Synergy Effect of Combination of Fractional CO₂ and Fractional Q-switched Ruby Laser Treatment for Skin Rejuvenation

Seyoung Kim
Eunsoo Park
Seungmin Nam

*Department of Plastic and Reconstructive
Surgery, College of Medicine, Soonchunhyang
University, Soonchunhyang University Bucheon
Hospital, Bucheon, Korea*

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Correspondence

Eunsoo Park
Department of Plastic and Reconstructive
Surgery, Soonchunhyang University Bucheon
Hospital, 1174, Jung-dong, Wonmi-gu, Bucheon
420-767, Korea
Tel: +82-32-621-5319
Fax: +82-32-621-5016
E-mail: peunsoo@schmc.ac.kr

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Background and Objectives

Fractional photothermolysis is an important laser modality in the management of several skin conditions and photoaging. Fractional photothermolysis, in the Asian population, has shown significant improvement in facial skin texture and overall skin tone, but not in dyschromia or facial lentigines. Therefore, additional treatment is needed for facial lentigines.

Materials and Methods

For combined laser therapy, the treatment included 3-4 treatment sessions with fractional CO₂ laser and 2-3 treatment sessions with fractional Q-switched ruby laser at 4-week intervals. Treatment with two types of devices was performed alternately.

Results

The majority of patients obtained a satisfactory appearance after the final treatment. Regarding objective improvement, 5 patients (20%) had "Near total improvement" at the end of treatment. Fifteen patients (60%) and 5 patients (20%) had "Marked improvement" and "Moderate improvement", respectively. None of them showed any obvious side effects.

Conclusion

The use of combined fractional CO₂ and fractional Q-switched ruby laser for treatment of photoaging showed successful results, including enhanced skin texture and removal of pigmentation.

Key words

Fractional CO₂ laser; Fractional Q-switched ruby laser; Pigmentation; Resurface

INTRODUCTION

The term photoaging describes damage to the skin caused by intense and chronic exposure to sunlight. The visible effects of photoaging are fine wrinkles, mottling, pigmentation and roughness of the skin. These changes are usually associated with chronologic aging. However, photoaging is not a good indicator of chronologic age. It just makes a person look older than his or her chronologic age.

Fractional photothermolysis is an important laser modality in the management of several skin conditions and photoaging. Fractional photothermolysis, in the Asian population, has shown significant improvement in facial skin texture and overall skin tone.¹ However, there is not much improvement in dyschromia or facial lentigines.² Therefore, additional treatment is needed for facial lentigines. The Q-switched ruby laser has been effective for treating many pigmented epidermal and dermal lesions, including lentigines.^{3,4}

The purpose of this study is to review our clinical experience of the effect of combination of fractional CO₂ and fractional Q-switched ruby laser treatment for skin rejuvenation.

MATERIALS AND METHODS

This is an observational study performed in the department of plastic and reconstructive surgery, Soonchunhyang hospital. 25 women (mean age 49.2 years, range 34-64 years; Fitzpatrick skin type III to IV) had been treated in this method of combination of fractional CO₂ and fractional Q-switched ruby laser treatment from April, 2012 to February, 2013. Photoaging is defined as facial hyperpigmentation with shallow coloring large pore size, striations, rhytide or acne scarring. Exclusion criteria for this study included Fitzpatrick skin type V to VI, history of significant active acne, malignant or premalignant skin lesion, use of isotretinoin within 12 months or pregnancy.

Occlusive application of topical anesthetic cream (eutectic mixture of lidocaine and prilocaine; EMLA® cream 5%, AstraZeneca, Sweden) was performed 1 hour before each procedures. Patients were treated on the entire face with both laser modalities. For combined laser therapy, the treatment included 3-4 treatment sessions with fractional CO₂ laser and 2-3 treatment sessions with fractional Q-switched ruby laser at 4 week intervals. Treatment with two type devices was performed alternately. Patients were treated with fractional CO₂ laser (LineXel®; UTI Co. Ltd, Korea) for facial skin

resurfacing. The laser procedure was performed with a pulse duration of 180-220 ms, with a distance between spots of 0.8-0.9 mm, and spot size of 1 mm (1st degree). For pigmented skin lesion, the fractional Q-switched ruby laser (Melastar®; Asclepion Co. Ltd., Germany) was used. The laser parameters for the present study were set as follows: wavelength of 694 nm, spot size of 7.1 × 7.1 mm, a pulse width of 25-40 ns, a fluence of 4.0-5.0 J/cm² and a repetition rate of 1.5 Hz. After treatment, the treated areas were cooled with ice packs and a sunscreen was applied throughout the treatment period.

Clinical photographs were used to evaluate patient satisfaction and objective improvement of facial wrinkle lines, skin texture and pigmentation with clinical photographs. Photographs (Nikon D90 digital camera, Japan) were taken under identical settings at baseline evaluation, every treatment visit (before and after session) and 1 month after the last session.

Patient satisfaction was categorized as "none, fair, good and excellent". An experienced independent physician assessed clinical improvement of treatment areas using photographic review. Results were classified as grade I (<25%, minimal to no improvement), grade II (25-50%, moderate improvement), grade III (50-75%, marked improvement) and grade IV (>75%, near total improvement). Any side effects were also noted.

RESULTS

Most patients obtained a satisfactory appearance after the final treatment. Of 25 patients, 7 patients (28%) were in "excellent", 13 patients (52%) were in "good", 4 patients (16%) were in "fair", and 1 patient (4%) showed "none" in patient satisfaction, respectively. There was "near total improvement" objective improvement in 5 patients (20%) at the end of treatment. 15 patients (60%) and 5 patients (20%) had "marked improvement" and "moderate improvement", respectively (Figs. 1-3).

None of them showed any obvious side effects. The most frequent side effect was transient erythema. Transient erythema that lasted for 3-4 days was reported by 80% of the patients treated with fractional CO₂ laser, whereas transient erythema that lasted for 2-3 days was reported by 10% of the patients treated with fractional Q-switched ruby laser. Edema that lasted for 2-7 days was reported by 3 patients who were treated with fractional CO₂ laser. All adverse effects were mild and lasted for less than 1 week. There was transient hyperpigmentation in 3 patients, but the worsening of the pigmentation was not severe, and all patients completely healed within 10-14 days.

Fig. 1. Clinical appearance of 46 year-old female (Left) Baseline (Right) One month after final treatment.

Fig. 2. Clinical appearance of 72 year-old female (Left) Baseline (Right) One month after final treatment.

Fig. 3. Clinical appearance of 72 year-old female (Left) Baseline (Right) One month after final treatment. Not only skin texture, also pigmented lesion was improved.

DISCUSSION

Fractional photothermolysis has become an important laser modality in management of a number of skin conditions and photoaging. Fractional photothermolysis is the fractional emission of light into microscopic treatment zones, creating small columns of injury to the skin in a pixilated fashion.⁵ Epidermal and dermal disruptions occur in these focal zones of thermal injury, stimulating dermal collagen production and elastic tissue formation.^{6,7} Fractional photothermolysis has been used successfully to treat photodamage and overall dyschromia in the Caucasian population.⁸⁻¹⁰ In the Asian population, there has been a significant improvement in facial skin texture and overall skin tone.¹ However, there is not much improvement in dyschromia or facial lentigines.² Therefore, additional treatment is needed for facial lentigines.

Based on our clinical experience, combination of CO₂ fractional laser and fractional Q-switched ruby laser treatment resulted in significant improvement of not only skin texture, but also multiple pigmented lesions without unremarkable side effects. The Q-switched ruby laser, especially in the fractional mode, has been effective in treating pigmented lesions. It is thought that treatment with a 694 nm Q-switched ruby laser with fractional mode can effect in pigmented dermal lesions. Therefore, fractional Q-switched ruby laser has been effective in treating many pigmented lesions, including lentigines.^{3,4} This combined technique has a disadvantage in treatment session times, but it has an advantage in reducing side effects and obtaining reliable results. This combination therapy, including the use of CO₂ fractional laser and fractional Q-switched ruby laser, has been an effective treatment option for patients who want refinement of their pigmented skin lesion as well as facial rejuvenation.

CONCLUSION

The use of combined fractional CO₂ and fractional Q-switched ruby laser for the treatment of photoaging drew successful results, such as enhanced skin texture and removal of pigmentation.

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