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Perspective

OCT and OCTA Application for Ocular Disorders Diagnosis

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DESCRIPTION

Optical Coherence Tomography (OCT) angiography (OCTA) produce images of blood flow with unparalleled resolution of all the vascular layers of the retina in a quick, non-invasive manner; however it is still under development. For more than 50 years, Fluorescein Angiography (FA), a different approach of visualising flow, has been employed in clinical practise. However, FA is unable to scan numerous critical layers of blood vessels in the eye; only the surface vascular plexus can be visualised. Regardless, FA was utilised in the development of the area of medical retina. The radial peripapillary capillary network, as well as the intermediate and deep capillary plexuses, may be seen by OCT Angiography (OCTA). This feature brings up a world of possibilities in terms of disease description and quantification, disease aetiology study, and development of new therapy alternatives

The development of OCTA follows that of higher-speed structural OCT imaging, at very early stages. Surprisingly, most of the recent effort to design instrumentation platforms has been directed toward improving OCTA. At the same time, the scanning methodologies and software being developed for OCTA are rapidly improving. While the velocity of development is remarkable and exciting, understanding what OCTA is and what it can do becomes a barrier. Understanding OCTA necessitates a thorough understanding of many aspects of imaging, beginning with how the imaging works and what the possible defects and strengths are.

OCT angiography instruments are being developed by a number of OCT instrument manufacturers. There are research prototype devices available. Most of these instruments are familiar to the researchers. These instruments' technology and software are continuously evolving. As a result, specific recommendations are limited to the time period during which the specific software or hardware version of the instrument was in use, which is likely to be a short duration. As a result, the evaluation following will attempt to be as generic as possible, but the user should be aware that the features and performance of individual OCTA instruments may vary over time.

OCT creates images by measuring the amplitude and latency of reflected or diffracted light using interferometry. Depth ranging is accomplished by interfering reflected or backscattered light from ocular structures with light that has travelled a defined reference route on the retina or anterior eye. This technique is a variation of Michelson interferometry. The intensity of the interferograms produced varies with the quantity of light reflected off a structure in the eye, and the frequency of the interference fringes provides information about the delay or optical route length relative to the reference path. To put it another way, OCT determines the depth of a certain structure inside the tissue as well as the amount of light it reflects or scatters. Because early OCT equipment employed a scanning reference delay, this measurement is known as an axial scan or A-scan, similar to ultrasound. As the light beam is scanned in the transverse direction, a B-scan or cross sectional picture is produced by successively obtaining several A-scans.

Volumetric information is obtained by raster scanning a portion of the retina or anterior eye and progressively capturing several B-scans that are shifted perpendicular to the B-scan image. The reflectance or scattering at blood flow regions varies from one scan to the next. It is feasible to visualise blood flow by comparing repeated OCT B-scans and examining for variations between the scans on a pixel-by-pixel basis. The key concerns in OCTA are how scans are obtained, how differences are detected, and what constitutes a difference.

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