PHARMAEUTICAL RECENT ADVANCES IN CARBON LASER PEEL: A REVIEW

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Abstract: Clinics for dermatology are increasingly utilizing laser technology and other energy sources. Although few controlled research has been conducted in the field of skin rejuvenation by fractional photothermolysis, a number of devices have appeared recently that appear less effective than laser ablation approaches but are safer. This brief essay aims to introduce the many developing technologies in dermatology without going into great detail. Restoring skin equilibrium is the goal of the He Carbon Peel Facial. It gives skin an even glow, flawless texture, and complexion. Resurfacing with carbon dioxide lasers is now widely accepted. Even though improvements in laser technology have made this technique much better and reduced operator error, problems and negative outcomes still happen. We will pay special attention to lasers and other light sources in enhancing applications such as the treatment of vascular lesions, acne, and encapsulated ink tattoos; light-emitting diodes; advancements in the treatment of cellulitis; photodynamic therapy; suction techniques; scarring; and finally the recent and undoubtedly upcoming introduction of home devices for use in a variety of dermatologic applications (depilation, rejuvenation, treatment of acne, etc). To increase the bond strength of the fibers to the plastic layers, a laser-assisted 3D printing procedure for producing carbon fiber reinforced plastic parts was created.

INTRODUCTION:
The Carbon Peel Facial, commonly known as the "China Doll Peel Facial" (so named for the skin's china doll-like appearance), is a cutting-edge laser resurfacing procedure that uses concentrated light beams to repair skin flaws. The procedure's main selling point is that the skin regenerates, pigment, dark spots, and uneven skin texture visibly diminish and become more uniform. Procedures that enhance skin quality and require little recovery time are becoming more popular. In particular, topical carbon suspension and Q-switched Nd:YAG laser therapy, also known as the "carbon peel laser procedure," have grown in popularity in recent years. The advantages of laser resurfacing are now widely acknowledged and have evidenced by numerous papers in medical journals and book chapters, as well as numerous speeches at national seminars. It has been observed that there is a common pattern of various side effects and complications following the treatment when experience is accumulated on bigger series of patients. The risk that the patient would encounter additional difficulties or adverse effects increases as the depth of laser ablation is increased to remove rhytids. The surgeon may prolong the recovery period, lengthen the duration and intensity of erythema, subject the patient to changes in pigmentation, and increase postoperative pain in an effort to reduce the greatest number of wrinkles.

Plasma techniques, fractional photothermolysis, and other advancements in skin rejuvenation:
Several fractional skin rejuvenation devices have just entered the market, and despite the fact that there haven't been many controlled studies, sales are starting to pick up. These devices were created in an effort to prevent the negative consequences of the ablative (CO2 and Er:YAG) lasers, which, despite their efficiency, had the disadvantages of sluggish healing and the potential for scarring and hypopigmentation. It should be kept in mind that fractional photothermolysis-based treatments are less efficient than ablative lasers, which only require one session, remove epidermal lesions, have predictable results, and cause more skin tightening. A fractional part of the tissue is affected by each microthermal zone created by fractional laser systems, sparing the surrounding skin for a quicker epithelization process. Ablative laser therapy's negative effects don't materialize, and little post-treatment care is necessary. Each lesioned location is surrounded by viable tissue and covers a radius of around 50 to 70 m, ensuring complete reepithelization within 24 hours. The Fraxel laser at 1550 nm (2004, Reliant Technologies), Lux IR (IPL) at 1540 nm, erbium laser (2005, Palomar), Affirm Laser at 1440 nm (2006, Cynosure), Reliax at 10600 nm (Lumenis), Mosaic at 1550 nm (Lutronic), ProFractional at 2940 nm (2007, Sciton), Active FX at 10600 (1410 nm) Any energy source that creates skin damage with pixels less than 500 nm in diameter while producing high fluence and a small spot diameter can be referred to as fractional. This ensures that the skin will quickly regenerate within 24 to 48 hours. As a result, there is a lower chance of infection and less time off of work is needed. As a result, there is a lower chance of infection and less time off of work is needed. As a result, cutaneous collagen coagulates in an annular pattern, tightening the skin. The volume of coagulated or necrotized tissue, as well as the ideal depth of skin injury for each lesioned area, are yet unknown. Furthermore, we are unsure of the optimal parameters for each system and the percentage of skin that should be covered or treated in each session, as well as the total number of sessions required. The principal indication for using fractional techniques is acne scarring, followed by fine and moderate wrinkles, melasma, and facial rejuvenation. There is currently evidence that fractional techniques are beneficial in treating these conditions. It does appear evident that all of these strategies are efficient, and how well they are used will rely on how well they are trained and how well they use their judgment when deciding which parameters are right for each situation. A plasma-based system is a different promising possibility (Portrait plasma skin regeneration [PSR]). It is efficient for rejuvenation and works on a different concept than fractional methods. PSR does not rely on laser light or RF radiation like other systems do. Nitrogen gas and high-frequency electromagnetic radiation combine to create...
a plasma as the energy source. This plasma is administered through a handheld device to create a 6-mm spot with a homogeneous energy distribution and without making direct contact with the target skin surface. The energy is provided in pulses, and each patient's needs can be met by adjusting the fluence and depth of penetration. After treatment, the stratum corneum stays intact, lowering the risk of infections and negative effects. The treated skin begins to peel finely and uniformly 48 hours following the therapy. Seven days are required for epidermal regeneration. With this system, you only need to apply it once, and the results are similar to those of peeling procedures. However, because the skin tightening is thermally induced here, you may need to take a few days out of work depending on the energies utilized. The method is also applicable to all phototypes and does not rely on chromophores. According to histologic investigations, the collagen band near the dermal epidermal junction narrows, and a reduction in solar elastosis lasts even a year after treatment.

Acne: Developments in Photodynamic Therapy and Conventional Laser and Light Therapies
Numerous improvements and novel procedures have been made in the treatment of acne in recent years, but it is still too early to say whether or not they will be efficient and affordable enough to replace the current ones. The mechanisms of action are currently hypothetical, and there is no proof of their efficacy. They cannot be used alone as a single medication at this time since there have been insufficient rigorous randomized controlled trials of their efficacy. It is exceedingly difficult to customize protocols for each individual patient due to the dizzying array of equipment, protocols, and parameters for the many types of acne.

Advances in Skin Pigment Insertion and Removal (Including Tattoos): In most cases, it takes a combination of different laser types to completely remove tattoo pigment. Therefore, if a specific pigment cannot be removed with the right fluence of energy from a Q-switched laser, we should switch to a different system (such as a ruby 694 nm laser, an alexandrite 755 nm laser, or the particularly effective Nd:YAG 1064 and 532 nm laser), but we should never excessively increase fluence as this would also increase the risk of side effects. The most suitable lasers are Q-switched systems with nanosecond pulses. While millisecond pulses can result in scarring, these pulses create shock waves that literally shatter the pigment through a photoacoustic method. Sun-tanned patients require extra caution and should postpone therapy until after waiting and, if possible, undergoing an initial test or using topical bleaching agents prior to treatment. The market may soon see the release of lasers with shorter pulse durations (picoseconds and femtoseconds) and potential for increased therapeutic efficacy. Despite these factors, we should always start therapy with the longest wavelength that is accessible.

Do Light-Emitting Diodes Work?
LEDs are low-cost light sources that have been used in dermatology for photorejuvenation21–23 (yellow light at 570–600 nm and red light at 630–635 nm) as well as for treating conditions including acne (blue light at 415 nm and yellow light at 570–600 nm) and other types of dermatitis. 24-27 They should function using a photobiostimulation method. Their efficacy is still a hot topic of discussion. The equipment can produce light with high penetrating power at wavelengths between 630 and 850 nm. Market-available systems include those made by Gentlewave, Omnilux, and Active FX. Although additional information is needed to fully understand the biological mechanism, it appears that they largely exert their effects by making the mitochondrial membrane more permeable, which raises the pH, activates cyclic adenosine monophosphate (cAMP), and boosts DNA/RNA synthesis. Few data are currently available to support the efficacy of LEDs for dermatologic applications because until recently, the majority of clinical research have concentrated on lasers and other energy sources that specifically kill a cutaneous target. Advances in Cellulitis Treatment: Several systems that integrate laser systems, radiofrequency sources, pulsed light sources, suction, and ultrasound are currently available on the market. Although they have not yet surpassed liposuction in effectiveness, they are starting to become a viable option. As is customary in this subject, technology is advancing faster than fundamental research, and while systems are offered with FDA (US Food and Drug Administration) approval, there is not enough literature to back them up. Thermage, Sciton, Titan, and TriActive are systems that combine a laser light source with suction, and they are among the most popular. Other systems include Ultrashape (which uses ultrasound to create an acoustic effect), LipoSonix (which creates a thermal and lipoacoustic ultrasound effect), and SmartLipo (from Cynosure), which uses a minimally invasive Nd:YAG fiber laser that "lays" at 10 000 J/cm2. Their performance is frequently erratic, but occasionally they produce results that are outstanding or even excellent. They appear to be more effective in patients with extremely lax abdominal skin, possibly as a result of the skin tightening and fat removal that follows. The greatest development in the field of vascular laser therapy occurred in 2006 with the consecutive application of a pulsed dye laser at 595 nm and a Nd:YAG laser at 1064 nm (Cynergy Multiplex, Cynosure). 29,30 With the creation of methemoglobin, the pulse from the pulsed dye laser causes a chromatropic shift in the absorption spectra of oxyhemoglobin. This exponentially increases the absorption of the Nd:YAG laser pulse at 1064 nm. This has the consequence of making deep thermal effects possible at much lower fluences. Multiple pulses from a pulsed dye laser at the same wavelength have been shown to have stronger therapeutic effects. This technique appears to offer a novel therapeutic alternative that enhances outcomes for dark, hypertrophic port wine stains (nevus flammeus or capillary vascular malformations) refractory to pulsed dye laser treatment. We employ a 10-mm diameter spot from a pulsed dye laser (6–10 ms, 8–10 J/cm2) in individuals with treatment-resistant port wine stains, followed by a second Nd:YAG pulse (15–45 ms, 30-45 J/cm2), with ideal air cooling and ice packs. After one minute, in cases of resistance, a second dye laser pulse of 0.5 ms duration with a spot size of 10 mm and fluence of 7-9 J/cm2 is delivered. Which Scarring Types Can Laser Therapy Treat?
It is yet unknown which wavelength is the best option for photodynamic therapy. In this application, LED systems, which don't produce heat, are rapidly gaining ground. Such methods might enable gradual photoactivation as well as avoiding the heat effect of photosensitizers. Deep and superficial structures can be treated with dual LEDs, which emit light at two different wavelengths: red light at 630 nm and blue light at 405 nm (for example, sebaceous glands in acne). In addition, less expensive new photosensitizers with superior performance (in addition to Metvix and Levulan) are projected to become available. Topical photodynamic therapy is now being utilized for illnesses like erythroplasia, lichen sclerosis, warts, alopecia areata, extramammary Paget disease,
epidermodysplasia verruciformis, lichen planus, photorejuvenation, acne, and depilation in addition to the indication of nonmelanoma skin cancer.

New Suction Techniques:
Recently, a number of systems have entered the market that combine suction of the skin with the use of laser light, pulsed light, or radiofrequency radiation. 47 The suction process aids in reducing the concentration of melanin and hemoglobin in the target area, bringing the target area closer to the energy source, and utilizing the most efficient portion of the light spectrum. These devices' major goals are to lessen therapy-related pain, lessen side effects by avoiding competing with other chromophores (such as hemoglobin and melanin), and improve therapeutic efficacy. There are two different kinds of equipment: photoneumatic therapy, which merely suctions the skin without compressing it, and pneumatic skin flattening48 or PSF [Inolase], which suctions and raises the skin to induce a pneumatic flattening of it and reduce the blood volume in the target region (PPX [Aesthera, Lumenis – Alumina]). These systems have mostly been employed in laser depilation as well as in the simultaneous mechanical extraction of sebum from pores during the treatment of acne. As there are currently no clinical trial data available to substantiate their efficacy, several systems have not yet received FDA approval. The truth is that their usefulness and the best settings haven't been established yet, thus this strategy should just be seen as an intriguing concept worth exploring further.

Problems with laser resurfacing:
Thankfully, genuine laser resurfacing issues are extremely rare. The most serious issue, which frequently leaves scars, is infection. Numerous agents have the potential to infect patients. A herpes simplex infection could develop following laser therapy. Small skin blisters and a tingling or burning sensation are frequent warning signs. Patients who exhibit these symptoms should get a Tzanck stain for the virus and start taking large doses of antiviral medications as away. Additionally, topical Zovirax® ointment works well. Systemic medications include Valtrex, Famvir, and Zovirax. Infections caused by bacteria can also occur. Staphylococcus, Streptococcus, and Pseudomonas are the most prevalent (Figures 10 to 12). Obtaining cultures is necessary, and the patient needs to be given both topical and systemic antibiotics. Fluconazole® should be used to treat any suspected fungi or Candida organisms after being inspected under a microscope. Similarly, yeast infections can be identified through microscopic inspection and effectively treated. Antiviral and antibiotic agents' regular use has been disputed. Before the treatment, more than 50% of laser surgeons usually give their patients antibiotics and antiviral medications, and they keep taking them for at least 5 to 10 days. These safety measures might reduce the prevalence of the aforementioned infections. After laser resurfacing, hypertrophic or keloid scarring could develop. Infection and deep lasing into or through the reticular dermis are the two most frequent causes. To check for the potential of hypertrophic scarring, a very proactive program should be followed. The resurfaced skin area should be palpated in all patients after about two weeks. A proactive approach should be used because these areas may develop scarring if there is any indication of induration, if redness is shown that is different in one location from an adjacent area, or if the patient claims that they feel one area is thicker or has a burning sensation. Although the hyperpigmentation that results after laser treatment is always just temporary (Figures 18 and 19). It is typically caused by the patient unintentionally getting sun exposure on the recently laser-treated area. Patients with dark skin tones and members of particular ethnic groups, such as Asians or Hispanics, are also more likely to develop hyperpigmentation. The issue almost always goes away completely, but it could linger for up to 9 months. Bleaching agents like hydroquinone, Kojic acid, or a mixture of Retin-A® 0.1% cream, hydroquinone 5%, and steroid (Kligman's mixture) may be used to treat it. The same regimen may be administered as a pretreatment three to four weeks prior to surgery. A permanent side effect of laser resurfacing is hypopigmentation. Patients with hyperpigmentation or melanosis, particularly those from ethnic groups like Hispanics and Asians, are more likely to have it because of resurfacing that has penetrated too deeply into the reticular dermis. For hypopigmentation, there is no alternative to disguise cosmetics. After undergoing laser resurfacing, some topical medications or cosmetics cause exceptional sensitivity in the patients (Figures 20 to 22). It is common for patients to say that a cosmetic they had been using consistently for 20 years has started to cause their skin to break out. Dermatitis from contact is uncommon. Topical antibiotics like Neosporin, Bacitracin, and Polysporin have been documented to produce severe contact dermatitis that necessitates the use of systemic steroids and, in some cases, hospitalization. There have been reported sensitivity reactions to astringents, aloe vera, and even fabric softeners. If the unprotected tooth is hit by a laser beam, tooth enamel damage could result. The impact of the laser or the accompanying heat generation could break the enamel. Although there is no cure for this issue, it can be prevented by using specialized mouth guards that are sold commercially. Alternatively, whenever the laser is utilized in the perioral area, moist gauze may be placed over the teeth inside the lips. Patients who have undergone lower eyelid laser resurfacing may experience scleral show, as well as a temporary or permanent ectropion. The majority of these ectropions will disappear with time, lubrication, and massage. Tarsal adequacy in patients undergoing lower eyelid resurfacing should be thoroughly assessed. A tarsal tightening technique should be performed on any patient whose tarsal integrity is shown to be deficient before, or in addition to, lower eyelid resurfacing. The eyes must be shielded from unintentional laser light exposure. The use of laser therapy has led to corneal abrasions. When using a laser in the periorbital region, laser-safe scleral eye shields or a specialized Jaeger plate should be worn.

Conclusion:
There was only one documented experience for each indication using varied laser procedures on a small number of patients. However, common mechanisms of action were proposed in relation to the peeling impact of the process, including the decrease in P. acnes microbial colonization, sebaceous gland function, as well as the histologically demonstrated thinned stratum corneum of the epidermis. All of these methods, when combined, may help to reduce inflammation. It's interesting to note that the carbon peel laser technique has been shown to have a peeling effect, cleaning the skin's surface and clogged pores. This corrects the hypercornification of the follicular epithelium, which may be preventing the physiologic outflow of sebum to the skin surface, and lowers skin inflammation. As we have seen recently, technology is advancing faster than fundamental science, and as a result, many devices on the market now have only a theoretical mechanism of operation. Studies that back up the efficiency of these tools and
explain how to use them most effectively are frequently absent. The growth of home devices for the treatment of various skin issues is another new occurrence. In the upcoming years, the number of such gadgets will significantly rise.

Long-term Results of Carbon Dioxide Laser Resurfacing of the Face