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Serial Spectral-Domain Optical Coherence Tomography Findings in Acute Retinal Pigment Epitheliitis and the Correlation to Visual Acuity

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Purpose: To evaluate the features of acute retinal pigment epitheliitis (ARPE) at onset and in the course of recovery by serial spectral-domain optical coherence tomography (SD OCT) and the correlation to visual acuity (VA).

Design: Retrospective cohort study.

Participants: Consecutive patients with ARPE.

Methods: A review of medical records was performed.

Main Outcome Measures: Integrity of SD OCT retinal bands at onset and in the course of disease, time required to achieve each retinal band restoration, corresponding VA change, and final VA.

Results: Four patients were included. Initial SD OCT showed a dome-shaped hyper-reflective lesion at the photoreceptor outer segment layer disrupting the ellipsoid zone (EZ) and interdigitation zone (IZ) (100%). In the early phase, there was also upward displacement of the external limiting membrane (ELM) and mild transient thickening of the retinal pigment epithelium (RPE)/Bruch's complex (Bc). Acute retinal pigment epitheliitis resolved in a sequence of (1) a decrease in height of SD OCT hyper-reflective lesion and the upwardly displaced ELM returning to its normal position with irregularity; (2) complete disappearance of the hyper-reflective lesion; (3) restoration of ELM; (4) restoration of EZ; and (5) restoration of IZ. The average time to restore ELM, EZ, and IZ was 4.3±5.2, 7.3±7.2, and 12.5±12.4 weeks, respectively, and the corresponding logarithm of the minimum angles of resolution (logMAR) VAs were 0.24±0.23, 0.09±0.07, and 0.05±0.06, respectively. Visual acuity improved when IZ was restored.

Conclusions: Early SD OCT revealed an inflammatory lesion in the photoreceptor outer segment layer displacing ELM. The RPE was involved only mildly and transiently. Recovery occurred in a sequence of ELM, EZ, and IZ restoration, and VA improved when the IZ was restored. These features suggested that the IZ (i.e., the contact between photoreceptors and RPE) is the primary site of inflammation in ARPE. *Ophthalmology 2017;■:1–7 © 2017 by the American Academy of Ophthalmology*

Acute retinal pigment epitheliitis (ARPE) is a rare, idiopathic inflammatory disease of the retina that affects healthy young adults.[1] It was first described by Krill and Deutman in 1972[2] and had the characteristics of acute central scotoma and fine pigment stippling in the macula surrounded by hypopigmented halos.[1,2]

The pathophysiology of ARPE is unknown. Krill and Deutman[2] believed that the retinal pigment epithelium (RPE) was the primary site of inflammation in ARPE on the basis of clinical features.[2] However, investigators in recent years showed that there was a hyper-reflective lesion in the outer neurosensory retina in ARPE seen on optical coherence tomography (OCT),[1,3–8] suggesting that the outer neurosensory retina instead of the RPE could be the primary site of inflammation. However, because of the rarity of ARPE, only a few case reports are available to describe the anatomic OCT features. The 2 largest case series in the literature consist of 18 eyes[1] and 4 eyes.[3] Description of the changes of OCT features over time is lacking. Changes in visual acuity (VA) accompanying the changes of OCT features have not been studied before. To understand the pathophysiology, it is important to evaluate both the anatomic changes and the functional VA changes over time in the course of disease.

Acute retinal pigment epitheliitis generally is believed to have good visual prognosis, and treatment is not required. A case series showed that 89% of cases had complete recovery of vision within 2 months without treatment.[1] Steroid has a potent anti-inflammatory effect and could control ocular inflammation. Whether the use of systemic steroids would facilitate visual recovery or affect the visual outcome of APRE has not been studied before.

In this study, we present 4 cases of ARPE, 3 of which were treated with an oral steroid. We describe the features at

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Table 1. Demographic Data, Presentation, and Outcome of 4 Patients with Acute Retinal Pigment Epitheliitis

Patient No.	Eye	Age, yrs	Sex	Time to Presentation after Symptoms Onset	Presenting VA	SD OCT Features at Presentation					Oral Steroid (wks)	Final VA	Length of FU (wks)
						ONL	*ELM*	*EZ*	*IZ*	*RPE/Bc*			
1	Right	24	F	2 days	20/30	Involved	Displaced upward	Disrupted	Disrupted	Mildly thickened	Yes (7.6)	20/20	8
2	Right	42	F	2 days	20/100	Uninvolved	Displaced upward	Disrupted	Disrupted	Mildly thickened	Yes (4.1)	20/25	17
3	Left	18	F	1 wk	20/30	Uninvolved	Irregular	Disrupted	Disrupted	Intact	No	20/20	4
4	Left	27	M	12 wks	20/60	Uninvolved	Disrupted	Disrupted	Disrupted	Intact	Yes (13.0)	20/25	27

ELM = external limiting membrane; EZ = ellipsoid zone; F = female; FU = follow-up; IZ = interdigitation zone; M = male; ONL = outer nuclear layer; RPE/Bc = retinal pigment epithelium/Bruch's complex; SD OCT = spectral-domain optical coherence tomography; VA = visual acuity.

onset and during recovery by serial spectral-domain OCT (SD OCT). The changes of VA in relation to changes of OCT features are investigated.

Methods

Patients

The medical records of consecutive patients diagnosed with ARPE and treated at the Eye Clinic of the University of Hong Kong between January 2011 and July 2016 were reviewed. The diagnosis of ARPE was made on the basis of the characteristic features of (1) acute central scotoma, (2) fine pigment stippling in the macula surrounded by hypopigmented halos, and (3) the presence of a characteristic hyper-reflective lesion at the outer retina on SD OCT. Secondary causes giving rise to similar ocular features, such as multiple evanescent white dot syndrome, idiopathic enlarged blind spot syndrome, acute macular neuroretinopathy, multifocal choroiditis, and central serous chorioretinopathy, were excluded. The study was conducted according to the Declaration of Helsinki and approved by the institutional review board of the University of Hong Kong.

Spectral-domain OCT and complete ophthalmological examinations, including VA test, tonometry, slit-lamp biomicroscopy, and dilated fundus examination by indirect ophthalmoscopy, were performed at all visits. All VA tests were performed with Snellen chart with the patients' own refractive correction and pinhole, and the value was converted to the logarithm of the minimum angle of resolution (logMAR) for statistical analysis.

Definitions

The retinal reflective bands imaged by SD OCT were defined according to international consensus, in which the 4 hyper-reflective bands in the outer retina represent the external limiting membrane (ELM) and photoreceptors ellipsoid zone (EZ), interdigitation zone (IZ), and RPE/Bruch's complex (Bc) in order from inside to outside.[9]

In this study, the retinal band on SD OCT is described as "disrupted" when it is discontinuous, "irregular" when it is continuous but with undulations, and "intact" when it is continuous and without undulations. "Restoration" refers to recovery of a disrupted or irregular retinal band to an intact retinal band on SD OCT.

Outcome Measures and Statistical Analysis

The primary outcomes measured included the VA and integrity of the retinal bands on SD OCT at the final visit. The secondary outcomes measured included the changes in the retinal bands on SD OCT in the course of disease, time required to achieve restoration of each retinal band on SD OCT, and VA at each band restoration.

Table 2. Time and Visual Acuity upon Restoration of Different Retinal Hyper-reflective Bands on Spectral Domain Optical Coherence Tomography in 4 Patients with Acute Retinal Pigment Epitheliitis

Patient No.	ELM Restoration		EZ Restoration		IZ Restoration	
	Time (wks)	*VA*	*Time (wks)*	*VA*	*Time (wks)*	*VA*
1	2	20/60	3	20/25	6	20/20
2	1	20/50	3	20/30	8	20/25
3	2	20/20	5	20/20	5	20/20
4	12	20/25	18	20/25	31	20/25

ELM = external limiting membrane; EZ = ellipsoid zone; IZ = interdigitation zone; VA = visual acuity.