WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 4, 225-232. Research Article ISSN 2277– 7105

COMPARATIVE STUDY BETWEEN CARBON DIOXIDE FRACTIONAL LASER AND CHEMICAL RECONSTRUCTION OF SKIN SCARS TECHNIQUE WITH 100% TRICHOLOROACETIC ACID IN THE TREATMENT OF ATROPHIC ACNE SCARS

[1]*Rony Ibrahim Mohamed, [2]Emad El Din El Gamal and [3]Hany Othman Abo Al-Wafa

Dermatology, Venereology and Andrology Department, Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

Article Received on
23 Jan. 2019,
Revised on 12 Feb. 2019,
Accepted on 04 March 2019
DOI: 10.20959/wjpr20194-14063

***Corresponding Author**
Dr. Rony Ibrahim Mohamed
Dermatology, Venereology and Andrology Department, Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

ABSTRACT

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous units, it is primarily seen in adolescents. Its onset coincides with the period of puberty and may add to the psychological challenges experienced during this period. Acne scars are a common complication of acne. They can be classified into atrophic and hypertrophic. The atrophic includes ice-picks, boxcar and rolling scars. Different treatment modalities have been used to treat them such as laser resurfacing, skin needling and chemical peeling. This study compares between CO2 fractional laser and Chemical reconstruction of skin scars technique (CROSS) with 100% trichloroacetic acid in the treatment of atrophic scars. This study enrolled 40 patients with atrophic scars of different types and severities. The patients were 28 females and 12 males. Their age ranged between 18-35 years old. They were subdivided into 2 groups each of 20 patients, Group A were treated by Carbon dioxide fractional laser while B were treated by CROSS technique. Each patient was subjected to 4 sessions at 4 weeks intervals. Patients' results were assessed using digital photographs, qualitative global scarring grading system and patient's satisfaction. Improvement of the scars was observed in 70.0% of Group A, while 85.0% of Group B were improved. 65.0% of Group A were satisfied while 85.0% of Group B were satisfied. The 2 modalities used in this study represent effective and safe treatment options for atrophic acne scars with no statistically significant difference between them.

KEYWORDS: Acne scars, atrophic, puberty, dermatology, CO2 laser, CROSS.

MATERIALS AND METHODS

This study enrolled 40 patients with atrophic acne scars of different durations, types and severities. Their age ranged between 18 and 35 years old. They were subdivided into 2 groups each of 20 patients (A and B), A were treated by Carbon dioxide fractional laser while B were treated by CROSS technique.

History taking and examination of patients were performed

- History taking: it included age, sex, marital status, onset, course and duration of scars, previous acne and acne scars treatment and post treatment complications such as hyperpigmentation.
- Dermatologic examination: to assess the skin type, the scar type (ice pick, boxcar and rolling) and the scar severity according to the qualitative acne global scarring grading system which was performed to each patient.

Methods

Group A

Local anaesthetic cream was applied to the face for approximately 30-45 minutes before the procedure. After sterilization of the face by alcohol, the procedure started by focusing the fractional Co2 laser on the scars.

Group B

The skin was first cleaned and degreased with alcohol. Patients were treated by 100% TCA applied focally on the scars by a cotton-tipped wooden applicator until frosting occurred (usually within 10 seconds).

Assessment of patients

Each patient was subjected to 4 sessions at 4 weeks intervals. Before treatment informed consent was obtained from all the patients. Patients' results were assessed using digital photographs taken at baseline, at each session and 4 weeks after the last session, also using qualitative global scarring grading system (Fig.1) and patient's satisfaction. Clinical improvement in texture, atrophy and overall satisfaction was graded on a quartile scale (poor = <25% improvement, good = 25-49% improvement, very good= 50-74% improvement, excellent = ≥ 75% improvement) using both subjective and objective assessment.

Grade	Level of disease	Clinical features
1	Macular	These scars can be erythematous, hyper- or hypopigmented flat marks. They do not represent a problem of contour like other scar grades but of colour
2	Mild	Mild atrophy or hypertrophic scars that may not be obvious at social distances of 50cm or greater and may be covered adequately by makeup or the normal shadow of shaved beard hair in men or normal body hair if extrafacial
3	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial, but is still able to be flattened by manual stretching of the skin (if atrophic)
4	Severe	Severe atrophic or hypertrophic scarring that is evident at social distances greater than 50cm and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial and is not able to be flattened by manual stretching of the skin

Figure (1): Qualitative global scarring grading system.

RESULTS

The skin type included in this study was skin type II and III. Group A had 12 patients with skin type III (60.0%) and 8 patients with skin type II (40.0%) while Group B had 12 patients with type II (60.0%) and 8 patients with type III (40.0%). However, this was statistically not significant (p=0.206).

Patients were classified according to the type of scars, duration and severity of scars. More than two thirds of Group A had ice-pick scars represented by (65.0%), boxcar scars (20.0%) and rolling scars (15.0%). 40.0% of the patients of Group A had their scars from 7 to less than 10 years while only 10.0% had their scars for 10 years or more. More than two thirds of them had grade IV scars while only 15.0% had grade III scars. On the other hand, more than two thirds of Group B had ice-pick scars represented by (65.0%), rolling scars (30.0%) and boxcar scars (5.0%). Half of the patients (50.0%) had their scars from 2 to less than 5 years while only 5.0% had their scars for 10 years or more. 60.0% of the patients had grade IV scars while only 15.0% had grade III scars which was nearly similar to Group A.

Table (1): Types, duration and severity of the scars.

Scar	Group A (n=20)		Group B (n=20)		X^2	^{MC}p
	No.	%	No.	%		
Type						
Ice pick	13	65.0	13	65.0	2.625	0.259
Rolling	3	15.0	6	30.0		
Boxcar	4	20.0	1	5.0		
Duration (years)						
Less than 1 year	0	0.0	0	0.0	3.982	0.284
From 1 to less than 2 years	0	0.0	0	0.0		
from 2 to less than 5 years	6	30.0	10	50.0		
from 5 to less than 7 years	4	20.0	6	30.0		
from 7 to less than 10 years	8	40.0	3	15.0		
10 years or more	2	10.0	1	5.0		
Severity						
Grade I	0	0.0	0	0.0	0.284	1.000
Grade II	4	20.0	5	25.0		
Grade III	3	15.0	3	15.0		
Grade IV	13	65.0	12	60.0		

Regarding patients' satisfaction, more than two thirds of Group A were satisfied representing 65.0% while 85.0% of Group B were satisfied. Group A reported excellent improvement in 30.0%, very good improvement in 10.0% and good improvement in 25.0%, while Group B reported excellent improvement in 20.0%, very good improvement in 30.0% and good improvement in 35.0%. However, the results were not statistically significant (p=0.144) between the 2 groups which shows that both treatments were satisfactory.

Table (2): Patient satisfaction.

Patient satisfaction	Group A (n=20)		Group B (n=20)		X^2	P
	No.	%	No.	%		
Unsatisfactory	**7**	**35.0**	**3**	**15.0**		
Poor	7	35.0	3	15.0	2.133	0.144
Satisfactory	**13**	**65.0**	**17**	**85.0**		
Good	5	25.0	7	35.0		
Very good	2	10.0	6	30.0		
Excellent	6	30.0	4	20.0		

Regarding objective improvement of the scars, more than two thirds of the patients of Group A were improved representing 70.0%, while 85.0% of Group B were improved. Group A reported excellent improvement in 25.0%, very good in 10.0% and good in 35.0%. On the other hand, Group B reported excellent improvement in 15.0%, very good in 35.0% and good

in 35.0%. although both treatments reported improvement, there was no statistically significant difference between them.

Table (3): Objective improvement of the scars.

	Group A (n=20)		Group B (n=20)		X^2	^{MC}p
	No.	%	No.	%		
Improvement						
Poor	6	30.0	3	15.0	4.159	0.238
Good	7	35.0	7	35.0		
Very good	2	10.0	7	35.0		
Excellent	2	25.0	3	15.0		

More than two thirds of Group A representing 70.0% didn't report any side effects. On the other hand, more than two thirds of Group B reported side effects. The common side effects in Group B were moderate pain and hyperpigmentation representing 25.0% and 20.0%. however, the result was statistically significant between the 2 groups which showed that TCA treatment resulted in more side effects than Co2 Fractional laser (p=0.027).

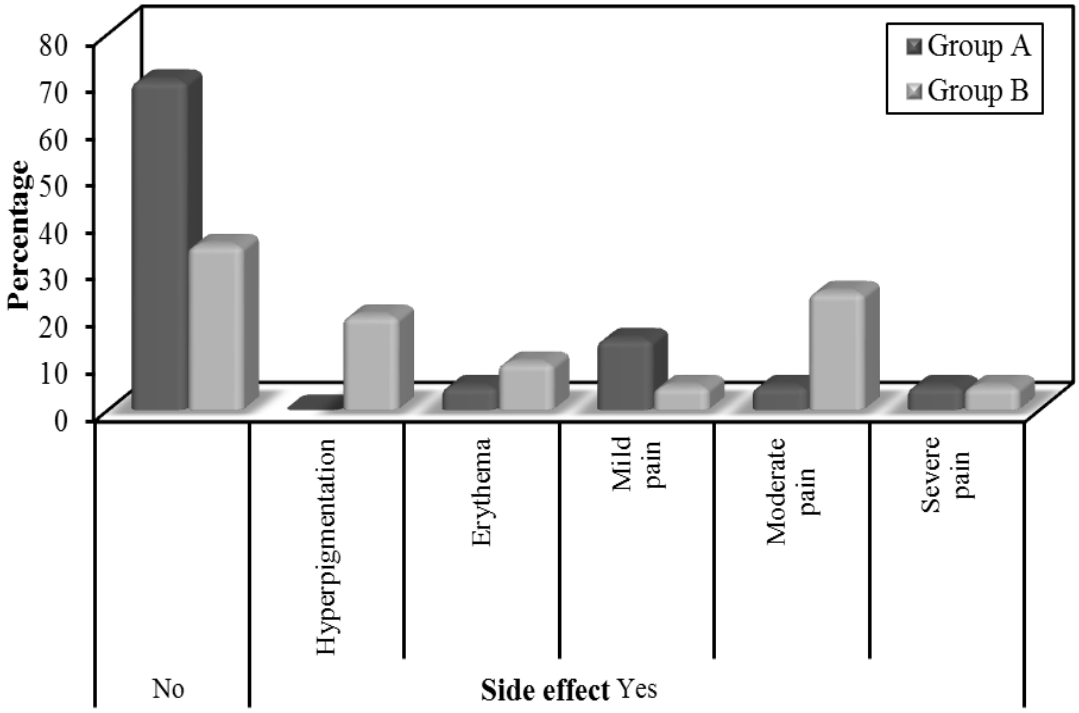

Figure (2): Side effects.

Grade IV patients in Group A were representing more than two thirds of the sample (65.0%) pre-treatment while post-treatment they represented only 25.0%.

On the other hand, grade IV patients in Group B were represented by 60.0% pre-treatment, while post-treatment were represented by 25.0% only. However, the result was statistically significant in both groups, which shows great improvement in both types of treatment. Although Group A showed better results and improvement than Group B, there is no statistically significant difference between both groups.

Table (4): Pre-treatment versus Post-treatment.

Scar severity	Group A (n=20)		Group B (n=20)		X^2	^{MC}p
	No.	%	No.	%		
Pre-treatment						
Grade I	0	0.0	0	0.0	0.284	1.000
Grade II	4	20.0	5	25.0		
Grade III	3	15.0	3	15.0		
Grade IV	13	65.0	12	60.0		
Post-treatment						
Grade I	4	20.0	4	20.0	0.198	1.000
Grade II	4	20.0	4	20.0		
Grade III	7	35.0	7	35.0		
Grade IV	5	25.0	5	25.0		
p_1	<0.001*		0.048*			

*P<0.05= significant.

DISCUSSION

Regarding the patients' satisfaction, in the present study patients treated by fractional laser showed 65.0% satisfaction, this was consistent with another study conducted by Manuskiatti et al[1] which showed 62.0% satisfaction. On the other hand, a study conducted by Cho et al[2] reported a satisfaction of 85.0% which is higher than the present study. This difference may be attributed to the difference in skin type it was carried out on Asians, also may be due to the laser mode used as it was mentioned in that study that 2 different modes of laser were used.

While regarding satisfaction from CROSS technique, in a study by Kim et al[3], 90.0% of the patients were satisfied by the results which is nearly similar to our study (85.0%). On the other hand, all patients were satisfied using CROSS technique in a study conducted in India[4], this difference may be attributed to the difference in skin type and priming of the skin as these patients were primed by tretinoin 0.025% cream 2 weeks before the treatment, which might help in the improvement.

Regarding the side effects, Group A who were treated by fractional laser, more than two thirds of them didn't report any side effects and only 30.0% of them reported side effects

which were erythema and pain. Similarly, in a study conducted by Seung et al[5], same side effects were reported. On the other hand, in another study conducted in 2009[6], erythema, pain and post inflammatory hyperpigmentation were reported as side effects.

Regarding CROSS technique in the present study, more than two thirds of Group B reported side effects. The side effects in Group B were pain, erythema and hyperpigmentation. This was consistent with another study conducted in 2009[3] in which pain and erythema were reported. Similarly, in another study conducted in Egypt[7] pain and hyperpigmentation were reported as side effects. On the other hand, in another study conducted in India[4] erythema was the only side effect reported. This difference may be attributed to the difference in skin type.

In patients of Group B treated by CROSS technique in the current study, 12 patients were grade 4 pre-treatment, post treatment 7 of them improved to grade 1, 2 and 3 which is reported as 58.3% improvement. Similarly, in a study conducted by Nofal et al[7] 12 patients pre-treatment were grade 4, 8 of them improved to grade 2 and 3.

CONCLUSION

Based on the current study:

- Using a CO2 laser represents a new treatment paradigm by offering the ability to ablate and resurface deep dermal tissue targets, without significant risk for adverse sequelae.
- CO2 laser was proved to be effective among all grades of scars.
- CROSS technique with 100% TCA is a safe, cost effective, minimally invasive technique, with good efficacy for the cosmetic management of acne scars.
- The 2 modalities used in this study represent comparable effective and safe treatment options for atrophic acne scars with no statistically significant difference between them.
- CROSS technique is more suitable for patients who cannot tolerate pain, patients with fair skin, and patients with deep scars that cannot be fully reached with fractional laser. In addition, it is less invasive and more economic modality especially in developing countries.
- Assessment of the acne scar type, skin phototype, history of hyperpigmentation or scarring, pain tolerance, and appropriate downtime is critical to allow picking up the most appropriate modality.

ACKNOWLEDGMENT

I would like to express my deepest gratitude to the great team work who have always been an inspiration to me and they helped me a lot, without them this work would have never been accomplished. I am also greatly indebted to the patients who participated in this study for their understanding, cooperation, trust in me and patience through all the sessions.

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