

Restoration of outer segments of foveal photoreceptors after resolution of malignant hypertensive retinopathy

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Dear Sir,

I am Dr. Xiao-Qiang Liu, from the Department of Ophthalmology, Shanghai Tenth People's Hospital, Tongji University School of Medicine, Shanghai, China. I write to report a case of malignant hypertensive retinopathy demonstrated by spectral domain optical coherence tomography (SD-OCT).

Malignant hypertension is defined as the most severe type of hypertension demonstrated by a sudden increase in blood pressure to very high levels (often over 180/120mmHg). It can cause damage to the small blood vessels in the eye and result in hypertensive retinopathy characterized by retinal arteriolar narrowing, retinal flame-shaped hemorrhages, and/or exudates or cotton wood spots, with or without papilloedema, retinal vein or artery occlusion, and optic nerve head swelling. Macular edema and exudative neurosensory detachments may develop as well^[1-3]. Herein, we report a case of malignant hypertensive retinopathy demonstrated by spectral domain optical coherence tomography (SD-OCT).

A 24-year-old man presented in ophthalmology department with an acute vision loss in both eyes. He denied any history of systemic or ocular disease other than refractive error. On examination, his best-corrected visual acuity (BCVA) was found to be reduced to 20/200 in both eyes. Anterior segment biomicroscopy, pupillary examination, and tonometry were unremarkable bilaterally. Ophthalmoscopy

revealed bilateral mild optic disc edema, arteriolar narrowing, flame-shaped retinal hemorrhages, numerous cotton-wool exudates and serous retinal detachment of the macula (Figures 1A,B). SD-OCT (Cirrus, Carl Zeiss Meditec, Dublin, CA, USA) demonstrated bilateral macular edema and foveal serous neurosensory detachment (Figures 1C,D). Also of note is the disruption of the external limiting membrane (ELM), the inner segment/outer segment junction (IS/OS) and cone outer segment tips (COST) under the macula. Investigations related to the differential diagnosis of the fundus finding were soon performed. The patient's blood pressure was found to be 180/100mmHg. Laboratory tests revealed elevated levels of serum creatinine (6.06mg/dL) and blood urea nitrogen (45.12mg/dL). After consultation with a nephrologist, he was diagnosed with bilateral hypertensive retinopathy due to malignant hypertension. He was immediately admitted to the nephrology department for treatment of hypertension with oral nifedipine and arotinolol hydrochloride. After further examinations, an additional diagnosis of chronic renal insufficiency was made, although its exact etiology was unknown. The patient refused dialysis treatment and his hypertension gradually came under control by antihypertensive medication. Two weeks later, his blood pressure was reduced to 130/80mmHg, and his BSCV improved to 20/67 in both eyes. The cotton-wool exudates and retinal hemorrhages in both eyes had largely resolved (Figures 2A,B). SD-OCT demonstrated normal foveal contour and almost complete resolution of the subretinal fluid in both eyes except a mild foveal neurosensory detachment in the left eye. There were numerous areas of high intensity signal intraretinally in both eyes, corresponding to areas of lipid exudation. A large defect of ELM line, IS/OS line and COST line under the macula was also showed in both eyes (Figures 2C,D). Two months later, the patient's blood pressure remained under good control medically and his BSCV had returned to 20/20 in the both eyes. Except a little intraretinal hemorrhages remained, cotton-wool exudates and hard exudates had completely resolved in both eyes (Figures 3A,B). SD-OCT showed complete resolution of the subretinal fluid and almost complete restoration of the ELM line and IS/OS line in both eyes, while the COST line was still interrupted (Figures 3C,D).

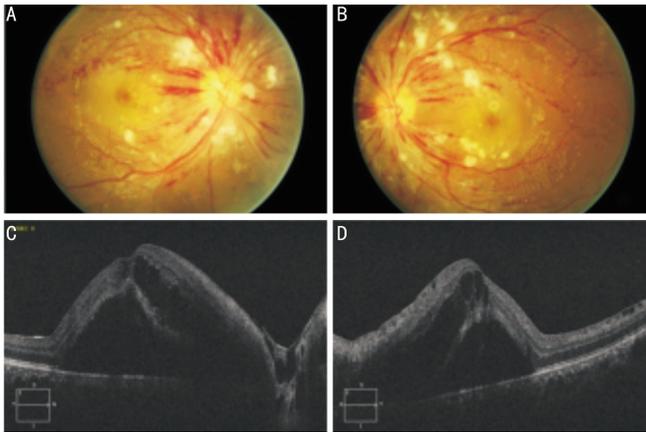


Figure 1 A (right eye), B (left eye): Fundus photographs of the both eyes showed mild optic disc edema, arteriolar narrowing, flame-shaped retinal hemorrhages, numerous cotton-wool exudates and serous retinal detachment of the macula at the initial visit. C (right eye), D (left eye): A horizontal sectional SD-OCT image of the both eyes at the initial visit showed macular edema and foveal serous neurosensory detachment. A disorganized outer retinal layers with disruption of the ELM line, the IS/OS line and COST line under the macula was also demonstrated.

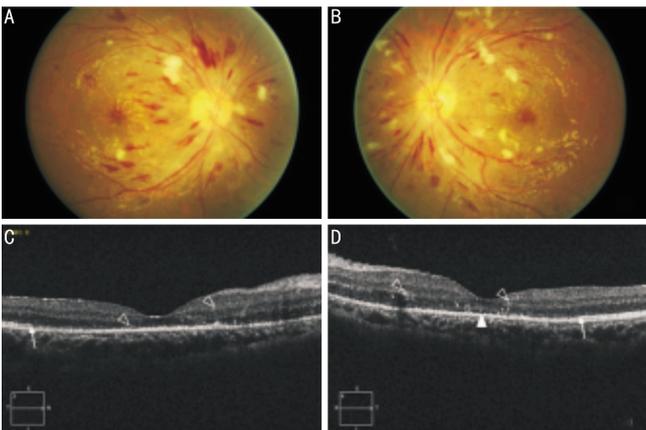


Figure 2 A (right eye), B (left eye): Two weeks after the initial visit, cotton-wool exudates and retinal hemorrhages had reduced in both eyes after lowering blood pressure treatment. C (right eye), D (left eye): SD-OCT demonstrated normal foveal contour and almost complete resolution of the subretinal fluid in both eyes except a mild foveal neurosensory detachment in the left eye (closed arrowhead). Note the hyperreflective dots intraretinally indicated persistent intraretinal exudates (open arrowhead). A large defect of ELM line, IS/OS line and COST line beneath the macula was also showed in both eyes (nasal to the arrow).

With promptly treatment of high blood pressure, malignant hypertensive retinopathy can usually have a good prognosis. The degree of visual recovery is variable and dependent upon the resolution of the vitreous hemorrhage, macular edema, foveal neurosensory detachment, or optic nerve head swelling. However, the underlying mechanism of the visual recovery process is not clear.

OCT is an important modality in evaluation of retinal microstructures in various retinopathies. It has been reported that time domain OCT can clearly demonstrate the serous

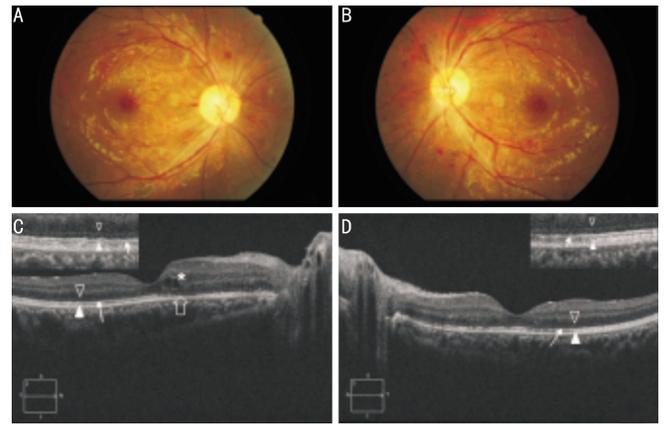


Figure 3 A (right eye), B (left eye): Two months after the initial presentation, except a little intraretinal hemorrhages remained, cotton-wool exudates and hard exudates had completely resolved in both eyes. C (right eye), D (left eye): A horizontal SD-OCT image demonstrated complete resolution of foveal neurosensory detachments in both eyes except an intraretinal cystic space (asterisk) in the right eye. An almost complete restoration of the ELM line (open arrowhead) and IS/OS line (arrow) was showed in both eyes except a small defect of IS/OS junction (blank arrow) in the right eye, while only a small part of COST line was restored in both eyes (temporal to the closed arrowhead).

retinal detachment with overlying macular edema in malignant hypertensive retinopathy, which may not be detected by conventional fundus examination [4,5]. The advancement of SD-OCT has further improved the resolution of images to display many unprecedented anatomical details of retina, including the hyperreflective lines in the outer photoreceptor layer: ELM, IS/OS and COST. Integrity of these lines has been found to correlate closely with visual functions in various retinopathies, and has been suggested to carry prognostic implications [6]. It is generally thought that a large defect of the outer segments of the foveal photoreceptors is correlated with poor visual outcome.

Recently, the relationship between the photoreceptor microstructures and visual acuity (VA) in eyes with macular edema (ME) and central serous chorioretinopathy (CSC) has been widely investigated by researchers. It has been reported that the integrity of IS/OS and ELM is correlated with final VA in eyes with ME associated with diabetic retinopathy or retinal vein occlusion [7-9]. Fujita *et al* [10] reported that both of the IS/OS and COST lines were strongly correlated with the improvement of the macular sensitivity in eyes with chronic central serous chorioretinopathy (CSC) after half-dose photodynamic therapy (PDT).

In the present case, on SD-OCT examination, bilateral macular edema, foveal serous neurosensory detachment and an interruption of the subfoveal ELM line, IS/OS line and COST line were documented on the initial presentation, which was accompanied with a poor visual acuity. Two

weeks after successful lowering of the blood pressure, a limited improvement of vision was attained with an almost complete resolution of macular edema and foveal neurosensory detachment. However, a large interruption of the subfoveal ELM line, IS/OS line and COST line was still existed. Two months later, a fairly good visual recovery was attained accompanied by an almost complete restoration of the subfoveal ELM line and IS/OS line, although a persistent defect of COST line was demonstrated.

The fundus and SD-OCT findings suggest the resolution of macular edema and serous retinal detachment play an important role in the early stage of visual recovery process of malignant hypertensive retinopathy, while the restoration of the integrity of the ELM line and IS/OS line may have crucial value in the late stage. It also implies that the restoration of COST line is slower than ELM and IS/OS line, and there is no significant correlation between the COST line and the visual function in malignant hypertensive retinopathy.

It should be noted that the current study is limited by the single-case approach and lack of functional examinations such as microperimetry and multifocal electroretinography. Further investigation with larger samples is necessary to clarify the role of the integrity of the outer segment of photoreceptors in the visual recovery of hypertensive retinopathy.

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