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ARVO abstract 2018

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Ethnic variations in preferred retinal locus of fixation using Optical Coherence Tomography in a healthy population

Purpose
The definition of the centre of the fovea is ambiguous, and it has been shown that the preferred retinal locus of fixation (PRL) is not positioned directly over the anatomical foveal centre. Using OCT, the centre of the fovea could be identified as the PRL at the time of acquisition (foveal reflex) or the position where photoreceptor elongation is greatest (peak ellipsoid zone). This study investigates the relationship between these loci, their offset, foveal architecture, and variations between ethnicities.

Methods
High-resolution 20° x 10° volume scans (97 B-scans) Spectralis OCT (Heidelberg, Germany) scans were acquired for 224 eyes of 76 white, 78 South Asian and 70 black young healthy volunteers (mean age 24 ± 6 years). Two investigators manually obtained retinal thickness at the peak of the ellipsoid zone (RTez) and the centre of the foveal reflex (RTfr). Variations in offset (*x,y*) distances between foveal reflex (PRL) and the ellipsoid zone (EZ) were correlated with RT, foveal width (FW) and foveal base width (FBW), and compared between ethnicities.

Results
RTez was significantly increased and FW significantly decreased in whites compared to South Asians and blacks ($P<0.0005$). FBW was significantly decreased in whites when compared to South Asian only ($P=0.001$). Only 21 eyes (9.4%) showed positioned correlation between PRL and peak EZ. Distance between PRL and peak EZ was significantly increased in South Asians (94 ± 61µm) compared to whites (51 ± 37) and blacks (62 ± 49; $P<0.0005$) while offset direction did not significantly vary between ethnicities ($P>0.05$). Decreased RTez were associated with wider FW (rho=-0.359; n=224; $P<0.0005$) and larger FBW (rho=-0.294; $P<0.0005$). Increased distance between loci were related to wider FBW only (rho=0.307; $P<0.0005$), and most commonly presented a superior-temporal directional offset ($P<0.0005$) independent of ethnicity ($P=0.41$).

Conclusion
We report significant variation in foveal morphology between ethnicities. In addition, the position of the assumed PRL during OCT acquisition indicates that over 90% of healthy subjects present eccentric fixation. Preferred retinal location, but not direction, significantly varies between ethnicities. Those with a wider foveal base present increased offset between the foveal reflex and the position where photoreceptor elongation is greatest.