

การเปรียบเทียบเครื่องแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซีกับ  
เครื่องแฟรคชันนอลเออเบียมกลาส 1550 นาโนเมตร ในการรักษาแผลเป็นหลุมสิว

## Comparison of a fractional bipolar radiofrequency device and a fractional Erbium:Glass 1550 nm device for the treatment of atrophic acne scars

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### บทคัดย่อ

เครื่องแฟรคชันนอลเออเบียมกลาส 1550 นาโนเมตร เป็นหนึ่งในเครื่องเลเซอร์ประเภทแฟรคชันนอลที่มีประสิทธิภาพดีในการรักษาแผลเป็นหลุมสิว ปัจจุบันมีการพัฒนาเครื่องมือแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซี ซึ่งปล่อยพลังงานคลื่นวิทยุขึ้นเพื่อเพิ่มประสิทธิภาพและลดผลข้างเคียงของการรักษาเมื่อเทียบกับการรักษาด้วยเครื่องเลเซอร์แฟรคชันนอลเดิม

**วัตถุประสงค์:** เพื่อเปรียบเทียบประสิทธิภาพและผลข้างเคียงจากการรักษาแผลเป็นหลุมสิวด้วยเครื่องแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซีกับเครื่องแฟรคชันนอลเออเบียมกลาส

**วิธีการศึกษา:** เป็นการวิจัยเชิงทดลองทางคลินิกในอาสาสมัครคนไทยที่มีแผลเป็นหลุมสิบบริเวณแก้มทั้งสองข้าง จำนวน 20 คนได้รับการรักษาห่างกันทุก 4 สัปดาห์ ทั้งหมด 3 ครั้ง โดยสุ่มเลือกข้างของใบหน้าว่าข้างใดได้รับการรักษาด้วยเครื่องแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซีและอีกข้างหนึ่งด้วยเครื่องแฟรคชันนอลเออเบียมกลาส ประเมินผลที่ 4 สัปดาห์หลังการรักษาครั้งที่ 3 โดยแพทย์ผู้ไม่เกี่ยวข้องกับการรักษา 3 คน และผู้เข้ารับการรักษาร่วมกับเก็บข้อมูลผลข้างเคียงภายหลังการรักษาแต่ละครั้ง

**ผลการศึกษา:** แผลเป็นหลุมสิวมักมีลักษณะดีขึ้นชัดเจนภายหลังการรักษาด้วยเครื่องมือทั้งสองชนิดโดยแตกต่างกันอย่างไม่มีนัยสำคัญทางสถิติของผลการรักษาด้วยเครื่องมือทั้งสอง ผลข้างเคียงจากการรักษา ได้แก่ ความเจ็บ ใบหน้าแดง แห้ง และตกสะเก็ดชั่วคราว โดยการรักษาด้วยเครื่องแฟรคชันนอลเออเบียมกลาสเจ็บกว่าการรักษาด้วยเครื่องแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซี แต่ระยะเวลาที่สะเก็ดหลุดหมดสิ้นกว่า พบผู้เข้าร่วมวิจัย 1 ราย มีสิ่วิวเข้มขึ้นในด้านของใบหน้าที่ได้รับการรักษาด้วยเครื่องแฟรคชันนอลเออเบียมกลาส

**สรุปผล:** เครื่องแฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซีและเครื่องแฟรคชันนอลเออเบียมกลาสมีประสิทธิภาพในการรักษาแผลเป็นหลุมสิวที่ดีใกล้เคียงกัน

**คำสำคัญ:** หลุมสิว/แฟรคชันนอลไบโพลาร์เรดิโอฟรีควเอนซี/แฟรคชันนอลเออเบียมกลาส

## ABSTRACT

Fractional Erbium:Glass 1550nm laser is a fractional photothermolysis (FP) laser with high effectiveness in atrophic acne scars treatment. Recently, fractional bipolar radiofrequency (RF) has been introduced to improve the efficacy and reduce side effects of the FP.

**Objective:** The objective of the study was to compare the effectiveness and side effects of fractional bipolar radiofrequency with fractional erbium:Glass in atrophic acne scar treatment.

**Materials and Methods:** A randomized split-face clinical study was conducted. Twenty Thai subjects with atrophic acne scars received three split-face monthly treatments, one side with fractional bipolar radiofrequency, and the other with fractional erbium:Glass. The improvement of acne scars was evaluated by three independent physicians and patients at four weeks after the last treatment. The side effects were recorded after each treatment.

**Results:** The study found significant improvement in acne scars after treatment with fractional bipolar radiofrequency and fractional erbium:Glass device without statistically significant difference between two devices. The side effects of both devices were pain, transient facial erythema and scab formation. The pain score of fractional erbium:Glass was higher than fractional bipolar radiofrequency but duration of scab shedding was shorter. One case had post-inflammatory hyperpigmentation on only the side treated with fractional erbium:Glass.

**Conclusions:** The fractional bipolar radiofrequency and fractional erbium:Glass have similar effectiveness for atrophic acne scar treatment.

Key words: atrophic acne scars/fractional bipolar radiofrequency/fractional Erbium:Glass

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## Introduction

Acne vulgaris is a common skin disease. Some acne lesions result in disfiguring scars. Laser treatment is one of several methods that is very useful in treating acne scars (Khalil, et al, 2011). There are many types of laser treatment including ablative laser resurfacing, nonablative laser and fractional photothermolysis. Although ablative lasers have been considered as “gold standards” for skin resurfacing, there are several side effects, such as prolonged erythema and dyspigmentation (Tanzi&Alster, 2003). Nonablative remodeling lasers can also reduce acne scars without significant downtime. However, nonablative lasers usually have low efficacy and require multiple treatment (Friedman, et al, 2004). The fractional Erbium:Glass 1550nm is a kind of fractional photothermolysis lasers which has high effectiveness in acne scar treatment (Chrastil, et al, 2008). This technique increases the efficacy of nonablative lasers but the recovery is faster and there is a lower risk of side effects than the ablative resurfacing system. More recently, fractional bipolar radiofrequency (RF), based on the principle of “sublative rejuvenation”, has been introduced to improve the efficacy and reduce the side effects of the fractional photothermolysis. The efficacy of the fractional bipolar RF device was also able to improve acne scars significantly (Gold&Biron, 2012). This study, was conducted to compare the clinical effectiveness and side effects of the fractional bipolar RF with the fractional Erbium:Glass 1550 nm device for the treatment of atrophic acne scars.

## Materials and Methods

Twenty Thai patients, aged 18–55, Fitzpatrick skin types III to V, with atrophic acne scars on both cheeks were enrolled in the study. The patients signed an informed consent form for participation. The randomization was done to determine which side of the face to be treated with the fractional bipolar radiofrequency (eMatrix<sup>®</sup>, Syneron, Israel) and the other with the fractional erbium:Glass 1550nm (Fraxel<sup>™</sup> re:store DUAL1550/1927, Solta Medical, CA). Before each treatment, the researcher took a photograph of each patient using VISIA<sup>®</sup> Complexion Analysis System (Canfield, Fairfield, NJ). Anesthetic cream (2.5% lidocaine/prilocain, EMLA, APP Pharmaceuticals) was applied to the treatment area with occlusion for one hour. Three treatment sessions were done at four-week interval. The device treating each side of the face was the same in all three treatment sessions. The parameter of the fractional bipolar radiofrequency device with 64 electrode-pins disposable tips was Program C; energy 53-59 mJ/pin for 2 passes. The energy settings of the fractional erbium:Glass 1550nm device ranged from 30 to 50mJ/MTZ with treatment levels 4-5 (corresponding to 10% to 14% treatment coverage) for 8 passes. A cooling system (Zimmer Cryo 6 Skin Cooling System) was used at the setting of 5. Patient skin response was used to set the appropriate energy for the treatment. After treatment, the patients had to apply moisturizer (Cetaphil<sup>®</sup> moisturizing cream, Galderma), sunscreen (Cetaphil<sup>®</sup> UVA/UVB Defense SPF 50, Galderma) and wash their face with mild soap (Cetaphil<sup>®</sup> Gentle Skin Cleanser, Galderma).

The clinical evaluation was done at one month after completing the three treatment sessions. First, clinical improvement of acne scars was evaluated by three masked dermatologists and patients. They independently evaluated the improvement of acne scars by comparing the photographs taken by VISIA<sup>®</sup> before and after completing 3 treatment sessions, using the grading scale. Second, improvement of facial texture was evaluated by comparing the texture scores obtained from VISIA<sup>®</sup> Complexion Analysis System before and after treatment. Third, the patients were asked to evaluate their satisfaction with the treatment using the quartile grading scale. Side effects including pain score, duration of facial erythema, facial dryness and duration of scab shedding and others, such as infection, ulceration, scar formation, dyspigmentation, acneiform eruption, were recorded.

### Statistical analysis

The data were reported as means±standard deviations (SD). Statistical analysis was conducted using the paired samples *t*-test for comparison the effectiveness and side effects between the two treatment devices. The *p*-value less than 0.05 was considered statistically significant.

### Results

Of 20 patients (12 men and 8 women), 19 patients completed 3 treatment sessions. One male patient with Fitzpatrick skin type III was excluded from the study due to side effects after the second treatment session.

The mean of acne scars improvement grade evaluated by the dermatologists after treatment with the fractional bipolar RF device was 2.70±0.37 and 2.86±0.42 for the fractional Er:Glass device. The mean of improvement grade evaluated by the patients after being treated with the fractional bipolar RF device was 2.74±0.73, and with fractional erbium:Glass device was 2.89±0.57. There was no statistically significant difference of the mean acne scars improvement grade between both devices.

The reduction of mean texture scores before treatment and after treatment of each session indicates the improvement of facial texture. The reduction of texture scores after treatment with fractional RF device was 2.71±1.92 and after treatment with fractional Er:Glass device was 2.94±1.84 with statistical significance (*p*=0.00). There was no

statistically significant difference in the mean reduction of texture scores between the two treatment devices ( $p = 0.62$ ).

Regarding patient satisfaction, after being treated with fractional bipolar RF device, 6 patients (31.6%) rated their satisfaction as moderately satisfied, 10 patients (52.6%) rated as very satisfied and 3 patients (15.8%) rated as the most satisfied. After being treated with the fractional Erbium:Glass device, 5 patients (26.3%) rated their satisfaction as moderately satisfied, 13 patients (68.4%) rated their satisfaction as very satisfied, and one patient (5.3%) rated as the most satisfied.

Independent-samples Kruskal-Wallis test was used to investigate the relationship between severity of acne scars and improvement grade after treatment. The milder severity of acne scars had higher improvement scale than the severe with statistically significant difference among each severity group,  $p=0.038$  in fractional RF and  $p=0.036$  in fractional Er:Glass device.

Side effects of both treatment devices were pain, transient facial erythema, facial dryness and scab formation. The mean of pain scores at the side treated with the fractional bipolar RF device was  $5.90 \pm 1.21$ , while at the side treated with the fractional Er:Glass device was  $7.75 \pm 1.37$ . The pain score after treatment with the fractional Er:Glass device was higher than with the fractional bipolar RF device  $1.85 \pm 1.30$ , with statistical significance ( $p < 0.001$ ). The duration of facial erythema was  $3.10 \pm 1.17$  days and  $2.90 \pm 1.65$  days after treatment with the fractional bipolar RF device and with the fractional Er:Glass device respectively. There was no statistical significance in the mean difference between the two devices. The duration of scab shedding after treatment with the fractional bipolar RF device was  $5.00 \pm 2.60$  days, and with the fractional Er:Glass device was  $3.45 \pm 2.95$  days. Treatment with the fractional bipolar RF device took longer duration of scab shedding than treatment with the fractional Er:Glass device =  $1.55 \pm 2.65$  days, with statistical significance ( $p = 0.01$ ). The duration of facial dryness after treatment with the fractional bipolar RF device was  $3.85 \pm 3.15$  days, and with the fractional Er:Glass device was  $3.25 \pm 2.71$  days. There was no statistical significance in the mean difference between the two devices.

Of 20 cases, one case with skin type III had prolonged facial erythema, lasting more than 2 weeks and had post-inflammatory hyperpigmentation after the second treatment session with fractional Er:Glass device, at parameter; fluence 40mJ/cm<sup>2</sup>, treatment level 5 (14% coverage), 8 passes. The hyperpigmentation resolved at six weeks after being treated with bleaching agent (combination of 4% hydroquinone, 0.01% fluocinolone acetonide, and 0.05% tretinoin; Triluma<sup>®</sup>). The other side of the face treated with the fractional bipolar RF did not have these side effects. However, no other side effects such as infection, ulceration, scar formation or acneiform eruption were present in any subjects.

## **Discussion**

As in previous studies, this study also found significant improvement in acne scars and skin texture after treatment with the fractional bipolar RF and the fractional erbium:Glass device. There was no statistical significance in the difference between both devices in the mean of acne scars improvement grade evaluated by the independent dermatologists and the patients, the mean of satisfaction, and the facial texture improvement evaluated by VISIA<sup>®</sup> Complexion Analysis System.

The statistically significant differences of the side effects after treatment with the fractional bipolar RF device and the fractional Erbium:Glass device were pain scores and the duration of scab shedding. The pain score of the fractional Er:Glass device was higher than of the fractional bipolar RF device but the duration of scab shedding in the fractional Er:Glass device was shorter than the fractional bipolar RF device.

In the previous study of Graber, et al, 2008, the incidence of post-inflammatory hyperpigmentation in the skin type II was 0.26%, whereas skin type III, IV, and V had post

inflammatory hyperpigmentation incidences of 2.6, 11.6, and 33%, respectively. In the present study, one case (1/20= 5%) with skin type III had prolonged erythema and post-inflammatory hyperpigmentation after the second treatment session with fractional Er:Glass device. However, the other side of the face treated with fractional bipolar RF device did not have such side effect.

The present study has a limitation in that the comparison of effectiveness among the atrophic acne scars subtypes (icepick, boxcar, and rolling scars) was not done because most participants had mixed types of acne scars. For the rolling scars, subcision is a good and recommended treatment method (Jacob, et al, 2001).

### **Suggestion**

Further research is therefore needed to evaluate the effectiveness of the combination treatment of subcision and subablative fractional bipolar radiofrequency device.

Moreover, a further three-month follow-up study is needed to investigate the sustainability of the acne scar treatment by the two devices.

### **Conclusion**

In conclusion, both fractional erbium:Glass 1550 nm (Fraxel™ re:store DUAL1550/1927, Solta Medical), a nonablative fractional photothermolysis laser, and the fractional bipolar radiofrequency (eMatrix® , Syneron) are safe and effective treatment modality for the treatment of atrophic acne scars in patients with Fitzpatrick Skin Types III to V, especially with mild to moderate severity grade of acne scars. Most of the patients were very satisfied with the result of the treatment. The effectiveness for atrophic acne scar treatment of the fractional bipolar RF device and the fractional Er:Glass device was similar. The side effects from the treatment were mild and transient.

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