
Ultrastructural Effects of Titan Infrared Handpiece on Forehead and Abdominal Skin

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Background and Objective

The purpose of this two-part study was to evaluate ultrastructural changes in cadaveric forehead skin and live abdominal skin for different fluence levels using the Titan infrared handpiece (Cutera, Inc., Brisbane, CA). This device is a non-coherent selectively filtered infrared device operating in the 1,100 nm to 1,800 nm band, intended to provide dermal heating.

Materials and Methods

Cadaveric forehead skin was treated with a 1 cm x 1.5 cm spot at fluences of 50 J/cm² and 100 J/cm². Exposure durations were from 5 to 10 seconds. Pre-, parallel, and post-cooling accompanied each exposure. Punch biopsies of the treatment areas were obtained immediately post treatment. Transmission electron microscopy was performed for samples from 1 mm thick sections between 0 and 5 mm to evaluate morphologic alterations of collagen fibrils.

Abdominal skin of one patient (pre-abdominoplasty) was treated in vivo with a 1 cm x 1.5 cm spot at fluences of 30 J/cm², 45 J/cm² and 65 J/cm². Exposure durations were from 3 to 6 seconds and each area received 4 passes.

Pre-, parallel, and post-cooling accompanied each exposure. Punch biopsies of the treatment areas and a control area were obtained immediately post treatment. Transmission electron microscopy at depths of 0-1 mm and 1-2 mm was performed for each biopsy to evaluate morphologic alterations of collagen fibrils in treated areas compared to the control area.

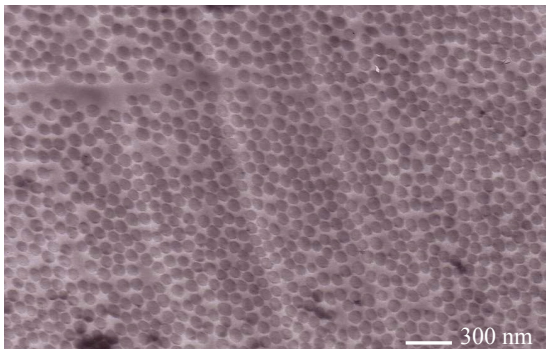
Results

In the cadaveric forehead skin samples, the percent collagen fibril alteration showed the largest increase in the depth range of 1 mm to 2 mm for both fluence settings.

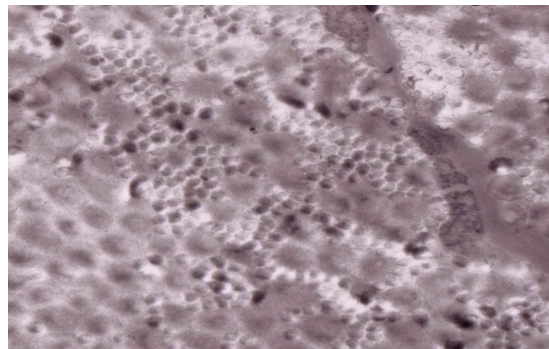
In the abdominal skin samples, collagen fibril alteration was not seen in the control site, but was observed at all treatment levels at both the 0-1 mm and 1-2 mm depths, with the least alteration seen at the shallow depth and the lowest fluence.

Conclusions:

Our findings suggest that collagen fibril denaturation, consistent with fibril thermocontraction, occurs immediately after treatment with the Titan infrared handpiece. Collagen denaturation occurs at a depth range appropriate for deep dermal treatments. The peak in collagen fibril alteration at 1 to 2 mm is consistent with contact cooling protecting the more superficial layers of the skin.



Unaltered collagen fibrils in abdominal control site.



Example of altered collagen fibrils in treated abdominal site.