

A comparative study of the resurfacing effect of microdermabrasion versus glycolic acid peel in the management of acne scars

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Abstract *Objective* To compare the resurfacing effect of microdermabrasion versus glycolic acid peeling in the treatment of acne scars.

Methods A total of 80 patients were selected randomly and divided into two groups A (treated with microdermabrasion) and B (treated with glycolic acid peeling). Data were coded and analyzed.

Results Of the 80 participants, 56 completed all 6 sessions. Among those 56 patients, 24 patients belonged to group A and 32 patients belonged to group B. In group A, good improvement was noted in 16.7% of the patients, 67% showed fair improvement, 12.5% showed poor improvement and 4.2% had no change after 6 sessions. In group B, 3% of the patients showed excellent improvement, 3% showed good improvement, 81.3% showed fair improvement, 6.25% showed poor improvement and no change was noted in 6.25% of the patients.

Conclusion This study infers that superficial scars showed greater improvement with microdermabrasion while reduction in active acne lesions was much more with glycolic acid peel. However, no statistically significant differences were found between the outcomes of both therapeutic modalities.

Key words

Acne vulgaris, glycolic acid peeling, postacne scars, microdermabrasion.

Introduction

Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit that is associated with significant psychosocial repercussions.¹ The main targets for acne treatment modalities are follicular hypercornification, seborrhea induced by hyperandrogenism, inflammation and bacterial

colonization of hair follicles by *Propionibacterium acnes*.² It is characterized by variety of lesions ranging from comedones, papules, pustules, cysts, nodules which ultimately lead to scarring in most of the patients.

Postacne scarring which is one of the most common cause of facial scarring, often lead to impairment of quality of life there by having significant effect on patients' self-esteem. Treating acne scars is one of the most challenging task in cosmetic procedures.^{3,4} There are various procedures for treating acne scars. This includes subcision, resurfacing techniques

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like microdermabrasion and chemical peeling, soft tissue augmentation, nonablative laser treatment, silicone gel sheeting and scar revision.⁵

Microdermabrasion, popularly known as “body polishing”, is a simple and safe, office cosmetic procedure. In this procedure aluminum oxide crystals or other abrasive substances are rubbed on the face under pressure and then vacuumed off, using a single hand piece.⁶ Chemical peeling is the application of a chemical agent to the skin, which causes controlled destruction of a part or the entire epidermis, with or without the dermis, leading to exfoliation, removal of superficial lesions, followed by regeneration of new epidermal and dermal tissues. In spite of the advent of newer techniques and laser, peeling still considered as a simple procedure, requiring hardly any instrumentation to rejuvenate the skin.⁷ In this back drop this study attempted to compare the efficacy and safety of microdermabrasion versus glycolic acid peeling in the treatment of acne scars.

Methods

This was a comparative study conducted in our Skin and STD Outpatient Department after getting approval from ethical committee of our institution. The study population included 80 patients between the age group of 15 to 30 years who attended our outpatient department during the study period of September 2011 to August 2013 with acne scars and pigmentation. Exclusion criteria included patients who had undergone previous procedures for acne scars, pregnant and lactating females, active bacterial or viral infection, history of intake of acne inducing drugs, uncooperative patient and patient with unrealistic expectations.

After explaining the concept, advantages and complications of the procedures to the

participants, informed consent was obtained from all the patients. Each patient was interviewed for age, sex, occupation, sun exposure, duration of the disease, family history, use of cosmetics and any precipitating factors. Patients were then subjected to a proper general, systemic and dermatological examination. They were divided in to two groups, those with odd numbers of serial entry were grouped as A and those with even number entry were grouped as B. All patients were pretreated with retinoic acid cream 0.05% for one week at night before starting the sessions.

The severity of acne in all the patients was graded on clinical grounds as⁸: grade 1: comedones, occasional papules; grade 2: papules, comedones, few pustules; grade 3: predominant pustules, nodules and abscess; and grade 4: mainly cysts, abscess and widespread scarring.

For grading of acne scars the following scale was used⁹: *grade 1* macular - erythematous, hypo or hyperpigmented; *grade 2* mild disease - mild atrophy, can be covered with makeup in women or facial hair in men; *grade 3* moderate disease - moderate scarring, not covered by makeup but can be flattened by manual stretching; and *grade 4* severe disease - scarring not flattened with manual stretching of skin.

Microdermabrasion It was done for group A patients. After degreasing, the procedure was done with aluminum oxide crystals done using a pressure of 15-20mm Hg vacuum starting from forehead, cheek, chin, nose and upper lips in three directions (vertical, horizontal and oblique). On completion of procedure, patient was asked to wash face with water and sunscreen was applied. Side effects if any were noted during each visit.

Chemical peeling Glycolic acid peeling was done for group B patients. Sensitive areas like the inner canthus of the eyes and nasolabial folds were protected with vaseline. After degreasing with acetone, glycolic acid was applied on the cosmetic units of the face starting from forehead, right cheek, nose, left cheek and chin in that order. The peel was neutralized after the predetermined duration of time that was usually three minutes. Neutralization was done with 10-15% sodium bicarbonate solution or washed off with water. Based on tolerability of the patient, higher concentrations of glycolic acid were used sequentially (20% , 35% , 50%).

Both group A and group B patients were advised to protect from sunlight by using sunscreen regularly during daytime for the next 20 weeks. The procedure was repeated every two weeks for 6 times. Results were assessed based on serial photographs, clinical improvement and physician's global assessment scale. The following graded scale was used for assessing the improvement: excellent (76-100%), good (51-75%), fair (26-50%) and poor (0-25%).¹⁰

Descriptive statistics were done in the form of mean and SD. Fisher exact test was applied to analyze the data. Values were considered significant when *P* values were less than or equal to 0.05.

Results

A total of 80 people participated in the study and they were grouped randomly into two groups A and B. Those in group A were subjected to microdermabrasion and those in group B were subjected to increasing concentrations of glycolic acid peels (20%, 35% and 50 %). Of the 80 participants, 56 completed all 6 sessions. In the 56 patients who completed all 6 sessions, 24 belonged to group A and 32 belonged to group B. In group A, 12 were males and 12 were

females. In group B, 12 were males and 20 were females. Their age ranged from 15 to 35 years, with a mean age of 22.4 years. The duration of acne scars in these patients ranged from 4 months to 3 years with a mean duration of 3.5 years.

Of the 56 people who completed the study, 41 (73%) were students, 2 (3.5%) were housewives, 3 (5.4%) were job seeking individuals and the rest (17.8%) belonged to other sectors of employment, however, none were employed in occupation involving comedogenic substances. In our study 6% of patients had family history of acne. The precipitating factors like stress and strain in were noted in 29 (51.7%) patients, premenstrual flare in 28 (50%) patients, diet like oily food in 22 (39%) patients and summer exacerbation in 13 (23%) patients. Thirty (53.6%) patients had a combination of at least two of the above factors and 3 (5.35%) patients had a combination of all four precipitating factors. Menstrual irregularity was present in only one patient out of the 32 females who participated in the study. Five (21%) out of the 24 males who participated in the study had occasional drinking and smoking habits.

Of the total 56 patients, 2 (4%) had grade I acne, 37 (66%) had grade II, 7 (13%) had grade III and 2 (4%) had grade IV acne vulgaris. Eight (14%) patients had no active acne lesions. 38 (68%) patients had grade II acne scar, 11 (20%) had grade III acne scar and 7 (12.5%) patients had grade IV acne scar. Pigmentation (postacne melanosis) along with various types of scars were present in 46 (82%) patients. The dermatological conditions observed in association with acne in this study were pityriasis sicca (dandruff or mild seborrhea) in 9 (16%) patients, seborrheic dermatitis in 5 (9%) patients and tinea versicolor in 1 (2%) patient.

Table 1 Comparison of percentage of improvement in different grades of acne scars between microdermabrasion and glycolic acid peeling.

Percentage of improvement	Microdermabrasion Acne scar grade				Glycolic acid peeling Acne scar grade				P value
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 1	Grade 2	Grade 3	Grade 4	
No change	-	-	1	-	-	2	-	-	
<25%	-	2	-	1	-	2	-	-	
25-50%	-	8	5	3	-	23	3	-	0.6817
51-75%	-	-	1	3	-	-	1	-	0.17
>75%	--	-	-	-	-	1	-	-	



Figure 1 (a) Baseline photograph of a patient with grade IV acne scars



Figure 1 (b) Good improvement of the scars after six sessions of microdermabrasion.



Figure 2 (a) Baseline photograph of a patient with grade II acne vulgaris and grade III acne scars.



Figure 2 (b) Fair improvement of the scars and reduction in active lesions after six sessions of glycolic acid peeling.

Group A (Microdermabrasion) Using the physician's global assessment scale, improvement in scars at the end of six sessions of microdermabrasion was noted as in **Table 1**.

Among the 24 patients, 51-75% improvement was noted in 4 (16.7%) patients of which three had grade IV (**Figure 1**) and one had grade III scars before treatment. Sixteen (67%) out of 24

patients had 25-50% improvement, among whom three had grade IV scars, five had grade III scars and eight had grade II scars before the procedure. Three (12.5%) patients had <25% improvement and 1 (4.2%) patient had no change after 6 sessions of microdermabrasion. Regarding complications only 4 (16.7%) patients complained of side effects. Dryness was the chief complaint in 3 patients, which subsided with moisturizing cream application. Increased tanning was observed in 1 patient. This was probably due to improper and irregular use of sunscreen.

Group B (Glycolic acid peeling) Using the physician's global assessment scale, improvement in scars at the end of six sessions of glycolic acid peeling, using serial concentrations. Of 32 patients, 26 (81.3%) showed 25-50% improvement, of these 26, 23 patients had grade II and 3 patients had grade III scars (**Table 1**) before start of procedure. 51-75% improvement was noted in 1 (3%) patient who had grade III scar (**Figure 2**) before treatment. One (3%) patient with grade II acne scar had 76-90% improvement, <25% improvement was observed in 2 (6.3%) patients with grade II scars. No change in scar clearance was noted in 2 (6.3%) patients with grade II scars. Of the 32 patients, the main side effects were mild burning sensation and erythema, which lasted for 24-36 hours, observed in 5 (15.6%) and 4 (12.5%) patients respectively.

Urticarial papules were observed in one patient within few minutes of using 35% glycolic acid. The patient continued with the treatment and completed all 6 sessions without further side effects. Though a possibility of contact urticaria may be considered, this may just be a coincidence and not attributable to the acid, as with higher concentrations of the same acid the patient did not develop any further side effects.

Table 1 show the comparison of percentage of improvement in different grades of acne scars with microdermabrasion and glycolic acid peeling. There was not statistically significant between two groups (Fisher's exact test, $p=0.68$). There was a significant reduction in the postacne melanosia compared to the improvement in atrophic scars on using glycolic acid peels but it was not statistically significant. The effect on active acne lesions was similar to that of microdermabrasion. There was significant reduction in development of new acne lesions within 3 to 4 sessions of glycolic acid peeling.

Discussion

Clearance of scars is the first request of the acne patients. Acne scars are determined by severity of inflammation and trauma like picking of the lesion and accidental rubbing. Remodeling of collagen is modulated by matrix metalloproteases (MMPs), which cause the damage and tissue inhibitors of metalloproteases (TIMPs), which restricts the damage. When the ratio of MMPs/TIMPs is low, atrophic scars occur and conversely, when the ratio is high, hypertrophic scars occur.¹¹

In our study, the age of patients ranged from 15-35 years with a mean age of 22.4 years. Al-Ameer *et al.*¹² in their study of 225 patients with acne vulgaris observed that the age at presentation of acne was 19.2 ± 3.0 years and Kane *et al.*¹³ noted that the mean age of presentation of their patients was 25.58 years which was more or less similar to our study. It is a known fact that acne is a disease more prevalent in adolescents. However, post-adolescent or adult acne is gaining importance. Of the 56 patients who completed the study, the ratio of female to male with acne scars was 4:3. Family history of acne scarring was present in only 6% of patients. This difference in incidence

of active acne and acne scarring among family members may probably be due to individual variation in habits, attitude and psychological makeup.

In our study, 51% of patients noticed increase in acne due to stress and strain, 39% noted exacerbation with diet containing oily food and regular rice intake and the incidence of premenstrual flare was 50%. In a study conducted by Salomone *et al.*¹⁴ in Santiago, of 40 patients between 13 and 25 years of age, 70% noted an increase in acne lesions with stress and 42% noticed an exacerbation with menstrual period, 58% noticed an exacerbation with foods, particularly dairy, mayonnaise and butter in 30%, chocolate in 27% and nuts in 12.5%. High glycemic index foods lead to hyperglycemia, reactive hyperinsulinemia and a resulting increase in insulin like growth-factor 1 (IGF-1) formation, increased androgens and an altered retinoid signalling pathway related to acne.¹⁵ A low glycemic index diet decreases IGF-1 levels and improves acne.¹⁶ Premenstrual flare was noticed in 28 (50%) of the 32 female patients in this study. The pilosebaceous duct becomes smaller between day 15 to 20 of the menstrual cycle and the blockage leads to premenstrual acne. However, the mechanism for this blockage is not known.¹⁷ Stoll *et al.*¹⁸ found an overall 44% prevalence of premenstrual flare which is comparable to our study. Khanna and Pandhi¹⁹ noticed a mean reduction in the noninflammatory and inflammatory lesion count during the postmenstrual period.

It was interesting to note that 13 (23.2%) patients in our study group had history of exacerbation of acne during summer. Past studies have shown varied results regarding seasonal variation in acne vulgaris. A Saudi Arabian study has shown that acne exacerbates in winter and often improves during the summer months.¹² An Indian study showed that majority

of patients with acne vulgaris worsened during summer.²⁰ The reason for exacerbation of acne in summer may be due to the fact that increased sweating may result in increased growth of the lipophilic *Propionibacterium acnes*. The association of these various factors with acne exacerbation noted in our study was in accordance with previous studies.

Pityriasis sicca, a milder variant of seborrheic dermatitis was the most common disease associated with acne vulgaris in this study. It was noted in 9 (16%) out of 56 patients. Both acne vulgaris and seborrheic dermatitis have predilection for the seborrheic areas of the body such as face, ears, scalp and upper part of the trunk. In seborrheic dermatitis, as well as, in acne vulgaris, the lipid composition of sebum is characterized by a high triglyceride level.²¹ In a Spanish study involving 2159 patients with seborrheic dermatitis, it was found that acne vulgaris was the most common concomitant disease seen in 35% of the subjects.²²

The most common type of acne scars noticed in this study was superficial pits and craters, which was observed in 83.9% of the patients. Icepick scars were observed in 21.4% and a combination of pits, craters, icepick and boxcar scars were seen in 12.5% patients. Layton *et al.*²³ observed that the icepick scars were the most common type of post-acne scars, noticed in 65.6% of the patients with post-acne scarring. Post-acne hyperpigmentation was observed in 46 (82.1%) patients in our study. Postacne hyperpigmentation is a common complication of acne vulgaris, particularly in pigmented skin.²⁴ Kane *et al.*¹³ patients noted that 67.7% of their patients had post-acne pigmentation. Similarly, Yeung *et al.*²⁵ observed 552 adolescent patients with acne vulgaris, of which 52.6% had hyperpigmentation. Taylor *et al.*²⁶ noticed 52.6% of their patients with postacne hyperpigmentation. The incidence of postacne

hyperpigmentation in our study was higher compared to that in earlier studies as this group was smaller and included patients with acne scars and pigmentation.

Group A: Microdermabrasion Of the 24 patients who underwent microdermabrasion, 14 patients had postacne pigmentation along with scars. 10 had grade II scars, 7 grade III and the other 7 had grade IV acne scars. None had grade I scars. In our study, 16 of the 24 patients (67%) had moderate (25-50%) improvement, good (51-75%) improvement was noted in 4 (16.7%) patients. 3 (12%) had mild (<25%) improvement and 1 (4%) patient had no change after 6 sessions of microdermabrasion. Significant improvement was appreciated better by patients with grade II acne scars.

In a study by Lloyd,¹⁰ 38% (9/24) had excellent results, 34% (8/24) good results, 17% (4/24) fair results and 12% (3/24) with poor results. In a study conducted by Tan *et al.*²⁷ in New York, immediately following microdermabrasion the skin temperature increased, sebum content decreased and a temporary increase in skin roughness and mild flattening of some wrinkles occurred. In our study, all patients had an improved skin tone (brightness) and texture (smoothness) at the end of 6 sessions with reduction in number of active acne lesions especially in those with grade II acne.

Group B : Glycolic acid peel All 32 patients who underwent glycolic acid peeling had pigmentation associated with acne scars. Of these participants, grade II and grade IV acne scars were present in 28 and 4 patients, respectively. None of the patients had grade I scars. In this study, 26 out of 32 (81%) patients showed moderate (25-50%) improvement, good (51-75%) improvement was noted in 1 patient and 1 patient had excellent (76-90%) improvement. Mild or fair (<25%) improvement

was observed in 2 patients and there was no change in scar clearance in 2 patients. Best results were observed in those with grade II scars.

In this study, there was a significant reduction in the postacne melanosis compared to the improvement in atrophic scars on using glycolic acid peels. The effect on active acne lesions was similar to that of microdermabrasion. There was significant reduction in development of new acne lesions within 3 to 4 sessions of glycolic acid peeling. Acne of varying severity has been one of the well-evaluated indications for glycolic acid (GA) peels. In a study conducted by Grover *et al.*²⁸ in 41 patients, 75-78% with acne, except the patient with nodulocystic lesions, showed a good to fair response with GA peels as compared to 90% response seen by Wang *et al.*²⁹ However, no statistically significant differences were found between the outcomes of both therapeutic modalities. The adverse effects in our study were easily manageable and did not affect the patient's compliance.

Conclusion

In our study we observed that the severity of the acne scars coincides with the duration and severity of acne lesions. Both microdermabrasion and glycolic acid peeling were well tolerated by all patients. Though side effects were minimal, it was little bit greater with glycolic acid peel than with microdermabrasion. Appreciation of improvement was better in patients with superficial scars than deep scars. Superficial scars showed greater improvement with microdermabrasion while reduction in active acne lesions was much more with glycolic acid peel. Both microdermabrasion and glycolic acid significantly reduced postacne pigmentation. Microdermabrasion had additional results of

improved brightness and smoothness of skin. Both microdermabrasion and glycolic acid produced comparable results in reduction of post acne scars and it was not statistically significant.

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