SCIENTIFIC CORRESPONDENCE

Two types of optical coherence tomographic images of retinal pigment epithelial detachments with different prognosis

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Aims: To report the optical coherence tomographic (OCT) findings in retinal pigment epithelium (RPE) detachments.
Methods: 24 eyes were analysed by OCT and by fluorescein (FAG) and/or indocyanine green angiography.
Results: RPE detachments were classified by the OCT images into those with a partial or total highly reflective line in the area of the detachment (nine eyes), and those that showed the same reflex in the detached area as in other parts (15 eyes). The nine eyes had irregular hyperfluorescence by FAG, significantly larger detachments, and lower visual acuity than the 15 eyes.
Conclusion: The OCT showed that two types of RPE detachments are associated with eyes with different characteristics.

Retinal pigment epithelial (RPE) detachments (PEDs) occur between the RPE basement membrane and the inner collagenous Bruch's membrane.[1] PEDs result from disorders of the flow of fluid from the retina to Bruch's membrane,[2] and are considered to be an important preclinical condition of age related macular degeneration.

Lewis reported that patients less than 55 years old have PEDs that are small, without choroidal neovascular membranes (CNVs), and have minimal impairment of vision. Conversely, lesions of older patients were larger with significant visual impairment.[3]

Optical coherence tomography (OCT) provides a cross sectional tomographic image of the retina and choroid,[4] and unlike fluorescein angiography (FAG) and indocyanine green angiography (ICG), it is a non-invasive and non-contact diagnostic technique. We have evaluated PEDs using OCT and report a new classification of the PEDs which is comparable with that found by angiography.

Abbreviations: CNVs, choroidal neovascular membranes; DD, disc diameter; FAG, fluorescein angiography; ICG, indocyanine green angiography; logMAR, logarithm of minimum angle of resolution; OCT, optical coherence tomography; PEDs, pigment epithelial detachments; RPE, retinal pigment epithelium

Table 1 Characteristics of patients who participated

Case	Sex	Lat	Age (years)	Visual acuity (logMAR) Initial	Final	Follow up (months)	PED size Initial	Final	FAG	ICG	OCT	CNV	Fellow eye
1	F	R	57	0.046	0.097	23	04 × 0.4	0.4 × 0.5	hyper	hyper	1	N	Normal
2	F	L	47	0	0	22	0.7 × 0.7	0.7 × 0.7	hyper	hyper	1	N	Normal
3	M	L	55	0	0.046	17	0.4 × 0.4	0.7 × 0.7	hyper	hyper	1	N	Drusen
4	F	L	46	0	0	19	0.3 × 0.4	0.3 × 0.4	hyper	hyper	1	N	Normal
5	F	R	76	0.523	0.097	24	2 × 2	2 × 2	hyper	hyper	1	N	PED
6	F	L	76	0.301	0.155	24	1 × 1	1 × 1	hyper	hyper	1	N	PED
7	M	L	71	0.699	0.097	24	1.5 × 1	2 × 1.5	hyper	hyper	1	N	Normal
8	F	L	44	0	0	18	0.2 × 0.2	0.2 × 0.2	hyper	hyper	1	N	Normal
9	F	R	55	0	0	21	1 × 0.7	3 × 3	hypo	hyper	1	N	Normal
10	F	L	59	0.222	0.222	6	1 × 0.8	1 × 0.8	hyper	hyper	1	N	Normal
11	F	L	71	0	0	12	0.2 × 0.2	0.2 × 0.2	nd	nd	1	N	Normal
12	M	R	36	0	0	0.5	0.5 × 0.5	0.5 × 0.5	hyper	nd	1	N	Normal
13	M	L	59	0	0	5	0.2 × 0.2	0.2 × 0.2	hyper	nd	1	N	Phthisis
14	M	L	79	0.523	0.824	6	2.0 × 3.0	0	hyper	hyper	1	N	Phthisis
15	M	R	71	0.222	0.222	25	0.4 × 0.4	0.4 × 0.4	hyper	irregular hypo	1	N	MD
16	F	L	66	0.523	0.824	13	1 × 1.5	1 × 1.5	irregular	irregular hypo	2	N	MD
17	M	R	72	1.398	1.523	18	2.5 × 2	0	irregular	irregular hypo	2	N	MD
18	M	R	69	0.301	0.699	16	1 × 0.6	0	irregular	no fluorescence	2	N	Normal
19	F	L	70	1.398	1.155	18	1.6 × 2	1.6 × 2	hypo	no fluorescence	2	N	Normal
20	F	L	73	1	1.523	15	1.5 × 1.5	1.5 × 1.5	irregular	irregular hypo	2	N	Normal
21	M	R	76	0.222	0.699	11	1 × 1	0	nd	no fluorescence	2	N	MD
22	M	R	66	0.301	0.824	7	1 × 1	1 × 1	irregular	irregular hypo	2	N	Normal
23	M	L	75	0.301	0.046	18	1 × 2	1 × 2.5	irregular	no fluorescence	2	N	MD
24	M	R	65	0.398	0.301	18	1.5 × 1.5	1.5 × 1.5	hypo	hyper	2	N	MD

Lat = laterality of the PED; visual acuity = logarithm of minimum angle of resolution (logMAR), initial and final = visual acuity at the initial visit and most recent visual acuity; PED size = size of the retinal pigment epithelial detachment by disc diameter (DD); FAG, hyper = hyperfluorescence in the PED from the early phase; irregular = irregular hyperfluorescence in the late phase; hypo = hypofluorescence both in early and late phases; nd = examination was not performed; ICG, hyper = hyperfluorescence in early and late phases; irregular hypo = irregular hypofluorescence at the late phase; no fluorescence = no fluorescence even at the late phase; OCT = classification of PEDs by the OCT images; N = CNV was not present.

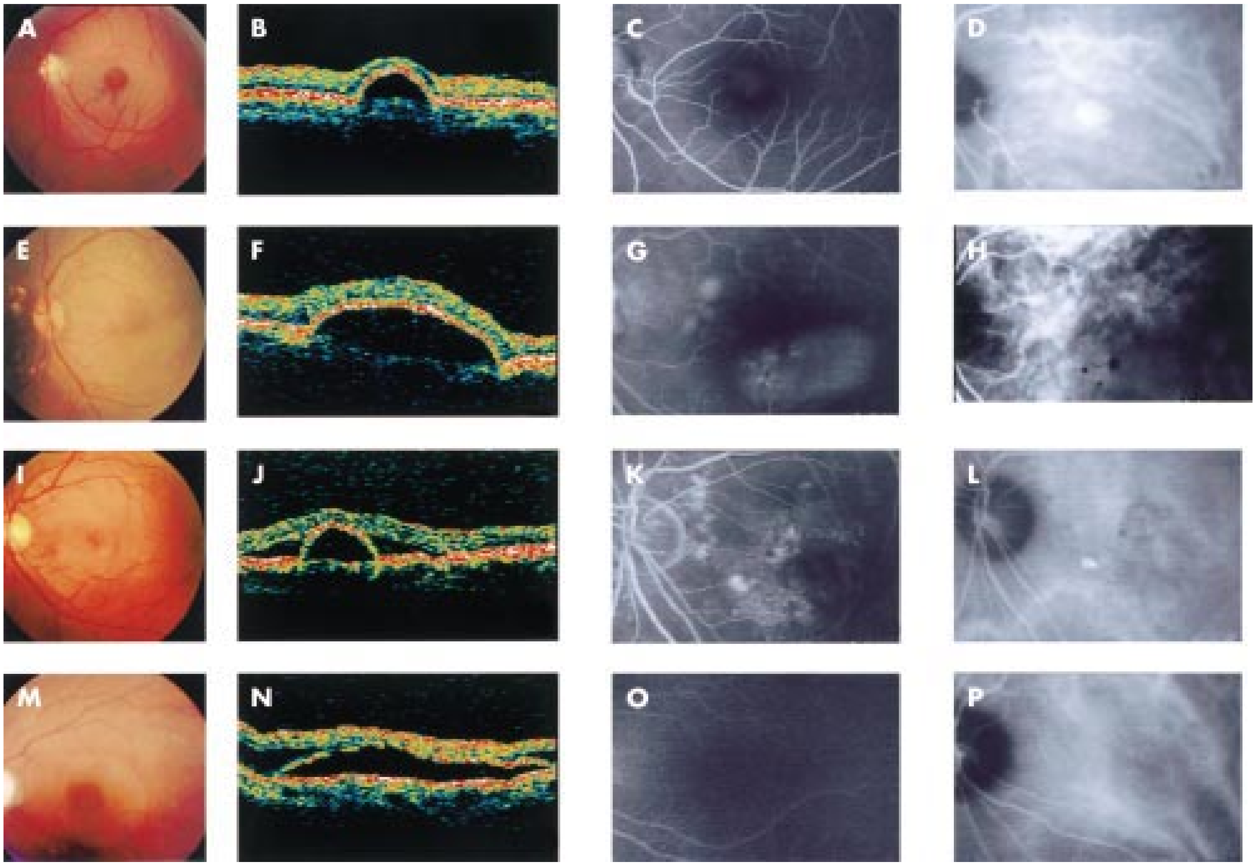

Figure 1 Colour fundus photograph (A), OCT (B), FAG (C), and ICG (D) findings from case 2 (group 1). OCT images show the dome-like elevation of the RPE with the same reflex under the RPE in the PEDs as that observed in other places. The size of the PED is about 0.8 DD. FAG and ICG show hyperfluorescence from the early phase. Colour fundus photograph, OCT, FAG, and ICG of case 5 (group 1) are shown in (E), (F), (G) and (H). OCT images show same reflex as that of (A). The PED is about 3.5 DD. FAG shows irregular hyperfluorescence; ICG shows irregular hypofluorescence. Colour fundus photograph, OCT, FAG, and ICG of case 16 (group 2) are shown in (I), (J), (K) and (L). A dome-like elevation with a partial highly reflective line in the PEDs at the level of RPE is observed by OCT. FAGs show irregular hyperfluorescence; ICG shows irregular hypofluorescence. Colour fundus photograph, OCT, FAG, and ICG of case 19 (group 2) are shown in (M), (N), (O) and (P). OCT image show highly reflective line over the PEDs at the level of RPE. FAG shows hypofluorescence; ICG shows no fluorescence.

MATERIALS AND METHODS

Twenty four eyes from 23 consecutive patients (12 men and 11 women) with PEDs were examined between February 1998 to May 2001. The clinical findings are listed in the Table 1.

Statistical significance was determined by using the χ^2, unpaired *t*, or Mann-Whitney U tests. A p value of <0.05 was considered significant.

The tenets of the Declaration of Helsinki were followed, and informed consent was obtained from all subjects.

RESULTS

A PED was confirmed in all of the patients by ophthalmoscopy (Fig 1A, E, I, and M).

OCT findings

OCT images showed a dome-like elevation of the RPE corresponding to the PEDs. The PEDs were divided into two groups by the presence or absence of a highly reflective line in the OCT images that divided the PEDs at the level of the RPE. Eyes in group 1 (n = 15) showed the same reflex in the area of PEDs as that observed under the RPE in other parts of the PEDs. Cases in group 1 with a PED of less than 1 disc diameter (DD) (case 2) and more than 1 DD (case 5) are shown in Figures 1B and F, respectively.

Eyes in group 2 (n = 9) showed a partial (Fig 1J total (Fig 1N highly reflective line in the area over the PEDs at the level of the RPE.

Age and fellow eye

The average age was 60.1 years in group 1 and 70.2 years in group 2 (p = 0.1141). Only one of 15 patients in group 1 (6.7%) had macular degeneration in the fellow eye, whereas five of nine patients (55.6%) in group 2 had it (p= 0.0074).

Visual acuity

The mean visual acuity (logarithm of minimum angle of resolution (logMAR)) at the initial visit was significantly better in the eyes in group 1 (VA = 0.169) than in group 2 (VA = 0.649; p = 0.0051). This difference was maintained at their most recent VA measurement (VA = 0.117 in group 1 *v* 0.844 in group 2; p = 0.0008). The differences tended to increase after successive follow ups.

Size of PEDs

At the initial visit, the mean size of the PEDs was significantly larger in group 2 (1.556 DD) than in group 1 (0.860 DD) (p = 0.0284).

FAG and ICG

PEDs were also classified by FAG and/or ICG by a modified method of Yuzawa and coworkers.[5] The PEDs were divided into three types by FAG; the classic hyperfluorescence of the lesion (Fig 1C) in 13 patients, irregular fluorescence (Fig 1G, K) in six patients, and hypofluorescence (Fig 1O) in three patients (Table 1).

All patients in group 1 who had FAG showed the classic hyperfluorescence, except case 9, and conversely, all patients in group 2 had irregular or hypofluorescence. The difference in the distribution of the FAG pattern was significant ($p < 0.0001$).

The PEDs could also be divided into three types by ICG examination; the hyperfluorescence type (Fig 1D) in 12 patients, the irregular hypofluorescence type (Fig 1H and L) in five patients, and no fluorescence (Fig 1P) type in four patients. Eleven of 12 patients (91.7%) in group 1 showed hyperfluorescence, and only one patient (11.1%) in group 2 showed hyperfluorescence ($p = 0.0002$).

DISCUSSION

We compared the cross sectional structure of the OCT determined two types of PEDs with the pattern from FAG and/or ICG and evaluated the underlying condition of the PEDs. The eyes in group 2 had significantly poorer visual acuity and larger PEDs than eyes in group 1. Patients in group 2 were older than those in group 1 although the difference was not significant. These results agree well with the findings previously reported for PEDs by Klein and coworkers[6] that PEDs in older patients tended to be larger and were associated with diffuse degenerative changes in the posterior pole. Yuzawa and coworkers also reported RPE atrophy after the absorption of turbid fluid within the subpigment epithelial space. The corresponding lesions showed irregular fluorescence by FAG,[5] and this may account for the poor vision in group 2.

An irregular, or absence of, fluorescence pattern by ICG may be due to the accumulation of materials on the choroid, inner collagenous layer, or subpigment epithelial space.[5] Laboratory data have also suggested a disturbance of Bruch's membranes caused by the accumulation of debris such as neutral lipids or phospholipids.[2] These lesions are then recognised as drusen clinically. The thickening may participate not only in the development of PEDs, but also in the development of CNV.[7] The highly reflective line at the level of RPE may indicate an abnormal state of Bruch's membrane produced by the accumulation of materials at the superficial layer of Bruch's membrane.

The non-invasive and non-contact diagnostic technique of OCT can provide important information on the structure of PEDs. If a highly reflective line is detected under the PEDs, our findings suggest that there may be an increase in the resistance of Bruch's membrane to fluid flow and necessitate a more frequent follow up of these patients.

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REFERENCES

1 **Murphy RP**, Yeo JH, Green WR, *et al*. Dehiscences of the pigment epithelium. *Trans Am Ophthalmol Soc* 1985;**83**:63–81.
2 **Bird AC**, Marshall J. Retinal pigment epithelial detachments in the elderly. *Trans Ophthalmol Soc UK* 1986;**105**:674–82.
3 **Lewis ML**. Idiopathic serous detachment of the retinal pigment epithelium. *Arch Ophthalmol* 1978;**96**:620–4.
4 **Hee MR**, Puliafito CA, Wong C, *et al*. Optical coherence tomography of central serous chorioretinopathy. *Am J Ophthalmol* 1995;**120**:65–74.
5 **Yuzawa M**, Kawamura A, Yamaguchi C, *et al*. Indocyanine green videoangiographic findings in detachment of the retinal pigment epithelium. *Ophthalmology* 1995;**102**:622–9.
6 **Klein ML**, Obertynski H, Patz A, *et al*. Follow-up study of detachment of the retinal pigment epithelium. *Br J Ophthalmol* 1980;**64**:412–6.
7 **Green WR**, McDonnell PJ, Yeo JH. Pathologic features of senile macular degeneration. *Ophthalmology* 1985;**92**:615–27.

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