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Case Series

Fractional CO_2 Laser Vs Microneedling Radiofrequency in Treatment of Acne Scars – A Case Series

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Abstract

Background: Post-acne scarring is a prevalent cosmetologically and psychosocial concern with significant impact on quality of life. Fractional CO_2 laser (FCO_2) and microneedling radiofrequency (MNRF) are widely used treatments, but their comparative efficacy and safety require further studies.

Aims and Objectives: This study was conducted to compare the efficacy and safety of FCO_2 versus MNRF in the management of post-acne scarring.

Methods: A case series was conducted including 10 patients selected according to Goodman and Baron global qualitative acne scar grading, and they were divided into two groups of 5 each, having Fitzpatrick skin type III–V. A total of four sessions were given for both the groups at an interval of 2 months. The assessment was done by the treating physician as well as by the blinded physician. Both the subjective and the objective assessment was done at the last follow up after second month of the fourth session.

Results: Mean Goodman & Baron scores improved from 29.2 → 11.4(61%) in the FCO_2 group. And from 33.3 → 14.0 (58%) in the MNRF group. In the FCO_2 group, 2 patients achieved Grade 4 (>75%) improvement and 1 achieved Grade 3 (51–75%). In the MNRF group, 1 patient achieved Grade 4 and 1 patient achieved Grade 3 improvement. FCO_2 is associated with longer redness, crusting and post-inflammatory hyperpigmentation.

Conclusion: Both modalities effective but FCO_2 had better improvement and higher chances of pigmentation with more post -procedural downtime. MNRF safer for pigmented skin with less downtime and may be more practical in routine practice.

Keywords: Acne Scars, MNRF, FCO_2, Lasers, CO_2.

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Introduction

Acne vulgaris is as a chronic inflammatory dermatological condition affecting around 85% of the adult population worldwide [1]. Acne vulgaris predominantly occurs during puberty, affecting 93% teenagers and 27% of adolescents [2].

Furthermore, the incidence of acne depends on lifestyle, environmental and genetic factors affecting all irrespective of gender with varied prevalence across different age groups, leading to post- acne scars. Acne scarring is a common cosmetological and psychosocial problem affecting quality of life. [3,4] Effective management has remained a clinical challenge for dermatologists due to the differing morphology, depth, and severity of these scars.[5] Microneedling Radiofrequency (MNRF) and Fractional CO_2 Laser (FCO_2) [6, 7] have recently gained popularity as an effective treatment options for the management of acne scars [8, 9]. Fractional MNRF device leads to long-term and controlled dermal remodeling in the form of neo- elastogenesis and neo-collagenesis creating radio frequency thermal zones without epidermal injury [10]. But FCO_2 laser has a dual effect inducing collagen remodeling and skin resurfacing via controlled thermal injury to the epidermis, encouraging wound-healing initiated by high level of matrix metalloproteinases resulting in enhanced production of myofibroblasts and matrix proteins such as the hyaluronic acid by degrading collagenous matrix.[11, 12] But though its effective, fractional CO_2; laser (FCO_2) is frequently known to cause post- inflammatory hyperpigmentation, pruritus, and procedural discomfort [13].

While, microneedling radiofrequency (MNRF) delivers energy directly into the dermis with use of insulated microneedles, escaping dermal damage caused by FCO_2 [14]. Thus, offering superior safety

profile while providing effective acne scar reduction with short post procedure downtime. Numerous randomized controlled trials (RCTs) have assessed the relative efficacy of these two interventions in the management of post- acne scars but with none concluding superiority of one over the other in terms of efficacy, safety, and patient satisfaction. [16–18]

Aims & Objectives

To assess and compare the clinical safety, efficacy, and tolerability of FCO_2 laser V/S MNRF in the management of acne scars.

Materials & Methods

This is a case series with total of 10 patients with moderate to severe acne scars attending the OPD at a tertiary care hospital were included in the study. Individuals of all age groups with Fitzpatrick skin types III to V, irrespective of gender were included. Patients who underwent previous dermatological treatments, such as: Skin resurfacing procedures, CROSS (Chemical Reconstruction of Skin Scars) with trichloroacetic acid, microneedling, Pregnant and lactating women, Individuals on photosensitizing medications, Patients having Keloidal tendency. Patients with pacemaker implantation, Individuals unwilling to provide consent for participation were excluded. Patients were distributed equally in 2 groups of 5 patients each and named the groups as FCO_2 group and MNRF group.

All the patients were screened and Acne Scar Grading was done using Goodman & Baron scale. Photographs of each patients were documented before each treatment session.. Procedure was performed after cleansing and applying the topical anaesthetic cream (lidocaine 2.5% and Prilocaine 2.5%) for 45 minutes before the procedure. Each patient received 4 treatment sessions at 2-month intervals. All the Patients were advised to apply topical sunscreen agent every 3 hours during the daytime over the treated area for photoprotection. Outcomes were evaluated by both a treating physician and a blinded observer 2 months after the final treatment session.

In the FCO_2 group, 25mJ of fluence with duration of 1.0ms and distance of 1.2mm**.** In MNRF group, Energy of 61 W, frequency 2 MHz, Cartridge: 36 non-insulated needles, each 0.3 mm in diameter was used.

Patients were analysed for reduction in Goodman and Baron score, adverse effects caused in both the groups.

Results

Total of 10 patients were included in the study, 5 in each group. Patient's age varied from 20 to 28 in both the groups. Mean age of 24.4 in FCO_2 group and 25.2 in MNRF group. There were 3 females and 2 males in FCO_2 group and 4 males and 1 female in MNRF group. Goodman and Baran score was recorded before starting of the procedure and 2 months after the session.

Both FCO_2 laser and MNRF groups significantly improved scar depth and skin texture. Mean Goodman & Baron scores improved from 29.2 → 11.4 (61%) in the FCO_2 group. And from 33.3 → 14.0 (58%) in the MNRF group. In the FCO_2 group: 2 patients achieved Grade 4 (>75%) improvement and 1 achieved Grade 3 (51–75%) (Table 1). In the MNRF group 1 patient achieved Grade 4 and 1 patient achieved Grade 3 improvement. Photographs of pre and post treatment incuded in Figure 1 and 2.

No major adverse events were encountered. FCO_2 patients experienced longer duration of redness, crusting, burning sensation and post inflammatory hyperpigmentation. MNRF group patients only experienced mild redness. A Dermatologist, blinded to the treatment type, evaluated pre- and post-treatment photographs using a standardized improvement grading scale (Grade 1–4) (Table 2).

Table 1: Mean Goodman & Baron Quantitative Scores

Group	Before treatment	After treatment	% Reduction
FCO_2	29.2	11.4	61%
MNRF	33.3	14.0	58%

Table 2: Blinded Physician Outcome Grades

Improvement Grade	FCO_2 (n=5)	MNRF (n=5)
Grade 1 (<25%)	0	0
Grade 2 (26 – 50%)	2	3
Grade 3 (51-75%)	1	1
Grade 4 (>75%)	2	1

Figure 1: Pre and Post treatment of MNRF

Figure 2: Pre and Post treatment of FCO_2

Discussion

Atrophic acne scars are a common and psychological devastating, complication of acne, it can be physically as well as leading to poor self-esteem, emotional debilitation, social isolation, anxiety, and depression. [3,4]. There are multiple treatment options available for acne scars such as chemical peels, subcision,

Trichloroacetic acid chemical reconstruction of skin scars, Ablative lasers such as FCO_2 laser, ER:YAG laser and MNRF. Ablative lasers improves the scars by causing selective photothermolysis [19]. In our study Mean Goodman & Baron scores improved from 29.2 → 11.4 (61%) in the FCO_2 group. And from 33.3 → 14.0 (58%) in the MNRF group. Chetan D Rajput et al conducted a study with 25 patients in each group, in FCO_2 group scores improved from 29.24 to 10.7 and from 33.2 to 13.04 in MNRF group [16]. In the study conducted on 30 patients by Reddy K Y et al [19], Goodman and Baron quantitative score improved in 3 (20%) patients by 3 grades in MNRF group, whereas 2 (33.3%) in FCO_2 group. 10(66.6%) patients improved by 2 grades in MNRF group, 9 (60%) patients in FCO_2 group. 3 patients improved better in MNRF group and 2 in FCO_2 group. We observed mild burning sensation, however Cho et al documented severe burning sensation after the FCO_2 procedure [20]. The results obtained by the end of our study was comparable with the other studies. However more studies in this regard with larger sample size are required.

Conclusion

In our study both the treatment modalities were effective. FCO_2 had better improvement but higher chances of pigmentation was observed and more downtime. MNRF was safer for pigmented skin, less downtime. MNRF may be more practical in routine practice.

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