

Fractional Co2 V/s Microneedling in the treatment of acne scars

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ABSTRACT

INTRODUCTION

Acne is a long-lasting inflammatory condition of the skin's hair follicles and oil glands. It is identified by comedones, inflammatory papules, pustules, and occasionally, nodules and cysts. Scarring that occurs as sequelae, is permanently disfiguring, both physically as well as psychologically. Multiple techniques are often required in combination to achieve the best results for managing acne scars, as there is no single ideal procedure or set algorithm. So, we decided to undertake this study to evaluate acne scar patients and compare the results of the existing two modalities, Fractional Carbon Dioxide Laser and Microneedling, in treating acne scars.

AIM

To observe and compare the efficacy and safety of fractional carbon dioxide laser and micro needling in the treatment of atrophic acne scars

MATERIALS AND METHODS

The patients were randomly allocated to the following two regimens:

Group A: Treated with Fractional Carbon Dioxide Laser (4 sittings) [25 patients]

Group B: Treated with Microneedling (4 sittings) [25 patients]

Each sitting was done at 4-week intervals.

❖ Pre-treatment and post-treatment Goodman Barron score was recorded.

Patients were followed up regularly every 3 weeks for 3 months and then monthly for another 3 months.

RESULTS

Among the 50 patients, the most common age group was 21-30 years (78%) and males exceeded females (1.77:1). Majority of patients (46%) had acne scars for 4+ years with cheeks being the predominant site followed by temples. Predominantly rolling and boxcars were present in all the patients. In patients treated with fractional carbon dioxide laser, the pre-procedure Goodman Baron score was 3.6 while the post-procedure was 2.72 whereas in the other group, the change in the score was from 3.56 to 2.84. P value was highly significant when

comparing the pre-and post-procedure scores but nonsignificant when comparing the 2 modalities.

CONCLUSION

In conclusion, we can infer that clinical improvement in both groups is almost the same and their difference is statistically insignificant.

Among other factors, age, type, and duration of scars, impact the final outcome while the grade of scars at presentation does not affect the outcome, according to my study.

Keywords – Acne scar, Microneedling, Co2 laser

INTRODUCTION

Since, time immemorial, humans being social animals, have been concerned about how they look, and to obtain a clear and smooth complexion, man has been experimenting. Millions of dollars are spent on cosmetics and cosmetology, every year.

Acne being a chronic inflammatory disease of the pilosebaceous unit, is clinically characterized by the presence of comedones, inflammatory papules, pustules, and sometimes, nodules and cysts arising commonly during adolescence, which can cause great psychosocial stress to the individual. Also, adolescence is the age when people are most concerned about their looks, hence the impact.

Scarring occurs as a result of damage to the skin during the healing of active acne, while acne is a transitory disease, scarring that occurs as a sequela, is permanently disfiguring, both physically as well as psychologically.

Since acne scarring is highly prevalent, and there are strong negative emotions about it in the affected patients, clearance of scars is the first and foremost request of acne patients. There are many therapeutic options available, both invasive and non-invasive methods. Still, unfortunately, none of them, even the most expensive ones, can achieve the goal of complete improvement without any side effects. There has been a constant search for the most effective and least invasive intervention.

Understanding the basic pathogenesis of acne and the various types of acne scars is essential to optimize the surgical treatment of acne. As there is no single, ideal procedure; multiple techniques are often required in combination to get the best results, yet there is no set algorithm for the management of acne scars. Various modalities are undertaken depending on the choice, financial status, coexisting pathologies, expertise of the treating physician, and the desired results.

Although a lot is and has been done in the cosmetic field for acne scars, there is still a scarcity of published data.

So, we decided to undertake this study to evaluate acne scar patients and to compare the results of existing two modalities that is Fractional Carbon Dioxide Laser and Microneedling in the treatment of acne scars.

MATERIAL & METHODOLOGY

This study was carried out in the Department of Dermatology, Venereology, and Leprology in a tertiary care hospital over a period of 2 years.

50 patients who were coming to treat the atrophic acne scars were observed and studied.

Inclusion Criteria

- Clinical diagnosis of moderate or severe atrophic acne scar, only boxcar and rolling type of atrophic acne scars will be enrolled for the study.
- Patient willing for the treatment
- Patients in the age group of 20-45 years.

Exclusion Criteria

- Previous h/o of photosensitivity or photosensitive disorders like SLE
- Use of drugs that may induce hyperpigmentation such as amiodarone, clofazimine, and minocycline.
- Pregnancy and lactation.
- Use of oral isotretinoin in the last 6 months
- H/o surgery or laser treatment in the last 6 months
- Herpetic infections or warts or any other active infection of adjacent skin
- Coagulopathies
- Presence of active acne
- Drug/cosmetic allergy
- H/o smoking, tobacco, alcohol drinking
- H/o thyroid, diabetes, hypertension, asthma
- H/o keloid formation
- Patient not giving consent
- Patients with unrealistic expectations.
- Patients who had taken therapy for acne scars in the past.

Consent:

- Written informed consent of each patient was taken.
- All patients were counseled about modalities of treatment available; thoroughly explained about outcome and complications of treatment offered.
- Photographs of each patient before initiating the treatment as well as at every follow-up were taken in proper illumination after consent.

Methods:

The patients were randomly allocated to the following two regimens:

Group A: Treated with Fractional Carbon Dioxide Laser (4 sittings) [25 patients]

Group B: Treated with Microneedling (4 sittings) [25 patients]

Each sitting was done at 4-week intervals.

- ❖ Each patient was subjected to a detailed relevant clinical history regarding the lesions' onset, duration, symptoms, and severity.
- ❖ Past history of any medication was asked.
- ❖ The skin type (according to Fitzpatrick's classification) of each patient was assessed.
- ❖ Scarring was assessed and divided into:
 1. Rolling scars
 2. Boxcar scar
 3. Pigmented atrophic macules
- ❖ Pre-treatment and post-treatment Goodman Barron score was recorded.
- ❖ Strict photoprotection was advised after each procedure.
- ❖ Patients were followed up regularly every 3 weeks for 3 months and then monthly for another 3 months.
- ❖ All the other concomitant treatments were withheld.

MICRONEEDLING

Desmond Fernandes designed a special Percutaneous Collagen Induction tool consisting of a rolling barrel with microneedles at regular intervals. ⁱ Based on the principles of Electroridopuncture which uses an acupuncture needle and galvanic current to directly stimulate scarred and ageing tissue to induce neo-collagenosis.

Pathophysiology: ⁽²⁾

Percutaneous Collagen Induction results from the natural response to wounding of the skin, even though the wound is minute and mainly subcutaneous. When a needle penetrates the skin, it causes localized damage and bleeding by rupturing the blood vessels. A completely different picture emerges when thousands of fine pricks are placed close to each other. This promotes the normal wound healing that occurs in three phases. ^(3,4,5)

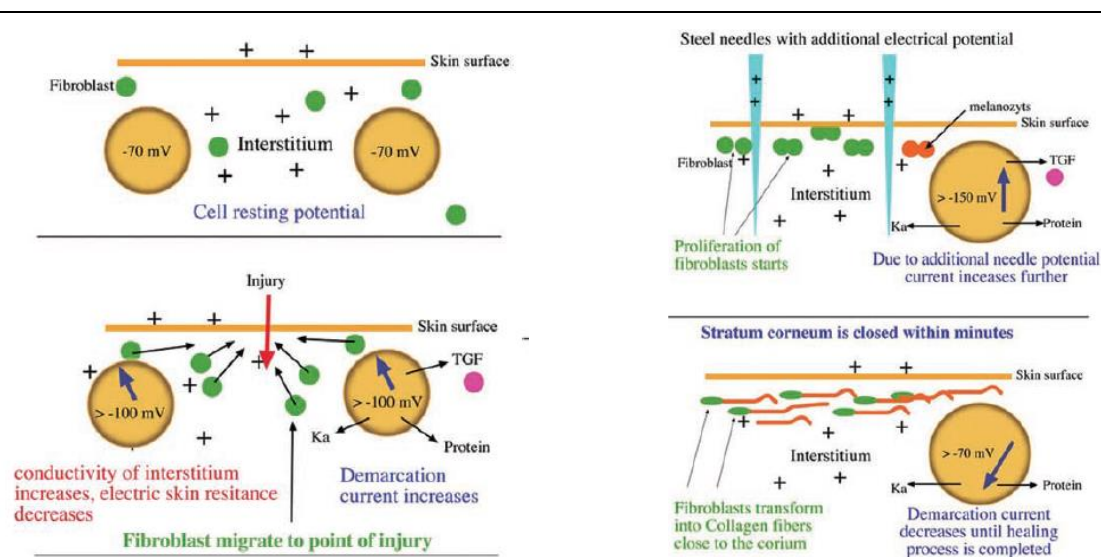
Phase 1 (Inflammation phase): Starts soon after the injury. The platelets have been activated by exposure to thrombin and collagen, they release numerous cytokines.

Phase 2 (Proliferation): After 5 days of skin needling, neutrophils are replaced by monocytes.

Phase 3 (Tissue remodelling): Mainly done by fibroblasts and continues for months.

A new theory suggests that bioelectricity, also known as demarcation current, triggers the growth factors necessary for maturation. When stainless steel microneedles puncture the skin, they create small wounds that prompt cells to react with a demarcation current. This current is further intensified by the needles' own electrical potential. Recent research has revealed that living cells have a resting electrical potential of -70 mV, with the interior being negatively charged and the surface positively charged. The electrical potential is influenced by transport mechanisms and can quickly increase to -100 mV or higher when a single acupuncture needle approaches the cell. This electrical potential difference is typical during the wound-healing process ⁽²⁾.

FIGURE 1: ADAPTED FROM TEXTBOOK, ACNE SCARS CLASSIFICATION AND TREATMENT, FIRST EDN, CHAP-9, P.60.



Cell resting potential before and after an injury

Activation of "Demarcation Currents" induced by stainless steel micro-needles induces fibroblasts' proliferation followed by synthesis of new collagen in the upper dermis

Procedure:

The skin is disinfected, and topical EMLA cream is applied. For treating acne scars, the professional device used has a rolling barrel 20 mm wide with 192 needles in 8 rows. The needles used should have a length of 1.5 mm and a diameter of 0.25 mm. Depending on the pressure applied, they penetrate the scar tissue between 0.1 and 1.3 mm. Rolling the device involves moving it with some pressure, 4 times in 4 directions: horizontally, vertically, and diagonally right and left. This ensures an even pricking pattern, resulting in about 250 to 300 pricks per square centimetre. Because the needles are set in a roller, every needle initially penetrates at an angle and then goes deeper as the roller turns. Finally, the needle is extracted at the converse angle, resulting in curved tracts that reflect the path of the needle as it rolls into and then out of the skin, for about 1.3 mm into the dermis. The epidermis and particularly the stratum corneum remain "intact," except for these tiny holes, which are about four cells in diameter. The treatment times can vary from 10 to 60 minutes, depending on the size of the area being treated ⁽⁶⁾.

FIGURE 2



DERMAROLLER



MICRONEEDLING PROCEDURE



IMMEDIATELY POST PROCEDURE

Post-Treatment Care

Day 1 and 2: The tissue may have slight to moderate swelling and may be tender, red, and bruised, with a slight lymph discharge from the treated areas. Minor itching, may exhibit the appearance of “cat scratches.”

Day 3: The treated areas slightly crust and remain faintly pink to red.

Day 4–5: The redness and crusting have diminished.

Day 5–7: There is barely any evidence of a procedure.

Results

Generally, start to be seen after about 6 weeks but the full effects can take at least 3 months to occur and as the deposition of new collagen takes place slowly, the skin texture will continue to improve over a 12-month period.

Aust et al. showed a considerable increase in collagen and elastin deposition at 6 months postoperatively. The epidermis demonstrated 40% thickening of stratum spinosum and normal rete ridges at 1 year postoperatively. ⁽⁷⁾

The number of treatments required varies depending on the individual collagen response on the condition of the tissue, most individuals will require around 3 treatments approximately 4 weeks apart, 2-6 treatments be needed.

LASERS

Rapid technological advancement has taken place in the field of lasers and light devices over the past decade, allowing better and safer treatments. Laser and light devices ⁽⁸⁾ used in acne scars are as follows:

FIGURE 3

Laser, light device and wavelength	Chromophore and mode of action	Clinical application
CO ₂ laser 10600 nm ablative and fractional CO ₂	Water, nonselective tissue ablation, thermal damage and collagen shrinkage	Grade 4 atrophic and hypertrophic scars
Er:YAG 2940 nm ablative and fractional Er:YAG	Water, nonselective ablation, minimal thermal damage	Grade 2–3 atrophic and hypertrophic scars
Er: Glass 1540/1550 nm nonablative fractional	Water, nonablative, columns of thermal damage in dermis	Grade 1–2 atrophic and hypertrophic acne scars
1320/1440 nm nonablative fractional	Water, nonablative, columns of thermal damage in dermis	Grade 1–2 atrophic and hypertrophic acne scars
Pulse dye laser 585 nm	Selective photothermolysis; oxyhemoglobin	Hypertrophic scars and keloids
IPL	Selective photothermolysis; hemoglobin, melanin	Hypertrophic scars, erythematous and hyperpigmented macular scars
Nd:YAG 1064 nm	Hemoglobin, water	Grade 1 atrophic scars
Diode 1450 nm	Water	Grade1 atrophic scars

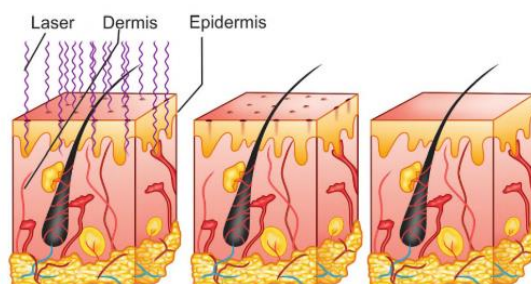
Laser resurfacing includes devices employing ablative, non-ablative, and fractional ablative technologies. The three approaches differ in their method of thermal damage, varying degrees of efficacy, downtime, and side effect profiles.

Fractional photothermolysis for acne scars:

Fractional photothermolysis is a technology developed by Anderson and Manstein that removes fractions of skin instead of wiping away the entire layer. ⁽⁹⁾

FP treats only fractions of the skin by inducing small three-dimensional zones of thermal damage, referred to as “Microscopic Thermal Zones” (MTZs). The surrounding tissue is not involved, which allows fast epidermal repair via migration of the surrounding viable cells, hence the name fractional. Depending on the chosen parameters of energy per MTZ and the density of MTZs per square centimetre, anywhere from 3-40% of the skin can be covered with each treatment. The MTZs are usually smaller than 400um in diameter and can penetrate the skin to varying depths of up to 1,300 um; depending on the wavelength, pulse energy, and the device chosen. As the energy of each spot increases, the size/diameter of the MTZ increases, as well as the penetration depth. Thus, energy is chosen based on the desired depth of the treatment. ⁽¹⁰⁾

FIGURE 4: Principle of Fractional Carbon Dioxide Laser (From textbook Step by Step Treatment of Acne Scars by Niti Khunger)



The benefits of fractional resurfacing include faster recovery time and lower rates of complications compared with traditional laser resurfacing.

Carbon dioxide laser: Skin resurfacing with the CO2 laser remains the gold standard technology for production of the most dramatic clinical and histologic improvement in severely photo-damaged and scarred facial skin ⁽⁸⁾. By producing a wavelength of 10,600 nm; laser penetrates upto approximately 30 um into the skin by absorption and vaporisation of water containing tissue. Use of the CO2 laser for skin resurfacing yields an additional benefit of collagen tightening through heating of dermal collagen. The triple helical structure of collagen is altered resulting in the shortening of fibres by one third ⁽¹¹⁾. Persistence of this collagen contraction results in part from these shortened fibres serving as a scaffold for neo-collagenesis. Beyond this time, wound healing and fibroblasts upregulation of immune modulating factors leading to persistent collagen remodelling may explain continued clinical improvement upto 1 year after the procedure.⁽¹²⁾

Adverse effects of ablative lasers: ⁽¹³⁾

IMMEDIATE	LATE
<ul style="list-style-type: none"> • Transient erythema • Localised edema • Pruritus 	<ul style="list-style-type: none"> • Prolonged erythema • Pigmentary changes • Milia, Acne • Infection • Hypertrophic scars

Procedure:

- ❖ Topical anesthetic cream was applied for 45 minutes then skin was disinfected with betadine and spirit solution followed by cleansing with Normal Saline.
- ❖ Eye protection was provided with eye shield.
- ❖ Patients were treated with Point Energy -10mj, Power 10-12W, Pulse-duration 1-1.3 ms, Interval – 1ms, Distance 0.2-0.4mm, Mode – Normal with spot size - 0.1x0.1mm - 20x20mm (variable according to the patient's scar).

FIGURE 5



Post procedure care:

- ❖ For all patients, Topical Fusidic acid 2 % cream was applied over treated area; antibiotics [Tablet Azithromycin (500 mg) 1 OD] and anti-inflammatory drug [Tablet Ibuprofen (400 mg) 1 BD] for 3 days were given along with topical sunscreen.
- ❖ All patients were followed up 1 week post procedure. Next sitting was done after 4 weeks interval.
Patients were advised to avoid the use of scrubs, loofahs or any such abrasive cleansers and to avoid sun exposure for a week to prevent postinflammatory hyperpigmentation.

Results:

Results were evaluated on the basis of:

- Objective assessment using Goodman Barron Score (Qualitative):
 - Excellent: reduction in score by 2 from pretreatment value.
 - Good: reduction in score by 1 from pretreatment value.
 - Poor: no reduction in score.
- Clinical improvement in % was documented by standardized photographs at 2 months and 6 months after completion of treatment.
- Subjective assessment using 6-point Visual Analogue scale (each patient was asked to grade between 0 to 6 as per his/her satisfaction with 0 being no satisfaction at all and 6 being complete satisfaction).
0-2: Poor.
3-4: Good.
5-6: Excellent.

RESULTS

The total number of patients in the study was 50.

The patients were randomly divided into two groups.

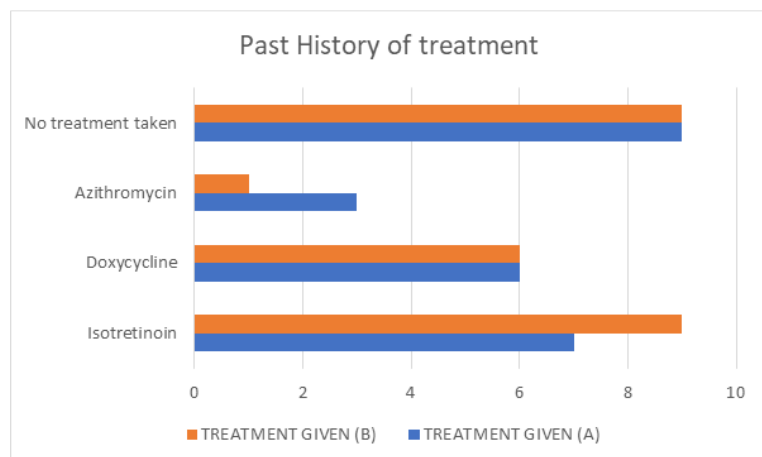
Group A was given 4 sittings of Treatment A which is a Fractional Carbon Dioxide Laser at intervals of 4 weeks.

Group B was given 4 sittings of Treatment B which is Microneedling at intervals of 4 weeks.

Table 2. AGE-WISE DISTRIBUTION OF ACNE SCAR PATIENTS

Age Range	TREATMENT GIVEN (A)	TREATMENT GIVEN (B)	TOTAL
21 – 30	18 (36%)	21 (42%)	39 (78%)
31 – 40	6 (12%)	4 (8%)	10 (20%)
41- 50	1 (2%)	0	1 (2%)

Out of 50 patients, 32 that is 64 percent were males and 18 that is 36 percent were females. Both groups A and B have same sex distribution that is 16 males and 9 females each. The male-to-female ratio is 1.77:1

FIGURE 6: DISTRIBUTION OF PATIENTS ACCORDING TO PAST HISTORY OF TREATMENT

32 that is 64 percent of the patients had taken treatment for their acne; of them, 16(32%) of the patients had taken Isotretinoin, followed by 12 (24%) of the patients who had taken Doxycycline and 4 (8%) of the patients had taken Azithromycin. 18 patients that is 36 percent had not taken any treatment.

4 that is only 8% of the patients presented within 1 year of development of acne scars, 13 patients (26 percent) presented after 1 but within 2 years, 10 patients had a history of acne scars for 2-3 years while the majority is 23 patients (46%) presented after 4 years or more.

Table 3: GRADING OF SCARS (QUALITATIVE GOODMAN BARON SCORE)

Grade	No of patients	% of patients
1	0	-
2	1	2%
3	19	38%
4	30	60%

54 percent of the 50 patients had rolling and boxcar scars, while 36 percent only had rolling scars and 10 percent only had boxcar scars.

Table 4: MEAN PRE AND POST PROCEDURE GOODMAN BARON SCORE

TREATMENT GIVEN	Mean Pre-Procedure GBS	Mean Post Procedure GBS	P value
TREATMENT GIVEN (A)	3.6 ± 0.5	2.72 ± 0.67	0.0001 (<0.01)

TREATMENT GIVEN (B)	3.56 ± 0.5	2.84 ± 0.98	0.0001 (<0.01)
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Degree of freedom for each group = 24

However, on comparing the improvement of mean GBS of both the groups with each other, p-value is 0.6, that is non-significant.

FIGURE 7: COMPARISON OF RESULT BY PERCENTAGE OF IMPROVEMENT AS RECORDED BY PHYSICIAN

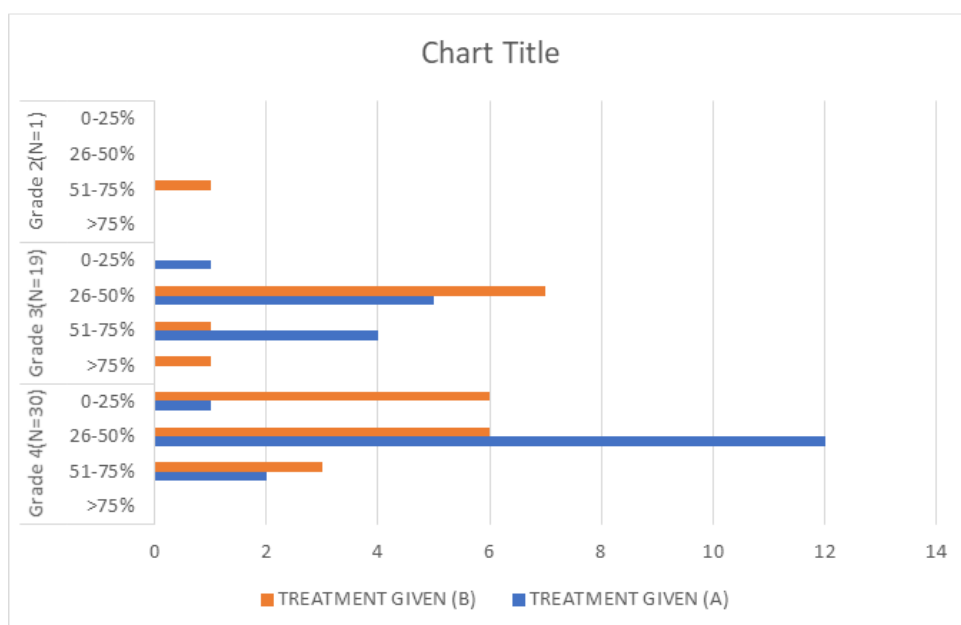


Table 5: PATIENT RESPONSE ON VISUAL ANALOGUE SCALE

Patient Satisfaction (6-point scale)	TREATMENT GIVEN (A)	TREATMENT GIVEN (B)	TOTAL
1 to 2 (not satisfied)	1 (4%)	6 (24%)	7 (14%)
3 to 4 (moderately satisfied)	22 (88%)	15 (60%)	37 (74%)
5 to 6 (highly satisfied)	2 (8%)	4 (16%)	6 (12%)
TOTAL	25	25	50

In Group A, out of 25 patients, 1 patient (4%) was not satisfied with the treatment, the majority that is 22 patients (88%) were moderately satisfied, while only 2 patients (8%) were highly satisfied.

In Group B, out of 25 patients, 6 patients (24%) were not satisfied with the treatment, a majority that is 15 patients (60%) were moderately satisfied, while 4 patients (16%) were highly satisfied.

Mean score in group A = 3.5 ± 0.71

Mean score in group B = 3.36 ± 1.0

On applying the paired t-test, on the mean value of patient satisfaction score, between the two groups, p-value = 0.52, which is not significant, degree of freedom taken was 48.

Change in 2 points of change of GBS was recorded as excellent while change by one point was recorded as good and no change in point was recorded as poor

FIGURE 8: CHANGE IN QUALITATIVE GOODMAN BARON SCORE PRE AND POST PROCEDURE

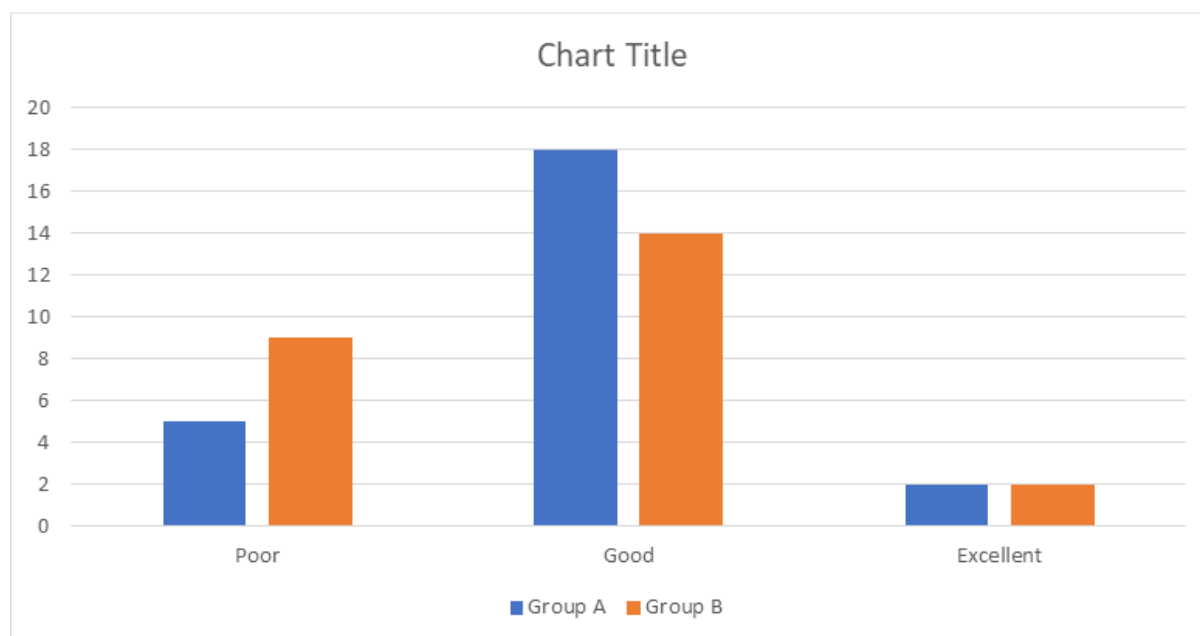


Table 6: EFFECT OF GRADE OF SCARS ON RESPONSE

Pre-Procedure GBS	Grade of acne scars		
	4(n=30)	3(n=19)	2(n=1)

Response (Poor)	10(33%)	4(21%)	0
Response (Good)	18(60%)	13(68%)	1(100%)
Response (Excellent)	2(7%)	2(11%)	0

Table 7: COMPLICATIONS SEEN IN GROUP A

COMPLICATIONS	TREATMENT GIVEN (A)
Transient edema, erythema, scabbing, and exfoliation < 7 days	N=87(87%)
Reversible post-inflammatory hyperpigmentation	N=1(1%)
Flare-up of Acne	N=4(4%)
Erythema, scabbing, and exfoliation > 7 days	N=8(8%)
Transient erythema, flare-up of acne	2(2%)

Table 8: COMPLICATIONS SEEN IN GROUP B

COMPLICATIONS	TREATMENT GIVEN (B)
Transient pain, burning sensation, erythema <5 days	N=96(96%)
Pain, burning sensation, erythema >5 days	N=4(4%)
Periporitis	N=1(1%)

DISCUSSION

There are numerous surgical as well as nonsurgical techniques available for acne scar modulation. They range from simpler and cheaper chemical peelings to expensive lasers. This study was conducted to compare two of the modalities, Fractional Carbon Dioxide Laser and Microneedling.

The most common age group involved in the present study was between 21-30 years (78%), followed by 31-40 years (20%), and only one patient of 41-50 years (2%). The mean age at presentation in the present study was 27.07 years. The mean age in the study by S. Dogra et alⁱ (14) is 25.47 years, which is almost comparable to our study. Similarly in a study by Hassan et alⁱ (15), the mean age of the patients was 25.07 years with a standard deviation of 2.95 years and regarding age distribution, most patients 37 (52.9 %) were in age group of 26-30. The younger population is more likely to be concerned with their facial appearance.

In the present study, out of 50 patients, 32 (64%) were males and 18 (36%) percent were females. The male-to-female ratio is 1.77:1. In a study by Hassan et al⁽¹⁵⁾, of the 70 patients enrolled in the study, 39 (55.7 %) were males and 31 (44.3 %) were females. However, in the study by S. Dogra⁽¹⁴⁾ et al, among 36 patients, 26 were female and 10 male patients. Females are more concerned about facial aesthetics than males, but the reverse ratio in our study could be attributed to the severe scarring in males, more access to health services among the male population, exclusion of pregnant and lactating females, and the relative unwillingness to undergo invasive procedures among females.

32 that is 64 percent of the patients had taken treatment for their acne; of them, 16(32%) of the patients had taken Isotretinoin, followed by 12 (24%) of the patients who had taken Doxycycline and 4(8%) of the patients had taken Azithromycin. 18 patients that is 36 percent had not taken any treatment.

4 that is only 8% of the patients presented within 1 year of development of acne scars, 13 patients (26 percent) presented after 1 but within 2 years, 10 patients had history of acne scars for 2-3 years while majority that is 23 patients (46%) presented after 4 years or more. Thus, a very few percentages of people seek early treatment, early treatment results in better response. 30 (60%) patients had grade 4 scarring at the time of presentation; 19(38%) had grade 3 scarring while grade 2 scarring was seen in 1(2%) patient. In the study by S. Dogra et al.¹⁰², moderate and severe grade scarring was seen in 16 and 14 patients, respectively. Our results are in concordance with a study by G. Faghihi⁽¹⁶⁾ et al, who noticed grade 4 among 14(44%), grade 3 scarring among 17(53%) and grade 2 scarring among 1(3%). Thus, most patients who seek treatment have moderate to severe scarring.

In group A that is patients treated with Fractional Carbon Dioxide Laser the mean pre procedure was 3.6 while post procedure it was 2.72. In group B that is patients treated with Microneedling, the mean pre procedure GBS was 3.56 and post procedure mean GBS was 2.84. By Paired t-test, in both the groups, on comparing mean GBS, pre and post procedure, the p value is 0.0001($p < 0.01$), that is highly significant. However, on comparing the improvement of mean GBS of both the groups with each other, p- value is 0.6, that is non-significant. Thus, we can infer that while both the modalities are efficacious in treating atrophic acne scars, the difference in their efficacy is not statistically significant. These results are in concordance with similar studies, like study by S. Dogra et al⁽¹⁴⁾, in which

patients treated with microneedling, mean acne scar assessment score decreased from 11.73 to 6.5, the difference from baseline was statistically significant ($P < 0.05$).

Patients treated with Fractional Carbon Dioxide laser, at the end of 6 months, after completion of treatment, by physician assessment, the improvement recorded was <25% in 2 patients (8%), 26-50% in 17 patients (68%), 51-75% in 6 patients (24%), >75% in none of the patients. In a study, by A. Badheka⁽¹⁷⁾ et al, among 15 patients, 2 patients (13.33%) showed >75% improvement, 5(33.33%) patients showed 51-75%, 5 (33.33%) patients showed 26-50% improvement, while 3 patients (20%) showed <25% improvement. Thus, we can say that with Fractional Carbon Dioxide Laser, majority show moderate efficacy (26-75%).

In group B, that is patients treated with Microneedling, at the end of 6 months, after completion of treatment, by physician assessment, the improvement recorded was <25% in 6 patients (24%), 26-50% in 13 patients (52%), 51-75% in 5 patients (20%), >75% in 1 patient (4%). In

study by S. Dogra et al ⁽¹⁴⁾, who recorded, 50–75% improvement in majority patients and >25% improvement in all patients. Our assessment was slightly on the lower side, with about a quarter of patients, who showed less than 25% improvement and majority showed 26-50% improvement only.

Mean VAS score in group A was 3.5 ± 0.71 and mean VAS score in group B = 3.36 ± 1.0 . On applying paired t test, on the mean value of patient satisfaction score, p value = 0.52, that is not significant, implying that there is no difference in patient satisfaction among the two groups. In a study by Manuskiatti et al ⁽¹⁸⁾, of 13 patients treated with 3 sittings of Fractional Carbon Dioxide Laser, 5/13 (38.4%) rated themselves as having >75% improvement, 6/13 (46.2%) rated themselves as having 50-75% improvement while 2/13 (15.4%) rated themselves as having 25-50% improvement. Their patient satisfaction rate is slightly higher than as seen in group A of present study. In study by S. Dogra et al ⁽¹⁴⁾, in patients treated with microneedling, assessment of the treatment based on VAS score, four patients (13.3%) reported “excellent response”, 20 patients (66.6%) stated “good response”, and six (20.0%) reported response as poor after having five sittings of dermaroller, all these results are comparable with the results seen in Group B of our study.

On measuring the response by change in Qualitative Goodman Baron scale, in Group A, out of 25 patients, patients (20%) showed poor response, majority that is 18 patients (72%) showed good response, while only 2 patients (8%) showed excellent response. In Group B, out of 25 patients, 9 patients (36%) showed poor response, majority that is 14 patients (56%) showed good response, while only 2 patients (8%) showed excellent response. In a study by Cho et al ⁽¹⁹⁾, among 20 patients treated with Fractional Carbon Dioxide Laser, 3 months after the last treatment revealed that one patient (5.0%) had excellent response, sixteen (80%) showed good response, and three (15.0%) showed poor response. Their results are similar to as seen in group A of present study. In a study by Sharad et al ⁽²⁰⁾, the mean improvement in scars in 15 patients treated with Microneedling was 31.33% that is fair to good response, which is comparable to group B in the present study.

In patients with scars with <1 year duration, among 4 patients, 2(50%) showed excellent response, with 1–2-year duration, among 13 patients, 1(7.7%) showed excellent response, with 2–3-year duration, among 10 patients, 6(60%) showed good response, patients with scars with 3-4 year duration, among 6 patients, 5(83.3%) showed good response, and in patients with scars of >4 year duration, among 17 patients, 7(47%) showed good response, while 9(53%) showed poor response and none showed excellent response. On applying chi-squared test, $p=0.011(<0.05)$, we can say that as the duration of scars increases, the likelihood of better response decreases.

In patients with grade 4 scarring, among 30 patients, 2(7%) showed excellent response, with grade 3 scarring, among 19 patients, 4(21%) showed excellent response and in a single patient with grade 2 scarring, a good response was seen. Applying the chi-squared test, to the above data, $p=0.57$, non-significant, we can infer that the initial scar grade does not alter the outcome. Similarly, Fabbrocini et al. ⁽²¹⁾, in their study of 32 patients, found that the scar grade at presentation does not affect the outcome.

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Figure 9



Pre-Treatment



Post Treatment

Figure 10



Pre-Treatment



Post Treatment

Figure 11



Erythema persisting for 1 week



POST INFLAMMATORY
HYPERPIGMENTATION AFTER
TREATMENT A

REGIMEN B

Figure 12



Pre-Treatment



Post Treatment



ERYTHEMA FOLLOWING MICRONEEDLING WHICH RESOLVED IN 1 WEEK