The relevance of the neuroretinal rim (NRR) for early diagnostic of glaucoma is not a novel concept. In fact, we can all remember the ISNT mnemonic rule, which represented the distribution of sector thicknessess characteristic of a healthy NRR, for discriminating between normal papilla (rule intact) and suspect or glaucomatous papillae (rule infringed). This rule was not infallible because it was violated in nearly 30% of glaucoma cases, in addition to the fact that approximately 20% of healthy subjects exhibited distributions which departed from said rule.1 Gradually, with the introduction of optic coherence tomography (OCT), interest in NRR gave way to the peripapillary examination of the retina nervous fiber layer (RNFL).

Many of the mistakes committed when examining the NRR derived from identifying the external edges thereof with the limits of the disc that can be seen in the funduscopic examination, a clinically visible edge which not always coincided with the end of Bruch’s membrane (BM) and/or the scleral ring. Both structures constitutes the external limits of the NRR and are clinically and photographically invisible. OCT has allowed us to clearly identify the end of BM and therefore infer the thickness of the ring (the distance from said end to the internal limiting membrane). Initially, this calculation was made on the horizontal plane (BMO-HRW: Bruch’s Membrane Opening-Horizontal Ring Width), a parameter which is still used for calculating the edge area provided in the disk analysis given by OCT-Cirrus.

However, the variability in the pathway of nervous fibers in the neural channel and, in short, of the ring morphology, renders the BMO-HRW calculation imperfect. Recently, a more precise parameter has been described which is less influenced by individual diversity in calculating the minimum distance between BM and the internal limiting membrane. This new parameter, known as BMO-MRW (Minimum Rim Width) has been included in the new 6.0 software of OCT Spectralis for analyzing NRR thickness. This version also produces at the same time the RNFL thickness (Figs. 1 and 2).

When comparing the Bruch membrane opening (BMO) with the clinically visible edge it can be seen that, in general lines, both in normal and glaucoma subjects, BMO is narrower excepting at the inferotemporal level,2 leading to hyper-estimation of its thickness in clinical assessments (Fig. 1). The opposite occurs when BMO is wider, which is frequently the case in patients with myopia and gamma-type peripapillary atrophy (Fig. 3).

It has been published that ring analysis derived from the BMO-MRW parameter is 1.6 times more sensitive than its horizontal counterpart (BMO-HRW) and 1.2 times superior to

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Fig. 1 – papilla with suspected glaucoma and Beta-type peripapillary atrophy. OCT Spectralis 6.0: the sectorial classification utilized for analyzing RNFL and NRR thickness (MRW) is the same (Garway-Health), so they can be compared easily. In this case, RNFL thickness analysis was classified as normal, with NRR thickness analysis being clearly pathological. If we projected the edge of the visible disk (green dotted line) over the BM apertura image provided by OCT (red dotted line) it can be seen how said line is located inwardly so that the clinical calculation also overestimates NRR thickness.

Fig. 2 – oblique papilla in healthy subjects classified as pathological and borderline in the peripapillary RNFL analysis by OCT-Spectralis version 5.8 (A) and 6.0 (B), respectively. The BMO-MRW analysis classified it within normal limits.
conventional RNFL analysis. In addition, it features a high positive predictive value of 16, making it particularly attractive for early glaucoma diagnostics (Fig. 1) and, as could be expected, it provides a better structure/function correlation.\(^3\,5\)

An important drawback for RNFL peripapillary analysis is the high prevalence of false positives in the chromatic abnormality classification which, in Caucasian patients, could reach 40% with OCT-Cirrus, and somewhat lower with OCT-Spectralis.\(^6\) This lack of specificity increases in proportion to the myopia grade, with false positive rates rising up to 50% with moderate myopia.\(^7\) Other related factors include the presence of peripapillary atrophy, papillary inclinations and/or rotation, smaller disk size and larger fixation-disk angle.\(^6\,7\)

In a preliminary study, the authors were able to demonstrate that the majority of patients (86%) with oblique papillae classified as anomalous in the peripapillary RNFL examination carried out with OCT-SD were classified as normal in the MRW NRR analysis (Fig. 2).

Accordingly, it can be concluded that NRR examination utilizing the new MRW parameter is more sensitive and specific than its predecessors and that, accordingly, it could play a crucial role in the early diagnostic of patients with glaucoma. In addition, it appears to be less sensitive to disc size or morphology and therefore, even without eliminating completely the appearance of false positives, it substantially reduces the rate thereof.

However, without taking into account the as yet limited experience with this new exploration, a possible drawback is that both the recording and analysis take up more time, which for the time being could limit its routine use in clinical practice.

References