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CASE REPORT

Hypertensive choroidopathy with eclampsia viewed on spectral-domain optical coherence tomography

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Abstract
Purpose We report a case of hypertensive choroidopathy with detailed retinal images obtained using spectral-domain optical coherence tomography (SD-OCT).
Case A 19-year-old pregnant woman with no history of high blood pressure had an eclamptic seizure at the 39th week of pregnancy; the baby was delivered by emergency Caesarean section. Six days later, she presented with bilateral blurred vision (best-corrected visual acuity [VA], 0.5, right eye; 0.3, left eye). Bilateral extensive, punctate, pale-yellow Elschnig's spots were present in the posterior fundus. SD-OCT showed a serous retinal detachment (SRD) and retinal pigment epithelium detachment (PED) representing a waveform retinal pigment epithelium (RPE) layer in each eye. The reflective intensity decreased partly at the waveform RPE. A wavy structure suggestive of fibrin was present in both foveas between the photoreceptor ellipsoid zone and the RPE-outer segment line. Four weeks after delivery and oral antihypertensive treatment, the SRDs, PEDs and wavy structure resolved and the VA recovered.
Conclusion SD-OCT visualized SRDs, PEDs, wavy structures under the photoreceptor ellipsoid zone, and areas of low intensity RPE layer in hypertensive choroidopathy.

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Introduction

Eclampsia is a manifestation of vasogenic edema in the central nervous system resulting from pregnancy-induced hypertension [1, 2]. Hypertensive choroidopathy is a manifestation of vasogenic edema in the choroid and has been reported in association with malignant hypertension, renal disease, pheochromocytoma, and pregnancy-induced hypertension [3, 4]. Endothelial damage of the choroidal vasculature can lead to fibrinoid necrosis of the choroidal arterioles with choriocapillary occlusion. Non-perfusion of the choriocapillaris causes necrosis of the overlying retinal pigment epithelium (RPE), implying breakdown of the outer blood–retinal barrier. RPE detachments (pigment epithelial detachments [PED]) and serous retinal detachments (SRDs) can develop [4–6].

Although some optical coherence tomography (OCT) images have shown hypertensive choroidopathy [7, 8], few reports have shown the detailed retinal images obtained using spectral-domain OCT (SD-OCT). We report hypertensive choroidopathy with an intraretinal split and partially decreased reflective intensity of the RPE on SD-OCT images.

Case report

A 19-year-old pregnant woman with no history of hypertension, diabetes mellitus, ocular disease, or other vascular diseases developed high blood pressure (BP) and had an eclamptic seizure at the 39th week of pregnancy; the baby was delivered by emergency Caesarean section. Magnetic resonance imaging showed cerebral edema resulting from high BP, which was treated with intravenous glycerin and 20 mg/day of oral nifedipine. Two days after delivery, the patient regained consciousness and reported bilateral blurred vision; 6 days after delivery, she was referred to us. The best-corrected visual acuity (BCVA) was 0.5 in the right eye and

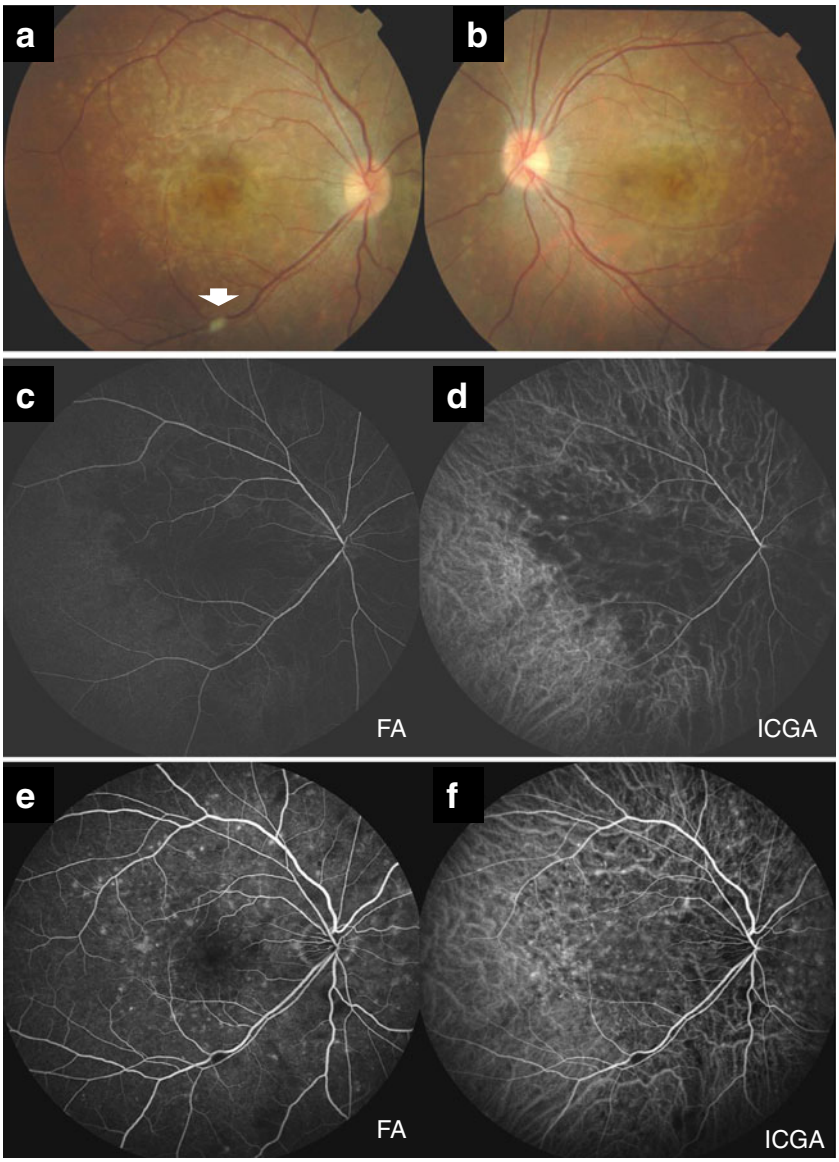

Fig. 1 **a**, **b** Color fundus photographs of both eyes at the first visit show numerous bilateral punctate, pale-yellow Elschnig's spots in the posterior fundus; a soft exudate spot is seen in the right eye (arrow). **c** An early-phase FA image and **d** an ICGA image of the right eye. **e** Middle-phase FA and **f** ICGA images. FA and ICGA show a filling defect of the choroid in the early phase and numerous hyperfluorescent and hypofluorescent spots in the middle phase associated with Elschnig's spots. Most hyperfluorescent spots in the middle phase seen on FA correspond to hypofluorescence on the ICGA images

0.3 in the left eye. The anterior chambers were clear without cells. Bilateral extensive, punctate, pale-yellow Elschnig's spots in the posterior fundus (Fig. 1a, b) and a soft exudate in the right eye (Fig. 1a) were seen. Early-phase fluorescein angiography (FA) and indocyanine green angiography (ICGA) images showed filling delay in the choroid at the posterior fundus, indicating choriocapillary occlusion (Fig. 1c, d) and numerous hyperfluorescent spots in the middle to late phase (Fig. 1e, f). SD-OCT (Spectralis Heidelberg Retina Autograph+OCT, Heidelberg Engineering, Heidelberg, Germany) showed a SRD and multiple PEDs (Fig. 2a) in both eyes. The RPE layer represented a waveform for multiple PEDs; the RPE was swollen in this area and the reflective intensity was partly decreased. The reflective intensity of Bruch's membrane also was partly decreased.

A wavy structure was seen at the fovea in each eye between the ellipsoid zone and RPE-outer segment (PRE-OS) line (Fig. 2b). Eight days after delivery, the SRDs and the PEDs decreased in height, and the BCVA improved to 0.8 bilaterally. The wavy structure remained almost unchanged (Fig. 2c). Four weeks later, despite an unclear photoreceptor ellipsoid zone in some areas, the SRDs, PEDs, and the wavy structure resolved bilaterally (Fig. 2d). The reflective intensity of the RPE appeared to be almost recovered. The deep pale-yellow Elschnig's spots resolved bilaterally in both fundi, and the BCVA improved to 1.2 and 0.9 in the right and left eyes, respectively.

Discussion

The RPE changes in the area of choriocapillary occlusion represent Elschnig's spots [4, 6, 9], which were seen as dark areas on the early-phase FA and ICGA images. In those areas,

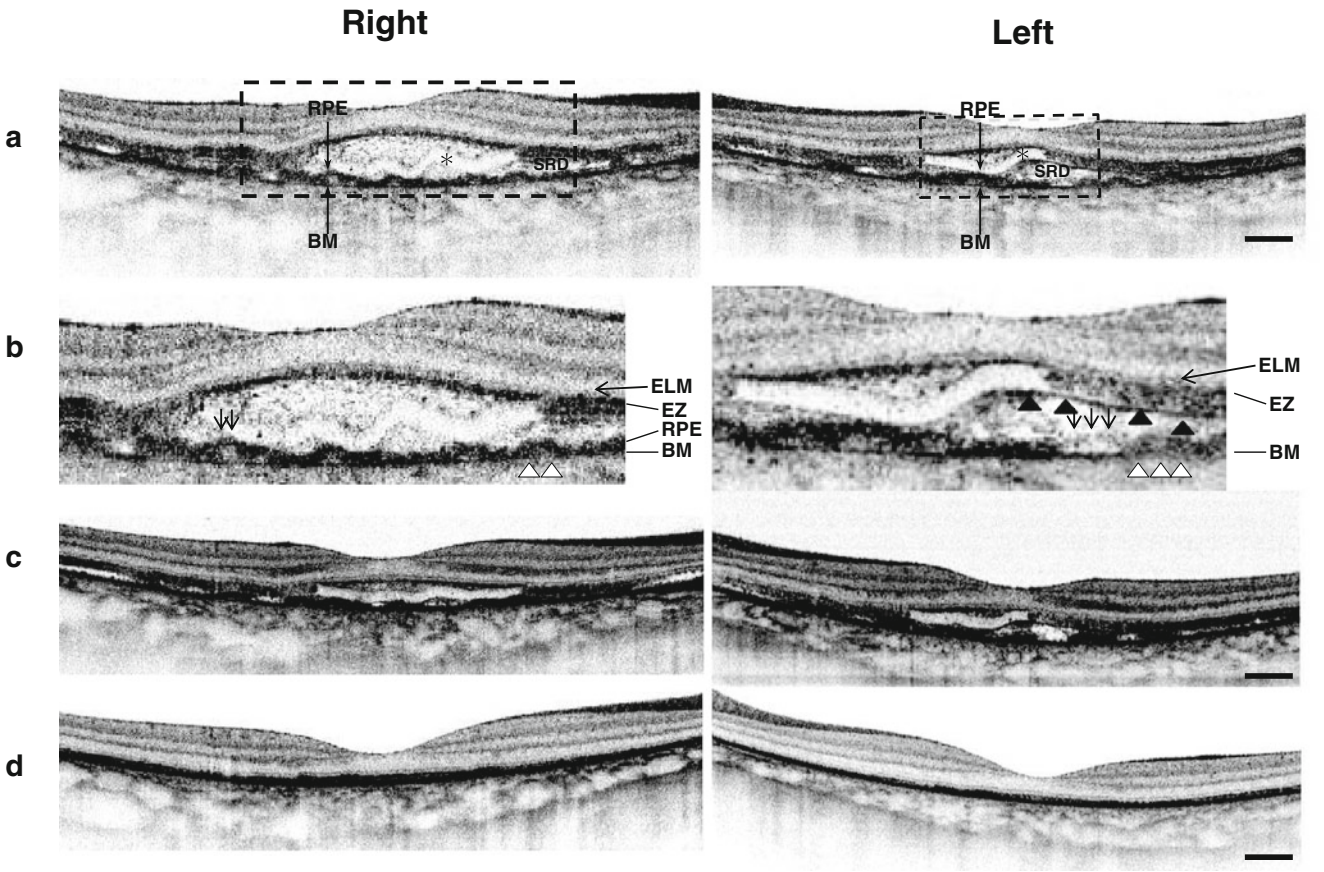

Fig. 2 Horizontal cross-sectional SD-OCT images of both eyes. **a** At the first visit, 6 days after delivery, SRDs and multiple RPE detachments (PEDs), seen as a separation of Bruch's membrane and the RPE are seen. A wavy solid structure (*) is also seen at the fovea in each eye. **b** A magnified view of the area is outlined by dashed lines in Fig. 2a. Black arrowheads indicate the RPE-OS. The wavy structure in each eye is between the photoreceptor ellipsoid zone and the RPE-OS. The reflective intensity of the RPE layer is partly decreased (arrows), as is that of Bruch's membrane (white arrowheads). **c** Eight days after delivery, the SRDs and PEDs have decreased in height, but the size of the solid structure is almost unchanged. **d** Four weeks after delivery, the SRD, PEDs, and the solid structure have resolved bilaterally. The low-intensity RPE line is unclear. BM Bruch's membrane, ELM external limited membrane, EZ photoreceptor ellipsoid zone; bar = 250 μm; right: right eye; left: left eye

numerous hyperfluorescent spots also were seen in the middle to late phase of the FA and ICGA images. The hyperfluorescent spots in the ICGA images represent staining and leaking of fluorescence from the choroidal vessels and must indicate damage in the choroidal vessels. The hyperfluorescent spots on the FA images reflect breakdown of the outer blood-retinal barrier, which causes SRDs and PEDs, and those spots appeared as hypofluorescence on the ICGA images representing blockage.

Hirano et al. [7] and Ugarte et al. [8] had previously published OCT images of hypertensive choroidopathy that visualized SRDs and PEDs. In the current case, we saw the SRD and PEDs and the detailed changes in the RPE layer and Bruch's membrane on the SD-OCT images. The waveform RPE layer, which formed as a result of multiple PEDs, was swollen, and its reflective intensity partly decreased, as did that of Bruch's membrane. We speculated that the low-intensity area of the RPE layer and Bruch's membrane might indicate degeneration of the RPE and Bruch's membrane, which was reported as the pathologies seen in experimental hypertensive choroidopathy [5]. These changes must have resulted from underlying choroidal circulatory failure seen as a filling delay on the early-phase FA and ICGA images. The low-intensity RPE line resolved and the SRDs and PEDs resolved in 4 weeks. No special treatment was needed except delivery of the infant and BP control.

A wavy structure also was seen between the ellipsoid zone and the RPE-OS line that resolved in 4 weeks. The wavy structure, possibly fibrin, may be precipitated in the fluid space within the outer photoreceptor layer. Intraretinal splits in the outer photoreceptor layer also were reported in Vogt–Koyanagi–Harada disease (VKH) in SD-OCT images [10]. VKH and hypertensive choroidopathy are similar in that both are characterized by breakdown of the outer blood-retinal barrier. Although the optical findings resembled VKH in the current case, persistent large and small dark dots and dark

patches were not seen in the midperiphery on ICGA, and the systemic status indicated hypertensive choroidopathy.

In conclusion, SD-OCT delineated SRDs, PEDs, fibrin-like wavy structures under the photoreceptor ellipsoid zone, and a swollen RPE layer in hypertensive choroidopathy.

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Conflict of Interest The authors have no financial interest in any aspect of this report.

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