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Swept-source optical coherence tomographic findings in eyes with metastatic choroidal tumor

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ABSTRACT

Purpose: To report the swept-source optical coherence tomographic (OCT) findings in two eyes with choroidal metastases.

Observations: Two patients with choroidal metastasis were studied. The metastasis was from a breast cancer in Case 1 and from a lung cancer in Case 2. In Case 1, swept-source OCT showed a highly reflective solid tumor with low optical reflective tissues that had replaced the choroidal tissue. Swept-source OCT was able to image the choroidal mass where other fundus imaging methods such as fluorescein angiography did not show the mass. Ophthalmoscopy of Case 2 showed hemorrhages in the inner retina, on the tumor, and in the vitreous. Swept-source OCT showed a subretinal mass with a steeple-crowned cap and a ruptured Bruch's membrane on the tumor.

Conclusion and importance: Swept-source OCT imaging can detect the inner structure of a choroidal mass and retina around it in good detail.

1. Introduction

Choroidal metastases are the most frequent malignancy of the eye.[1] The most common primary site is the lung in men and breast in women.[1] The diagnosis of a choroidal metastasis is based on the clinical history, ophthalmoscopic appearance of the fundus, and images of fluorescein angiography (FA), indocyanine green angiography (ICGA), fundus autofluorescence (FAF), optical coherence tomography (OCT), and ultrasonography (US). In 66% of the patients with choroidal metastasis, there is a history of systemic cancer but the other 34% do not.[1] The appearance of the fundus and the images obtained by the different methods are very important not only for the diagnosis but also for the monitoring of the effectiveness of the therapies. Thus, it is essential to updated the findings made with new fundus imaging devices.

Many characteristics of choroidal metastasis have been obtained by time domain OCT (TD-OCT) and spectral domain OCT (SD-OCT).[2,3] Recently, new retinal and choroidal findings of choroidal metastases have been obtained by enhanced depth imaging OCT (EDI-OCT)[4,5] and swept-source OCT. Both instruments have allowed clinicians to examine the choroid in greater detail. The swept-source OCT device uses a wavelength-tunable laser and dual balanced photodetector which allows higher imaging speed, and the longer wavelengths increase the depth of imaging to include the choroid. The resolving power is 20 μm transversely, 8 μm longitudinally.[6] Francis et al. have reported the findings of a choroidal nevus using the swept-source OCT images, and they reported that certain intralesional characteristics were depicted better by swept-source OCT than EDI-OCT.[6]

There is only one case report of a choroidal metastasis examined by swept-source OCT.[7] The authors of that publication reported the results of intensity-modulated radiotherapy for a patient with choroidal metastasis using information obtained with SS-OCT. However, the characteristics of the metastasis were not presented. Other findings made by this new imaging technology have not been reported.

We have examined two cases of choroidal metastasis and determined their characteristics from the swept-source OCT images. The first case was a choroidal metastasis of a breast cancer, and the swept-source OCT findings were compared to those obtained by FA, FAF, and ICGA. The second case was a choroidal metastasis of a lung cancer, and the swept-source OCT findings of the tumor and a vitreous hemorrhage will be presented.

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2. Findings

2.1. Case 1

In 2014, a 68-year-old woman presented with blurred vision in her left eye that had developed one month earlier. She had undergone mastectomy for left breast cancer in 2006. The pathological report of the breast cancer showed that the primary lesion had adenoidal structure with mucin. Metastases to the lung and brain were treated by chemotherapy and radiation since 2010.

Our findings showed that her decimal best-corrected visual acuity (BCVA) was 1.5 OD and 0.3 OS. The other findings in her right eye were within the normal limits. The left fundus had a large yellowish elevation of the retina with many brown pigments in an area superior and superior-temporal of the optic disc. A serous macular detachment was detected (Fig. 1A). FA showed a subretinal tumor that was hyperfluorescent with hypofluorescent patches, and FAF showed the reverse pattern (Fig. 1B and C). ICGA showed the tumor as a hypofluorescent area in the early and middle phases (Fig. 1D).

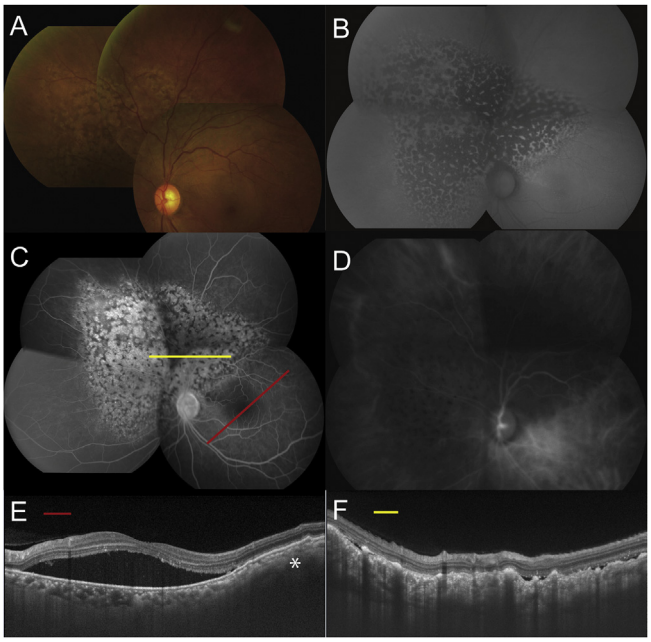

Fig. 1. Case 1. Findings in Case 1 with a choroidal metastasis from a breast cancer.

(A) Fundus photograph of the left eye showing a large yellowish elevated mass in the macular area with many brown pigment granules superior and superior-temporal to the optic disc.
(B) Fluorescein angiography (FA) shows the subretinal tumor as hyperfluorescent with hypofluorescent patches.
(C) Fundus autofluorescence images shows the reverse pattern of FA.
(D) Indocyanine green angiogram (ICGA) shows the tumor as hypofluorescent in the early and middle phases.
(E) Swept-source optical coherence tomography (OCT) shows subretinal fluid in the macular area without the choroidal tumor beneath. In the region temporal to superior-temporal to the macula where the FA and FAF images did not show any abnormalities, swept-source OCT shows that the RPE and retina are elevated with a dark optical reflective choroidal mass (*) which has pushed the large choroidal vessels upward. The retina is intact in this area in the swept-source OCT image.
(F) Swept-source OCT shows a high optical reflective solid tumor with low optical reflections which appears to have replaced the choroid in the area of the tumor. The RPE layer is not present and Bruch's membrane is partially observed. High optical reflective elevations are seen between the retina and tumor with subretinal fluid.

Swept-source OCT showed a highly reflective solid mass with low optical reflection that had replaced the choroid (Fig. 1F). The thickness of the choroid was about twice that of normal choroid, and no normal choroidal structures were seen. The retinal pigmented epithelial (RPE) layer was not detected but Bruch's membrane was partially observed. A large optical reflective mass was seen between the retina and the tumor, and it corresponded with the pigments that were seen as hypofluorescent areas in the FA images and hyper-autofluorescent in the FAF images. Subretinal fluid and an elongated and irregular photoreceptor layer with hyper-luminescent speckles were seen. The retinal structure was intact except for the changes in the photoreceptor layer. Subretinal fluid was also seen to have accumulated in the macular area away from the choroidal tumor (Fig. 1E). On the other hand, swept-source OCT showed an elevation of the RPE and retina in the area superior and superior-temporal to the macular where FA and FAF showed no abnormality. The choroid appeared as a dark optical reflective mass which pushed the large choroidal vessels upward. The small and middle size choroidal vessels were not altered, and the RPE and retina were intact in this area in the swept-source OCT images.

Unfortunately, the patient did not return for further examinations because she could still use her other eye, and she felt that her life expectancy was very short.

2.2. Case 2

A 65-year-old woman had undergone partial lung excision for a lung adenocarcinoma in 2009 and presented in our clinic in 2010 because of blurred vision. We diagnosed her with choroidal metastasis with subretinal fluid in her left eye, and she underwent systemic chemotherapy with oral Gefitinib. One month later, the subretinal fluid was not present, and the size of the tumor had decreased. The chemotherapy was reinstituted when she had a relapse in her lungs in 2012; 4 courses with Pemetrexed, Cisplatin and Bevacizumab, and 4 courses with Pemetrexed and Bevacizumab.

She noted floaters in May 2014 and returned to our clinic. Her BVCA was 1.0 OU, and the findings in her left eye were within the normal limits. The anterior segments were normal but there were many white cells in the anterior vitreous of her right eye. A high dome-shaped, yellowish-white subretinal tumor with some hemorrhages was observed in the nasal-temporal periphery of her right eye where the first choroidal metastasis was seen in 2009 (Fig. 2A). Only a small amount of subretinal fluid had accumulated in the peripheral inferior area. FA and ICGA showed the tumor as a hyperfluorescent mass in the early to late phases (Fig. 2C and D). B-mode ultrasonography showed the lesion as a dome-shaped mass (Fig. 2B). The tumor was so large that swept-source OCT could not examine all of it in detail. She was diagnosed with a local relapse of the choroidal metastasis, and chemotherapy was reinstituted with oral Gefitinib. One month later, the height of the tumor was reduced, but four months later, hemorrhages were detected in the inner retina (Fig. 3A). FA and ICGA did not detect any choroidal neovascularization (Fig. 3B and C). Swept-source OCT showed the tumor as a subretinal mass like a steeple-crowned cap (Fig. 3D), and the structure of the retina was indistinct because of the retinal hemorrhages (Fig. 3D and E). Bruch's membrane could not be identified.

She returned to our clinic nine months after starting chemotherapy because of a sudden development of blurred vision from a vitreous hemorrhage. Her BVCA in the right eye was reduced to 0.4, but B-mode ultrasonography showed no enlargement of the tumor compared to the last examination. Because of the possibility that the tumor had worsened, we decided to supplement the treatment with local external-beam radiotherapy (total 30 Gy/10 times, X ray)