Detection of secondary choroidal neovascularization in chronic central serous chorioretinopathy by swept source-optical coherence tomography angiography

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Chronic central serous chorioretinopathy (CSCR) is characterized by persistent circumscribed elevation of the neurosensory retina due to subretinal fluid (SRF) accumulation. Up to one-third of eyes with chronic CSCR are complicated by the sequela of secondary choroidal neovascularization (CNV). Swept source-optical coherence tomography angiography (SS-OCTA) is a relatively new non-invasive imaging technology, which visualizes retinal and choroidal vasculature by measuring blood flow (Makita et al. 2006). Herein, the sensitivity and specificity of SS-OCTA for the detection of secondary CNV in chronic CSCR were evaluated.

Thirty-five eyes of 24 patients (aged 54 ± 11 years; 88% males) with the clinical diagnosis of chronic CSCR and visual symptoms for more than 6 months were enrolled between March and November 2016 and retrospectively reviewed at our tertiary eye care centre (Medical Retina Unit, Department of Ophthalmology; Rudolf Foundation Hospital Vienna; Karl Landsteiner Institute for Retinal Research and Imaging). Baseline analysis included slit-lamp biomicroscopy of the fundus (Haag-Streit AG, Bern, Switzerland), spectral domain (SD)-OCT, blue-peak autofluorescence, fluorescein (FA) and indocyanine green angiography (ICGA; Spectralis High Resolution Angiography HRA+OCT Confocal Scanning Laser Ophthalmoscope; Heidelberg Engineering GmbH, Heidelberg, Germany) and best corrected visual acuity (BCVA) using back-illuminated Early Treatment Diabetic Retinopathy Study (0.94 ± 0.35 ETDRS letters) charts starting at 4 m converted to Snellen (20/30 Sn). In addition, consenting patients were examined with a beta version of Topcon’s DRI Triton SS-OCTA (Topcon Corporation, Tokyo, Japan) device (Fig. 1). The images were meticulously analysed by another retina specialist for the

Fig. 1: Multimodal imaging of a 49-year-old woman with chronic central serous chorioretinopathy (A) 30° blue-peak autofluorescence image of the right posterior pole with teardrop-shaped hypofluorescence (arrowheads) due to long-standing SRF. (B) Corresponding spectral domain optical coherence tomography of the foveal region with SRF (asterisk), flat irregular retinal pigment epithelium elevation and speckled hyperreflectivity at Sattler’s layer (arrowhead). (C) Fluorescein angiography with late leakage (left arrows) and mid-phase indocyanine green angiography showing an ill-defined hypercyanescence (right arrow). (D) 6 × 6 mm en face swept source-optical coherence tomography angiography image showing projection and black band artefacts clearly demonstrating choroidal neovascularization formation (circle) with buds at the vessel termini. (E) Corresponding choriocapillaris B-scan segmentation (1:1 ratio).
existence of neovascularity, who was masked to initial findings. Eight of 35 eyes (23%) showed evidence of CNV on FA/ICGA, while seven of them (20%) were identified by SS-OCTA, giving a statistically significant difference (p < 0.05, Fisher’s exact test) and a sensitivity of 88%. No CNV complex was found in 27 eyes without evidence of CNV in FA (100% specificity).

According to our findings, FA remained the gold standard in the detection of chronic CSCR complicated by secondary CNV. However, the right diagnosis was challenging owing to concomitant features such as an expression variability. OCTA – being commercially available for a few years – is still a field in its infancy. Bonini et al. (2015) first compared traditional multimodal imaging to a prototype Avanti SD-OCTA (Optovue Inc., Fremont, CA, USA) in chronic CSCR with secondary CNV. They evaluated 27 eyes and considered it equal to angiography. Similar outcomes were concluded by de Carlo et al. (2016). Bousquet and his group investigated flat irregular retinal pigment epithelial detachments in CSCR with SD-OCTA for secondary CNV formation and found it superior in comparison with conventional imaging methods.

To our knowledge, an advanced SS-OCTA technology with a 1050 nm wavelength laser has not been used before in this setting. Interestingly, the sensitivity was not as high compared to SD-OCTA, at least in this cohort. A high incident power and wavelength with a faster scanning rate in SS-OCTA should lead to better penetration even below the retinal pigment epithelium (Povazay et al. 2007). Improvement in automated thresholding – normally implemented to suppress noise artifacts from low signal areas – could increase the chance of valid OCTA signal detection (Cole et al. 2017). Limitations of this study were its retrospective analysis and its relatively small number.

In conclusion, we regarded the information provided by SS-OCTA meaningful and clinically relevant in a difficult clinical setting such as chronic CSCR complicated by secondary CNV. At present, we would not consider it as an alternative but rather an additional instrument. It should be implemented as a sensitive and harmless first-line testing device.

References

When does visual acuity stabilize after macular hole surgery? Five-year follow-up of surgery for idiopathic macular hole
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Editor,
Macular hole closure rates of over 90% and improvement in visual acuity (VA) after successful repair have been reported in surgical studies with removal of the internal limiting membrane (ILM), gas tamponade and face-down positioning in previous studies (Karacorlu et al. 2005; Ozdemir et al. 2010; Hu et al. 2016).

In this retrospective study, we report 5-year follow-up results of 162 eyes of 146 patients with idiopathic macular hole whose surgery involved removal of the ILM (without dye assistance), 12–14% perfluoropropane tamponade and face-down positioning for about 5 days (Table 1). The differences between preoperative VA and postoperative VA at all subsequent follow-up visits were statistically significant (all, p < 0.001). There was a statistically significant difference in postoperative VA between 1 month and 3 months, between 6 months and 1 year and between 1 year and 2 years (all, p < 0.001). There was no statistically significant difference in best corrected visual acuity (BCVA) 2 years after surgery at subsequent visits. It has been demonstrated that VA continues to improve until 2 years and remains stable afterwards.

At 5 years postoperatively, 139 eyes (90%) achieved VA of 20/40 or better. All eyes with VA of 20/40 or better had complete restoration of the external limiting membrane. None of the eyes with VA of 20/25 or better had impairment of the ellipsoid zone. Although anatomical success was achieved in all patients after the first operation,