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Treating Fine to Moderate Rhytids with the CO_2RE Fractional CO_2 Laser System

Introduction

The carbon dioxide (CO_2) laser, one of the earliest lasers used for general industry purposes, has been the gold standard for treating sun damaged skin for the past two decades.[1,2] CO_2 laser energy is readily absorbed by water in tissue. Since soft tissue is comprised primarily of water, CO_2 laser energy can be used effectively for the excision, incision, ablation, vaporization and coagulation of soft tissue. CO_2 laser energy applied to the skin will not only ablate the center of a target but will also cause peripheral thermal damage. When controlled, this thermal damage leads to subsequent regeneration and remodeling of collagen.

The first effective cosmetic CO_2 lasers were either super-pulsed or ultra-pulsed with arbitrarily short pulses that limited the overall ablative and thermal damage. The procedures using these lasers involved removing most of the surface epidermal layer. This was very effective in treating moderate rhytids and surface pigmentation. The unfortunate consequences of this significant ablation were prolonged healing, prolonged erythema and common hypopigmentation.[3,4] Non-ablative lasers were developed to reduce the side effects of ablative CO_2 and Er:YAG lasers. These non-ablative lasers proved to be helpful in treating fine wrinkles but were not extremely effective.

The most recent approach to treating sun damage utilizes fractional technology.[5,6] Fractionated lasers deliver pulses in a scanned pattern to create microscopic wounds that reach greater dermal depths while leaving surrounding tissue undamaged, allowing the skin to heal much more quickly. Many wavelengths have been used in fractional lasers including 1410 nm fiber, 1440 nm Nd:YAG, 1550 nm Erbium-fiber, 2790 nm Er:YSGG, 2940 nm Er:YAG and 10,600 nm CO_2. This paper discusses the CO_2RE 10,600 nm fractional CO_2 laser.

The CO_2RE device has many unique features that distinguish it from other fractional lasers beginning with a radiofrequency (RF) excited aluminum waveguide carbon dioxide laser head. This contrasts with many CO_2 lasers that begin with direct current (DC) excited glass laser heads. As shown in Figure 1, the RF excited laser has a much narrower pulse when compared to the DC excited laser pulses. The real advantage of a narrow pulse is that the longer tail leads to more heating in surrounding tissue and therefore more pain, as shown in Figure 2.

Figure 1 (RF vs. DC Laser pulses)

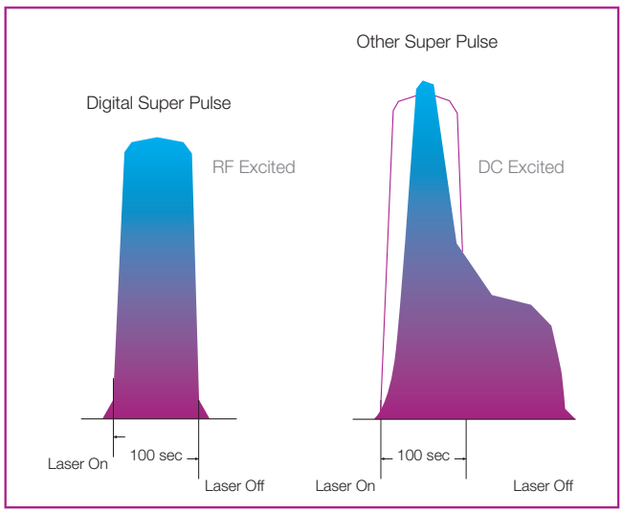


Figure 2, Pain related to pulse duration

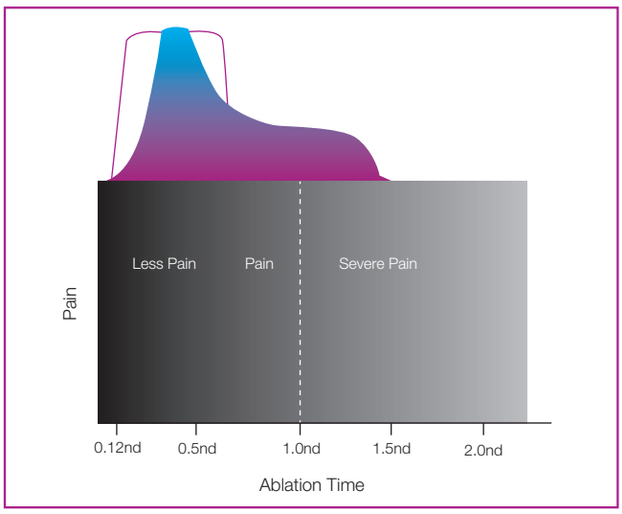
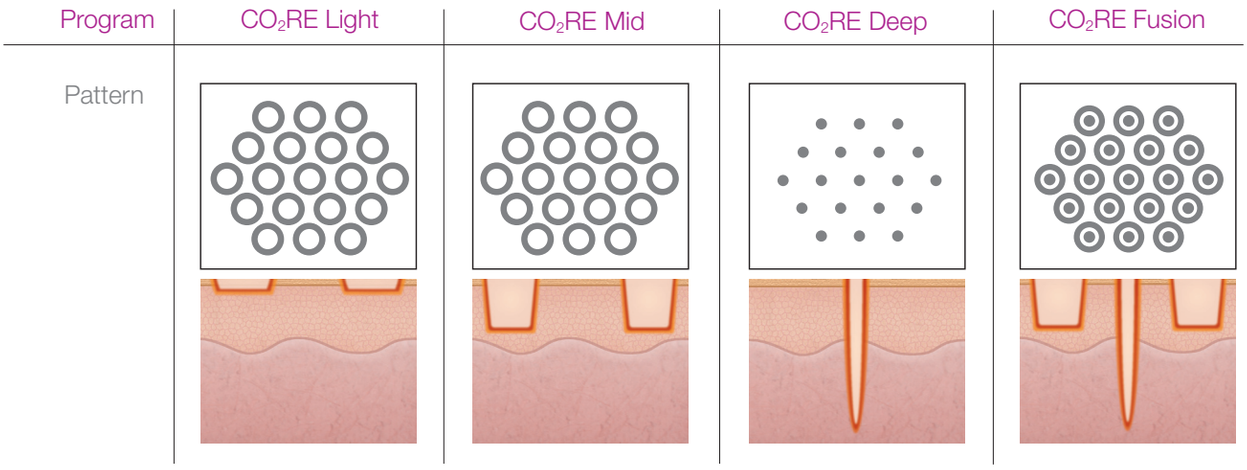


Figure 3 (CO_2RE Fractional scan patterns)



The second difference in the CO_2RE is the presence of dual scanners that may be combined to provide pulses in different depths simultaneously. There is the ability to have superficial (or light) pulses, middle depth (mid), deeper (deep) or a mixture of the mid and deep modes to create the unique fusion mode as shown in Figure 3.

General Treatment Methods

When performing a treatment with CO_2RE, the parameters are varied depending on the location, type of skin and the type of problem being treated. These are the general parameters I recommend for treating moderate rhytids in different areas of the face.

On the forehead and cheek areas, I use the CO_2RE Mid mode at 30% density, ring size 3, and 150 mJ energy. Over the periorbtal area I use the same mid setting at 25–30% density, ring size 3 and ~125 mJ energy. When treating the eyelids I insert protective, stainless steel intraocular shields over the eye before treating with the CO_2RE Light mode at 35% density, ring size 2, and ~50 mJ energy.

The lateral cheeks are usually treated with the CO_2RE Mid mode at 35% density, ring size 3 and 200 mJ energy. The inner cheeks, nasal-labial folds and perioral areas are usually treated with the CO_2RE Fusion mode at a 25% density, ring energy ~100 mJ and core energy ~50 mJ.

When treating the neck, I use high CO_2RE Light to low CO_2RE Mid energies and parameters. For surgical and acne scars I predominantly use the CO_2RE Deep" mode alone.

Different areas of the face will heal at different rates. This is mostly dependent on the depth and energy of the laser pulses.

Case History

A 67 year old female presented for treatment of facial rhytids, (see Figure 4) and requested fractional CO_2 laser treatment. The patient was counseled as to the risks and benefits of fractional CO_2 laser treatments and an informed consent was signed. The patient was started on Valtrex 1gm, daily starting two days before the procedure through the fifth day after treatment. The skin was cleaned with acetone to remove the oils. Topical anesthetic with Tetracaine 6%/Lidocaine 6% was applied for 30 minutes. The stronger topical anesthetic (Benzocaine 20%, Tetracaine 8%, Lidocaine 8%) was then reapplied for another 30 minutes. Infraorbital and submental blocks were performed with Lidocaine 2% with epinephrine. A total of 6 cc of anesthetic was used.

The forehead, nose, lateral cheeks and chin were treated with the CO_2RE Mid mode at 30% density, a ring setting of 3 and 175 mJ of ring energy. The medial cheeks and the perioral areas were treated with the CO_2RE Fusion mode at 25% density, with 85 mJ of ring energy and 50 mJ of core energy.

Area(s)	CO_2RE Mode	Density	Ring Setting	Energy
Forehead & Cheeks	Mid	30%	3	150 mJ
Periorbital Area	Mid	30%	3	150 mJ
Eyelids*	Light	35%	2	50 mJ
Lateral Cheeks	Mid	35%	3	200 mJ
Medial Cheek, Nasal-labial Fold & Perioral Area	Fusion	25%	N/A	100 mJ ring 50 mJ core

Table 1. General Tx Parameters - Moderate Rhytids

* Requires stainless steel intraoccular shields

The periorbital areas were treated with the CO_2RE Light mode at 40% density, a ring setting of 3 and 60 mJ of ring energy. After the treatment, the area was cooled with iced gauze and Aquaphor was applied.

The patient was told to expect the skin to be red for 1-5 days post treatment. It was also explained there could be mild to moderate swelling for up to 3 days, and possibly some burning sensation if the skin became too dry during the first 3-5 days. The dry skin condition could be completely alleviated by a thick application of Aquaphor.

For comfort she was instructed to use a vinegar/water soak (one part white vinegar/10 parts water) for 15 minutes at least twice daily for one week. She was also advised to treat the skin gently, to avoid scrubbing or scratching the skin and to avoid contact with very hot water for three days.

The patient experienced only 5 days of social downtime in total and was able to return to her work after 7 days. At the 6 weeks post treatment follow-up visit she expressed complete satisfaction with the treatment, reported no difficulties healing and suffered no side effects.

Figure 4. Pre-Treatment

Figure 5. 6 Weeks Post Treatment

Conclusion

CO_2 laser has been the gold standard for resurfacing for almost twenty years. As discussed above, the complications that arose from fully ablative CO_2 laser treatments led to a drastic reduction in that procedure. Fractional CO_2 laser has now become the "gold standard". There are many fractional CO_2 devices available in the market but the CO_2RE has many unique features that truly separate it from the competition.

The ability to deliver both superficial and deep components to a pulse and the lightest delivery handpiece are impressive design developments.

The ability to deliver both deep and superficial pulses simultaneously also leads to improved efficacy and more rapid healing of the surface. This stems from being able to put the increased energy deep into the dermis through a very small epidermal injury but treating the epidermis at the same time with a much less intense amount of energy.

References

1. Lowe NJ, Lask, G, Griffin, ME, et al. Skin Resurfacing with the Ultrapulse Carbon Dioxide Laser. Dermatol Surg 1995;21:1025-1029.

2. Fitzpatrick RE, Goldman MP, Satur, NM, et al. Pulsed Carbon Dioxide Laser Resurfacing of Photoaged Skin. Arch Dermatol 1996; 132:395-402.

3. Bernstein LJ, Kauvar ANB, Grossman, MC Geronemus RG.

The Short- and Long-term Side Effects of Carbon Dioxide Laser Resurfacing. Dermatol Surg 1997;23:519-525.

4. Nanni CA, Alster TS. Complications of Carbon Dioxide Laser Resurfacing. An Evaluation of 500 Patients. Dermatol Surg 24:315-320, 1998.

5. Manstein D, Herron GC, Sink RK, et al. Fractional Photothermolysis: A New Concept for Cutaneous Remodeling Using Microscopic Patterns of Thermal Injury. Lasers Surg Med 34:426-438, 2004

6. Laubach HJ, Tannous Z, Anderson RR, et al. Skin Responses to Fractional Photothermolysis. Lasers Surg Med 38:142-149.

Stephen W. Eubanks, M.D., is a board certified dermatologist who has practiced in the Denver area since 1984. He received his medical degree from the University of Oklahoma and his dermatology training from Fitzsimons Army Medical Center in Denver.

He began his dermatology career at the University Park Medical Clinic and established the Laser Center at University Park in 1989. When the University Park site closed, Dr. Eubanks helped establish the Dermatology & Laser Center at Harvard Park.

Dr. Eubanks is an assistant clinical professor at the University of Colorado Health Sciences Center. He has a long-standing full service dermatology practice that includes skin cancer surgery, standard dermatology care, cosmetic dermatology and comprehensive experience in skin laser surgery.

He has been one of Denver's pioneers in laser resurfacing with both carbon dioxide and Erbium:YAG lasers. Using a total of six different lasers to treat a variety of conditions his laser surgery experience includes the establishment of one of Colorado's first vascular laser surgery centers treating children with vascular birthmarks, adults with facial blood vessels and abnormal leg veins and scars and stretch marks.

Dr. Eubanks lectures and teaches laser related courses throughout the country and has consulted for prominent international laser corporations for fifteen years. He teaches dermatology for primary care physicians through a continuing medical education company. He enjoys hiking, skiing, mountain climbing, golf and kayaking.

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