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Glycolic acid peels
[Treatment of the Aging Face: Chemical Peels]

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Glycolic acid, the smallest in molecular weight of the [alpha]-hydoxy acids (AHAs), has revolutionized the skin care market in the 1990s. Its appeal reflects the apparent cosmetic benefits derived from its

chemexfoliating properties. Its utility then as a superficial peeling agent, yielding a quick recovery time and minimal postpeel discomfort, has found great popularity with both the public and physicians alike.

It appears that glycolic acid's peeling abilities vary with the formulation, concentration, and pH of the product. This controversy is ongoing despite efforts to standardize glycolic acid peels. In this author's experience, glycolic acid best penetrates the epidermis, conferring a greater reactivity and faster onset of effects, when the pH is low (<2.5) and the acid is not neutralized. Nevertheless, further studies are needed.

Practical considerations before performing a glycolic acid peel

Ideal candidates for glycolic acid peel are patients seeking to improve the tone and appearance of their skin with minimal recovery time and without interruption of their work or social schedules. The physician must explain to the patient that certain aesthetic improvements can be achieved, namely reduction of fine lines, sallow complexion, dyspigmentation, lentigines, ephelides, and rough textured skin; however, these goals require a series of treatments. The patient may expect some degree of cosmetic enhancement within six treatments.

It is important to note that the glycolic acid peels are superficial peeling agents and therefore they must be repeated over time. This is unlike the medium-depth and deeper chemical peeling agents, which in general yield a greater degree of improvement after just one treatment, but which require greater recovery time. The patient should be counseled that deeper lines and wrinkles, such as perioral rhytides and glabellar creases, should be treated with deeper chemical peeling agents, filling agents, dermabrasion, or laser surgery to ensure the cosmetic effect they are seeking.

Glycolic acid peels can be used on male or female patients with any of the six Fitzpatrick skin types. Most patients tolerate the procedure well. Patients with more sensitive skin may tolerate only the lower concentration peels (20-35%).

Any cosmetic unit, such as the face, neck, chest, back, hands, arms, and legs, can be treated with glycolic acid peels. Since the neck is the most sensitive area, the concentration of the acid and skin contact time should be lowered. The hands, arms, legs, chest, and back seem to be more tolerant of higher concentrations.

Glycolic acid peels are being used to treat conditions such as acne vulgaris, rosacea, shallow acne scars, melasma, postinflammatory hyperpigmentation, seborrheic and actinic keratoses, keratosis pilaris, and warts. Again, the physician must instruct the patient on the need for repeated treatments. In this article, specific examples of these conditions will be discussed.

Prepeel evaluation

Medical history and examination

At the time of the prepeel consultation, a detailed medical and skin history should be obtained. Any prior history of viral infections such as chronic or recurrent herpes simplex, especially in the cosmetic unit being treated, should be noted. If the patient has a history of herpes, prophylactic treatment with an antiviral agent must be started at least 6 hours before the glycolic acid peel. If the patient presents to the office with active disease, the physician is best advised to postpone the peel.

Patients with active dermatoses such as atopic, seborrheic, and eczematous types, or sensitive skin or other dry skin complaints may be less tolerant of the peel. If the patient presents with any of these conditions, they may be more likely to peel to a greater depth or have a greater reactivity and discomfort to the peeling agent. The physician must therefore exercise caution with these patients.

Patients on retinoids, either oral (e.g., Accutane/13-cis-retinoic acid) or topical (e.g., Retin-A/all-trans-retinoic acid), may have increased disruption of the stratum corneum and therefore the depth of penetration of the glycolic acid peel may be greatly increased. It is recommended that patients discontinue use of topical tretinoin at least 7 days prior to the peel. The use of glycolic acid peel with patients who are on Accutane therapy remains controversial due to questions regarding healing; therefore it should be left to the physician's expertise.

Another medication that may affect peel penetration is topical 5-fluorouracil (5-FU), which may disrupt actinic keratoses. Therefore glycolic acid peels may cause epidermolysis of these treated areas. However, this is a favorable effect in the destruction of these premalignant conditions. Nevertheless, the increased potential for causing a deeper depth chemical peel of these involved areas must be communicated to the patient.

Relative exclusions

Active herpes simplex and facial warts are relative exclusions to glycolic acid peels. The potential for spreading either the herpes or papilloma virus to areas desquamated by the peel is a major concern. Therefore it is recommended that these conditions be treated first and the glycolic acid peel be undertaken only when healing is complete.

Other cosmetic treatments that risk disruption of the stratum corneum should not be performed within 1 week of the glycolic acid peel. These treatments include hair removal, bleaching agents, waxing, depilatories, electrolysis, masques, exfoliants, and loofahs. Likewise, no shaving should take place for 24 hours before a peel. Most importantly, those patients who do not heed the requirement of photoprotective behavior should be excluded from treatment.

Prepeel instructions and patient preparation

Once the patient is considered a candidate for glycolic acid peel, the prepeel instructions should be reviewed with the patient (Fig. 1) in the office. The patient should be instructed to begin a daily at-home glycolic acid product. The product can be started nightly for the first week, then increased to twice daily as tolerated. Initially an 8% product is recommended; this concentration may be increased over time. Cream formulations are generally preferred by the older, more photoaged patient, while lotion formulations are preferred by the younger, less photoaged patient. Gel formulations are well accepted by oilier skin types.

Graphic
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Fig. 1. Glycolic acid peel/acne wash pre-procedure instructions.

This prior preparation allows for preliminary desquamation and a more homogenous uptake of the glycolic acid peel. The patient may recognize this as a fine flaking of the skin. This preparatory treatment may help identify to the physician any unusual sensitivity to glycolic acid, which, to date, is rare.

The physician may want to obtain a baseline photograph at this visit. The physician is also encouraged to take photographs during varying degrees of peeling for purposes of documentation. The physician should reemphasize to the patient that the peel process is gradual and should be repeated at least monthly. In addition, the patient must be compliant with their use of home glycolic acid products.

Upon completion of the prepeel preparation, the patient should be instructed to arrive on the day of the peel with a clean face, having removed any contact lenses. Female patients should remove all makeup and cosmetics from their skin. Male patients should abstain from shaving on the peel day. A consent form should

be signed and witnessed in the office before the actual procedure is undertaken. An example of such a consent form is shown in Fig. 2.

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Fig. 2. Chemical peel consent.

Peel procedure

Supplies and preparation

The materials needed for a glycolic acid peel are readily available and inexpensive. They include 60 in. drape sheets or cotton towels, a fan-shaped brush or 2 in. × 2 in. gauze sponges or a cotton-tipped swab or applicator, premoistened and frozen 4 in. × 4 in. gauze sponges, a small fan, a timer, a nylon bib, a shower cap or hair clips, dispensing cups, and ice water in a bowl or a water spray bottle. The patient should be instructed to lie back on the table with the head slightly inclined. While lying on the table, the patient should be draped with the sheets or towels wrapped around the neck, the shower cap placed on the head to cover the hair, and the nylon bib placed over the drape sheets or towels around the patient's neck. Removal of the patient's contact lenses is recommended. The physician should first inspect the areas to be peeled, noting any abrasions, areas of dry skin, or possible irritation. A thorough skin cleansing should then be performed. Many cleansing agents can be used, but the author prefers a pH-balanced cleanser to ensure that the quality of the peel is standardized. Petrolatum should be applied sparingly to the lateral and medial canthi of the eyes, the nasal alae, the nasolabial creases, the outer commissures of the lips, and the lips themselves. This is done to protect potential pooling sites from extra glycolic acid solution. The fan should be directed at the patient's face and a hand-held fan offered to the patient to assist in keeping the treated area cool.

The peel procedure

The physician should select a 20% or 30% glycolic acid preparation for the initial peel. Approximately 2 cc of the glycolic acid solution is needed to cover the entire face or one premoistened pad. The glycolic acid solution may be transferred into a small dispensing cup and applied with a fan-shaped brush, a cotton-tipped swab or applicator, a gauze sponge, or by finger massage with a gloved hand. The premoistened glycolic acid pads are wiped across the skin with a gloved hand. The advantage here is less chance of dripping.

Application of the glycolic acid should be started at the forehead, continued to the cheeks, the chin, and then the nose. Continuous reapplication of the acid can be performed without fear of enhanced penetration. Patients should be instructed to keep their eyes closed throughout the entire procedure. The solution must be carefully applied around the upper lip to avoid dripping into the nasal cavity and applied sparingly around the eyes. If the solution should enter the eye, immediate flushing with water is recommended. The sensation of glycolic acid in the eye is akin to lemon juice in the eye. To date, no untoward effect has been reported with this occurrence. Nevertheless, flushing with water does quell this sensation. As soon as the glycolic acid touches the skin, the timer is turned on. The entire application should take place within a 30-second interval and the skin should be kept saturated with the glycolic acid solution. The acid is then allowed to remain in contact with the skin until erythema occurs. The desired endpoint of the peel is a resultant even erythema. The duration of the first peel should be approximately 2-5 minutes while watching for this erythema. The importance of keeping the contact time of glycolic acid with the skin under 5 minutes on the first peel is to avoid any delayed hypersensitivity reactions. On subsequent peels, this time interval may be decreased or extended, depending on the patient's reaction and comfort level during the procedure. The patient's comfort level may be assessed by asking the patient to verbalize the discomfort on a scale of 0-10 (10 being the greatest degree of discomfort). If the patient verbalizes a level of 8-10 at any time during the procedure, the peel should be terminated immediately. In addition, if at any time during the peel blanching is noticed

(epidermolysis), the glycolic acid should be neutralized and rinsed off with cool water.

The onset of epidermolysis (frosting or blanching) should be noted and the reaction stopped. An exception here would be in the treatment of actinic keratoses, where epidermolysis is the desired reaction. If the 20% concentration is able to stay on the skin for 5 minutes, then a subsequent peel should begin with the next higher concentration but a shorter time of exposure is recommended. Once this concentration is maximized at 5 minutes, the next higher concentration is chosen for the subsequent peel.

To initiate termination of the procedure, the closed eyes should be covered with damp 2 in. × 2 in. gauze sponges. The glycolic acid is then neutralized with a bicarbonate solution which produces a noticeable foaming reaction on the acidified skin and abruptly ends further action of any remaining free acid. The end of the foaming reaction signals the end of neutralization. During neutralization, patients may verbalize that their pain or discomfort level is enhanced; this lasts for approximately 15 seconds. The treated area may then be sprayed with chilled water or covered with prefrozen 4 in. × 4 in. gauze sponges. This provides additional relief from any residual sensations of burning, stinging, or discomfort. The patient will usually feel comfortable within 1 minute of such application. At this point the sponges can be removed, the petrolatum wiped off, and the face or cosmetic unit dried with the drape sheet. If the patient reports any areas of continued burning or stinging, the bicarbonate neutralizer may be sprayed again until the patient indicates that the sensation has ceased.

Postpeel treatment instructions

A postpeel, glycolic acid-free moisturizer is applied at the end of the procedure. It is recommended that the home glycolic acid preparations be avoided until the skin returns to a normal appearance. This may take 3-7 days after the procedure. For that period only, the glycolic acid-free moisturizer should be used. The patient is also instructed not to use any retinoids on the skin during this recovery period. The patient should be instructed not to apply makeup for the first 24 hours and to avoid sun exposure. The patient is told to expect postpeel tightness in the first 24 hours and possibly some degree of erythema. If edema, stinging, tingling, burning, itching, or persistent erythema is experienced, the patient is instructed to apply cool or ice-water compresses over the next 24-48 hours until these sensations subside. If epidermolysis has occurred during the procedure, the patient is told that the skin will generally scab within 7-10 days. It is usually unnecessary to use topical hydrocortisone after the peel unless edema or epidermolysis has occurred. At this time the patient should be given the post-peel instructions (Fig. 3). In addition, sunscreens may be used and should be encouraged if the patient is going to be outdoors. The patient is admonished not to peel, pick, or exfoliate the skin in any way. If the patient is having any significant discomfort it is advised that the physician monitor the patient at that time. The patient is then instructed to schedule a return for their subsequent peel within 4 weeks.

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Fig. 3. Glycolic acid peel/acne wash post-procedure instructions.

Patient expectations

It is difficult to predict for the patient the precise number of treatments needed and the anticipated degree of resulting improvement due to many patient variables such as skin type, condition being addressed, the degree of photodamage and photoaging, and patient compliance with photoprotective behavior and treatment protocols. However, for patients with wrinkles and fine lines, sallow complexions, or dyspigmentation, results are achievable if conditions are standardized as much as possible and the treatment schedule is heeded. The best results are seen with fine lines and wrinkles occurring on the cheeks and periocular areas. The most

striking improvements are observed in patients with sallow complexions. Most patients report that the glycolic acid imparts a dewy glow to their skin, making them feel comfortable about their skin's appearance. Many times these patients do not feel the need to wear makeup or cosmetics. Lightening of the dyspigmentation can be seen within 3 months of treatments.

Once the patient experiences the above improvements, a maintenance program can be offered to the patient. In general, the patient is asked to return for follow-up peels every 3 months. The concentration of the glycolic acid chosen at that time depends on their compliance with their home treatment products. They are also advised that it is important for them to continue with their home glycolic acid preparations as well as other physician-prescribed antiphotoaging treatments.

Pitfalls and adverse reactions

Unexpected epidermolysis can result if a patient has not discontinued the use of topical retinoids before the peel. The patient must be instructed regarding this effect, and that a deeper peel due to enhanced penetration may result in scabbing. In this event, it is recommended that the physician counsel the patient to prolong the use of a glycolic acid-free moisturizer and may recommend topical hydrocortisone. In some cases, when periocular and perioral edema is severe, oral steroids may be needed. It may also be necessary to begin the patient on oral antiviral agents as well as oral antibiotics, particularly in patients with a history of recurrent herpes simplex. In cases of severe edema and erythema the use of oral steroids is significantly helpful if given early.

An adverse reaction to a peel may occur if a vigorous rubbing or abrasive technique is used to apply the glycolic acid to the skin. Pronounced erythema and edema may result. The same postpeel instructions are applicable. The risk here is of hypo- or hyperpigmentation occurring in the scrubbed sites. This must be monitored by carefully following up with the patient. Another possible reaction to the peel is the eruption of acneiform papules periorally, in particular, on the chin. This perioral dermatitis has been observed in a few patients and is resolved with topical and/or oral antibiotics. Subsequent peels may still be performed on other cosmetic units such as the cheeks, nose, and forehead if the chin/perioral area is protected. Although rare, a limited physical urticaria has been seen immediately after the peel on the treated sites. This generally resolves within 24 hours without additional treatment.

Emerging uses of the glycolic acid peel

Although used over the past two decades, glycolic acid peels have only recently been popularized since the technique has become standardized. The benefits of these peels are finding broader application not only in cosmetic improvement of the skin, but also in certain skin disorders such as acne, rosacea, melasma, seborrheic keratosis, actinic keratosis, keratosis pilaris, and warts. The use of glycolic acid peels as an adjunctive therapy in the treatment of these disorders has been found to facilitate recovery in many of these cases. While the author proposes a mechanism for the peel's effects, she does not suggest that this be considered a primary or solo therapeutic agent until further studies are conducted. Rather these cases and discussions are offered as another possible treatment modality in the dermatologic armamentarium.

Acne vulgaris

Since one of the many causes and consequences of acne is follicular plugging, glycolic acid with its unique effect on corneocyte dyscohesion has been reported to be effective. Used as an acne wash or deep pore cleansing agent, the glycolic acid procedure can be performed alone or in conjunction with acne surgery. It appears that the glycolic acid peel causes a subcorneal epidermolysis, thereby dislodging the keratotic plug obstructing the follicular orifices. In so doing, it facilitates acne surgery, enhances penetration of topically applied antiacne agents, and hastens their improvement and overall recovery time. Patients generally report

that an immediate improvement is seen after the first 2 weeks. Inflammatory acneiform papules and pustules appear to dry and heal quickly. An illustration of this effect is seen after just 24 hours. The noninflammatory or comedonal type also improves, but the closed comedonal type may respond more slowly.

It is this author's experience that pustules react more readily to the free glycolic acid and rupture releasing the exudate, which is washed or wiped away. It is felt by some that the acidic nature of the free glycolic acid peeling agents may actually be bactericidal, but this needs further investigation. Also, the author believes that, in some acne cases, less acne scarring occurs when acne is treated early on with the glycolic acid peel as an adjunctive treatment. Because of the rapid improvement, the courses of oral antibiotics may be shortened. This may have further impact on parents who worry regarding their child's potential future resistance to antibiotics. Lastly, the ability to treat the acne patient with a hands-on treatment modality is welcomed by the patient and is gratifying to the physician.

Melasma

Dyspigmentation, postinflammatory hyperpigmentation, lentigines, and melasma can be improved with the use of glycolic acid peels. Peels may actually hasten the improvement seen with the concurrent use of topically applied bleaching agents, glycolic acid, and retinoids. According to one study the use of glycolic acid 70% solution produced an improvement equivalent to Jessner's solution in patients who were pretreated with topical tretinoin. The authors felt that with peels, improvement could be seen by 3 months compared to 10 months with topical treatments alone.

The authors did not feel that the Wood's lamp was predictive of which patients would respond to treatment. Their study suggested that improvement could be seen in epidermal and combined epidermal/dermal types of melasma. Glycolic acid's mechanism of action is not yet known on the melanocyte and melanin pigment. Nevertheless, the ability to treat all skin types with this agent makes it an attractive treatment modality.

Seborrheic keratosis

Most patients are interested in removing these stigmata of aging. Although there are at present many means by which seborrheic keratoses can be treated, newer methods are readily sought as alternatives when other methods fail or are not acceptable to the patient. The ease of application of the glycolic acid peel and the other cosmetic benefits it imparts makes it an attractive alternate therapy. The thinner lesions appear to desquamate more quickly and easily. It can be applied to thicker more hyperkeratotic lesions by directly applying a 70% glycolic acid solution with a small brush. The solution may need to be left on for longer than 5 minutes, with the maximum suggested time being 15 minutes in these cases. It is believed that the discohesion of the keratinocytes leads to the lysis of the lesion.

Actinic keratosis

Like seborrheic keratosis, there is a list of treatments available for these preskin cancers. Nonetheless, when the patient presents with numerous lesions, it may be impractical for the physician to try and treat each lesion individually. One method is to pretreat the lesions with 5-FU twice a day for 1 week prior to the peel to reveal the actinic keratoses. The patient is cautioned that the skin will be red and that the peel will cause a great degree of desquamation, much like a severe sunburn, if they have numerous lesions. The patient should be informed that in this scenario the peel may be uncomfortable. The patient should be reassured that the discomfort will be greatly quelled with neutralization and ice compresses. Occasionally a patient may require an over-the-counter analgesic. With a 70% glycolic acid peeling solution, a response of epidermolysis is generally seen within 2 minutes. As mentioned earlier, it is this response that is the desired end-point. All of the admonitions and pre/posttreatment care are discussed above. This is the only case where the physician may routinely prescribe topical steroids for a few days postpeel to calm the postinflammatory reaction that

results. This is because the desired epidermolysis has occurred and there is little concern here of reversing or quenching the reaction with the use of the topical steroids.

Keratosis pilaris

To date, keratolytics and retinoids have been used with little benefit in this condition. This disorder of keratinization is greatly enhanced by the use of the glycolic acid peel. The patient should be pretreated with a home glycolic acid preparation and may find the higher concentrations more helpful. Since this condition appears not only on the face but on more stubborn treatment areas such as the upper arms, thighs, and back, the glycolic acid peel may be used in higher concentrations on these sites. While the peel appears to be effective in yielding a softer skin texture, it is important that the patient maintain skin care with the home care glycolic acid products indefinitely. The peels may be performed until the required response is obtained. Then the patient may be required back periodically for maintenance treatments.

Conclusion

It is hoped that this article brings a better understanding of the glycolic acid peel technique and process. Its use in alleviating the signs of photoaging have already been realized. In addition, the broader applications of this peeling technique for skin disorders makes it an exciting treatment modality for the future.

Appendix

1. Costello EJ, Filchone EM. Preparation and properties of pure ammonium DL lactate. J Am Chem Soc 1953: 75: 1242-1422.

2. Ditre CM, Griffin TD, Murphy GF, et al. The effects of AHAs on photoaged skin: a pilot histological and ultrastructural study. J Am Acad Dermatol 1996: 34: 187-195 Bibliographic Links.

3. Greaves MW. Topical alpha-hydroxy acid derivatives for relieving dry itching skin. Cosmet Toil 1991: 105(10): 61.

4. Griffin TD, Van Scott EJ. Case of pyruvic acid in the treatment of actinic keratoses: a clinical and histopathological study. Cutis 1991: 47: 325-329.

5. Keenan WF. Comparative efficacy of two different formulations on xerosis [letter]. J Am Acad Dermatol 1990: 23: 769-770 Bibliographic Links.

6. Klaus MV, Wehr RF, Rogers RS III, Russell TJ, Krochmal L. Evaluation of ammonium lactate in the treatment of seborrheic keratoses. J Am Acad Dermatol 1990: 22: 199-203 Bibliographic Links.

7. Lavker RM, Kaidbey K, Leyden JJ. Effects of topical ammonium lactate on cutaneous atrophy from a potent topical corticosteroid. J Am Acad Dermatol 1992: 25: 535-544 Bibliographic Links.

8. Perricone NV. An alpha hydroxy acid acts as an antioxidant. J Geriatr Dermatol 1993: 1: 101-104.

9. Ridge JM, Siegle RJ, Zuckerman J. Use of alpha hydroxy acids in the therapy for photoaged skin. J Am Acad Dermatol 1990: 23: 932 Bibliographic Links.

10. Sakaki S, et al. Application of MTT test for screening of cell growth activators. evaluation of alpha-hydroxy acids. J Soc Cosmet Chem 1993: 27: 116-119.

11. Siskin SB, Quinlan PJ, Finkelstein MS, Marlucci M, Maglietta TG, Gibson JR. The effects of ammonium

lactate 12% lotion vs. no therapy in the treatment of dry skin of the heels. Int J Dermatol 1993: 32: 905-907.

12. Smith W. Hydroxy acids and skin aging. Soap Cosmet Chem Spec 1993: 9: 55-56.

13. Smith HF, et al. J Individ Hyg Toxicol 1941: 23: 259.

14. Stern EC. Topical application of lactic acid in the treatment and prevention of certain disorders of the skin. Urol Cutan Rev 1946: 50: 106-107.

15. Takahashi M, et al. The influence of hydroxy acids on the rheological properties of stratum corneum. J Soc Cosmet Chem 1985: 36: 177-187 Bibliographic Links.

16. Van Scott EJ, Yu RJ. Control of keratinization with [alpha]-hydroxy acids and related compounds. I. Topical treatment of ichthyotic disorders. Arch Dermatol 1974: 110: 586-590 Bibliographic Links.

17. Van Scott EJ, Yu RJ. Modulation of keratinization with alpha hydroxy acids and related compounds. In: Frost P, Gomez EC, Zaias N, eds. Recent advances in dermatopharmacology. New York: Spectrum, 1978: 211-217.

18. Van Scott EJ, Yu RJ. Substances that modify the stratum corneum by modulating its formation. In: Frost P, Horwitz SN, eds. Principles of cosmetics for the dermatologist. St. Louis: CV Mosby, 1982: 70-74.

19. Van Scott EJ, Yu RJ. Hyperkeratinization, corneocyte cohesion and alpha hydroxy acids. J Am Acad Dermatol 1984: 11: 867-879 Bibliographic Links.

20. Van Scott EJ. The unfolding therapeutic uses of the alpha hydroxy acids. Med Dermatol 1988: 3: 1-5.

21. Van Scott EJ. Alpha hydroxy acids: procedures for use in clinical practice. Cutis 1989: 43: 222-228 Bibliographic Links.

22. Van Scott EJ, Yu RJ. Alpha hydroxy acids: therapeutic potentials. Can J Dermatol 1989: 1: 108-112.

23. Van Scott EJ, Yu RJ. Alpha hydroxy acids: science and therapeutic use. Cosmet Dermatol 1994: 7(suppl 10): 12-20.

24. Clark CP. Alpha hydroxy acids in skin care. Clin Plast Surg 1996: 23: 49-56 Bibliographic Links.

25. Piacquadio D, Dobry M, Hunt S, Andree C, Grove G, Hollenbach KA. Short contact 70% glycolic acid peels as a treatment for photodamaged skin. A pilot study. J Dermatol Surg 1996: 22 (5): 49-52.

26. Ditre CM, et al. Introduction: practical use of glycolic acid as a chemical peeling agent. J Geriatr Dermatol 1996: 4(suppl B): 2-7.

27. Kakita LS, Petratos MA. The use of glycolic acid in Asian and darker skin types. J Geriatr Dermatol 1996: 4(suppl B): 8-11.

28. Rendon-Pellerano MI, Bernstein EF. The use of glycolic acid in the management of xerosis and photoaging. J Geriatr Dermatol 1996: 4(suppl B): 12-16.

29. Briden ME, Rendon-Pellerano MI. Treatment of rosacea with glycolic acid. J Geriatr Dermatol 1996: 4(suppl B): 17-21.

30. Briden ME, Kakita LS, Petratos MA, Rendon-Pellerano MI. Treatment of acne with glycolic acid. J Geriatr Dermatol 1996: 4(suppl B): 22-27.

31. Stiller MJ, Bartolone J, Stern R, et al. Topical 8% glycolic acid and 8% lactic acid creams for the treatment of photodamaged skin: a double-blind vehicle-controlled clinical trial. Arch Dermatol 1996: 132: 631-636 Ovid Full Text Bibliographic Links.

32. Bartolone J, Santhanam U, Penska C, Lang B, Anthony J. Alpha hydroxy acids modulate skin cell biology. Poster presentation, SID, Chicago, IL, May 1996.

33. Bernstein EF, Van Scott EJ, Yu RJ, Lakkakorpi J, Ditre CM, Uitto JJ. A pilot investigation of the effects of citric acid on viable epidermal thickness and dermal glycosaminoglycans. Poster presentation, SID, Chicago, IL, May 1996.

34. MacEachern L, Rensjers K, Dickens M. The percutaneous absorption of glycolic acid in human skin. Poster presentation, SID, Chicago, IL, May 1996.

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