Title

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Re: Spaide et al.: Volume-rendering optical coherence tomography angiography of macular telangiectasia type 2 (Ophthalmology 2015;122:2261-9)

TO THE EDITOR: We agree very much with Spaide et al[1] that a great advantage of optical coherence tomography (OCT) angiography is its 3-dimensional (3D) nature, and that color coding for the depth of vessels is a natural way to represent this 3D information. However, we think it is disingenuous for Dr Spaide to imply that he was the first to adapt this approach from CT and MR literature and apply it to OCT angiography. He wrote:

> Instead of imaging the average or densest voxel, volume rendering uses all the voxel values to make an image that retains the sense of depth and is less prone to image artifact. These methods were adapted to OCTA, which does not use dye, by Dr. Spaide.

In fact, volume rendering of angiography and color coding of vessel depth had already been used by several groups since the early days of OCT angiography. Barton et al[2] reported volume rendering of skin vasculature detected by Doppler OCT as early as 1999. Zhao et al[3] had described 3D volume-rendered Doppler OCT angiography of port wine stain vasculature by 2001. Yasuno et al had described 3D volume-rendered OCT angiography of in vivo human macular and optic nerve head vessels in 2006.[4] Wang et al (*Optics Express* 2007) had shown 3D volume rendering of mouse cortical vessels. Fingler et al (*Optics Express* 2009) had demonstrated volume rendering of human retinal microvasculature. Vakoc et al (*Nature Medicine* 2009) had used color coding to render complex 3D vasculature in tumor and brain layers using OCT angiography. Mariampillai et al (*Optics Letters*), Srinivasan et al (*Optics Letters*), and Yu et al (*Journal of Biomedical Optics*) had all used volume rendering to visualize 3D vascular structures in 2010. Jia et al (*Proceedings of the National Academy of Sciences* 2015) had used color to separate shallower retinal circulation from deeper choroidal circulation using the en face slab visualization approach, as did Kim et al (*Proceedings of the National Academy of Sciences* 2013) for visualizing vascular beds in geographic atrophy. And pixel transparency of the retinal slab was adjusted to optimize the visualization of choroidal neovascularization.[5] We list these prior works here so the reader can appreciate the work of pioneers in this field.

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D.H.: has a significant financial interest in Carl Zeiss Meditec; Oregon Health & Science University (OHSU) and Dr. Huang has a significant financial interest in Optovue, Inc., a company that may have a commercial interest in the results of this research and technology. These potential conflicts of interest have been reviewed and managed by OHSU.
J.A.I.: US Patent No. 6,735,463, "Doppler Flow Imaging Using Optical Coherence Tomography" with royalties paid to Leica Microsystems, Inc.
R.K.W.: Grants — National Institutes of Health; Grants and Nonfinancial support — Carl Zeiss Meditec Inc., outside the submitted work. In addition, Dr. Wang has a patent Oregon Health & Science University with royalties paid to Carl Zeiss Meditec, Inc., and a patent University of Washington pending.
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REPLY: We wish to thank the authors for their letter and also thank them for reading our paper.[1] Volume rendering has been used in representation of both computed tomography and magnetic resonance imaging for more than 3 decades. Thus, the techniques used in our paper are not new. We suggest reading the quoted sentence in the context of the paragraph in which it was embedded. We stated that the previous