

## EFFECTIVENESS OF RADIO- FREQUENCY ABLATION IN THE TREATMENT OF KELOIDS AND HYPERTROPHIC SCAR- A SHORT DURATION INTERVENTIONAL STUDY

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### ABSTRACT

#### BACKGROUND

None of the therapeutic options for the treatment of keloids has been found completely effective and satisfactory. A radiofrequency ablation can be new treatment modality in keloid and hypertrophic scar.

The aim of this study was to assess the clinical safety and efficacy of radiofrequency (RF) in keloid and hypertrophic scar.

#### MATERIALS AND METHODS

This study included 25 patients who were suffering from keloids. All patients have subjected to 5 sessions of RF one week apart. Assessment of the scar volume and both objective and subjective parameters has been performed before and after completion of the sessions.

#### RESULTS

The study shows a volume reduction of 53.05 %. There was a significant reduction of keloid pliability, height, and erythema compared with baseline. Patients reported a significant reduction of their subjective symptoms compared with baseline. Some of the patients mentioned about pain after the procedure, none of the patients reported about infection, nor bleeding after the RF procedure. In some of the patients, post-procedure side effects were observed as post-treatment pain in 7, Blistering in 3, Ulceration in 2 and no side effect in 13.

#### CONCLUSION

Radiofrequency tissue volume reduction is an effective treatment modality for keloids. It is an easy procedure with the acceptable cosmetic outcome and less rate of recurrence.

#### KEYWORDS

Keloid, Radiofrequency Ablation, Treatment Modality for Keloid, Hypertrophic Scar.

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#### BACKGROUND

Keloid scarring in wound healing can be an immense clinical problem for both patient and physician. In the context of growing aesthetic awareness, a rising number of patients feel disappointed with their scars and are frequently seeking help for functional and aesthetic improvement.<sup>1</sup> Keloids and hypertrophic scars are the results of a derailed normal wound-healing process. Regular wound healing consists of three phases- inflammation, proliferation, and remodeling. A dysfunction in one of these phases can bring forth fibrous tissue outgrowths, which lead either to a keloid or a hypertrophic scar.

Keloids are generally defined as scars with an extension that exceeds the borders of the original lesion. On the contrary, hypertrophic scars do not spread outside the boundaries of the original lesion. Hypertrophic scars usually arise within the first month after the inciting event, grow intensively for a period of time, and then regress. Keloids may appear later but with an unregulated and often indefinite proliferation. Keloids occur often after the trauma like piercing, burns, tattoos, or others. In the context of growing aesthetic awareness, a rising number of patients feel disappointed with their scars and are frequently seeking help for functional and aesthetic improvement.<sup>2</sup> The radiofrequency (RF) therapy has been used in cosmetic medicine.<sup>3</sup> Radiofrequency tissue volume reduction (RFTVR) is a surgical technique that induces extensive fibrosis in the treated tissues. Because of its mechanism of action, it was considered as a suitable modality for the treatment of keloids.<sup>4</sup>

#### MATERIALS AND METHODS

The study includes total of 35 patients having keloid or hypertrophic scar. All patients were collected from an outpatient facility in the department of dermatology at a

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tertiary care center in our city. Out of 35 enrolled patients, 25 completed the study. The institutional ethical committee approval was taken before the initiation of the study. All study subjects were informed about the procedure, duration, side-effect, and all related queries were answered. Written informed consent was taken from each patient.

Every patient was treated with intralesional radiofrequency ablation once a week for consecutive 5 weeks with no other treatment modality were allowed. The device used was an RF generator. The device operates at approximately 4 MHz and is used with various electrodes and hand pieces to deliver RF energy to the tissue. In the setting, 1. Xylocaine sensitivity followed by Local anaesthetic (1% Lidocaine, 1/100,000 epinephrine) is infiltrated into the keloid and into the surrounding tissues. 2. Intracath no 22 was used with the insulation and small nick was made at the base of middle and the tip of a needle to ensure a flow of current were inserted in the targeted lesion. 3. The device has been used with the maximal temperature of 90°C and a power output of 10 to 12 W. The used mode was the cut/coagulation (blend mode). The uninsulated part of the intracath tip was inserted into the keloid, and the pre-set energy was applied to the keloid tissue until a maximal temperature of 90°C was reached. The procedure was repeated every week for 5 weeks. Patients were instructed to use topical and systemic antibiotics for 1 week after the procedure.

Evaluation of the volume of the keloids was performed by the same observer at baseline, and at every weekly session till the last session. Assessment of the volume was made using length, width, and height of target lesion using the measuring tape. In addition, objective parameters (height, erythema, and pliability) and subjective complaints (itching, pain, and tenderness) were recorded on a scale of 0 to 3, 9 with the score 0 revealing minimum complaint and score 3 revealing maximum complaint, before treatment and after 5 weeks of treatment. Photographs were taken before and in each visit as well as the recording of any side effects.

**Statistical Analysis-** Data were coded and entered using the statistical package for social science (SPSS) version 17 (SPSS Inc., Chicago, IL). Data were summarized using mean and SD for quantitative variables and percent for qualitative variables.

**RESULTS**

This study included 35 patients with skin phototype II to IV. Clinical data of patients with keloid were presented in Table 1. They had a total of 43 keloids of more than 6-month

duration and from diverse causes. Their ages ranged from 24 to 55 years with a mean of 35.4 years. The duration of the lesions ranged from 1 to 6 years with a mean of 3.84 years. There was a significant reduction of the volume of all lesions in all patients after a total of 5 sessions depending on the size of the keloid (p = 0.001), with a volume reduction of 53.05%. There was a significant reduction of keloid pliability, height, and erythema compared with baseline (p <.001) (Table 2 and Figures 1-4). Patients reported a significant reduction of their subjective symptoms compared with baseline (p <.001) (Table 2). Some of the patients mentioned about pain after the procedure, none of the patients reported about infection, nor bleeding after the RF procedure. In some of the patients, post-procedure side effects were observed as post-treatment pain in 7, Blistering in 3, Ulceration in 2 and no side effect in 13. The IL treatment was generally well tolerated. Minor bleeding from the penetration points was detected and disappeared after 5 to 15 minutes of compression. No adverse textural changes were observed at the treated site.

**DISCUSSION**

The usage of RF has successfully treated keloids and hypertrophic scar. In this study, this modality showed nearly 53.05% reduction in the keloids volume at the end of 5 sessions each one week apart; additionally, all objective and subjective parameters have been significantly reduced after the use of this modality.

Radiofrequency tissue volume reduction induces controlled protein denaturation or necrosis in soft tissue structures using very low levels of RF energy. After this technique, wound healing will take its normal process with scar formation and retraction of tissue, resulting in an overall reduction of volume in the treated area. The newly formed scar tissue is partially resorbed by the body over time, causing further volume reduction. Because of this mechanism of action, RFTVR appeared a suitable tool for the treatment of keloids.<sup>2</sup> After proper scar volume reduction, IL steroid will be expected to give better results and can prevent scar recurrence.

The study conducted by Weshay AH, Hay RM, Sayed K and et.al on Combination of Radiofrequency and Intralesional Steroids in the Treatment of Keloids of 21 patients observed the mean volume reduction of 95.4% after 3 to 4 session 8 weeks apart. In our study, we observed mean volume reduction of 53.04% at the end of 5 sessions one week apart. Detail comparison is mentioned in (Table-2).<sup>5</sup>

Criteria	Findings
1. Age	24-55 with the mean of 35.4 years
2. Sex	Male 14 Female 11
3. Duration	1-6 years with mean 3.84 years
4. Skin Phototype-	Type I 00 Type II 3 Type III 11 Type IV 11

5. Site of Lesion- Sternum	5
Back	5
Hand	6
Shoulder	6
Abdomen	3
6. Previous Treatment- Yes	17
No	8
7. Type of previous treatment- ILS	6
Topical steroid	7
Both	4

**Table 1. Clinical Data of Patients with Steroid**

Sl. No.	Criteria	Our study (Mean ± SD)	Weshay AH, Hay RM, Sayed K and et al.
1.	Volume/cm <sup>3</sup> before treatment	4 -12 (7.88 ± 2.55)	2.5–40 (8.26 ± 8.86)
2.	Volume/cm <sup>3</sup> after 4 months	-	0–3 (0.34 ± 0.72)
3.	Volume /cm <sup>3</sup> after 1 week 2 weeks 3 weeks 4 weeks 5 weeks	4 -12 (7.88 ± 2.55) 3.5 -11.5 (7.16 ± 2.46) 3 - 10 (6.24 ± 2.27) 2 - 7.5 (5.22 ± 2.067) 0.5 – 7 (3.7 ± 1.84) P value -0.119 (week 1 and week 5)	-
4.	% volume reduction after 5 weeks	53.05%	-
5.	% volume reduction after 5 years	-	95.42%
6.	Hardness- Before After	Hard -25 Soft-00 Hard-00 Soft-25	-
7.	Pruritus- Before After	Present -13 Absent-12 Present-02 Absent-23	-
8.	Pain- Before After	Present-17 Absent-08 Present-03 Absent-22	-
9.	Side effects	Post-treatment pain - 7 Blistering - 3 Ulceration - 2 No side effect -13	-

**Table 2. Comparison of our Study and Study of Weshay AH, Hay RM, Sayed K and et al.**

**CONCLUSION**

Intralesional radiofrequency ablation technique in keloid and the hypertrophic scar is proven to be sufficiently effective to decrease the size of the lesion along with relieving the associated symptoms, though the short duration of therapy is not 100% effective it shows the significant amount of reduction in just time period of 5 weeks. The treatment does not require any advance operative facility or expertise it is an OPD based procedure with the minimum cost of around only 50 INR per session. The subjective finding for every patient after the procedure is quite satisfactory.

There is no specific treatment mentioned for keloids and hypertrophic scars. Multiple therapies and treatment options are available. Radiofrequency ablation can be used as initial treatment followed by some other adjust treatment option to get further good results as it is cost effective and also gives promising results in short duration results into better compliance of patients for further treatment options.

**Draw Backs of Study-** Loss of follow-up of the study subject after completion of therapy. There is no long-term observation and effectiveness of therapy is possible for our study.

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