

MICRO NEEDLING VERSUS CARBON DIOXIDE FRACTIONAL LASER IN MANAGEMENT OF ACNE SCARS

Shanza Obaid, Nadia Iftikhar, Asher Mashhood*, Ayesha Khokhar, Zarnab Zainab, Kanza Aftab

Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Pakistan, *Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To compare the effectiveness of carbon dioxide fractional laser with micro needling in acne scarring.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Dermatology, Pak Emirates Military Hospital Rawalpindi, from Jun 2019 to Mar 2020.

Methodology: Overall 40 patients with acne scars assessed by consultant dermatologist were made part of study. The patients were divided into two treatment groups through lottery method. Group A, was managed by micro needling technique, while Group B was managed by carbon dioxide fractional laser, each to be done monthly for a total of three sessions. The response was measured by the dermatologist and patients in both the groups. The side effects were also compared in both the groups.

Results: Out of 40 patients with acne scars included in study, 17 (42.5%) underwent micro-needling while 23 (57.5%) underwent carbon dioxide fractional laser treatment after randomization. Thirty (75%) patients were female while 10 (25%) were male. The patients with acne scars responded better in carbon dioxide fractional laser group as compared to micro needling in opinion of dermatologists (p -value=0.01) and also patients themselves (p -value=0.03). Side effects were significantly higher in carbon dioxide fractional laser group as compared to micro needling (p -value=0.02).

Conclusion: Significant number of patients respond well to carbon dioxide fractional laser treatment and the response included both expert opinion and patients own opinion, but adverse effects were seen more in same group. Therefore, better response but at the cost of more adverse effects was noted.

Keywords: Acne vulgaris, Carbon dioxide, Laser, Micro-needling.

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INTRODUCTION

Acne vulgaris is a common chronic inflammatory disease related to pilo-sebaceous unit. It is one of the well known skin illnesses and it influences 80% of the young adult population.¹ Acne generally has an extended course with severe or insidious relapse or reappearance with the passage of time. Pathogenesis of acne involves various factors which include propionibacterium acnes activity, excess sebum production, androgenic stimulation, follicular hypercornification, various inflammatory cells response and cytokine activation.²

Acne leads to scarring which has a great physical and psychological impact on the patients.³ Prevention of acne scars development can be done by controlling skin inflammation during acne outbreak. Despite appropriate and effective primary prevention of scarring, it occurs in 95% of all acne patients. There are two basic forms of acne scars, Hypertrophic scars and Atrophic scars. Atrophic scars are further sub classified into

ice pick, box scars and rolling scars.

Various modalities have been researched and used in clinical practice to manage the scars related to acne lesions.⁴ These modalities include chemical peeling laser treatment, punch grafting technique, fat transplantation, other tissue augmentation agents, micro needling, subcision and combined therapies. In last decade laser treatment has been gaining a lot of importance and making place in administration of the acne scars.⁵ In 2018, Kravas *et al*, published a review of 59 studies and concluded that numerous energy based devices (CO₂ ablative laser, RF, Non ablative fractional thermolysis) have been utilized with fluctuating degrees of efficacy and altogether different safety profiles. However, no conclusive evidence exists regarding the outcome of various interventions. Additionally, no standardized scale is accessible for acne scarring, which leads to fluctuation in assessment and understanding of data in various investigations.⁶

Harris *et al*, in 2015 published a review of skin needling and came up with the conclusion that there is reasonable evidence to recommend that skin needling

Correspondence: Dr Shanza Obaid, House#4, Mochh House, OPP AFIRM, RA Bazar, Rawalpindi Pakistan

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is advantageous and benign for treating acne scarring. However, double-blinded, randomized controlled trials are required to make more definitive conclusions.⁷ In 2019, Zayed *et al*, performed a study with the objective to assess and compare the clinical and histopathological outcome of micro-needling versus ablative fractional CO₂ laser targeting atrophic post-burn scars. According to them, ablative fractional CO₂ laser is far more efficacious than micro-needling in the management of atrophic post-burn scars in terms of histopathological outcome (*p*-value 0.083); nevertheless, a substantial growth in elastic fiber deposition was shown by micro-needling and therefore it can be termed as an encouraging therapeutic method when additional treatment modalities are combined with it.⁸ Qian *et al*, in 2012 after studying 31 patients with acne scarring concluded that high-energy pulsed and cool-scanned fractional ablative CO₂ laser system is safe and effective for facial atrophic acne scarring. Improvement in scarring was noted in the majority of patients with minimal discomfort and minimal downtime. Out of 12.9% patients showed excellent improvement and 38.71% showed good to fair response. Continued improvement over time was also an important clinical finding.⁹

Afzal *et al*, studied effectiveness of micro-needling in post acne scarring and came up with the findings which showed that that micro-needling is a productive tool for aesthetic enhancement of post acne scarring.¹⁰ Doctors dealing with skin conditions in Pakistan often have to rely on guidelines based on researches conducted in other parts of the world due to limited local data. We designed this study with the objective to compare of the efficacies of CO₂ laser versus micro needling in acne scarring at dermatology department of a teaching hospital of Pakistan.

METHODOLOGY

This study was conducted at the Department of Dermatology in Pakistan Emirates Military Hospital Rawalpindi, from June 2019 to March 2020. The World Health Organisation (WHO) sample size calculator was used to calculate the sample size with a population prevalence proportion of patients improving with micro-needling as 0.9%.¹¹ The non-probability consecutive sampling technique was used for gathering the samples for this study.

Inclusion Criteria: Patients of both genders with acne scars diagnosed by consultant dermatologist between the age of 18 and 55 were part of the study.

Exclusion Criteria: Patients with active/recurrent herpes infection or the patients with a previous complaint of hypertrophic scarring/keloid, patients who have used oral retinoid in last six months were excluded. Patients who underwent any treatment for the scars in last one year were pregnant and lactating women and patients refusing consent to participate in the study were also excluded from the study.

For getting the ethical approval for the current study, Ethical review board committee of the hospital was approached. Ethical approval was granted (Itr no. A/28/EC/37/19). Before commencement of the study, comprehensive description of the study was given to all the participants and afterwards written informed consent was taken from them. Patients were distributed into two groups A and B through lottery method. Group A was managed by the standard micro needling technique procedure.¹² Before procedure, face was wiped down with alcohol swab and topical anesthetic cream was applied for forty minutes. Micro needling was performed with sterile needles of depth 2mm in crisscross pattern. Patient was prescribed topical antibiotic application for complete three days and sun protection was advised. Group B was managed with the standard CO₂ fractional laser treatment.¹³ Energy of 30 milli joules and ablation depth of 1.6mm was set for each session. Total three sessions were performed, one month apart for both the procedures. Response was recorded by both the patients and an independent dermatologist assessor one month after the last session. Expert categorized it on the basis of percentage of improvement. Response was classified as less than 25% (poor), 25-50% (fair), 50-75% (good) and >75% (excellent) response. Patient rated their satisfaction from 0-10 and >6 was regarded as sufficient satisfaction for the procedure. Side effects were also recorded in each group which from previous studies were expected to be prolonged erythema, photosensitivity, post-inflammatory hyperpigmentation and hypertrophic scar.¹⁴

Characteristics of participants and the distribution of the patients in two treatment groups were recorded. Chi-square test was applied to look for the correlation of physicians grading of response, patient's satisfaction and presence of adverse effects in both treatment groups. Statistical Package for the social sciences (SPSS) version 23 was used for data analysis. The *p*-value of ≤0.05 was considered significant.

RESULTS

Total 40 patients were recruited in the study. Out of 40 patients with acne scars included in the study,

17 (42.5%) underwent micro-needling while 23 (57.5%) underwent CO2 fractional laser treatment after the randomization. Table-I shows that 30 (75%) patients were male while 10 (25%) were female. Table-II shows, application of chi-square test revealed that CO2 fractional laser group showed a statistically significant better response in expert opinion (p -value=0.015) as well as opinion of patients themselves (p -value=0.03), but side effects were also more in the CO2 fractional laser group (p -value<0.024). Post inflammatory hyper-pigmentation was the most frequent adverse effect seen in the CO2 fractional laser group (4 patients-17.4%). Results showed that satisfactory response in expert opinion was seen in 17 (73.9%) patients of CO2 fractional laser group and 5 (41.6 %) patients of micro needling group.

Table-I: Characteristics of study participants (n =40).

Characteristics	n (%)
Age (years)	
Mean ± SD	28.24 ± 3.122
Range (Min-Max)	18-55 years
Gender	
Male	30 (75%)
Female	10 (25%)
Treatment Received	
Micro-Needling	17 (42.5%)
CO2 Fractional Laser	23 (57.5%)

Table-II: Outcome of various variables studied in the analysis.

Factors Studies	Micro-Needling (Group-A)	Fractional CO2 (Group-B)	p-value
Expert opinion (Improvement in %)			
Not satisfactory <25% (Poor)	12 (70.6%)	06 (26.1%)	0.015
25-50% (Fair)	01 (5.8%)	10 (43.5%)	
Satisfactory 50-75% (Good)	03 (17.6%)	05 (21.7%)	
>75% (Excellent)	01 (5.8%)	02 (8.7%)	
Patients Response			
Not Satisfactory	11 (64.7%)	07 (30.4%)	0.030
Satisfactory	06 (35.3%)	16 (69.6%)	
Presence of Any Adverse Effect			
No	15 (88.2%)	13 (56.5%)	0.024
Yes	02 (11.8%)	10 (43.5%)	
Prolonged Erythema	01 (5.9%)	01 (4.3%)	-
Photosensitivity	01 (5.9%)	01 (4.3%)	
Post-Inflammation Hyperpigmentation	-	4 (17.4%)	
Hypertrophic Scar	-	02 (8.7%)	
Pain during procedure	-	02 (8.7%)	

DISCUSSION

Patients with acne vulgaris use a lot of medical and even alternate medicine treatment in order to get rid of this chronic and recurring skin condition.^{5,15}

Previous epidemiological studies done in our part of the world have concluded that acne vulgaris has been a fairly common diagnosis in dermatology clinics especially for the young population and they have different beliefs regarding its etiology and management.¹⁵ Recent advances in medical science especially various laser treatments have revolutionized the dermatology management plans for various lesions. Scarring conditions which were once considered most difficult to manage have now been managed adequately in most of the cases with various modalities. Due to limited data in our set up we designed this study to compare the efficacies of CO2 laser versus micro needling in acne scarring at dermatology department of a teaching hospital of Pakistan.

Bhargava *et al.*¹⁶ in 2018 conducted a systematic review which included a critical assessment of the evidence pertinent to various modalities used for treating acne scarring i.e resurfacing (abrasion, peels, needling, ablative lasers), lifting (subcision), volumization (filler, PRP), tightening (fractional non ablative lasers, fractional RF) and surgical options (punch elevation). Detailed evaluation of result of 89 studies also supported that lasers and radiofrequency have great efficacy in atrophic acne scarring. Other modalities can also be utilized as an adjunct, the choice of which is dependent on the grade, type and extent of atrophic scars. Radiofrequency and micro needling, which are minimally invasive procedures have better outcomes with insignificant risks in patients with sensitive or dark skin types.¹⁶ Results of our study were somewhat similar with the recommendations of metanalysis conducted by Bhargava *et al.*, and CO2 fractional laser had more efficacy as compared to micro-needling.

The most common adverse effect seen in our patients was post inflammatory hyperpigmentation and that too with CO2 fractional laser therapy. Bernstein *et al.* in 1997 did a similar study and had findings similar to ours stating that although risk of adverse effects was usually very low for CO2 laser resurfacing, but the incidence of pigmentary changes was 19.2% after CO2 fractional laser. Hyperpigmentation was seen in 2.8% of patients. However, there was noteworthy and formerly unreported risk of hypopigmentation (16.3 % patients) in such patients.¹⁷

Saoji *et al.*, in 2017 compared CO2 fractional laser and dermaroller (a form of microneedling) for treating acne scarring in Indian ethnicity and concluded that fractional photothermolysis is possibly the only monotherapy that proffer the highest degree of scar reduc-

tion. Excellent response was seen in 20% patients of CO₂ fractional laser group and 12% patients of micro needling group. However derma roller has lesser down time and very few complications as compared to CO₂ fractional laser which has higher downtime and grave complications of post inflammatory hyperpigmentation.¹⁸

Badheka *et al*, in 2016 did a study to compare the efficacy of subcision, CO₂ fractional laser and derma-roller (microneedling) in acne scars and concluded that outstanding response was seen in 13.33%, 20% and 6.7% patients in the above treatment groups respectively. He concluded that CO₂ laser was better than subcision which in turn was better than dermaroller in terms of efficacy.¹⁴ However he also concluded that time tested procedures; like subcision if done effectively and appropriately have excellent response and is analogous to newer and expensive modalities like CO₂ fractional laser.¹⁴ Our results showed that CO₂ fractional laser emerged as superior treatment from efficacy point of view but at the cost of more side effects as compared to micro needling (which is similar to derma roller).

LIMITATION OF STUDY

This study has few limitations as well. Sample size was small hindering the generalizability of this study to local population. Patients could not be blinded to which treatment group they belong. Addressing of these limitations in future studies may generate better results.

CONCLUSION

Significant number of patients respond well to CO₂ fractional laser treatment and the response included both the expert opinion and patients own opinion, but adverse effects were also seen more in the same group. Therefore, better response may be at cost of more adverse effects.

Conflict of Interest: None.

Authors' Contribution

SO: Data analysis, NI: Concept, design, AM: Data collection, AK: Data collection, ZZ: Data interpretation, KA: Data interpretation

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