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Salicylic Acid Peel and Fusion Peel with Salicylic & Mandelic Acid Peel for Treatment of Acne Scars - A Comparative Study

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Abstract

Introduction. Acne vulgaris is one of the most common skin diseases affecting more than 85% of individuals worldwide. The study aimed to compare the therapeutic efficacy of Salicylic acid peel and Salicylic acid - mandelic acid peel for treatment of acne scars. **Material and Methods.** A comparative study was conducted on 41 patients, divided into two groups based on treatment choice by the subjects. Group A (23) were treated with 30% salycilic acid peels, and group B (18) were treated with 20% salycilic acid and 10% mandelic acid peels at an interval of 2 weeks for three sessions. The physician's global assessment scale and clinical photographs were used at the end of three sessions. All the data were analysed using SPSS considering $P<0.05$ as significant. **Results.** Of the total 41 patients analyzed, the mean age in both the groups were comparable. (Group A: 20.4 years; Group B: 20.5 years). Duration of acne was >12 months in both the groups 13 (56.52%) & 10 (55.56%)). Thirteen patients (56.52%) in group A and 1 (5.56%) in group B had no side effects which was statistically significant ($p=0.01$). Using the physician's global assessment scale 51-75% (Good) an improvement was seen in grade I 4 (17%) and 18 (78%) in grade II in group A and 2 (11%) in grade I and 12 (67%) in grade II in group B, respectively which was statistically significant ($p=0.001$). **Conclusion**. Both agents showed almost equal efficacy in improving mild-to-moderate acne scars. Adverse effects were less with Salicylic acid peel compared with mandelic acid peel..

Key words: Acne Vulgaris; Salicylic Acid; Mandelic Acid; Keratolytic Agents; Chemexfoliation; Treatment Outcome

Introduction

Acne vulgaris is one of the most common skin diseases affecting more than 85% of individuals worldwide. While acne is most prevalent among adolescents between 15 to 24 years old, it is not uncommon in adults either (1). It is an extremely common condition affecting the skin's pilosebaceous unit, affecting mostly the face and the back and chest. Acne pathogenesis is a multifactorial process consisting of four factors: follicular epidermal hyperproliferation, excess sebum production, the presence and activity of the commensal bacteria Propionibacterium acnes, and inflammation. Scarring can occur due to damage to the skin during the healing of active acne that may be atrophic or hypertrophic (2).

Although acne is often considered a cosmetic problem, it can have an enormous impact on patients' psychosocial and physical well-being, having a lifelong effect by disfiguring scars that correlates with various psychological factors such as depression, anxiety, anger, frustration, shame, low self-esteem, social isolation and body dissatisfaction (3).

According to recent dermatologic guidelines, the current first-line treatments for acne are conventional pharmacological therapies such as antibiotics, retinoids, hormonal agents and benzoyl peroxide (4). However, conventional treatment is not always desirable because of the development of antibiotic resistance of the Propionibacterium acnes and other bacteria (5) and the potential risk of adverse effects associated with topical and systemic treatments (6). Presently, non-pharmacological therapies like laser and light-based therapies, chemical peels, micro-needling, (micro)dermabrasion and (mechanical) lesion removal, dermal fillers, platelet-rich plasma (PRP) and the chemical reconstruction of skin scars (CROSS) technique are applied more often by care professionals. They are used as independent therapies, combined with con-

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Figure 1. Treatment Response in Group A (30% salicylic acid). (A) 22-year-old female with Grade II Acne vulgaris. (B) 51-75% clearance of lesions after three sessions of peel

ventional therapies or as maintenance therapy, especially in more persistent or chronic acne types where long-term treatment is required (5). Evidence suggests that a combination of various treatment modalities gives better results than monotherapy alone (7).



Figure 2. Treatment Response in Group A (30% salicylic acid). (A) 20-year-old female with Grade II Acne vulgaris. (B) 51-75% clearance of lesions after three sessions of peel

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Chemical peels are used to treat acne scars which are small and depressed. Lactic acid, salicylic acid, glycolic acid, Jessner solution, and 10 to 25% trichloroacetic acid and mandelic acid are commonly used for superficial chemical peeling (8). Salicylic acid has been used to treat various skin disorders for more than 2,000 years. The ability of salicylic acid to exfoliate the stratum corneum makes it a promising agent for peeling. The efficacy and safety of salicylic acid peeling in Fitzpatrick skin types I-III as well as in skin types V and VI have been well documented in the literature by Arif T et al. (9). Mandelic acid (MA) is a new emerging peeling agent for acne scars owing to its antibacterial and anti-inflammatory properties.

A previous study by Shishira et al. (10) reported that Salicylic acid peel was more productive than Mandelic acid peel. However, the side effects were less familiar with no post-inflammatory hyperpigmentation with the Mandelic acid peel. In this study, SA and MA were tested separately. Hence, it is worthwhile to evaluate the effectiveness and safety profile of this newer agent and to compare it with an older established peeling agent, salicylic acid (SA) in the treatment of acne scars.

However, sufficient evidence-based support in comparing the efficacy and safety of the above mentioned non-pharmacological therapies is scarce in developing countries, particularly in India. Therefore, we herein included SA with MA and compared the efficacy and safety of salicylic acid peel with salicylic-mandelic acid peel for acne scars among patients visiting dermatology department in a tertiary care hospital.

Aims and Objectives: To compare the effectiveness of salicylic acid peel with salicylic mandelic acid peel for treating acne scars among patients visiting the department of dermatology in a tertiary care hospital.

Material and Methods

Study design: A Comparative Prospective Observational Study.

Study setting: Department of dermatology in a tertiary care hospital, Salem

Study population: Patients with facial acne scars, above 17 years of age attending OPD in the Department of Skin in a tertiary care hospital, Salem.

Study sample and sampling technique: 50 subjects were recruited through the uni-



Figure 3. Treatment Response in Group B (20% salicylic acid + 10% mandelic acid peel). (A) 22-year-old male with Grade II Acne vulgaris. (B) 51-75% clearance of lesions after three sessions of peel.

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Table 1. Summary of baseline parameters between study groups (N=41)

Parameter	Study group		P value
	Group A (N=23)	Group B (N=18)	
Age (Mean± SD)	20.43 ± 2.52	20.5 ± 2.71	0.937
	Gender		
Male	8 (34.78%)	6 (33.33%)	0.923
Female	15 (65.22%)	12 (66.67%)	
	Occupation		
Student	13 (56.52%)	15 (83.33%)	0.218
House Wife	1 (4.35%)	1 (5.56%)	
Labourer	7 (30.43%)	1 (5.56%)	
Others	2 (8.7%)	1 (5.56%)	
	Duration of Acne		
1-3 Months	4 (17.39%)	3 (16.67%)	0.995
3-6 Months	4 (17.39%)	3 (16.67%)	
7-12 Months	2 (8.7%)	2 (11.11%)	
>12 Months	13 (56.52%)	10 (55.56%)	
	Precipitating factors		
Diet	16 (69.57%)	8 (44.44%)	0.105
Premenstrual Flare	8 (34.78%)	4 (22.22%)	0.380
Stress	3 (13.04%)	2 (11.11%)	1.000
Sunlight	9 (39.13%)	5 (27.78%)	0.447
	Associated Factors		
Menstrual Irregularities	2 (8.7%)	3 (16.67%)	0.736
Acanthosis nigricans	5 (21.74%)	2 (11.11%)	0.438
Polycystic Ovarian Disease	5 (21.74%)	1 (5.56%)	0.297
Hirsutism	2 (8.7%)	1 (5.56%)	0.915
	Addiction		
Alcohol	0 (0%)	1 (5.56%)	*
Smoking	3 (13.04%)	1 (5.56%)	
Both	3 (13.04%)	0 (0%)	
None	17 (73.91%)	16 (88.89%)	
Family History	6 (26.09%)	5 (27.78%)	1.000
Use of Cosmetics	7 (30.43%)	9 (50%)	0.202

*No statistical test was applied - due to 0 subjects in the cells

versal sampling method, and 41 were selected based on inclusion criteria. The subjects were divided into two groups. Group A (23) salicylic acid peel and group B (18) salicylic + mandelic acid peel according to the subject's choice for treatment.

Study period: February 2019 – August 2020.

Ethical and Informed consent: The permission was obtained from the ethical and research committee of the concerned hospital. The written informed consent was obtained from participants before the study

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Table 2. Summary of other parameters between the study groups (N=41)

Parameter	Study group		P value
	Group A (N=23)	Group B (N=18)	
	Onset		
Insidious	17 (73.91%)	15 (83.33%)	0.706
Sudden	6 (26.09%)	3 (16.67%)	
	Symptoms		
Asymptomatic	14 (60.87%)	11 (61.11%)	0.962
Itching	4 (17.39%)	4 (22.22%)	
Pain	3 (13.04%)	2 (11.11%)	
Both	2 (8.7%)	1 (5.56%)	
	Grading of Acne		
Grade I (macular patch)	6 (26.08%)	2 (11.11%)	*
Grade II (mild)	15 (65.21%)	13 (83.33%)	
Grade III (moderate)	2 (8.69%)	2 (11.11%)	
Grade IV (severe)	0 (0%)	1 (5.56%)	
	Side Effects		
Burning Sensation	4 (17.39%)	5 (27.78%)	0.01
Dryness	2 (8.7%)	3 (16.67%)	
Erythema	2 (8.7%)	2 (11.11%)	
Pruritus	2 (8.7%)	7 (38.89%)	
Nil	13 (56.52%)	1 (5.56%)	

*No statistical test was applied - due to 0 subjects in the cells

started and the procedure's steps were explained as well. Confidentiality of the subjects was maintained throughout.

Inclusion criteria:

– Patients with facial acne scars (atrophic scars).

– Patients >17yrs.

– Patients with Fitzpatrick's skin types III to V.

Exclusion criteria:

– Patients with active herpes simplex infection.

– History of Isotretinoin treatment in the past six months.

– Patients on anticoagulant therapy.

– Pregnant and lactating mothers.

– Patients with a history of keloidal tendencies.

– Patients with active acne.

– Patients with unrealistic expectations.

Data collection: Each patient was interviewed for age, sex, occupation, sun exposure, duration of the disease, family history, previous treatment history, use of cosmetics and any precipitating factors. The patients were subjected to a proper general, systemic and dermatological examination. Then grading of the acne scars was done using Goodman and Baron's qualitative global acne grading system, which is as below (11).

– The first grade consists of macular hyper or hypopigmented flat marks that are visible.

– The second grade includes mild atrophy or hypertrophic scars, may not be visible at a distance of 50 cm, can be concealed with cosmetics.

– The third grade consists of moderate atrophic or hypertrophic scars, visible at a social distance of 50 cm or greater, that cannot easily be concealed with makeup, but still can be flattened by manual pressure of the skin.

– The most severe grade is highly atrophic or hypertrophic acne, visible at a distance greater than 50 cm that is not flattened with the skin's pressure around the scars.

The obtained results were assessed based on serial photographs, clinical improve-

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ment and physician's global assessment scale. Adverse effects such as erythema, crusting, mild transient edema and post-inflammatory hyperpigmentation were monitored and recorded. The clinical findings and results were recorded in a pre-designed proforma for analysis and interpretation of data.

Procedure: Before the procedure, all treatment areas were gently cleansed (debris, including dirt, makeup and powder), by using a mild cleanser and 70% isopropyl alcohol.

Group A (23) patients were treated with 30% salicylic acid every 15 days for three 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 cosmetic units of the face starting from forehead, right cheek, nose, left cheek and chin in that order. Feathering strokes were applied at the edges to blend with the surrounding skin.

Group B (18) patients were treated with a combination peel of 20% salicylic and 10% mandelic acid peel every 15 days for three sessions.

Both Group A and Group B patients were advised to protect their skin from sunlight using sunscreen regularly at day time for the next 12 weeks.

Post-procedure: Physician's global assessment tool (12) and photographic documentation using identical camera settings, lighting and patient positioning was obtained at baseline, before each treatment session and three months after the final treatment session.

Statistical Methods

The percentage of improvement in both the groups was considered as the primary outcome variable. Grading of acne was considered as the primary explanatory variable. The baseline parameters such as age, gender, occupation, duration of acne, precipitating factors, associated factors, addictions, onset, symptoms, first, second and third follow up, and side effects were considered as another study relevant variable.

The descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Non normally distributed quantitative variables were summarized by the median and interquartile range (IQR).

All quantitative variables were checked for normal distribution within each explanatory variable category by using visual inspection of histograms and normality Q-Q plots. Shapiro-wilk test was also conducted to assess normal distribution. Shapiro wilk test p value of >0.05 was considered as a normal distribution.

Table 3. Summary of follow up between study groups (45 days) (N=41)

Parameter	Study group		P value
	Group A (N=23)	Group B (N=18)	
	First Follow Up		
Fair	20 (86.96%)	14 (77.78%)	
Good	2 (8.7%)	3 (16.67%)	0.719
Poor	1 (4.35%)	1 (5.56%)	
	Second Follow Up		
Fair	13 (56.52%)	12 (66.67%)	
Good	9 (39.13%)	5 (27.78%)	0.748
Poor	1 (4.35%)	1 (5.56%)	
	Third Follow Up		
Fair	1 (4.35%)	4 (22.22%)	
Good	22 (95.65%)	13 (72.22%)	*
Poor	0 (0%)	1 (5.56%)	

*No statistical test was applied - due to 0 subjects in the cells

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Table 4. Summary of percentage of improvement between study groups (N=41)

Percentage of improvement	Study group				P value
	Group A (N=23) 30% salicylic acid peel		Group B (N=18) 20% salicylic and 10% mandelic acid peel		
	Grade 2 (mild)	Grade 3 (moderate)	Grade 2 (mild)	Grade 3 (moderate)	
0-25% (Poor)	0	0	0	1 (6%)	1.000
26-50% (Fair)	0	2 (4%)	0	3 (17%)	1.000
51-75% (Good)	4 (17%)	18 (78%)	2 (11%)	12 (67%)	0.001
75-100% (Excellent)	0	0	0	0	*
No change	0	0	0	0	*

*No statistical test was applied- due to 0 subjects in the cells

For normally distributed quantitative parameters the mean values were compared between study groups using Independent sample t-test (Group A and Group B).

The categorical outcomes were compared between study groups using Chi square test /Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used.)P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis (13).

Results

A total of 41 subjects were included in the final analysis.

The mean age in both groups was comparable. (Group A: 20.4 years; Group B: 20.5 years). There were more females in both groups: 15 (65.22%) in group A, and 12 (66.67%) in group B. Of the 41 people who completed the study, 13 (56.52%) were students in group A, and 15 (83.33%) in group B followed by 7 (30.4%) labourers and others. Duration of acne was >12 months in both the groups - 13 (56.52%) and 10 (55.56%). The major precipitating factor was diet (which included oily food, high glycemic index diet) in both the groups 16 (69.57%) 8 (44.44%) followed by sunlight 9 (39.13%) 5 (27.78%) respectively. The associated factors were high for acanthosis nigricans 5 (21.7%) and 2 (11.11%) and polycystic ovarian disease in both the groups 5 (21.7%) and 1 (5.56%). 6 (26.09%) of group A and 5 (27.7%) of group B had a family history of acne. There was no significant association seen between the parameters and groups **(Table 1).**

Among 41 patients, 17 (73.91%) of group A and 15 (83.33%) of group B showed insidious onset of acne, 14 (60.87%) of group A and 11 (61.11%) of group B were asymptomatic. Itching and pain followed. The majority, 15 (65.21%) of group A and 13 (83.33%) of group B had Grade II acne. 13 (56.52%) of group A had no side-effects whereas only 1 (5.56%) had a side effect in group B which was statistically significant (p=0.01) **(Table 2).**

The difference in the first follow up between the study groups is found to be insignificant with a P-value of 0.719, with majority of 20 (86.96%) people with a fair first follow up in group A. The difference in the second follow up between the study groups was found to be insignificant with a P-value of 0.748, with majority of 12 (66.67%) people with a fair second follow up in group B. The difference in the third follow up was bigger in group A with 22 (95.65%) and 13 (72.2%) in group B showing GOOD score on follow up **(Table 3)**.

Using the physician's global assessment scale, decrease in acne scars at the end of three sessions, the improvement was noted as Poor, Fair, Good, Excellent. The 26-50% (Fair) improvement in grade II acne was seen in 1 (4%) of group A and 3 (17%) of group B, which was not significant. The 51-75% (Good) improvement in grade I 4 (17%) and 18 (78%) in grade II was seen in group A and 2 (11%) in grade I and 12 (67%) in grade II was seen in-group B, respec-

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tively which was statistically significant (p=0.001) **(Table 4)**.

Figure 1 a and b, **figure 2 a and b** shows treatment response in group A, where the 51-75% improvement can be seen in both figures (30% salicylic acid).

Figure 3 a and b shows treatment response of group B, where the 51-75% improvement can be seen (20% salicylic acid and 10% mandelic acid).

Discussion

To the best of our knowledge, the present comparative observational study was first conducted on 41 subjects with acne scars. Of the total 41 patients analysed, the mean age in both the groups was comparable (Group A: 20.4 years; Group B: 20.5 years). Duration of acne was >12 months in both the groups: 13 (56.52%) and 10 (55.56%). The major precipitating factor was diet in both the groups. 16 (69.57%) and 8 (44.44%). Majority, 15 (65.21%) of group A and 13 (83.33%) of group B had Grade II acne. 13 (56.52%) of group A had no side effects whereas only 1 (5.56%) of the group B, which was statistically significant (p=0.01). Using the physician's global assessment scale, decrease in acne lesions at the end of three-session, the 51-75% (Good) improvement was seen in grade I 4 (17%) and 18 (78%) in grade II in group A and 2 (11%) in grade I and 12 (67%) in grade II in-group B, respectively which was statistically significant (p=0.001).

The overall improvement in the present study was similar to a study done by Shishira R et al. (10), in a Randomized, Single-blind, Active Controlled Study where they compared the efficacy of salicylic acid and mandelic acid chemical peel in the treatment of mild to moderately severe Acne Vulgaris. The patient selection in the present study was done according to Goodman and Baron's qualitative global acne grading system, which contrasts to a review done by Catilo et al. (14), where they have mentioned the patient selection consideration and The Fitzpatrick scale Skin type classification for chemical peeling.

The procedure was done at an interval of two weeks in three sessions compared to four and six sessions by other authors. The present study used the physicians global assessment tool and clinical photography to assess the improvement after treatment. These findings contrast to a study done by Wang et al. (15), where they used Investigator Severity Assessment (ISA) after treatment with oral minocycline and supramolecular salicylic acid 30% chemical peels.

As far as side effects were concerned, both peels were well tolerated by the patients in both the groups but the salicylic acid peel was found to be much safer as it was well tolerated in terms of other side effects such as erythema, burning, and stinging sensation. Our finding is in contrast to a study by Dayal et al. (16), which reported 45% mandelic acid peel had fewer side effects than 30% salicylic acid peel in mild-to-moderate acne vulgaris. It can be attributed to the large structure of mandelic acid, leading to its slow and uniform penetration in the epidermis, making it an ideal peeling agent for the sensitive skin of the patients with severe acne and hyperpigmentation.

In the present study, on the comparison, both groups showed a decrease in all types of scars, but the percentage reduction i.e. improvement was better in group A compared to group B using the physicians global assessment tool where the 51-75% (Good) improvement was seen in grade I 4 (17%) and 18 (78%) in grade II in group A and 2 (11%) in grade I and 12 (67%) in grade II in-group B, respectively which was statistically significant (p=0.001). This finding is compared to a study done by Deepak J et al. (17). They did a Comparative study of fractional Co_2 laser with salicylic–mandelic acid peel v/s derma roller with salicylic–mandelic acid peel for post acne treatment atrophic scars.

As the present study used only chemical peeling, the findings is in contrast to a systematic review by de Vries et al. (1) based on 33 studies, which assessed the efficacy and safety of three main non-pharmacological therapies in the treatment of acne vulgaris: laser- and light-based therapies, chemical peels and FMRF.

Combination peels minimize side effects. Although superficial peels like SA and MA are useful in active acne, they are not considered an effective treatment for deep acne scars, where medium depth peels and TCA CROSS method are preferred. Caution is needed when medium and deep peels are used in dark-skinned patients due to the risk of pigmentary changes (18). Analysis of the avail-

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able literature reveals that chemical peels are the third most commonly performed non-invasive cosmetic procedure in the United States, with over 1,300,000 procedures performed in 2016 alone. When used for the appropriate indication with the proper technique, nearly all peel solutions and depths have demonstrated excellent clinical success in improving skin tone and texture, and are cost-effective compared to invasive procedures. Thus, chemical peels should remain indispensable tools in the dermatologist's aesthetic toolbox, particularly in light of the current rising healthcare costs in all developing countries (19).

Limitation

The major limitation is the small sample size and a single hospital-based study. We did not have a follow-up to identify the recurrence rate. Therefore, long-term prospective studies including a follow-up period of at least six months to a year are required to substantiate our findings covering al large geographical area.

Conclusion

We conclude that both salicylic acid (SA) and salicylic mandelic acid peel are an efficient, well-tolerated and reasonably safe procedure used as a treatment modality in acne vulgar. It is because of salicylic acid's property to inhibit microcomedone, thus leading to a decrease in follicular openings. The addition of mandelic acid to SA peel therapy leads to better outcomes in acne management as it reduces post-acne scars.

Abbreviations

PRP – platelet-rich plasma
CROSS – chemical reconstruction of skin scars
MA – mandelic acid
SA – salicylic acid
IQR – interquartile range
ISA – Investigator Severity Assessment

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Piling salicilnom kiselnom i kombinovani piling salicilnom i mandeličnom kiselinom u tretmanu ožiljaka od akni – komparativna studija

Sažetak

Uvod. Akne vulgaris su jedno od najčešćih kožnih oboljenja koje se javlja u više od 85% osoba u celom svetu. Cilj studije bio je da uporedi terapeutsku efikasnost pilinga salicilnom kiselinom i pilinga salicilnom i mandeličnom kiselinom u tretmanu ožiljaka od akni. **Materijal i metode.** Komparativna studija je izvedena na 41 pacijentu, koji su bili podeljeni u dve grupe na osnovu njihovog izbora tretmana. Pacijenti iz grupe A (23) tretirani su pilingom 30% salicilne kiseline a iz grupe B (18) pilingom 20% salicilne kiseline i 10% mandelične kiseline u periodu od dve nedelje po tri tretmana. Na kraju svakog tretmana, primenjena je skala opšte procene lekara i snimljene su kliničke fotografije. Svi podaci su analizirani pomoću SPSS uzimajući $p < 0,05$ kao signifikantan. **Rezultati.** Prosečna starost bila je uporediva u obe grupe pacijenata (41). (Grupa A: 20,4 godina, Grupa B: 20,5 godina). Trajanje akni je bilo > 12 meseci u obe grupe 13 (56,52%) i 10 (55,56%)). Kod 13 (56,52%) iz grupe A, i 1 (5,56%) iz grupe B nije bilo neželjenih pojava, što je statistički signifikantno ($p = 0,01$). Na skali opšte procene lekara poboljšanje 51 □ 75% (Dobro) viđeno je u stepenu I 4 (17%) i 18 (78%) u stepenu II u grupi A i 2 (11%) u stepenu I i 12 (67%) u stepenu II u grupi B, što je bilo statistički signifikantno ($p = 0,001$). **Zaključak.** Oba agensa su pokazala skoro identičnu efikasnost u poboljšanju blagih do umerenih ožiljaka od akni. Bilo je manje neželjenih efekata kod pilinga salicilnom kiselinom nego kod pilinga mandeličnom kiselinom.

Ključne reči: Akne vulgaris; Salicilna kiselina; Mandelična kiselina; Keratolitički preparati; Hemijski piling; Ishod terapije

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