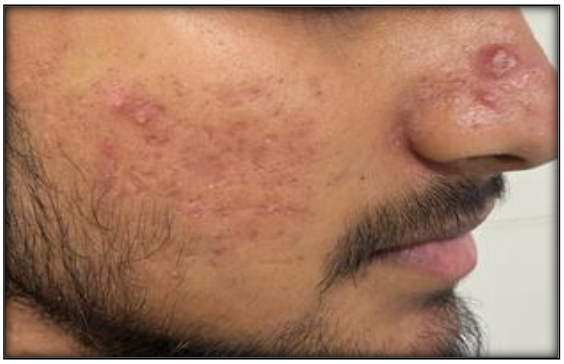

Figure 6: Representative Clinical Outcome Following Completion of Peel Therapy

[Figure 6] illustrates the overall clinical outcome achieved after completion of the treatment protocol. Marked reduction in inflammatory lesions together with improvement in skin appearance can be appreciated. The image reflects the favorable therapeutic response observed among study participants and demonstrates the utility of chemical peeling as an effective adjunctive modality in the management of inflammatory acne vulgaris.

Figures Summary

[Figure 1] demonstrates the baseline clinical presentation of inflammatory acne vulgaris with associated early atrophic scarring and textural changes. [Figure 2] illustrates active papulopustular acne lesions requiring therapeutic intervention. [Figure 3] depicts representative clinical improvement following chemical peel therapy with reduction in inflammatory lesion burden and enhancement of skin appearance. [Figure 4] shows a visible decrease in inflammatory acne lesions after treatment, indicating successful control of active disease. [Figure 5] highlights improvement in acne-associated textural irregularities and overall skin smoothness following therapy. [Figure 6] presents a representative final treatment outcome characterized by marked clinical improvement and reduction in acne severity. Collectively, the six clinical photographs provide visual evidence supporting the effectiveness of chemical peeling in the management of mild-to-moderate inflammatory acne vulgaris and demonstrate improvements in lesion burden, skin texture, and overall cosmetic appearance following treatment.

DISCUSSION

The present randomized comparative study evaluated the therapeutic efficacy, post-procedure downtime, and practical clinical utility of 30% salicylic acid and 40% pyruvic acid peels in patients with mild-to-moderate inflammatory acne vulgaris.[1] The findings demonstrated that both peeling agents were highly effective in reducing inflammatory acne lesions, with pyruvic acid exhibiting a slight numerical advantage in lesion reduction and a substantial advantage in reducing treatment-related downtime.[2,3] Additionally, pyruvic acid showed beneficial effects on early atrophic acne scarring, an outcome that was not observed with salicylic acid treatment.

Chemical peeling remains an important adjunctive modality in acne management because it addresses several pathogenic mechanisms simultaneously.[4] Controlled epidermal exfoliation promotes normalization of follicular keratinization, facilitates comedonal clearance, reduces microbial colonization, and enhances epidermal turnover.[5,6] These effects contribute to a reduction in inflammatory lesions while simultaneously improving overall skin quality. The favorable outcomes observed in both treatment groups reinforce the established role of chemical peels as effective procedural interventions in patients with inflammatory acne vulgaris.[7,8]

Salicylic acid has long been considered one of the most effective peeling agents for acne-prone skin because of its lipophilic nature and preferential penetration into the pilosebaceous unit. Its desmolytic action promotes dissolution of intercellular adhesions within the stratum corneum, facilitating rapid clearance of comedonal material and inflammatory lesions.[9,10] In the present study, treatment with 30% salicylic acid resulted in a mean reduction of 71.2% in inflammatory lesion counts, confirming its efficacy as an established acne treatment modality. However, visible epidermal desquamation was observed in all treated patients, resulting in a mean downtime of 4.8 days.[11] These findings suggest that although salicylic acid remains highly effective for active inflammatory acne, its associated cosmetic recovery period may limit its acceptance among individuals requiring rapid return to daily activities.[12]

Pyruvic acid demonstrated comparable efficacy with a mean inflammatory lesion reduction of 74.5%. The therapeutic effects of pyruvic acid can be attributed to its potent keratolytic, antimicrobial, anti-inflammatory, and sebostatic properties.[13] Unlike salicylic acid, pyruvic acid penetrates more deeply into the epidermis and papillary dermis and undergoes physiological conversion to lactic acid within the skin. This deeper penetration permits modulation of dermal remodeling processes and stimulation of fibroblast activity.[14] Consequently, pyruvic acid not only improves active acne lesions but also contributes to enhancement of skin texture and early scar remodeling. The observation that 80% of patients in the pyruvic acid group demonstrated visible improvement in early atrophic scarring supports this mechanism of action.[15]

One of the most clinically relevant findings of the present study was the significant difference in post-procedure downtime between the two treatment modalities.[16] Patients receiving pyruvic acid experienced transient erythema that resolved within 12–24 hours, resulting in a mean downtime of only 1.4 days. In contrast, salicylic acid treatment was associated with visible epidermal scaling and desquamation lasting an average of 4.8 days. The difference was highly statistically significant ($P < 0.01$).[17] From a practical perspective, reduced downtime has become an increasingly important determinant of patient satisfaction and treatment adherence, particularly among working professionals and socially active individuals. The markedly shorter recovery period observed with pyruvic acid enhances its attractiveness as a treatment option in contemporary aesthetic dermatology.[18]

The present study also highlights the importance of individualized patient selection when choosing a chemical peeling agent. Patients with severe seborrhea, extensive comedonal activity, and

predominant inflammatory lesions may derive substantial benefit from salicylic acid because of its strong affinity for sebaceous follicles.[19] Conversely, patients presenting with inflammatory acne accompanied by early atrophic scarring, textural irregularities, post-inflammatory hyperpigmentation, or occupational demands requiring minimal downtime may be better candidates for pyruvic acid treatment. Adoption of such objective selection criteria may improve therapeutic outcomes while enhancing patient satisfaction and compliance.[20]

Despite its encouraging findings, the study possesses certain limitations. The sample size was relatively small, and the duration of follow-up was limited to the treatment period. Long-term assessment of recurrence rates, scar remodeling, pigmentary outcomes, and patient-reported satisfaction would provide additional insights into the comparative benefits of these peeling agents. Larger multicentric studies are therefore warranted to validate the observed findings and establish more robust evidence-based recommendations for clinical practice.

Overall, the results indicate that both salicylic acid and pyruvic acid peels are effective interventions for mild-to-moderate inflammatory acne vulgaris. However, pyruvic acid appears to offer distinct advantages in terms of reduced downtime, enhanced cosmetic recovery, and improvement of early atrophic scarring, making it a valuable option in appropriately selected patients.

Limitations

The present study has certain limitations that should be considered while interpreting the findings. First, the study was conducted on a relatively small sample of 20 patients, which may limit the generalizability of the results to larger and more diverse populations. Second, the study population consisted exclusively of patients with Fitzpatrick skin types III–V; therefore, the findings may not be directly applicable to individuals with other skin phototypes. Third, the duration of follow-up was restricted to the treatment period and immediate post-treatment assessment, precluding evaluation of long-term therapeutic efficacy, recurrence rates, and sustained scar remodeling. Fourth, objective instrumental measurements of sebum production, scar severity, and quality-of-life improvement were not performed. Finally, although pyruvic acid demonstrated favorable outcomes in reducing downtime and improving early atrophic scarring, larger multicenter studies with extended follow-up are required to validate these observations and establish standardized treatment recommendations.

CONCLUSION

Both 30% salicylic acid and 40% pyruvic acid chemical peels were found to be effective treatment modalities for mild-to-moderate inflammatory acne vulgaris, producing substantial reductions in inflammatory lesion counts following four treatment sessions. While the overall efficacy of the two peeling agents was comparable, important differences were observed in post-treatment recovery and scar improvement.

Pyruvic acid demonstrated a slight numerical advantage in inflammatory lesion reduction and showed additional benefits in improving early atrophic acne scarring. Most notably, pyruvic acid was associated with significantly reduced post-procedure downtime, with patients experiencing only transient erythema compared with the prolonged visible desquamation observed following salicylic acid treatment. These characteristics make pyruvic acid particularly suitable for individuals seeking effective acne treatment with minimal interruption of social and professional activities.

Salicylic acid remains a highly valuable option for patients with predominantly active inflammatory and comedonal acne, especially in the presence of marked seborrhea. Conversely, pyruvic acid appears better suited for patients presenting with inflammatory acne accompanied by early atrophic scarring, textural irregularities, post-inflammatory hyperpigmentation, and a requirement for rapid cosmetic recovery.

The findings of this study support the use of objective patient-selection criteria based on clinical presentation, seborrheic status, scar burden, pigmentary concerns, and downtime expectations. Adoption of such an individualized approach may optimize therapeutic outcomes, enhance patient satisfaction, and improve overall treatment success in the management of acne vulgaris.

Clinical Recommendations Derived from the Study

Indications for 30% Salicylic Acid Peel

- Patients with marked seborrhea and excessive sebum production.
- Predominantly comedonal acne with active papules and pustules.
- Individuals without significant atrophic scarring.
- Patients willing to tolerate visible epidermal desquamation during the recovery period.
- Cases where rapid reduction of active inflammatory lesions is the primary treatment objective.

Indications for 40% Pyruvic Acid Peel

- Patients with inflammatory acne associated with early atrophic scarring.
- Presence of acne-related textural irregularities.
- Individuals with existing or potential post-inflammatory hyperpigmentation.
- Mild-to-moderate seborrhea without excessive oiliness.
- Patients requiring minimal social downtime and rapid return to routine activities.
- Individuals seeking simultaneous acne control and skin rejuvenation.

Future Directions

Future studies should include larger patient populations, longer follow-up periods, and objective assessment tools for acne severity, sebum production, scar remodeling, and patient-reported outcomes. Comparative studies involving combination peel protocols and evaluation of long-term recurrence rates may further refine the role of chemical peeling in contemporary acne management. In addition, multicentric trials involving diverse skin phototypes may help establish universally applicable treatment algorithms for selecting the most appropriate peeling agent according to individual patient characteristics.

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