ORION Concept | COSM'O LABORATORY | TECHN'O

Innovative R&D Methods for the Evaluation of "Perception" in dermo-cosmetology ...

CONSULTING | R&D METHODS - STUDIES | TECHNIQUES - DEVICES

IMAGE ANALYSIS OF CONFOCAL LASER MICROSCOPY TO STUDY THE EVOLUTION OF THE SUPERFICIAL PART OF THE RETICULAR DERMIS WITH AGE

LABORATOIRES CLARINS

***Jean-Christophe Pittet*[1], *Diane Hottelart*[2], *Katell Vié*[2]**
[1] Orion Concept, Tours, France.
[2] Laboratoires CLARINS, Pontoise, France.

INTRODUCTION—OBJECTIVES

The main objective of this work is to study by the confocal laser microscopy and echographic acquisitions, the relationship between the modification of the superficial part of the reticular dermis, the age and the presence of some elastosis induced by the repeated sun exposition.
As already described, the decrease of the superficial part of the dermis corresponds to a modification of the organization of the collagen/elastin network, mainly due to its fragmentation.
In parallel, the confocal laser microscopy in vivo allows to obtain non invasive and real time "optical biopsies" up to the superficial reticular layer.
The second aim of this trial is to compare these two technologies for the skin imaging.

MATERIALS & METHODS

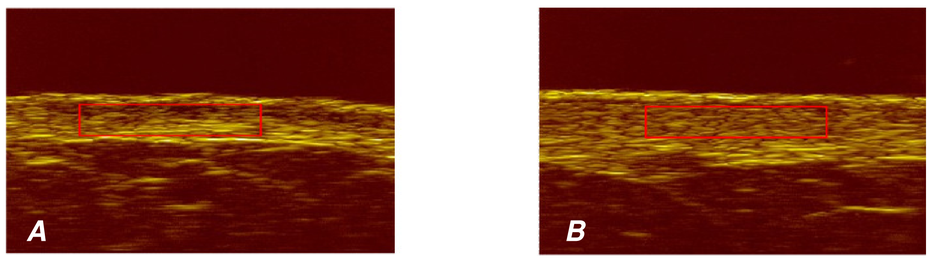
Subjects
For such a purpose, 142 healthy caucasian women aged from 21 to 77 years old were recruited.

Devices - Sites of measurements

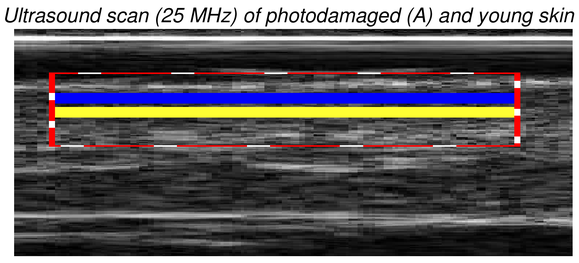
- ***Confocal imaging*** : Acquisitions were performed onto the cheek, using a confocal laser microscope working at 830 nm (VivaScope 1500, Mavig, Germany). Acquisitions consisted to obtain different stacks of images, up to 150 µm depth with a step of 2 µm. Such an acquisition profile allowed to reach the superficial part of the reticular dermis and to assess the level of the sun damage onto the architecture of the collagen/elastin network.
- ***Ultrasound scans*** : On the other hand, ultrasound acquisitions equipped with a 25 MHz probe (Dermcup, Atys, France) were performed on the forearm to characterize and quantify the SENEB (SubEpidermal Non Echogenic Band) according to the age.

Image processing & Analysis

- ***Confocal images*** : All confocal images (stacks) were analyzed with a specific software (ConfoScan V01, ORION Concept/MAVIG, France) to extract information about the organization of the superficial collagen/elastin network and to quantify the ratio of fragmentation corresponding to the grade of elastosis.
- ***Ultrasound scans*** : Analysis performed with a dedicated software (EchoScan V02, ORION Concept, France) consists in quantifying the difference of the echogenicity between the superficial (imaged by confocal microscopy as well) and deep dermis. Two equivalent regions of interest were defined onto these two locations into the dermis and the average of grey levels were calculated. A negative difference corresponds to a presence of a SENEB and a modification of the collagen/elastin network due to the sun damages.



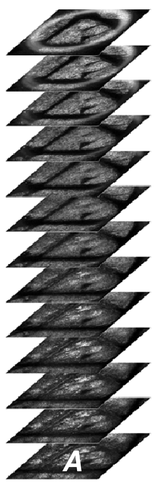
Ultrasound scan (25 MHz) of photodamaged (A) and young skin (B)

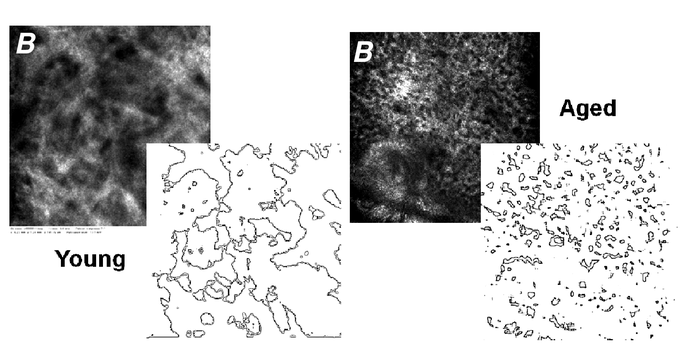


Quantification of the SENEB (Difference of the deep and superficial echogenicity of the dermis— EchoScan softwareV20 ORION-Concept, France)



Dermcup 2020 Atys Medical France





(A) Stack of images (500X500 µm) acquired up to 150 µm depth into the skin with a step of 2 µm.
(B) Quantification of the texture of the superficial reticular dermis and its fragmentation related to the age and the photodamage intensity ConfoScan software V01, ORION-Concept/MAVIG, France)



VivaScope 1500 Lucid—Mavig Germany

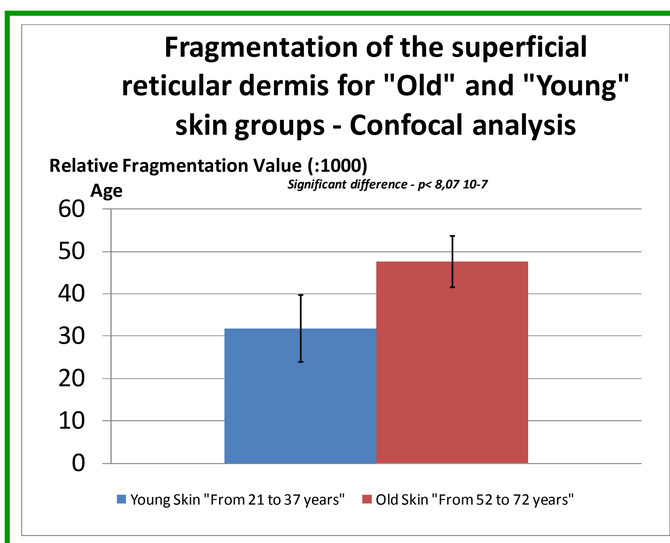
RESULTS

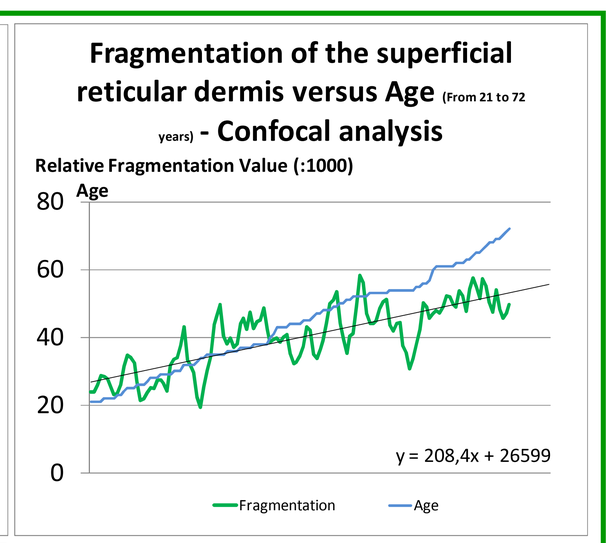
Results with the confocal laser microscopy demonstrated regular increase of the fragmentation with the ageing. In parallel, an important inter individual variation was observed probably correlated to an important disparity of the intrinsic cutaneous sensibility of the subjects and to the frequency of their sun expositions.

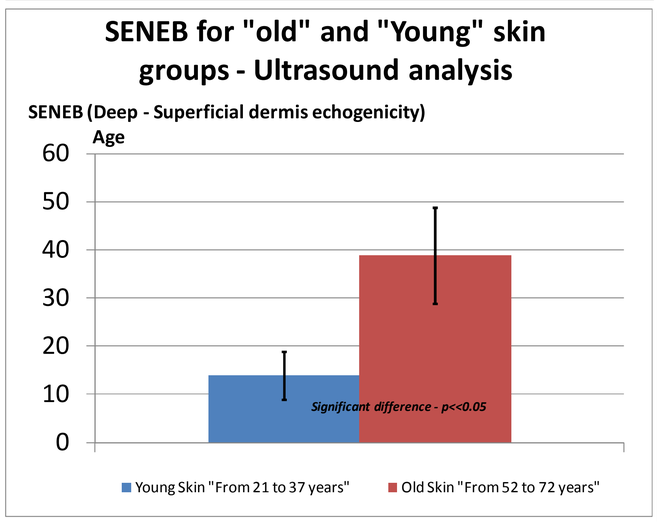
The comparison performed "group to group" (50 subjects aged from 21 to 37 years and 50 aged from 52 to 72) demonstrated a high significant difference ($p=8.07\ 10^{-7}$, *Student "t" test, two-tailed, unpaired*) confirming the modification of the reticular network with the age and the progressive installation of an elastosis and its worsening.

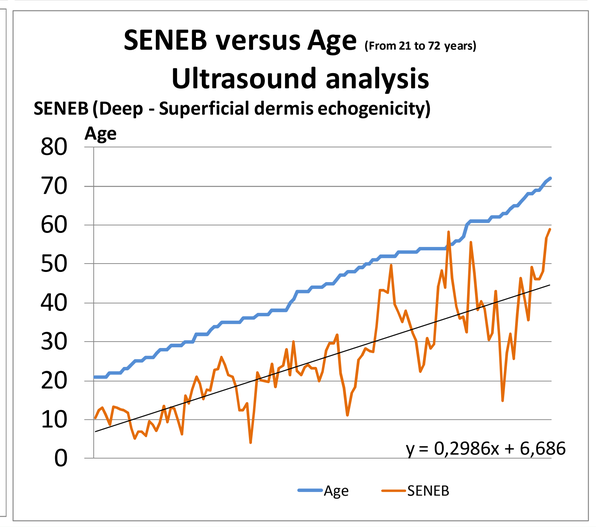
In parallel, the image analysis of the ultrasound images of the dermis and the quantification of the sub-epidermal hypoechogenic band (SENEB) demonstrated a regular increase of this parameter with the age too. These already described results confirms observations obtained by the confocal microscopy and the injury of the superficial part of the reticular dermis.

The comparison on the same groups, showed a significant difference of the SENEB both evaluate by visual scoring of the images ($p = 9.5.10^{-14}$, *Student "t" test, two-tailed, unpaired*) and image analysis and quantification oc the differential echogenicity between the superficial and the deep dermis ($p = 9.5.10^{-14}$, *Student "t" test, two-tailed, unpaired*)









CONCLUSION

These first results demonstrated the real interest of the confocal laser microscopy and the high frequency ultrasound scanning for the study of the intrinsic skin characteristics and in particular, their relationship with the ageing.

The combination of these techniques seems presented a real complementarities, in particular in the future, to quantify the depth of the sun damages into the skin.

CONSULTING
ORION Concept - 100 rue de Suède—37100 Tours, FRANCE
Phone/Fax : (33) 2 47 05 23 16 - Mobile : (33) 6 10 78 66 95
orion@orion-concept.com - www.orion-concept.com

R&D METHODS
COSM'O Lab. - 100 rue de Suède—37100 Tours, FRANCE
Phone/Fax : (33) 2 47 05 23 16 - Mobile : (33) 6 10 78 66 95
cosmo@cosmo-lab.com - www.cosmo-lab.com

TECHNIQUES