

Efficacy of fractional radiofrequency in management of acne scars: A Retrospective study

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Abstract

Background: There are various treatment modalities like chemical peeling, subcision, laser resurfacing with CO₂ laser, ErYAG laser are available for treatment of acne scars. Ablative lasers are most effective but associated with drawback of hyperpigmentation in type IV and V i.e. Indian skin types. The fractional radiofrequency (FRF) system have reported to cause dermal regeneration with minimal epidermal changes. This study was designed to assess efficacy of FRF in treatment of acne scars. **Aims:** This study is to assess efficacy of FRF for treatment of acne scars. **Methods and Material:** Thirty-one patients with acne scars received three treatments with FRF at the interval of 4 weeks. Acne scar assessment was done with Goodman and Baron's grading (GBG) and Echelle d'Evaluation Clinique des cicatrices (ECCA) system on pre and post treatment photographs taken at first visit and one month after the last treatment. **Statistical analysis used:** Wilcoxon signed rank test. **Results:** The results were assessed quantitatively by GBG showed improvement of 23 (63.8%) patients from grade 3 to grade 1 and 6 (75%) patients from grade 4 to grade 2. Thus 20 patients (64%) patients showed improvement by 2 grades. Median GB score improved from 18 to 8 and median EACC score improved from 45 to 20 after the treatment which are statistically significant on applying Wilcoxon signed rank test. No significant adverse effects like post inflammatory hyperpigmentation were seen. **Conclusions:** FRF is effective for treatment of moderate to severe acne scars. **Key words:** fractional radiofrequency, acne scars, lasers, non-ablative lasers.

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INTRODUCTION

Acne is common in adolescents. Acne is present in various grades of severity of grade 1 to grade 4. The most unwarranted sequelae of acne are acne scarring.¹ Acne may cause scarring even in mild grades of acne. The incidence rate of acne scars is 11-90% in men and women as reported

in various studies.² Acne scars lead to detrimental impacts on psychosocial life of adolescent patients.

Aim of acne treatment is prevention of permanent acne scarring. Severe grades of acne or delay in treatment may lead to the development of acne scars. Acne scars are classified into atrophic and hypertrophic types of scars. Atrophic acne scars are classified as ice pick, box and rolling type of acne scars.[Figure 1] Acne scar treatment armamentarium involves chemical peeling, subcision, laser resurfacing with CO₂ laser, ErYAG laser, etc.¹ Even though ablative lasers are known to be effective for treating acne scars, they are associated with prolonged downtime and the drawback of hyperpigmentation in Indian skin i.e. types type IV and V.³ The fractional radiofrequency (FRF) system has reported to cause dermal regeneration with minimal epidermal changes.⁴ FRF principally works by generating heat by radiofrequency and heating dermis thereby stimulating the collagen tissue, promoting the

regeneration of collagen and the reconstruction of soft tissues.⁶

Fractional radiofrequency energy can be delivered by two different modes such as needles or by an array of electrodes.⁵ This study is to assess the efficacy of FRF delivered by electrodes for treatment of acne scars.

SUBJECTS AND METHODS

This is a retrospective, cohort study performed on study population of patients with acne scars treated with FRF between January 2016 to December 2017 at Government Medical College, Latur. Institutional Ethical Committee approval was taken.

Healthy men and women above 16 yrs of age with acne scars were included in study. Pregnant females or those having active acne were excluded. Similarly patients with active electric or facial implant, history of surgical, chemical, light based treatment, isotretinoin treatment in past 3 months, keloidal tendencies were excluded from the study.

Thirty one patients satisfied the criteria which included 18 female and 13 male patients having mean age of 22.48 yrs. The patients were given 3 treatment sessions of FRF at the interval of 4 weeks. The treatment parameters were decided based on scar severity. The procedure area was cleaned with cleanser, topical anesthetic cream was applied over the face for 30 min before procedure. The patients were given 2 passes with 30% overlapping. The photographs were taken before and one month after 3rd sitting of the treatment. The photographs were assessed and improvement was determined by Global acne severity classification of the Goodman and Baron (GB) (qualitative and quantitative) and Echelle d'Evaluation clinique des cicatrices (ECCA) for acne scarring.[Table 1 to 5] After the procedure patients were advised moisturizers and sun protection for 1 week. If patient experienced pain he was advised to take a paracetamol tablet.

Fractional radiofrequency instrument: This instrument delivers fractional radiofrequency energy via electrode pin arrays. Two types of sets of electrodes having 64 pins and 81 pins are provided and the tip size is 21mm X 21mm and 13.5mmX 13.5mm. [Figure 2] The pins on tip are connected to bipolar radiofrequency electrodes which form positively and negatively charged electrodes and deliver energy upto 1.15 MHz at multiple points. The energy of 11-142 mj/pin and of 20 J by the assembly of pins is delivered to the skin surface in contact by sparing adjacent areas thus creating fractional effect. [Figure 3]

The energy can be delivered by selecting modes provided in instrument from M1 to M4. M1 mode delivers energy at superficial level of dermis and M4 upto deep layers of dermis. More energy was delivered to areas having moderate to severe scarring over cheek by selecting M3 and M4 modes and bony areas were given M1 and M2 modes of energy. [Figure 4] The study was performed using fractional radiofrequency device 'Dermatrix', manufactured by GSD.

RESULTS

The patients in this study group presented with an ice pick, box and rolling types of acne scars. All types of scars showed improvement in form of decrease in depth, improvement in the texture of skin, and softening of contours. The rolling scars responded the best and box scars the least. There were total 31 patients, 18 females and 13 males, between the age group of 16 to 40 years with mean age of 22.48 years. The physician's quantitative assessment of GB quantitative scar grading system showed 23 patients with grade 3 and 8 patients with grade 4 acne scarring.[Table 6] Out of these 23 grade 3 patients, 14 (60.8%) improved to grade 1 and of those 8 grade 4 patients, 6 (75%) improved to grade 2 acne scarring. Thus, average 64% patients showed improvement by 2 grades and 35% patients (11 out of 31) showed improvement by 1 grade. [Table 6] [Photographs 1 to 6]

GB quantitative assessment showed a moderate reduction in the 21(67.7%), good reduction in the 4 (12.9%), very good in 6 (19.3%) patients.[Table 7]

The qualitative assessment showed improvement of median GB score from 18 before to 8 after treatment, whereas a median EAAC score improved from 45 before to 20 after the treatment. Wilcoxon signed rank test was applied to GB score before and after the treatment had 'z' value of 4.88 and 'p' value <0.001 which are statistically significant. Similarly, EAAC score median value before and after the treatment had 'z' value of 4.95 and 'p' value <0.001 which are significant. [Table 8 and 9]

The treatment had erythema and burning pain for 1-2 hours after the session in almost all patients, which was managed with cold compresses and paracetamol tablets if required. The erythema subsided in 1-2 hours, followed by mild edema and crusting which persisted at the most for 7 days. No patient reported post inflammatory hyperpigmentation. One patient had persistent track marks for period of 3 weeks.

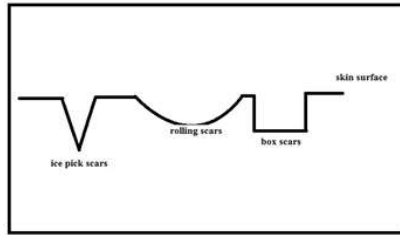


Figure 1



Figure 2



Figure 3



Figure 4

Table 1: Goodman-and-Barons-qualitative-scar-scale

Grade	Level of disease	Characteristics	Example of scars
1	Macular disease	Erythematous, hyper-or hypopigmented flat marks visible patient or observer irrespective of distance	Erythematous, hyper-or hypopigmented flat marks
2	Mild disease	Mild atrophy or hypertrophy that may not be obvious at social distance of 50cm or greater and may be covered adequately by makeup or the normal shadow of shaved beard hair in males or normal body hair if extra facial	Mild rolling, small soft popular
3	Moderate disease	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50 cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair if extra facial, but is still able to be flattened by manual stretching of the skin	More significant rolling, shallow "box car" mild to moderate hypertrophic or popular scars
4	Severe disease	Severe atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair in males or normal body hair if extra facial and is not able to be flattened by manual stretching of the skin	Punched out atrophic (deep "box car"), "ice pick", bridges and tunnels, gross atrophy, dystrophic scars significant hypertrophy or keloid

Table 2: Goodman-and-Barons-quantitative-scar-scale

Grade(type)		No. of lesions		
		1-10	11-20	>20
A	Milder scarring- Macular erythematous, pigmented, mildly atrophic dish-like	1pts	2pts	3pts
B	Moderated scarring-moderately atrophic dish like, punched out small scars with, shallow bases but atrophic areas(<5mm)	2pts	3pts	4pts
C	Server scarring- punched out with deep but normal bases, punched out with deep abnormal bases, liner or troughed dermal scarring, deep and broad atrophic areas	3pts	6pts	9pts
D	Hyperplastic popular scars	2pts	4pts	6pts
E	Hyperplastic keloidal or hypertrophic scars	Area <5cm ² -6pts	Area 5-20cm ² -12pts	Area>20cm ² – 18pts

Table 3: Grades of acne

Grades of post acne scarring	Level of disease	Clinical features
1	Macular	These scars can be erythematous, hyper-or-hypopigmented flat marks. They do not represent a problem of contour like other scar grades but of color
2	Mild	Mild atrophy or hypertrophy scars that may not be obvious at social distances of 50cm or greater and may be covered adequately by makeup or the normal shadow of shaved beard hair in men or normal body hair if extra facial
3	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by makeup or the normal shadow beard hair in men or body hair if extra facial, but is still able to be flattened by manual stretching of the skin (if atrophic)
4	Severe	Severe atrophic or hypertrophic scarring that is evident at social distances grater than 50cm and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extra facial and is not able to be flattened by manual stretching of the skin

Table 4: Assessment of improvement

Grades	Improvement status
0-5	Minimal reduction in GSGS scores
5-10	Moderate reduction in GSGS Scores
10-15	Good reduction in GSGS Scores
>15	Very good reduction in GSGS scores

Table 5: Echelle d’Evaluation cliniaue des Cicatrices d’acne (ECCa)

Description	Weighting factor(a)	Semiquantitative Score(b)	Grading (axb)
V- shaped atrophic scars, diameter <2mm, and punctiform	15	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	
U- shaped atrophic scars, diameter of 2-4mm, with sheer edges	20	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	
M- shated strophic scars, diameter > 4mm, superficial and with irregular surface	25	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	
Suerficial elastolysis	30	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	

Sub grading 1			
Hypertrophic inflammatory scars, scar of less than 2 year of age	40	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	/ /
Keloid scars and hypertrophic scars that are more than 2 years of age	50	0= no scar 1=Few scars 2= Limited number of scars 3= Many scars	/ /
Sub grading 2			
Global score (Subgrading 1*2)			/ /

Table 6: Distribution of patients according to GB grade before and after treatment.

Sr. No.	Before Treatment	After treatment			Total
		Grade 1	Grade 2	Grade 3	
1.	Grade 3	14	9	00	23
2.	Grade 4	00	6	2	8
Total		14	15	2	31

Table 7: Improvement status by quantitative GB score

0 to 5	0
6 to 10	21
11 to 15	4
above 15	6

Table 8: Comparison of GB score before and after treatment.

Sr. No	Variable	Median GB Score		'Z' value	'p' value	Significance
		Before Treatment	After treatment			
1.	GB Score	18	8	4.88	<0.001	Significant

Table 9: Comparison of EAAC score before and after treatment.

Sr. No	Variable	Median GB Score		'Z' value	'p' value	Significance
		Before Treatment	After treatment			
1.	EAAC Score	45	20	4.95	<0.001	Significant

Test applied for table 8 and 9 is Wilcoxon signed rank test.



Figure 1: Pre

Post

Figure 2



Figure 3



Figure 4



Figure 5



Figure 6

DISCUSSION

Various modalities for treatment of acne scarring like peeling are too mild or too harsh like ablative lasers.⁶ Moreover, procedures for acne scarring have great concern regarding downtime and post inflammatory hyperpigmentation.² FRF devices deliver heating directly to the dermis without significant epidermal damage. The RF devices do not target chromophores but heat the dermis by conduction of electrons through target tissue forming triangular zones of coagulation.¹

All acne scar patients showed improvement. This study demonstrates 64% of patients showing improvement by 2 grades, without significant adverse events even in type IV and V skin types. There is improvement in skin texture, hyperpigmentation just in a week. Similar studies performed by FRF devices in past have shown 50-90% improvement in acne scars.⁷ It has been observed in this study that mild to moderate scarring responds better than severe scars. Though there is decrease in acne scars by 2 grades in grade 4 acne scar patients, residual grade 2 scarring may not be acceptable by the patient. Severe acne scars may require a greater number of treatments for their better outcome. In the current treatment protocol only 3 treatments were given in the interval of 4 weeks as recommended by manufacturer of the instrument. The improvement in acne scars by individual scar types was not considered as counting them only by numbers may be misleading. The disposable tips used for FRF treatment are now available at affordable costs and may not pose an obstacle for using this technology. Considering these facts, it would be prudent to have a fractional radiofrequency as a first line therapy for treatment of mild to moderate acne

scars in IV and V skin types. In severe acne scarring ablative lasers combined with FRF may deliver better outcomes.⁸ More number of FRF treatment sessions given over longer duration may give improved outcomes. This is a retrospective study and is its limitation. Further studies with randomised, blinded, split face, prospective studies with FRF and FRF in combination with ablative lasers for severe acne scars having large sample size should be planned for further research.

CONCLUSION

The treatment with fractional radiofrequency is safe and effective for treatment of acne scarring with IV and V skin types. FRF treatment shows improvement in all types of acne scars. FRF provides the advantage of minimum downtime and no risk of post inflammatory hyperpigmentation.

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