Supplementary Online Content


eAppendix.

This supplementary material has been provided by the authors to give readers additional information about their work.
ROUND 1: GENERAL QUESTIONS (ASKED FOR EACH IMAGE)

All of the following images are taken from premature infants at risk for ROP, who had some change in retinal vasculature compared to their baseline exam. We will ask you to interpret each image as plus disease, pre-plus disease, or neither; and to explain your clinical diagnostic process. While you describe your reasoning, we will provide you with a pen to mark the key vessel(s) or other retinal features which contributed to your conclusions. We are also interested in your other qualitative observations about each image, such as whether you are concerned or reassured about the examination findings, how you might clinically manage a patient with that retinal appearance, and why.

We intentionally did not provide any additional clinical information such as demographic features, birth weight, gestational age, previous examination findings, or other peripheral retinal findings. This was done to limit the scope of our study, and also because the strict definition of plus disease is based only on appearance of posterior retinal vessels at a single point in time.

After we finish all images, we will return to ask several specific questions about each image.

Think-aloud protocol and image marking.

Would you classify this image as plus disease, pre-plus disease, or neither? Please explain your clinical diagnostic process. While describing your reasoning, please mark the key vessel(s), features of the vessels, and other retinal features which contributed to your conclusions.

How certain are you in diagnosing plus disease from this image (certain, somewhat certain, uncertain)? Explain if needed.

Is the field of view sufficient to interpret this image, and do you feel any additional clinical information is required? Please describe any additional information that you feel would be needed.
Image 1:

(a) By looking at veins in isolation, do you feel that this image has sufficient venous dilation for plus disease? What about arterial tortuosity when looking at arteries in isolation? What about looking at the overall image?

(b) The definition of plus disease is based on both arterial tortuosity and venous dilation. Do you believe it can be diagnosed because of severe venous dilation but little arterial tortuosity? If so, what features would make you diagnose plus disease in this context?

(c) What do you think is the most important factor in assessing venous dilation?
(a) By looking at arteries in isolation, do you feel that this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) The definition of plus disease is based on both arterial tortuosity and venous dilation. Do you believe it can be diagnosed because of severe arterial tortuosity but little venous dilation? If so, what features would make you diagnose plus disease in this context?

(c) What do you think is the most important factor in assessing arterial tortuosity?
(a) By looking at arteries in isolation, do you feel that this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) There is some venous tortuosity in this image. That parameter is not included in the definition of plus disease, but do you use it clinically in diagnosing plus disease? What about arterial dilation?

(c) How does the overall disease severity in this image compare to what is shown in Images #1 and #2? What retinal features make you feel that way?
(a) By looking at arteries in isolation, do you feel this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) By looking at this overall Image, are there features that make it appear more “severe” (compared to only looking at arterial tortuosity and venous dilation in isolation)?

(c) With regard to Images #1-4, can you place them in order of [i] increasing severity of arterial tortuosity, [ii] increasing severity of venous dilation, and [iii] increasing overall severity? Explain.
(a) By looking at arteries in isolation, do you feel this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) The definition of plus disease is based on presence of 2 or more quadrants of arterial tortuosity and venous dilation. Do you believe these abnormalities need to be in the same 2 quadrants to be considered plus disease?

(c) Comparing this to Images #2 and #4, which do you feel has more severe tortuosity of the temporal arteries? Why? In particular, are there specific features (e.g. amplitude, frequency, length of tortuous segment, regularity vs. irregularity, etc.) that make arterial tortuosity appear more “severe” to you?

(d) With regard to arterial tortuosity, would you generally consider it more severe to have one very tortuous vessel or several moderately tortuous vessels? How important is the location of vascular tortuosity (i.e. zone, distance from optic disc) for your assessment of disease severity, and what features do you look for?

(e) With regard to branching of tortuous vessels: (1) Do you take into account the tortuosity of single segments (defined as the portion of a vessel between two consecutive branch points) or of entire vessels (i.e. from the optic disc to the end of that vessel)? (2) If you consider single segments to be more important, which particular segments are most important for evaluation of arterial tortuosity (e.g. before the 1st branch point, before the 2nd branch point, etc)?
(a) By looking at arteries in isolation, do you feel that this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) What specific retinal features, beyond arterial tortuosity and venous dilation, would make you concerned about this image? Are these features in the posterior pole, mid-periphery, or periphery?

(c) Do you feel that “plus disease” appears different in patients with posterior (e.g. zone I) ROP compared to peripheral ROP? If so, how?
(a) By looking at arteries in isolation, do you feel that this image has sufficient arterial tortuosity for plus disease? What about venous dilation when looking at veins in isolation? What about looking at the overall image?

(b) What specific retinal features, beyond arterial tortuosity and venous dilation, would make you concerned about this image? Are these features in the posterior pole, mid-periphery, or periphery?
FINAL QUESTIONS

(a) With regard to Images #1-7, can you place them in order of increasing overall severity? Which ones would you consider “plus disease”? Would you consider treating any that do not meet your criteria for “plus disease”?

(b) What are the key retinal features that you look at when diagnosing “plus disease”? Are they within the posterior pole, mid-periphery, or periphery?

(c) Based on your clinical experience while observing disease progression, do you feel that you can generalize about whether you tend to see arterial tortuosity vs. venous dilation progress sooner?

(d) Based on your clinical experience while observing disease regression (e.g. after laser treatment), do you feel that you can generalize about whether you tend to see arterial tortuosity vs. venous dilation regress sooner?

(e) What is the relative importance of tortuosity compared to dilation in assessing disease severity? Do you consider arteries and veins together, or separately?

(f) Please characterize the pathophysiology of plus disease?

(g) With regard to the standard published photograph for plus disease (above), do you feel that this has sufficient arterial dilation for plus disease? Sufficient venous dilation?

(h) What are retinal features of the standard photograph that would concern you?