Study of microvasculature density using optical coherence tomography (OCT) angiography images

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Abstract

The understanding of the etiopathogenic mechanisms of increased vascular risk and its therapeutic implications is essential. In this study, we investigate microvasculature changes in patients between 18 to 70 years using optical coherence tomography (OCT) angiography images. We propose to establish an effective tool for the study of human vessels in the field of skin aging research. With the help of computational tools, some of them developed for us, we determine the diameters, density, and vessel bifurcations evaluated from the images with the purpose to find a correlation with the age of the volunteers. Our goal is that the results will be processed in a fully automatic and repeatable way, providing quantitative information for each image.

Introduction

Aging is associated with attenuated vasodilatory responses of the skin’s microcirculation to a variety of stimuli. Age-associated impairment in the vasodilator function of cutaneous micro vessels may reflect the increased risk of cardiovascular disease, although this remains debatable. Age is one of the most important risk factors for cardiovascular disease. As the proportion of older adults increases in most of the developed world, a greater understanding of the etiopathogenic mechanisms of increased vascular risk and its therapeutic implications becomes essential for all clinicians who assess and manage the geriatric patient. In this study, we investigate microvasculature alterations in patients according to age using optical coherence tomography (OCT) angiography images. Volunteers from 18 to 70 years old are involved and, for each age range, the diameter, density, and isotropy of the vessels will be evaluated.

Procedure

Figure 1. Telesto 320C OCT equipment

Angiography images will be obtained using the Telesto 320C OCT equipment (ThorLab®, USA). The Speckle Variance algorithm present in the equipment software will be used to visualize the vessels. Images of the vasculature of the hand (region more exposed to the sun) for each volunteer were taken.

✓ Blood vessel image acquisitions with the OCT equipment at the IFSC
✓ Image processing and obtaining the diameter of volunteer vessels, twenty per age group.
✓ Development of computational routines to carry out the process of establishing the diameter, density, and vascularization of vessels

Computational methods

Figure 2. Develop Computational routine to vessel analyzes.

Figure 4. Measurement routine of diameter of micro vessels.

Preliminary results

Figure 5. Preliminary results diameter vessels results.

✓ Diameters, density, and vessel bifurcations have been evaluated in the images and in an attempt to find a correlation with the age of the volunteers.
✓ We propose an effective computational tool for the study of human vessels in the field of skin aging research.
✓ Using the proposed algorithm, the results for diameters and density of micro vessels are being processed in a fully automatic and repeatable way, providing quantitative information for each image.

Team

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