Comparison of Mathematical Morphological Descriptors of Hyporeflective Cavities in Optical Coherence Tomography of Patients with Macular Telangiectasia Compared to Patients with Diabetic Maculopathy

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Clinical observation suggests MacTel cavities have a different morphology to cavities in patients with exudative vascular pathologies.

- In particular it has been noted that the hyporeflective cavities in MacTel are more oblong, less circular and more horizontally orientated than typical cysts in diabetic macular edema (DME).
- Distinguishing such morphological differences in OCT cavities using objective mathematical terms had not been attempted previously.
Macular Telangiectasia type 2 (MacTel)

- Bilateral Disease of unknown cause confined to the macular area, usually symmetric
- Not associated with inflammatory, genetic or other known cause or disease entity
- Characteristic alterations of the macular capillary network and neurosensory atrophy
- Manifests initially temporal to the fovea. Horizontal oval configuration. Not respecting horizontal raphe.
- Symptoms typically 5th – 6th decade, ♀=♂
Methods

- Following sample size calculations, images from 9 sequential patients with MacTel and 9 with DME were utilised for a comparative experimental study.

- A single horizontal OCT scan nearest to the centre of the fovea was exported for each eligible eye; if two eyes were eligible, only the right eye was recruited to the study.

- Images were anonymised, and analysed by a second masked researcher using previously validated MatLab® algorithms. (Aslam et al. 2009)

- Morphological descriptors of delineated cavities were derived by the software, namely circularity, eccentricity and orientation.

- As dimensionless indices, these measures are resistant to systematic error from varying imaging modalities or magnification.
- Circularity is defined as the ratio of perimeter of the area specified divided by the perimeter if that same area were in the shape of a perfect circle.

- Eccentricity is the ratio of the distance between the foci of the ellipse and its major axis length.
Results

- **16 cavities** from 9 eyes of patients with MacTel and **17 cavities** from 9 eyes of patients with DME were subjected to image analysis using MatLab algorithms.

- As hypothesised, the cavities in patients with MacTel were found to be significantly less circular and more eccentric compared to those with DME (p=0.038 for circularity and p= 0.019 for eccentricity).

- No significant difference was found in orientation of the cysts, although the study was not powered towards assessing this outcome measure.
Clinical Implications

- First study to demonstrate significant differences in objective mathematical shape descriptors of OCT hypo-reflective areas between differing pathologies.

- The findings add weight to the evidence suggesting that a separate aetiology is responsible for the formation of the cavities in each of the two clinical conditions studied.

- The measures described here could potentially help distinguish atrophic cavities from exudative cysts, without the need for invasive fluorescein angiography.

- These could be relevant for a variety of complex cases involving conditions such as toxic maculopathies, genetic disease and chronic macular degeneration.
- X-linked Retinoschisis

- Tamoxifen maculopathy
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