The Effect of Glycolic Acid on the Treatment of Acne in Asian Skin

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BACKGROUND. Glycolic acid has become important and popular for treating acne.

OBJECTIVE. To evaluate the efficacy and safety of serial glycolic acid peels with glycolic acid home care products on facial acne lesions and other associated skin problems.

METHODS. We collected 40 Asian candidates with moderate to moderately severe acne. They were divided into two groups according to the degree of greasiness of their facial skin. The two groups' members were treated with four series of 35% and 50% glycolic acid peels, respectively. They also used 15% glycolic acid home care products during this study period. The improvement of acne as well as other associated problems were assessed by both the physicians and the patient themselves.

RESULTS. Significant resolution of comedones, papules, and pustules was found. The skin texture of each candidate was dramatically rejuvenated. Consistent and repetitive treatment with glycolic acid was needed for the apparent improvement of acne scars and cystic lesions. The follicular pores also became comparatively smaller. Furthermore, most of the candidates had much brighter and lighter looking skin. Only small percentage of patients (5.6%) developed side effects.


Acne is a chronic or acute inflammatory process of pilosebaceous units. Clinically it is composed of comedones, papules, pustules, and less frequently, cysts and scars. The treatments of acne include variable topical agents such as benzoyl peroxide, retinoid acid, and antibiotics. Oral medications, eg, antibiotics or isotretinoin, are recommended in moderate and serious cases.1 Recently the use of alpha hydroxyl acids (AHAs) in acne has aroused the public interest.2-4 Low concentration of AHAs can reduce the thickness of stratum corneum by diminishing cornocyte cohesion. Higher concentrations penetrate skin more easily and even cause epidermal separation, epidermolysis, and stimulation of collagen synthesis in the dermis.2-3 Among the AHAs, glycolic acid is effective on xerosis, ichthyosis, acne, "age spots," keratoses, and wrinkles.2-3 Glycolic acid is widely used as peeling agent for superficial chemical peeling. It can be employed as serial peels at 1-4-week intervals with concentrations of 20-70% according to the skin condition. Both the concentration and the exposure times must be carefully adjusted by the physician for every peel.5-8 Glycolic acid has currently become an important adjunctive therapeutic agent for acne. Our purpose is to evaluate the therapeutic potential and the possible side effects of glycolic acid on acne and other associated skin problems.
Materials and Methods

Screening of the Candidates
We collected patients with moderate to moderately severe acne in our dermatology clinic in early 1995. All of our patients were type IV skin Taiwanese. All patients had either or both inflammatory (papules and pustules) and noninflammatory lesions (open and closed comedones). The number of inflammatory papulopustules was between 10 and 100, the number of noninflammatory comedones was between 10 and 200, and the number of enlarged cystic lesions was less than 5. The patients had no allergy to glycolic acid or other known allergic history. They were mostly young adults in healthy condition, and no other active skin lesions were found elsewhere on the body. The female patients who were interested in the protocol were advised to avoid pregnancy and breast-feeding during the course of the study. It was preferred that there was no concomitant use of estrogen or oral contraceptive. All of topical and oral medications for acne were discontinued at least 1 week prior to the study. A recommended 1-year rest period after oral isotretinoin was advisable before the study. Topical tretinoin was discontinued at least 12 weeks prior to the study. In addition, patients who had active herpes simplex infection or a history of hypertrophic scars or keloids were also excluded. We selected 50 candidates who met the above criteria. Finally, 40 patients who cooperated well were enrolled in our protocol and 10 other patients were excluded due to poor compliance. These 40 patients were divided into two groups based on the degree of facial skin greasiness. Group A was comprised of patients with dry or nongreasy facial skin and group B was comprised of patients with greasy facial skin. Applications of four series of 35% and 50% glycolic acid peels on group A and group B members were performed at 3-week intervals, respectively.

Protocol of Treatments
The study was held from July to October 1995 over 12 weeks. Our initial work (week 0) was to inform the qualified candidates and obtain personal history records and physical examination in our clinic. Each candidate received home-care instruction sheets and signed consent documents. Detailed explanations and communications on the study protocol were done by the physicians to ensure all the candidates were well informed. The patients were instructed to be pretreated twice daily at home with applications of 15% glycolic acid home products for 1 week prior to the initial peel. A series of four consecutive glycolic acid peels at 3-week intervals (week 1, week 4, week 7, and week 10) took place in our dermatology therapeutic room. We used the NeoStrata, free acid, nonbuffered 35% (for group A) and 50% (for group B) glycolic acid to employ the serial glycolic acid peels. The exposure times for glycolic acid were gradually increased by 1 minute in each subsequent peel and ranged from 2 minutes (week 1) to 5 minutes (week 10). No other facial cosmetics, topical agents, or oral medications were allowed during the research. The patients resumed the pre-peel regimens of home applications of 15% glycolic acid after their skin healing occurred in about 5-7 days post-peeling. It was important to impress the patients to use sunblocks of SPF more than 15. Photographs were taken before and after each peel for comparison. To maintain a fair judgment and to prevent bias, we used the same camera and attempted to take all pictures with the same angles and distance.

Assessments
Physicians and the enrolled patients participated in the assessments of the study. The baseline assessment of physicians was conducted before the initial peel (week 1). In this assessment, the total numbers of comedones, papules, pustules, cysts, and scars were carefully counted. The clinical conditions of other associated skin problems such as erythema, skin tone and texture, pore size, and pigmentation were recorded. Four post-peeling assessments were also conducted at the week following each peel (weeks 2, 5, 8, and 11). In these assessments, physicians also did the counting and recording of lesions, and evaluated the progression of clinical conditions by comparison with the baseline data and photographs. All the comparisons were made by the same physician (Dr. Huang) to prevent observer bias. The progression of clinical conditions was graded to be good (if more than 50% improved), fair (if 21-50% improved), poor (if 10-20% improved), no change, or worse. Any side effects of this study were described, if noted, at each assessment. On the other hand, the patients filled out self-assessment questionnaires prior to the first peel and did the final assessments after 4 serial peels (week 11) to evaluate the progression of their clinical conditions, whether they were improved or not.

Results
A total of 40 patients completed the protocol. They were 32 females and eight males with ages ranging from 16 to 51 years old. The mean age of the patients was 26 years old.

Assessments of the Physicians
Comedones (Figure 1)
All of the patients had comedones on their faces. At week 2, 17.5% of cases got fair resolution and 55.0% of patients had poor improvement. At week 11, 32.5% of the patients resulted in good improvement and 57.5% of cases obtained fair results. The overall outcome was obviously satisfactory with progression.

Papules (Figures 2 and 3)
Flesh-colored to erythematous papules were present in every case. Fifteen percent of patients experienced flare-ups of acne at week 2. At week 11, 37.5% yielded good results and 55.0% got fair responses. Papular lesions became exacerbated at the beginning of the study but visible resolution was noted after subsequent treatments.

Figure 1. Physician assessment: comedones. The overall outcome in patients with comedones was satisfactory after the study.

Figure 2. Physician assessment: papules. Although there might be a flare-up of papular lesions after the initial treatment, the overall result was satisfactory and improved gradually.
Figure 3. A) A 21-year-o/d female acne patient with inflammation; papules on her left cheek before the study. B) These lesions improved at week 11.

Pustules (Figures 4 and 5)

Thirty-four patients had pustular lesions. Twenty-three and one-half percent of the patients with pustules had an exacerbation at week 2. At week 11, 17.7% yielded good response and 26.5% obtained fair results.

Figure 4. Physician assessment: pustules. Although there might be an initial flare-up at week 2, this exacerbation of pustules gradually resolved then consistent improvement was noted after further treatments.
Cysts
Eleven patients had more than one but less than five enlarged cysts. The resolution of the cysts was not obvious. At week 11, 45.5% of the patients with cysts had fair resolution and 45.5% had poor results.

Acne Scars (Figure 6)
Twenty-nine patients were bothered by acne scars. The scars appeared as either depressed or hypertrophic lesions scattered on the face. The smoothing of the scars was subtle and slow. At week 11, 10.4% of the patients with scars obtained good responses and 58.6% of these patients got fair results.

Erythema
In total, 21 patients had the problems with redness (erythema). The outcome of this study was satisfactory in blanching of erythema. Forty-seven point six percent of the patients with erythema had good improvement at week 8 and 52.4% of them yielded good improvement at week 11.
Skin Tone/Pigmentation (Figure 7)
Seventy-seven and one-half percent of all patients had much brighter and lighter appearing skin at the end of study. Prominent blanching of postinflammatory hyperpigmentation caused by acne was found in most cases.

Figure 7. A) A 23-year-old female acne patient with postinflammatory hyperpigmentation on her right cheek. B) The hyperpigmentation improved at the end of study.

Pore Size
As carefully observed the clinical conditions and compared with close-up photographs, we found that glycolic acid peels had the effect of refining follicular pores. At the end of study, we noted more than half of all patients (67.5%) had smaller pores.

Skin Texture
There was a dramatic improvement of skin texture in every case. Ninety-seven and one-half percent of all candidates got smoother skin texture at week 8, and 100.0% got smoother at week 11. All of the patients had satisfactory rejuvenation of their skin as observed by our physicians.

Assessments of the Patients
At week 11, we instructed the patients to grade the progression of the above skin conditions by five degrees (good, fair, poor, no change, or worse result). Good results were assessed by 90.0% of the patients with comedones, 80.0% with papules, 82.9% with pustules, 81.3% with cysts, 97.1% with scars, and 89.5% with postinflammatory hyperpigmentation. Fifty-seven and one-half percent of all patients felt their follicular pores were much smaller. Almost all the patients (97.5%) felt smoother skin texture. Furthermore, 32.5% of all candidates felt "very satisfactory" results and 52.5% felt "satisfactory" results to the efficacy of glycolic acid treatments in this study.

Side effects
Side effects occurred in nine patients during this study: three cases developed postinflammatory hyperpigmentation, three cases experienced mild local herpes simplex infection, and three cases got mild skin irritation. The percentage of side effects was only 5.6%.

Discussion
The mechanism of glycolic acid in acne therapy may be due to deeper epidermolysis caused by higher concentrations of glycolic acid in unroofing of pustules and papules. Glycolic acid also can correct the type of abnormal keratinization seen in acne, and the loosening of the keratinocytes caused by glycolic acid can extend along the follicular epithelium down to the sebaceous glands. Surfacing of comedones and papules is noted immediately after the glycolic acid peel. Glycolic acid at higher concentrations can exert more profound dermal effects. These effects include increased collagen synthesis, increased of acid mucopolysaccharides, and improved quality of elastic fibers. Consistent and repetitive glycolic acid peeling resulting in dermal thickening may correct scars and improve skin texture.

At the beginning of the protocol, some unfavorable factors that contributed to the outcome of this study were removed during the
selection of patients. As all of the enrolled candidates were Taiwanese with similar oriental type N skin, it was unnecessary to consider the response of different skin type according to the Fitzpatrick's classification. On the other hand, sebaceous activity became the most important factor influencing our results. There was a large variation of facial skin greasiness of the enrolled candidates. We had to divide the candidates into two groups based on the degree of greasiness of their facial skin and applied peels at different concentrations of glycolic acid accordingly in order to correct the variation. The prepeeling home application of glycolic acid products would increase the tolerance to glycolic acid peels and might act as a primary skin allergy test before the peels. Sustained use of glycolic acid products might also maintain long-term benefits.

There were several interesting findings in our work. First, we found that there was usually a flare-up of acne after the initial treatment with quick resolution after subsequent treatments. This phenomenon had been described in previous reports. They postulated that the exacerbation might relate to the transient loosening and extruding of microcomedones in the action of glycolic acid. Clinically, retinoid acid in the treatment of acne might have similar effects as glycolic acid. Therefore, reassurance of the patients become important if flareups occurred to educate them that continuation of further treatments with glycolic acid was necessary to obtain a good response.

Second, glycolic acid is very effective in the treatment of hyperpigmentation. As many Asian females preferred a more fair and even skin coloration, glycolic acid might become popular and could provide an alternative choice to the current depigmenting agents. The possible mechanism of depigmentation may be due to epidermolysis of pigmented skin then reepithelization of new less-pigmented skin as well as coverage of dermal color by the new less-pigmented epidermis. Glycolic acid also has a structural similarity to ascorbic acid and may have a possible direct depigmentary effect on skin. Complete sun avoidance is crucial to a more permanent whitening of skin. The keratolytic effect of glycolic acid also can make skin to look brighter and less sallow.

Third, on the treatment of acne scars and cystic lesions, we found the results were subtle. The patients who have severe acne scars or cystic lesions may not be good candidates for improvement with glycolic acid peeling in a short period. They might need more subsequent peels to obtain good results or they should receive further surgical intervention or oral medication to accelerate improvement.

Furthermore, glycolic acid can exert a satisfactory rejuvenation effect so that patients might employ a good skin texture with younger and more radiant appearance after a period of treatments. As we observed, glycolic acid reduces follicular pores and makes the skin smoother. This finding about pore size contradicted results of chemical peeling as mentioned in textbooks and other articles before, and brought an additional bonus to this work. We propose that the thickening of dermis and increased perifollicular collagen synthesis by glycolic acid might exert a compression effect to the dilated pores, but some doctors suggested the keratolytic effect of glycolic acid might cause smoothing the dilated pores (Murad H., personal communication).

In this study, we used the serial glycolic acid peels with glycolic acid home care products to treat acne patients. We believe the therapeutic effect and the rapid improvement on acne and other associated conditions in this short period (only 12 weeks) were mainly produced by the serial peels. The use of glycolic acid home care products alone might obtain some therapeutic effect but it might not be dramatic and should take longer period of time. Indeed, the use of glycolic acid home care regimens should be considered to part of the integrated peeling procedure as mentioned in other textbooks and articles.

The side effects were unexpectantly few in our study. Only nine candidates developed side effects during this study, and most important, only three candidates developed postinflammatory hyperpigmentation although all of our candidates were type IV skin Asian. Actually, two of these three patients with postinflammatory hyperpigmentation did not follow our patient instructions. One patient did not avoid sunlight and developed pigmented spots after attending a funeral outdoor. The other one applied aloe gel of an unknown brand personally and experienced an irritable erythematous eruption. We propose that the depigmentary effect of glycolic acid contributed to this low percentage of postinflammatory hyperpigmentation. The herpes simplex infections of three candidates were mild, and topical or oral acyclovir were not necessary. All of the cases of iritation were mild and no one had to discontinue the protocol. These results suggest glycolic acid peeling and use of glycolic acid home care products are safe and can be used not only on fair-skinned individuals but also on Asian patients with minimal risk.

In conclusion, the risks and side effects are minimized with the use of glycolic acid on the treatment of acne even in Asian skin. Glycolic acid can exert profound effects on acne lesions and other associated skin problems. Glycolic acid may be an ideal adjunctive therapy for acne. The therapeutic value of glycolic acid needs to be evaluated through more clinical trials.
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References