A SPLIT FACE STUDY OF CO₂ FRACTIONAL LASER VS RADIOFREQUENCY CAUTERY FOR THE DESTRUCTION OF VARIOUS BENIGN NON-INFECTIONOUS EPIDERMAL AND APPENDAGEAL TUMORS OF THE SKIN

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Abstract

Background: Benign non-infectious epidermal and appendageal tumors of skin comprise a large and disparate group of tumors and no single classification system unifies them, as their cells of origin and clinical presentation vary substantially. Aim of the Study: A split face study of CO₂ fractional laser vs radiofrequency cautery for the destruction of various benign non-infectious epidermal and appendageal tumors of the skin. Materials and methods: A total of 70 patients attending the OPD with bilateral various benign non-infectious epidermal and appendageal tumors of skin were evaluated, graded and clinically offered 1-3 sittings of radiofrequency ablation on right side of face and CO₂ fractional laser on left side of face as required. Results: All patients completed the treatment protocol. Age of the patients ranged from 18-48 years with a mean of 28 years. Out of 70 patients, 30 patients had acquired melanocytic nevi, 23 were having milia, 10 had syringoma, 5 had senile comedones and 2 had angiofibromas. The results were statistically analyzed using paired "t" test and compared using "z" test. Both modalities showed significant results but RF Ablation did not proved to be as efficacious when compared with CO₂ fractional laser in treating various benign non-infectious epidermal and appendageal tumors of skin. Conclusions: In a fully equipped centre and good patient affordability, CO₂ laser is the best modality, while in poor settings or poor patient affordability, radiofrequency ablation along with other medical therapies and counseling is also an option to be considered for the treatment of various benign non-infectious epidermal and appendageal tumors of skin.

Keywords: Benign tumors of skin, CO₂ fractional laser, RF Ablation, syringoma, senile comedones, acquired melanocytic nevi

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1 INTRODUCTION

Benign non-infectious epidermal and appendageal tumors of skin comprise a large and disparate group of tumors and no single classification system unifies them, as their cells of origin and clinical presentation vary substantially. The drive to attain cosmetic facial enhancement with minimal risk and rapid recovery has inspired the field of nonsurgical skin rejuvenation. Laser resurfacing was introduced in the 1980s with continuous wave carbon dioxide (CO₂) lasers; however, because of a high rate of side effects, including scarring, short-pulse, high-peak power, and rapidly scanned, focused-beam CO₂ lasers and normal-mode erbium-doped yttrium aluminium garnet lasers were developed, which remove skin in a precisely controlled manner. The prolonged 2-week recovery time and small
but significant complication risk prompted the development of non-ablative and, more recently, fractional resurfacing in order to minimize risk and shorten recovery times. Nonablative resurfacing produces dermal thermal injury to improve rhytides and photodamage while preserving the epidermis. Fractional resurfacing thermally ablates microscopic columns of epidermal and dermal tissue in regularly spaced arrays over a fraction of the skin surface. This intermediate approach increases efficacy as compared to nonablative resurfacing, but with faster recovery as compared to ablative resurfacing. Neither nonablative nor fractional resurfacing produces results comparable to ablative laser skin resurfacing, but both have become much more popular than the latter because the risks of treatment are limited in the face of acceptable improvement.

2 MATERIALS AND METHODS
A split-face trial was conducted in a total number of 70 patients of both genders aged 18-50 years with various benign non-infectious epidermal and appendageal tumors of skin attending Dermatology outpatient department of Muzaffarnagar Medical College, Muzaffarnagar. U.P. were included in the study.

Inclusion criteria:
Adult patients with bilateral facial lesions and realistic expectation

Exclusion criteria:
Patients below 18 years with known allergy to lignocaine, on anticoagulation therapy, having pacemakers with known cardiac illness, Pregnant and lactating mothers.

First the participants were elaborately explained about the procedure. Oral and written consent was taken from each individual. The patients were explained about the CO$_2$ laser and radiofrequency ablation therapy, the cost factor included, benefits, span, conceivable results and visualization of the treatment. Digital photographs of the face were taken before and after the procedure and on subsequent follow ups. Skin biopsy before taking the treatment to confirm the clinical diagnosis and to determine the depth and diameter of the lesion had been taken for all the patients. Although the number of lesions was unequal on both sides, to maintain uniformity for comparison, as a standard protocol all the lesions on right side of the face was subjected to radiofrequency ablation and left side of the face was treated with CO2 fractional laser.

Procedure For CO$_2$ Fractional Laser
Before the procedure, the treatment regions were scrubbed of trash, including soil, cosmetics, and powder, utilizing a gentle chemical and 70% isopropyl liquor. Lidocaine, 2.5%, and prilocaine, 2.5%, cream (dolocaine, tetralid cream) was applied under impediment to one side of face. Following an hour of utilization, the sedative cream was taken out to acquire a totally dry skin surface and liquor was utilized to degrease the skin. Eyes were protected with opaque goggles. The procedure was done under proper aseptic condition. The number of passes and the fluence to be used depends on the thickness of the lesion. A half-face, single-pass treatment was then performed without pulse overlapping using a 15-W CO$_2$ laser using 0.6 - 1.2 ms of pulse duration. The energies used were between 24 – 36 mJ, depending on the severity of the lesion. Frequency taken was in the range of 50-100 MHz and the period of 10-20 ms with Stamp mode.

Figure 1: CO$_2$ Fractional Laser

Table 1. Parameters of CO$_2$ Laser
All participants received one to two sessions of ablative CO₂ fractional resurfacing on left side of the face. Following the light, there was an unmistakable carbon particle that supported in perception of the treatment progress. The flimsy layer of shallow crusting was not taken out in light of the fact that this filled in as a biocompatible injury dressing. Each participant was followed-up for a period of 24 weeks.

**Procedure for Radio frequency Ablation**

![Radio frequency Ablation](image)

Before the procedure, the treatment territories were purified of trash, including earth, cosmetics, and powder, utilizing a mellow chemical and 70% isopropyl liquor. Lidocaine, 2.5%, and prilocaine, 2.5%, cream (dolocaine, tetralid cream) was applied under impediment to one side of face. Following an hour of utilization, the sedative cream was taken out to acquire a totally dry skin surface and liquor was utilized to degrease the skin. Eyes were protected with opaque goggles. The procedure was done under proper aseptic condition and under local anesthesia by utilizing Megasurg Gold™ (M/s Dermaindia) with a recurrence 0.2–2.93 MHz, 230 volts, utilizing both cut and coagulation modes. Removal was done at first under the slicing mode to level the skin and later, under the coagulation mode to smoothen the skin further and control the dying. The mellow crusting which was gathered at first was eliminated with fine-tipped Adson’s forceps and hydrogen peroxide. There was no evidence of scarring. After the procedure, the patients were instructed to prevent sun exposure for the next 4-5 days after each procedure and a topical non-occlusive antibiotic cream formulation was prescribed over this period. Ice packs were applied over the treated regions. The subjects were told to follow severe photograph defensive measures with UVA+UVB range of sunscreens. The patients were explored following multi week for any antagonistic impacts. Any unfriendly impact that happened because of the treatment was noted down. The objective parameters were estimated at the end of 24 weeks using global improvement scale and also by evaluating patient’s satisfaction score (PSS). Photos of the two sides of the face were taken at 0 and 24 weeks under steady foundation, position and lighting and contrasted and the pre-treatment pictures.

The improvement on global improvement score was rated as worsened, minimal improvement, moderate improvement, marked improvement and near total improvement depending upon the change in grade of lesions by both treating physician and the patient. The improvement on global improvement score was rated as worsened (GRADE 0), minimal improvement(GRADE 1), moderate improvement(GRADE 2), marked improvement(GRADE 3) and near total improvement (GRADE 4) depending upon the change in grade of lesions by both treating physician and the patient.

**OBSERVATION AND RESULTS**

The present study was conducted in the Department of Dermatology, Venereology and Leprology at Muzaffarnagar Medical College, Muzaffarnagar, UP. The study was conducted between March 2016 and August 2017 (18 months) at Muzaffarnagar Medical College, Muzaffarnagar, UP. The study was conducted between March 2016 and August 2017 (18 months) at Muzaffarnagar Medical College, Muzaffarnagar, UP.
months). A total number of 70 patients with various benign, non-infectious, epidermal and appendageal tumors of skin presenting bilaterally over the face in the patients of age >18 years, who fulfilled the inclusion and exclusion criteria were enrolled for the study.

Proper informed consent in patient language was taken. A complete history was taken and thorough examination of all the patients was carried out in the study group. Required investigations were performed and patients who fulfilled were included. Female patients (49 in number, 70%) outnumbered male patients (29 in number). Age of the patients ranged from 18-48 years with a mean ± SD of 28.6 ± 6.24. Although the number of lesions was unequal on both sides, to maintain uniformity for comparison, as a standard protocol all the lesions on right side of the face was subjected to radiofrequency ablation and left side of the face was treated with CO2 fractional laser. All patients completed the study, including the 6 months follow up. The results were statistically analyzed using paired "t" test and results of radiofrequency ablation was compared with CO2 fractional laser using "z" test. The data was presented as MEAN+_SD and p values were calculated referring to appropriate tables.

The improvement is estimated at the end of 6 months by using a global improvement scale. The value of p<0.06 for radiofrequency ablation and < 0.0001 for carbon dioxide laser was obtained. The patients were graded into 0-4 grades of improvement by using Global improvement scale. However, we compared effect (with photographs) at 0 week and 24 weeks only. Out of 70 patients, 30 patients had acquired melanocytic nevi, 23 were having milia, 10 had syringoma, 5 had senile comedones and 2 had angiofibromas. At the end of the session, all patients showed improvement with results in grade 3 with radiofrequency ablation and in grade 4 with carbon dioxide laser).

The mean ±SD of Global Improvement Scale for various benign non-infectious epidermal and appendageal tumors of skin was 3.01±0.9 at 24th week for the right side of the face with RF Ablation and was 3.12±0.8 at 24th week for the left side of the face with CO2 Laser with confidence interval of 95%. The results were then compared using —z test. The comparative value (z) between the two modalities was 2.19 and the P value was <0.0001 which is statistically significant. Improvement result was also obtained by patient satisfaction score (PSS) which was calculated as follows: 0= none, 2= mild, 4= good, 6= very good, 8= excellent. The result of CO2 laser was highly significant (p <0.0001). Both modalities showed significant results but RF Ablation (p<0.06) did not proved to be as efficacious when compared with CO2 fractional laser (p<0.0001) in treating various benign non-infectious epidermal and appendageal tumors of skin.

**Patient Satisfaction Score (PSS):** A final PSS was calculated on the basis of an anonymous record filled by patient at 24th week. 41.42% showed very good result (score 6) with RF ablation and 35.71% with excellent result (score 8) for CO2 fractional laser.

**According to patient satisfaction score,** 25 patients in CO2 group showed an excellent response compared to RF group in which 20 patients showed an excellent response after 6 months. 24 patients in CO2 group showed very good response compared to RF group in which 29 patients showed very good response after 6 months. 12 patients in CO2 group showed good response compared to RF group in which 14 patients showed good response after 6 months. 9 patients in CO2 group showed mild response compared to RF group in which 7 patients showed mild response after 6 months.

![Figure 3: patient satisfaction score](http://doi.org/10.36295/ASRO.2020.231925)
TABLE 2. Patient satisfaction score (RF Ablation)

<table>
<thead>
<tr>
<th>Number of patients (n=70)</th>
<th>Percentage of patients</th>
<th>Result</th>
<th>Score</th>
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<tbody>
<tr>
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<td>None</td>
<td>0</td>
</tr>
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<td>7</td>
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<tr>
<td>14</td>
<td>20</td>
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<tr>
<td>20</td>
<td>28.57</td>
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</table>

TABLE 3. Patient satisfaction score (CO2 Laser)

<table>
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<th>Percentage of patients</th>
<th>Result</th>
<th>Score</th>
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<tbody>
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<td>0</td>
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</tr>
<tr>
<td>25</td>
<td>35.71</td>
<td>Excellent</td>
<td>8</td>
</tr>
</tbody>
</table>

According to global improvement scale,
27 patients in CO2 group showed near total improvement compared to RF group in which 24 patients showed near total improvement after 6 months. 26 patients in CO2 group showed marked improvement compared to RF group in which 27 patients showed marked improvement after 6 months. 16 patients in CO2 group showed moderate improvement compared to RF group in which 12 patients showed moderate improvement after 6 months. 1 patient in CO2 group showed minimal improvement compared to RF group in which 4 patients showed minimal improvement after 6 months.

Fig 1. Comparison data in global improvement scale between RF Ablation and CO2 Laser after 6 months

Fig 2. Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of acquired melanocytic nevi.

Fig 3. Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of angiofibromas.
Fig 4. Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of senile comedones.

![Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of senile comedones.]

Fig 5. Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of periorbital syringomas.

![Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and 24 weeks in a patient of periorbital syringomas.]

Fig 6. Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and weeks in a patient of milia.

![Pre and post treatment photographs of RF (right side) and CO2 Fractional laser (left side) at 0 and weeks in a patient of milia.]

Adverse effects:

51 patients from RF side and 53 patients from CO2 does not required more than 1 session. Postoperatively in all patients, the scab was shaped in the central regions and the hour of decrustation was 1 to 5 days. Brief erythema and hyperpigmentation happened in most of patients and afterward cleared unpredictably in 2 to 3 weeks. Post procedure, topical antibiotics, hydroquinone and broad spectrum sunscreens (UVA + UVB) are prescribed and instructed to take strict measures. After 6 months from the termination of the treatment session, most patients were pleased with the results, except 12 patients who developed postinflammatory hyperpigmentation, PIH (7 with RF and 5 with CO2) and 6 patients who developed scarring (4 with RF and 2 with CO2).

Conclusion

In a fully equipped centre and good patient affordability, CO2 laser is the best modality, while in poor settings or poor patient affordability, radiofrequency ablation along with other medical therapies and counseling is also an option to be considered for the treatment of various benign non-infectious epidermal and appendageal tumors of skin. Also we conclude that senile comedones and acquired melanocytic nevi showed good response to both the treatment modalities but response with CO2 was better appreciated than RF with minimal side effects. Further large scale studies are needed to see the efficacy and response of CO2 laser in benign appendageal tumors.

References
