

Management of Acne Scars: Comparative Study of Therapeutic Efficacy of Fractional CO₂ Laser and Micro - Needling with and Without Topical Epidermal Growth Factor Application Post - Procedure

Dr. K. Sai Tejaswini¹, Dr. Nirupama Bhagya Lakshmi. T², Dr. B. V. Ramachandra³

¹MD DVL, Guntur, Andhra Pradesh 522001, India
Email: [tejak195\[at\]gmail.com](mailto:tejak195[at]gmail.com)

²Eluru, Andhra Pradesh 534005, India (Corresponding Author)

³Visakhapatnam, Andhra Pradesh, India

Abstract: Introduction: Post - acne scarring is one of the very distressing and difficult problems for patient and physicians alike. The treatment modalities for acne scarring include surgical techniques like punch excision, subcision, resurfacing techniques like microdermabrasion, ablative and non - ablative lasers, fillers. The clearance of the lesions with these procedures is still not effective. Treating the acne scars to obtain adequate response is one of the most challenging cosmetic procedures. Aims & Objectives: The present study is undertaken to explore the effectiveness of modalities (fractional CO₂ LASER and micro - needling) of treatment for acne scars and also to evaluate role of topicaledgepidermal growth factor in the improvement of acne scars. Materials & Methods: This study was carried out in the outpatient department of ASRAM hospital, Eluru in a group of 40 patients. A very detailed history, thorough clinical examination, dermoscopic evaluation and histopathological examination were documented. Dermlite dermoscope was used in the study. Results: In the present study, 37% patients were males and 63% patients were females with a male to female ratio of 1: 1.7. In the present study, majority of the cases belonged to 20 - 30 years age group followed by 30 - 40 years age group. Majority had acne scars with duration of 6 - 10 years. 62.5% of patients had acne scars exclusively over cheeks, 12.5% of patients had scarring over cheeks and forehead and 25% of patients had scarring over cheeks and chin. The most common pattern found in the present study was the mixed type of scarring - combination of rolling, boxcar and ice pick scars followed by the rolling scars and superficial boxcar scars. CO₂ laser resurfacing showed highest mean percentage of improvement in quantitative and qualitative scores, followed by micro - needling. Conclusion: Fractional CO₂ laser resurfacing is more efficacious than micro needling with longer down time interfering with daily activity of patients and mandatory avoidance of sun exposure in post treatment period are the limiting factors.

Keywords: acne scars, fractional CO₂ LASER, micro - needling, goodman and baron grading of acne scars, topical epidermal growth factor

1. Introduction

Various modalities of treatments are available for managing the acne scars. But no single modality is the solution to the problem and achieving acceptable level of patient's satisfaction has still remained unresolved. One of the commonly used procedural treatments for post - acne scarring are fractional CO₂ laser and micro - needling. This comparative study was undertaken to evaluate the efficacy and adverse effects of fractional CO₂ laser resurfacing and micro - needling.

2. Materials and Methods

Source of data: A hospital - based study was conducted on group of 40 patients in the Department of Dermatology, Venereology and Leprosy, ASRAM, Eluru, AP. Patients were recruited from OPD and study was conducted from November 2018 to October 2020.

Inclusion Criteria

- Patients aged between 15 - 40 years with both superficial and deep acne scars.
- Patients of both genders (male and female).
- Emotionally balanced patients with realistic expectations
- Patients diagnosed of having post acne scarring grade 2 to 4
- Patients who have not undergone any other procedures for scarring in last 6weeks.

Exclusion Criteria

- Patients with active bacterial or viral infections
- Patients with keloidal, bleeding tendency
- Patients with unrealistic expectations and unable for follow up
- Pregnant and lactating women

Data Collection

After obtaining the consent from the patient, information was taken as per the proforma, enclosed, recorded on the clinical forms. Complete history regarding the onset, progression, associated conditions is included in the

Volume 10 Issue 12, December 2021

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

proforma. Written consent was obtained from each patient after giving them the above information. The patients were photographed; and assessed clinically at the time of enrolment to grade the severity of scarring as per the grading system proposed by Goodman and Baron.

Clinical Examination

Inspection of all sites of body including face, upper limbs, lower limbs, and trunk was done. The morphology of lesions, their distribution, sites of involvement was recorded.



Ice Pick Scars

Box - Car Scars

Rolling Scars

Procedure

Patients were divided randomly into four groups - A, B, C, D. Prior to either of the procedures, thick application of topical anaesthesia was done and left on for 45 minutes. Group - A and C were treated with Fractional CO₂ LASER with and without topical epidermal growth factor respectively. In groups A and B, patients were treated with fractional CO₂ laser unit in 3 sessions at monthly interval. In the first session, Power to tissue: 15%, pulse duration: Ultra pulse - < 300 micro seconds; spot size: 100mm was delivered to the patient. Parameters were increased in subsequent sittings based on treatment response and patient.

Group - B and D were treated with micro - needling with and without topical epidermal growth factor respectively. Dermaroller (dermaroller - T, Lazhora medical cosmetics, Chennai) with 1.5mm - long needles, 192 needles in 8 rows, needle diameter at penetration point: 0.25mm, width and diameter of the roller head: 20mm was used. The treatment area was rolled in eight directions (vertical, up, down, horizontal, to the right, to the left, and in both diagonal directions) applying minimal pressure. The end point for any treatment session was the presence of uniform bleeding points over the treated area. In the patients with deep - seated scarring, the skin was stretched in a perpendicular direction to the derma roller movement so that the base of the scars could also be reached. After treatment, when the bleeding stopped, the formed serous ooze is removed from the surface of the skin using sterile saline solution.

All patients were instructed to apply topical antibiotic fusidic acid for a period of one week, to prevent the secondary infection, then moisturizing cream until the erythema resolved.

Emphasis on avoidance of sun exposure was given by using sunscreens with a sun protection factor (SPF) value of 30 or more during the day.

All the groups were treated for three sessions and at each session, qualitative and quantitative grading of acne scars and patient's response by questionnaire were recorded.

3. Results

In our study, 55% (22) patients were males and 45% (18) patients were females with a male to female ratio of 1.2: 1. Majority of the cases belonged to 25 - 31 years age group (n= 20, 50%). Followed by 18 - 24 years age group (n=11, 27.5%) Only one patient was from the age group of >40 yrs. In this study 15 patients (37.5%) had acne scarring for 5 - 6years, 11 patients (27.5%) had acne scarring for 3 - 4 years, 8 patients (20%) had acne scarring for greater than 8 years and 5 patients (12.5%) had scarring for more than 8 years. Out of 40 patients, involvement of cheeks was seen in 24 cases (60%), cheeks and forehead were involved in 11 cases (27.5%) and cheeks and chin were involved in 5 cases (12.5%). Majority of cases had combination of ice - pick, rolling and boxcar scars 12 (30%), followed by combination of rolling, boxcar scars and linear scars 11 (27.5%), followed by predominantly rolling scars 6 (15%). According to qualitative score, 18 (45%) cases were of grade 3 followed by 11 (27.5%) cases under grade 2, 4. According to quantitative score, 14 patients (35%) had a score of 37 - 48 followed by 12 patients (30%) each with a score of 49 - 60.

In patients treated with Fractional CO₂ LASER, pre - treatment number of patients with grade 3, 4, 2 severity was 10, 5 and 5 respectively based on Goodman and baron qualitative scale. Post - treatment grade 1 severity was seen

in 10 and grade 2 severity was seen 6 patients respectively. Mean percentage of improvement in quantitative score for all 20 cases (42.45%) was 64.86% after treatment.

In patients treated with micro - needling, Pre - treatment number of patients with grade 4, 3, 2 severity was 6, 8 and 6 respectively based on Goodman and baron qualitative scale. After Post treatment grade 1 severity was seen in 7 and grade 2 severity was seen 10 patients respectively. Mean

percentage of improvement in quantitative score for 20 cases (40.9%) after treatment was 58.4%.

Based on both qualitative and quantitative scores, fractional Co₂ laser group showed statistically higher therapeutic efficacy compared to micro - needling (p=0.00).

4. Photographs

Fractional Co₂ Laser

Before



After



Micro - Needling

Before



After



Table based on quantitative scores:

Groups	Mean % of improvement in quantitative score	T value	P value	decision
Co ₂ laser	64.8%±10.4			
Micro - needling	58.4%±15.5	9.423	0.000	significant

Table based on qualitative scores:

Groups	Post treatment		chi - square	P value	decision
	Grade 1, 2	Grade 3, 4			
Co ₂ laser	16	4	4.913	0.04	significant
Micro - needling	11	9			

Complications following both the procedures like erythema, pain, bleeding, edema and post inflammatory hyperpigmentation were recorded. Of these, post inflammatory hyperpigmentation was particularly in group A. amongst group C, pain was the major complaint.

Based on patient's response and questionnaire, downtime was relatively low in groups C and D, in whom topical epidermal growth factor was used.

	Group A	Group B	Group C	Group D
Erythema	1 week	4days	3 - 4 days	3days
Peeling, crusting	1 week	4days	4 - 5days	2days
Texture, tone	Good++	Good+	Good+++	Good++

5. Discussion

Facial acne scars occur frequently, usually as a consequence of severe acne during the teenage years. Many patients seek treatment for the resultant disfigurement for the limitations placed on social interaction, self - esteem, and daily activities.

In the present study, Goodman and Baron quantitative and qualitative scale was followed. In the previous studies, Anupama YG et al⁽⁹⁾, Asif M et al⁽⁸⁾ and BS Chandra Shekar et al⁽¹⁰⁾ Goodman and Baron grading system was used. Shilpa Garget al⁽²⁾ and Imran Majid et al⁽⁷⁾ have used qualitative grading scale proposed by Goodman and Baron but quantitative grading was not used. In few studies, quartile grading scale and patient satisfaction were used to assess the efficacy of treatment.

In present study, higher prevalence of acne scarring was seen in females (64%) compared to males (30%) with a male to female ratio of 1: 1.7. There was prevalence of 58.3% and 57% among females in the studies conducted by Imran Majid et al⁽⁷⁾ and Sai Yee et al⁽¹⁾ respectively. In the present study, age of patients varied from 15 to 40 years with mean age of 27.5years. Majority of the cases belonged to 20 - 30 years age group followed by 30 - 40 years age group. Similar age range of patients was observed in studies conducted by Moetaz El - Domyati et al⁽³⁾.

In the present study, history of pricking sensation was present in 51.8% of the patients in which grade 2, 3, 4 was observed in 14.2%, 42.8% and 35.7% respectively.

In the present study, 62.5% of patients had acne scars exclusively over cheeks, 12.5% of patients had scarring over cheeks and forehead and 25% of patients had scarring over cheeks and chin. This finding was consistent with the finding of the study conducted by Imran Majid et al⁽⁷⁾ who observed that the commonest site of involvement was the cheeks.

The most common pattern found in the present study was the mixed type of scarring - combination of rolling, boxcar and ice pick scars followed by the rolling scars and superficial boxcar scars. In the study done by Nofal E et al⁽¹⁵⁾, the type of scars in the increasing order was the ice pick, rolling and boxcar scars that included 45 patients.

In the present study, scars belonging to Goodman and Baron qualitative score grades 2 and 3 were predominately seen - with grade 3 being 54.6% and grade 2 (25%). In a study done by Shilpa Garg et al, out of 49 patients 16 had grade 4, 22 patients had grade 3 and 11 patients had grade 2.

Fourteen (35%) patients had quantitative score of 37 - 48, followed by 12 (30%) patients with score of 49 - 60 and 7 (17.5%) patients with score of 25 - 36 in the present study. Taking both quantitative and qualitative grades into account is advisable to qualitative grade alone in assessing the therapeutic outcome of each modality in post acne scarring.

Fractional Co₂ LASER was done in group A and C without and with topical EGFR respectively. After the treatment

sessions, there was reduction in pre - treatment grades (both qualitative and quantitative) about one or two grades. Similar observations of significant and notable improvement in acne scarring after fractional Co₂ LASER was reported by Imran Majid et al⁽⁷⁾, Ochi H et al⁽⁵⁾, Omi T et al⁽¹¹⁾ and Qian H et al⁽¹⁴⁾ group B and D were subjected to micro needling treatment and according to qualitative score, pre - treatment grades of 2, 3, and 4 were noticed in 7, 11, 2 patients respectively. After last session, post treatment grades had achieved reduction in scarring by one or two grades.

In these groups, three patients were lost to follow up and the probable reason could be intense pain of the procedure. Similar observations of improvement in acne scarring after micro needling were reported by Dogra s et al⁽⁴⁾, Alster TS et al⁽¹³⁾ and Ibrahim MK et al⁽⁶⁾.

Several attempts have been addressed to decrease the degree of downtime and incidence of PIH, including using conservative energy settings and epidermal protection, strict sun avoidance, the use of preoperative and postoperative treatment regimens, such as early sunscreen application, topical or systemic steroid, and moisturizer modified with anti - inflammatory agents or probiotics, bleaching agents, and light emitting diode.

Epidermal growth factor (EGF) family is one of the important regulatory mediators secreted by platelets, macrophages and fibroblast providing paracrine effect on keratinocytes. It is a potent stimulator for cell proliferation and migration thereby promoting epithelisation and healing process Studies of EGF for various medical conditions have been conducted, such as on oral ulcer, diabetic foot ulcer and chronic venous ulcer; however, studies on aesthetic procedures are still limited.

In the study conducted by Thanya et al⁽¹²⁾, there was no role of topical epidermal growth factor in the down time of acne lasers.

6. Limitations

- Enrolment of lesser number of patients was one of the limitations.
- In acne scarring, combination therapy with use of two or more modalities has yielded better results but monotherapy was employed in the present study.

7. Conclusion

Fractional Co₂ laser resurfacing is more efficacious than micro needling with longer down time interfering with daily activity of patients and mandatory avoidance of sun exposure in post treatment period are the limiting factors. Micro needling has got better safety profile as compared to Co₂ LASER but is relatively less effective than Co₂ laser.

Treatments that can completely clear the acne scars are not yet available. Therefore, the prevention and early treatment of the acne remain a primary strategy against scars.

References

- [1] Leyden JJ Md. Understanding and Reducing the Risk for Acne Scarring. *Semin Cutan Med Surg.* 2015 Sep; 34 (5 Suppl): S89 - 91. Sanjeev. Vaishampayan, SukritiBaveja, Shilpa Garg. Acne, Rosacea and Perioral dermatitis. In: S. Sacchidanand, Chetan Oberai, Arun C. Inamdar, editors. *Indian Association of Dermatology and Venereology text book.4thedition., Mumbai; Bhalani; 2015. p.1365 – 1395*
- [2] Sanjeev. Vaishampayan, SukritiBaveja, Shilpa Garg. Acne, Rosacea and Perioral dermatitis. In: S. Sacchidanand, Chetan Oberai, Arun C. Inamdar, editors. *Indian Association of Dermatology and Venereology text book.4thedition., Mumbai; Bhalani; 2015. p.1365 – 1395*
- [3] El - Domyati M, Barakat M, Awad S, Medhat W, El - Fakahany H, Farag H. Microneedling Therapy for Atrophic Acne Scars: An Objective Evaluation. *J Clin Aesthet Dermatol.* 2015 Jul; 8 (7): 36 - 42.000; 26 (9): 857–871
- [4] Dogra S, Yadav S, Sarangal R. Microneedling for acne scars in Asian skin type: an effective low - cost treatment modality. *J Cosmet Dermatol.* 2014 Sep; 13 (3): 180 - 7
- [5] Ochi H, Tan L, Tan WP, Goh CL. Treatment of Facial Acne Scarring with Fractional Carbon Dioxide Laser in Asians, a Retrospective Analysis of Efficacy and Complications. *Dermatol Surg.* 2017 Sep; 43 (9): 1137 - 1143.
- [6] Ibrahim MK, Ibrahim SM, Salem AM. Skin microneedling plus platelet - rich plasma versus skin microneedling alone in the treatment of atrophic post acne scars: a split face comparative study. *J Dermatolog Treat.* 2017 Sep 26: 1 - 6.
- [7] Majid I, Imran S. Fractional CO 2 laser resurfacing as monotherapy in the treatment of atrophic facial acne scars. *J CutanAesthetSurg* 2014; 7: 87 - 92
- [8] Asif M, Kanodia S, Singh K. Combined autologous platelet - rich plasma with microneedling verses microneedling with distilled water in the treatment of atrophic acne scars: a concurrent split - face study. *J Cosmet Dermatol.* 2016 Dec; 15 (4): 434 - 443.
- [9] Anupama YG, Wahab AJ. Effectiveness of CO2 laser with subcision in patients with acne scars. *Cosmet Laser Ther.* 2016 Nov; 18 (7): 367 - 371.
- [10] Chandrashekar BS, Sriram R, Mysore R, Bhaskar S, Shetty A. Evaluation of microneedling fractional radiofrequency device for treatment of acne scars. *J CutanAesthet Surg.* 2014; 7 (2): 93 - 97.
- [11] Omi T, Kawana S, Sato S, Bonan P, Naito Z. Fractional CO2 laser for the treatment of acne scars. *J Cosmet Dermatol.* 2011 Dec; 10 (4): 294 - 300.
- [12] ThanyaTechapichethvanich. The effects of recombinant human epidermal growth factor containing ointment on wound healing and post inflammatory hyperpigmentation prevention after fractional ablative skin resurfacing: A splitface randomized controlled study. *J Cosmet Dermatol.* 2018; 1–6.
- [13] Alster TS, Graham PM. Microneedling: A Review and Practical Guide. *Dermatol Surg.* 2017 Aug 7
- [14] Qian H, Lu Z, Ding H, Yan S, Xiang L, Gold MH. Treatment of acne scarring with fractional CO2 laser. *J Cosmet Laser Ther.* 2012 Aug; 14 (4): 162 - 5
- [15] Nofal E, Helmy A, Nofal A, Alakad R, Nasr M. Platelet - rich plasma versus CROSS technique with 100% trichloroacetic acid versus combined skin needling and platelet rich plasma in the treatment of atrophic acne scars: a comparative study. *Dermatol Surg.* 2014 Aug; 40 (8): 864 - 73.