In vivo assessment of skin collagen changes in aging mice by second harmonic generation microscopy and optical coherence tomography

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ABSTRACT

Background: Collagen is the main extracellular matrix component in the skin. Oral intake of collagen is claimed to have anti-aging properties, however, there are few research studies to confirm these points. Therefore, there is an urgent need to establish a method that can quickly assess the state of collagen without any skin biopsy. The aim of this study was to investigate the role of second harmonic generation(SHG) and optical coherence tomography(OCT) in assessing the state of collagen in the skin.

Methods: Twelve 16-month-old chronological aged mice were randomly divided into collagen group and control group, with 6 mice in each group. The collagen group: oral intake of collagen prepared from deer bone 100mg / kg^{-1}·d for 4 weeks; the control group: oral intake of an equal volume of saline. Another 4 young mice were taken as the normal group. After 4 weeks, the mouse skin was subjected to SHG and OCT imaging, and the same portion of the skin of each mouse was selected. After the observation, the skin of the corresponding site was stained with HE and Masson, and the collagen content of each group was observed. The dermis thickness was measured using Image-Pro Plus image analysis software, and the volume fraction of collagen was analyzed using ImageJ.

Results: The results of SHG and OCT showed that the skin collagen content of aging mice decreased significantly, and the skin collagen content increased after oral administration of collagen, which was statistically different from the control group (P <0.05). These results were confirmed by HE and Masson staining.

Conclusions: Ingestion of collagen (100mg / kg^{-1}·d) suppressed the reduction of collagen content in the dermis of aging mice. This can be evaluated in vivo by SHG and OCT in a real-time non-invasive way.

KEY WORDS: Collagen, SHG, OCT, skin aging, real-time, non-invasive imaging
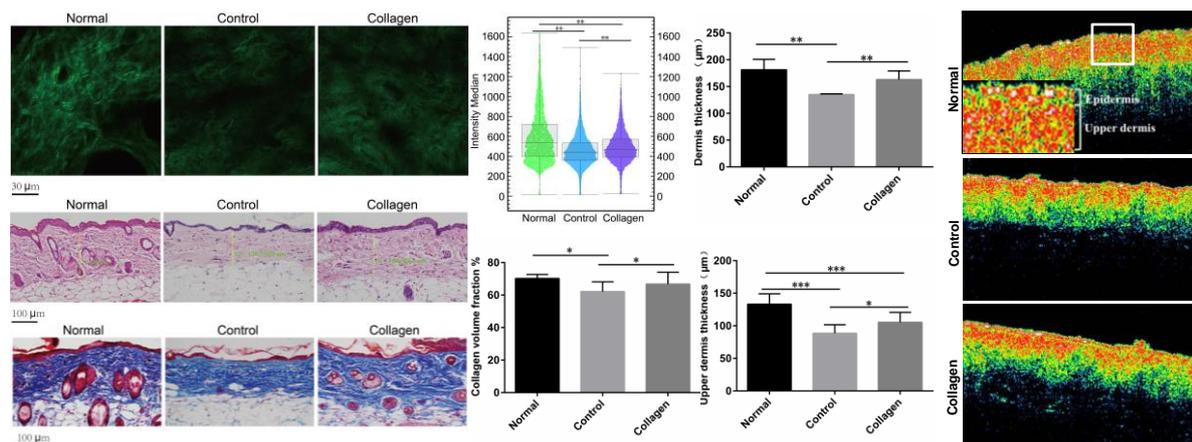
Figure 1: The changes of collagen in the skin

References

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