correlation with the severity of disc swelling in papilledema eyes. The authors acknowledge that their qualitative analyses of the OCTA images may be suboptimal, and we offer the following caveats to their statements that eyes with ODE have a greater level of RPC density reduction than eyes with presumed ODD and normal eyes. We previously studied OCTA changes in ODE from optic neuritis, NAION, and papilledema, using customized software to quantify the RPC.[2] We concur that RPC is reduced in NAION and optic neuritis/papillitis, but we found significant differences between these 2 entities and papilledema. Thus, we feel it is inappropriate and potentially misleading to group these 3 optic nerve disorders for comparison with ODD and normal controls. Furthermore, we showed that the papilledema group consisted of different grades of edema, and a significantly decreased PCD in high-grade papilledema when compared to grade 1 or 2 papilledema.

In other work, we compared OCTA findings in papilledema and pseudopapilledema eyes including ODD.[3] With OCTA, we found that the commercial software identified lower RPC density in both papilledema and pseudopapilledema eyes compared to normal eyes. However, when customized software was used to subtract large vessel (which, when obscured by disc swelling, can falsely lower the measured RPC density) contributions, then we found that normal and papilledema discs had the same RPC density, and pseudopapilledema discs had a significantly lower value. Based on these data, we advise great caution be exercised when interpreting qualitative or commercial software analyses of OCTA images of possibly swollen optic discs. Our studies were performed with spectral-domain systems, but we do not expect that swept source–based systems, without custom analysis as we have done, will yield different results.

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Reply to Comment on: Morphologic Features of Buried Optic Disc Drusen on En Face Optical Coherence Tomography and Optical Coherence Tomography Angiography

WE THANK DRS FARD AND SUBRAMANIAN FOR THEIR INTEREST in our paper and appreciate the opportunity to clarify important issues. They raised a question on the validity of comparing retinal peripapillary vascularity between optic disc edema (ODE) and optic disc drusen (ODD). Based on their previous study,[1] the authors asserted that quantitative measurements of vascularity on optical coherence tomography angiography (OCTA) are different among eyes having ODE with varying etiology and severity; thus, comparisons between ODD and unclassified ODE could be biased. However, we still believe that the analysis method in our study could be meaningful in the differentiation between ODD and ODE, for the following reasons.

First, our qualitative analysis of OCTA images showed clear distinction between ODD and ODE. In previous studies by Fard and associates, the authors quantitatively calculated the percentage of peripapillary capillary density in each eye within a specific region (eg, circle or sector around the optic nerve head) using customized software.[1,2] In contrast, we qualitatively evaluated the shape and presence of focal vessel density decrease in the radial peripapillary capillary (RPC) layer, as observed by the examiner. As a result, 25 of 62 (40.3%) eyes with ODE showed irregular regions of focal vessel density decrease in the RPC layer, while 23 of 92 (25.0%) eyes with buried ODD showed a C-shaped region of vessel density decrease in the same layer at the nasal side of the disc (Figure 3 in our article).[3] We believe that the vessel density might fluctuate but this characteristic pattern would not. Thus, distinctive patterns of peripapillary vascularity change between ODD and ODE could be used as a differential point. However, abnormal patterns of vascularity change could not be detected in the remaining 60% of eyes with ODE and 75% of ODD. Therefore, the use of OCTA alone is not effective enough in the differentiation between ODD and ODE compared to en face OCT and should be used as adjunct.

Second, one of the purposes of our study was to depict intuitive distinctions between ODE and ODD using commercial en face OCT and OCTA so that clinicians can easily detect without the use of specialized tools. As artifacts are common in identifying the RPC densities of papilledema using commercial software, a customized software is

necessary to better quantify capillary densities.[1] However, this is not applicable for most ophthalmologists; thus, pointing out a differential pattern of ODD and ODE using commercial OCTA images could be more helpful for practical reasons. In that sense, our study could be valuable to ophthalmologists to assist their decision without the use of complicated analysis using customized software.

The analysis of OCTA images of swollen optic discs is still an unknown area. We should move forward to yield accurate analysis with improved software, as the authors suggested.

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CONFLICT OF INTEREST DISCLOSURES: SEE THE ORIGINAL article for any disclosures of the authors.

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Comment on: Morphologic Features of Buried Optic Disc Drusen on En Face Optical Coherence Tomography and Optical Coherence Tomography Angiography

KIM AND ASSOCIATES[1] HAVE USED EN FACE OPTICAL coherence tomography (OCT) and OCT angiography (OCTA) to distinguish presumed cases of "optic disc drusen" (ODD) from papilledema. The excellent quality of the images allows us to comment on the findings.

The Optic Disc Drusen Studies Consortium has published consensus recommendations for the OCT diagnosis of ODD.[2] On OCT, exposed and buried ODD are seen as rounded, signal-poor lesions within the prelaminar optic nerve head, occasionally associated with a hyperreflective cap, hyperreflective lines, or multiple aggregates. Neither the images as presented, nor the criteria used to identify ODD in the current study met consortium OCT criteria for the diagnosis of ODD. Instead, the criteria used by Kim and associates relied on the presence of a peripapillary hyper-reflective ovoid mass-like structure (PHOMS).

The authors have previously asserted that PHOMS are uncalcified precursors or variants of ODD.[3,4] However, the histological correlate of PHOMS has yet to be confirmed. It is therefore imperative that authors not assume that PHOMS are ODD, as has been done in this paper. Several of the coauthors have acknowledged the disagreement as to whether PHOMS are ODD noting "that if ODD are defined according to the….[consensus] guidelines then PHOMS should be regarded as a different diagnostic entity".[4] Regardless of the differing viewpoints, this report by Kim et.al. is an en face OCT and OCTA study of PHOMS, not ODD.

For this communication, we will only point to the most compelling argument against equating PHOMS with ODD, which is that PHOMS occur in a variety of optic nerve head disorders.[5] We propose to define three categories of PHOMS: 1.Drusen-associated PHOMS includes cases that meet the consortium criteria for the OCT diagnosis of ODD and PHOMS. 2.Disc edema-associated PHOMS includes patients with any type of disc edema and PHOMS, and 3. Anomalous disc-associated PHOMS that principally occur in mildly tilted optic discs or a myopic obliquely-inserted discs (MOID); a common cause of pseudopapilledema without ODD. MOID typically has an elevated, pale C-shaped halo nasally, retinal pigmentary changes temporally and unlike the fully developed tilted disc syndrome, has little or no rotation or retinal ectasia. Pichi and associates[6] noted the frequent occurrence of a "dome-shaped hyper-reflective structure" nasally on OCT, identical to the PHOMS in ODD.[2] Others have confirmed this observation.[5,7]

The patients presumed to have "buried ODD" in the present study[1] were myopic, with OCT characteristics consistent with "anomalous disc-associated PHOMS".

The authors have raised an important point not to be overshadowed by this disagreement, which is that the underlying cause of PHOMS needs to be better understood. PHOMS is not a diagnosis; it is a non-specific structural OCT finding associated with an elevated optic disc. The composition of PHOMS must ultimately be determined histopathologically. There already exists some histopathology to support the view that PHOMS are herniating nerve fibers in papilledema and ODD.[2,5] The authors of this paper have proposed several plausible alternatives for example, that PHOMS might be caused by granulation tissue or degenerating axons.[4] Until this question is resolved, we suggest using the above descriptive nomenclature.

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