Fractional Laser Systems

If you are considering the purchase of a fractional laser system, you should be aware that there are many companies who have developed a system, or handset for an existing system, to perform this treatment. The first fractional aesthetic laser was introduced to the market in 2004. Fractional technology has been shown to be very effective for modifying skin abnormalities including acne scars and wrinkles. It also tends to tighten the skin and will reduce or eliminate hyperpigmentation and uneven skin tone.

This technology was developed because the laser manufacturers intended to capture a new market of patient who wanted more dramatic results than what was currently available, without going to what the public perceived as the more invasive traditional CO_2 or Erbium resurfacing treatment. This line of reasoning was accurate; demand for fractional treatments is one of the fastest growing segments of the aesthetics market. The fractional laser treatment is now gaining popularity with the patient base who has experienced most of the established treatment options and want the more dramatic changes delivered by this new type of procedure but with the major selling point of reduced downtime.

The technology behind fractional laser systems is relatively simple and has been used in industrial applications since the 1970's; none of the aesthetic laser companies developed this technology. The concept of using a fractional laser beam for aesthetic skin treatments is a relatively recent development. There are numerous fractional systems on the market and some of the companies selling a fractional system will try to make it sound like they developed the technology behind the treatment. That is not true.

A fractional laser is simply a laser beam that has been 'fractionated' (or split) into multiple smaller beams. In one design, the original, single laser beam is delivered through an optical device that breaks up the single beam and creates a grid of pin-sized micro-beams (for example, a square pattern of 81 small beams in a 9 x 9 formation). In another design, the micro-beam is delivered by a scanner that randomly fires in a grid pattern. When aimed at the patient's skin the micro-beams heat tiny spots on the skin in this grid pattern. Because of this grid pattern, a fractional laser will affect approximately 20% of the surface tissue with each treatment. Depending on the wavelength of the laser technology used, either the heat from each of the micro-beams will reach deeper into the tissue (with non-ablative wavelengths) or the laser beam will “cut” deep into the tissue (with the ablative wavelengths). The effect is that the top layers, where the skin is actually burned or ablated, will have areas of healthy, untouched skin surrounding those tiny "holes" and this skin will grow over the "holes" and create a new-looking surface that is somewhat tighter than the pre-treatment skin. The tissue that is affected by the heat, deeper in the dermis, will begin some form of collagen remodeling. The overall outcome is a healthy, tighter looking exterior skin layer with reduced lines or wrinkles, reduced scar material and reduced pigmentation issues. Fractional treatments are administered in a series of individual treatments, from 3 to 6, spaced approximately 6 to 8 weeks apart.

As mentioned earlier, the fractional laser was developed because there was a number of patients who wanted some type of skin resurfacing treatment, but didn't want to endure the extensive down-time associated with traditional laser skin resurfacing. The old "gold standard" CO_2 laser skin resurfacing treatment is extremely effective (far more dramatic than any fractional treatment) but the patient is bleeding, oozing and unable to be out in public for one or more weeks and then may have residual redness for many months. Some experience 2 to 3 weeks of actual down-time and residual redness for up to a year. When all is said and done,

their skin will look almost baby-new, but that downtime price is too high to pay for the vast majority of patients.

The original fractional devices utilize a wavelength in the 1500nm range (1530nm to 1550nm) and entered the market with promises that there was no downtime and, after just a few treatments, would deliver comparable results as a CO2 laser peel. The reports that are surfacing (outside of the "articles" in industry magazine, which are really just disguised advertisements) say the results are good but the down-time is much longer than the manufacturer claims and some patients experience residual redness for up to two months post treatment. The treatment is somewhat to very painful and requires a strong topical plus some type of oral anxiolytic (such as Valium). Additionally, with the 1500nm systems, the patient is recommended to get a series of treatments (4 to 6) to achieve the desired results. Most patients cannot take the pain and do not finish the series so they do not get the full benefit of the technology.

Both wavelengths, CO2 at 10600nm and the original fractional lasers in the 1500nm range, are known to produce collateral thermal damage, resulting in extended recovery time due to the thermal damage caused by the laser induced heat. These wavelengths scatter to some degree when they strike the skin, causing heat damage to the surrounding tissue, resulting in swelling and redness. Those laser beams tend to form a cone within the tissue, spreading the thermal damage out in an expanding circle as it reaches deeper into the tissue. As a result, with the fractional technology, the heat damage from the micro-laser beams overlap in the dermis and then negate the benefits of splitting the original laser beam. Any fractional system that utilizes a 1500nm range laser beam will create some level of deep thermal damage based on the amount of power (fluence) used by the operator. Results vary, but many patients who get treated with a 1500nm fractional system at a higher fluence experience 10 days or more of noticeable swelling and, in some cases, residual redness for up to two months. Some manufacturers will claim that their systems will go as deep as 1.5mm (not microns), but getting a patient to endure the pain that would be associated with that deep penetration is highly improbable.

There have been a number of fractional systems introduced into the market recently, all designed to match or improve on the 1500nm fractional technology. The most noted improvement is the use of an erbium laser with a fractional beam. The erbium is widely known as the best alternative to the CO2 laser because it can deliver a skin resurfacing treatment on all skin types over all areas of the body with similarly dramatic results and far less down time with no residual redness. There are a number of erbium lasers on the market and many of them now have a fractional handset option. With a fractional erbium treatment, the patient can literally have one day of downtime, which is unheard of with the 1500nm or 10600nm fractional systems on the market. This is because the 2940nm wavelength of the erbium has a high affinity to water, meaning it vaporizes the water in the skin instantly without overheating the surrounding tissue. The erbium is also a true ablative wavelength, whereas the 1500nm wavelength is non-ablative. The erbium produces no scatter so it basically drills straight down into the skin to the depth the operator determined by setting the power. It limits the collateral damage so there is very little swelling of the surrounding tissue and no long-term residual redness.

One of the more notable advancements in fractional technology, as a whole, is the treatment that combines both a fractional erbium treatment and a light to medium erbium resurfacing peel. The fractional erbium treatment will remove approximately 20% of the surface tissue and provide deep thermal collagen remodeling down below 100 microns while creating a tighter surface because the unaffected surface tissue will grow over the “holes” created by the ablative, fractionated beam. When followed immediately by a traditional resurfacing treatment, this will

now remove 100% of the surface tissue down to 10 to 30 microns for an amazing combined effect with very little additional patient downtime.

When choosing a fractional laser system, as when choosing a standard laser system, be aware that power is an important factor. Having the option to adjust the depth of the ablation is very important, as you will have the ability to deliver the full range of patient requirements, from a light treatment to a very heavy and deep treatment. Being able to provide a deep treatment is important to appeal to the patient with the prominent wrinkles who may have tried other types of treatments but was not satisfied with the results. Sufficient power is the key to delivering results to all your patients. Remember that it is always possible to turn down a powerful laser but you cannot squeeze more power out of a weak laser. Trying to overcome the lack of power in a laser system by either shrinking the spot size or making multiple passes usually results in patient complications and burns. The component of the system that actually generates the laser light must have the capability to produce a powerful enough beam to deliver an effective treatment. The systems that utilize a handset to generate the laser light, or the tabletop units, are substantially less powerful than a full sized laser unit. See our section on Laser Shopping Information for more details on the difference between a laser system and a laser-generating handset.