

Nerves of steel?



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Retinal vessel diameter and retinal nerve fiber layer thickness

On December 1, 2023, Mohamed Geneid defended his thesis “The relationship between retinal vessel diameter with retinal nerve fiber layer thickness and optic nerve head parameters: the Northern Finland Birth Cohort Eye study” at the Faculty of Medicine, University of Oulu. The Ph.D. project was conducted at the Dept. of Ophthalmology, Oulu University Hospital, University of Oulu. The main supervisor was Docent Johanna Liinamaa, M.D., Ph.D., and the co-supervisor was Docent Ville Saarela, M.D., Ph.D., both at Oulu University Hospital, University of Oulu.

Introduction

Retinal vessels are the only blood vessels in the human body that can be examined with non-invasive techniques. High-resolution images of retinal blood vessels and the optic nerve can be obtained without dilating the pupil. Retinal vessel diameter (RVD) can be analyzed with high-resolution images and RVD-measuring computer software, such as Integrative Vessel Analysis. Many systemic diseases (such as diabetes, hypertension, coronary heart disease, and atherosclerosis), brain (such as Alzheimer’s disease), and eye diseases (such as glaucoma) are correlated with RVD.

Methods

This study used three imaging devices (Heidelberg retina tomograph (HRT); optical coherence tomography (OCT); and Scanning laser polarimetry, commercially called (GDx) to evaluate RVD and its association with retinal nerve fiber layer (RNFL) thickness and optic nerve head (ONH) parameters in middle-aged Caucasians. A total of 10,321 participants from the Northern Finland Birth Cohort (NFBC) were randomized in the NFBC Eye

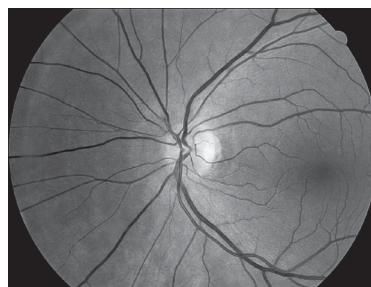


Figure 1. Left optic nerve and retinal vessels.
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Key points:

- There is a correlation between RVDs and RNFL thicknesses.
- RNFL thickness imaging devices evaluate different entities and use various techniques.
- Thinner RVDs correlate to thinner RNFL thickness, a finding in favor of glaucoma vascular theory.

Study, and 60% of the eye screening group attended the eye examination. In addition to RVD, RNFL thickness and other parameters were measured with HRT, OCT, and GDx.

Results

We detected significant relationships between RNFL thickness, ONH parameters, and RVDs through HRT and OCT. Similar correlations were found between RNFL and retinal venular diameters using only GDx. The RNFL thickness measured with different devices varied, as these three imaging devices evaluate different entities and use different techniques to measure the RNFL thicknesses.

Conclusion

Our study revealed normal anatomical correlations between RNFL and RVDs, setting normal values for these measures in middle-aged Caucasians. These findings may help in the early detection of eye or systemic diseases with vascular or neuronal effects.

Remaining questions:

- Could the early recognition of narrow RVDs help in early glaucoma detection?
- Would it be possible to predict future cardiovascular disease with RVD?
- Patients with Alzheimer’s disease showed decreased RNFL thickness; could these changes be detected and predicted with OCT long before the diagnosis?

References

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