Original Article

Comparison of Efficacy of 40% Mandelic Acid with 30% Salicylic Acid Peels in Mild-to-Moderate Acne Vulgaris: A Randomized Study

Rajkiran Takharya, Jude Ernest Dileep[1], Paquirissamy Oudeacoumar[1], Damayandhi Kaliyaperumal[1], Ilakkia Priya sadasivam[1], Lisa Jennifer Dsouza[2]

Department of Dermatology, Manipal Tata Medical College, Jamshedpur, Jharkhand, [1]Department of Dermatology, Aarupadai Veedu Medical College and Hospital, Pondicherry, [2]Department of Dermatology, Kasturba Medical College, Manipal, Karnataka, India

Abstract

Background: Chemical peel is a cosmetic procedure that is becoming a popular modality in treating acne vulgaris (AV). Mandelic acid (MA) is an upcoming peeling agent for AV due to its anti-inflammatory and antibacterial traits. Hence, it is worthwhile to appraise this newer agent's effectiveness and safety profile and compare it with a more traditional and established peeling agent, salicylic acid (SA), in the treatment of AV. **Aims:** The aim of this study was to compare the efficacy of 40% MA with 30% SA peels in south Indian patients suffering from mild-to-moderate facial AV. **Materials and Methods:** One hundred patients suffering from mild-to-moderate facial AV were distributed randomly into two groups of 50 each, with group A receiving 40% MA peel and group B receiving 30% SA peel at an interval of two weeks for six sessions. The duration of the study was twelve weeks. Clinical pictures and Michaelsson acne scores (MAS) were used to evaluate the effectiveness of treatment objectively. Adverse effects of both the peeling agents were also noted. **Statistical Analysis Used:** A value of $P \leq 0.05$ was considered significant. **Results:** Overall, there was no significant difference in the efficacy between the two peels. However, adverse effects were slightly higher with SA peel. **Conclusions:** The 40% MA peel was equally effective as 30% SA peel in mild-to-moderate facial AV. However, safety profile and tolerability were better in the MA peel group than the SA peel group.

Keywords: Acne vulgaris, chemical peeling, mandelic acid, Michaelsson acne score, salicylic acid

Introduction

Acne is a chronic inflammatory state of the pilosebaceous units, characterized by the emergence of comedones, erythematous papules and pustules, less often by nodules or pseudocysts. In the etiology of acne vulgaris, multiple factors play a role, determining the severity of the disease. Specific factors that may precipitate acne include genetic and environmental factors like diet, menstruation, emotional stress and cosmetics. The main factors responsible for the pathogenesis are increased sebum production, an abnormality of microbial flora, cornification of the pilosebaceous duct, production of inflammation and increased androgen levels. The severity of acne is associated with the degree of seborrhea, which is directly dependant on the extent and rate of growth of sebaceous glands, which is under the direction of androgens.[1] Acne affects 80% of individuals between puberty and 30 years of age.[2] It was also recorded in 54% of women and 40% of men over 25 years.[3] Non-inflamed lesions, the comedones, are either open comedones (blackheads) or closed comedones (whiteheads)—inflammatory lesions, perhaps superficial or deep, include papules, pustules and nodules. A microbial etiology of acne has been suggested since the beginning of the last century. There is considerable evidence that indicates that micro-organism, particularly *Cutibacterium acne or*

Submission: 03-09-2022 **Revision:** 15-11-2022
Acceptance: 05-12-2022 **Web Publication:** 17-06-2023

Access this article online

Quick Response Code:

Website: www.tjdonline.org

DOI: 10.4103/tjd.tjd_106_22

Address for correspondence: Dr. Jude Ernest Dileep, A-Block, Department of Dermatology, Aarupadai Veedu Medical College and Hospital, Kirumampakkam, Pondicherry 607403, India. Email: judegenext@gmail.com

How to cite this article: Takharya R, Dileep JE, Oudeacoumar P, Kaliyaperumal D, sadasivam IP, Dsouza LJ. Comparison of efficacy of 40% mandelic acid with 30% salicylic acid peels in mild-to-moderate acne vulgaris: A randomized study. Turk J Dermatol 2023;17:44-51.

Propionibacterium acne, is essential in the pathogenesis of acne vulgaris. However, it is still unsure whether *P. acne* is a causal agent in developing non-inflamed or inflamed acne lesions. Various treatment modalities like topical, systemic antibacterial, sebostatics, retinoids have been used as the treatment modalities for acne, and nowadays, dermatologists seek to employ new technologies in acne care like chemical peeling.[4] It's the application of the chemical agents on the skin that causes controlled destruction of the portion or entire epidermis with or without dermis leading to shedding and eliminating superficial lesions followed by restoration of new epidermal and dermal tissues.[5] Despite the advent of more contemporary techniques and LASER, peeling is still considered a simple procedure, requiring hardly any instrumentation to rejuvenate the skin.[5] Because of the resurfacing of the epidermal layer, the melanin content is declined, and it is more evenly distributed, improving hyperpigmentation.[6] SA is a β-hydroxy acid. SA has keratolytic properties as it solubilizes intracellular cement. Its lipid solubility allows the interaction with multilamellar frameworks encircling the keratinocytes in the stratum corneum and hair follicle, thereby showing follicular atrophy and comedolytic action inside the sebaceous unit.[7] "So, it is beneficial in comedonal and inflammatory acne.[8] MA is an 8-carbon alpha hydroxyl acid (AHA) which is named after German "Mandel", meaning almond and acquired from hydrolysis of an extract of bitter almonds. It has a high melting point, is partially soluble in water, and is freely soluble in isopropyl and ethyl alcohol.[9] It causes the dissolution of intercellular cement substances, stimulates collagen synthesis and promotes cellular regeneration.

Aim and Methods

Aim

This study was aimed at comparing the efficacy of 40% MA with 30% SA peels in mild-to-moderate acne vulgaris.

Methods

This was a prospective comparative study. One hundred patients of both genders with mild-to-moderate acne in the age group 15 to 45 years were included in the study. They were divided into two groups, 50 each; Stratified randomization was done using computer-generated random numbers into two groups (Group A 40% MA and Group B 30% SA). The study was done for a period of two years from January 2020 to December 2021.

Pregnant and lactating women, patients with history of hypersensitivity to SA or MA, patients with severe acne vulgaris (Grades III and IV), patients with hypertrophic scars or keloids, active infection (such as herpes simplex infection, open acne cysts), and patients who have received isotretinoin for during the last 6 months were excluded from the study.

Group A patients were treated with 40% MA every 14 days for six sessions. Group B patients were treated with 30% SA peel every 14 days for six sessions. Sensitive areas like the inner canthus of the eyes and nasolabial folds were protected with Vaseline. After degreasing with acetone, the corresponding peel was applied on the face starting from forehead, right cheek, nose, left cheek and chin in that order. Feathering strokes were used at the edges to blend with the surrounding skin. The end point for MA peel was erythema and for SA peel pseudo frosting or five minutes whichever ever occurred first. The procedure was concluded with face washing with tap water.

Both Group A and Group B Patients were advised to protect themselves from sunlight by using sunscreen regularly at daytime, at least until the study gets over. Results were assessed based on serial photographs, clinical improvement. Michaelsson acne scores (MAS) were used to evaluate the efficacy of therapy. The following graded scale was used for assessing objectively the progress: excellent (76%–100%), good (51%–75%), fair (26%–50%), and poor (0%–25%).[10]

The clinical findings and results were recorded in the pre-designed proforma for analysis and interpretation of data. Efficacy of the treatment based on total lesion count reduction (by using MAS Score), and adverse effects (erythema/dryness/pruritus or burning) were noted.

Statistical analysis

Categorical variables were summarized as the frequency with percentage, and continuous variables were summarized as mean. Fisher's exact test or chi-square test was applied to analyze the data. A value of $P \leq 0.05$ was considered significant.

Results

At the end of 12 weeks of peeling sessions the grading of improvement in acne from the baseline was assessed in each group using MAS score. More than 75% decrease in MAS score from the baseline was graded as excellent improvement; A 51 to 75% decrease was Graded as good improvement; A 26 to 50% decrease was Graded as fair improvement and less than 25% decrease in MAS score Graded as poor improvement.

Group A (40% MA peel)

Among 50 participants in Group A, 31 (62%) showed excellent improvement in their acne score of which 10 (20%) had Grade I acne and 21 (42%) had Grade II acne before treatment. Good improvement was noted in 17 participants (34%) of which 8 (16%) had Grade I acne and 9 (18%) had Grade II acne. Only two participants (4%) showed Fair improvement that were having Grade I acne. None showed Poor improvement [Table 1].

Group B (30% SA peel)

Among 50 participants in group B 22 (44%) showed excellent improvement in their acne score of which 3 (6%) had Grade I acne and 19 (38%) had Grade II acne before treatment. Good improvement was noted in 27 participants (54%) of which 6 (12%) had Grade I acne and 21 (42%) had Grade II acne. Only one participant (2%) showed Fair improvement that was having Grade I acne. None showed Poor improvement [Table 2].

Comparison of percentage of improvement in different grades of acne between 40% MA peel and 30% SA peel

Table 3 shows the comparison of percentage of improvement in different grades of acne with 40% MA peel and 30% SA peel. Patients with mild acne (Grade 1) who were treated with 40% MA showed good improvement in 16% of the patients. On the other hand, 12% of the patients with mild acne who were treated with 30% SA peel showed good improvement. Patients with moderate acne (Grade II) who were treated with 40% MA showed good improvement in 18% of the patients. On the other hand, 42% of the patients with grade II acne that were treated with 30% SA peel showed good improvement [Table 3 and Figures 1–4].

Improvement in mean MAS score from baseline to end of the study was more or less similar in both Group A and Group B indicating both MA peel and SA peel are equally effective in Grade I and Grade II acne vulgaris [Tables 4 and 5].

There was no statistically significant difference in the efficacy between the two Groups in terms of mean MAS score and mean percentage improvement.

Table 1: Percentage of improvement in different grades of acne with 40% MA peel

Percentage of improvement	Grade I acne	Grade II acne	Total *N* (%)
No change	0	0	0
0%–25% (poor)	0	0	0
26%–50% (fair)	2 (4%)	0	2 (4%)
51%–75% (good)	8 (16%)	9 (18%)	17 (34%)
76%–100% (excellent)	10 (20%)	21 (42%)	31 (62%)
Total	20 (40%)	30 (60%)	50 (100%)

Table 2: Percentage of improvement in different grades of acne with 30% SA peel

Percentage of improvement	Grade I acne	Grade II acne	Total *N* (%)
No change	0	0	0
0%–25% (poor)	0	0	0
26%–50% (fair)	1 (2%)	0	1 (2%)
51%–75% (good)	6 (12%)	21 (42%)	27 (54%)
76%–100% (excellent)	3 (6%)	19 (38%)	22 (44%)
Total	10 (20%)	40 (80%)	50 (100%)

Table 3: Comparison of percentage of improvement in different grades of acne between 40% MA peel and 30% SA peel

Percentage of improvement	40% MA peel Group A		30% SA peel Group B		*P* Value
	Grade 1	Grade 2	Grade 1	Grade 2	
No change	0	0	0	0	
0%–25% (poor)	0	0	0	0	0.044
26%–50% (fair)	2(4%)	0	1(2%)	0	
51%–75% (good)	8(16%)	9(18%)	6(12%)	21(42%)	
70%–100% (excellent)	10(20%)	21(42%)	3(6%)	19(38%)	

Adverse effects

Burning sensation was reported more in group B with 12 (24%) participants when compared to only 6 (12%) patients in group A. Dryness was noted in 2 (4%) in Group B and only one participant (2%) in Group A. Erythema was observed in 3 (6%) in Group B and only in 1 participant (2%) in Group A. Pruritus was noted in 4 (8%) in Group B and in 3 participants (6%) in Group A. The adverse effects were slightly more frequently observed in Group B when compared to Group A though this is not statistically significant ($P = 0.94$). Side effects were well tolerated by participants in both the Groups

Discussion

Acne is one of the prevalent skin ailments that present to dermatologists in day-to-day practice. Diagnosis of acne is easy; however, treatment selection depends on multiple factors such as grading of acne, duration of disease, previous treatments are taken, and the tendency for scarring and post-inflammatory pigmentation. So, procedure should be tailored to the individual patient, and it must also take into record the influence of acne on patients quality of life. Various treatment choices are available, but there is a necessity for an effective additional treatment to accelerate the improvement in acne vulgaris. Both topical and systemic retinoids are the mainstay in the treatment ladder for acne. Chemical peeling is also gaining importance, especially in mild-to-moderate acne. To the best of our knowledge, there are no published data about comparing 40% MA peel vs. 30% SA in acne treatment. However, few studies were published using either SA or MA alone to treat acne with different concentrations. This prospective study was carried out in 100 patients with mild-to-moderate acne vulgaris.

In our study, females outnumbered males with a male to female ratio of 1:2.1. This finding is consistent with previous studies by Vijay Kumar Garg *et al.*[6] (0.3:1), Doaa S.Sayed *et al.*[11] (0.1:1), Sadaf Fasih *et al.*[12] (0.7:1), and Olga Lekakh *et al.*[13] (0.3:1). However, studies conducted by Dayal S *et al.*[14] and Shishira *et al.*[15] observed a male preponderance of 1.1:1 and 1:0.6, respectively.

Figure 1: Before and after (12 weeks) treatment photographs of a patient treated with 40% mandelic acid peel (male)—group A. Before treatment (MAS score 20). After treatment (MAS score 5)

Table 4: Showing mean MAS score for both groups

Study groups	Mean Baseline MAS score	MAS score After 12 weeks treatment	*P* Value
Group A	20.16	4.95	0.0001
Group B	22.80	6.64	0.0001

Table 5: Mean percentage improvement between groups A and B

Peeling agent groups	Mean percentage improvement	*P* Value
Group A	75.92 %	0.187
Group B	72.96 %	

Age group and gender ratio

In our study, a maximum number of acne patients belonged to 15 to 25 years in both Group A 72% and Group B 68% making it 70% of the total 100 participants. The mean age of the study population in Group A and Group B was 20.3 and 20.4 years, respectively. This was more or less similar to studies done by Vijay Kumar Garg *et al.*,[6] Jartarkar *et al.*,[16] Shishira *et al.*,[15] and Doaa S.Sayed *et al.*[11] Slightly lesser mean age of 19.54 and 19.21 was noted by Dayal S *et al.*[14] and Sadaf Fasih *et al.*[12] respectively. A mean age of 26.3 was reported by Olga Lekakh *et al.*[13] The higher prevalence of acne in adolescents is a recognized entity, and the present study was consistent with it [Table 6].

Precipitating factors

In our study, 17% of participants mentioned increased acne due to diet, including regular rice and oily food intake; summer exacerbation was seen in 23%, premenstrual flare in 19% and stress-induced exacerbation was noted in 9%. In a study conducted by Salomone *et al.*[17] in Santiago, of the Forty patients between 13 and 25 years of age, 70% saw a flare-up in acne lesions with stress, and 42% saw a worsening with menstrual period, 58% saw a worsening with a variety of foods, especially mayonnaise, butter, dairy, nuts and chocolate.

Figure 2: Before and after treatment (12 weeks) photographs of a patient treated with 40% mandelic acid peel (female)—group A. Before treatment (MAS score 23.5). After treatment (MAS score 10.5)

Table 6: Comparative analysis of age and gender ratio from studies done elsewhere

S. no.	Researcher	Peeling agents used	Mean age	Sex preponderance (male:female)
1	Our study	40% mandelic acid vs. 30% salicylic acid peel	20.35	1:2.1
2	Vijay kumar Garg *et al.*[6]	Glycolic acid vs. SMP	22	0.3:1
3	Dayal *et al.*[14]	45% mandelic acid vs. 30% Salicylic acid peel	19.54	1.1:1
4	Jartarkar *et al.*[16]	20% salicylic acid and 30% mandelic acid peel	21.65	1:1.5
5	Shishira *et al.*[15]	30% mandelic acid peel	21.13	1:0.6
6	Doaa S.Sayed *et al.*[11]	SA peel vs. lactic acid peel	24.90	0.1:1
7	Sadaf Fasih *et al.*[12]	SA peel	19.21	0.7:1
8	Olga Lekakh *et al.*[13]	SA peel vs. pulsed dye laser	26.3	0.3:1

Worsening of acne during summer was noted in 23 (23%) participants in our study. Previous studies noted variable results regarding seasonal variation in acne. Sardana *et al.*[18] also reported worsening of acne during summer. The reason for aggravation of acne in summer may be because increased sweating may result in increased growth of the lipophilic Propionibacterium. The association of these factors with acne exacerbation noted in our study was in accordance with previous studies. One Saudi Arabian study by Al Ameer [19] reported worsening of acne in winter and improvement in summer as it was thought that it could be due to the bactericidal effect of ultraviolet light.

Treatment efficacy

In our study with respect to mild acne (Grade I), good improvement was noted in 16% of the participants in Group A (40% MA) and in 12% of the participants in Group B (30% SA). Excellent improvement was noted in 20% of participants in Group A and 6% of participants in

Figure 3: Before and after treatment (12 weeks) photographs of a patient treated with 30% salicylic acid peel (male)—group B. Before treatment (MAS score 36.4). After treatment (MAS score 14)

Group B. With respect to moderate acne (Grade II), good improvement was reported in 18% of the participants in Group A (40% MA) and in 42% of the participants in Group B (30% SA). Excellent improvement was noted in 42% in Group A and 38% participants in Group B.

In our study, the mean MAS score after 12 weeks of treatment improved to 4.95 from a baseline score of 20.16 in Group A and 6.64 from the baseline score of 22.80 in Group B. The improvement in mean MAS score was more or less equal in both the Groups indicating both MA peel and SA peel were equally effective in Grade I and Grade II acne vulgaris. The mean percentage of improvement was 75.92% in Group A and 72.96% in Group B, and the difference was not statistically significant; thus, both the peels were equally efficacious in our study.

Adverse effects

Both peels were tolerated well by the participants in both Groups. The adverse effects were slightly more frequently observed in Group B when compared to Group A though this is not statistically significant ($P = 0.94$). The adverse effects were transient, and they subsided within 24 h. The adverse effects were well tolerated in the study by Dayal *et al.*[14] also.

Conclusion

Both 40% MA peel and 30% SA peel were equal in efficacy in the treatment of Grade I and Grade II acne vulgaris in South Indian patients. Both the peels were well tolerated and safe.

Limitations

In our study no follow-up was done after 12 weeks of treatment to know the long-term efficacy as well as reoccurrence rate of acne vulgaris. Therefore, prospective studies, with more number of participants, and more number of treatment sessions with a long-term follow-up period of at least 6 months to 1 year is needed to substantiate our result.

Figure 4: Before and after (12 weeks) treatment photographs of a patient treated with 30% salicylic peel (female)—group B. Before treatment (MAS score21.5). After treatment (MAS score 12)

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Lever L, Marks R. Current views on the aetiology, pathogenesis and treatment of acne vulgaris. Drugs 1990;39:681-92.
2. Cunliffe WJ, Gould DJ. Prevalence of facial acne vulgaris in late adolescence and in adults. Br Med J 1979;1:1109-10.
3. Goulden V, Stables GI, Cunliffe WJ. Prevalence of facial acne in adults. J Am Acad Dermatol 1999;41:577-80.
4. Kim RH, Armstrong AW. Current state of acne treatment: Highlighting lasers, photodynamic therapy, and chemical peels. Dermatol Online J 2011;17:2.
5. Khunger N; IADVL Task Force. Standard guidelines of care for chemical peels. Indian J Dermatol Venereol Leprol 2008;74 Suppl:S5-12.
6. Garg VK, Sinha S, Sarkar R. Glycolic acid peels versus salicylic-mandelic acid peels in active acne vulgaris and post-acne scarring and hyperpigmentation: A comparative study. Dermatol Surg 2009;35:59-65.
7. Levesque A, Hamzavi I, Seite S, Rougier A, Bissonnette R. Randomized trial comparing a chemical peel containing a lipophilic hydroxy acid derivative of salicylic acid with a salicylic acid peel in subjects with comedonal acne. J Cosmet Dermatol 2011;10:174-8.
8. Briden ME. Alpha-hydroxyacid chemical peeling agents: Case studies and rationale for safe and effective use. Cutis 2004;73:18-24.
9. Taylor MB. Summary of mandelic acid for the improvement of skin conditions. Cosmetic Dermatol 1999:26-8.
10. Lloyd JR. The use of microdermabrasion for acne: A pilot study. Dermatol Surg 2001;27:329-31.
11. Sayed DS, Abdel-Motaleb AA. Salicylic acid versus lactic acid peeling in mild and moderate acne vulgaris. AAMJ 2012;10 Suppl-2:341-354.
12. Fasih S, Arif AB. Salicylic acid peeling in the treatment of facial acne vulgaris. Pak J Physiol 2016;4:7-8.
13. Lekakh O, Mahoney AM, Novice K, Kamalpour J, Sadeghian A, Mondo D, *et al*. Treatment of acne vulgaris with salicylic acid

chemical peel and pulsed dye laser: A split face, rater-blinded, randomized controlled trial. J Lasers Med Sci 2015;6:167-70.
14. Dayal S, Kalra KD, Sahu P. Comparative study of efficacy and safety of 45% mandelic acid versus 30% salicylic acid peels in mild-to-moderate acne vulgaris. J Cosmet Dermatol 2019; 00:1-7.
15. Jartarkar SR, Mallikarjun M, Gangadhar B, Manjunatha P. Mandelic acid chemical peel in Acne vulgaris: A boon or a bane?. 1OSR eloog Journal of Dental and Medical Sciences (1OSR-JDMS) 2015;14:32-5.
16. Jartarkar SR, Gangadhar B, Mallikarjun M, Manjunath P. A randomized, single-blind, active controlled study to compare the efficacy of salicylic acid and mandelic acid chemical peel in the treatment of mild to moderately severe acne vulgaris. Clin Dermatol Rev 2017;1:15-8.
17. Salomone C, Nicklas C, Navarrete-Dechent C, Droppelmann K, Perez- Cotapos ML. Comparitive study of dietary habits between acne patients and a healthy cohort. Indian J Dermatol Venerol Leprol 2012;78:99-101.
18. Sardana K, Sharma RC, Sarkar R. Seasonal variation in acne vulgaris–myth or reality. J Dermatol 2002;29:484-8.
19. Al-Ameer AM, Al-Akloby OM. Demographic features and seasonal variations in patients with acne vulgaris in Saudi Arabia: A hospital-based study. Int J Dermatol 2002;41:870-1.