Original Article

Efficacy of Fractional CO_2 Laser in Treatment of Mild to Moderate Facial Atrophic Acne Scars

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ABSTRACT

Objective: To evaluate the efficacy of fractional Co_2 laser in the treatment of mild to moderate atrophic facial acne scarring.

Study Design: Descriptive case series study

Place and Duration of Study: This study was conducted at the Dermatology Department Unit-I, King Edward Medical University, Mayo Hospital, Lahore between Oct, 2014 to April, 2015.

Materials and Methods: One hundred and fifty patients were included in this study. fractional Co_2 laser (10,600nm) flounce was delivered with settings of 15-20mj/cm^2, pulse duration upto 3ms, interval of 1ms, distance of 0.8mm, spot size 300 microm, single pass using the fractional mode. Total six treatments at 4 weeks interval were given and final assessment after 4 weeks of 6th session was done.

Results: Mean age was observed 23.56±5.12 years. Out of 150 cases, 58 patients (38.7%) were males while remaining 92 patients (61.3%) were females. Mean acne scar count at baseline 4.94±1.36 and after 24 weeks mean acne scare count were 3.98±1.70. There were only 4 patients (2.7%) were married and 146 patients (97.3%) were unmarried. Distribution of cases by acne scar severity at baseline was as follows: 15 patients (10.0%) were having mild acne scars and 135 patients (90%) were having moderate acne scars. Acne scar severity after 24 week. 121 patients (80.7%) mild acne scars were seen and in 29 patients (19.3%) moderate acne scars were observed. Efficacy of fractional Co_2 laser in the treatment of mild to moderate atrophic facial acne scarring were observed in 123 patients (82.0%).

Conclusion: fractional Co_2 laser appears to be effective and well tolerated for the treatment of mild to moderate atrophic facial acne scarring.

Key Words: Facial Atrophic Acne Scars, Fractional Co_2 Laser, Efficacy

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INTRODUCTION

In teenagers in particular, acne is a common skin disease.[1] The course depends on the cause and the severity of the cause.[2] The acne vulgaris disease is multifactory because of its hyperkeratinisation, excessive production of sebum and the colonization of propionibacterium acnes.[1] It is characterized mostly on face, chest, back and arms by comedons, papules, pustuli, nodules and cysts. Atrophic acne scar is one of the most dramatic inflammatory acne consequences.[2] The plan was new, comprehensive and useful, which classified scars as ice pickers, shallow boxers and deep boxcars.[3]

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Acne scars are common and lead to psychosocial disfigurement and problems. Atrophical scarring occurs in pilosebaceous follicles during dynamic aggravation because of impaired resolution or damage healing.[4] A four class subjective structure depending on cavity morphology and instance covered by cosmetics or ordinary hair designs. The Global Classification of Acne Scarring Seriosity levels increase from the macular scar tissue (grade 1), mild atrophy or hypertrophic scar which may not be evident at 50cm or more and which may well be covered satisfactorily by cosmetics and hair patients (grade 2). (grade 4).[3] So many ways to heal acne cure such as chemical peeling, dermabrasion, booster boom, punching extraction, autologous exchange of fat, dermal fillers and non-ablative laser treatment have been taken for granular purposes. There are currently no gold standards and the adequacy of these strategies is restricted.[5,6]

The CO2 laser is an ablative device which has been viably demonstrated for treatment of a wide scope of dermatologic conditions, including treatment of inflammation scars.[7] There is another CO2 laser framework with a partial methodology, it uses high energy pulses delivered over very small beam distance to induce small circles of vaporized tissue.[6] Each treated

territory is encircled by typical unaffected tissue, which brings about very quick healing with few complexities.[7]Manuskiatti et al carried out a similar study in which acne scars were treated in subjects with 3 sessions of CO_2laser on an average of 7 weeks interval and 62% rated themselves as having 50% improvement in their scars volume and surface smoothness.[8]

MATERIALS AND METHODS

This was a descriptive case series study. After approval of synopsis, 150 patients fulfilling the inclusion criteria were included in the study from the Outpatient Department of Dermatology Unit-I, Mayo Hospital, Lahore. Informed written consent was taken and protocol of research was explained to every patient. Detailed demographic profile i.e. name, age, sex was recorded. Patients with mild to moderate atrophic facial acne scars according to qualitative scarring grading system and baseline scar were recorded. Photographs were taken before and after each sitting of laser. The treatment area cleaned and lidocaine 1% applied on entire face. Fractional CO_2 laser (10,600nm) flounce was delivered with settings of 15-20mj/cm^2, pulse duration upto 3ms, interval of 1ms, distance of .8mm, spot size 300 microm, single pass using the fractional mode. A total of 6 treatments at 4 weeks interval was given and final assessment after 4 weeks of 6th session was done.

Treatment was considered effective if there is $\geq$50% improvement in quantitative acne scarring score based on lesion counting and acne severity score from baseline. Data entry and analysis was done by using SPSS 18.0. Quantitative data (age, acne scars count) was presented by using mean and SD. Qualitative data (sex: male or female) was presented by using frequency, tables and percentages. Efficacy of the treatment presented as frequency and percentages.

RESULTS

One hundred fifty patients were including in this study during the study period of six months from 10-10-2014 to 09-04-2015.Age of the patients ranged between 18-45 years. Mean age was observed 23.56±5.12 years (Table1).Out of 150 cases, 58 patients (38.7%) were males while remaining 92 patients (61.3%) were females (Table2).Mean acne scar count at baseline were 4.94±1.36 and after 24 weeks mean acne scare count were 3.98±1.70 (Table 3 & 4).There were only 4 patients (2.7%) were married and 146 patients (97.3%) were unmarried (Table5).Distribution of cases by acne scar severity at baseline was as follows: 15 patients (10.0%) were having mild acne scars and 135 patients (90%) were having moderate acne scars (Table6). Acne scar severity after 24 week was as follows: In 121 patients (80.7%) mild acne scars were seen and in 29 patients (19.3%)moderate acne scars were observed (Table7). Efficacy of fractional CO_2 laser in the treatment of mild to moderate atrophic facial acne scarring was observed in 123 patients (82.0%) (Table8). Stratification with regard to age and gender presented in Table 9 and 10.

Table No.1: Age distribution of cases (n=150)

Age (Year)	No.	%
18-25	122	81.3
26-35	21	14.0
36-45	07	04.7
Mean±SD	23.56±5.12	

Table No.2: Gender distribution of cases

Gender	No.	%
Male	58	38.7
Female	92	61.3

Table No.3: Distribution of cases by acne scar count (baseline)

Acne scar count	No.	%
< 4	62	41.3
5-6	88	58.7
Mean±SD	4.94±1.36	

Table No.4: Distribution of cases by acne scar count (24 week)

Acne scar count	No.	%
< 4	102	68.0
5-6	48	32.0
Mean±SD	3.98±1.70	

Table No.5: Distribution of cases by marital status

Marital status	No.	%
Married	04	02.7
Unmarried	146	97.3

Table No.6: Distribution of cases by acne scar severity (baseline)

Acne scar severity	No.	%
Mild	15	10.0
Moderate	135	90.0

Table No.7: Distribution of cases by acne scar severity (24 week)

Acne scar severity	No.	%
Mild	121	80.7
Moderate	29	19.3

Table No.8: Distribution of cases by efficacy

Efficacy	No.	%
Yes	123	82.0
No	27	18.0

Table No.9: Age stratification with regard to age

Age (Year)	Efficacy		Total
	Yes	No	
15-25	98	24	122
26-35	18	03	21
36-45	07	-	07

P 0.374

Table No.10: Gender stratification

Gender	Efficacy		Total
	Yes	No	
Male	47	11	58
Female	76	16	92

P 0.806

DISCUSSION

Atrophic facial scars happen often, mostly as results of severe acne form episodes during adolescence. Many patients seek disfigurement due to apparent differences in texture of their skin. Different methods of treatment had been used alone or in combination to treat atrophic scars, including dermabrasion, excisional closed surgery, punch grafting and lift, collagen implants, silicone implants, chemical peeling and laser abrasion.[9,10] Each of these therapies was limited by side effects, in particular scarring and pigmentation. The risk of complications after laser treatment can significantly reduce by the recent development of energy-efficient, pulsed carbon dioxide laser (CO2) that reduces thermal lesions to the uninvolved adjacent tissue structures.[11,12] Due to the latest high-energy pulsed laser technology, the use of CO2 laser has been limited in previous reports on atrophic scarring. A small number of cases with energy ranging from 250 to 500mJ and 2-5W reported to show Fitzpatrick impressive clinical results. At 500mJ and 5-10W, Weinstein and Alster[12] reported good scar reactions. Compared to its predecessors (e.g. super pulsed CO_2 laser or continuous CO2 scanners), the high-energy, pulsed CO_2 laser system offers a visible advantage because it limits the heat conductiveness to its surrounding skin.[13,14]

Therefore, after laser irradiation, scarring and other pigment/textural changes are minimized. The high-energy ultra-pulsed CO_2 laser produced slightly better reactions in a clinical comparison with fewer laser lasers than the high-energy surgipulse CO_2 laser in periorbital rhythm therapy.[15] It raises concerns about the absolute number of the laser passes required to achieve this desired effect, as the fibrotic tissue in scars does not absorb laser Energy and the surrounding normal skin. Due to the accumulated thermal tissue injury, several steps over a scarred surface can increase the risk of cavities. A laser is therefore desirable that is able to maximize tissue vaporization with the pulse. This is best achieved through the ultra-pulsed CO_2 laser system, as the majority of the supplied energy goes above the critical irradiance required to vaporize the tissue. The choice of post-acne scar treatment depends on the morphological type and severity of each scar on the face.[16] Post-acne scares have also been classified according to four different degrees, irrespective of the individual morphology of the scars.[17]

The latest technique in light-based skin rejuvenation is fractional lasers and many different equipment are on the market. Ablative CO2 lasers combine traditional laser ablation principles with a fractional laser intervention technology which ensures that MTZ consists of a central Microscopic Ablation Zone (MAZ), which consists of a small zone of coagulation. The applications of laser parameters are well known for their intensity level (W) and pulse duration (ms), spotsize, spot energy (mJ/pulse) and spot density and the possible effects on the dimensions of the MTZ and the result of the healing reactions.[18] Thus the depth of ablation in AFT depends on the energy used with higher energies and therefore increases the penetration depth was shown in an ex vivo histological study.[19] Previous study has assessed the effectiveness of fractional CO2 laser surface resorption in acne scars which showed mild to excellent improvements in acne scars in 1-3 fractional CO_2 laser treatments.[20]

Thus, 13 patients with moderate to severe acne scars were treated with a fractional laser CO2 for 2-3 sessions in an uncontrolled trial by Chapaset al.[20] 20–100 mJ pulse energy with accumulated 200–1,200 MTZ/cm^2 densities used. There have been significant quartile scale improvements of at least 25-5% and no serious adverse reactions have been identified. Walgrave et al[21] also used the same pulse power range but with a slightly higher density accumulated of 600–1200 MTZ/cm^2 to treat 30 patients with moderate to severe acne scars. After 1–3 treatments, clinical improvements were 26–50 percent and there were no long-term adverse effects. The results of this study show that fractional CO_2 laser is 82% efficient for the treatment of slight to moderate acne scar. Our results are similar to Manuskiattiet al[8] findings.

CONCLUSION

The treatment of mild to moderate acne in the face appears to be efficient and well tolerated with fractional CO2. Due to its accuracy and limited thermal damage difficult skin types and cosmetic areas can be treated with the least risk of harmful complications such as scarring or permanent pigmentation.

Author's Contribution:

Concept & Design of Study:	Aisha Malik
Drafting:	Shanza Akram
Data Analysis:	Shanza Akram
Revisiting Critically:	Aisha Malik, Shanza Akram
Final Approval of version:	Aisha Malik

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Tan JKL. Current measures for the evaluation of acne severity. Expert Rev Dermatol 2008;3: 595-603.

2. Fife D. Practical evaluation and management of atrophic acne scars: tips for the general dermatologist. J Clin Aesthet Dermatol 2011;4: 50–7.
3. Jacob CI, Dover JS, Kaminer MS. Acne scarring: a classification system and review of treatment options.J Am Acad Dermatol 2001;45:109-17.
4. Taub AF, Garretson CB. Treatment of acne scars of skin types ii to v by sublative fractional bipolar radiofrequency and bipolar radiofrequency combined with diode laser. J Clin Aesthet Dermatol 2011;4:18-27.
5. Woo SH, Park JH, Kye YC. Resurfacing of different types of facial acne scar with short-pulsed, variable-pulsed, and dual-mode Er:YAG laser. Dermatol Surg 2004;30:488-93.
6. Tay YK, Kwok C. Minimally ablative erbium: YAG laser resurfacing of facial atrophic acne scars in Asian skin: a pilot study. Dermatol Surg 2008;34:681-5.
7. Hasegawa T, Matsukura T, Mizuno Y, Suga Y, Ogawa H, Ikeda S.Clinical trial of a laser device called fractional photothermolysis system for acne scars. J Dermatol 2006;33:623-7.
8. Manuskiatti W, Triwongwaranat D, Varothai S, Eimpunth S, Wanitphakdeedecha R. Efficacy and safety of a carbon-dioxide ablative fractional resurfacing device for treatment of atrophic acne scars in Asians. J Am Acad Dermatol 2010;63: 274-83.
9. Goodman G. Dermabrasion using tumescent anesthesia. J Dermatol Surg Oncol 1994;20:802-7.
10. Garrett AB,Dufresne RG, Ratz JL, Berlin AJ. Carbon dioxide laser treatment of pitted acne scarring. J Dermatol Surg Oncol 1990;16:737-40.
11. Fitzpatrick RE. Use of the ultrapulse CO2 laser for dermatology including facial resurfacing. Lasers Surg Med 1995;57:5.
12. Weinstein C, Alster TS. Skin resurfacing with high-energy, pulsed carbon dioxide lasers. In: Alster TS, Apfelberg DB, eds. Cosmetic Laser Surgery. New York: John Wiley & Sons Inc 1996:9-27.
13. Hobbs ER, Bailin PL, Wheeland RG, Ratz JL. Superpulsed lasers: minimizing thermal damage with short duration, high irradiance pulses. J Dermatol Surg Oncol 1987;13:955-6.
14. Fitzpatrick RE, Ruiz-Esparza J, Goldman MP. The depth of thermal necrosis using the CO2 laser: a comparison of the superpulsed mode and conventional mode. J Dermatol Surg Oncol 1991;17:340-4.
15. Alster TS. Comparison of the "superpulse" CO2 laser and the "ultra pulse" CO2 laser in the treatment of periorbitalrhytides. Lasers Surg Med 1995;57:5.
16. Kadunc BV, Trindade De Almeida AR. Surgical treatment of facial acne scars based on morphological classification; A Brazilian experience. Dermatol Surg 2003;29:1200–9.
17. Goodman GJ, Baron JA. Postacne scarring: A qualitative global scarring grading system. Dermatol Surge J Am Acad Dermatol 2001;45:109–17.
18. Paasch U, Haedersdal M. Laser systems for ablative fractional resurfacing. Expert Rev Med Devices 2011;8:67–83.
19. Hantash BM, Bedi VP, Chan KF, Zachary CB. Ex vivo histological characterization of a novel ablative fractional resurfacing device. Lasers Surg Med 2007;39:87–95.
20. Chapas AM, Brightman L, Sukal S. Successful treatment of acne scars w/CO. Lasers Surg Med 2008;40:381-6.
21. Walgrave SE, Ortiz AE, MacFalls HT, Elkeeb L, Truitt AK, Tournas JA, et al. Evaluation of a novel fractional resurfacing device for treatment of acne scarring. Lasers Surg Med 2009;41:122–7.