International Journal of Research in Dermatology
Gosavi AP et al. Int J Res Dermatol. 2021 Jan;7(1):113-117
http://www.ijord.com

DOI: https://dx.doi.org/10.18203/issn.2455-4529.IntJResDermatol20205605

Case Series

Resurfacing of facial acne scars with pulsed carbon dioxide laser: a case series of 10 patients

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Received: 29 October 2020
Revised: 08 December 2020
Accepted: 09 December 2020

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ABSTRACT

Acne vulgaris is a common skin disorder affecting 80% of people between 11-30 years of age with many experiencing some degree of scarring. Pulsed wave carbon dioxide (CO2) laser resurfacing is a recent addition in armamentarium of treatment options for acne scars. This study focuses on one of the most common type of acne complication - atrophic scars treated with pulsed wave carbon dioxide laser. To evaluate efficacy of pulsed carbon dioxide laser for treatment of mild to moderate atrophic facial acne scars. 10 subjects (6 male and 4 females, aged 22-35 years) with skin type III-V and atrophic acne scars were treated with 4 sessions of carbon dioxide non-ablative laser resurfacing on 6 weeks interval. 7 out of 10 subjects in our study perceived an excellent to good improvement with 2 patients showing fair improvement and 1 patient with no improvement. Adverse effects were limited to prolonged erythema (two patients), and post-inflammatory hyperpigmentation (three patient). Excellent to good clinical improvement observed in 70% of patients with acne scars. This underscore pulsed carbon dioxide laser's effectiveness in the treatment of mild to moderate atrophic acne scars.

Keywords: Acne vulgaris, Atrophic acne scars, Carbon dioxide laser

INTRODUCTION

Acne vulgaris is a common skin disorder that affects upto 80% of the population during adolescence.[1,2] The condition has been associated with social stigma resulting in several consequences including depression, decreased self-confidence, poorer body image satisfaction.[3-6,8,9] Atrophic facial scars occur, most often as a consequence of severe form of acne vulgaris. Various treatment modalities, alone or in combination, have been used to treat atrophic scars, including dermabrasion, excisional surgery with closure, punch grafting and elevation, collagen implants, chemical peeling.[10-16] With the recent development of high-energy, pulsed carbon dioxide (CO2) lasers that minimize thermal injury to uninvolved adjacent tissue structures, the risk of complications following laser treatment can be significantly reduced. The purpose of this study was to investigate the clinical outcome and safety of pulsed wave carbon dioxide 10,600 nm laser in the treatment of atrophic facial scars.

CASE SERIES

This study consisted of 10 subjects aged between 22-35 years (6 male and 4 female) clinically diagnosed with atrophic facial acne scars. We selected subjects with Fitzpatrick skin types III-V with Goodman and Baron grade 2, 3 and 4. The study protocol and informed consent documents was obtained by Ethical Committee. Informed consent was obtained from each subject before enrolment. Patient who was pregnant or lactating, who had concomitant treatment to involved areas or

propensity for keloids scarring or who received isotretinoin or underwent filler injections or ablative/non-ablative laser skin resurfacing procedures within the preceding 12 months, patients with unrealistic expectations and not willing for consent were excluded.

The device used was fractional ablative CO2 laser (model-Alma Pixel CO2) that alters the pulse width and energy simultaneously, thus offering a way to control the degree of ablation and deep tissue heating. The patients were suitably primed and anaesthesia was obtained with topical eutectic mixture of 2.5% lidocaine and 2.5% prilocaine cream applied to lesions under occlusion 1 hour prior to laser therapy for local anaesthesia. Eyes were protected with eye shields. The laser was calibrated in the Pulse mode at 30-50 MJ and 15-30W, dwell time of 2 m/sec using 3 mm spot size delivered through a collimated handpiece. Laser pulses were placed adjacent to one another without overlapping, thereby preventing char formation. Parallel to the application of thermal laser pulses, cooling was provided with a constant flow of cold air. Treatment endpoints were determined by the slight erythema.

Following the procedure, topical antibiotic application was given for 3 days after the procedure followed by strict photo-protection with sunscreen of SPF 30. Patients underwent 4 sessions of pulsed carbon dioxide laser. An interval of 6 weeks was maintained between the treatment sessions.

Assessment was documented by the treating dermatologist at baseline and following every session which was 6 weeks apart. The final follow-up was 6 weeks after the last (fourth) session.

Qualitative assessment was done by dermatologist using the Goodman and Baron qualitative global scarring grading system comprising four levels: grade-1 as macular, grade-2 as mild, grade-3 as moderate, and grade-4 as severe.

Digital photographs were taken using identical settings before initiating the treatment and at every follow-up visit. During the last follow-up visit, which was 6 weeks after the last treatment, final assessment of the photographs was done by observer not related to the study.

At the same time, patient's satisfaction to the treatment was recorded using a quartile grading scale to assess the response. A score of 0, 1, 2, and 3 was thus given if the response was <25%, 25–50%, 51–75%, and >75%, respectively. The response was documented as excellent if the score was 3, good if the score was 2, and fair if the score obtained was 1. The documented data and photographs were also evaluated for adverse effects such as erythema, hyperpigmentation, edema.

A total of 10 patients with acne scars 5 belonging to Fitzpatrick photo type III, 3 to skin type IV, 2 to skin type V were included in the study. The study population was within the age group 22-35 years with a mean age of 28.5 years and comprised of 6 males and 4 females. The duration of scars ranged from as less than 6 months to 8 years. Descriptive data shown in Table 1.

Table 1: Patient's demographics, methods and results.

Subjects	Sex/age (years)	Type of acne scar	Fitzpatrick skin type	Global acne improvement score	
				Pre treatment grade	Post treatment grade
1	M/25	Rolling	III	2	1
2	F/30	Boxcar	IV	3	2
3	M/22	Ice pick + rolling	III	4	2
4	M/33	Rolling + boxcar	V	4	3
5	F/35	Ice pick + rolling	IV	2	1
6	M/28	Rolling	III	3	2
7	F/32	Rolling + boxcar + ice pick	III	4	4
8	F/28	Ice pick + boxcar	IV	2	1
9	M/30	Rolling	V	3	2
10	M/32	Boxcar	III	3	2

Based on the global acne scarring system, at the onset of treatment of first session, patients with grade 4 acne scars comprised of 3 cases of our study population, grade 3 consisted of 4 cases and 3 cases with grade 2. After completing four sessions, during the last follow up, 3 patients were in grade 1, 5 patients in grade 2, 1 patient in grade 3 and 4. Overall, patients with grade 3 and 4 improved from 7 cases to 2 cases which is evident in Table 1, Table 2, Table 3.

Table 2: Acne grading before and after treatment based on qualitative global acne scarring system.

Grade of acne	Number of patient Pre-treatment grade	Number of patient Post-treatment grade
1	0	3
2	3	5
3	4	1
4	3	1

Table 3: Grading of improvement by observer (final assessment done 6 weeks after the fourth session).

Global improvement scale	Percentage of response N (%)	Photographic assessment by observer
None	**<25**	1
Fair	**26-50**	2
Good	**51-75**	4
Excellent	**>75**	3
Total	-	10

The observer found the improvement to be excellent in 3 patients, good in 4 patients, fair in 2 patients and none in 1 patient.

At the end of four sessions, 4 patients graded their improvement as excellent, 3 patients reported good improvement, 2 patients were fairly satisfied with the improvement, and 1 patient did not notice any satisfactory improvement as seen in Table 4.

Table 3: Grading of improvement by patient (final assessment done 6 weeks after the fourth session).

Global improvement scale	Self-assessment by patient
None	1
Fair	2
Good	3
Excellent	4
Total	10

Transient erythema was noted in 4 patients. Post treatment erythema and mild crusting lasted for 3 days. Prolonged erythema (extending beyond 4 days) was encountered in two patients. Posttreatment hyperpigmentation occurred in 3 patients necessitating the initiation of de-pigmentary cream.

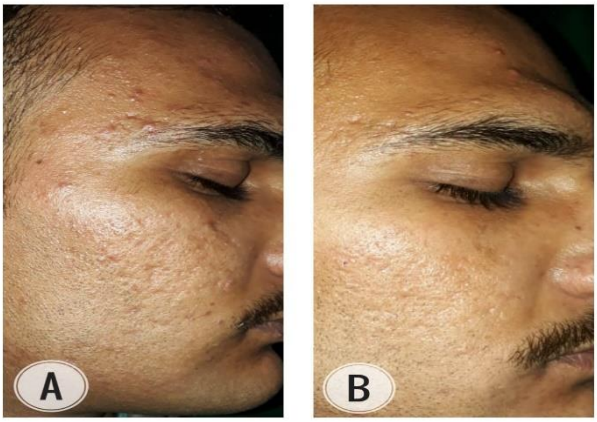

Figure 1: (A) Patient with grade IV scarring before treatment and (B) After 4 sessions patient descended to grade III.

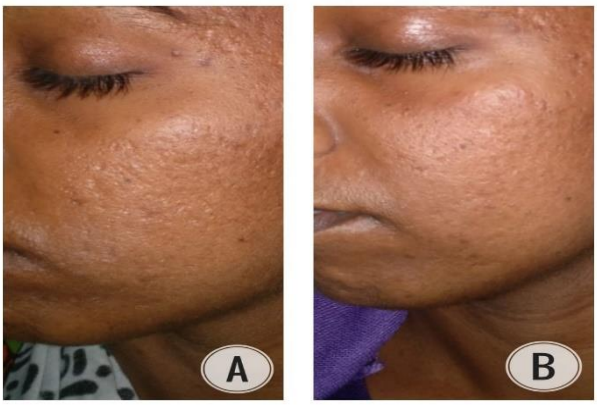

Figure 2: (A) Patient with grade III scarring before treatment and (B) after 4 sessions perceived good improvement.

DISCUSSION

Traditional medical treatments for acne vulgaris include a variety of topical and oral medications. The use of lasers and light devices has increased dramatically in recent years due to the overall ease of treatment, predictable clinical efficacy and minimal adverse effects.[17,18] The basic principle of treating atrophic acne scars is reducing the depth of scar borders and stimulating neo-collagenases to fill in the depressions.

The demand for the excellent clinical results of a non - ablative laser with lower risk of side effects associated with post-treatment and a shorter downtime, has led to development of a pulsed carbon dioxide laser.[19] Pulsed wave carbon dioxide laser produces greater heat at high energy densities with a relatively longer irradiation time, and thus a higher level of vascularization. The energy produced by the laser at the skin surface vaporizes tissue, but this energy is responsible for the shrinkage of the

dermis of the dermis through dehydration. This thermal injury produces a dermal stimulation with a resultant inflammatory reaction, the consequence of which is active angiogenesis and tissue remodelling. This active angiogenesis is reflected in the skin erythema.[20,21]

This study demonstrates that carbon dioxide laser with high energy pulse mode can effectively improve acne scars with minimal risks and downtime. The outcome was assessed both subjectively and objectively. Subjective scoring was based on photographic assessment by patient satisfaction and objective scoring was done using Goodman and Baron qualitative global acne scarring systems.

At the end of four sessions, significant number of patients slipped down a grade or two from the time of initial evaluation which was based on qualitative global acne grading system developed by Goodman and Baron. In comparison with the initial score all the 9 patients had a drop in the total score at the end of four sessions.7 patients collectively in grade 3and 4 pretreatment improved to 2 patients' post-treatment. Fair improvement was observed in 2 patients with no satisfactory improvement in 1 patient. Subjective assessment revealed that 9 of 10 patients had noticed more than 25% improvement, with 4 of them showing more than 75% improvement at the end of 4 sessions.

CONCLUSION

There was 70% excellent to good clinical improvement observed in acne scars.7 out of 10 subjects in our study perceived an excellent to good improvement. Clinical improvement by dermatologist's grading showed an excellent response in 3 patients and a good response in 4 patients. Minimal post-laser adverse effects and truncated healing time add to the credibility of High energy pulsed carbon dioxide laser. Thus, it can be said that carbon dioxide laser is an effective and relatively safe modality in treatment of atrophic acne scars.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Ethical committee of BJGMC, Pune

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Cite this article as: Gosavi AP, Chavan RB, Kundale DR, Bhatt N. Resurfacing of facial acne scars with pulsed carbon dioxide (CO2) laser: a case series of 10 patients. Int J Res Dermatol 2021;7:113-7.