

# The Future of Non-Invasive Rejuvenation Technology: Devices

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## ABSTRACT

Non-invasive rejuvenation of the skin is performed regularly in many cosmetic offices. Using evidence-based medicine, we will review the various technologies being used for non-invasive rejuvenation. This includes the use of intense pulsed light (IPL), which has been thoroughly studied and shown to be quite useful for this type of rejuvenation in removing the red and brown pigments, as well as affecting collagen. Fractional lasers, both non-ablative and ablative in nature, also can show dramatic improvements in the skin and associated clinical studies are reviewed here. Also described are radiofrequency (RF) fractional pin devices and RF microneedles used for non-invasive rejuvenation. Picosecond lasers are showing very positive results in the non-invasive rejuvenation market. Finally, absorbable sutures are being used to lift the skin and add volume in the skin over a duration of time. They are quickly becoming more popular.

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## INTRODUCTION

Non-invasive rejuvenation with technology devices, or energy based devices (EBDs), has become standard in many offices. We need to examine the evidence-based medicine behind this increasing technology, to make sure that we are dealing with fact over fiction, with reproducibility over one great case, and making the technology legitimate while demanding to learn the safety of these devices along with their efficacies. We need to be assured that our patients are taken care of, and that utilizing this technology will improve their well-being. This article will review some of the exciting new technological advances with EBDs.

We have been using intense pulsed light (IPL) sources for many years. Originally designed to treat vascular lesions, we soon learned that they are effective for other indications as well, including hair removal and pigmentary concerns. Soon we learned that collagen and elastin changes occurred with their use and this led to the term photorejuvenation being coined, which has become common term among laser surgeons. In 2000, Biter<sup>1</sup> reported on the use of IPL over a period of time to affect textural changes in the skin along with improving the reds and browns and even pores in the skin. In 2015, Ping et al<sup>2</sup> published their findings in a retrospective analysis of the long-term effects of using an IPL over time in a group of Chinese patients. Their group in Foshan, China has treated over 5300 patients with the IPL and studied the first 2354 patients

who received treatment to examine the clinical facial features that occurred over time. Each patient was required to have received at least three IPL treatments to be included in the analysis and most of the patients who were studied had yearly IPL treatments as well. Clinical photographs were taken yearly during the 12 years of follow-up in this group of patients, and an independent panel studied the effects seen.

The results showed that there was an effective rate between 88.24% and 96.45% in the study participants for improving signs of photodamage and for the rejuvenation of the skin. It is the single largest clinical evaluation in IPL history and as shown in Figure 1, has had and will have profound effects on our patients.

Fractional skin resurfacing has also gained popularity all over the world. Whether we are using ablative fractional lasers or non-ablative fractional lasers, we have seen great effects from these devices in our patients. With the ablative fractional CO<sub>2</sub> lasers, one thing we have learned from our colleagues is that long-term results with them are achievable. The work by Clementoni showed one- and two-year results following fractional CO<sub>2</sub> lasers.<sup>3</sup> In 2014, evaluations by Tan et al<sup>4</sup> took this work further and looked at 56 patients and followed them for one month post laser resurfacing and then 30 patients at five years. Photodamage scores in those 30 patients were significantly changed

**FIGURE 1.** Before and after 14 IPL treatments.

Photos Courtesy of Dr. Ping Chen, Foshan, China.

( $P < 0.01$ ) at one month, one year, and five years as compared to baselines. An example is shown in Figure 2.

Fractional laser skin resurfacing for hypertrophic scars also has become a popular treatment in recent years, thanks to the work of Waibel and Beer, who first reported on treating these lesions successfully.<sup>5</sup> Tan et al<sup>6</sup> have also reported on the use of fractional CO<sub>2</sub> lasers in the treatment of scars and have shown that with fractional CO<sub>2</sub> lasers, treating these lesions can be accomplished. A case is shown in Figure 3.

Fractional EBDs are not limited to lasers and recent work with radiofrequency (RF) energy has shown that these too can be used successfully to treat wrinkles and rhytids, as well as acne

and traumatic scars. Work by Hruza et al<sup>7</sup> and Gold and Biron<sup>8</sup> showed that pin-based delivery of bipolar RF energy into the skin would have an effect on wrinkle and scars. RF energy is color-blind and therefore useful in all skin types with minimal risks of pigmentary concerns following treatment. What made these devices popular and makes them continue to be popular today is that they all work by having minimal epidermal destruction and allowing delivery of RF energy at varying depths into the dermis. Collagen destruction and collagen remodeling will follow and lead to positive results. Several devices for pin-type RF energy delivery are now available and we have reported on scanning technologies and newer delivery methods being successful in this regard.<sup>9,10</sup> Fractional EBDs with microneedles and RF are also becoming very popular. Some of the devices in this category have insulated microneedles and some in this category have non-insulated microneedles to deliver their RF energy into the skin. From all published studies, it appears that both forms of microneedling, insulated and non-insulated, work well in treating wrinkles and lax skin, and both have shown positive effects in skin lifting as well.<sup>11,12</sup> One must decide which modality works best for them – RF destruction at the tip of the needle or RF destruction along the course of the entire needle. Both penetrate the dermal-epidermal junction before delivering their RF energy, which is why post-inflammatory pigment changes are not very common with these modalities. Examples of RF fractional therapies are shown in Figures 4 and 5.

Pigmentary concerns are some of the most common and problematic changes that we face daily in our clinical practices. EBDs have treated these conditions over the years with modest effects. In recent years, picosecond lasers have been introduced into the cosmetic armamentarium. These newer lasers not only treat tattoos faster and better than the traditional Q-switched

**FIGURE 2.** Fractional CO<sub>2</sub> laser treatment. One treatment 5 years after CO<sub>2</sub> laser.

Photos Courtesy of Dr. Ping Chen, Foshan, China.

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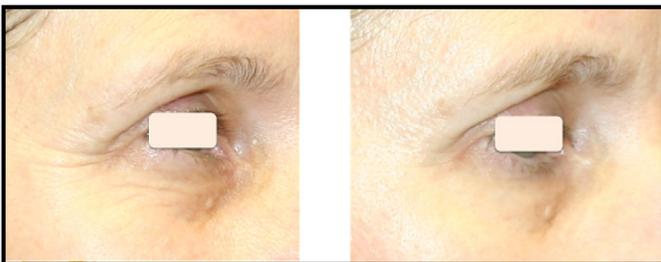
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**FIGURE 3.** A case of scar treatment with fractional CO2 lasers – baseline and 6 months.

Photos Courtesy of Dr. Ping Chen, Foshan, China.

**FIGURE 4.** Intensif Microneedling. Before and 1 month post 3 Tx.

Photos Courtesy of Michael H. Gold MD.

**FIGURE 5.** Intensif microneedling before and post 2 Tx.

Photos Courtesy of Michael H. Gold MD.

lasers. Recent studies have shown that the picosecond lasers are useful in treating various pigmentary concerns. Some of the newer fractionated picoseconds are not just producing results with pigment, but are addressing wrinkles and texture as well. Picosecond lasers are becoming more and more useful, not only for tattoo removal, but also for pigment and rejuvenation effects seen in our patients.<sup>13, 14</sup>

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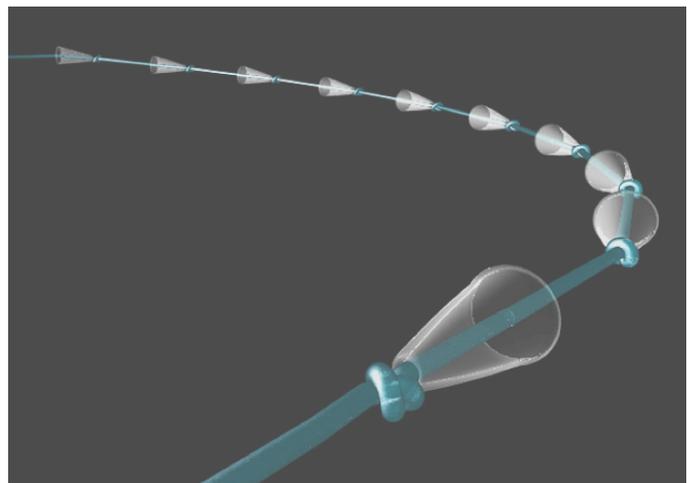
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RF energy also is popular to use for skin tightening. Many of the laser companies have entered this market and claim superiority over others in how well their device tightens the skin. Bulk RF heating through either monopolar, unipolar, or bipolar RF has shown, in multiple clinical studies, to have a positive effect for skin tightening. The effects work over a time period, and multiple treatments will normally be required to achieve the desired effects. Maintenance treatments will also need to be given, although this part of the equation has never been fully elicited from an evidence-based method. Many devices exist in this category as noted and we always recommend that one study the published reports on these individual devices and that choose one based on science rather than on hype from the manufacturer. These devices differentiate themselves by varying the RF electrode configuration and by how many electrodes are actually employed with each system.<sup>15-17</sup>

We will move away from non-invasive rejuvenation and EBDs and describe one of the more exciting trends that has entered the US market recently – the use of absorbable sutures for skin lifting. The use of permanent threads is not new to the US market and over the past decade we have seen several of these products come and go. Some have left the market because they were fraught with adverse events that were not acceptable to any of us. This led to the adoption by many of an absorbable suture, known as the Silhouette InstaLift, which has become the go-to product for skin lifting in our era. The material used in the US is poly-glycolic acid, although outside the US, polylactic acid is used. For all practical purposes, the products act identically. The sutures are composed of bidirectional cones and knots, as shown in Figure 6. When applied through proper vector placement within the skin, immediate and dramatic lifting is accomplished, which actually improves over time as the suture materials absorb and form

**FIGURE 6.** Absorbable sutures, known as the Silhouette InstaLift; the sutures are composed of bidirectional cones and knots.

**FIGURE 7.** Examples of clinical work with this material and its effects.

Photos Courtesy of Michael H. Gold MD.

new collagen. Clinical work with this material has shown its effects and an example is shown in Figure 7.<sup>18,19</sup>

EBDs have been very useful for rejuvenating the skin over the years. Newer technologies following evidence-based medicine have made these devices a reality for all of us in the laser and EBD field. As noted earlier and throughout this article, we can live in a world of hype or a world of reality. We need to choose to live in a world where well-done clinical studies pave the way for real science to explain how these devices work, to show the results that these devices can deliver, and to be truthful and honest in how we share these works with the world.

## DISCLOSURES

Dr. Gold is a consultant for the following: Lumenis, Syneron-Candela, Venus Concept, EndyMed, and Sinclair.

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