Central serous chorioretinopathy and choroidal thickness in UK Biobank

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Purpose

Central serous chorioretinopathy (CSR) is part of the pachychoroid spectrum. The choroidal circulation is altered in CSR, with increased choroidal vascular permeability, thickened choroid and dilated choroidal vessels. The identification of multiple subjects that were graded as having CSR during the ocular component of UK Biobank (UKBB) presented an opportunity to carry out a more detailed grading on these subjects. In particular, to characterise choroidal thickness, SPED presence and vessel diameter compared to subjects with no CSR pathology.

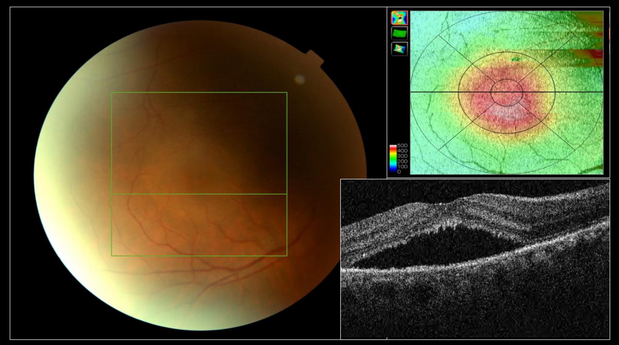


Figure 1. Topcon 1000 output of a UKBB subject with CSR and no other pathology

Method

UKBB is a biomedical database with over 500,000 UK participants aged 40-69 years. Of these, colour and optical coherence tomography (OCT) images were obtained using spectral domain OCT (Topcon-1000, Topcon, Japan) in 68,514 participants (68,281 with gradable OCT). The images were graded masked by trained and certified graders.

Eyes graded as CSR were further analysed for number of fluid areas, fluid height and diameter, serous pigment epithelial detachment (SPED) presence, subfoveal choroidal thickness (SFCT), sub-fluid choroidal thickness (SFLCT), maximum choroidal thickness (MCT), greatest (vertical) choroidal vessel diameter (CVD) on foveal scan and sub-fluid (CVDSF). These were compared to 109 pathology-free matched UKBB eyes. T-tests were used for comparisons, using SPSS v26. Hours of daylight at imaging-time were calculated by deducting time of sunrise (London) on image date from image time.

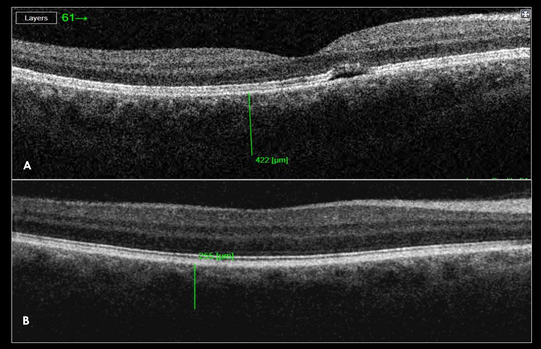


Figure 2. Thickened choroid in a CSR subject (A) and the choroid of a pathology-free subject (B)

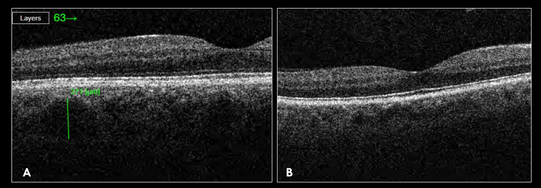


Figure 3. Dilated choroidal vessels in a CSR subject (A) and the choroid of a pathology-free subject (B)

Results

273 eyes (227 subjects) were graded as CSR; 38 eyes were excluded due to other pathology or inconclusive CSR features, resulting in 235 eyes of 195 subjects (40 bilateral).

Most (88%) had one area of fluid, with 8.5% having 2, and 3% with 3 or more areas. In 64%, fluid was extrafoveal, 21% subfoveal and 15% juxtafoveal. Vertical location (within the arcades) was approximately equal between superior, central and inferior. Nasal fluid was most frequent (60%) followed by 22% central and 18% temporal location. Mean fluid height was 89 µm (0-309 µm) and diameter 1073 µm (130-5298 µm). 85% of subjects had no SPEDs, 8.6% had 1, 5.6% 2 or more.

CSR-eyes had significantly thicker mean SFCT and MCT compared to controls (For SFCT: 348 µm (188-502 µm) versus 265 µm (111-443 µm), p<0.001; For MCT: 394 µm (225-536 µm) versus 320 µm (176-458 µm) (p<0.001) respectively). CVD was significantly higher in CSR eyes (181 µm (88-438 µm) versus 165 µm (93-267 µm) for controls (p=0.003). There was no significant difference between CVD and CVDSF between groups (p=0.708), and no correlation between light-hours at time of imaging and choroidal thickness (for SFCT or MCT, p=0.191 and 0.345).

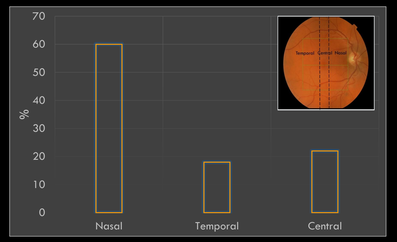


Figure 4: Fluid location

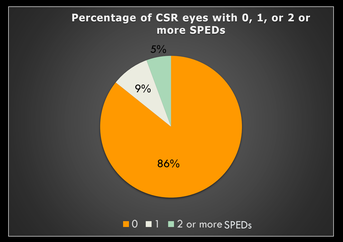


Figure 5. Number of SPEDs

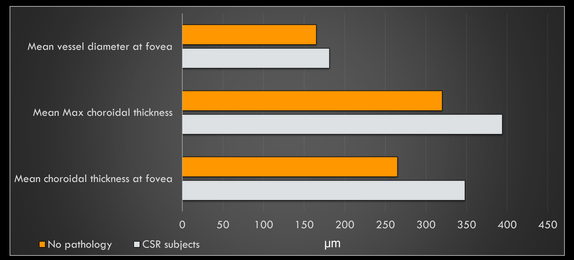


Figure 6. Choroidal thickness and vessel diameter in CSR and pathology free subjects

Conclusion

- Choroidal thickness at the fovea, and maximum choroidal thickness of those with CSR were significantly higher than those of individuals with no pathology (both p=<0.001)
- Vertical diameter of the largest (gradable) vessel on the foveal scan was significantly greater in those graded as CSR (p=0.001)
- There was a propensity towards nasal occurrence of fluid with 60% occurring nasally, compared to only 18% temporally
- There was no correlation between hours of daylight exposure and choroidal thickness

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