

Scanning Laser Polarimetry with Enhanced Corneal Compensation for Detection of Axonal Loss in Band Atrophy of the Optic Nerve

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- **PURPOSE:** To compare the abilities of scanning laser polarimetry (SLP) with enhanced corneal compensation (ECC) and variable corneal compensation (VCC) modes for detection of retinal nerve fiber layer (RNFL) loss in eyes with band atrophy (BA) of the optic nerve.
- **DESIGN:** Cross-sectional study.
- **METHODS:** Thirty-seven eyes from 37 patients with BA and temporal visual field defect from chiasmal compression and 40 eyes from 40 healthy subjects were studied. Subjects underwent standard automated perimetry and RNFL measurements using an SLP device equipped with VCC and ECC. Receiver operating characteristic (ROC) curves were calculated for each parameter. Pearson correlation coefficients were obtained to evaluate the relationship between RNFL thickness parameters and severity of visual field loss, as assessed by the temporal mean defect.
- **RESULTS:** All RNFL thickness parameters were significantly lower in eyes with BA compared with normal eyes with both compensation modes. However, no statistically significant differences were observed in the areas under the ROC curves for the different parameters between GDx VCC and ECC (Carl Zeiss Meditec, Inc, Dublin, California, USA). Structure-function relationships also were similar for both compensation modes.
- **CONCLUSIONS:** No significant differences were found between the diagnostic accuracy of GDx ECC and that of VCC for detection of BA of the optic nerve. The use of GDx ECC does not seem to provide a better evaluation of RNFL loss on the temporal and nasal sectors of the peripapillary retina in subjects with BA of the optic nerve. (*Am J Ophthalmol* 2008;145:747-754. © 2008 by Elsevier Inc. All rights reserved.)

SCANNING LASER POLARIMETRY (SLP) HAS BECOME A widely used noninvasive clinical method to evaluate the retinal nerve fiber layer (RNFL) mainly in

patients with glaucoma.^{1,2} SLP uses a confocal scanning laser ophthalmoscope with an integrated polarimeter to estimate quantitatively the thickness of the RNFL by measuring the change in polarization of the incident light as it double-passes through the birefringent RNFL. The amount of retardation in the reflected light is proportional to the RNFL thickness,³ although a contribution of anterior segment birefringence also is present and has to be compensated for.⁴

The latest commercially available SLP device, the GDx VCC (Carl Zeiss Meditec, Inc, Dublin, California, USA), has an integrated variable corneal compensator (VCC) that determines and neutralizes the eye-specific anterior segment polarization axis and magnitude and provides more exact RNFL thickness measurements than the earlier fixed corneal compensation (FCC) technology.⁵⁻⁷ However, shortly after the introduction of the GDx VCC, several scans showing atypical retardation patterns (ARP) were observed in some patients. These scans show irregular patches of elevated retardation values that do not match the expected retardation based on the RNFL anatomic features. ARPs seem to result from poor signal-to-noise ratio as a consequence of light scattering in the eye.⁸ To compensate for a decrease in signal, the instrument automatically increases the gain to augment the polarization signal, which paradoxically increases the noise from deeper structures such as the sclera. ARPs are more common in older and myopic eyes and in eyes with thin retinal pigment epithelium.⁹ ARPs produce artifactual patchy areas of increased RNFL thickness in regions usually associated with decreased thickness, particularly in the temporal and nasal areas of the peripapillary retina.¹⁰

An enhanced algorithm (enhanced corneal compensation [ECC]) has been developed to improve the signal-to-noise ratio and to eliminate artifacts associated with ARPs while still allowing compensation for the anterior segment birefringence.^{11,12} The GDx ECC introduces a large, previously established birefringence bias to shift the measurement of total retardation into a higher value region and to boost the signal-to-noise ratio. Several studies in glaucoma patients have found ECC to be superior to VCC with regard to diagnostic accuracy and the correlation between RNFL measures and visual function.^{10,13-15}

The pattern of RNFL loss in patients with lesions of the optic chiasm represents an interesting model to evaluate

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the ability of any instrument to detect loss of RNFL in the nasal and temporal sectors of the optic disk. In patients with extensive mid-chiasmal lesions and showing severe bitemporal hemianopia with preserved nasal field, the crossed nerve fibers originating in the nasal hemiretina are lost, with preservation of the uncrossed fibers, which originate in the temporal hemiretina and penetrate the optic nerve through the superior and inferior arcuate fiber bundles. Therefore, RNFL loss occurs predominantly on the nasal and temporal sides of the optic disk. Such a pattern may be identified on ophthalmoscopy as band atrophy (BA) of the optic nerve and is an important clinical sign in the diagnosis of patients with chiasmal compression and in estimating the chances of improvement of visual field defects after decompression of the optic pathway.¹⁶

In a previous study, we demonstrated that GDx FCC has poor sensitivity to detect axonal loss in the temporal and nasal regions of the optic disk in patients with BA of the optic nerve.¹⁷ In another study, we found that GDx VCC significantly improved detection of RNFL loss in the temporal quadrant when compared with GDx FCC, but still performed worse than optical coherence tomography (OCT).¹⁸ Because the introduction of ECC presumably improves SLP performance by eliminating or reducing ARPs in the nasal and temporal areas of the peripapillary retina, we designed a study to compare the ability of GDx ECC and GDx VCC to detect RNFL loss in patients with BA of the optic nerve.

METHODS

THIS WAS AN OBSERVATIONAL, PROSPECTIVE, CROSS-sectional study. Participants were recruited for examination at the Department of Ophthalmology of the University of São Paulo Medical School between May 1, 2003 and October 31, 2005. A total of 37 eyes of 37 patients (21 male) with temporal hemianopia from chiasmal compression and 40 eyes from 40 normal age- and gender-matched controls (21 male) were studied. All patients with a history of chiasmal lesions had been submitted to previous treatment of the suprasellar lesion and had stable visual field defects and visual acuity (VA) for at least one year before study entry.

All subjects underwent a complete ophthalmologic examination including visual field evaluation. Visual field testing was performed using the Goldmann perimeter (Haag-Streit AG, Bern, Switzerland). The V-4-e, I-4-e, I-3-e, I-2-e, and I-1-e stimuli were used to draw the isopters. Kinetic determinations were followed by static presentation of the stimuli, particularly in the central 30-degree area, to search for localized defects. In addition, all patients also underwent standard automated perimetry (SAP) using the 24-2 full-threshold strategy (Humphrey Field Analyzer; Carl-

Zeiss Meditec, Dublin, California, USA). Visual field and SLP examinations were performed on the same day or within a maximum period of two weeks.

The inclusion criteria for the study were best-corrected VA of 20/30 or better in the study eye; age between 15 and 80 years; spherical refraction within ± 5 diopters (D); cylinder refraction within ± 4 D; intraocular pressure less than 22 mm Hg; and reliable visual field. A reliable Humphrey visual field test was defined as one with fewer than 25% fixation losses, false-positive responses, or false-negative responses. Patients with a history of intraocular pressure elevation, with clinical signs of glaucomatous optic neuropathy or optic disk anomaly, were excluded.

Patients with BA were required to have complete or partial temporal hemianopia on Humphrey and Goldmann perimetry and a nasal hemifield within normal limits on both tests. A normal nasal hemifield on Goldmann perimetry was defined as the presence of normal I-4-e, I-2-e, and I-1-e isopters. On SAP, a normal hemifield was defined as the absence of any cluster of at least three points with $P < .05$ on the pattern deviation plot. Only one eye of each patient was selected for analysis. In 31 patients, only one eye met the inclusion criteria. For the six patients in whom both eyes fulfilled the inclusion criteria, one eye was selected randomly for analysis. The severity of visual field defect in patients with BA was determined by calculating the temporal mean defect (TMD). This was performed by averaging the values of the total deviation plot for the 22 temporal points of the SAP threshold 24-2 test, excluding the two points immediately above and below the blind spot.

The control group consisted of normal healthy volunteers recruited from among the hospital staff. All normal subjects had normal ophthalmic findings and normal SAP visual fields. A normal SAP visual field was defined as a pattern standard deviation (PSD) within the 95% confidence limit and a glaucoma hemifield test result within the normal range. Healthy control eyes also had healthy-looking optic disks and RNFLs. One eye of each healthy subject was included for analysis, and the selection between right or left eye was performed to match the selection in patients with BA.

• **SCANNING LASER POLARIMETRY:** The thickness of the peripapillary RNFL was determined using a commercially available GDx device using VCC and ECC technologies (software version 5.4.0; Carl Zeiss Meditec). The spherical equivalent refractive error of each eye was entered into the software to allow the GDx to focus on the retina. The general principles and operation of SLP have been reported previously.² In brief, the device uses a diode laser with a wavelength of 780 nm to create a polarized laser beam aimed at the retina.³ The reflected light double-passing the RNFL is used to obtain the retardation image at that point. The GDx VCC uses a variable corneal

polarization compensator that allows eye-specific compensation of anterior birefringence. After determining the axis and magnitude of corneal polarization in each eye by macular scanning⁵, three appropriately compensated retinal polarization images per eye were obtained automatically and were combined to form each mean image used for analysis. With the ECC software, the corneal polarization compensator was adjusted automatically to introduce a bias retardation of approximately 55 nm and to position the slow axis of polarization close to vertical. This adjustment bias boosts the signal and thus overcomes low sensitivity that can make retardation measurements susceptible to optical and electronic noise. After image acquisition, the bias was subtracted to obtain the final RNFL retardation values.⁹

The quality of the reflectance image and retardance image for cornea and macula was reviewed for even illumination, centering, and appropriate corneal compensation. Images were considered to be of high quality if sharply focused with even illumination and well centered on the optic nerve, with minimal eye movement. All images had a quality score of at least 8.

RNFL thickness images obtained in both compensation modes were divided into four segments: superior 120 degrees (with 0 degrees at the 12-o'clock position, 295 to 55 degrees), nasal 70 degrees (55 to 125 degrees), inferior 120 degrees (125 to 245 degrees), and temporal 50 degrees (245 to 295 degrees). These segments were used to calculate the different parameters of the nerve fiber analysis. The GDx VCC parameters investigated in this study were temporal-superior-nasal-inferior-temporal (TSNIT) average, superior average, temporal average, inferior average, and nasal average.

To quantify the presence of ARPs on GDx VCC scans, we used the software-provided parameter typical scan score (TSS). The TSS is a continuous variable ranging from zero to 100 and is the result of a support vector machine analysis of SLP data labeled for training based on the subjective appearance of each scan (typical vs atypical). TSS is based on the slope, standard deviation, and average magnitude of RNFL thickness measurements from the edge of the optic disk extending outward to 20 degrees. Low TSS scores indicate atypical scans and high TSS scores indicate typical ones. As in earlier studies, TSS values of less than 80 indicated atypical images.^{11,15}

• **STATISTICAL ANALYSIS:** RNFL thickness values obtained in the GDx VCC and GDx ECC mode were compared using the paired *t* test. The histogram analysis and the Shapiro-Wilk test confirmed that the distributions satisfied the normality assumption. GDx VCC and GDx ECC-obtained RNFL thickness values of eyes with BA also were compared with values from normal controls using the Student unpaired *t* test.

Receiver operating characteristic (ROC) curves were used to describe the ability of GDx VCC and ECC parameters to

discriminate eyes with BA from healthy eyes. The method of DeLong and associates was used to compare areas under the ROC curves (AUCs).¹⁹ The sensitivity at 80% and 95% specificity was calculated for each parameter. Pearson correlation coefficients were used to evaluate the relationship between RNFL thickness parameters and TMD-determined severity of visual field loss.

P values less than .05 were considered statistically significant. The statistical analyses were carried out with the SPSS software version 15.0 (SPSS, Inc, Chicago, Illinois, USA).

RESULTS

A TOTAL OF 37 EYES FROM 37 PATIENTS WITH TEMPORAL hemianopia and 40 eyes from 40 normal subjects were studied. Thirty-two patients had pituitary adenoma, three had craniopharyngioma, and two had suprasellar meningioma. The mean age \pm standard deviation (SD) was 44.5 ± 12.1 years (range, 18 to 72 years) in BA patients and 42.7 ± 10.9 years (range, 18 to 71 years) in normal subjects ($P = .39$, Student unpaired *t* test). The average SAP mean deviation (\pm SD) and SAP TMD in BA patients were -8.25 ± 5.13 decibels (dB) and -17.91 ± 11.2 dB, respectively. The fundoscopic examination revealed signs of BA of the optic disk and RNFL in all 37 eyes with temporal hemianopic field defect.

Table 1 shows comparisons of VCC and ECC values for the different RNFL thickness parameters in eyes with BA and normal controls. In eyes with BA, the parameter temporal average was significantly lower with ECC than with VCC. In normal subjects, RNFL thickness measurements were significantly lower with ECC than with VCC mode for TSNIT average, nasal average, and temporal average.

We also compared RNFL thickness measurements in eyes with BA of the optic nerve vs healthy eyes for the GDx VCC and GDx ECC. All RNFL thickness parameters were significantly lower in eyes with BA than in normal eyes for both compensation modes ($P < .001$ for all comparisons). Table 2 shows AUCs and sensitivities at fixed specificities for GDx VCC and GDx ECC. The average thickness parameter had the largest ROC curve area in both compensation modes (0.97 and 0.96, for GDx VCC and ECC, respectively; $P = .45$). No statistically significant difference was observed in the AUCs for the different parameters between GDx VCC and ECC. For the nasal average parameter, ROC curve areas were 0.93 and 0.88 for GDx VCC and ECC, respectively ($P = .19$). For the temporal average, ROC curve areas were 0.77 and 0.72, respectively ($P = .46$).

Table 3 shows the associations between GDx VCC and ECC thickness parameters and TMD values. With VCC, the highest correlation was observed for the

TABLE 1. Comparison of Mean Values (\pm Standard Deviation) of VCC and ECC GDx Scanning Laser Polarimeter Retinal Nerve Fiber Layer Thickness Parameters (in μm) with Areas under the Receiver Operating Characteristic Curves and Sensitivities at Fixed Specificities in Eyes with Band Atrophy of the Optic Nerve and Normal Controls

Parameter	Band Atrophy (n = 37)			Normal (n = 40)		
	VCC	ECC	P value*	VCC	ECC	P value*
TSNIT average	38.24 \pm 6.97	37.55 \pm 6.59	.28	55.72 \pm 4.28	52.84 \pm 4.32	<.001
Superior average	46.08 \pm 10.6	46.12 \pm 10.81	.95	67.14 \pm 6.77	66.85 \pm 6.33	.48
Inferior average	46.02 \pm 8.19	47.16 \pm 7.75	.16	63.87 \pm 6.92	64.72 \pm 6.16	.12
Nasal average	23.91 \pm 8.32	23.32 \pm 6.33	.56	42.29 \pm 8.81	33.97 \pm 6.65	<.001
Temporal average	20.98 \pm 7.68	14.15 \pm 3.89	<.001	28.09 \pm 7.63	17.66 \pm 4.17	<.001

ECC = enhanced corneal compensation; TSNIT = temporal, superior, nasal, inferior, temporal; VCC = variable corneal compensator. Comparison between patients with band atrophy and controls were statistically significant for all parameters with both GDx VCC and GDx ECC ($P < .001$ for all comparisons, Student *t* test).

*Paired *t* test. Significant values appear in boldface.

TABLE 2. Area under the Receiver Operating Characteristic Curves with Sensitivity at Fixed Specificities for the Retinal Nerve Fiber Layer Parameters of Scanning Laser Polarimetry with Variable Corneal Compensation (GDx VCC) and Enhanced Corneal Compensation (GDx ECC)

Parameter	ROC Curve Area (SD)		P value*	Sensitivity/Specificity of GDx VCC		Sensitivity/Specificity of GDx ECC	
	GDx VCC	GDx ECC		Specificity \geq 95%	Specificity \geq 80%	Specificity \geq 95%	Specificity \geq 80%
TSNIT average	0.97 (0.01)	0.96 (0.02)	0.45	90/95	95/80	92/95	97/80
Superior average	0.93 (0.02)	0.93 (0.02)	0.96	65/95	100/80	47/95	97/80
Inferior average	0.94 (0.02)	0.95 (0.02)	0.48	72/95	95/80	90/95	97/80
Nasal average	0.93 (0.03)	0.88 (0.03)	0.19	52/95	95/80	55/95	85/80
Temporal average	0.77 (0.05)	0.72 (0.05)	0.46	15/95	65/80	15/95	57/80

ECC = enhanced corneal compensation; SD = standard deviation; TSNIT = temporal, superior, nasal, inferior, temporal; VCC = variable corneal compensator.

*Method of De Long and associates.

TABLE 3. Associations between GDx VCC and GDx ECC Scanning Laser Polarimetry Retinal Nerve Fiber Layer Thickness Parameters and Temporal Mean Defect of the Visual Field

GDx VCC RNFL Thickness Parameters	R*	P value	GDx ECC RNFL Thickness Parameters	R*	P value
TSNIT average	0.64	<.001	TSNIT average	0.67	<.001
Superior average	0.72	<.001	Superior average	0.70	<.001
Inferior average	0.51	.001	Inferior average	0.51	.001
Nasal average	0.38	.022	Nasal average	0.48	.003
Temporal average	-0.003	.98	Temporal average	0.023	.89

ECC = enhanced corneal compensation; RNFL = retinal nerve fiber layer; TSNIT = temporal, superior, nasal, inferior, temporal; VCC = variable corneal compensator.

*Pearson correlation coefficient. Significant values appear in boldface.

parameter superior average ($r = 0.72$; $R^2 = 52\%$; $P < .001$). With ECC, the highest correlation also was observed for the parameter superior average ($r = 0.70$; $R^2 = 49\%$; $P < .001$; Figure). The parameter nasal average was significantly correlated with TMD in both compensation

modes. No statistically significant correlation was found for the parameter temporal average in either mode.

In eyes with BA of the optic nerve, TSS differed significantly between images produced with VCC (mean, 94.5; SD, 11.9; range, 56 to 100) and ECC (mean, 99.8;

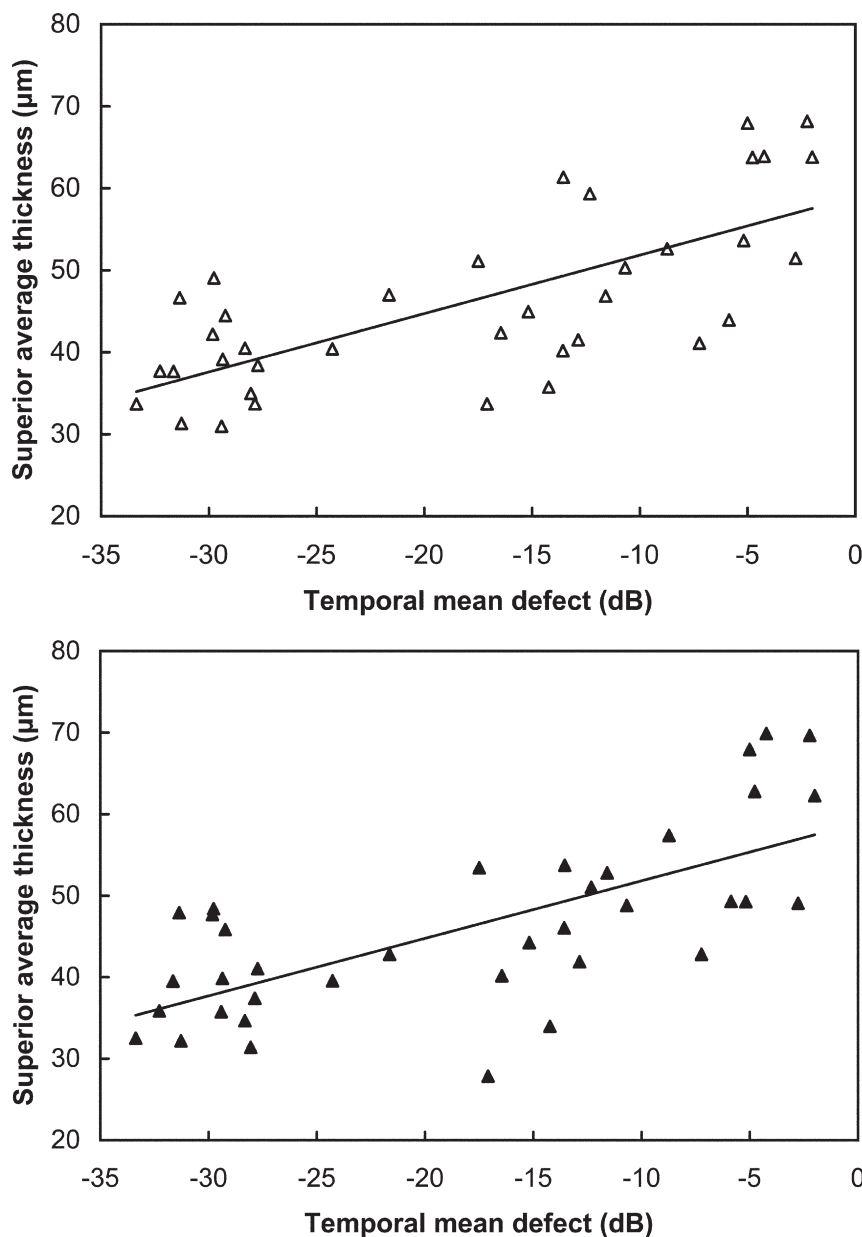


FIGURE. Scatterplots demonstrating scanning laser polarimetry superior average parameter vs temporal mean defect values in the 37 eyes with band atrophy of the optic nerve (Top) with variable corneal compensation and (Bottom) with enhanced corneal compensation. dB = decibels.

SD, 1.2; range, 93 to 100; $P = .001$, paired t test). In normal eyes, the corresponding values were 91.2 ± 15.3 (range, 35 to 100) in VCC mode and 99.4 ± 2.5 (range, 87 to 100) in ECC mode ($P < .001$). Four (11%) of 37 eyes with BA and seven (18%) of 40 normal eyes had a TSS of less than 80 in the VCC mode. None of the 77 eyes evaluated in the two groups had a TSS of less than 80 in the ECC mode.

DISCUSSION

IN THE PRESENT STUDY, WE FOUND THAT SLP RNFL THICKNESS measurements in eyes with BA of the optic nerve were

significantly lower than in healthy eyes, regardless of the compensation mode used (i.e., VCC or ECC). However, no significant differences were observed between these two compensating modes in their ability to detect RNFL loss in patients with BA of the optic nerve.

Previous studies performed in patients with glaucoma demonstrated a better performance of the GDx ECC compared with VCC for detection of RNFL loss, particularly in the presence of ARPs. Toth and Hollo evaluated 27 eyes with glaucoma and 19 healthy eyes with ARPs using both VCC and ECC.¹⁵ The presence of ARPs on peripapillary SLP VCC images was assessed by using the TSS score (TSS values < 80 were taken as an indication

of the presence of ARPs). The authors observed that the RNFL parameters TSNIT average, superior average, and inferior average, as well as the nerve fiber indicator, were significantly lower with ECC than with VCC, and concluded that the ECC technology substantially improves polarimetric image analysis on eyes showing atypical polarization patterns.¹⁵ Reus and associates evaluated GDx ECC and VCC in 177 subjects, including 29 healthy subjects, 70 patients with glaucoma and 78 subjects with ocular hypertension, and observed that the two modes differed with regard to the shape of the peripapillary retardation graph, as the modulation was markedly larger on the ECC graph.¹⁴ The authors concluded that the ECC mode provides a better assessment of RNFL morphologic features than the VCC mode and may enhance the clinical usefulness of GDx VCC in glaucoma management. In a recent study, Medeiros and associates showed that the GDx ECC performed significantly better than VCC for diagnosing glaucoma in patients with more severe atypical patterns of retardation.²⁰ For example, for patients with TSS values of 20, indicating severe atypia, the estimated ROC curve area from a regression model for the nerve fiber indicator parameter was 0.910 for GDx ECC, but only 0.684 for GDx VCC.

The above-mentioned studies have concentrated on investigating parameters related to the superior and inferior peripapillary RNFL, because glaucomatous damage is usually more prominent on these areas. The study of temporal and nasal peripapillary RNFL, however, is particularly important for other diseases, including hereditary, toxic, compressive, and traumatic neuropathies. In the current study, we investigated whether the addition of ECC represents an improvement in the diagnostic ability of SLP to detect damage in the nasal and temporal areas, compared with the GDx VCC. To the best of our knowledge, this is the first study to make a comparison of the diagnostic accuracy of these two methods in patients with BA of the optic nerve, a particularly useful model to study the quantification of RNFL loss in the nasal and temporal quadrants of the optic disk. Our findings indicated that the two compensation modes, ECC and VCC, were equally accurate as diagnostic tools in eyes with BA of the optic nerve and healthy controls. The AUCs of the RNFL parameters studied were similar for the two modes for all parameters investigated (Tables 1 and 2).

Our results may seem somewhat surprising because the elimination or reduction of ARPs in the GDx ECC scans would be expected to improve the ability of this instrument to detect RNFL loss in the temporal and nasal areas of the peripapillary retina.^{10,13-15,20} ARPs are known significantly to affect measurements obtained on these areas, which in turn significantly affects the performance of the GDx VCC. The absence of difference in the performance of GDx ECC and GDx VCC may be explained by the relatively small number of eyes with substantial ARP included in our study. Although mean TSS values were

significantly lower with VCC than with ECC both in eyes with BA and in normal controls, ARPs (defined as TSS < 80) were present in only a small number of eyes with BA (11%) and normal controls (18%). In fact, the overall mean VCC TSS value (92.8) of the population included in our study was considerably higher than values reported in previous studies using the VCC. For example, Bowd and associates, Sehi and associates, and Reus and associates reported average VCC TSS values of 85.4, 86.3, and 82.0, respectively.^{10,13,14} The reason for the low incidence of ARP in our study population may be explained, at least in part, by the relatively younger age of our patient population when compared with studies evaluating patients with glaucoma, because ARPs are known to be more common in older subjects.

We also evaluated the relationship between functional loss, as measured by SAP, and structural loss, as measured by the two SLP compensating modes, in patients with BA of the optic nerve. Slight improvements were seen on the structure-function relationships measured by ECC compared with VCC, especially for the nasal sector. However, relationships remained weak and nonsignificant for the temporal sector with both compensating modes. Similar findings have been reported for patients with glaucomatous visual field loss. Mai and associates evaluated the relationship between RNFL retardation and SAP visual field sensitivity in 68 patients with primary open-angle glaucoma and concluded that ARPs weakened the structure-function relationship.²¹ More recently, Bowd and associates applied linear and logarithmic regression analyses to the associations between RNFL and visual field sensitivities (decibel threshold measurements) in six corresponding sectors using SLP VCC and ECC measurements in 127 eyes with glaucoma or suspected glaucoma.¹⁰ Structure-function associations (R^2) ranged from 0.03 (temporal RNFL) to 0.22 (supertemporal RNFL) for VCC and from 0.01 (temporal RNFL) to 0.26 (supertemporal RNFL) for ECC. Associations were slightly stronger for ECC than for VCC, although differences were only significant for the infero-temporal RNFL segment.¹⁰

The quantification of axonal loss in BA of the optic nerve can be important in the diagnosis and management of patients with chiasmal compression usually resulting from tumors such as pituitary adenomas, craniopharyngiomas, and meningiomas. In such patients, the absence of RNFL loss is a good prognostic indicator for visual recovery after successful treatment. Patients with visual field defect but without BA of the optic nerve are expected to have marked visual improvement after chiasm decompression, whereas patients with severe RNFL loss are unlikely to recover as much. An optimal correlation between visual field and RNFL would be very useful, particularly in patients with recurrent or residual suprasellar lesions when deciding whether further surgery would be useful for visual improvement. Theoretically, an ideal RNFL and visual field structure-function correlation would allow one to

define whether visual field defects are the result of dysfunctional retinal ganglion cells from current chiasmal compression or of dead retinal ganglion cells from previous (old) compression established before tumor recurrence.²²

Structure-function associations between RNFL parameters and the TMD in eyes with BA of the optic nerve in the present study indicate that both GDx VCC and ECC compare well with several corresponding OCT values. In a previous study, we found Pearson correlation values of 0.63, 0.54, 0.53, and 0.45 for OCT parameters corresponding to average thickness and thicknesses in the superior, inferior, and nasal quadrant, which are very similar to the present findings using VCC and ECC (Table 3).¹⁸ In fact, SLP correlation values observed in the best GDx VCC and ECC parameter of the superior quadrant measurement (0.72 and 0.70, respectively) were slightly superior to the best OCT parameter (average RNFL, 0.63). However, values from the temporal quadrant indicate a great discrepancy between our OCT data and that of SLP. Whereas the Pearson correlation value between the TMD and the OCT

RNFL in the temporal quadrant was 0.41, the corresponding values with GDx VCC and ECC were -0.003 and 0.023 , respectively. In view of these findings, OCT still seems to be better than SLP in assessing RNFL loss in eyes with BA of the optic nerve. Our data suggest that atypical retardation patterns cannot account for the lower ROC curve areas observed in the temporal quadrant in this study, because both ECC and VCC performed poorly to detect loss in this segment. The reason for such poor performance is unclear; however, it may be related to variations of birefringence of the nerve fibers in the different quadrants of the peripapillary retina and their effect on retardation measurements obtained by SLP (Zhou Q, written communication, October 16, 2007).

In conclusion, we were not able to find significant differences between the diagnostic accuracy of GDx ECC and that of VCC for detection of BA of the optic nerve. The use of GDx ECC does not seem to provide a better evaluation of RNFL loss on the temporal and nasal sectors of the peripapillary retina in subjects with BA of the optic nerve.

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Biosketch

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Biosketch

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