Quantitative Retinal Optical Coherence Tomography Angiography in Patients With Diabetes Without Diabetic Retinopathy

We are writing this letter in reference to the recent article by Dimitrova and associates.[1] This article compares quantitative changes in superficial and deep capillary networks as measured by optical coherence tomography angiography (OCTA) between control subjects and diabetic patients without diabetic retinopathy, and its correlation with retinal structure parameters and systemic characteristics.

One of the advantages of OCTA is the visualization of deeper retinal vascular plexuses via layer-by-layer analysis; however, OCTA artifacts are common and may lead to incorrect interpretations.[2,3] Particularly, projection artifacts from superficial blood vessels on the deeper layers (a fluctuating shadow cast by the flowing blood cells in the overlying retinal vessels projecting to the deeper layers) are regarded as a motion signal, which if wrongly detected, interferes with lesion detection and the true assessment of deeper retinal vascular plexuses. Currently, findings from reported OCTA studies on the deep capillary plexus without using projection-resolved algorithms are very likely to be affected by these "false" blood flow signals, although this issue has been raised. In addition, it also was reported that projection artifacts are often detected in the outer retina, which is an avascular space, even in normal eyes, weakening the ability of OCTA to identify lesions in deeper retina.[4] Clearly, projection artifacts greatly confound image quality and accuracy in assessment of deep capillary networks, masking real structures or lesions in the deeper vascular plexuses.

In this circumstance, efforts have been made to try to resolve such issues. For example, Zhang et al.[5] recently proposed a projection-resolved (PR) algorithm by comparing the flow signal normalized to the reflectance signal at the voxel with that of a more superficial voxel, without referencing predefined slabs. The flow signal is deemed as the projected flow signal if it is weaker than the in situ flow signal. Compared with the standard slab-subtraction OCTA algorithm for suppressing projection artifacts, the PR OCTA algorithm can reduce the vascular similarity in the deeper en face OCTA slabs in comparison with the vascular pattern in the above slabs, and also preserve vascular continuity and integrity, demonstrating that the suppression of projection artifacts is further improved.[5] Hwang et al.[6] applied the PR OCTA in a case-control study and reported that three retinal vascular plexuses can be distinctly visualized and diabetic retinopathy can be detected more accurately compared with the conventional OCTA algorithm. However, the proposed PR OCTA algorithm still cannot remove entire projection artifacts, particularly under larger vessels.[5] Further improvements are essentially needed.

In summary, although deeper retinal vascular plexuses can be visualized by current OCTA algorithms, the influence of projection artifacts on visualization of deeper retinal vascular plexuses remains one of the major issues. The morphology of the deep capillary plexus can be accurately assessed or measured only after projection artifacts are effectively resolved.

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