



ORIGINAL RESEARCH ARTICLE

The efficacy and safety of a 70% glycolic acid peel with vitamin C for the treatment of photoaging

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Abstract: Glycolic acid peels have been shown in many studies to improve the appearance of photoaged skin. Vitamin C is known to be a potent natural antioxidant and plays an important role in the collagen biosynthetic pathway. In this study, we report our clinical experience with 70% glycolic acid peel added with vitamin C. We found that all parameters of photoaging, in particular the composite wrinkling score, discolouration score and the global photoaged score, showed statistically significant improvement. Patient satisfaction also revealed improvement in keeping with the physician assessment. It is also associated with an excellent safety profile. In conclusion, a combination of 70% glycolic acid with vitamin C chemical peel is a well-tolerated effective treatment of photoaging in Asian skin.

Keywords: chemical peel; vitamin C; photoaging; pharmacology

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Introduction

Chemical peels, also known as chemoexfoliation or derma peeling, have been used for many years in dermatological practice in the treatment of photoaged skin. Although deep peels such as phenol peels are associated with the best results, superficial and medium-depth peels such as alpha hydroxy acid (AHA) and trichloroacetic acid (TCA) peels also yield excellent results without causing excessive skin damage^[1].

Glycolic acid is the smallest organic acid in the AHA group. When applied to the skin, its peeling effect results in the dis cohesion of keratinocytes in the stratum corneum^[2] and the stimulation of biosynthesis of glycosaminoglycans (GAGs) especially hyaluronic acid

and collagen fibres^[3]. The resultant thickening of the dermis layer is postulated to be the main mechanism for the improvement of photoaged skin.

Patients who seek treatment for photoaging are offered various options including topical medications, chemical peels, microdermabrasion and laser resurfacing. We report our experience with a commercial preparation of 70% glycolic acid and vitamin C chemical peel (VCi, Ocean Health, USA).

Materials and methods

Over a six-month period, a total of 15 patients from the dermatology clinic of National University Hospital, Singapore, with clinically evident photoaged facial skin

underwent a series of three 70% glycolic acid peels with vitamin C, each four weeks apart. These patients had no history of oral retinoid or chemical peels within the past six months, no topical retinoid application within the past one week or laser ablative procedures within the last month prior to embarking on the priming regime. They had no active facial dermatitis or infection.

Treatment regimen

Priming

All patients were instructed to apply a 10% glycolic acid solution (Therapeutic Dermatologic Formula, VCI[®] Clarify, Ocean Health, USA) and facial moisturizer (Therapeutic Dermatologic Formula, VCI[®] Hydrate, Ocean Health, USA) twice daily. Sunscreen (Therapeutic Dermatologic Formula, Sunscreen, PA +++ UVA/UVB SPF 50+) was also to be applied once daily in the morning. This continued daily for one month.

Peeling

Four weeks later, the patient received the first chemical peel. A single pass of 70% glycolic acid and vitamin C peel (Therapeutic Dermatologic Formula VCI) was applied for 3–5 min depending on patient's tolerance. Spot neutralization (Therapeutic Dermatologic Formula VCI[®] Peel Neutralizer) was performed on areas of erythema, with subsequent full neutralization upon the termination of the peel.

Post peel care

For the first three days of each peel, patients were instructed to use 10% vitamin C serum (Therapeutic Dermatologic Formula, "C"-Scape Serum) twice daily, a facial moisturizer (Therapeutic Dermatologic Formula VCI[®] hydrate) twice daily, another facial moisturizer (Therapeutic Dermatologic Formula VCI[®] Quick recovery cream) as required, and sunscreen once daily. From day 4 until the next peel, Quick Recovery Cream (Therapeutic Dermatologic Formula VCI[®] Clarify) twice daily was substituted for 10% glycolic acid solution.

Clinical evaluation

Grading of photoaging was performed based on the following 10 clinical parameters:

1. Fine peri-orbital wrinkles (FPW)
2. Coarse peri-orbital wrinkles (CPW)
3. Upper lip wrinkles (ULW)
4. Lower lip wrinkles (LLW)
5. Melasma
6. Solar lentigines
7. Guttate hypomelanosis

8. Poikiloderma
9. Solar keratosis
10. General skin texture graded from smooth to severe roughness

A rating of nil (1), mild (2), moderate (3) and severe (4) was scored for each parameter. The sum obtained constituted the global photoaging score. A visual analogue scale (VAS) of photoaging by both physician and patient was also performed at each visit. This was a 10 point scale (1–10), with "1" meaning no visible features of photoaging and "10" being severe photoaging features.

In addition, a safety assessment score according to five clinical parameters of redness, swelling, oozing or crusting, hyperpigmentation and scarring was obtained after the administration of each peel at weeks 4, 8 and 12 using a rating of absent (1), mild (2), moderate (3) and severe (4). All ratings were made by the managing dermatologist.

Ethics statement

Approval for this study was obtained from the national ethics review board, National Healthcare Group (NHG) Domain Specific Review Board (Reference no.: 2015/00848).

Results

Study population

All patients, except one, were female, and skin types ranged from Fitzpatrick skin type II to IV. The mean age was 53.7 years (range 38–64 years). 2 patients (13.3%) withdrew from the study: one experienced severe contact dermatitis whereas the other withdrew for personal reasons.

Physician scores

Wrinkle score

The wrinkle score was composed of the sum of scores for FPW, CPW, ULW and LLW. The composite score (**Figure 1**) for each participant ranged from 1 to 16. There was a trend towards improvement (*i.e.*, decrease) in wrinkle score with statistically significant improvement noted at week 12, which was sustained till week 16

Discolouration score

The discolouration score was composed of the sum of scores for melasma, solar lentigines, guttate hypomelanosis and poikiloderma. The composite score for each participant ranged from 1 to 16 (**Figure 2**). There was similarly a trend towards improvement (*i.e.*, decrease) in the discolouration score with a statistically

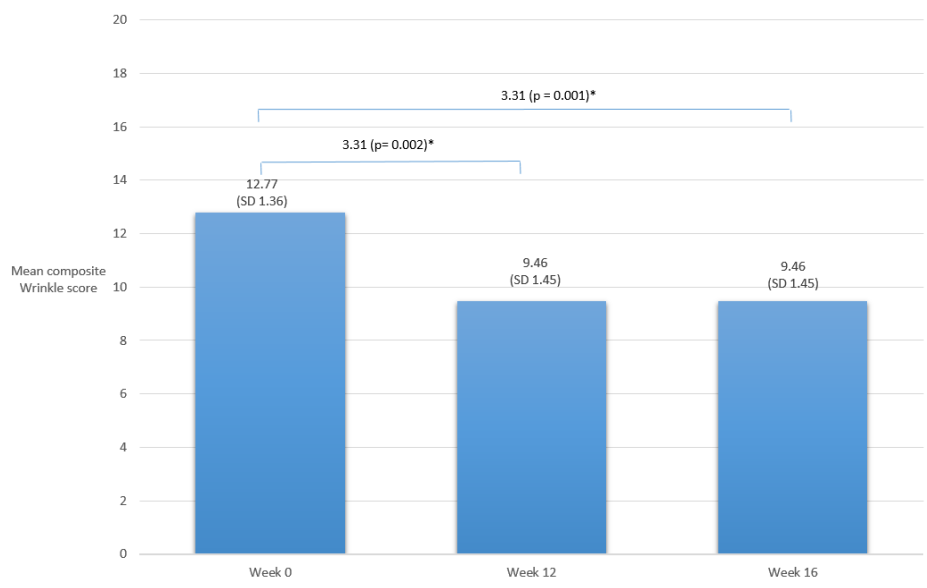


Figure 1. Wrinkle scores (*Wilcoxon signed rank test of change)

significant improvement noted at week 12, which was sustained till week 16 (Figure 2).

Global photoaging score

There was a high statistically significant reduction in this global score at week 12 compared to baseline, and this improvement was also sustained till week 16 (Figures 3, 4A and 4B)

Visual Analogue Scale

There was an overall improvement in both physician and patient VAS scores over the course of the study (Figure 5).

At every time point after the commencement of the peels, patient VAS scores were consistently slightly higher than the physicians. At week 16, physician and patient VAS scores reduced by approximately one-third of the baseline.

Safety assessment

None of the patients had oozing/crusting, hyperpigmentation or scarring at any time. For redness and swelling, a downward trend was noted (Table 1). At week 16, all side effects had resolved, except in two patients who reported with mild erythema (score 2).

Discussion

Glycolic acid peels have been shown in many studies to improve the appearance of photoaged skin. Isoda and colleagues reported that after a single session of GA peel, elastic fibres were increased after 2 weeks and significantly increased after 28 days^[4]. Kubiak *et al.* compared 70% GA with 15% TCA peels and found clinical

improvement in hydration and elasticity parameters as well as improvement in UV-induced post-inflammatory pigmentation in both groups. However, patients' satisfaction rates for GA peels were higher because of a superior side effect profile^[5]. Table 2 is a comparative table of other studies evaluating the use of glycolic acid chemical peels in the treatment of photoaging.

Vitamin C is a potent natural antioxidant and it plays an important role in the collagen biosynthetic pathway. Numerous studies have supported its use in the protection and rejuvenation of photoaged skin. A six-month double-blind, vehicle-controlled study of moderately photoaged patients using 5% vitamin C cream on the neck and forearms produced a highly significant decrease in the deep furrows with histological evidence of elastic tissue repair^[6]. Our study shows encouraging results with the use of a combination 70% glycolic acid–vitamin C peel in the treatment of photoaged skin, and that the treatment is well-tolerated.

This was noted to affect all parameters of photoaging, in particular the composite wrinkling score, discolouration scores and also the global scoring. Of note, patient satisfaction scores also revealed an improvement in keeping with the physician assessment. Statistically significant results were seen in all scores by week 12 and these were sustained at week 16, four weeks after the final peel.

Furthermore, there was an excellent safety profile with reports of primarily mild redness, which also resolved by week 16.

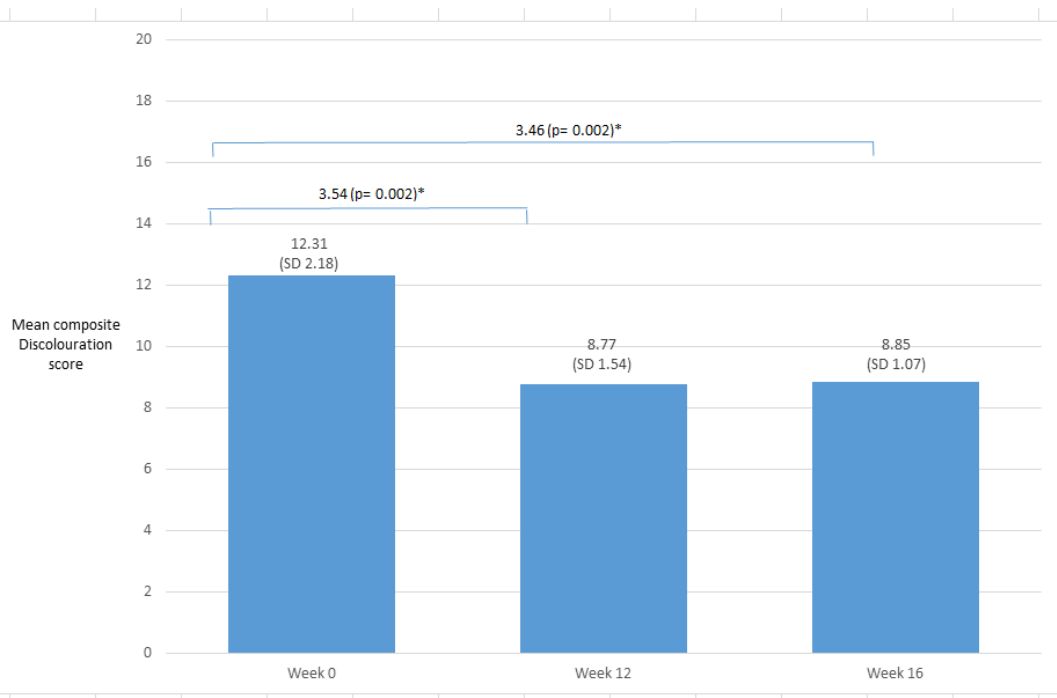


Figure 2. Discolouration scores (*Wilcoxon signed rank test of change)

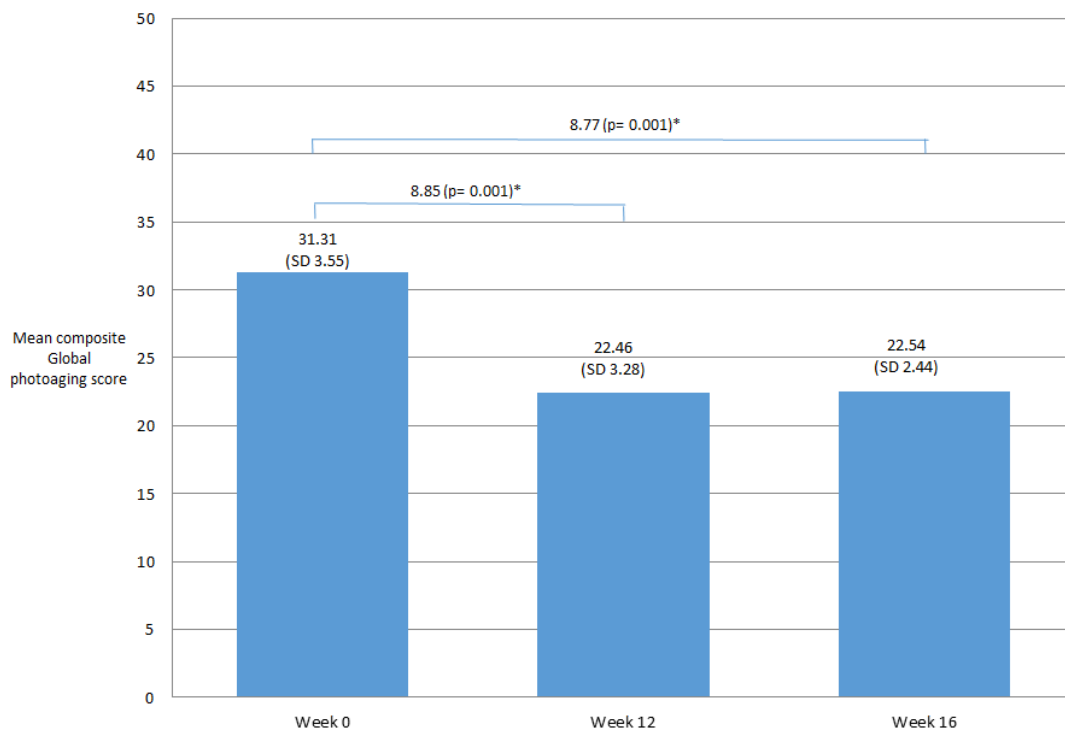


Figure 3. Global photoaging scores (*Wilcoxon signed rank test of change)



Figure 4. A 62-year-old patient at (A) Week 0, pre-treatment and (B) Week 16, after 3 sessions of 70% glycolic acid peel with vitamin C

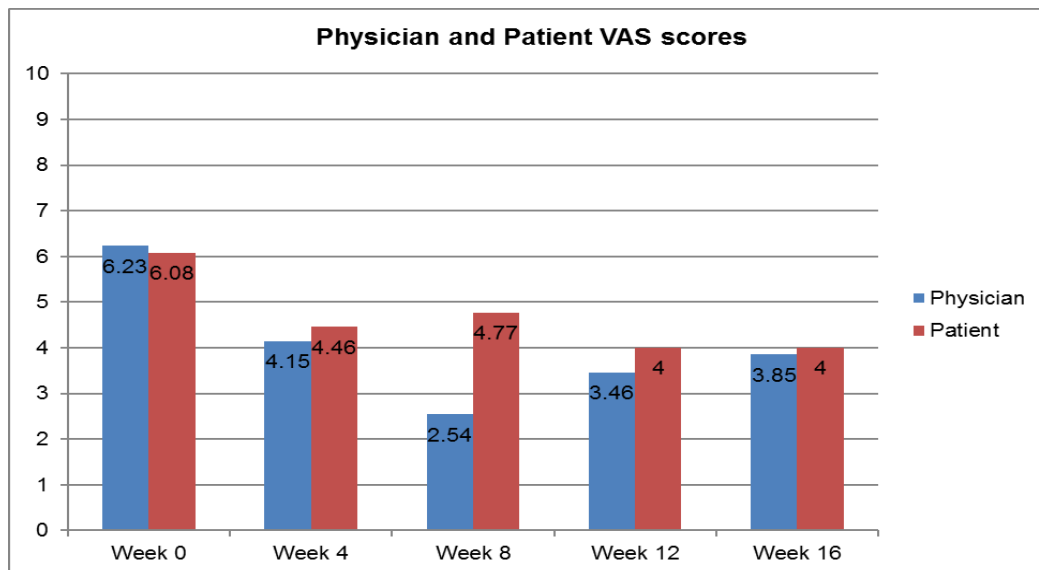


Figure 5. Physician and patient's VAS scores

Table 1. Safety assessment score post chemical peel

Side effect	Mean score (SD)		
	Week 4	Week 12	Week 16
1. Redness	2.38 ± 0.83	2.23 ± 0.49	1.15 ± 0.36
2. Swelling	2.08 ± 0.83	1.38 ± 0.49	1 ± 0.00
3. Oozing/crusting	1.00	1.00	1.00
4. Hyperpigmentation	1.00	1.00	1.00
5. Scarring	1.00	1.00	1.00

Table 2. Comparative table of other studies evaluating the use of glycolic acid chemical peels in the treatment of photoaging

Article	Compound used	Parameters (physician measured)	Advantage/efficacy	Side effect profile
Evaluation of 70% glycolic peels versus 15% trichloroacetic peels for the treatment of photodamaged facial skin in aging women ^[5] .	Glycolic acid (GA, 70%) vs. trichloroacetic acid (TCA, 15%)	<ul style="list-style-type: none"> • Skin elasticity • Epidermal hydration • Reduction in melanin intensity 	Overall 70% GA higher efficacy	<ul style="list-style-type: none"> • Stinging (TCA 27%; GA 63%) • Erythema (TCA 7%; GA 63%)
Clinical improvement of photoaged skin with 50% glycolic acid. A double-blind vehicle-controlled study ^[7] .	50% glycolic acid vs. vehicle gel	<ul style="list-style-type: none"> • Rough texture • Fine wrinkling • Coarse wrinkling • Solar keratosis • Lightening of solar lentigines <p>Histological improvement (thinning of stratum corneum, granular layer enhancement, epidermal thickening, increase in dermis collagen thickness).</p>	Overall 50% GA higher efficacy for all parameters measured, except coarse wrinkling	<ul style="list-style-type: none"> • Erythema, scaling, irritant dermatitis reported in 50% GA group. • Neither caused post-inflammatory hyper- or hypo-pigmentation, scarring or persistent erythema
A clinical and histologic evaluation of two medium-depth peels. Glycolic acid versus Jessner's trichloroacetic acid ^[8] .	70% GA + 35% TCA (GA-TCA) vs. Jessner's solution + 35% TCA (JS-TCA)	<ul style="list-style-type: none"> • Removal of actinic keratosis • Lightening solar lentigines • Neoeelastogenesis • Histological improvement (thicker Grenz zone) 	Overall GA-TCA higher efficacy in all parameters, except lightening solar lentigines (equal efficacy) Postulation: 70% GA as initial wounding agent may allow TCA to penetrate deeper and produce deeper histological wound	<ul style="list-style-type: none"> • Erythema, crusting and swelling reported in both groups • Neither caused post-inflammatory hyper- or hypopigmentation, persistent erythema, persistent erosions, or milia
Short contact 70% glycolic acid peels as a treatment for photodamaged skin. A pilot study ^[9] .	70% GA peels, half of subjects randomized to a 10% GA-based moisturizer twice daily	<ul style="list-style-type: none"> • Tactile roughness • Fine and coarse wrinkling • Mottled pigmentation • Sallowiness • Laxity • Overall severity • Number of actinic keratosis • Optical profilometry • Histological improvement 	Overall, 70% GA + 10% GA moisturizer twice daily has higher efficacy, except for histological improvement	<ul style="list-style-type: none"> • Patients in both groups tolerated therapy well
Clinical tolerance and efficacy of capryloyl salicylic acid peel compared to a glycolic acid peel in subjects with fine lines/wrinkles and hyperpigmented skin ^[10] .	20%–50% GA vs. 5%–10% salicylic acid, capryloyl salicylic acid (LHA).	<ul style="list-style-type: none"> • Reduction in fine wrinkling • Reduction in hyperpigmentation 	Overall 5%–10% LHA peel greater efficacy	<ul style="list-style-type: none"> • Erythema, dryness and scaling reported in both groups

Conclusion

In conclusion, a combination of 70% glycolic acid with vitamin C chemical peel is a well-tolerated effective treatment of photoaging in Asian skin. As this was a retrospective evaluation, a major limitation was the lack of control group. A longer period of follow-up reviews would be useful in determining the long-term sustainability effect of this chemical peel.

Author contributions

SS Yang and JK Heng administered the chemical peeling treatment, collected all data and wrote the manuscript. MM Liao and HSM Toh performed data and statistical analysis, besides being involved in the manuscript's writing. CWD Aw and S Ho wrote and edited the manuscript.

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Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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