Efficacy and safety of superficial chemical peeling in treatment of active acne vulgaris*

Hassanain Al-Talib[1]
Alyaa Al-khateeb[2]
Ayad Hameed [3]
Chandrika Murugaiah[4]

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Abstract: Acne vulgaris is an extremely common condition affecting the pilosebaceous unit of the skin and characterized by presence of comedones, papules, pustules, nodules, cysts, which might result in permanent scars. Acne vulgaris commonly involve adolescents and young age groups. Active acne vulgaris is usually associated with several complications like hyper or hypopigmentation, scar formation and skin disfigurement. Previous studies have targeted the efficiency and safety of local and systemic agents in the treatment of active acne vulgaris. Superficial chemical peeling is a skin-wounding procedure which might cause some potentially undesirable adverse events. This study was conducted to review the efficacy and safety of superficial chemical peeling in the treatment of active acne vulgaris. It is a structured review of an earlier seven articles meeting the inclusion and exclusion criteria. The clinical assessments were based on pretreatment and post-treatment comparisons and the role of superficial chemical peeling in reduction of papules, pustules and comedones in active acne vulgaris. This study showed that almost all patients tolerated well the chemical peeling procedures despite a mild discomfort, burning, irritation and erythema have been reported; also the incidence of major adverse events was very low and easily manageable. In conclusion, chemical peeling with glycolic acid is a well-tolerated and safe treatment modality in active acne vulgaris while salicylic acid peels is a more convenient for treatment of darker skin patients and it showed significant and earlier improvement than glycolic acid

Keywords: Acne vulgaris; Salicylic acid; Polyglycolic acid

INTRODUCTION

Acne vulgaris is a chronic disorder of the pilosebaceous apparatus caused by abnormal desquamation of follicular epithelium. This leads to the obstruction of the pilosebaceous canal, resulting in inflammation and subsequently the formation of papules, pustules, nodules, comedones, and scarring.[1] Acne vulgaris can greatly influence a person's quality of life therefore, it is necessary to deal with acne vulgaris to prevent emotional consequences and persistent complications.[2] Acne vulgaris is the most common skin disease among teenagers in the US. About 85 % of general population has an acne vulgaris in their lives, which mostly included on the face, upper back and chest. [3] Acne vulgaris is caused by over activity of the sebaceous glands and blockage in the ducts, which leads to the formation of comedones that later on inflamed, by *Propionibacterium acnes*.[3] Recently, the chemical peel procedures are more commonly used in photo-aging, active acne vulgaris, actinic keratosis, and acne scar.[4] Many clinicians propose the use of superficial chemical peels as a treatment option of acne vulgaris as it is a relatively safe procedure.[4] Superficial chemical peels remains the standard for dealing with acne scar, fine lines, pigmentation and other skin problems. Currently, superficial chemical peeling processes are widely used in treatment of active acne vulgaris and as daily simple procedure done by plastics surgeons or dermatologist in a therapeutic setting.[5] Different superficial chemical peels are used in skin via removing of stratum corneum layer, smoothing out the rough area, promoting product ingredient penetration and enhancing collagen production.[6] Using superficial chemical peels in treatment of active acne will breakdown corneosomes, exfoliate superficial layers of epidermis, increase epidermal activity of enzymes and lead to epidermolysis, in addition to deal with a percentage of the current lesions.[7]Acne vulgaris is commonly associated with stress, anxiety, high humidity, exposure to dirt, hormonal changes, and drugs.[5] Many regimens are used for its treatment like topical retinoids, benzoyl peroxide, topical antibiotic, oral antibiotics and hormone therapy. [5] Limited studies have been conducted on using superficial chemical peels on patients with active acne vulgaris and the efficacy and safety of such treatment options are yet to be determined through the review of the clinical results. Although the topical treatments are effective, other acne cases like active acne and resistant acne vulgaris are hard

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[1] Laboratory Medical Science Cluster, Faculty of Medicine, Universiti Teknologi MARA (UiTM) – Sungai Buloh, Malaysia.
[2] Biochemistry and Molecular Medicine Discipline, Faculty of Medicine, Universiti Teknologi MARA (UiTM) – Sungai Buloh, Malaysia.
[3] Faculty of Medicine and Health Sciences, Ucsi University – Kuala Lumpur, Malaysia.
[4] Department of Biomedical Sciences and Therapeutics, Faculty of Medicine and Health Sciences, University Malaysia Sabah – Sabah, Malaysia.

to treat. The use of chemical peels agents to manage such conditions should be focused to achieve effective and safe clinical outcomes. The purpose of this study was to review the efficacy of superficial chemical peeling in the treatment of active acne vulgaris and to determine the safety of superficial chemical peeling in the treatment of active acne vulgaris.

METHODOLOGY

Abstracts of previously published articles with titles relating to the study topics were viewed and relevant articles were downloaded and viewed for details. Literatures selection was done based on inclusion and exclusion criteria. Manuscripts which identify the efficiency and safety superficial chemical peeling in the treatment of active acne vulgaris were chosen to be used for the structured review. Quality Assessment checks on the papers, research table was constructed, the findings were compared and interpreted and discussions and conclusion were made.

BIBLIOGRAPHIC DATABASES

A literature search was conducted both electronically and manually. Electronic data and articles published in the English language were searched online in PubMed. Manual search was also done on references from selected articles.

LITERATURE SEARCH METHOD

The studies included in the review were chosen according to the following elements: Patients (P) we have included patients with active acne vulgaris; Intervention (I) using superficial chemical peels for active acne vulgaris; Comparison (C) Quantitative assessment of control and side effect of active acne.; Outcomes (O) Control and remission of active acne; Study (S) the study include prospective clinical trial. We conducted a search on PubMed and Google scholar using the terms "Active acne vulgaris, Glycolic acid (GA), Jessner's solution, Patients' number, Peeling, Peels, Salicylic acid (SA), Seborrhea, Superficial chemical peel, Trichloroacetic acid, Resorcinol." All prospective clinical trials or case series from 2000 and 2014 and written in English language which deal with human being only, were included and grouped according to the peeling agent used and the indication, being acne or acne scars. However studies that were excluded from this study were those without defining clinical events, also papers published in none peered review journals and those who neglecting certain sources and result in reviews being biased.

QUALITY ASSESSMENT AND DATA EXTRACTION

This study used JADED scoring for quality assessment for randomized controlled trial and Newcastle Ottawa for non-randomized controlled trial. Studies with the score 0-2 were considered to have a low quality and studies with the score 3-5 were considered to have high quality. Data were extracted from the selected literatures using research table. The name of the first author, year of publication, journal name and the study title were captured. Sample size, duration of the study, patient, intervention, comparison, outcomes and study design (PICOs) of the reviewed papers were also included. Pre-procedure and post-procedure cares, types and parameters of superficial chemical peels used in the studies, assessment methods, outcomes and complications of the studies were summarized in the tables and analyzed.

RESULTS

A total of 32,556 articles were found in the literature search using the keywords and additional filters. Abstracts of 27 articles related to the study topics were viewed. Full text articles were downloaded. A total of 7 articles that met the inclusion and exclusion criteria were chosen to be used in this study. We found a total of seven articles on both superficial chemical peeling and active acne vulgaris whether on PubMed or Google scholar table 1. [1] Among the seven articles on acne scars, one randomized prospective trial of split-face model and compared between GA and Jessner's solution, and showed no significant difference between two peels.[8]

There were two open label trials that evaluated the effects of SA 30% peels on comedones. [9,10] One study evaluated a polyethylene glycol (PEG) vehicle that reduced the stinging sensation. Both studies revealed a significant improvement of both comedonal and acne lesions in greater than 75% of patients, with few or mild adverse events (Table 2). Other two studies evaluated the efficacy of GA on comedonic acne and showed improvement in retentional lesions after 3 months (Table 3).[11,12] Both studies confirmed that a minimal adverse event was reported on 97% of patients who showed no any complaints. A study by Kessler et al found that both GA and SA were similarly effective in treatment of acne vulgaris with minimal adverse events reported by SA.[13] There were two studies comparing GA and SA chemical peels, in first study SA had a higher efficacy than GA on acne lesions (P<0.001) with adverse events being more common with GA (40%) than with SA (24%). Also SA peels for comedones and papules showed a significant improvement 4 weeks earlier than GA peels. However, in a second study there were no significant differences in effectiveness between GA and SA.[14,15]

DISCUSSION

Acne vulgaris is a common skin disease that affects young and old individuals and varies in types and severity. Acne vulgaris is treatable skin lesion. This study was conducted to review the useful effects of superficial chemical peels in treatment of active acne vulgaris. This study revealed that superficial chemical peels were

Table 1: Summary of literature search

Database	Key words	No. of abstract retrieved	No. of an article selected
PubMed	(1) Active acne vulgaris	219	-
	(2) Superficial chemical peels	65	4
	(1) e (2)	2	1
Google Scholar	(1) Active acne vulgaris	14.700	-
	(2) Superficial chemical peels	16.400	-
	(1) e (2)	1.170	2

Table 2: Study population with efficacy and adverse effects of chemical peels

Author	Population and acne Characteristics	Outcome of study	Tolerability
Kessler, et al., 2008 (13).	N= 20, American patients, (13-35) year, with Acne vulgaris mild to moderate inflamed pimple, two months duration study.	Both GA and SA peels were significantly effective by the second treatment and there were no significant differences in effectiveness between the two peels. SA peel showed sustained effectiveness two months post-treatment. More adverse events were reported with the GA peel.	Safety peeling for both GA and SA, mild complications increased after the first treatment and decreasing after the frequent treatments.
Hashimoto et al.,2008 (10).	N= 16, Japanese patients, (16-29) years with mostly severity acne, comedonal acne (less than (10) papules or pustules), Medications allowed, two and half months duration study.	Comedones are reduced to 75%. The mean total facial comedones count, was decreased from 39.3 at baseline to 9.2 after 10 weeks treatment by the time of completion of the study.	Mild burning sensation and erythema were noted in 8.8% of patients treated with SA.
Dainichi et al.,2008 (9).	N = 436, Japanese patient, (17–46) years, patients having comedonal acne, nodulo-cystic acne, concomitant acne and redness. Three months study period.	Comedones are significant improvement (greater than 75% clearance of lesions occurred). Scanning electron microscopy after 1 week treatment with 30% SA revealed a restoration of the regular grooves of the skin and removal of the cornified plugs from the hair follicles.	No complaints of pain, burning, or stinging and no signs of edema, bleeding, crusting, or post-inflammatory pigmentation.
Garg et al., 2009 (14).	N = 44, Indian patients, (16 –27) years, with acne vulgaris and post-acne scarring and hyperpigmentation. Treated for 24 week.	Both GA and SA peels decrease the comedones; SA had a higher efficacy for most active acne lesions (P<0.001) and hyperpigmentation (P<0.001). SA peels for comedones and papules showed a significant improvement 4 weeks earlier than GA.	Adverse effects were less common with SA (24% than GA with 40%. Also 17.3% patients developed a burning or stinging sensation. In treatment with GA peels 8.7% of the patients had visible desquamation. Dryness was seen more often with SA treatment (14.28%). Photosensitivity and initial acne flare were same among both GA and SA groups.
Dréno et al., 2011(15).	N = 397, pacientes com (30–40) anos com pele de fototipos (II–IV), e estudo com duração de 3 meses.	Inflammatory and retentional lesions were reduced in mild cases after three months. Both open and closed comedones decreased significantly during study period.	Adverse effects were infrequent with some patients complaint of irritation, tightening, pruritus, and 96.7% of the patients did not encounter any adverse effect.
Kim et al., 1999 (8)	N = 26, Korean patients; (16 – 27) years, mild-to-moderate severity; (III–IV) skin type; concomitant acne treatment; without acne treatment, study period for three months.	After the first treatment session, the severity of acne had not changed among most of the patients. But after the third session, 50 % of the patients treated with either GA or Jessner's solution showed improvement. No significant differences in treatment effects between the 2 methods.	More adverse effects seen by Jessner's solution as erythema and exfoliation form compared to GA ($p < 0.01$).
Atzori et al., 1999 (11).	N = 80, Italian patients (16 – 27) years, with comedonal acne, nodulo-cystic and papulo-pustular concomitant acne. Study period for 2 years.	Rapid improvement was observed in comedonic acne within three applications of GA. In the papulo-pustular significant improvement was achieved by the fourth application. Nodular-cystic forms required eight to ten applications.	A minimal inflammatory lesions developed in 20% of the patients. one patient had tenacious erythema.

safe and effective. Peeling outcomes is dependent on many factors such as patient condition, stage of acne, peeling agent and its concentration, preparation before operation and follow up after operation as well as the skillful level of aesthetician or dermatologist. [16] It is easy to achieve great chemical peel results without complications when appropriate pre-peel and post-peel consideration was contemplated.

Many chemical peels used in treatment of acne vulgaris like GA that is also used for the reduction of wrinkles. [15] Although a slight redness and swelling might be seen after treatment with GA and it's especially happens in black-skinned patients. [5,17] GA is an alpha-hydroxyl acid and works by removing the corneum stratum layer, scattering basal melanocytic layer and stimulating epidermolysis. [18] Treatment with GA is generally tolerated and patient compliance is excellent, although GA showed no poisonous effect and has a long time span it should be avoided in contact dermatitis, pregnancy and lactation. [18] Previous studies have indicated that GA peeling was affected by dose and duration of application with high concentration was more harmful on tissue than lower concentration. [19]

Table 3: Chemical peeling and post – peeling assessments

Estudo	Peeling agents and concentrations	Study design and post-peeling assessment
Kessler, et al., 2008 (13)	GA 30%, SA 30%	Double-blind, randomized controlled study, prospective, split-face. Quantitative and qualitative assessment was done based on the number of papules and pustules Clinical response was graded as: Good > 50% improvement. Satisfactory (21%–50%) Poor (10%–20%) No change Worsening
Hashimoto et al.,2008 (10)	SA 30%	Open-label trial, ten weeks study. Clinical response was assessed by both changes in severity and comedone count reduction rate.
Dainichi et al.,2008 (9)	SA 30 % - PEG	Open-label trial, non-specific peeling number, Assessments by a questionnaire on adverse effects and efficacy of the peeling, which was filled out by patients. The evaluation scores for each question were divided into five answer categories: Not at all: 0%. Little: 0% to 25%. Some: 25% to 50%. Quite a lot: 50% to 75%. Very much: 75% to 100%.
Garg et al., 2009 (14)	GA 35%, SA 20% –mandelic acid 10% peels	Open-label trial, comparative study. Pre- treatment assessments of acne lesion was done by Michaelson method, Post- treatment assessment of the response on a 5-point visual analog scale: Good > 60%. Satisfactory 31 – 60%. Poor < 30%. No change Worsening
Dréno et al., 2011(15)	RAL 0.1%, GA 6%	Open-label trial, Efficacy of treatment was assessed by counting inflammatory lesions (papules & pustules) and retentional lesions (open and closed comedones) on days 30 and 90 using a 5- grade rating scale: 0 = no improvement. 1 = mild improvement. 2 = moderate improvement. 3 = notable improvement. 4 = very notable improvement.
Kim et al., 1999 (8)	GA 70%, Jessner's solution	A randomized prospective clinical trial of split-face model therapy was done. Skin lesions were graded by using Cunliffe's acne grading system based on depth and width of acne lesions. 0.25: a few small inflamed lesions. 0.5: small inflammatory lesions over a wider area. 1.0: more intensely inflamed. 1.5: intensely inflamed lesions over a wider area. 2.0: deeper lesions but not nodular.
Atzori et al., 1999 (11)	GA 70%	Open-label trial, the procedure was well tolerated and patient compliance was excellent when asked to evaluate their skin. Assessments by patient opinion and clinical rating based on this scale: Mild improvement. Moderate improvement. Marked improvement. Worsening. 95% of the patients reported marked improvement, while the rest reported a moderate effect.

SA-PEG : Salicylic acid in polyethylene glycol, GA; Glycolic acid, RAL; Retinaldehyde, SA; Salicylic acid.

A study by Kim *et al.* confirmed that GA is superior to Jessner's solution in treatment active acne with less adverse events (erythema and exfoliation) compared with Jessner's solution ($p < 0.01$). [9] However, Garg *et al* found that GA had a lower efficacy than SA in treatment of active acne vulgaris ($P<0.001$) and hyperpigmentation ($P<0.001$) since GA don't have anti-inflammatory effects hence making it lower rank to SA in the treatment of acne lesions.[14] Another chemical peel used in treatment of acne vulgaris is SA which is a Beta-hydroxyl acid with both keratolytic properties and anti-inflammatory also could infiltrate simply to pilosebaceous layers and

is not toxic, self-neutralizing with minimal dermal infiltration. [20] Previous study showed that SA can be used for all stages of active acne due to its anti-inflammatory and comedolytic properties. [20] The adverse events of salicylic acid are minor and temporary like dryness and erythema. Salicylic acid toxicity (Salicylism) occurs when applied to large area due to systemic absorption of the acid and is usually associated with high concentrations. [20]

Other chemical peeling agent Trichloroacetic acid (TCA) is an inorganic complex that could be applied alone or in combination with other chemical agents. [21] In addition TCA causes epidermal necrosis and accelerate cellular growth. The TCA peeling endpoint is identified by a white frosted appearance on the skin, and then the process should be stopped at once. A lighter concentration of the peeling agent should be used in skin group type IV–VI. Frosting in these skin group types is not favored and may induce post-peel dyschromias and dark circle. [17] TCA is highly effective agent in the treatment of active acne and skin pigmentation and it is steady, easy to set up and effectively accessible. TCA has some disadvantages like post-inflammatory hypopigmentation and post-inflammatory hyperpigmentation, which might be observed more commonly in higher concentrations and in dark-skinned patients. [17,22]

In summary, acne vulgaris is a chronic, relapsing disease. It is important to have an option for patients who may require a more aggressive treatment option or when the patient cannot tolerate common acne medications. Previous studies confirmed that, superficial chemical peel therapy played important role in reduction of papules, pustules and comedones in active acne vulgaris. Although, it was associated with minor adverse events like erythema, edema and occurrence of post-inflammatory hyperpigmentation or hypopigmentation, but such complications are transient and can be successfully managed. As Handog *et al* stated "Compared to newer machine based technologies for acne and acne scars, chemical peeling is affordable and with minimal downtime, and can be performed in any dermatologist's office". [23]

After reviewing previous studies it could be concluded that the both GA (30 – 70 %) and SA (30 %) were effective in reducing inflammatory lesions of acne. Also GA is highly tolerated and safer in treatment of acne among darker skin patients and could be used in treatment of acne scars as well. Moreover SA peels is more convenient for treatment patients with hyperpigmentation or darker skin due to its whitening efficacy on the skin even SA peels for comedones and papules showed a significant improvement earlier than GA. ❑

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MAILING ADDRESS:
Hassanain Al-Talib
Jalan Hospital Sungai Buloh,
Faculty of Medicine-UniversitiTeknologi MARA (UiTM)
47000 Sungai Buloh, Selangor, Malaysia
Email: hassanainiy@yahoo.com

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