

OCT Angiography in the iris and sclera with anterior segment add-on lens and tracking



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PURPOSE

Optical coherence tomography angiography (OCTA) of the anterior segment (AS) can provide visualization of the iris and sclera vasculature. We investigate how AS imaging can be utilized as a diagnostic tool for AS degenerative ocular diseases such as pterygium, inflammatory diseases such as scleritis and proliferative retinal diseases leading to neovascularization of the iris.

METHODS

- An AS add-on lens was designed as an attachment to PLEX® Elite 9000 (ZEISS, Dublin, CA) swept-source OCT system (1060 nm central wavelength).
- PLEX Elite prototype software was modified and equipped with AS tracking and AS-specific scan patterns:
 - AS Angio 18x12 mm: 200 kHz, 6mm depth
 - AS Angio 6x6 mm: 200 kHz, 6 mm depth
- 10 eyes in the age range of 65–80 years old, including normal, pterygium, and glaucoma were imaged with the above scan patterns. En face projections of angiographic scans were evaluated by an expert grader for quality and graded on the scale of 1-5. Grades higher than 3 were considered clinically useful based on these definitions:
 - 1 = Unusable
 - 2 = Poor quality, but able to see some information
 - 3 = Fair. Image quality affects ability to assess/diagnose
 - 4 = Good. Artifacts, if any, do not interfere with assessment/diagnosis
 - 5 =Excellent

CONCLUSIONS

AS OCTA imaging with the add-on lens attachment to a PLEX Elite instrument equipped with AS tracking, provides quality images of AS vasculature and is a promising diagnostic tool. Results show the capability of OCT/OCTA images in visualizing hypervascularity, pterygium, anterior atrophy, and structural abnormalities.

RESULTS

All 20 images were graded higher than 3 and were considered clinically useful. Figure 1 demonstrates a wide angle (18x12 mm) and a high-definition (6x6 mm) OCTA en face with minimum motion artifacts. The vessel architecture of a pterygium is visible on the wide field of view and in greater detail with the high-definition scan (b.1-2). Structural and flow projection on cross-sectional B-scans in Figure 2 highlight areas of increased vessel tortuosity (a.3), increased vascularity (b.3), and decreased vascularity (c.3).

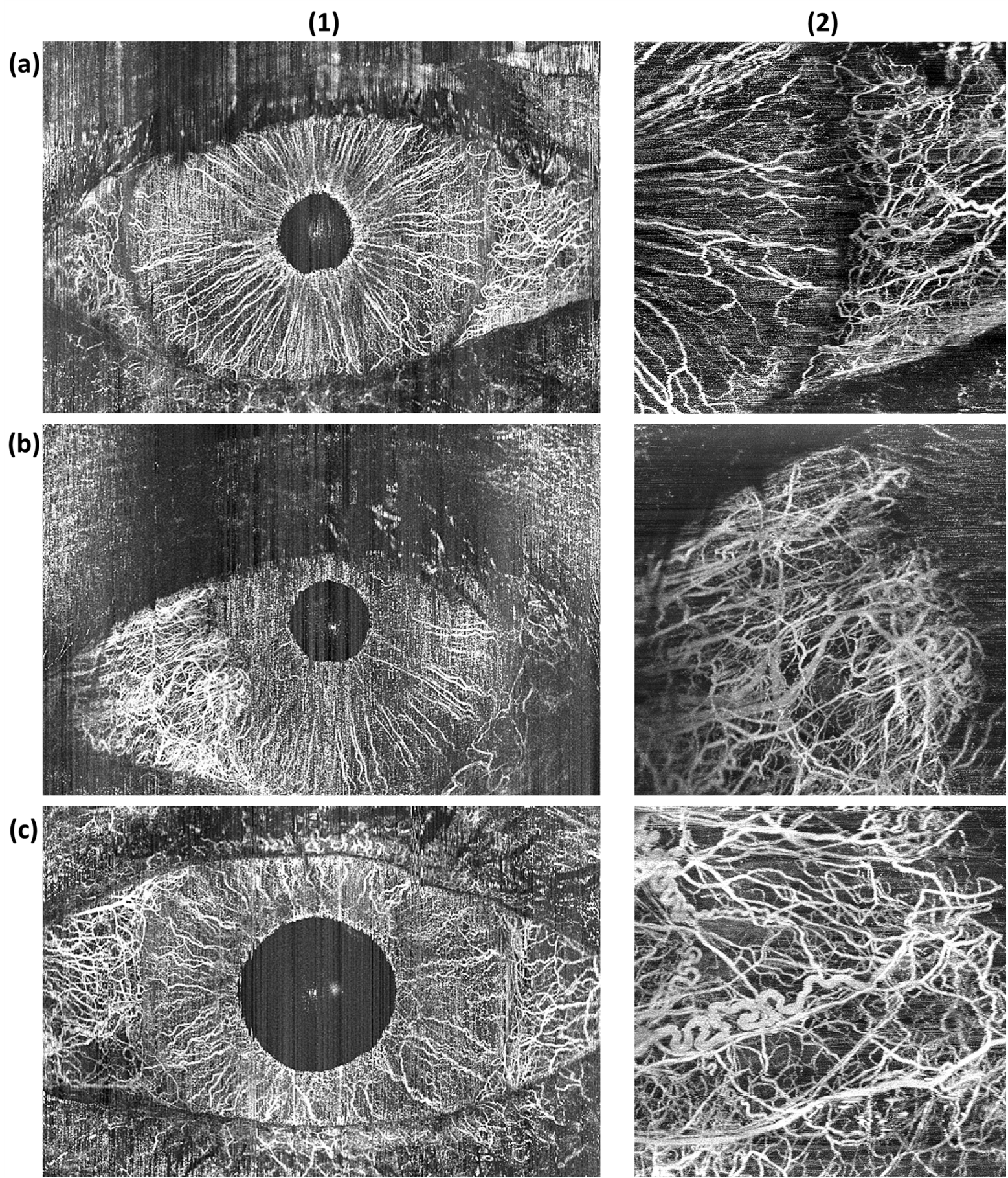


Figure 1: OCTA en face projection of an AS Angio 12x18 mm (a.1, b.1, c.1) and 6x6 mm (a.2, b.2,c.2) from a) Healthy, b) Pterygium, and c) Glaucoma.

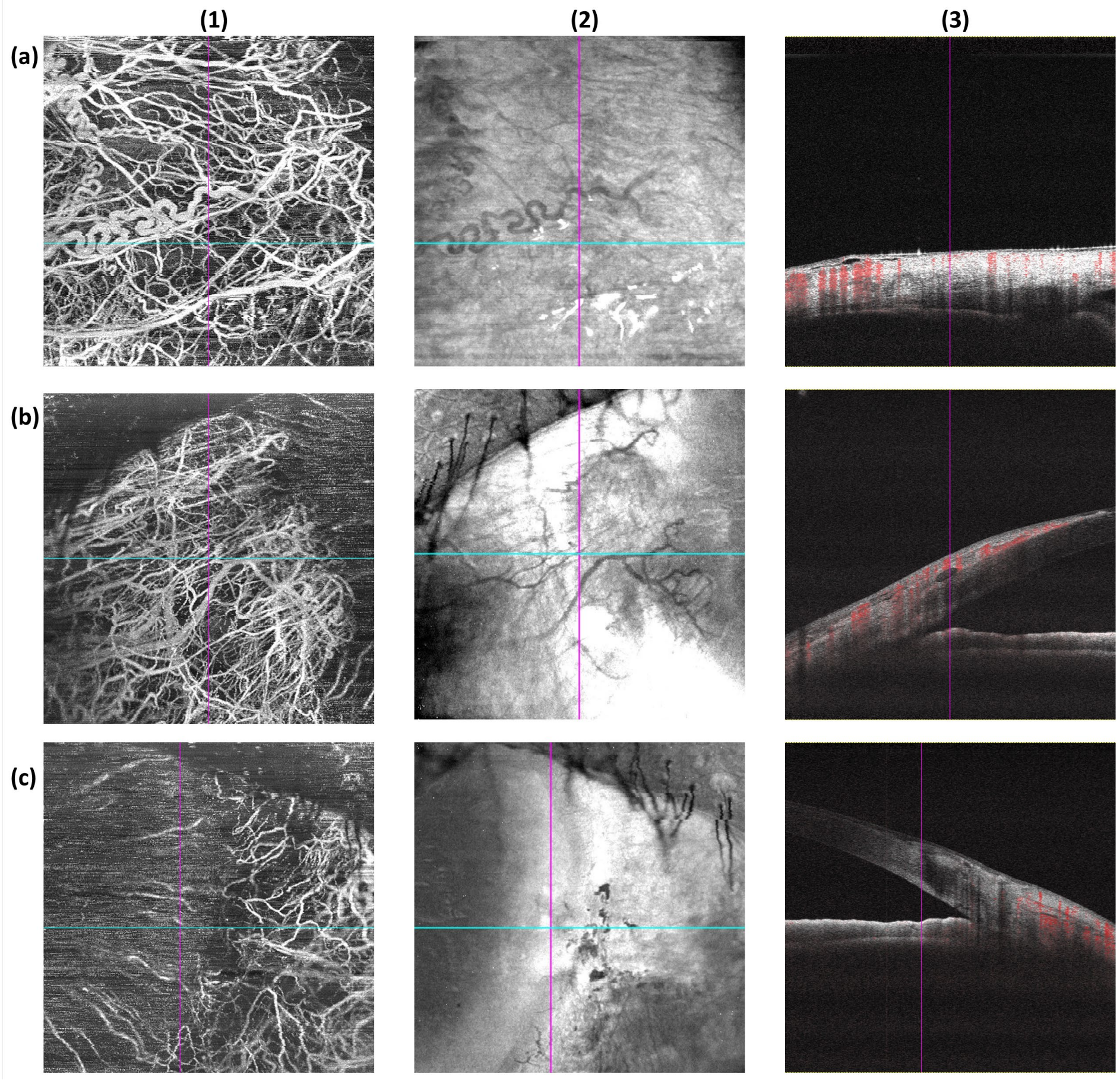


Figure 2: OCTA en face (a.1, b.1, c.1), OCT en face (a.2, b.2, c.2), and cross-sectional B-scans (a.3,b.3,c.3) of AS Angio 6x6 mm from a) Normal tension glaucoma, b) Pterygium, c) Open angle glaucoma.

