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A comparative study of efficacy of dermaroller versus fractional CO₂ laser for management of post acne scars

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Abstract

Background: Acne vulgaris is a chronic skin disease caused due to blockage and/or inflammation of pilosebaceous units in which lesions present as non-inflammatory, inflammatory or mixture of both. The inflammatory type, often results in distressing scars for which dermaroller therapy and fractional CO₂ laser have shown to be effective treatment modalities.

Material and Methods: This is a prospective, descriptive and hospital based study. Total of 140 cases were enrolled in study carried out for 1 year in the Department of Dermatology at tertiary health centre and medical college with subsequent follow up of up to six months. Patients with acne scars under the groupings of a score > 3 points on Global Acne Scarring Classification Scale were enrolled.

Results: Out of 140 patients, (70 - dermaroller group, 70 - CO₂ laser group) completed treatment and follow-up. Dermaroller therapy results indicated that the baseline was 23.43±6.32 and reduced to 13.23±3.65 after the treatment. This difference was found to be statistically highly significant with p value as <0.0001. On the other hand, the baseline and follow up after fractional CO₂ laser therapy was evaluated and the results indicated that the mean objective score before treatment was 23.95±6.85 and after treatment, it was 16.34±4.75. This difference was statistically highly significant p value <0.0001.

Conclusion: On comparing the efficacy of dermaroller therapy and fractional CO₂ laser in the treatment of post-acne scars, both were found to be efficacious while fractional CO₂ laser being more effective in treating severe acne scars than dermaroller therapy.

Keywords: Fractional CO₂ laser, dermaroller therapy, acne scars

Introduction

Acne vulgaris is the most inflammatory illness of pilosebaceous part occur in young persons and teenager which cause multiple troubling and hard to treat scars. It is a common condition with prevalence as high as 80% among adolescents and persists to adulthood^[1]. Scarring can be a complication of untreated acne due to skin injury through the mechanism of heals of skin. Two kinds found according to decrease or increase of collagen: atrophic plus hypertrophic. Atrophic one occurs due to decrease of collagen post inflammatory acne. There are three types-ice picks, rolling and boxcar^[2].

Scarring occur after acne is considered worrying difficulty. Severe scarring is associated with psychological distress, particularly in young adults, and often results in decreased self-confidence and diminished quality of life^[3]. Various treatment modalities are used for acne scars including not invasive and invasive procedures, noninvasive: (biochemical peels, retinoid topically, microdermabrasion) and small invasive: (lasers, small needle radiofrequency apparatus) and invasive: (surgery for acne scar, laser for ablation), each technique with benefits and difficulties^[4]. Treatment of acne scarring is a common indication for ablative lasers, more improvement is seen after CO₂ laser than other techniques. The fractional devices, both ablative and non-ablative, have been used for traditionally^[5].

The improvement in appearance of acne scars following fractional CO₂ laser is due to the combination of processes of healing that initiates new collagen deposition after ablation and collagen remodeling initiated by the zone of coagulation surrounding the ablated area. CO₂ lasers produce significant improvement at the cost of long recovery times and post-inflammatory hyperpigmentation^[6].

Dermaroller therapy is also known as Microneedling or Percutaneous Collagen Induction (PCI). And is used to treat several skin conditions, such as pigmentary disorders, wrinkles, post-acne atrophic scars and burn scars. Skin needling is thought to have a lower risk of post-inflammatory hyperpigmentation than other procedures and can be safely performed on all skin types. Due to the pain associated with microneedling, topical anaesthetic creams are often necessary [7].

Material and Methods

This is a prospective, descriptive and hospital based study. Total of 140 cases were enrolled in study carried out for 1 year in the Department of Dermatology at tertiary health centre and medical college with subsequent follow up of up to six months. Prior to the study, an institutional ethical committee clearance was obtained.

Inclusion Criteria

- Patients were either sex above the age of 18 years.
- Patients with acne scars under the groupings of a score > 3 points on Global Acne Scarring Classification

Table 1: Global acne scarring classification

Grade or Type	Number of Lesions 1 (1-10)	Number of Lesions 2(11-20)	Number of Lesions 3(>20)
Milder scarring (1 point each) Macular / erythematous / pigmented / Mildly atrophic / dish-like	1 point	2 points	3 points
Moderate scarring (2 points each) - Moderately atrophic - dish like - Punched out with shallow bases, small scars (<5mm) - Shallow but broad atrophic areas	2 point	4 points	6 points
C) Severe scarring (3 points each) - Punched out with deep but normal bases, small scars (<5mm) - Punched out with deep but abnormal bases, small scars (<5mm) - Linear or troughed dermal scarring - Deep, broad atrophic areas	3 point	6 points	9 points
D) Hyperplastic - Papular scars - Keloidal/Hypertrophic scars	2 points (Area < 5mm) 6 points	4 points (Area 5-20 cm ²) 12 points	6 points (Area > 20 cm ²) 18 points

Procedure

Patients who were using any topical treatments for acne or for scars were told to stop these medications at least 1 week before the start of fractional laser treatment or Dermaroller treatment. No concomitant cosmetic procedures were allowed between the sessions and no topical drugs were prescribed except sunscreens and topical antibiotic creams in the post-procedure period. After an informed consent was taken, a baseline photograph showing all the scars to be treated was taken using standard camera angle and light settings. Then, a topical anaesthetic cream containing a eutectic mixture of topical tetracaine and lignocaine in a cream base was applied for 1 hour on the treatment area to achieve a satisfactory anaesthetic effect. After satisfactory anaesthesia was achieved, the treatment area was cleaned with a mild cleanser followed by 70% ethanol solution.

Fractional CO₂ Laser

Fluence- 15-25 J/cm².

Densities- 100-150 MTZ/cm².

Energy- 40-45 mJ.

Scale.

Exclusion Criteria

- Patients with active acne.
- Patients with keloidal tendency.
- Pregnant and lactating women.
- Immuno suppressive diseases like HIV, diabetes, malignancy and chemotherapy.
- Concomitant isotretinoin use.
- Hypersensitivity to fractional CO₂ lasers.
- Patients who lost follow-up after initial visits and patients not willing to participate in study.

Study Method: Patients in group A were treated with 4 sessions of Dermaroller at monthly interval. Similarly, patients in group B will be treated with 4 sessions of fractional CO₂ laser at monthly interval. Follow-up was done at the subsequent visits on 1, 2, 3, 4 and 6th month.

Study Tools: Baseline photographs showing all the scars to be treated.

Ablation depth of 1.0-1.2 mm at each spot.

A single or double pass was used over each scar along with its margins. Each morphological type of scar was treated in a similar manner and the patient was advised skin cooling with icepacks for 5-10 minutes after the procedure. The laser parameters were kept identical at each visit.

Dermaroller

The area to be treated is anaesthetised with topical anaesthesia for one hour. After preparation of the area, rolling is done 15-20 times in horizontal, vertical and oblique directions, petechiae or pinpoint bleeding, which occurs is easily controlled. After treatment, the area is wetted with saline pads. The entire procedure lasts for 15 to 20 minutes depending on the extent of the area to be treated. Four treatments with Dermaroller were given at one-month interval for mild-to-moderate acne scars.

Digital photographs were taken using identical lighting, angle and face position settings at every follow up visit. The final assessment was made by a single observer at the last

followup visit, 6 months after the last laser session and a quartile grading scale was used to assess the response objectively. Adverse effects and recovery times were recorded in each session and visit. Finally, data was analysed and the results were confirmed.

Results

A total of 140 patients of acne scars were enrolled for this study from the outpatient Department of Dermatology, Venereology and Leprosy. The patients were randomly allocated into two groups of 70 patients each in which one group was treated with dermaroller and the other group was treated with fractional CO₂ laser.

Table 2: Distribution of age group of the patients

Age	Dermaroller Therapy		Fractional CO ₂ laser Therapy	
	Frequency	%	frequency	%
<= 20	3	4.3	2	2.8
21-25	23	32.8	25	35.8
26-30	25	35.7	30	42.8
31-35	18	25.7	12	17.2
>35	1	1.5	1	1.5
Total	70	100	70	100

In case of dermaroller treatment, it was seen that the majority of the patients were in the age group of 21 to 25 years and 26 to 30 years comprising 32.8% and 35.7% of each group respectively. Thus, on an aggregate together

Table 4: Objective assessment of patients in dermaroller group

Dermaroller Therapy	Frequency	Percentage
Satisfactory	8	11.4
Good	31	44.3
Very Good	26	37.1
Excellent	5	7.2
Total	70	100

In table 4, out of 70 patients treated with dermaroller, 8 patients had satisfactory response i.e. 0-25% improvement in point score, 26 patients had very good response i.e. 51-

they made up 68.5% of the total patients in the dermaroller group. On the contrary, the least number of patients were in the >35 years age group comprising 1.5%.

Similarly, age analysis of patients who underwent the fractional CO₂ laser resurfacing treatment showed that the majority of the patients belonged to the age group of 26-30 years (42.8%), followed by patients under the age group of 21-25 years (35.8%). Together it comprised 78.6%. This group had the least number of patients in > 35 years age group forming 1.5% in table 2.

Table 3: Comparison of gender distribution between Dermaroller Therapy and Fractional CO₂ Laser Therapy

Gender	Dermaroller Therapy		Fractional CO ₂ laser Therapy	
	frequency	%	frequency	%
Male	31	44.2	29	41.5
Female	39	55.8	41	58.5
Total	70	100	70	100

The two groups who underwent the dermaroller and fractional CO₂ laser resurfacing treatment were analyzed for male-female ratio. It was seen that 44.2% of the patients were male and 55.8% were females for the dermaroller treatment and in the case of fractional CO₂ laser resurfacing treatment the number of females who underwent the treatment was 58.5% as compared to males who were 41.5% (Table 3).

Table 5: Objective assessment of patients in Fractional CO₂ laser group

Fractional CO ₂ laser	Frequency	Percentage
Satisfactory	1	1.5
Good	24	34.2
Very Good	36	51.4
Excellent	9	12.9
Total	70	100

In table 5, out of 70 patients treated with fractional CO₂ laser, 01 patients had satisfactory response i.e. 0-25% improvement in point score, majority of patients had very good response 36 i.e. 51-75% improvement in point score,

75% improvement in point score, majority of the patients i.e. 31 patients had good response (26-50% improvement in point score) and 5 patients had an excellent response.

24 patients were in the good response category (26-50% improvement in point score) and 9 patients had excellent results.

Table 6: Comparing baseline mean objective score with follow up after DT

Therapy	Baseline	After 6 Months	After 6 Months
Dermaroller Therapy (Mean SD)	23.43±6.32	13.23±3.65	<0.0001
Fractional CO ₂ laser Therapy (Mean SD)	23.95±6.85	16.34±4.75	<0.0001
P value	0.075	0.016	

The objective score was calculated for Dermaroller therapy, and the results indicated that the baseline mean objective score which was 23.43±6.32 was reduced to 13.23±3.65 after the treatment. This difference was found to be

statistically highly significant with p value as <0.0001. On the other hand, the objective scores for the baseline and follow up after fractional CO₂ laser therapy was evaluated and the results indicated that the mean objective score

before treatment was 23.95 ± 6.85 and after treatment, it was 16.34 ± 4.75 . This difference was statistically highly significant p value < 0.0001 in table 6.

Discussion

Acne scarring occurs subsequent to visible resolution of deep inflammation. Scarring may occur regardless of the severity of acne. Although, acne scarring is likely to be associated more often with nodulocystic acne, it may occur in cases with only superficial forms of acne as well, especially when effective treatment is delayed^[8]. A study showed that approximately 16% of patients with acne seek proper treatment and among those seeking such help, 74% wait greater than 12 months, 12% wait for 6 to 12 months, 6% wait for 6 months and only 7% wait for less than 3 months to be seen professionally for therapy of their acne^[9]. In our study, most of the patients were 26-30 years this scar become deteriorated. This also agreed by another study showed that the atrophic component of the scar is emphasized by premature facial capacity changes and understated laxity of skin after age 25 or 35 years^[10]. Gender was another factor related to the general characteristics of acne scar that was studied in this work, as these results revealed, women were more frequently presented to the dermatologist with acne scar than males. These results met in line with a comparable gender distribution by many authors, all reported an overall prevalence rates more in females than males in all age group^[11, 12].

In dermaroller, 11.4% patients had satisfactory response i.e. up to 25% improvement in point score, 37.1% patients had very good response i.e. 51-75% improvement in point score, majority of the patients i.e. 44.3% patients had good response (26-50% improvement in point score) and 7.2% had excellent response i.e. $> 75\%$ improvement in point score. In fractional CO₂ laser, again 1.5 % patients had satisfactory response i.e. upto 25% improvement in point score, majority of the patients 51.4% had very good response i.e. 51-75% improvement in point score, 34.2% patients were in the good response category (26-50% improvement in point score) and 12.9% of patients showed excellent improvement in point score. Similar result was seen according to Abel F study^[13].

On comparing the improvement in two modalities it is evident that both the methods are almost equally efficacious in reduction of post acne scars, but fractional CO₂ laser treatment showing better efficacy in severe scars. The percentage reduction achieved by fractional CO₂ laser was higher for severe scars, compared to dermaroller therapy and the difference was found to be statistically significant. These results were confirmed by study of Chawla, 2014 indicating that fractional CO₂ laser treatment is a new treatment for post acne scars it is better^[14]. The good degree of improvement after CO₂ laser resurfacing was attributed to its mode of action which incorporate tissue removal, prompt collagen shrinkage, and remodeling of dermal collagen. Columns of miniscule ablated epidermis and dermis after treatment with fractional CO₂ laser may lead to visible epidermal healing as confirmed by clinical improvement of scar and skin texture^[15, 16].

Limitation of the study

The small sample size of the study, there is a need to have a large sample-sized study with a relatively long-term follow up of the patients focusing different types of scars and duration.

Conclusion

It is important to realise that a typical patient has scars of different morphological types and grades and it is difficult to treat all these scar types satisfactorily with a single treatment option and multiple techniques are required. However, of all the treatment options available to treat post-acne scars, fractional photothermolysis is probably the only monotherapy that offers the highest degree of scar amelioration and patient satisfaction. In summary, fractional CO₂ laser resurfacing method is more effective method for the treatment of severe acne scars than derma roller as indicated by the statistical analysis

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