Correlation between retinal sensitivity assessed by microperimetry and OCT findings after epiretinal membrane surgery

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Purpose:

To verify the correlation between retinal sensitivity (RS) assessed by microperimetry (MP3, Nidek) and optical coherence tomography (swept-source OCT, Topcon) parameters in eyes submitted to the epiretinal membrane (ERM) and peeling of internal limiting membrane (ILM) surgery.
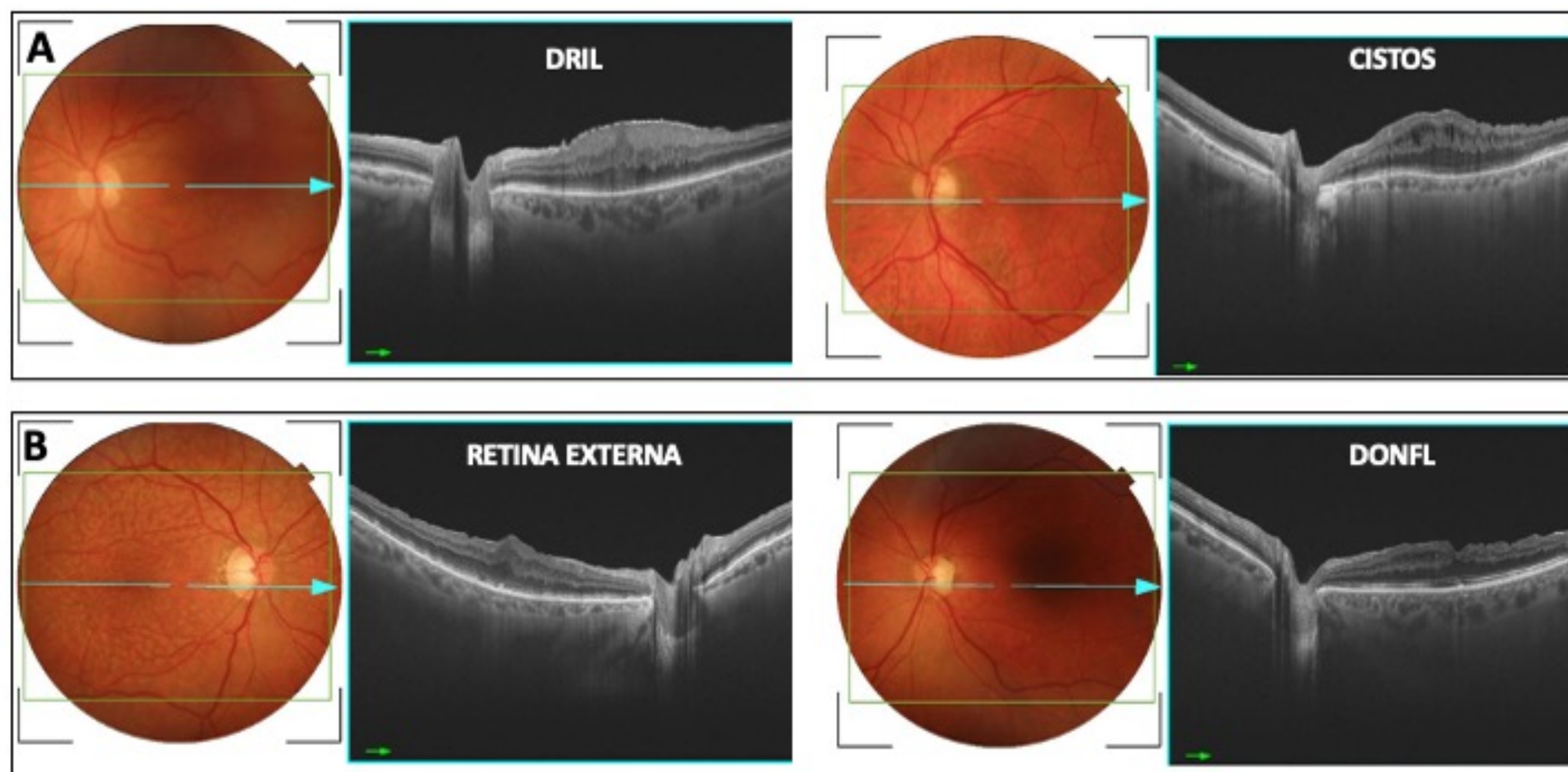
Methods:

Thirty eyes underwent pars plana posterior vitrectomy for ERM treatment. Best-corrected visual acuity (BCVA) and 3D volumetric OCT imaging were preoperatively acquired.

Six months after the surgery, BCVA, OCT imaging, and RS were assessed.

Methods:

- Analyzed OCT parameters included: the total macular and the ganglion cell layer complex (GCC) thickness.
- Cysts, disorganization of retinal inner layers (DRIL), changes of the outer retina and presence of dissociated optic nerve fiber layer were assessed (Figure 1).

- MP3 parameters tested were 44 points covering 20 central degrees, with direct correspondence with the 9 sectors of ETDRS map (Figure 2).

Figure 1: On the left, fundus color fundus photograph. On the right, high-resolution B-scans passing through the center of the fovea. A-DRIL; B- changes of outer retina ; C- cysts; D- DONFL.

Figure 2 - A: Example of an MP3 scan of the right eye of a patient with ERM with 44 points by MP3 covering the central 10 degrees in direct correspondence with the 6 mm diameter OCT-ETDRS map centered on the fovea. B: Note the distribution of the 44 points tested. Each point tested presents the value of the retinal sensitivity measured in dB in a direct correspondece with the OCT-ETDRS map (in microns).

Results:

RS parameters were significantly lower in patients(table 1).

The total macular thickness measurements were thicker than controls preoperatively and significantly reduced postoperatively.

Preoperative GCC measurements were higher than controls, showing a significant reduction postoperatively and were significantly lower when compared to controls.

Eyes with lower RS in the fovea were correlated with the preexisting DRIL. Lower MP3 RS values were associated with DRIL, outer retinal changes, and cysts after surgery(table 2).

Table 1: Postoperative microperimetry (MP3) retinal sensitivity measurements mean values in ETDRS map 9 sectors and mean sensitivity with the respective values of the areas under the ROC curve.

Retinal sensitivity (MP3)	Patients (n= 30)	Controls (n= 30)	p-value	AUC
Fovea (µm)	22.3±4.2	27.1±3.0	<0.001*	0.83 (0.73–0.93)
Temporal inner (µm)	24.7±3.3	27.5± 1.6	<0.001*	0.81 (0.70–0.92)
Superior inner (µm)	24.6±3.3	26.5±1.8	0.01*	0.73 (0.60–0.85)
Nasal inner (µm)	24.7±2.9	26.8±2.1	0.003*	0.72 (0.59–0.85)
Temporal outer(µm)	21.5±6.6	26.6±1.9	<0.001*	0.83 (0.73–0.93)
Superior outer(µm)	22.5±4.5	25.8±2.1	0.001*	0.77 (0.66–0.89)
Nasal outer(µm)	24.1±3.8	25.8±1.9	0.03*	0.65 (0.51–0.79)
Inferior outer(µm)	22.4± 5.4	25.1±2.1	0.01*	0.66 (0.52–0.79)
Mean sensitivity	22.3±3.5	26.3±1.7	<0.001*	0.82 (0.72–0.92)

MP3: microperimetry, AUC: areas under the ROC curve,

Table 2: Mean ± standard deviation of postoperative microperimetry retinal sensitivity and its correlation with pre and postoperative OCT findings.

	Postoperative Microperimetry (dB)			
	Fovea	p-value	Mean values	p-value
Preoperative DRIL				
Yes	19.1±3.1	0.001*	21.9±2.5	0.15
No	23.5±2.9		23.7±3.3	
Postoperative DRIL				
Yes	18.5±3.9	0.03*	21.6±3.2	0.27
No	22.6±3.2		23.3±3.0	
Outer retina changes				
Yes	19.1±3.1	0.04*	21.6±1.7	0.20
No	22.6±3.5		23.4±3.3	
Intraretinal cysts				
Yes	19.0±3.1	0.001*	21.7±2.3	0.08
No	23.6±2.9		23.9±3.3	
DONFL				
Yes	21.4±3.7	0.24	22.9±3.3	0.62
No	24.2±3.0		23.8±1.1	

DRIL: disorganization of retinal inner layers. DONFL: dissociated optic nerve fiber layer.

Conclusions:

Macular thickness measurements remains thicker after ERM surgery.

GCC thickness was significantly reduced after surgery, suggesting an atrophy of this layer.

Despite the great visual improvements, the RS parameters were significantly lower.

DRIL, outer retinal changes, and cysts were poor prognostic factors for visual function recovery after ERM surgery.