



Fractional CO₂ Laser Treatment of Mild Periorbital Wrinkles in Iraqi Patients

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(Received 25 February 2018 ; accepted 30 September 2018)

Abstract: Background and Objective: Public demand for procedures to rejuvenate photodamaged facial skin have stimulated the use of fractional CO₂ laser as a precise and predictable treatment modality. The purpose of this study was to assess the effect of fractional CO₂ laser system for reducing periorbital rhytids. **Materials and Methods:** twenty seven subjects with mild periocular wrinkles, and photoaged skin of the face were prospectively treated two to three times (according to clinical response) in the periorbital area with a fractional CO₂ laser device equipped with a scanning hand piece. Improvements in eyelid wrinkles was evaluated clinically and photographically. Subjects also scored satisfaction and tolerability. **Results:** seventy % of subjects achieved or maintained 50–60% improvement at 3 months. Nearly 40% of subjects maintained 20–40% improvement at 3 months after treatment. Subject satisfaction was high and the procedure was well tolerated. Mild-to-moderate erythema and edema persisted for up to three to four days. **Conclusion:** Treatment with a fractional CO₂ laser device improves periorbital rhytids, and tightens skin.

Introduction

Traditional surgical options to improve facial rhytids include face-tightening and blepharoplasty, alone or with chemical peeling and dermabrasion. Chemical peels and dermabrasion are helpful, but their use at periorbital skin is limited and the risks of scarring, dyspigmentations and unpredictable depth of skin injury are considerable. Surgical approaches to tighten the lower lid may have complications like overcorrection, under correction, exposed sutures, suture abscesses, or temporary tenderness over the orbital rim where the suture is anchored (Alster TS, Garg S. 1996).

The skin is divided into three layers: the epidermis, the dermis, and the subcutaneous tissue. The skin is thicker on dorsal and extensor surfaces than on the ventral and flexor

surfaces. The thinnest area of skin is at the eyelid (0.3mm), (Liu D. 1997).

Skin Aging: The skin begins to show signs of aging by ages 30 to 40 years. Aged skin is thin, fragile, and inelastic. There is a gradual loss of dermal collagen, fat, and elastic fibers. Elastic fibers are responsible for the elasticity and resilience of the skin. In normal aging, there is loss and fragmentation of elastic fibers resulting in fine wrinkles. In aged skin the epidermis is thinner than in youthful skin. Wrinkles are actually a defect of the dermis. The epidermis is of equal thickness within and between wrinkles. It is the dermis that is thinner in the center of the trough of the wrinkle. The deepest wrinkles occur in facial areas with the greatest degree of solar elastosis, because the abnormally thickened dermis allows for even deeper wrinkles, (Thomas P. 2016).

LASER" is an acronym of light amplification by stimulated emission of radiation. It gained widespread acceptance in dermatology and is now used for the treatment of numerous cutaneous conditions including aging skin, pigmented and vascular lesions, tattoos, scars, and unwanted hair. The search for laser rejuvenation alternatives was prompted by the high complication rates associated with traditional ablative resurfacing. Fractional resurfacing produces clinical and histologic changes comparable to ablative lasers, but spares most of the skin and is characterized by rapid reepithelization and mild side effects just like nonablative resurfacing, (Štulhofer D, et al., 2010). Fractional refers to treating a portion or fraction of the skin, without specification of laser type, spot size or wavelength. By treating only microscopic areas in one session, healing time is greatly reduced. Each treated area is surrounded by normal viable skin from which migration of keratinocytes occurs. Each treatment spot is termed a microscopic treatment

zone (MTZ) which heals via migration of the normal surrounding epidermis, as opposed to healing via differentiation. Very high energies can be tolerated without bulk heating, and epidermal healing is completed within 36 hours. This rapid healing time reduces the incidence of infections, pigment alterations, and scarring (Baumann L 2009).

Patients and Methods:

This prospective study done at the Laser medicine reaserch clinics of the Institute of Laser for Postgraduate Studies-Baghdad University, during the period from August 2017 to December 2017. Twenty seven patients with fine periorbital wrinkles, and photoaged skin (20 females, 7 males) enrolled in the study. Their ages ranged from 30 to 51 years (mean age 43 years). Eighteen patients with Fitzpatrick's skin type III and nine had type IV, as in table (1) (Klaus W., 2006).

Skin type	Skin color	Sunburn & tanning history
I	White	Always burn, never tans
II	White	Always burn, tans minimally
III	White	Burns moderately, tans gradually
IV	Olive	Minimal burning, tans well
V	Brown	Sometime burns & tans darkly
VI	Dark brown	Never burns & tans darkly-black.

A detailed history was taken and physical examination was done.

Inclusion and exclusion criteria:An ideal candidate was patient of any age in good health, with fair skin type, who has photodamaged skin and realistic postoperative expectations.

Contraindications to the procedure include: history of keloids and connective tissue disease, radiotherapy or scleroderma. Unrealistic expectations, after a face-lift or blepharoplasty. Topical antibiotics and sunscreen cream were prescribed. Prophylactic oral antiviral therapy was prescribed only for those with recurrent herpes infections.

Clinical examination: All patients were assessed at pre- and post-treatment. They were checked for local infections and any other skin disease and skin photo type and type of

periorbital wrinkles. Improvements in fine wrinkles, and skin laxity were evaluated clinically, photographically, and by recording patients satisfaction scale. Photographs were taken using a digital camera (Nikkon,DX 5100,5.6 megapixel power, Thailand) before, immediately after each session and one month later for comparison. The improvement graded on a quartile scale,as in (table:2) (Dvora A. Bruce E. 2010).

Improvement grade	Quartile scale
1	0–25%
2	26% –50%
3	51%–75%
4	76–100%

Pain graded during treatment on a scale of: 0 (no pain) to 4 (very painful edema persisted for up to three to four days). Patients satisfaction was

recorded as a scale of 4 points as bellow, table(3) (Dvora A. Bruce E. 2010).

Grade	Satisfaction
0	Poor
1	Fair
2	Good
3	Complete(excellent)

Laser safety techniques. Protective eye goggles (completely opaque) worn by the patients and (wet gauzes placed over their eyes) and emphasis on eye closure during irradiation. Physicians used special eye glasses with special wavelength filter for CO₂ laser. Good ventilation was assured in the room and a vacume used to remove any smoke. The methodology also involved preoperative, operative and post operative preparations. A written informed consent was given to patients and a well made questionnaire was used.

Periorbital area was examined properly to determine the type of wrinkles and to identify the skin phototype (Fitzpatrick). Also looking for any local infection or skin disease. Patients (females) were asked to remove any make up or any other topical remedies before treatment and to dry the area properly, contact lenses if any, were removed. Then the area was gently cleansed. Topical anaesthesia EMLA 5% cream applied to the area before treatment to decrease pain during the session.

After applying these preparations and selecting the suitable parameters, patients were treated two to three times in the periorbital area at 4 weeks interval with a fractional CO₂ laser device equipped with a computed scanning handpiece.

The laser handpiece was applied perpendicularly to the area and moved the handpiece from zone to another (without overlap) starting from the

upper eyelid to the outer canthal area, then to the lower eyelid and infraorbital zones. Also the upper check, temple area and the forehead over the eyebrows was treated because these areas are regarded as one cosmetic unit.

Laser parameters: Subjects received an average of two treatments at three to four-weeks intervals to allow time for skin to recover after each treatment. **Settings:** power 10-14 watts (W). After the initial treatment with a low power setting, power was increased at subsequent sessions as tolerated by the subjects. The laser duration was (1.1 ms), interval between point and next point was (1.0ms), distance between fractional points was (1.3 mm).

Results: Of the twenty seven patients, only 20 completed the study, since 7 patients defaulted after the first session for unknown reasons. The majority of patients responded well to the treatment (14 patients, 70%), moderate response in 3 patients (15%) and another 3 patients (15%) poorly responded. Seventy percent of patients maintained 50–60% improvement at three months, forty percent achieved or maintained 20–40% improvement at 3 months. Subject satisfaction was high and the procedure was well tolerated. Clinical examples are shown in table (4).

Score	1 st month	2 nd month	3 rd month
1	50	35	15
2	30	40	15
3	10	20	40
4	10	5	30

Scale: 1=0-25%, 2=26-50%, 3=51-75%, 4=76-100%.

About 70% were highly satisfied and 10% reported for each of the other grades. Table(5):

	Excellent	Good	Fair	Poor
Grade of satisfaction/% of patients	70	10	10	10

Minimal redness and swelling last 24-72 hours after treatment, these resolved by antihistamines. Downtime was mostly one day. Undesirable effects were reported mainly erythema in (90%) patients, swelling in (40%) patients. These started shortly after sessions (within few minutes), erosions and crusting were noticed in (30%) patients. Ten patients (50%) complained from mild itching that

persists for 5-7 days. Fortunately, no infection was reported in this study. Three patients developed conjunctivitis before laser exposure due to contact with EMLA 5% cream. The procedure was comfortable apart from mild discomfort experienced by half of patients, mild pain in 15%, one patient claimed moderate pain. Table(3) pain score and patients percentage.

Pain score	0	1	2	3	4
% of patients.	30	50	15	5	0



Fig.(1):A;50 years old female patient before 1st session.B; same patient immediately after session. Notice the redness at the periorbital areas.C: Same patient one month later. good reduction in fine rhytids.



Fig.(2):A 46 years old female patient(A: before and B:after two sessions)

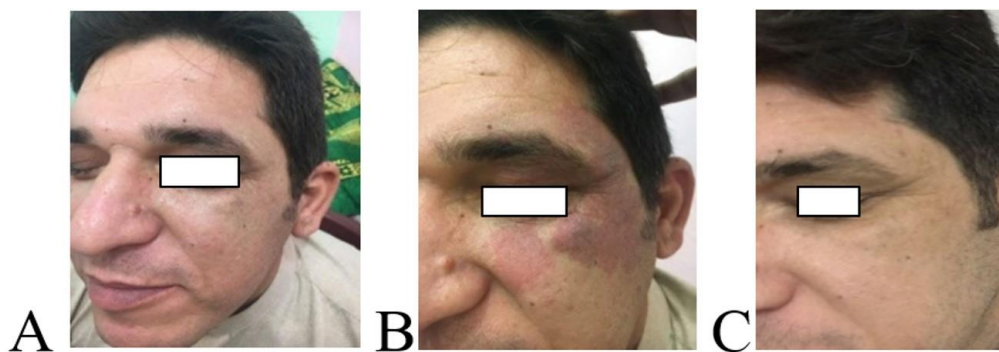


Fig.(3): A42 years old male.A:befor. B: redness three days after laser,more sever reaction due to higher power used (15 watt).C.Same patient after 2 months.complete resolution of redness with good response of wrinkles.

Discussion

Periorbital wrinkles may develop from aging and sun-induced changes in dermal collagen or by tension in underlying muscles. Because dynamic rhytides can only be treated by botox injection, there is a need for a way to treat age-induced wrinkles (Dvora A. Bruce E. 2010, Keen M, et al. 1994). This study showed that fractional CO₂ laser devices provide measurable improvement in periorbital wrinkles. Patient satisfaction was remarkably high and the procedure was well tolerated. The advantage of multiple treatments with relatively low powers is that downtime and adverse effects, especially pain during and after treatment, are minimized.

In this study the periorbital area, the area above eyebrows, temporal zone and upper cheek were treated in order to achieve an isomorphic skin, since these areas are regarded as one cosmetic unit. Fortunately, this caused skin tightening in two vectors; zygomatic and temporal that intensifies the tension on the lower lid and possibly helped reducing the wrinkles. These findings were somewhat similar to that found by Ruiz-Esparza and colleagues, using a nonablative RF device, who achieved improvement in lower lid laxity by treating extraorbital areas of nine patients (although by different device). Treating these areas around the orbital rim and lateral to the lower eyelid might also lower the chance of ectropion (Ruiz-Esparza J. 2004).

The present study was the first in Iraq to prospectively evaluate the use of a fractional CO₂ laser device for the treatment of eyelid rhytides. It is difficult to compare the results with those of other trials because of different numbers of treatment sessions and methods used to assess results. However, our technique was safe enough to permit direct treatment of the eyelid. Seventy percent of patients maintained 50–60% improvement at three months, and approximately thirty percent achieved or maintained 20–40% improvement at 3 months. Subject satisfaction was high and the procedure was well tolerated.

These results are comparable to those found by Dvora Ancona and Bruce E. Katz, who used comparable parameters and achieved (sixty percent of patients showed 26–50% improvement in eyelid wrinkles and skin laxity at three months) (Dvora A. Bruce E. 2010). In fractional CO₂ resurfacing, these changes are thought to be due to shrinkage of dermal collagen and induction of neocollagenesis. The

response was more evident after the second session, many patients mentioned an initial good response which lasted for about two weeks and then recurrence of wrinkles after the first session (probably due to the effect of edema that occurs shortly after laser, then it subsides and wrinkles reappear). This finding was not found after the second session. Therefore it is preferable to do more sessions to maintain the results. This might explain the relatively high default rate after the first session. So, it is mandatory to explain this event to patients from the start of treatment.

Another trial done by Biesman and colleagues (Biesman BS, et al., 2006). In their 72 patients, achieved lower eyelid tightening in 71–74% of patients, upper eyelid tightening in 88%. Upper eyelid tightening was greater than lower eyelid tightening. However, treatment outcomes were variable and unpredictable for unknown reasons. Starting with low parameters and gradually rising energies and optimal patient selection yielded minimal side effects in comparison with the outcomes. Mainly redness and swelling happened and subsided within few days with simple measures. Using EMLA 5% and selecting low wattage initially made the sessions tolerable and relatively pain free, this allows easy and proper treatment of the delicate anatomical areas around the eye.

The short downtime spent by subjects in this study contrasts with other trials using fractional CO₂ lasers where the downtime was often three to five days. The reason for this difference is likely because of the low wattages used in the initial sessions and the very careful increases in energies used in next sessions. Most patients had significant downtime for only one day with only mild erythema and edema for several days after the treatments.

Again, this study agrees with Biesman and colleagues (Biesman BS, et al., 2006), who stated that making appropriate expectations is the key to patient satisfaction. The procedure in the present study, although not an alternative to blepharoplasty surgery, is a viable non-surgical option for rejuvenating the periorbital facial skin. It is suitable for fine non-dynamic rhytids, but not for infraorbital fat herniation or too lax skin.

Conclusions:

Treatment with a fractional CO₂ laser device produces long-lasting improvement in fine periorbital rhytids and less benefits on skin laxity after an average of two treatments spaced

three to four weeks. Adverse events were minimal and the procedure was safe, effective and well tolerable.

Recommendations:

1. Continue to follow subjects for longer periods to further evaluate the longevity of clinical benefits.
2. Further comparative studies with different fractionl CO2 parameters and other laser systems to get the best choices.

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ليزر ثنائي اوكسيد الكربون CO2 المجزء لعلاج التجاعيد البسيطة حول الحجاج

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الخلاصة: خلفية الدراسة: الحاجة المتزايدة لتجديد شباب بشرة الوجه المتضررة نتيجة التقدم في السن وتأثير اشعة الشمس حفزت استخدام ليزر ثنائي اوكسيد الكربون المجزء كطريقة علاج دقيقة ويمكن ان تعطي نتائج مرضية في كل مرة. **الغرض من الدراسة:** لتقييم تأثير هذا النوع من الليزر في علاج التجاعيد البسيطة حول الحجاج. **المواد والطرق:** سبع وعشرون مريضاً يعانون من تجاعيد بسيطة في منطقة حول الحجاج تم فحصهم سريريا والتقاط صوراً فوتوغرافية للمنطقة قبل العلاج ثم عولجوا بليزر ثنائي اوكسيد الكربون المجزء مرتين الى ثلاث مرات حسب الاستجابة وتم تقييم النتائج بعد ثلاث اشهر من اخر جلسة علاج بالفحص السريري والصور الفوتوغرافية وكذلك تقييم العملية بناء على تحمل المرضى للألم المرافق للعملية ودرجة رضاهم عن النتائج. **النتائج:** سبعون بالمائة من المرضى حافظوا على التحسن الحاصل بنسبة 50-60% بعد ثلاث اشهر. بينما 40% من المرضى اظهروا تحسن بنسبة 20-40%. بينما كانت الجلسات العلاجية جيدة التحمل ونسبة رضاهم عن النتائج مرتفعة. الاعراض الجانبية كانت احمرار بسيط ووذمة تماثلت للشفاء بعد 3-4 ايام.