**FIGURE LEGENDS**

**Figure 1 Quantification of Bruch’s Membrane Surface Roughness.** Bruch’s membrane surface layer was used to visualize and quantify the development choroidal folds and their progression during spaceflight. Bruch’s membrane layer (red) and internal limiting membrane (blue) were manually segmented on OCT images from (A) the vertical block scan centered over the fovea and (B) the radial scan centered over the optic nerve head. Inner retinal folds (\*\*), and choroidal folds (\*\*\*) are marked on each transverse OCT image. The subtle retinal folds indicated in (A) are extensions of the prominent inner retinal folds observed in the same crewmember in Figure 2B. Bruch’s membrane surface layer colored heightmap was generated to better visualize the pattern and orientation of (C) macular and (D) peripapillary choroidal folds during spaceflight: teal represents no change while dark blue and yellow represent posterior and anterior displacement respectively. The change in Bruch’s membrane macular surface roughness was quantified within three adjacent 1x5 mm regions (C) to track the successive progression of choroidal folds spanning from the peripapillary region (C, Fovea – 2mm ROI) toward the fovea region (C, Fovea ROI) during spaceflight. Peripapillary surface roughness was calculated within the nasal, superior, temporal, and inferior quadrants of an elliptical region of interest within 500 to 1000 µm of Bruch’s membrane opening (D).

**Figure 2 Distribution of Choroidal Folds, Retinal Folds, and Peripapillary Wrinkles in ISS Crewmembers.** (A) Example OCT image indicating a region of peripapillary wrinkles (\*). (B) Example OCT image indicating region of inner retinal folds (\*\*) and choroidal folds (\*\*\*). In both (A) and (B) the infrared image includes the OCT scan pattern location (green lines) with the bold line representing the OCT image to the right. (C) Of the 36 participants in this study, all 6 individuals who presented with folds during spaceflight demonstrated bilateral choroidal folds. Within these 6 individuals, 8 eyes had only choroidal folds, 2 eyes had both choroidal folds and inner retinal folds, and 2 eyes had choroidal folds, inner retinal folds, and peripapillary wrinkles. (D) The prevalence of each fold type within ISS crewmember eyes demonstrating the earliest signs of optic disc edema (data presented here) differed from the prevalence of each fold type within IIH patient eyes demonstrating papilledema.10,21 Within the 42 eyes that showed signs of developing optic disc edema during spaceflight, 2 (5%) eyes had peripapillary wrinkles, 4 (10%) had inner retinal folds, and 10 (24%) had choroidal folds. As reported in Sibony et al., of 125 study eyes with papilledema, 58 (46%) eyes had peripapillary wrinkles, 59 (47%) had inner retinal folds, 25 (20%) had outer retinal folds, and 13 (10%) had choroidal folds.10,20

**Figure 3 Progression of Macular Choroidal Folds in ISS Crewmembers During Spaceflight.** Compared to preflight, macular Bruch’s membrane surface roughness increases with spaceflight duration in crewmembers with macular choroidal folds. Seven study eyes from four individual crewmembers demonstrated choroidal folds in the 3 macular regions of interest (see Figure 1C for locations) during spaceflight. Each individual crewmember is represented by a different symbol shape. Open symbols represent data from the right eye and grey symbols represent data from the left eye. A meaningful increase in surface roughness was determined when the change compared to preflight exceeded a 2.3 µm threshold (shaded region).

**Figure 4 Progression of Peripapillary Choroidal Folds in ISS Crewmembers During Spaceflight.** Peripapillary Bruch’s membrane surface roughness increased nasal, superior, and inferior to the optic nerve head, but not temporally. Average Bruch’s membrane surface roughness was quantified in an annular region circumscribing the ONH within 500 µm to 1000 µm of Bruch’s membrane opening. Each individual crewmember is represented by a different symbol which are consistent across figures. Open symbols represent data from the right eye and shaded symbols represent data from the left eye. A meaningful increase in surface roughness was determined when the change compared to preflight exceeded a 2.8 µm threshold (shaded region).