Can an eye exam predict the risk of stroke?

Cardiovascular disease (CVD) accounts for nearly 200,000 deaths in the UK per year, with coronary heart disease, stroke and heart failure accounting for most of these deaths. General practitioners need an accurate and reliable tool to help them identify patients at high risk of having a cardiovascular event. Numerous multivariable CVD risk scores have been developed based on factors such as high blood pressure, diabetes, smoking status, etc. Can a simple eye exam help to further improve CVD risk prediction?
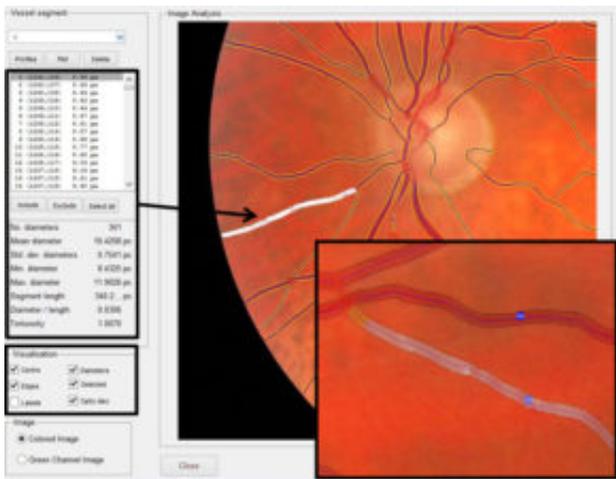

Fig. 1. Vessel analysis visualisation screen of QUARTZ

Examination of retinal blood vessels offers a simple opportunity to observe the blood circulatory system, with images being easily captured using fundus photography. Aspects of retinal vessel shape and size (morphology) have been associated with future risk of many systemic and vascular diseases. However, uncertainty over the presence and nature of some of these associations exists. Analysis of data from large population based studies will help to resolve these uncertainties. UK Biobank is such a study, its depth and breadth of health data recorded make it a powerful research resource. UK Biobank includes a retinal image repository with nearly 136,000 retinal images.

QUARTZ (QUantitative Analysis of Retinal vessel Topology and siZe) is a software system developed by our research group that provides an automated framework for extracting quantitative measures of vessel morphology from large numbers of retinal images. The vessel analysis visualisation screen of QUARTZ is illustrated in Figure 1. A novel image quality assessment methodology has recently been developed and incorporated into QUARTZ. This new addition means that QUARTZ is now fully automated in all aspects (requires no human intervention). This will make it practical to run the QUARTZ software on large retinal image datasets.

The QUARTZ software is currently being used to process the entire 136,000 images of the UK Biobank retinal dataset. Once processed, the vessel morphometric data will be used in epidemiological studies, examining the association of vessel morphology to disease risk factors and outcomes. This could lead to the accurate assessment of retinal vessel morphology from an eye exam being an important biomarker of early vascular disease, which could enhance CVD risk prediction.

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