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EN-FACE OPTICAL COHERENCE TOMOGRAPHY IMAGING IN A CASE OF CHOROIDAL RUPTURE

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En-face Optical Coherence Tomography Imaging in a Case of Choroidal Rupture

Tomoko Mase, CO,[1] Satoshi Ishiko, MD, PhD,[2] Tomofumi Tani, MD, PhD,[1] Akitoshi Yoshida, MD, PhD,[1]

[1] Department of Ophthalmology, Asahikawa Medical University, [2] Department of Medicine and Engineering Combined Research Institute. Asahikawa Medical University

Address corresponding Author: Satoshi Ishiko

Address: 2-1-1-1 Midorigaoka Higashi, Asahikawa, 078-8510, Japan

Telephone: +81-166-68-2543

Fax: +81-166-68-2549

E-mail: ishiko@asahikawa-med.ac.jp

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ABSTRACT: We report a case of choroidal rupture resulting from blunt trauma that we followed using en-face optical coherence tomography (OCT) imaging. At the initial examination, four lesions with a subretinal hemorrhage developed in the macular area, and the findings under the lesions were unclear. We observed the extent of the minute findings non-invasively by en-face OCT imaging from the initial examination. Six months after the trauma, the fine crescent-shaped lines seen by angiography and OCT B-scan images were consistent with findings observed on the en-face OCT images. The combination of other examinations with en-face OCT imaging was useful for follow-up.

INTRODUCTION

Choroidal ruptures are breaches in the choroid, Bruch's membrane, and retinal pigment epithelium (RPE) that occur in about 5% to 10% of patients who sustain a blunt ocular trauma. Irregular reflections from the choriocapillaris-RPE have been visualized using optical coherence tomography (OCT) depending on the degree of the RPE defect and fibrosis at the rupture site.[1] Recent OCT developments have enabled the capture of three-dimensional retinal images. En-face images facilitate screening of the entire lesion, which is difficult with conventional B-scan sections.[2] We report a case of a choroidal rupture in which en-face OCT imaging provided useful information for diagnosis and non-invasive follow-up.

CASE REPORT

A 22-year-old man sustained a blunt trauma to his right eye. His best-corrected visual acuity (BCVA) in that eye was 20/200. Four lesions with a subretinal hemorrhage were observed during a fundus examination of the macular area including the fovea (Figure 1A). Hypofluorescence on fluorescein angiography images (FA) and blurred findings on indocyanine green angiography (IA) images were observed at those lesions (Figure 1B, C). On OCT B-scan images, a retinal detachment and low-signal lesions under the retinal detachment at these four lesions were observed (Figure 1D). On the en-face images between the RPE and lamina choriocapillaris, a crescent-shaped low-signal line was detected at each subretinal hemorrhagic lesion except for in the foveal area (Figure 2A). On OCT B-scan images, minute findings of the ruptured RPE and Bruch membrane were observed that corresponded to the crescent-shaped lesion detected by en-face OCT imaging but only in one lesion (Figure 2A, B). Based on these findings, we diagnosed this case as a choroidal rupture.

One month after the trauma, the BCVA of the right eye was 20/100. The subretinal hemorrhages began to resolve but still remained. No other findings were observed by fundus examination, although the crescent-shaped low signals including the foveal area at the level of the RPE were observed on en-face OCT images (Figure 3).

Six months after the trauma, the BCVA of the right eye was 20/50. The subretinal hemorrhages had resolved. The findings on angiography and longitudinal OCT images except for the fundus photographs corresponded to the crescent-shaped findings on the en-face OCT images and began to resolve (Figure 4).

DISCUSSION

Using OCT, we detected minute changes in a ruptured choroid in a case with subretinal hemorrhages immediately after the injury. The current generation of spectral-domain OCT (SD-OCT) has a sufficiently long wavelength to penetrate the deep layers and the greater depth resolution. Therefore, the findings under the subretinal hemorrhage were visible. In addition, RPE has high reflectivity. Consequently, the fine changes in the RPE were detected easily.

The choroidal rupture was observed clearly only on the en-face OCT images; therefore, this imaging modality is useful to obtain findings under the subretinal hemorrhage caused by blunt trauma, as reported previously.[3] En-face OCT imaging enables precise descriptions of the location and depth of the pathology because of the ability to select the thickness and the depth when constructing the slice of the en-face images.[3-6] In the current case, the rupture and even a hemorrhagic retinal detachment were detected by selecting the depth around the level of the RPE.

By combining the en-face OCT images and other imaging modalities, we were able to evaluate the pathology in greater detail. Only the OCT B-scan imaging did not allow us to determine whether or not the findings were artifacts. En-face OCT imaging was reported to provide a global overview of the entire area, which is useful for detecting fine lesions.[6] Furthermore, it would be hard to decide the appropriate line for the OCT B-scan examination when the typical fundus findings were unclear.[1,3,7,8] When compared with the findings on en-face OCT images, we observed the OCT B-scan images at the exact location of the lesions. Therefore, when assessing fine lesions by OCT B-scan images, a comparison with en-face OCT images seems useful. Angiography is necessary to evaluate pathological activity. Both angiography and en-face OCT images should be used to gain a maximal understanding of the pathology.

In a case of a choroidal rupture, secondary choroidal neovascularization that occurred at a relatively early stage was reported.[7] Therefore, frequent follow-up evaluations are optimal. In the current case, we easily followed the morphologic changes associated with the choroidal rupture using en-face OCT imaging. Angiography is useful to evaluate the pathological activity; however, it is an invasive procedure. En-face OCT imaging is non-invasive and easy to perform to evaluate the lesions.[9] Therefore, en-face OCT imaging would be useful to examine the pathological changes non-invasively during frequent follow-up examinations.

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LEGENDS

Figure 1. (A) A fundus photograph shows four lesions with subretinal hemorrhages (yellow arrows). (B, C) Fluorescein angiography and indocyanine green angiography images (629 seconds). (B) Hypofluorescence at the subretinal hemorrhage lesions. (C) A linearly shaped area of low reflectivity in two hemorrhages is seen (arrows) but not clearly. (D) A B-scan image at the dotted line in A. The findings under the subretinal hemorrhage at the foveal area are unclear.

Figure 2. (A) An en-face image around the retinal pigment epithelium (RPE) shows linear low reflections at each arrow. (B) A B-scan image at the yellow dotted arrow in A. At the level of the RPE-Bruch's membrane level, a minute finding that resembles a rupture is seen (yellow arrows).

Figure 3. One month after the trauma, an en-face image around the retinal pigment epithelial plane shows the crescent-shaped low signal in the foveal area for the first time (arrow). In another three locations, the crescent-shaped low signals are more apparent than

those from 1 month previously.

Figure 4. Six months after the trauma. (A) An en-face image around the retinal pigment epithelial plane shows that the crescent-shaped low signal is more apparent in the foveal area (white arrow). (B) A fundus photograph shows resolution of the subretinal hemorrhages, but the choroidal rupture is not readily detected. (C) A B-scan image at the dotted line in A. A posteriorly concave area of disruption of the RPE-choriocapillaris is seen (arrow). (D, E) Fluorescein angiography and indocyanine green angiography images (620 seconds) show, respectively, the crescent-shaped hyperfluorescence and hypofluorescence that correspond to the en-face image in A.

IMAGES

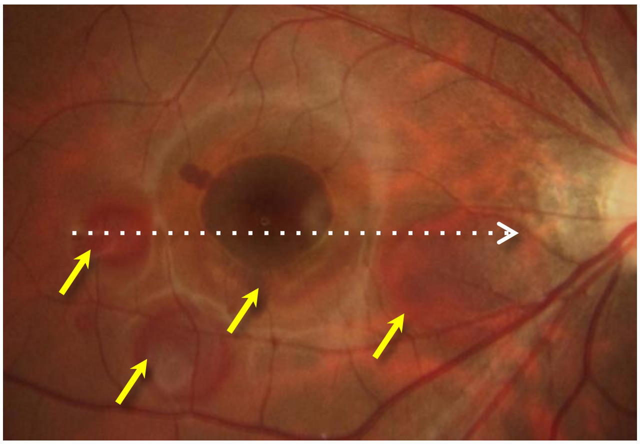


Figure.1-A

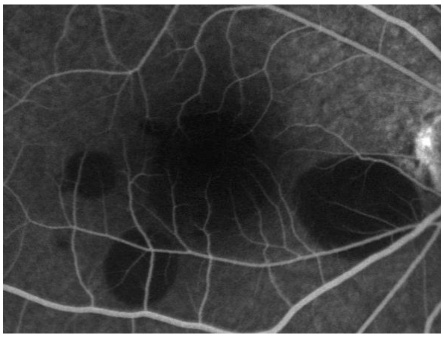
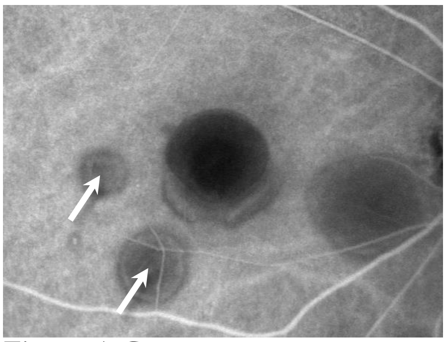


Figure.1-B



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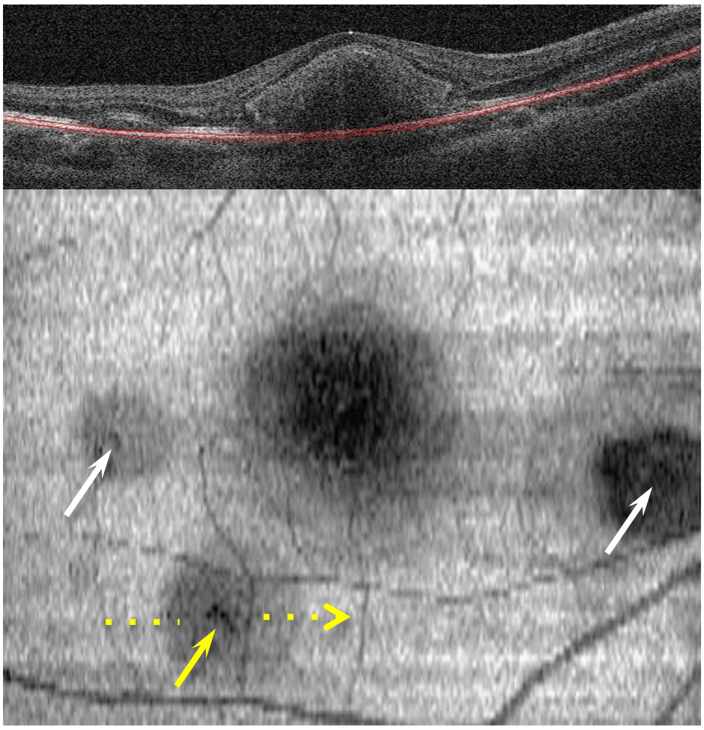

Figure.2-A

Figure.2-B

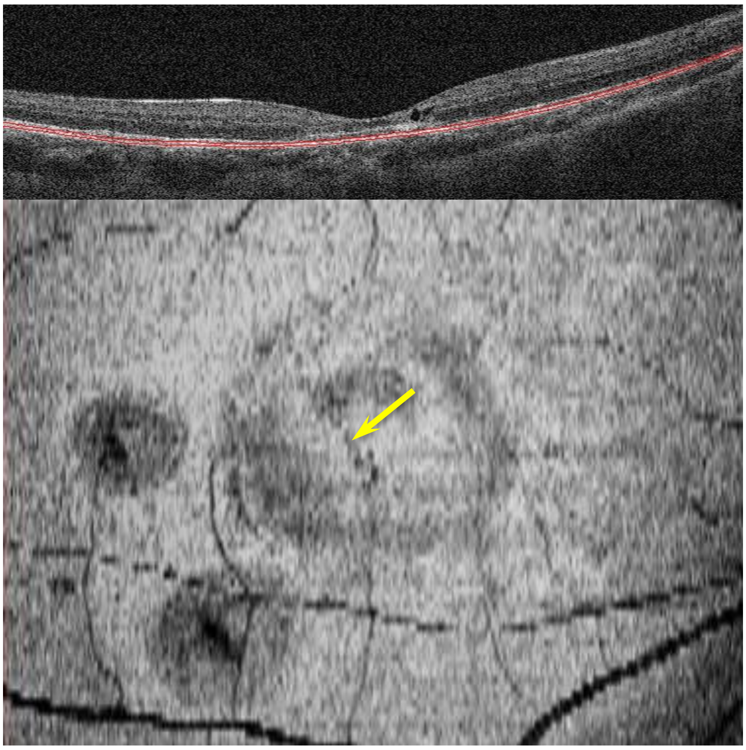

Figure.3

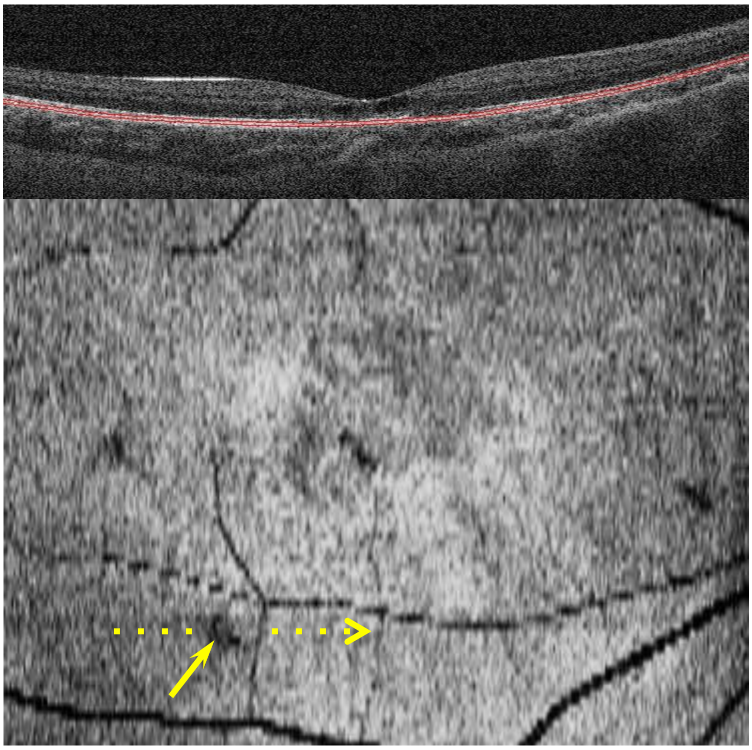

Figure.4-A

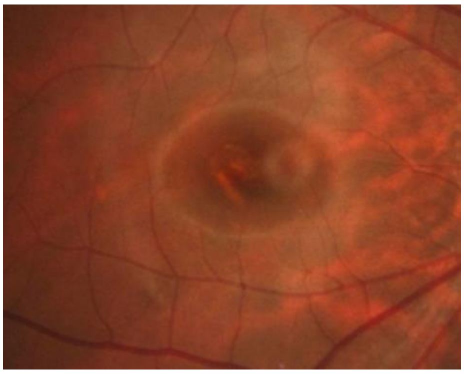

Figure.4-B

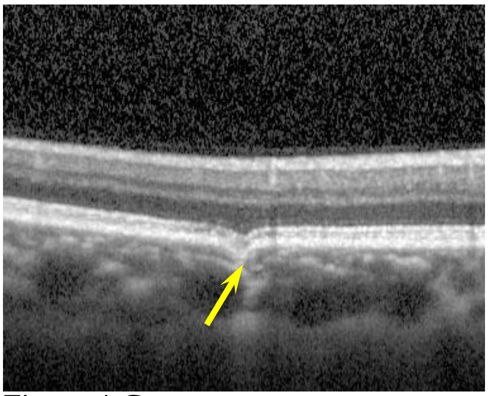

Figure.4-C

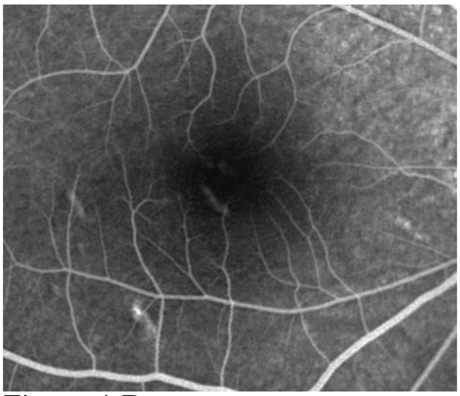

Figure.4-D

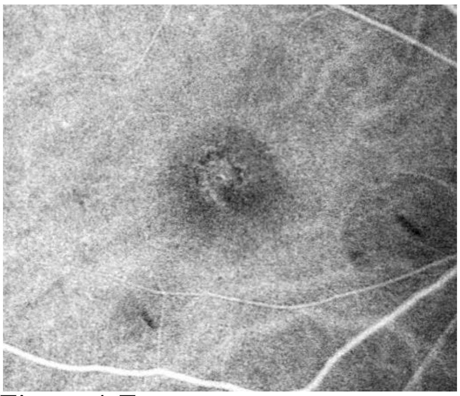

Figure.4-E