BRIEF REPORT

Efficacy and Safety of 10,600-nm Carbon Dioxide Fractional Laser on Facial Skin with Previous Volume Injections

Background: Fractionated carbon dioxide (CO_2) lasers are a new treatment modality for skin resurfacing. The cosmetic rejuvenation market abounds with various injectable devices (poly-L-lactic acid, polymethyl-methacrylate, collagens, hyaluronic acids, silicone). The objective of this study is to examine the efficacy and safety of 10,600-nm CO_2 fractional laser on facial skin with previous volume injections. **Materials and Methods:** This is a retrospective study including 14 patients treated with fractional CO_2 laser and who have had previous facial volume restoration. The indication for the laser therapy, the age of the patients, previous facial volume restoration, and side effects were all recorded from their medical files. Objective assessments were made through clinical physician global assessment records and improvement scores records. Patients' satisfaction rates were also recorded. **Results:** Review of medical records of the 14 patients show that five patients had polylactic acid injection prior to the laser session. Eight patients had hyaluronic acid injection prior to the laser session. Two patients had fat injection, two had silicone injection and one patient had facial thread lift. Side effects included pain during the laser treatment, post-treatment scaling, post-treatment erythema, hyperpigmentation which spontaneously resolved within a month. Concerning the previous facial volume restoration, no granulomatous reactions were noted, no facial shape deformation and no asymmetry were encountered whatever the facial volume product was. **Conclusion**: CO_2 fractional laser treatments do not seem to affect facial skin which had previous facial volume restoration with polylactic acid for more than 6 years, hyaluronic acid for more than 0.5 year, silicone for more than 6 years, or fat for more than 1.4 year. Prospective larger studies focusing on many other variables (skin phototype, injected device type) are required to achieve better conclusions.

KEYWORDS: Fractional CO_2, safety implants, volume restoration

INTRODUCTION

The cosmetic rejuvenation market now abounds with various injectable devices including: Poly-L-lactic acid (PLLA), polymethyl-methacrylate, collagens, hyaluronic acids (HA), silicone (S), and calcium hydroxylapatite (CaHA).[1] The choice of which one to use in practice is physician led, based on facial assessments, product characteristics and the desires of the patient. Some of these devices can augment facial volume for long periods of time and are heat-labile, others are permanent.[1]

Access this article online

Quick Response Code:

Website: www.jcasonline.com

DOI: 10.4103/0974-2077.110094

Fractionated carbon dioxide (CO_2) lasers are a new treatment modality for skin resurfacing. This laser therapy is based on the theory of fractional photothermolysis introduced by Manstein *et al*.[2] These lasers have been shown efficacious in treating facial photoaging changes and scars and have an improved safety and recovery profile compared with traditional CO_2 laser resurfacing.[3-5] Although CO_2 laser skin resurfacing is widely hailed as a safe and effective treatment modality, morbidity is widely reported as well. Furthermore, the patient's medical history may affect the decision to use laser resurfacing. The objective of the current study is to examine the efficacy and safety of 10,600-nm CO_2 fractional laser on facial skin with previous volume injections with molecules known to be heat-labile or with molecules contraindicated in previous studies involving continuous CO_2 laser.

MATERIALS AND METHODS

In this retrospective study, 14 patients (Fitzpatrick

Hélou Josiane, Maatouk Ismaël, Moutran Roy, Obeid Grace, Stephan Farid

Department of Dermatology, Hôtel-Dieu de France Hospital, Faculty of medicine, Saint Joseph University, Beirut, Lebanon

Address for correspondence:

Dr. Ismaël Maatouk, Department of Dermatology, Hôtel-Dieu de France, Faculty of Medicine, Saint Joseph University, Beirut, Lebanon. E-mail: ismaelmaatouk@yahoo.com

skin-type IV – V) having had previous facial volume restoration (PLLA, HA, S, fat) were included. They have been treated with fractional 10,600-nm CO_2 laser (FX_Lumenis, Inc., Santa Clara, CA) and completed their treatment sessions. The molecules were injected in nasolabial folds and/or cheeks. The volume administered was not known since this injection was not performed in our clinic. However, the purpose of the injection as patients stated was to have volumetric effects, and it was considered to be sub-dermal except for the HA. The indication of the laser therapy, age of the patients, previous facial volume restoration and side effects were all recorded from their medical files. Superficial and deep ablations (Active FX and Deep FX) were performed for all the patients. These women have been treated between January 2009 and June 2010 with a single session of CO_2 followed by 5 days of prophylactic acyclovir administration in all patients and 1 week of topical corticosteroids application over the treated area.

Objective assessments were made through clinical physician global assessment records and improvement scores records over a period of 2 years, from June 2010 till June 2012. Patients' satisfaction rates were also recorded answering 2 questions about satisfaction and effects of laser CO_2 on facial volume (especially for people previously injected with volumetric fillers).

The average energy delivered per session was 125 mJ/cm^2 for the Active FX treatment, and 15 mJ/cm^2 for the Deep FX treatment.

RESULTS

Fourteen patients with average age of 52.14 years (±10 years) were included in the study. Two patients (14.28%) were treated for acne scars and twelve (85.72%) for photoaging rejuvenation. Review of their medical records show that 5 (35.7%) patients had PLLA injection 6.86 years (±0.4) prior to the laser session. Eight (57.14%) patients were injected with HA for more than 0.5 year (1.1 years (±0.6)) prior to the laser session. Two (14.28%) patients had fat injection more than 1.4 years previous to the laser session, 2 (14.28%) had silicone injection implanted 6 and 8 years respectively previous to the laser sessions and one (7.14%) patient had facial thread lift 9 years ago. Some of the injectable products were palpated clinically (PLLA, silicone).

The follow-up results 6 months after the session revealed that one (7.14%) patient had clinical improvement of 76% to 100%, seven (50%) had improvement of 51-75%, four (28.58%) had moderate clinical improvement of 26-50% and two (14.28%) had no improvement.

Patients' characteristics and results are shown in Table 1.

The patient surveys regarding overall satisfaction revealed that 9 of the 14 (64.28%) were very satisfied or satisfied, three (21.4%) were slightly satisfied and two (14.28%) were unsatisfied.

Side effects included pain during the laser treatment (7 patients-50%), post-treatment scaling (13 patients-92%), post-treatment erythema (14 patients-100%), post-treatment hyperpigmentation (2 patients-14.28%) which spontaneously resolved within a month. The duration of the side effects did not affect the grade of clinical improvement or the degree of satisfaction that the patients recorded. Other possible adverse events, including post-therapy blister formation, scarring, hypopigmentation, secondary bacterial infection, and viral infection were not encountered.

Concerning the previous facial volume restoration, no granulomatous reactions were noted, no facial shape

Table 1: Patients' characteristics and results

Patients	Sex	Age	Poly-lactic acid	Fat	Hyaluronic acid	Silicone	Facial thread lift	Laser indication	Follow up		
									15th day	3rd month	6th month
1	F	50	6.4y		1.7y			PA	E,O	PS	P
2	F	65	7.2y		0.5y			PA	E,O	S	S
3	F	52	6.8y					PA	E,O	PS	S
4	F	51	6.9y					PA	E,O	P	S
5	F	64	7y		0.8y			PA	E,O	PS	P
6	F	64						PA	E,O	PS	S
7	F	46		1.4y				AS	E,O	PS	S
8	F	45				8y		AS	E,O	S	S
9	F	46				6y	9y	PA	E,O	PS	S
10	F	49			1.0y			PA	E,O	P	S
11	F	48	2y		0.9y			PA	E,O	PS	S
12	F	46			2.3y			PA	E,O	S	S
13	F	49			1.8y			PA	E,O	PS	S
14	F	55			1.4y			PA	E,O	PS	S

E: Erythema, O: Oedema, P: Hyperpigmentation, S: Satisfied, PS: Partially satisfied

deformation, and no asymmetry were encountered whatever the facial volume injection material was.

DISCUSSION

In this retrospective study, the focus was on the safety and efficacy of fractionated CO_2 laser on patients with previous facial volume restoration. Results prove that PLLA (injected more than 6 years previous to the laser session), fat injection (more than 1.4 years), facial silicone implants (implanted 6 and 8 years, respectively, in 2 patients), HA (injected for more than 0.5 year), and facial thread (performed 9 years before laser session) were all safe and we did not encounter any dissolution of these fillers.

No studies are found to answer whether the aggressivity of the laser treatment performed in patients with previous implants (silicone, fat, hyaluronic acid) is safe; and after how many months/years CO_2 laser treatment can be performed safely. This "aggressivity" is reflected by depth of penetration of fractional CO_2 beam that depends upon fluency and pulse characteristic. Temperatures in skin exposed to a single pass of a CO_2 laser reach 100°C which is sufficient to cause full-thickness burns and resultant scarring.[6] Some volumetric injectable molecules are known to be heat-labile. Depth of filler placement and depth of CO_2 fractional column penetration have relevant interactions: If they coincide, then filler will be "destroyed" by heat. Some papers stated that when applying CO_2 laser to skin, there is heat and inflammation effects up to 300 mm near the skin surface to approximately 150 mm at the deep dermis or deeper.[7]

Other previous reports described a "silicone flaming" after traditional CO_2 laser performed on facial skin with previous silicone implant and some articles stated that "prior injection with silicone is a relative contraindication to skin resurfacing with a CO_2 laser".[6] We think that avoidance of this reaction is possible by usage of a single-pass mode of laser, with great care to avoid overlapping pulses. Multiple treatment sessions with minimal penetration are preferable to deeper lasing in a single-treatment episode.

We did not have any patient with previous calcium hydroxylapatite (CaHA) implant. However, a recent article reported the case CaHA nodule resolution in a patient following CO_2 laser session.[8] An eventual explanation of this problem would be the dissolution of CaHA particles by the fractional CO_2 laser by high-temperature vaporization of CaHA, with localized melting and rehardening into an α-calcium orthophosphate structure that displays increased brittleness with easy cracking and fissuring into multiple pieces.[8]

Concerning clinical improvement and patients 'overall satisfaction, they were similar to the results published with same skin type patients in many articles.[9-12]

The frequency of side effects (including pain during the laser treatment, post-treatment scaling, post-treatment erythema, post-treatment hyperpigmentation) was equivalent to the frequency in patients who had not been subject to facial volume injection.[9-12]

CONCLUSION

In conclusion, 10,600-nm CO_2 fractional laser treatment seems to be safe when used on facial skin previously treated with volume restoration with PLLA for more than 6 years, HA for more than 0.5 year, S for more than 6 years, fat for more than 1.4 year. However, it is difficult to generalize these results based on 14 patients. Therefore, prospective studies with larger series focusing on many other variables (skin phototype, injected device type) are required to achieve better conclusions.

REFERENCES

1. Thioly-Bensoussan D. A new option for volumetric restoration: Poly-L-lactic acid. J Eur Acad Dermatol Venereol 2006;20(Suppl 1):12-6.
2. Manstein D, Herron GS, Sink RK, Tanner H, Anderson RR. Fractional photothermolysis: A new concept for cutaneous remodeling using microscopic patterns of thermal injury. Lasers Surg Med 2004;34:426-38.
3. Geronemus RG. Fractional photothermolysis: Current and future applications. Lasers Surg Med 2006;38:169-76.
4. Bogdan Allemann I, Kaufman J. Fractional photothermolysis: An update. Lasers Med Sci 2010;25:137-44.
5. Tierney EP, Kouba DJ, Hanke CW. Review of fractional photothermolysis: Treatment indications and efficacy. Dermatol Surg 2009;35:1445-61.
6. Zager W, Huang J, McCue P, Reiter D. Laser resurfacing of silicone-injected skin: The "silicone flash" revisited. Arch Otolaryngol Head Neck Surg 2001;127:418-21.
7. Oni G, Robbins D, Bailey S, Brown SA, Kenkel JM. An *in vivo* histopathological comparison of single and double pulsed modes of a fractionated CO_2 laser. Lasers Surg Med 2012;44:4-10.
8. Reddy KK, Brauer JA, Anolik R, Bernstein L, Brightman LA, Hale E, *et al*. Calcium hydroxylapatite nodule resolution after fractional carbon dioxide laser therapy. Arch Dermatol 2012;148:634-6.
9. Fife DJ, Fitzpatrick RE, Zachary CB. Complications of fractional CO_2 laser resurfacing: Four cases. Lasers Surg Med 2009;41:179-84.
10. Chan HH, Alam M, Kono T, Dover JS. Clinical application of lasers in Asians. Dermatol Surg 2002;28:556-63.
11. Cho SB, Lee SJ, Kang JM, Kim YK, Chung WS, Oh SH. The efficacy and safety of 10,600-nm carbon dioxide fractional laser for acne scars in Asian patients. Dermatol Surg 2009;35:1955-61.
12. Naouri M, Delage M, Khallouf R, Georgesco G, Atlan M. CO_2 fractional resurfacing: Side effects and immediate complications. Ann Dermatol Venereol 2011;138:7-10.

How to cite this article: Josiane H, Ismaël M, Roy M, Grace O, Farid S. Efficacy and safety of 10,600-nm carbon dioxide fractional laser on facial skin with previous volume injections. J Cutan Aesthet Surg 2013;6:30-2.

Source of Support: Nil. **Conflict of Interest:** None declared.