Editorial

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Anterior Segment Optical Coherence Tomography in Glaucoma Diagnostics: is Fourier- or Time-domain more useful?

Zaher Sbeity[1,2]* and Angelos Efstathopoulos[1]

[1]Evangelic Hopsital Mülheim, Department of Ophthalmology, University of Düsseldorf, Mülheim an der Ruhr, Germany
[2]New York Medical College, Valhalla, NY, USA

Several new methods based on evolving technologies were introduced in the last decades to enhance and facilitate anterior segment diagnostics in glaucoma. Nowadays, in addition to conventional slit lamp biomicroscopy and gonioscopy, ultrasound biomicroscopy (UBM) and recently anterior segment optical coherence tomography (AS-OCT) are considered to be valuable and indispensable tools especially for patients with primary and secondary angle closure glaucomas.

In the early 1990s the AS-OCT was introduced for cornea and glaucoma diagnosis [1]. In contrast to UBM, AS-OCT is a noncontact, high resolution imaging technique which is fast and optimal for noncompliant patients or even children [2] and has been used to image a variety of anatomic ocular structures in glaucoma patients such as filtering bleb, anterior chamber angle, episcleral and intracameral shunts, posterior chamber and iris.

An optimal AS-OCT is not yet available, since each module has its own advantages and limitations, making it increasingly difficult to choose among them.

Time-domain AS-OCT

Early AS-OCT machines like Visante OCT (Carl Zeiss, Meditec, Dublin, CA, USA) and the slit-lamp adapted OCT (Heidelberg Engineering, Dossenheim, Germany) utilized the time-domain technology. These imaging technologies are still great and relatively affordable tools for anterior segment diagnostics in particular for cornea and glaucoma. In glaucoma patients, it has been successfully used to image filtering blebs including internal scleral ostium and scleral flap after filter surgeries. Diverse anatomic structures of the anterior chamber can be also imaged and angle parameters such as TISA, ACA can be quantified. Furthermore the clinical diagnosis of a plateau iris configuration, which might be challenging for general ophthalmologists, can be facilitated by this technology. Imaging of the retroiridal structures and the ciliary body however is very limited and accurate imaging is almost always impossible. Another drawback of this technology is the limited resolution to image the scleral spur [3], hence making detection of eyes at risk of latent angle closure difficult.

Fourier-domain OCT

In the last few years, Fourier-domain OCT (FD-OCT) improved significantly the accuracy of diagnosis of various retinal and optic nerve diseases. Fourier-domain OCT is a fast, high definition and three-dimensional imaging technology [4] which provides a high resolution imaging. Meanwhile a variety of commercial FD-OCTs are available (FD -OCT-1000 Topcon, Tokyo, Japan, Cirrus Carl Zeiss, Meditec, Dublin, CA, USA, RTVue-100 , Optoview, Inc., Fremont, CA, USA), and the Spectralis OCT Heidelberg Engineering, Dossenheim, Germany). Most of these FD-OCTs have nowadays an anterior segment module that is majorly used for cornea and refractive surgery and glaucoma diagnostics, providing fast imaging with high resolution of the entire cornea including the anterior chamber angle, the iris, and the crystalline lens [5].

In glaucoma unlike time-domain AS-OCT, FD-OCT provides fast and far more details of the bleb wall anatomy and is able to image Schlemm's canal after canaloplasty. Also angle structures like Schwalbe's line and sclera spur are better imaged by FD-OCT [6]. Unlike Time Domain OCT, the reflectivity of the inferior anatomic part of the angle is most of the time barely seen. In our experience and despite high resolution technology, FD-OCT imaging of anterior chamber angle is still suboptimal and this is due to restricted ability to image the iris root and ciliary band.

Both Fourier- as well as time-domain AS-OCT are essential in angle closure glaucoma diagnostics and can be used most of the time interchangeably.

FD-OCT is optimal for anterior segment diagnosis post canaloplasty and post trabeculectomy. Time domain AS-OCT on the other hand provides better diagnostic imaging in plateau iris and latent angle closure. Optimizing this technology can be achieved by providing a FD-OCT system that uses wavelength explicitly optimal for the anterior segment.

References

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*Corresponding author: Zaher Sbeity, M.D, F.E.B.O Assistant Professor and Chief, Glaucoma Service, Department of Ophthalmology, Evangelic Hospital of Mülheim, Wertgase 30, 45468, Mülheim an der Ruhr, Germany, Tel: 49-2083094978; Fax:49 -2083092965; E-mail: zaher.sbeity@evkmh.de