coefficients showed that all Heidelberg Retina Tomograph II cup parameters as well as the photographically determined vertical cup-disc ratio were positively correlated and rim parameters were negatively correlated with the IOP values measured on the same days. Notably, disc size and axial length but not corneal curvature varied with cup size, which was influenced by IOP fluctuation (Table).

Comment. Previous studies that also used the Heidelberg Retina Tomograph as well as those that used other techniques have demonstrated the reversibility of cupping in adult cases of glaucoma. Those studies claimed that the compliance and position of the optic disc and lamina cribrosa were primary determinants for the cup reversal. Sigal et al proposed that elevated IOP deforms ONH tissues indirectly through its influence on the sclera rather than direct action on the internal surface of the ONH. According to them, the highest magnitude of compression occurred within the ONH neural tissues. Asymmetrical deformation of the optic disc and axial length fluctuations correlated with IOP under conditions of stable corneal curvature. This may clinically support the idea that scleral biomechanics play a critical role in the reversibility of cupping after IOP reduction. As raised by Lesk et al, younger age may contribute to the elastic scleral properties. Meanwhile, the negative correlation of rim parameters with IOP fluctuations may reflect the neural tissue strain and plasticity.

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Clinical assessment of the optic disc and nerve fiber layer (NFL) is an important method to diagnose and monitor the progress of glaucomatous optic neuropathy but is often difficult in eyes with tilted discs. Clinically, there are 2 orientations of tilting of the optic disc: temporal and inferior (Figure 1). Optical coherence tomography (OCT) demonstrates an acceptable diagnostic ability for glaucoma by comparing an individual patient’s NFL thickness profile with those in a normative database. The purpose of this study is to characterize the NFL of nonglaucomatous eyes with tilted discs using OCT.

Methods. This study was approved by the institutional review board of the University of California, Los Angeles. Our entire optic disc photograph database was screened for temporally or inferiorly tilted discs. Eyes with severely temporally tilted discs with a maximal-to-minimal disc diameter ratio higher than 1.4 and eyes with severely inferiorly tilted discs with apparent rotation of the long axis of the disc by more than 75° from the vertical meridian were selected. Patients with a diagnosis of glaucoma were excluded. The NFL thickness profile was obtained by using OCT (3D OCT-1000; Topcon, Tokyo, Japan). The cut-off value of NFL thickness was 115 μm, which was previously defined as abnormal NFL thickness in our study.

Characterization of Retinal Nerve Fiber Layer in Nonglaucomatous Eyes With Tilted Discs

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Figure 1. Examples of a temporally tilted disc (A) and an inferiorly tilted disc (B).
glaucoma, glaucomatous visual field defects, intraocular pressure higher than 21 mm Hg, or history of intraocular surgery, steroid use, ocular trauma, or any ocular diseases were excluded. StratusOCT software version 3.0 or 4.0.4 (model 3000; Carl Zeiss Meditec, Inc, Dublin, California) was used to measure the thickness of the peripapillary NFL. Eyes with OCT NFL images of poor signal quality or images in which the NFL segmentation algorithm failed to identify the NFL were excluded. The OCT measurements of the NFL in eyes with temporally and inferiorly tilted discs were compared with those of aged-matched healthy individuals without tilted discs.

Results. Stereoscopic optic disc photographs of 9435 patients were screened for severely tilted optic discs. Thirty-two eyes (21 patients [0.22%]) with temporally tilted discs and 11 eyes (7 patients [0.07%]) with inferiorly tilted disc were enrolled. The control group consisted of 57 eyes (36 patients). Both the temporally and the inferiorly tilted disc groups had a statistically significantly more myopic mean refractive error (mean [SEM], −7.67 [3.81] diopters [D] and −5.25 [3.86] D, respectively), higher astigmatism (mean [SEM], 1.07 [1.12] D and 1.68 [1.90] D, respectively), and worse visual field mean deviation (mean [SEM], −2.69 [2.21] dB and −4.01 [1.69] dB, respectively) and pattern standard deviation (mean [SEM], 2.66 [1.63] dB and 3.35 [2.71] dB, respectively) than the control group (P < .01). The average NFL thicknesses of the temporally (mean [SEM], 90.7 [16.4] µm) and inferiorly (mean [SEM], 92.4 [15.7] µm) tilted disc groups were statistically significantly lower than those of the control group (mean [SEM], 102.6 [9.6] µm) (P < .001 and P = .005, respectively).

The superior peak of the temporally tilted disc group was located more temporally than that of the control group (mean [SEM], 55° [19°] vs 75° [16°], respectively; P < .001). The inferior peak of the temporally tilted disc group was also located more temporally than that of the control group, but the difference was not quite statistically significant (mean [SEM], 297° [10°] vs 291° [21°], respectively; P = .08) (Figure 2).

The mean thicknesses of the temporal, superior, and nasal quadrants of the inferior tilted disc group were very similar (mean [SEM], 84.22 [18.96] µm, 85.36 [34.53] µm, and 84.50 [21.71] µm, respectively). With the mean NFL thickness of all 256 points along the circular scan plotted, no obvious peak of NFL thickness was noted in the superior half, but a peak was noted in the inferior half of the inferiorly tilted disc group (Figure 2).

The significance of all results remained unchanged on further analysis with repeated-measures linear regression models with a compound symmetry covariance structure to account for the inclusion of fellow eyes.

Comment. Eyes with tilted discs have a different distribution of NFL thicknesses compared with normal eyes, with the peak of the superior half of the temporally tilted disc shifted temporally and the superior peak of the inferiorly tilted disc blunted. These characteristics should be considered when applying OCT to the interpretation of NFL measurements in eyes with tilted discs.

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Intraretinal Neovascularization in Diabetic Retinopathy

The hallmark of proliferative diabetic retinopathy is neovascularization occurring at the vitreoretinal interface and in the vitreous, although intraretinal neovascularization (IRNV) is also reported to be a common finding if repeated fluorescein angiography is performed. However, the appearance of the IRNV in routine histological sections has been reported only rarely. Herein, we describe the histological features of IRNV in both eyes of a man with chronic diabetes mellitus.

Report of a Case. A 53-year-old man with chronic diabetes mellitus, hypertension, chronic kidney disease,