

Tilted optic discs: The Beijing Eye Study

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Abstract

Purpose To determine the prevalence of tilted optic discs and their associations with ocular and general parameters.

Methods The Beijing Eye Study included 4439 subjects out of 5324 subjects invited to participate (response rate 83.4%) with an age of 40+ years. The present investigation consisted of 4324 (97.4%) subjects for whom readable fundus photographs of at least one eye were available. The main outcome parameter was the presence of tilted optic discs defined as small discs with an oblique orientation and oval disc shape without signs of pathology in eyes without high myopia (defined as > -8 D).

Results Tilted optic discs were detected in 31 eyes (0.36; 95% confidence interval: 0.23, 0.49%) of 23 patients (16 women). Tilted discs were associated with myopia (-6.59 ± 0.68 D *vs* -0.60 ± 0.02 D, $P < 0.001$), astigmatism (1.55 ± 0.24 D *vs* 0.59 ± 0.01 D, $P < 0.001$), lower best corrected visual acuity ($P < 0.001$), visual field defects ($P < 0.001$), and small optic disc area ($P < 0.001$).

Conclusions Tilted optic discs are present in about four out of 1000 eyes of adult Chinese in Northern China. They are associated with medium myopia, astigmatism, decreased visual acuity, and visual field defects.

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Introduction

Tilted optic discs have been considered to be relatively small optic nerve heads with an oblique or horizontal orientation and oval disc shape, occurring in eyes without high myopia.^{1–4}

They have been described to be associated with stable visual defects. Other than the Blue Mountains Eye Study,⁴ population-based studies on the prevalence of tilted optic discs and their associations with ocular and general parameters have mostly been lacking; therefore, it was the purpose of the present study to assess frequency and associations of tilted optic discs in a Chinese population-based study.

Methods

The Beijing Eye Study is a population-based cohort study in Northern China. It has been described in detail previously.⁵ The Medical Ethics Committee of the Beijing Tongren Hospital approved the study protocol and all participants gave informed consent. At the time of the survey in the year 2001, there were 5324 individuals aged 40 years or older residing in those seven communities. In total, 4439 individuals participated in the eye examination (response rate: 83.4%). This study included 8594 (96.8%) eyes of 4324 (97.4%) subjects for whom readable fundus photographs were available. Mean age was 55.9 ± 10.4 years (range: 40–101 years), and the mean refractive error was -0.39 ± 2.24 D (range, -20.13 to $+7.50$ D). After receiving informed consent, the participants underwent a thorough ophthalmic examination as described in detail previously.⁵ It included measurement of visual acuity, visual field examination by frequency doubling perimetry using the screening program C-20-1 (Zeiss-Humphrey, Dublin, CA, USA), and assessment of intraocular pressure. Digital photographs of the cornea, optic disc, and fundus, and retro-illuminated photographs of the lens were taken using the Neitz CT-R camera (Neitz Instruments Co, Tokyo, Japan) after dilatation of the pupil. Tilted optic discs were defined as small optic nerve heads with an oblique orientation and oval disc shape without signs of pathology.

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Results

After exclusion of highly myopic eyes with a myopic refractive error > -8 D, tilted optic discs were detected on the fundus photographs of 31 eyes (prevalence rate per eye: $0.36 \pm 0.07\%$ (mean \pm SE; 95% confidence interval: 0.23, 0.49%) of 23 (0.5%) patients (16 women). In the eyes with tilted discs compared with the remaining eyes, refractive error was significantly more myopic (-6.59 ± 0.68 D *vs* -0.60 ± 0.02 D; $P < 0.001$), astigmatism was higher (1.55 ± 0.24 D *vs* 0.59 ± 0.01 D; $P < 0.001$), best corrected visual acuity was lower (0.72 ± 0.06 *vs* 0.92 ± 0.02 ; $P < 0.001$), visual field defects in frequency doubling perimetry were detected more often (48.4 *vs* 9.8%; $P < 0.001$), beta zone of peripapillary atrophy occurred significantly ($P < 0.001$) more often,⁶ and, if present, beta zone was located significantly ($P < 0.001$) more often in the inferior region than in the temporal region. Both groups did not vary significantly in age ($P = 0.60$), gender ($P = 0.21$), and intraocular pressure ($P = 0.26$). In the subjects with unilateral tilted discs, visual acuity was significantly lower in the eyes with tilted discs than in the contralateral eye.

Conclusions

Tilted optic discs occur in about four out of 1000 non-highly myopic eyes of adult Chinese. As in Caucasians,^{1,3} tilted discs were associated with moderate myopia, astigmatism, inferiorly located beta zone of peripapillary atrophy, decreased visual acuity, and visual field defects.

One may infer that a visual field defect in an eye with a tilted disc is not proof of an acquired optic nerve disease such as glaucoma. In children, detection of tilted discs may prompt refractometry to exclude corneal astigmatism and prevent amblyopia.

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