

Non Fractional Broadband Infrared Light for **Periorbital Skin Tightening** Measured by Three-Dimensional inVivo Optical Skin Imaging (3D-profilometry): - Preliminary Results

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Summary

Background: Background: As prolonged healing time and the risk of complications limit the use of ablative laser systems in patients who desire rejuvenation of photo damaged skin the search for better non invasive save and effective treatment options has begun.

Objective: To prove the ability of a novel system emitting constant and controlled broadband near infrared light (Novaplus, Ultramed, Geneva, Switzerland) for non invasive skin tightening by deep dermal heating and fibroblast stimulation.

Material and Methods: Seventeen volunteers were treated three times with a two week interval between treatments. Two passes of non fractional broadband near infrared light in the spectrum of 800 nm to 1.800 nm were applied in chopped pulses at an average fluence of 28 J/cm². Clinical photography and three-dimensional in vivo optical skin imaging were conducted at baseline and two weeks after the third treatment for evaluation of the skin tightening effect. Wrinkle depth and width were measured by a three dimensional in vivo optical skin imaging system (3d-profilometry) (Aphrodite®).

Results: Two weeks after the third treatment the median wrinkle depth reduction was 18.0%; the median wrinkle width reduction was 13.2%. No adverse effects were noticed.

Conclusion: Non fractional broadband near infrared light (800 nm to 1.800 nm wavelength) is a save and effective novel approach to non invasive rejuvenation of photo damaged skin.

Key words: non-fractional infrared light, broadband, non invasive, skin tightening, periorbital skin.

Introduction

Anti aging attitudes of western societies are creating challenges to dermatologists, plastic surgeons and physicians around the world. The use of ablative lasers is limited due to prolonged healing time and the risk of complications. A new trend in skin surgery has led to the development of non ablative lasers and light sources for the treatment of UV-damaged, scarred and injured skin. These are becoming popular because there is little or no down time and a minimal risk of side effects.

A pilot study was conducted at five European sites using a non-fractional broadband infrared light as non invasive skin tightening protocol in periorbital areas.

Material and Methods

Study design

20eventeen volunteers (15 females, two males) aged 38 to 65 years (median 48.6 years) were recruited. All of them sought improvement of their wrinkly periorbital skin (crow's feet). Informed consent was given by all participants before the first treatment. Standardized digital photographic documentation and three-dimensional in vivo optical skin imaging (3D-profilometry) of the deepest periorbital wrinkle in the left and right periorbital region was performed at baseline and at week six. Wrinkle depth and width was measured by a three dimensional in vivo skin imaging (3d-profilometry) system (Aphrodite®). Treatments of both cheeks and periorbital areas were conducted at baseline, week 2, and week 4 without use of any anaesthetics.

Non-fractional broadband infrared light source

Nova Plus® (Ultra med, Geneva, Switzerland) is a new device capable to emit three different types of broadband of light spectrum:

A: 800 to 1800 nm near infrared, for deep dermal heating and fibroblast stimulation;

B: 500 to 800 nm for the treatment of pigmented lesions, and vascular lesions;

C: 600 to 1000 nm for hair removal.

The energy density that may be applied range from 20 J/cm² to 45 J/cm². Light is delivered in chopped pulses of 5 ms to 3000 ms. All treatments mentioned above are conducted with a single hand piece utilizing a spot size of 6 cm² (40x15mm) with no change of filters needed. To avoid epidermal injury skin contact cooling is integrated in the hand piece, cooling the skin surface down to minus 5°C to +5°C (+5°C used in routine treatments).

For skin tightening two passes of non-fractional broadband infrared light from 800 nm to 1.800 nm are applied in a chopped pulse mode at a fluence ranging from 21 J/cm² to 45 J/cm². As the use of higher fluence may cause a burning sensation in the dermis, in most cases 28 J/cm² were used without local anaesthesia.

Results

Three-dimensional in vivo optical skin imaging provided quantitative assessment of the surface topography and periorbital fine lines before and two weeks after three treatment sessions. At baseline the median wrinkle depth measured by a 3d-profilometry attached computer soft ware (Aphrodite®) was 539 µ (range 280 µ to 800 µ), the median wrinkle width was 6.62 µ (range 3.52 µ to 10.0 µ). Two weeks after the third treatment the median wrinkle depth measured was 442µ (range 256 µ to 656 µ) - the average improvement was 18.0%. The median wrinkle width was 5.757 µ (range 3.20 µ to 8.40 µ), - the average improvement was 13.2%.

Discussion

Various treatment options for rejuvenation of photo damaged skin have been developed in the past. Some of them lost popularity because of the risk of undesired side effects and prolonged periods of recovery. ^{1, 2} Aesthetically oriented patients seek for less invasive methods a variety of new light sources has been encountered. ^{3, 4, 5} Most of these devices stimulate fibroblasts and create new collagen production with more or less side effects. Still, assessment of the resulting improvement in the appearance of photo damaged skin is a delicate issue. ⁶ Objective methods for

the evaluation of the clinical results had to be found in order to give prove of the benefit of non-invasive surface remodelling.

⁷ Due to two passes of chopped light pulses the Nova Plus® system is able to effectively heat up dermal layers to above 65°C while keeping the epidermis protected with an adapted cooling system. Thus, creating a sub-treshold light induced insury to the dermis and/or dermal vessels leads to a wound repair response with fibroblast stimulation resulting in a skin tightening effect due to new collagen formation at a low rate of side effects and no complications.

This study shows that non-fractional broadband near infrared light (800 nm to 1.800 nm wavelength) of an average fluence at 28 J/cm² applied to the skin surface in chopped pulses is able to improve the clinical appearance of photo damaged skin. Three-dimensional in vivo optical skin imaging provided quantitative assessment of surface topography and periorbital wrinkles before and after three treatment sessions. The average improvement of wrinkle depth comparing before and after measurements was 18.0%, the average improvement of wrinkle width was 13.2%.

Further controlled studies with larger numbers of patients, perhaps a larger number of treatment sessions, and a longer follow up period are necessary to establish non-fractional broadband infrared light as a save and effective novel approach to non invasive rejuvenation of photo damaged skin.

3D-profilometry of deepest periorbital wrinkle at baseline.



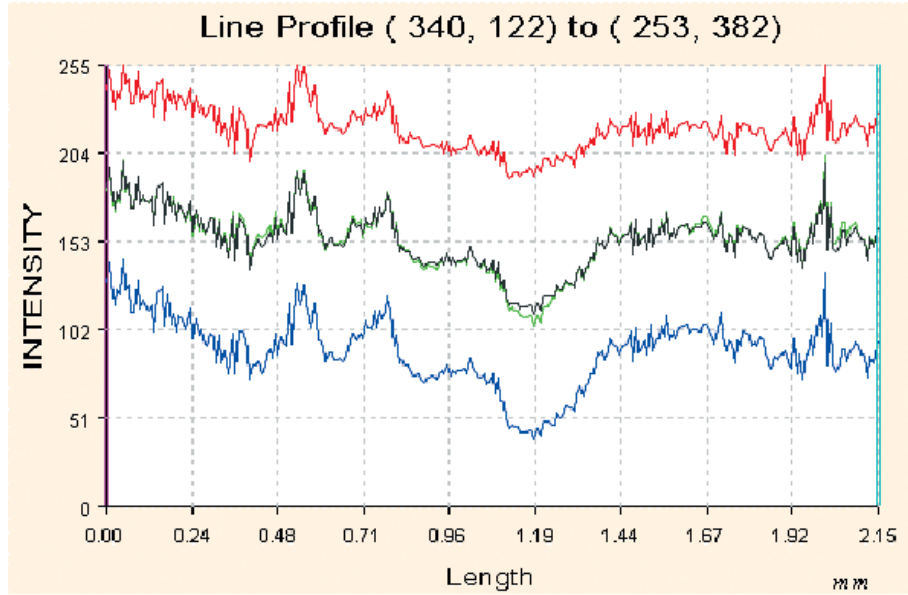
before

3D-profilometry of deepest periorbital wrinkle after three treatments with non-fractional broadband infrared light (800 - 1.800 nm) in doubled, chopped pulses at 28 J/cm².

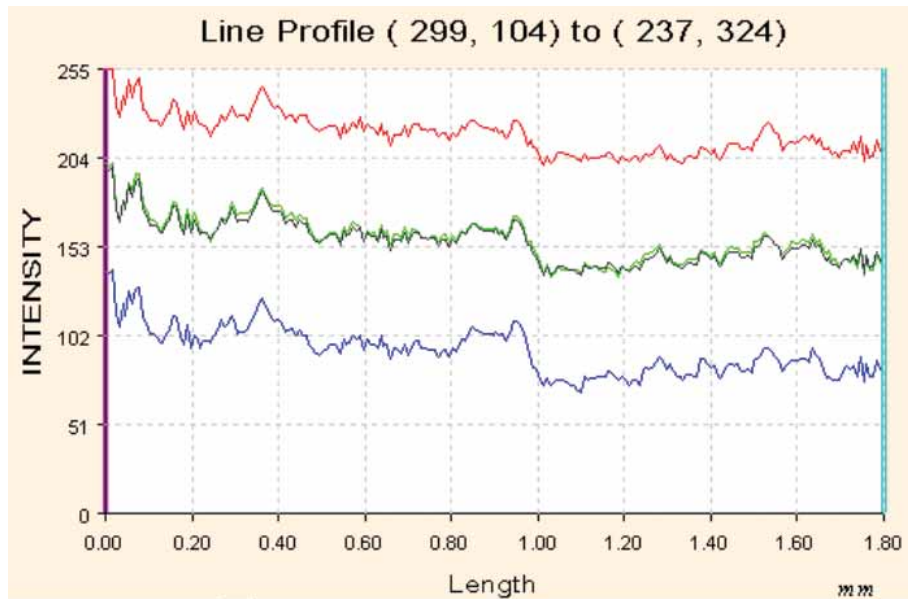


after

Line profile measured by 3d-profilometry attached computer software (Aphrodite®) at baseline.



Line profile measured by 3d-profilometry attached computer software (Aphrodite®) after three treatments with non-fractional broadband infrared light (800 - 1.800 nm) in doubled, chopped pulses at 28 J/cm².



Wrinkles of a patients before treatment



before



after



before



after

Wrinkles of a patients before treatment



before



after

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