Retinal Vessel Caliber Is Associated with the 10-year Incidence of Glaucoma: The Blue Mountains Eye Study


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PURPOSE: To examine associations between quantitatively measured retinal vessel caliber and the 10-year incidence of primary open-angle glaucoma (OAG).

DESIGN: Population-based cohort study.

PARTICIPANTS: The Blue Mountains Eye Study examined 3654 persons at baseline and 2461 persons at either 5 years, 10 years, or both times. After excluding 44 subjects with OAG at baseline, 2417 participants at risk of OAG at the 5- or 10-year examinations were included.

METHODS: Retinal vessel calibers of baseline retinal photographs were measured using a computer-based program and summarized as central retinal artery and vein equivalents (CRAE, CRVE). Incident OAG was defined as the development of typical glaucomatous visual field loss combined with matching optic disc rim thinning and an enlarged cup-to-disc (C:D) ratio of >0.7 or C:D asymmetry between the 2 eyes (≥0.3) at either the 5- or 10-year examination. Generalized estimating equation models were used to account for correlation between eyes while adjusting for glaucoma risk characteristics including intraocular pressure (IOP) or ocular perfusion pressure (OPP).

MAIN OUTCOME MEASURES: We assessed the 10-year incidence of OAG.

RESULTS: There were 82 persons (104 eyes) who developed incident OAG over the 10-year follow-up. After adjusting for age, sex, family history of glaucoma, smoking, diabetes, hypertension, hypercholesterolemia, body mass index, spherical equivalent refraction, and C:D ratio, narrower CRAE was associated with higher risk of incident OAG (adjusted odds ratio [OR], 1.77; 95% confidence interval [CI], 1.12-2.79, per standard deviation decrease in CRAE). This association persisted after further adjustment for IOP (adjusted OR, 1.87; 95% CI, 1.14-3.05) or OPP (adjusted OR, 1.76; 95% CI, 1.11-2.78), and remained significant when analyses were confined to eyes with IOP <20 mmHg and C:D ratio <0.6 at baseline. There were no independent associations between CRVE and incident OAG.

CONCLUSIONS: Retinal arteriolar narrowing, quantitatively measured from retinal photographs, was associated with long-term risk of OAG. These data support the concept that early vascular changes are involved in the pathogenesis of OAG and suggest that computer-based measurements of retinal vessel caliber may be useful to identify people with an increased risk of developing the clinical stage of glaucoma.

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