Spectral-domain optical coherence tomography features in cases of pre-eclampsia and the relationship with systemic parameters

Pre-eclampsia is a multisystem progressive disorder characterized by the new onset of hypertension and proteinuria or end-organ dysfunction in the last half of pregnancy.[1] The prevalence of retinal involvement may vary according to the severity of pre-eclampsia.[2] The correlation between systemic features and retinal morbidity in pre-eclamptic women is still controversial.[2–5] To the best of our knowledge, there is lack of data regarding the correlation between other systemic features and retinal morbidity.

We retrospectively reviewed 10 visually symptomatic pre-eclamptic women who underwent complete ophthalmic examination and were found to have an abnormal spectral-

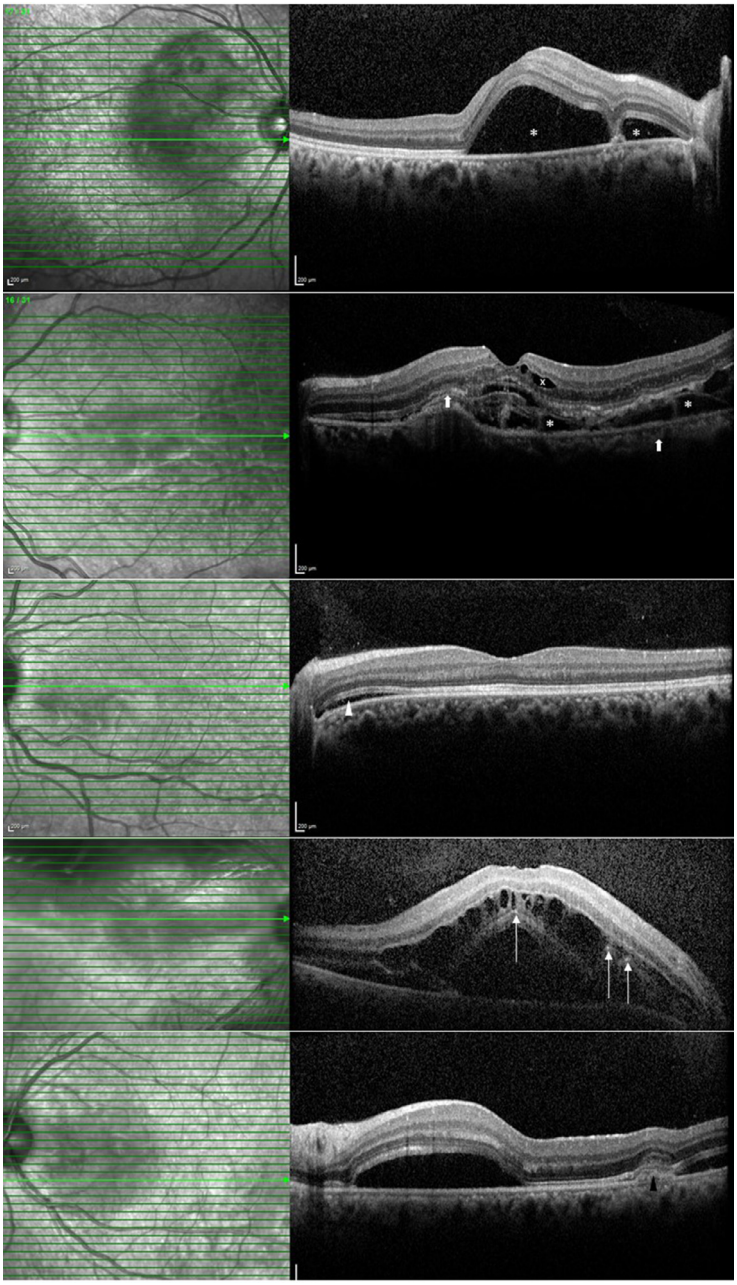

Fig. 1—Spectral-domain optical coherence tomography findings in pre-eclamptic women. First row: subretinal fluid (*). Second row: subretinal fluid (*), disruption of ellipsoid zone (arrow), and intraretinal fluid (x). Third row: peripapillary subretinal fluid (white arrowhead). Fourth row: intraretinal hyper-reflective dots (long arrow) within subretinal fluid. Last row: Elschnig spot (black arrowhead).

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Table 1—Baseline characteristics and laboratory findings (n = 10).

Variable	Range value	(mean ± SD)
Patients age, years	20–36	26.1 ± 0.6
Gestational age, days	207–254	235 ± 20.3
Delivery age, days	221–281	253.7 ± 31.6
Birth weight, g	1250–2800	2155.9 ± 609.03
Diastolic blood pressure, mm Hg	76–149	101.2 ± 25.5
Systolic blood pressure, mm Hg	127–224	163.2 ± 33.4
Urine protein, g	1–4.1	2.3 ± 1.2
Hemoglobin, g/dL	7.8–13.3	10.4 ± 1.6
Platelets, μL	58–338	152.7 ± 88.6
Creatinine, mg/dL	0.45–1.02	0.75 ± 0.17

domain optical coherence tomography (SD-OCT) finding between 2012 and 2017. Pre-eclampsia was diagnosed by The American College of Obstetricians and Gynecologists criteria. One patient developed HELLP syndrome.

All 10 women underwent a complete ophthalmoscopic examination, including best-corrected visual acuity (BCVA), slit-lamp biomicroscopy, and Spectralis OCT (Heidelberg Engineering, Heidelberg, Germany). Features on SD-OCT evaluated included central subfield thickness (CST, defined as the average thickness of the macula in the central 1 mm Early Treatment Diabetic Retinopathy Study (ETDRS) grid), presence of subretinal (SRF)/intraretinal fluid (IRF), ellipsoid zone (EZ) integrity at the fovea (normal/abnormal), presence of EZ irregularities[3] (EZ band without smooth appearance), peripapillary subretinal fluid, Elschnig spots (focal elevations of a thick highly reflective band of retinal pigment epithelium on SD-OCT),[3] and intraretinal hyper-reflective dots within SRF Figure 1.[6] Systemic parameters were also evaluated, including age, gestational age, diastolic and systolic blood pressures, presence of proteinuria, platelets count, and liver function (aspartate transaminase/alanine transaminase [AST/ALT]). The study adhered to the tenets of the Declaration of Helsinki and was approved by the local ethics committee. No informed consent was needed.

Twenty eyes of 10 pre-eclamptic women were included in the study. Baseline characteristics and laboratory findings are presented in Table 1. At presentation, the mean ± SD BCVA was 0.6 ± 0.15 logMAR (20/80 Snellen equivalent). SD-OCT showed bilateral eye involvement in 100% of the women in an asymmetrical pattern. Peripapillary subretinal fluid was seen in 80% of the women in our study, 60% have shown abnormal EZ integrity at the fovea, and up to 40% had intraretinal hyper-reflective dots. Table 2 shows Spearman correlation test between other SD-OCT features to systemic and laboratory findings. We found negative correlation between mean diastolic and systolic blood pressure and the level of proteinuria to EZ integrity at fovea (i.e., the higher the blood pressure and proteinuria level, the more likely of identifying EZ abnormalities). Strong positive correlation was also noticed between the amount of intraretinal fluid to the rise of AST/ALT and platelets level, respectively. After correction for multiple tests, in exception of the correlation between AST/ALT and IRF, none of the above remained statistically significant.

In conclusion, a moderate positive correlation was found between the elevation of AST/ALT and the amount of intraretinal fluid. Elevated liver enzymes may provide a biomarker indicating a greater risk for retinal complications such as intraretinal fluid and may indicate a need for retinal examination in patients with pre-eclampsia.

Zvi Gur, MD,* Ortal Buhbut, MD,* Xavier Fagan, MD,† Gal Tsaban, MD, PhD,‡ Jaime Levy, MD§

*Department of Ophthalmology, Soroka University Medical Center, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel; †Medical Retina Unit, Royal Victorian Eye and Ear Hospital, Melbourne, Australia; ‡Department of Internal Medicine, Soroka University Medical Center, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel; §Department of Ophthalmology, Hadassah University Medical Center, Faculty of Medicine, Hebrew University, Jerusalem, Israel.

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Correspondence to Jaime Levy, MD, Department of Ophthalmology, Hadassah University Medical Center, Faculty of Medicine, Hebrew University, Jerusalem, Israel; levjaime@gmail.com.

Table 2—Spearman correlation between spectral-domain optical coherence tomography features and other clinical and systemic parameters (n = 10)

SD-OCT features	Diastolic BP	Systolic BP	Urine protein	Hemoglobin	Creatinine	Elevated AST/ALT	Platelets
Central subfoveal thickness	−0.55 ($p = 0.89$)	−0.42 ($p = 0.23$)	−0.20 ($p = 0.59$)	−0.59 ($p = 0.09$)	−0.32 ($p = 0.35$)	0.14 ($p = 0.69$)	−0.55 ($p = 0.123$)
Subretinal fluid	0.26 ($p = 0.43$)	0.41 ($p = 0.20$)	0.50 ($p = 0.14$)	0.61 ($p = 0.06$)	0.33 ($p = 0.31$)	0.04 ($p = 0.9$)	0.69 ($p = 0.25$)
Intraretinal fluid	−0.48 ($p = 0.13$)	−0.48 ($p = 0.13$)	−0.18 ($p = 0.60$)	−0.57 ($p = 0.55$)	0.15 ($p = 0.60$)	0.82 ($p = 0.002$)*	−0.85 ($p = 0.02$)
Peripapillary subretinal fluid	0.98 ($p = 0.77$)	−0.97 ($p = 0.77$)	0.15 ($p = 0.66$)	0.33 ($p = 0.34$)	−0.51 ($p = 0.10$)	−0.26 ($p = 0.43$)	0.26 ($p = 0.45$)
RPE elevations	−0.22 ($p = 0.50$)	−0.39 ($p = 0.23$)	0.13 ($p = 0.70$)	0.33 ($p = 0.39$)	−0.647 ($p = 0.3$)	0.14 ($p = 0.66$)	0.30 ($p = 0.99$)
Intraretinal hyper-reflective dots	0.33 ($p = 0.31$)	0.32 ($p = 0.30$)	0.48 ($p = 0.15$)	−0.10 ($p = 0.79$)	−0.24 ($p = 0.48$)	0.069 ($p = 0.80$)	0.16 ($p = 0.76$)
Elschnig spots	−0.22 ($p = 0.5$)	−0.38 ($p = 0.91$)	−0.36 ($p = 0.29$)	−0.17 ($p = 0.62$)	0.75 ($p = 0.82$)	−0.43 ($p = 0.18$)	0.17 ($p = 0.62$)
EZ irregularity	0.05 ($p = 0.88$)	0.12 ($p = 0.70$)	0.30 ($p = 0.30$)	0.51− ($p = 0.12$)	−0.16 ($p = 0.62$)	0.32 ($p = 0.23$)	−0.14 ($p = 0.71$)
EZ integrity at fovea	−0.72 ($p = 0.01$)	−0.79 ($p = 0.03$)	0.64− ($p = 0.04$)	0.50 ($p = 0.14$)	0.34 ($p = 0.33$)	0.34 ($p = 0.3$)	0.34 ($p = 0.35$)

BP, blood pressure; AST/ALT, aspartate transaminase/alanine transaminase; EZ, ellipsoid zone; RPE, retinal pigment epithelium; SD-OCT, spectral-domain optical coherence tomography.
*Statistically significant.

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Footnotes and Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this article.