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Editorial

Optical Coherence Tomography Angiography- A Way to Future..!

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Imaging of the retina with Optical coherence tomography, Fluorescein angiography and Indocyanine angiography form important battery of ancillary tests in diagnosis, management and further follow up in retinal diseases. Optical coherence tomography angiography (OCTA) has been recently added to the armamentarium which is gaining importance in multimodal imaging.

Optical coherence tomography (OCT) uses interferometric analysis of short-coherence-length light to provide depth-resolved imaging of ocular tissues such as choroid and retina. If multiple images are taken of the same area over time, changes in reflectance properties over that area of tis¬sue can be measured. Stationary tissue shows little variation, whereas moving elements-blood flow for instance-show more prominent changes [1]. The variation over time of some of these measurable reflectance parameters (such as amplitude or phase information of the reflected light) forms the basis for a flow imaging technique called OCT angiography (OCTA).

Fluorescein angiography (FA) is an invasive test that requires intravenous administration of dye. FA cannot separately visualize the intraretinal structures of major capillary networks; the images of superficial and deep capillaries overlap, so 2 of the 3 major capillary networks (superficial retinal, deep retinal and choriocapillaries) do not appear to be imaged well despite the retina being a nearly transparent structure [2]. FA has other drawbacks that can limit its widespread use as it is relatively expensive, time-consuming. The dye poses risks of allergic reactions and anaphylaxis in rare instances. Evaluation of patients requiring frequent follow-up examinations or those that may not tolerate injection of the intravenous dye, a rapid non-invasive technique to visualize retinal and choroidal vessels would be beneficial [3].

OCTA, in comparison, is a non-invasive technique that acquire volumetric angiographic information without the use of a dye. The en-face images obtained can be scrolled to visualize individual vascular plexuses and to segment the inner retina, outer retina, choriocapillaries, and other areas of interest [4].

An OCTA consists of orthogonal registration algorithm (in-built software which has the ability to correct some motion artifacts) is used to produce merged 3-dimensional OCT angiograms. Each volume set is composed of 216 line-scan locations at which 5 consecutive B-scans are obtained.

In patients of diabetic retinopathy, OCTA provides valuable information with respect to capillary perfusion, vessel density and foveal avascular zone characteristics. Studies have shown that OCTA is being used in early detection of choroidal neovascular membranes [5]. Hyperflow vascular lesions, feeder vessels, presence of anastomosis and loops are distinctive features noted on OCTA which help in earlier diagnosis, treatment and prognostication of the disease. Mactel Type 2 patients on OCTA showed dilated appearance of vessels, telangiectasia, enlargement of vessels, larger intervascular spaces, reduction and/or loss of capillary density, and abnormal anastomoses [6].

In cases of central retinal vein occlusion and cases of branch vein occlusion, OCTA -having an added benefit of being non-invasive and repeatable, provides valuable information regarding capillary non-perfusion areas, extent of FAZ irregularities with respect to area and longest measured diameters.

Management of multiple other retinal pathologies like PCV, CSCR, Sickle cell retinopathy etc.is being streamlined with the help of OCTA.

Having said these numerous advantages the newer technology has to be tempered with problems like ghost images, blink and motion artefacts. The current available modules use in clinical practice are not widefield and have good quality imaging up to the equator only.

Compensatory software for eye-tracking device that corrects for eye movements during the scanning process, coupled with follow-up function that leads to highly reproducible retinal perfusion measurements will be an giant leap to make it impeccable [3]. Even before the presence of clinically visible signs a flow index of the retina and optic nerve head can be used to ascertain perfusion compromise. OCTA has enormous implications for understanding tissue perfusion which are precursors of obvious morphological changes in retinal vasculature. The current ongoing research on use of higher wave length monochromatic light will also enable acquisition of more accurate information of deeper structures and give more vivid details of retinochoroidal vasculature. OCTA, thus is serving as a boon and ongoing exploration in the field of software, hardware, artificial intelligence is the way to future, taking the world towards eliminating needless blindness.

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