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# Measurement of the Optic Nerve Head Descending Fibers at Bruch's Membrane Opening Level with Spectral Domain Optical Coherence Tomography in Normal and Glaucoma Eyes.

Fernanda Mari Fagundes Fujihara; Paulo Augusto de Arruda Mello; Camila Zanella Benfica; Nedio Castoldi; Fernanda Miranda Mendes; Alessandro Finkelstein; Rodrigo Leivas Lindenmeyer; Daniel Lavinsky; Helena Messinger Pakter; Fabio Lavinsky.

## — Author Affiliations & Notes

Fernanda Mari Fagundes Fujihara

Ophthalmology, Hospital Banco de Olhos de Porto Alegre, Porto Alegre, RS, Brazil

Paulo Augusto de Arruda Mello

Department of Ophthalmology, Federal University of São Paulo, Sao Paulo, SP, Brazil

Camila Zanella Benfica

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Nedio Castoldi

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Fernanda Miranda Mendes

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Department of Ophthalmology, Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil

Alessandro Finkelstein

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Department of Ophthalmology, Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil

Rodrigo Leivas Lindenmeyer

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Department of Ophthalmology, Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil

Daniel Lavinsky

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Department of Ophthalmology, Federal University of Rio Grande do Sul, Porto Alegre, RS, Brazil

Helena Messinger Pakter

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

Ophthalmology Department, Hospital Nossa Senhora da Conceição, Porto Alegre, RS, Brazil

Fabio Lavinsky

Department of Ophthalmology, Federal University of São Paulo, Sao Paulo, SP, Brazil

Department of Ophthalmology, Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

## Footnotes

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## Abstract

**Purpose :** This study aims to evaluate a novel structural parameter: the descending fibers width at the Bruch's membrane opening level (DF-BMO) and its association with other structural and functional parameters in normal and glaucoma patients.

**Methods :** Subjects with glaucoma presenting typical optic nerve head (ONH) findings, high intraocular pressure with or without visual field damage and normal controls were included. Patients underwent 24-2 perimetry (Humphrey Field Analyzer) and SD-OCT (Spectralis). A vertical B-scan of the ONH with the largest cup extension was obtained for the measurements. The mean width between the BMO and the innermost portion of the descending fibers in the inferior and superior portions of the cup constituted the DF-BMO (Figure 1). Automated individual macular layers were checked for proper segmentation and plotted using the average of sectors from the ETDRS grid circle. Statistical analysis was performed using generalized estimating equations (GEE) to allow for clustered observations. Age, gender, presence of glaucoma, disc area and cup extension were accounted in the model. The area under the receiver operating characteristics curve (AUROC) to discriminate between glaucoma and normal eyes for DF-BMO was also calculated.

**Results :** 109 eyes (67 subjects) qualified for the study. The number of eyes was 95 in the glaucoma and 14 in the control group. The mean DF-BMO was  $260.04 \pm 106.06 \mu\text{m}$  and  $476.14 \pm 124.70 \mu\text{m}$ , for glaucoma and normal eyes, respectively. Other characteristics are described in Table 1. In the GEE models, DF-BMO was significantly associated with cRNFL ( $P=0.001$ ) and the inner circle of the GCIPL ( $P=0.006$ ). The inferior portion of the DF-BMO was associated with the inferior cRNFL ( $P<0.001$ ), whereas their superior counterparts were not ( $P=0.674$ ). Age and gender weren't significant in any of the models. The AUROC for the DF-BMO was 0.896 ( $P<0.001$ ). At the cutoff value of  $365 \mu\text{m}$ , the sensitivity and specificity were 83.2% and 78.6%, respectively, with a positive predictive value of 96.3%.

**Conclusions :** The DF-BMO was significantly associated with structural glaucoma parameters (cRNFL and inner circle of GCIPL) and differentiated well between normal and glaucoma patients. This parameter may constitute an additional OCT biomarker for the structural diagnosis and monitoring of glaucoma.

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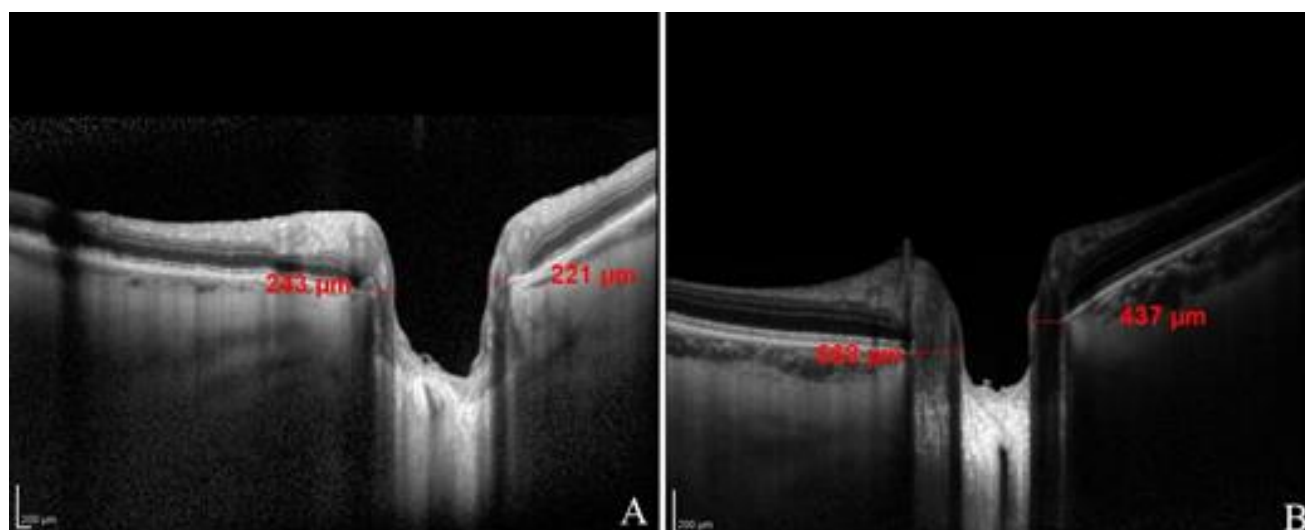


Figure 1 - Measurement of the descending fibers width at the Bruch's membrane opening level (DF-BMO) . A: Case; B: Control.

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Figure 1

- Table 1 – Comparison of Visual Field, Circumpapillary Retinal Nerve Layer (cRNFL), Macular Ganglion Cell Layer/Inner Plexiform Layer (GCIPL) and Optic Nerve Head (ONH) Parameters between Eyes from the Control and Glaucoma Group.

Parameter	Control	Glaucoma	P-value*
Age (years)	44.86 (13.51)	68.62 (9.64)	<0.001
Gender (N, %)			
Female	4 (57.14%)	42 (70.00%)	0.488
Male	3 (42.86%)	18 (30.00%)	
MD (dB)	-0.56 (0.83)	-7.97 (8.14)	<0.001
VFI	99.43 (0.85)	78.73 (25.51)	<b>0.003</b>
Disc area (mm <sup>2</sup> )	1.95 (0.44)	2.25 (0.48)	<b>0.027</b>
Cup extension (μm)	683.57 (312.00)	1235.07 (291.03)	<0.001
cRNFL (μm)	100.07 (7.19)	75.29 (18.41)	<0.001
cRNFL superior (μm)	142.75 (18.17)	100.10 (30.20)	<0.001
cRNFL inferior (μm)	121.68 (14.96)	86.24 (28.82)	<0.001
GCIPL inner (μm)	94.52 (8.78)	75.37 (15.65)	<0.001
GCIPL outer (μm)	62.88 (7.69)	54.07 (8.05)	<0.001
DF-BMO - mean (μm)	476.14 (124.70)	260.04 (106.06)	<0.001
DF-BMO - superior (μm)	436.14 (112.79)	248.33 (108.60)	<0.001
DF-BMO - inferior (μm)	532.31 (146.36)	274.54 (132.01)	<0.001

MD = mean deviation; VFI = visual field index; cRNFL = circumpapillary retinal nerve fiber layer; GCIPL = ganglion cell layer/inner plexiform layer; DF-BMO = descending fibers width at the Bruch's membrane opening. Inner and outer refer to the inner and outer circle of ETDRS grid (3mm and 6mm, respectively). Parameters are summarized by mean and standard deviation, unless stated otherwise. P-value is for the overall difference between groups. Statistically significant values appear in bold face.

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Table 1

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