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LETTER TO THE EDITOR



# Multirater Validation of Peripapillary Hyperreflective Ovoid Mass-like Structures (PHOMS)

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**ABSTRACT**

Peripapillary hyperreflective ovoid mass-like structures (PHOMS) are a new retinal optical coherence tomography (OCT) finding. The *Optic Disc Drusen Studies Consortium* had made recommendations to distinguish PHOMS from true optic disc drusen (ODD) in 2018. While publications on PHOMS have increased since then, the accuracy of the definition of PHOMS and reliability of detection is unknown. In this multi-rater study, we demonstrate that the 2018 definition of PHOMS resulted in a poor multi-rater kappa of 0.356. We performed a Delphi consensus process to develop a consistent and refined definition of PHOMS with clear principles around the nature of PHOMS and how they differ from normal anatomy. Fifty explanatory teaching slides, provided as supplementary material, allowed our expert group of raters to achieve a good level of agreement (kappa 0.701, 50 OCT scans, 21 raters). We recommend adopting the refined definition for PHOMS.

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*To the Editor*: In 2018 a consortium of ophthalmologists and neurologists reported a novel optical coherence tomography (OCT) finding, peripapillary hyperreflective ovoid mass-like structures (PHOMS).[1] The early definition of PHOMS was made in the context that they often occur alongside optic disc drusen (ODD), but there are several features to demonstrate that PHOMS are distinct from ODD and should not be confused with ODD.[2,3] This definition did not define PHOMS in other contexts or distinguish PHOMS from normal anatomical variants. The definition of PHOMS has traditionally been one of exclusion.[1,3] In the present multirater validation exercise, we determined the accuracy of our definition. A total of 100 OCT optic disc scans were reviewed for the presence of PHOMS by 15 independent raters. There were three possible answers: (i) yes; (ii) no; (iii) possible. The level of agreement was determined by Fleiss multi-rater kappa in R. The overall multi-rater kappa was poor at 0.356.

We reviewed the disagreements and conducted a Delphi approach amongst the authors to create an internally consistent definition of

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PHOMS. At the end of this process we defined PHOMS by:

(1) *Location*: strictly peripapillary and sitting on top of Bruch's membrane in the OCT B-scan. Frequently; a gap can be observed in the B-scan scans of PHOMS aligned through the centre of the optic disc;
(2) *Effect on adjacent retinal layers*: there is typically an upward deflection (like a ski slope, see supplementary material) of at least two of the other retinal layers;
(3) *Signal appearance*: which is similar to the reflectivity to the retinal nerve fibre and ganglion cell layers because there is evidence that they may represent axonal stasis,[4] and because the normal egress of axons at the optic disc can resemble PHOMS. This downward slope of essentially normal axons can easily be mistaken for PHOMS and can be observed in tilted discs, discs with an elevated border and myopia.[5]

After this process a repeat two-rater assessment (AP, SH) was performed using this refined definition of PHOMS on 106 OCT optic nerve B-scans and revealed an excellent kappa of 0.811. Six scans remained ambiguous even after discussion among raters (for example slides #33 and #34 in the supplementary material). We then created 50 teaching slides to explain the new consensus definition (supplementary material) and after reviewing these slides our 21 expert raters were then asked to review 50 more OCT B-scans.

A good level of agreement was achieved with a kappa of 0.701.

In conclusion, a good inter-rater agreement can be achieved for PHOMS even on a single B-scan on optic nerve OCT. Future studies should test joint access to the entire volume scans on a shared OCT viewer platform which will have to meet contemporary Information Governance and Data Protection requirements. Importantly, the image characteristics of PHOMS have been defined more succinctly and teaching slides are provided (see supplementary material). As PHOMS are increasingly being recognised in a range of pathologies, we recommend adopting our proposed definition.

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