Purpose: The raising number of commercial flights exposes crew and passengers to hypoxic conditions. Due to both technical and economical reasons, flight cabins are pressurized to a value of around 565mmHg (0.74atm), equivalent to breathing 15% oxygen (normal at sea level 21%). How these conditions affect ocular physiology is not completely understood. We aimed to study the relationship between hypoxia and peripapillary blood flow (ppBF).

Methods: Prospective cohort study. All volunteers answered a health questionnaire and the Hypoxia Challenge Test (HCT) was performed, according to the British Thoracic Society protocol. Ocular coherence tomography angiography of the optic disc was performed at three timepoints (baseline, hypoxia, post-hypoxia) using AngioVue® device. Peripapillary blood flow density was assessed using AngioAnalytics® in a 0.75mm wide ring around the optic nerve head. Only images with high-quality acquisition signal were included. Cardiovascular parameters and respiratory data were continuously recorded during HCT. Statistical analyses were performed using STATA.

Results: Studied population included 30 healthy subjects (14 women), with a mean age of 29±4.2 [range 22-37] years. A within-subject difference in ppBF for both right and left eyes was found (p<0.05). Paired analysis confirmed the increase in mean ppBF in hypoxic conditions (OD: 60±0.5 to 62±0.5 mmHg, p=0.01; OS: 60±0.4 to 62±0.5 mmHg, p=0.03), when compared to baseline (p<0.01), and a subsequent decrease in post-hypoxia conditions (OD: 62±0.5 to 60±0.4 mmHg, p=0.01; OS: 62±0.5 to 61±0.4 mmHg, p=0.02).

Conclusions: Hypoxic conditions may be associated with an increase in ppBF. As there is scarce data on the subject, these findings in a healthy population may help to understand physiologic responses to a hypoxic stress and better manage high-risk ocular disorders. Further studies are warranted to study this response in non-healthy eyes, such as vascular-dysfunction prone glaucoma patients.