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Erbium YAG Laser Resurfacing versus Trichloroacetic Acid 35% Peeling in the Treatment of Atrophic Facial Acne Scars

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Abstract

***Background**: Various methods of skin resurfacing have been used for decades to correct the acne damaged skin. One of the familiar methods is chemical peeling. However, with the advances in the knowledge of laser, laser-resurfacing techniques became available. Compared to CO_2 laser and short- pulsed Erbium lasers, Long-pulsed Erbium: Yttrium Aluminium Garnet (Er:YAG) laser produces more heat in tissues, and larger zones of residual thermal damage, and so better collagen contraction and subsequent remodeling, thus improving skin scars.*

***Objective:** to compare the clinical response to long-pulsed Er:YAG laser 2940 nm versus trichloroacetic acid (TCA) 35% peeling in the treatment of different types of atrophic acne scars, and to correlate the pre-treatment clinical evaluation of acne scars with the therapeutic response.*

***Methods:** 20 patients with atrophic acne scarring were included and divided into 2 groups (10 patients each). Group I had long-pulsed Er: YAG laser treatment and group II had TCA 35% peeling treatment. Clinical evaluation using a standard improvement score and photographic documentation were performed at baseline and 3 months after the end of therapy. Postoperative recovery was monitored and the rate of complications recorded.*

***Results:** The overall improvement was equal in both groups (60%). However, the degree of improvement was better with Er:YAG laser than with TCA peeling. Nearly equal responses in ice pick scars were achieved in both groups (fair to good), while better response to Er:YAG laser was observed in rolling and shallow boxcar scars (good to excellent with laser compared to fair with peeling). Deep boxcar scars showed bad response to both modalities. In both groups, distensible acne scars showed better degree of improvement than non-distensible scars. Hyperpigmentation and acne flare were recorded in both groups, but prolonged erythema and hypertrophic scarring were seen only with Er:YAG resurfacing. In both groups, complications were more in patients with skin type IV than with type III.*

***Conclusion:** Each of long- pulsed Er: YAG laser and TCA 35% is relatively safe and effective modality in treatment of distensible icepick, rolling, and shallow boxcar atrophic acne scars. However, further studies on larger scale of patients are needed to confirm our results.*

Introduction

Acne vulgaris carries with it significant psychosocial morbidity, social withdrawal, and clinical depression, in addition to the potential for long term scarring and disfigurement[1].

Many systems were established for classification of acne scars so that the morphology of each scar can be assessed and treatment can be designed accordingly. Jacob et al.[2] divided atrophic acne scars into: icepick scars, rolling scars, and boxcar scars. Kadunc and Trindade de Almeida[3] classified acne scars into elevated, dystrophic, and depressed scars. Depressed or atrophic scars are contour or volume defects that may be distensible or non distensible, depending on underlying attachment.

Various methods of skin resurfacing have been used for decades to correct the acne damaged skin. One of the familiar methods is chemical peeling[4]. Trichloroacetic acid (TCA) emerged as the leading agent for chemical peeling, because of the ability of the peeler to design specifically the depth of acid penetration according to the nature of the skin and type of the problem[5].

With the advances in the knowledge of laser, laser-resurfacing techniques became available. Kaufman and Hibst[6] were the first investigators to report the use of Erbium: yttrium-aluminum-garnet (Er: YAG) laser for skin resurfacing. Er: YAG laser is absorbed by water, as its wavelength is 2940nm i.e. in the infrared spectrum. It leads to true tissue ablation of the dermis and the epidermis without coagulation of the blood vessels[7,8,9].

Long-pulsed Erbium lasers (with pulse durations up to 500 μs) have been developed to increase the amount of collagen shrinkage, and to decrease the amount of intra-operative bleeding. Compared to CO_2 laser and short- pulsed Erbium lasers, longer pulse lasers produce more heat in the tissues, and larger zones of residual thermal damage, and so better collagen contraction and subsequent remodeling. Because of the efficient hemostasis, it can be used at greater depths for more improvement in the scars[10].

The aim of this study was to compare the clinical response to long-pulsed Er: YAG laser 2940 nm versus TCA 35% peeling in the treatment of different types of atrophic acne scars, and to correlate the clinical evaluation of acne scars with the therapeutic response.

Patients and Methods

Patients

The study included 20 patients with atrophic facial acne scars, attending at the Dermatology Outpatient Clinic of Ain Shams University Hospitals, in the period between January and December 2007. The patients were divided into 2 groups of 10 patients; group I: for whom single session of Long-pulsed Er: YAG laser was performed, and group II: who had TCA 35% chemical peeling sessions at biweekly intervals, for a maximum of 10 sessions.

Methods

Full medical history was taken with emphasis on: type and duration of acne, present activity of acne, previous and present medications for treatment of acne, as well as medications that could aggravate the inflammatory process of acne (e.g. corticosteroids, anabolic steroids, anti-tuberculous medications) and other relevant medications (e.g. oral contraceptive pills and isotretinoin), relevant medical conditions (e.g. herpes simplex infection, photosensitivity, allergy, keloids, hypertrophic scarring, post-inflammatory hyper-pigmentation), and relevant surgical history including: dermabrasion, laser surgery, or filler injection.

A thorough dermatological examination was performed to each patient including: evaluation for the presence of active acne lesions, evaluation for the presence of post-inflammatory hyper-pigmentation, hypertrophic scars, keloids, or active herpetic lesions, and evaluation of acne scarring as regards type, size, depth, distensibility, and distribution.

Exclusion criteria included patients with history of any resurfacing or peeling procedure within the last year, isotretinoin therapy within 2 years before

the study, ongoing oral contraceptive pills, dermabrasion, or filler injections within 3 years before the study, patients with keloidal tendency, active acne lesions, active herpes simplex, or inflammation in the treatment areas, and patients with photosensitive dermatoses, photoactive medication, haemorrhagic diasthesis, severe systemic disease, or relevant medications.

Before the treatment procedure, all patients were instructed to avoid sun exposure and to apply sunscreen with SPF>15, topical tretinoin cream, hydroquinone 4%, and hydrocortisone 0.5-1% once daily for 2 weeks preoperatively.

Er:YAG laser

For group I patients, intravenous Traval® 5mg/kg, and Fentanyl® 1 μg/kg were injected, to eliminate any pain during the procedure. Patients were treated with a 3.5 mm spot sized hand piece. Three passes of laser were fired, without laser overlap. The partially desiccated skin was removed with saline soaked gauze between each laser pass. The first 2 passes with a fluency of 6.5 J/cm^2 were applied to the whole face perpendicular to each other (longitudinal then horizontal). The third pass was applied to the shoulders of the scars only, with a fluency of 10 or 13 J/cm^2. The pulse duration was 1ms.

After laser treatment, Sufratulle dressings over the whole face were applied and covered with tubogrid to stay in place for the first 48 hrs. Then the patients were instructed to perform gentle facial rinses with saline (over the dressings) every 2 hours for the next 5-7 days and apply local antibiotic cream such as Fusidic acid 2% cream, and β-sitosterol 0.25% ointment 3 times daily for 2 weeks.

Oral prophylaxis consisted of Acyclovir 200-400 mg twice daily for one day before, and 5 days after the procedure in those patients with history of recurrent herpes simplex. In addition, broad-spectrum antibiotic was given for one day before, and 5 days after the treatment. For itching, oral antihistaminics were prescribed. Oral Paracetamol was advised to decrease the pain.

Two weeks after laser treatment, 0.025% tretinoin, 4% hydroquinone, and sunscreens with SPF> 30 were recommended for 4 to 6 weeks. The patients were allowed to apply camouflage make-up after 2 weeks postoperatively.

TCA 35% chemical peeling

For group II patients, the skin was washed with soap and water immediately before peeling, followed by adequate rinsing with water to remove any soap residue. Using gloved hand, the skin was carefully cleansed with 70% alcohol- and acetone-soaked gauze to degrease the skin. Two by two inch gauze sponges were soaked in the TCA 35% and wrung out to avoid a splashing effect. After closure of the eyes, the acid was then applied evenly in rapid, regular strokes (2 to 4 strokes per site), from site to site (forehead, 2cheeks, chin, and nose) moving from the least sensitive to the most sensitive areas. The emergence of white frosting in the already-treated sites was monitored closely including: the level of frosting, the time elapsed for it to appear, and re-blanching. Areas, showing insignificant frosting, were recoated and special attention was drawn to the pain and erythema.

Immediately after frosting, post peel washing of the skin with water was done to minimize pain and erythema. A steroid-antibiotic ointment twice daily was applied, for the entire first week. After scale formation, discontinuation of the ointments was done, to prevent its detachment. The patients were instructed to wash the face with soap and water starting from the second day, and to avoid irritating soaps and skin picking. The patients were also instructed to avoid sun exposure and to use sunscreens with SPF>15 regularly**.**

Clinical evaluation

Photographic documentation was done at baseline before treatment and every 2 weeks till 3 months after the end of the treatment, under identi-

cal camera settings, lighting, and patient positioning, using a Sony DSC-W30 digital camera.

Clinical improvement scores were categorized as follows: complete resolution (100%) was judged to have occurred when the acne scar was no longer present, no or poor response (score 1) was judged to have occurred if there is less than 25% decrease in the size of the scar. Partial response was estimated as fair, good, or excellent according to the percentage of reduction of the scar as follows: score of 2 or fair response with 26% to 50% reduction of scar, score of 3 or good response with 51% to 75% reduction of scar, and score of 4 or excellent response with 76% or more improvement (Table 1).

Patients were also evaluated for the occurrence of complications.

Statistical analysis

Statistical analysis of the results was done using SPSS V 13 program. For comparison between 2 variables, Pearson chi-square test was done, for comparison between more than 2 variables, Fisher test and Mann-Whitney test were done, and for correlation, Student t-test (unpaired) was done. Results were considered significant when P-value was <0.05, and highly significant when P-value <0.01.

Results

Our study patients were 12 males (60%) and 8 females (40%), and their ages ranged between 18-32 years with mean age 26.1± SD 5.3. Their skin photo-types according to Fitzpatrick skin phototyping (11) were: type III for 6 patients (30%), and type IV for 14 patients (70%). Nineteen patients (95%) had combined types of atrophic acne scars, while 1 patient (5%) had only single type (rolling scars). The atrophic scars included: ice-pick scars, rolling scars, and boxcar scars. The acne scars were distributed over cheeks, forehead and chin in 8 patients (40%), over both cheeks and forehead in 4 patients (20%), and over both cheeks only in 8 patients (40%). Fourteen patients (70%) had non-distensible scars, while 6 (30%) had distensible scars. The clinical data of the patients is summarized in Table (2).

In the ten patients treated with Er: YAG laser (group I): the overall fair to excellent improvement occurred in 6 patients (60%). The improvement was excellent in 2 patients (20%) (Fig. 1), good in 2 patients (20%) (Fig. 2), fair in 2 patients (20%), and poor in 4 patients (40%). The excellent results were in those with distensible rolling scars, while the poor results were in those with non-distensible deep boxcar scars.

As regards complications, prolonged erythema was experienced in 6 patients (60%). In 4 of them the erythema lasted more than 8 weeks, and in the other two it lasted more than 12 weeks then resolved. Hyper-pigmentation occurred in 2 patients (20%) and resolved spontaneously after an average of 10-12 weeks. Recurrence of acne occurred in 4 patients (40%), 4 weeks post-treatment. Hypertrophic scarring occurred in 2 patients (20%) on the chin of one patient, and on the lower cheeks of the other, 6 weeks post-treatment. No other adverse effects occurred such as: infections (viral, bacterial, or fungal), contact dermatitis, delayed wound healing, or milia formation.

In the ten patients treated with TCA 35% (group II): the overall fair to excellent improvement occurred in 6 patients (60%) and was graded as fair (score 2) in all of them (Figs. 3 and 4), while the response was poor in 4 patients (40%) (score 1).

The number of peeling sessions ranged from 4 to 10 sessions. Four sessions were done to 4 patients (40%), seven sessions were done to 4 patients (40%) and 10 sessions were done to 2 patients (20%). Patients who did not complete the 10-sessions regimen stopped the sessions (although completed follow up) due to the drawbacks of the procedure on their social and professional activities during the post-peel period.

Complications occurred in 8 patients (80%). Recurrence of acne occurred in 6 patients (60%). Post-inflammatory hyper-pigmentation occurred in 6 patients (60%), mostly because of incompliance to avoidance of sun exposure. It occurred 1 month

after the beginning of sessions and resolved after 6-8 weeks. No other complications occurred such as: scarring, prolonged erythema, infections (viral, bacterial, or fungal), delayed healing, contact dermatitis or milia formation.

The overall improvement (irrespective to the degree) was equal in both groups, however, the degree of improvement was better in group I with a statistically significant difference (P value = 0.05) (Table 3).

Nearly equal responses in ice pick scars were achieved in both groups (fair to good), while better response to Er:YAG laser was observed in rolling and shallow boxcar scars (good to excellent with laser compared to fair with peeling). Deep boxcar scars showed bad response to both modalities. However, differences were not statistically significant (Table 4).

Distensible acne scars (mainly rolling and shallow boxcar scars) showed better degree of improvement in both groups and the results showed a statistically highly significant difference (P value = 0.005).

As regards complications, the occurrence of delayed erythema and hypertrophic scarring were recorded only in group I, whereas, acne flare and hyper-pigmentation were recorded in both groups but more in group II, without a statistically significant difference. However, in both groups, complications were more frequent in patients with skin type IV than with type III, with a statistically significant difference as regards acne flare and hyper-pigmentation [P value = 0.007 (highly significant), and 0.03 (significant) respectively] (Table 5 and Fig. 5).

Table 1. Improvement scores of acne scars after therapy

Improvement scores	Degrees of improvement	Percentage of improvement
1	Poor	25 or less
2	Fair	26-50
3	Good	51-75
4	Excellent	76 or more

Table 2. Clinical data of the patients.

Group	Patient number	Sex	Age	Skin type	Scar type	Distensibility	Distribution
Group I	1	Male	28	III	Icepick + rolling	Non-distensible	Cheeks+ forehead
	2	Male	30	IV	Icepick + rolling	Non-distensible	Cheeks + forehead + chin
	3	Female	31	III	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin
	4	Female	18	IV	Rolling	Distensible	Cheeks
	5	Male	28	III	Icepick + rolling	Distensible	Cheeks
	6	Male	28	III	Icepick + rolling	Non-distensible	Cheeks + forehead
	7	Female	30	III	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin
	8	Male	30	IV	Icepick + rolling	Non-distensible	Cheeks + forehead + chin
	9	Male	28	III	Icepick + rolling	Distensible	Cheeks
	10	Female	18	IV	Rolling + shallow boxcar	Distensible	Cheeks
Group II	1	Male	18	IV	Icepick + rolling	Non-distensible	Cheeks
	2	Male	20	IV	Icepick + deep boxcar	Non-distensible	Cheeks + forehead
	3	Female	27	IV	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin
	4	Female	32	IV	Icepick + shallow boxcar	Distensible	Cheeks
	5	Male	29	IV	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin
	7	Male	18	IV	Icepick + deep boxcar	Non-distensible	Cheeks
	8	Female	32	IV	Icepick + shallow boxcar	Distensible	Cheeks
	9	Male	29	IV	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin
	10	Female	26	IV	Icepick + deep boxcar	Non-distensible	Cheeks + forehead + chin

Table 3. Comparison between both groups as regards the improvement score

Groups		**Improvement degree**				
		Poor	**Fair**	**Good**	**Excellent**	**Total**
Group I	N	4	2	2	2	10
	%	40	20	20	20	100
Group II	N	4	6	0	0	10
	%	40	60	0	0	100
Chi-square	X^2	7.638				
	P-value	0.05*				
	* statistically significant					

A B

Fig. 1. Combined rolling and icepick scars. A: Before Er:YAG laser. B: Marked improvement after 3 months (score 4).

A B

Fig. 2. *Combined icepick and rolling scars. A: Before Er: YAG laser. B: Moderate improvement after 3 months (score 3).*

A B

Fig. 3. *Combined icepick and deep boxcar scars. A: Before TCA 35%. B: Fair improvement after 10 sessions (score 2).*

A B

Fig. 4. Combined ice pick and deep boxcar scars. A: Before TCA 35%. B: Fair improvement after 4 sessions (score 2).

Table 4. Comparison between both groups as regards the improvement of each scar type

Acne scar type		Poor N	Fair N	Good N	Excellent N	Total N (%)	Mean rank	Mann-Whitney test (P-value)
Ice Pick	**Group I**	4	2	2	0	8 (80%)	5.13	0.893
	Group II	4	6	0	0	10 (100%)	4.90	
Rolling	**Group I**	0	2	4	2	8 (80%)	3.25	0.468
	Group II	0	1	0	0	1 (10%)	2.00	
Shallow boxcar	**Group I**	0	0	1	0	1 (10%)	2.00	1.00
	Group II	0	2	0	0	2 (20%)	1.00	
Deep boxcar	**Group I**	2	0	0	0	2 (20%)	2.50	1.00
	Group II	7	0	0	0	7 (70%)	2.50	

Table 5. Comparison between the Fitzpatrick skin types (III and IV) as regards the occurrence of complications.

Complications		Fitzpatrick skin type			Chi-square		
		III	IV	Total	X^2	P-value	
Erythema	N	1	2	3	3.750	0.153	NS
	%	10	20	30			
Acne flare	N	1	4	5	10.000	0.007*	S
	%	10	40	50			
Hyper-pigmentation	N	0	4	4	4.727	0.03*	S
	%	0	40	40			
Scarring	N	0	1	1	0.972	0.615	NS
	%	0	10	10			

NS: Non-significant, S: Significant, *=P<0.05, HS: Highly significant, **=P<0.01.

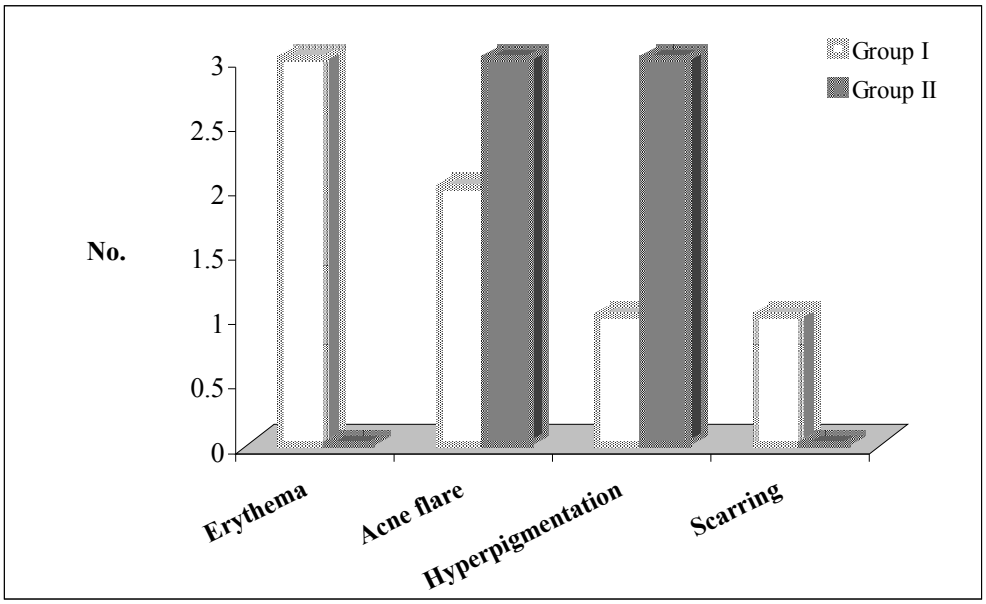

Fig. 5. The relation between the skin type (III and IV) and occurrence of complications.

Discussion

Atrophic scars are the most common complication of acne, constituting a persistent, disfiguring problem. Various therapeutic modalities have been used with various results for the treatment of post-acne scars, including invasive techniques such as dermabrasion, surgical excision, punch grafting, punch elevation, subcision and laser skin resurfacing, and non-invasive techniques such as: topical tretinoins, peeling and skin fillers[10].

Therapeutic improvement in our patients after resurfacing with long-pulsed Er: YAG laser, was seen in 6 patients (60%), with remarkable results in rolling, ice pick, and shallow boxcar scars, while deep boxcar scars showed bad response. Woo et al.[12] used the short-pulsed Er: YAG laser and showed similar good results with the ice pick and shallow boxcar scars and bad results with the deep boxcar scars. On the other hand, they had not experienced good results with the rolling scars.

In laser resurfacing, the duration of erythema is proportional to the depth of thermal damage. As Er: YAG laser has narrow zone of thermal damage, decreased extent and duration of erythema is usually observed[13]. In our study, erythema appeared in all patients. It lasted 3 weeks in 4 patients (40%) but then gradually reduced. In the other 6 patients (60%), the post- treatment erythema was prolonged more than 2 months. In agreement with our results, Jeong et al.[14] experienced prolonged erythema in 50% of their patients, in spite of avoidance of deep resurfacing. They attributed that to a multiplicity of factors such as: patient's tendency, postoperative trauma to the resurfaced area, or irritant dermatitis.

Hyper-pigmentation occurred in two patients (20%) and resolved spontaneously after 2.5 months. Tanzi & Alster[15] reported the occurrence of hyper-pigmentation in 12/25 patients (45%), treated by dual-mode 2940 nm Er:YAG laser for moderate to severe atrophic facial scars. They referred this high percentage not only to the dark skin types they studied, but also to the absence of a pre-treatment regimen. On the other hand, a pretreatment regimen was applied in our study for 2 weeks prior to laser therapy. Lowe et al. stated that hyper-pigmentation is the most common complication, especially when progressing from photo-types III to V[16].

In the group treated by Er: YAG laser, recurrence of acne occurred in 4 patients (40%), one month post-treatment, and then resolved with treatment. Similarly, Tanzi & Alster[15] reported that 8 patients (32%) experienced acne recurrence, during the first postoperative week. They attributed the early occurrence of this complication to the use of occlusive dressings.

The greatest risk for developing hypertrophic scars occurs when the wound extends into the reticular dermis, but it can occasionally occur in 10% of cases treated with Er: YAG laser resurfacing[7]. In our study, hypertrophic scarring occurred in 2 patients (20%) on the chin of one patient, and lower cheeks of the other, 6 weeks post-laser treatment. Hypertrophic scars can develop anywhere, but they are most likely to be seen on the lips, chin, inferior mandibular margin, and the bony prominences of the malars and forehead region. Therefore, it may be recommended to use laser test spots prior to the resurfacing to evaluate the patient's healing response[17].

In patients treated with TCA 35% (group II), improvement increased with increasing the number of sessions (4 sessions were done as minimum). Similarly, Lee et al.[18] found that the degree of clinical improvement was proportional to the number of courses. Also, Al-Waiz and Al-Sharqi[19] attributed the increased improvement with TCA 35% with increasing the number of sessions, to the deeper penetration of TCA, because the skin had not returned to the pre-peel thickness in the short interval between the sessions. Thus, the shallower the scar is, the earlier is the improvement.

In our study, hyper-pigmentation occurred in 6 patients (60%), 1 month after peeling, and resolved after 6-8 weeks. Coleman & Brody[20] stated in their study that complications, especially the pigmentary ones, were less in the fair colored skin and intense in the dark colored skin.

The acne recurrence in group II occurred in 6 patients (60%). Monheit[21] experienced acne eruptions and folliculitis in 7 of his patients (30%) after TCA peeling, and attributed that to the emollient creams used during the healing phase of treatment.

Comparison between both groups revealed that the overall improvement (i.e. irrespective to the degree) was equal in both groups (60%). However, the degree of improvement was better in the laser group (group I) than the TCA group (group II), with a statistically significant difference (P-value = 0.05) (Table 3).

Nearly equal responses in ice pick scars were achieved in both groups (fair to good), while better response to Er:YAG laser was observed in rolling and shallow boxcar scars (good to excellent with laser compared to fair with peeling). Deep boxcar scars showed bad response to both modalities (Table 4).

Distensible acne scars (mainly rolling and shallow boxcar scars) showed better degree of improvement in both groups and the results showed a statistically highly significant difference (P-value <0.01).

Koo et al.[22] applied different resurfacing methods using variable pulsed and long pulsed Er: YAG lasers on 70 patients, according to the depth and pattern of the scars, and compared that with conventional peeling methods on other 70 patients. For mild depressed scars, they applied even depth resurfacing and for moderate-depth acne scars, they used the shoulder technique. They stated that laser resurfacing was more effective and safer than conventional peeling methods. This is due to its precision with depth control and variable methods of application[22].

Taken all together, we realize that each of long-pulsed Er: YAG laser and TCA 35% is relatively safe and effective modality in treatment of atrophic acne scars. TCA 35% is cheaper, more feasible, and can be done in the outpatient clinic with no necessary analgesia or anaesthesia, but Er: YAG laser is expensive, and needs hospitalization with necessary anaesthesia. On the other hand, multiple sessions are needed with TCA 35% peeling for proper improvement and satisfaction, with 2 weeks interval inbetween the sessions, which needs a very compliant patient and discipline to the time of visits and follow up. However, Er: YAG laser sessions should be spaced every 3-6 months. Thus, care must be drawn to the patient's needs and lifestyle as well.

In conclusion, improvement of the atrophic acne scarring depends on its nature, size, depth, distensibility, and exact modality of treatment. Ice pick scars give the same response with either Er: YAG laser and TCA 35%, rolling and shallow boxcar scars give better response with the Er: YAG laser, and deep boxcar scars give bad results with both. Moreover, distensibility of acne scars is an important factor in determining the response to treatment. However, further studies on larger scale of patients are needed to confirm our results.

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الاربيم ياج ليزر مقارنة بحمض ثلاثي كلور الاستيات 35%
في علاج ندبات العد الوجهية الضامرة

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هناك العديد من الطرق العلاجية التي تستخدم منذ عقود لإعادة تسطيح الجلد المدمر بالعد ومنها التقشير الكيميائي والاربيم ياج ليزر طويل النبضة.

وتهدف هذه الدراسة إلى المقارنة بين الاستجابة الاكلينكية لكل من الاربيم ياج ليزر طويل النبضة 2940 نانومتر والتقشير الكيميائي باستخدام حمض ثلاثي كلور الاستيات 35% في ندبات العد الضامرة.

وقد وجد أن استجابة الندبات المنقرة لكلا العلاجين تقريباً متساوية في حين أن الندبات المموجة والمربعة السطحية أظهرت استجابة أفضل لليزر، أما عن الندبات المربعة العميقة فقد كانت استجابتها ضعيفة لكلا العلاجين، وفى كل أنوع الندبات كانت النتائج أفضل في الندبات القابلة للاستطالة.

ومن هذا نستنتج أن كلاً من الاربيم ياج ليزر طويل النبضة والتقشير الكيميائي بحمض ثلاثي كلور الاستيتات 35% يعد نوعاً ما أمناً وفعالاً في علاج ندبات العد المنقرة والمموجة والمربعة السطحية و بخاصة القابلة للاستطالة منها .