

Non-ablative Lasers: Current Approaches and Perspectives

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Introduction

The treatment of dermatosis, like facial rhytids, by ablative techniques such as chemical peeling and dermabrasion involve destruction of epidermis. As far as ablative laser therapy is concerned, it is well known to be associated with complications like scarring and undesirable post-inflammatory pigmentary changes. And the time for re-epithelialization and healing, the "downtime", also affects ones' daily life.

With the advent of longer wavelength laser technique, selective subsurface remodeling can be achieved. In this lecture, different aspects of non-ablative laser technique had been discussed. The speaker also shared his experience in the use of a 1320 nm Nd:YAG laser (CoolTouch 2 model) with the audiences.

Purposes of non-ablative procedure

It was hoped that non-ablative therapy could decrease pathological skin conditions such as acne scarring, surgical scarring and striae; and resume a better skin texture and young looking by decreasing wrinkles.

Treatment modalities for rejuvenation

Currently, there are various treatment modalities available for rejuvenation. The major ones are listed as follow:

1. Long-term skin care regimens such as vitamin A, vitamin C analogs, alpha hydroxyl acid, etc.
2. Botulinum toxin (Botox)
3. Microdermabrasion
4. Regional ablative resurfacing
5. Non-ablative laser therapy

Concept of non-ablative laser therapy

The idea of non-ablative laser therapy was originated from the observation that people who had undergone pulsed dye laser therapy for port-wine stain improved skin texture afterwards. Histologically there was remodeling of collagen fibres in the dermis and this might be responsible for the disappearance of skin wrinkles.

Radiation with a longer wavelength can penetrate deeper into the dermis. So by irradiating the skin with a radiation, which possesses long wavelength and high horizontal scattering property, in combination with adequate cooling of the epidermis, it is possible to selectively damage the dermal collagen without destroying the epidermis. Thus oedema, erythema, blistering and scarring can be minimized. Moreover the longer wavelength such as 1320 nm will not be absorbed by melanin, therefore theoretically there should be no post-inflammatory hyperpigmentation.

Ideal non-ablative laser treatment

An ideal non-ablative laser treatment should consist of the following:

1. Lead to long-term improvement
2. Easy to use and with few side effects
3. Affordable
4. No interference with life styles, that is no "downtime"

In real life practice, multiple treatment sections with slower result are required in order to minimize the downtime.

Choices of non-ablative laser rejuvenation

There are various laser techniques in the market for non-ablative rejuvenation. They can be grouped into three major categories. (1) The infrared lasers such as 1320 nm Nd:YAG laser, 1450 nm Diode laser, 1540 nm Er:YAG laser, Q-switch Nd:YAG and Alexandrite lasers; (2) the visible light lasers such as pulsed dye laser and frequency-double Nd:YAG laser; (3) the broad band light includes intense pulse light.

Since the infrared light spectrum is not absorbed by melanin and does not burn the skin, it is particularly useful and safe in all skin types. Nevertheless, the infrared laser bypasses telangiectasia so that when treating patients with vascular and pigmentary lesions, a combination of different laser techniques is needed.

CoolTouch 2 (1320 nm) laser

This laser machine consists of three components: a laser probe, a cryogen jet and a photometer. The infrared energy penetrates down to 200-400 nm and targets at the dermal collagen layer of the skin. It works at a temperature range 45-48°C.

This laser modality can be particularly useful in dermatosis such as lax skin, acne scar or surgical scar, wrinkles, enlarged pores and striae.

According to the speaker's experience, it was uncommon to have purpura, blistering and pigmentation with this laser technique. Erythema after the laser therapy usually lasted for minutes to hours.

Algorithm of laser treatment in various dermatoses suggested by the speaker

Dermatosis	Laser treatment suggested
Telangiectasia	Intense pulse light
Mottled pigmented lesions	Microdermabrasion or intense pulse light on light skinned individuals
Mild rhytids	Intense pulse light or 1320 nm Nd:YAG laser
Moderate rhytids	1320 nm Nd:YAG laser
Acne scarring	Erythematous lesions: intense pulse light, pulse dye laser, 1320 nm Nd:YAG laser; non-erythematous lesions: 1320 nm Nd:YAG laser

At times, a combination of various treatment modalities such as Botox, microdermabrasion and laser may be required in the same patient in order to achieve the optimal result.

Patient should be explained about the long-term nature of the treatment and the result usually appears slowly over several months.

Learning points:

Non-ablative laser therapy relies on subsurface remodeling secondary to selective dermal collagen damage. Theoretically, when it couples with optimal cooling of the epidermis, it can minimize the side effects associated with conventional ablative laser method. However the patients must understand the long-term treatment requirement and slow result.