

Comparison of Heidelberg Spectralis OCT with Disc-Macula Distance to Disc Diameter Ratio in Diagnosing Optic Nerve Hypoplasia

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PURPOSE

Congenital optic nerve hypoplasia (CONH) is the most common congenital optic nerve disorder and is among the three leading causes of blindness in children. Diagnosis of CONH can be challenging in children or uncooperative individuals. The purpose of this study was to evaluate whether Heidelberg Spectralis OCT is a valid test for diagnosing congenital optic nerve hypoplasia (CONH) compared to disc-macula distance to disc diameter (DM:DD) ratio.

METHODS

A total of 48 participants (24 normal and 24 with CONH) aged from 9-80 years were recruited. All participants underwent comprehensive eye examinations, fundus photography and Spectralis OCT. Normal participants were age matched with participants having CONH in four age categories (0 - <9 years, 9 - <18 years, 18 - <40 years, 40 years and up). Asymmetric optic disc size and DM:DD ratio were noted in the cases of bilateral CONH; thus, both eyes were used for data analysis in the bilateral CONH cases, resulting in 37 eyes with CONH. Only the right eyes of control participants were used for data analysis. DM:DD ratios were determined from fundus photographs by one of the authors who was masked to the diagnosis of CONH. Receiver operating characteristic (ROC) curves for DM:DD ratio and Spectralis OCT Bruch's membrane opening (BMO) area were constructed. The Mann-Whitney test was performed to compare DM:DD ratio in normal eyes versus those with CONH. Paired t-test was used to compare BMO area in normal eyes versus those with CONH.

FIGURE 1

Unadjusted receiver operating characteristic (ROC) curve analysis for DM:DD ratio. The unadjusted area under the curve (AUC) for DM:DD ratio is 0.66 (95% confidence interval: 0.54-0.77). The optimal cutoff value for DM:DD ratio is 3.00; at this point, sensitivity is 58% and specificity is 61%.

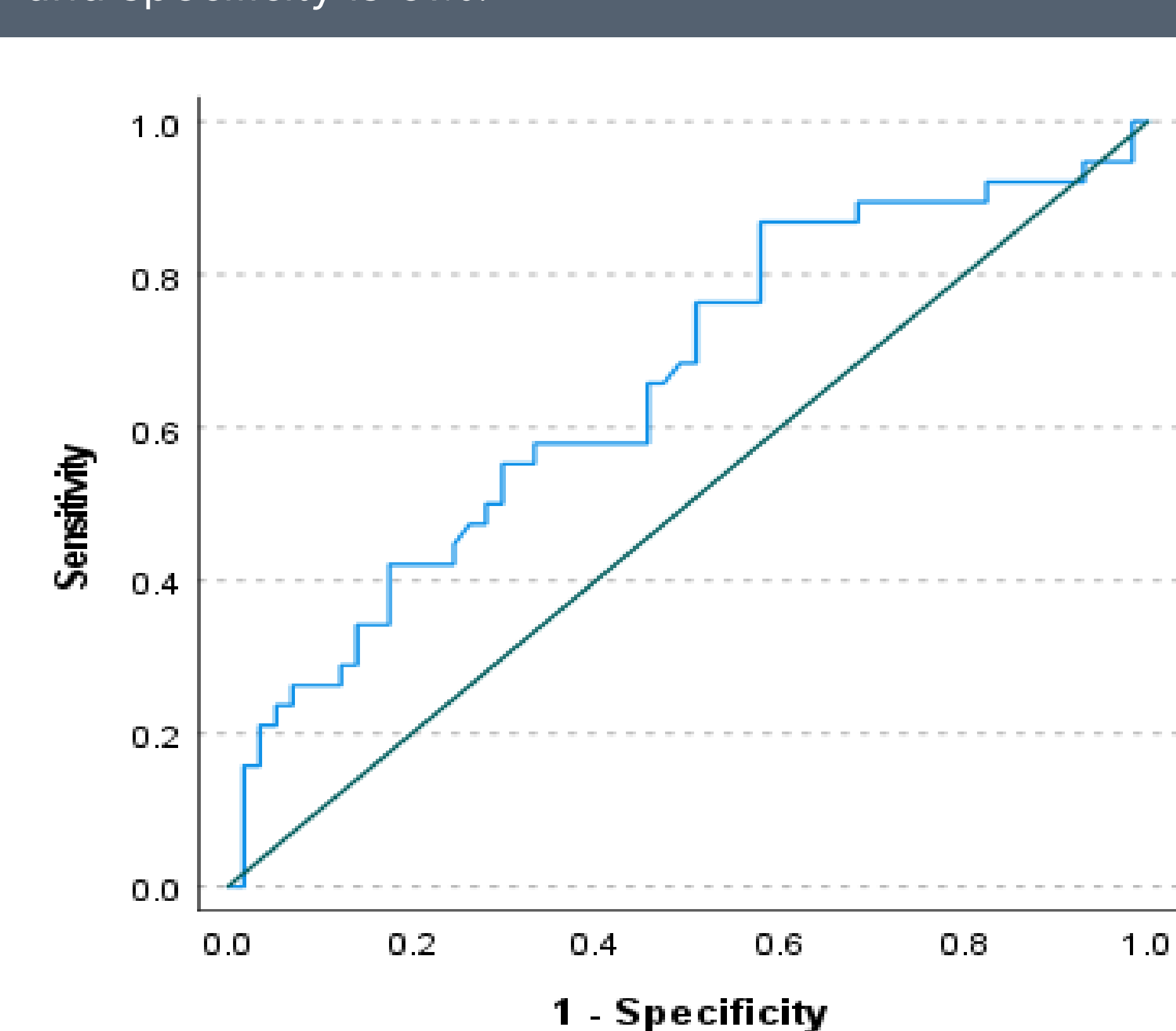


FIGURE 2

Unadjusted receiver operating characteristic (ROC) curve analysis for Spectralis OCT BMO area. The unadjusted area under the curve (AUC) for OCT BMO area is 0.36 (95% confidence interval: 0.23-0.48).

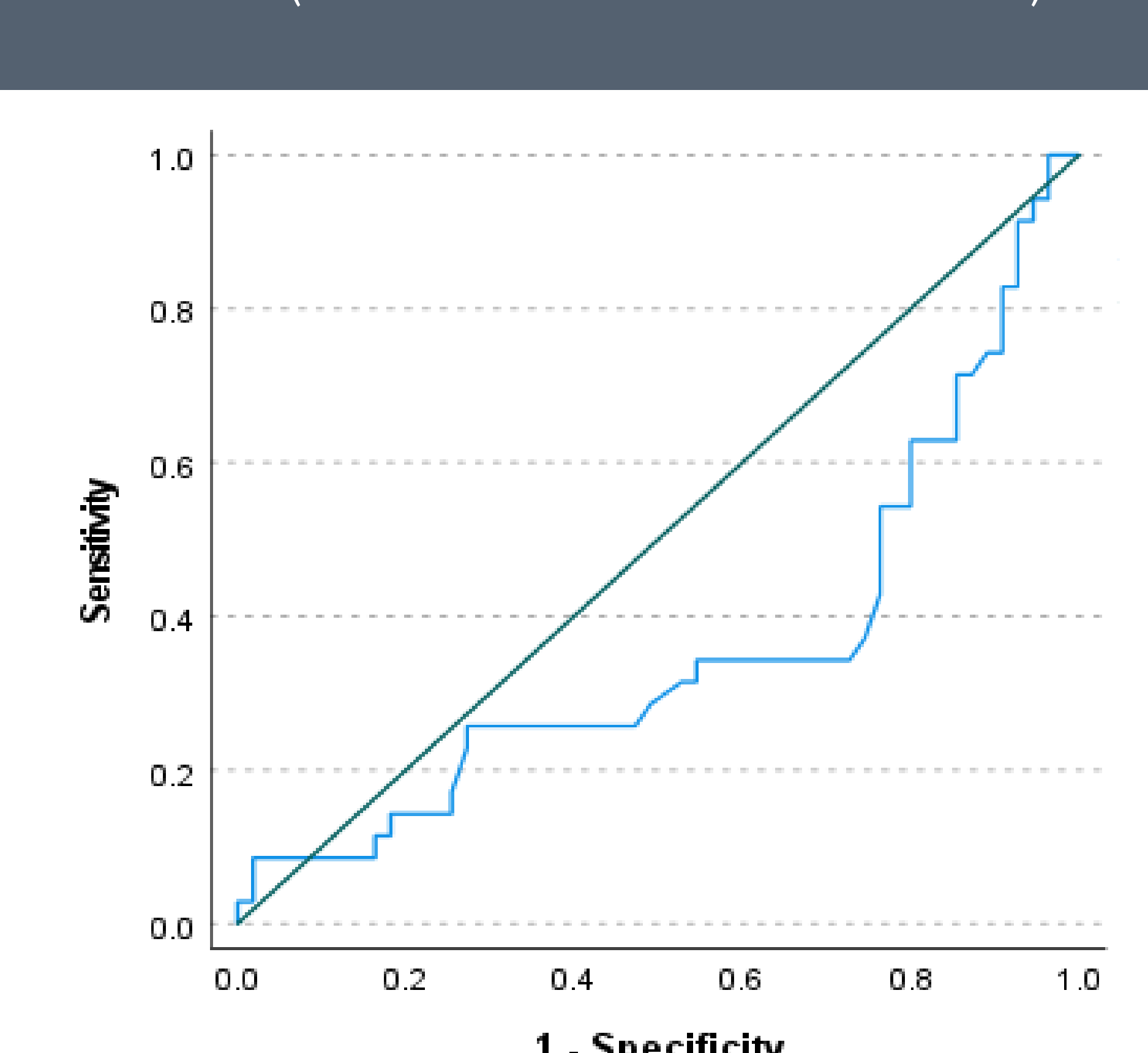


FIGURE 3

Fundus photos and Spectralis OCT of Participant # 10. 64-year-old Black female. BCVA: OD 20/20, OS 20/20, DM:DD ratios were 4.46 OD, 5.38 OS. BMO area was 1.68 OD, 1.07 OS. Manifest refraction was -2.25-4.75 x 105 OD, -2.50-4.75 x 80 OS

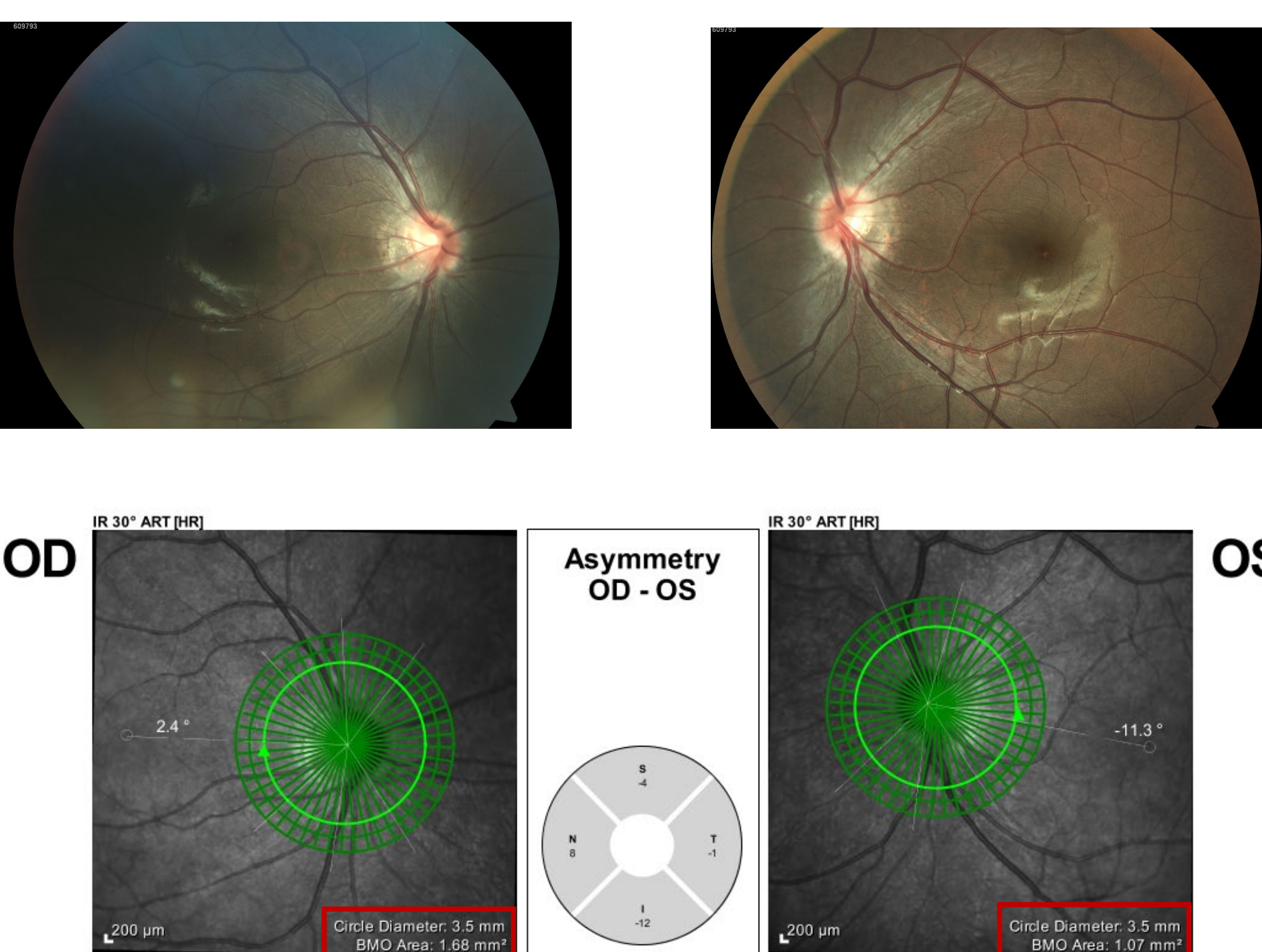
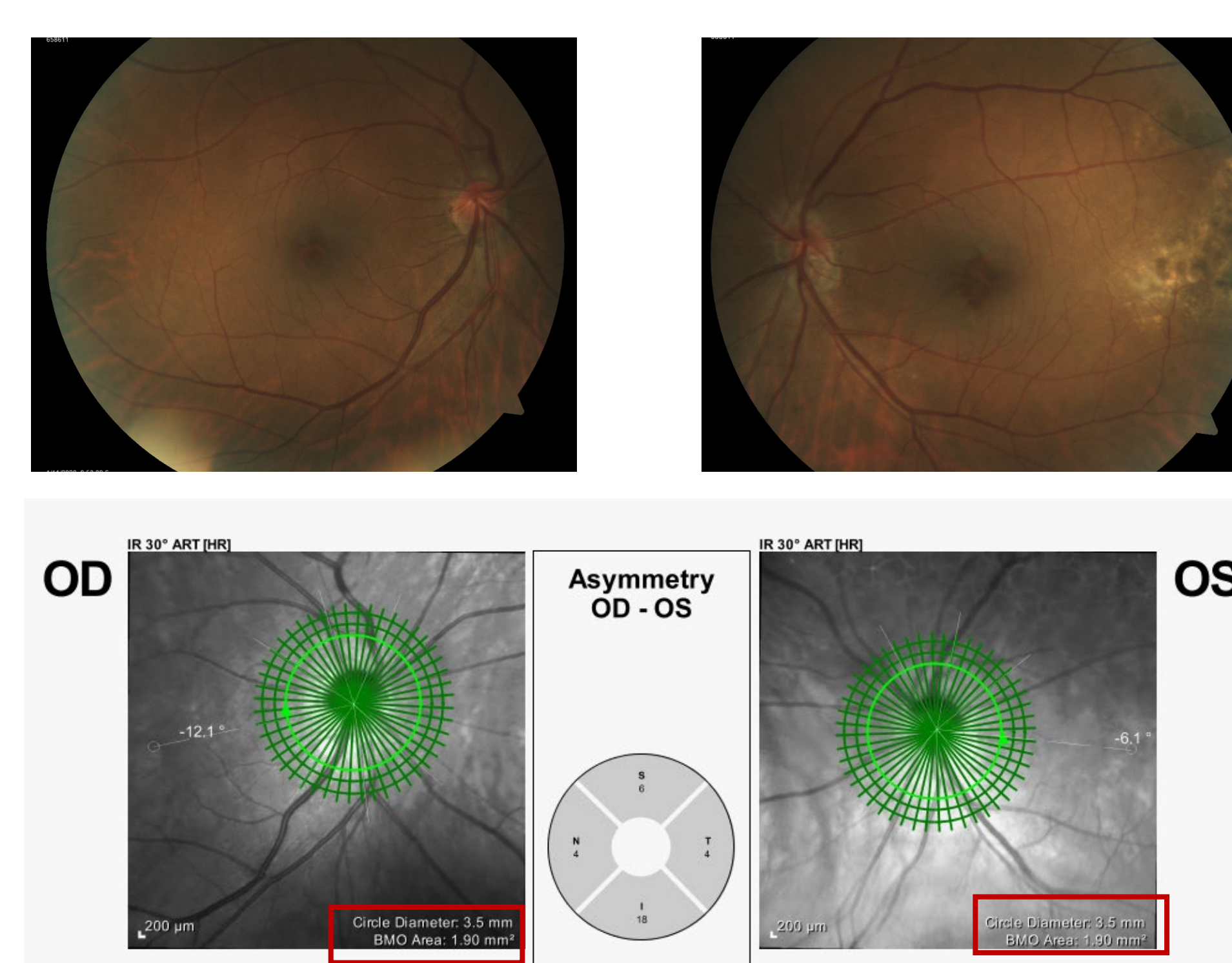


FIGURE 4

Fundus photos and Spectralis OCT of Participant # 39. 57-year-old Caucasian female. BCVA: OD 20/20, OS 20/20, DM:DD ratios were 4.24 OD, 4.3 OS. BMO area was 1.90 OD, 1.90 OS. Manifest refraction was +3.00-4.75 x 100 OD, -4.25-1.75 x 80 OS



RESULTS

Table 1 shows the demographic characteristics of our participants. Mean (\pm SD) DM:DD ratio was 3.11 (\pm 1.13) for the normal eyes and 3.52 (\pm 1.05) for the eyes with CONH, with a statistically significant difference ($P = 0.01$). BMO area by Spectralis OCT was 1.88 (\pm 0.46) mm² for the normal eyes and 1.72 (\pm 0.50) mm² for the eyes with CONH, without a statistically significant difference ($P=0.85$). The area under the curve (AUC) of the ROC curve for DM:DD ratio was 0.66 (95% confidence interval: 0.54-0.77), shown in Figure 1. The AUC for BMO area by Spectralis OCT was 0.36 (95% confidence interval: 0.23-0.48) (Figure 2). A statistically significant difference was found between AUC for Spectralis OCT BMO area and that for DM:DD ratio ($P<0.001$).

CONCLUSIONS

- The DM:DD ratio is a valid test to aid in diagnosis of CONH.
- BMO area by Spectralis OCT is not helpful in diagnosing CONH. Caution is needed when interpreting BMO area in individuals with CONH.

TABLE 1
Characteristics of CONH and Control Participants

	CONH Participants (%) (n = 24)	Control Participants (%) (n = 24)	P value
Gender			0.64
Female	14 (58.3)	13 (54.2)	
Male	10 (41.7)	11 (45.8)	
Race/Ethnicity			0.46*
Black	20 (83.3)	17 (70.8)	
Hispanic White	1 (4.2)	1 (4.2)	
Non-Hispanic White	3 (12.5)	6 (25.0)	
Age (years)			0.07
Range	9.6-80.1	12.6-70.0	
Mean (SD)	44.0 (21.4)	35.5 (18.7)	

*Due to the small number of CONH subjects, p-value indicates probability of black race vs. non-black race differing in the two groups.

CONTACT

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