Heart disease is in the eye of the beholder

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In a new study from Shiley Eye Institute at UC San Diego Health, researchers have identified a potential new marker that shows cardiovascular disease may be present in a patient using an optical coherence tomography (OCT) scan—a non-invasive diagnostic tool commonly used in ophthalmology and optometry clinics to create images

of the retina. The finding suggests it may be possible to detect heart disease during an eye examination.

In the paper published March 2, 2021 in *EClinical Medicine* by *The Lancet*, the research team examined lesions of the retina, the inner-most, light-sensitive layer of the eye, to determine if a cardiovascular disorder may be present.

"The eyes are a window into our health, and many diseases can manifest in the eye; cardiovascular disease is no exception," said lead author Mathieu Bakhoum, MD, Ph.D., a physician-scientist and retina surgeon at UC San Diego Health. "Ischemia, which is decreased blood flow caused by heart disease, can lead to inadequate blood flow to the eye and may cause cells in the retina to die, leaving behind a permanent mark. We termed this mark 'retinal ischemic perivascular lesions,' or RIPLs, and sought to determine if this finding could serve as a biomarker for cardiovascular disease."

As part of the study, the team reviewed the records of individuals who received a retinal OCT scan at UC San Diego Health from July 2014 to July 2019. From that cohort, two groups were identified after medical chart review: one consisted of 84 individuals with heart disease and the other included 76 healthy individuals as the study's control group. An increased number of RIPLs was observed in the eyes of individuals with heart disease.

According to the researchers, the higher number of RIPLs in the eye, the higher the risk for cardiovascular disease.

"The only way we can visualize the smallest blood vessels in the body is in the eye. The retina in particular provides important evidence of the adverse effects of cardiovascular issues, such as high blood pressure," said Anthony DeMaria, MD, Judith and Jack White Chair in Cardiology

and cardiologist at UC San Diego Health. "It's my hope that the presence of RIPLs in the eye will serve as a marker for cardiovascular disease when patients are undergoing assessment of risk factors for heart disease, or when patients are undergoing evaluation for the suspected presence of heart disease."

DeMaria said detection of RIPLs could result in identification of cardiovascular disease that would enable early therapy and preventative measures, and potentially reduce numbers of heart attacks or strokes.

A person's risk for cardiovascular disease is determined by the atherosclerotic cardiovascular disease (ASCVD) risk score calculator, the national guideline developed by the American College of Cardiology. The guideline is considered the gold standard for assessing a patient's 10-year risk of experiencing a cardiovascular event, such as heart attack or stroke. In the study, researchers found a correlation between the number of RIPLs in a patient's eye and their ASCVD risk score.

"Individuals with low and borderline ASCVD scores had a low number of RIPLs in their eyes, but as the ASCVD risk increased, so did the number of RIPLs," said Bakhoum.

Ophthalmologists at UC San Diego Health now consider referring patients to a cardiologist if RIPLs are identified during an OCT scan. The research teams hopes this paper and future studies will result in RIPLs becoming a common ophthalmological marker for identifying potential cardiovascular disease, and incorporated into the overall ASCVD risk score.

"Globally, cardiovascular disease is the number one cause of death and unfortunately many people are unaware they may have heart issues," said Bakhoum. "The key in preventing this is early detection and treatment. It's our hope that by identifying RIPLs as a marker for cardiovascular

disease providers will be able to identify heart issues before a catastrophic event, such as a heart attack or a stroke, occurs."

More information: Christopher P. Long et al. Prevalence of subclinical retinal ischemia in patients with cardiovascular disease – a hypothesis driven study, *EClinicalMedicine* (2021). DOI: 10.1016/j.eclinm.2021.100775

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