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Fundus Autofluorescence Imaging and Optical Coherence Tomography Analysis of Reticular Pattern Dystrophy of the Retinal Pigment Epithelium

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Abstract: The purpose is report a case of reticular pattern dystrophy of the retinal pigment epithelium (RPE) in a 56-year-old woman with breast cancer. Images were obtained using fundus photography, fundus autofluorescence (FAF) imaging, and optical coherence tomography (OCT). The patient complained of bilateral metamorphopsia for 2 months. She underwent surgical treatment and chemotherapy for breast cancer 5 years earlier, and was receiving tamoxifen citrate (20 mg/day) for the previous 2 years. On initial examination, she had a visual acuity of 1.2 in both eyes. Ophthalmoscopy revealed bilateral, peculiar yellow-grey deposits in a reticular pattern at the RPE level. FAF imaging showed clearly defined hyperfluorescent lesions corresponding to the reticular pattern deposits, and the OCT demonstrated focal RPE thickening, called bumps. In addition, the inner segment/outer segment interface was disrupted. Based on these findings, we diagnosed our patient with reticular pattern dystrophy of the RPE. FAF and OCT were useful for demonstrating the peculiar reticular pattern and in localizing the retinal deposits in a patient with reticular pattern dystrophy of the RPE.
Keywords: Reticular pattern dystrophy, Retinal pigment epithelium, Fundus autofluorescence, Optical coherence tomography, Photoreceptor inner segment/outer segment junction, Breast cancer.

INTRODUCTION

Pattern dystrophies are a collection of uncommon disorders affecting the retinal pigment epithelium (RPE) bilaterally, predominantly at the macula [1, 2]. Each condition is characterized by specific RPE alterations; several forms have been identified, including butterfly-shaped, reticular, adult-onset foveomacularvitelliform dystrophy, simulating fundus flavimaculatus, and fundus pulverulentus [1, 2]. On fundus examination, pattern dystrophy is characterized by the accumulation of yellow, orange, or brown material at the level of the RPE, and by RPE alterations at the macular area[1, 2]. Reticular pattern dystrophy is generally diagnosed on the basis of presence of yellow macular deposits in a reticular pattern on fundus examination [1-3]. Several recent reports have described cases of reticular pattern dystrophy examined by fundus autofluorescence (FAF) and optical coherence tomography (OCT) [4, 5].

Tamoxifen citrate, an oral antiestrogen, is most commonly used as an adjuvant therapy for breast cancer [6-10]. Various ocular complications, such as lens opacity, whorl-like superficial corneal opacity, inner retinal crystalline deposition, macular edema, RPE abnormalities, and optic neuritis, have been reported in tamoxifen toxicity [6-10].

In the current report, we describe a case of reticular pattern dystrophy of the RPE mimicking tamoxifen retinopathy in a patient with breast cancer.

CASE REPORT

A 56-year-old Japanese woman was referred to our clinic for a 2-month history of bilateral metamorphopsia. She was diagnosed with breast cancer 5 years previously and treated by surgical resection and chemotherapy. She had been receiving standard-dose tamoxifen citrate (20 mg/day) for the previous 2 years, resulting in a cumulative dose of approximately 15 g. In addition, she had previously received several other medications including leuprorelin acetate, anastrozole, capecitabine, gemcitabine hydrochloride, doxorubicin hydrochloride, zoledronicacid hydrate, cyclophosphamide hydrate, and vinorelbineditartrate.

On ophthalmic examination, her visual acuity was 1.2 in both eyes, both anterior segments were normal, and the ocular pressures were normal. Ophthalmoscopy of both eyes revealed peculiar yellow-grey deposits in a reticular pattern at the level of the RPE (Fig. 1). Moreover, the reticular patterned lesions extended predominantly from the fovea toward the temporal peripheral retina. The temporal lesions exhibited a punctate pattern rather than a reticular pattern.

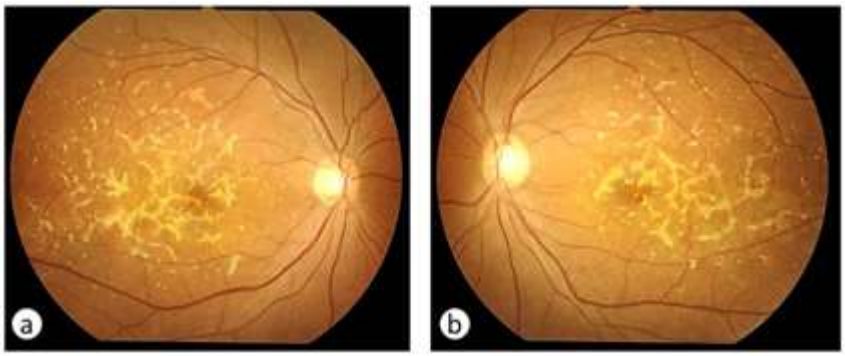

Fig.: 1 Fundus photographs of the (a) right and (b) left eyes.

Peculiar yellow-grey deposits in a reticular pattern were observed at the level of the retinal pigment epithelium (RPE).

Fundus autofluorescence (FAF; Heidelberg Retina Angiograph 2, Heidelberg Engineering, Heidelberg, Germany) imaging showed clearly defined hyperfluorescent lesions corresponding to the reticular pattern deposits (Fig. 2). Infrared FAF (IR-FAF) imaging also showed mild hyperfluorescent lesions corresponding to the reticular pattern deposits (Fig. 3).

FAF imaging shows clearly defined hyperfluorescent lesions corresponding to the reticular pattern deposits.

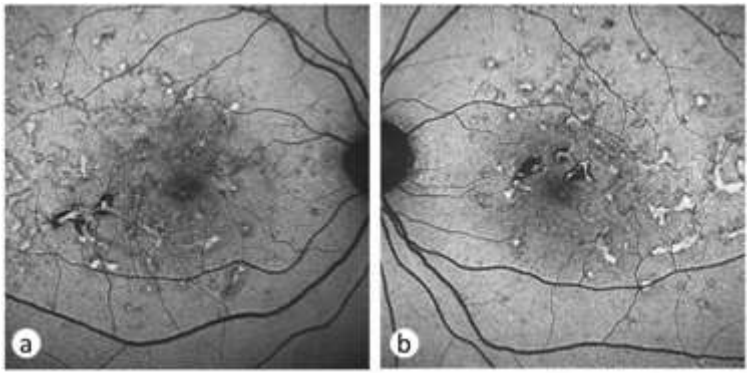

Fig. 2: Fundus autofluorescent (FAF) imaging of the (a) right and (b) left eyes

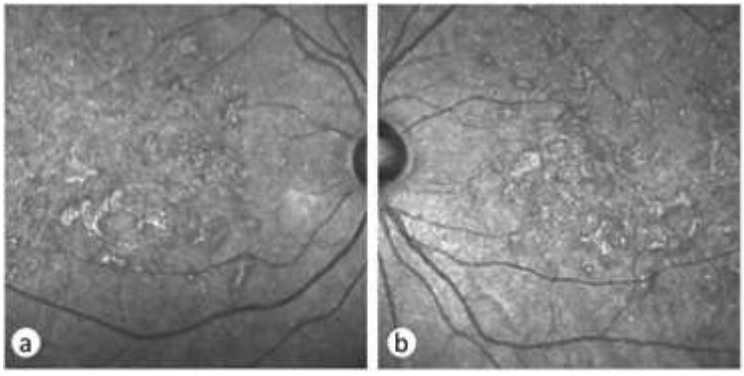

Fig. 3: Infra-red fundus autofluorescent (IR-FAF) imaging of the (a) right and (b) left eyes

IR-FAF imaging shows mild hyperfluorescent lesions corresponding to the reticular pattern deposits.

OCT (DRI OCT-1 Atlantis; TOPCON, Japan) demonstrated focal thickening of the RPE, called bumps (Fig. 4, arrowheads), and the inner segment/outer segment (IS/OS) interface was disrupted (Fig. 4, arrows). The material was located above the RPE and resulted in the absence of the IS/OS interface.

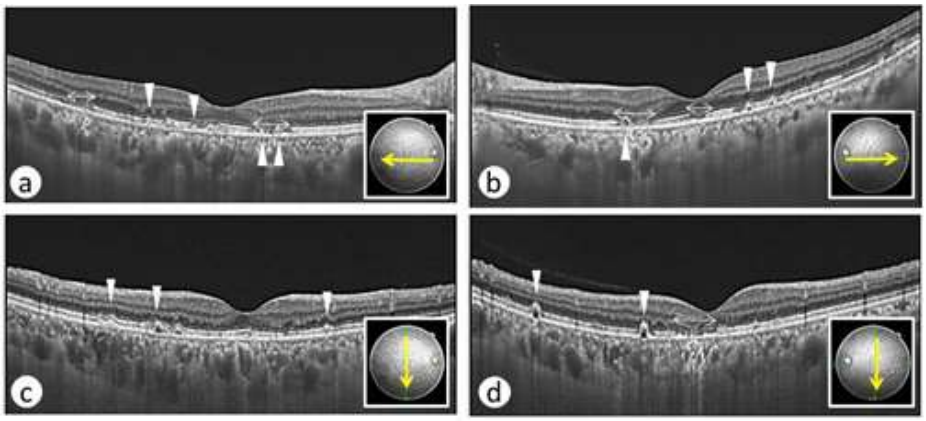

Fig. 4: Optical coherence tomography (OCT) images of the (a, c) right and (b, d) left eyes in horizontal (a, b) and vertical (c, d) directions (insets). OCT shows focal thickening of the RPE, called bumps (arrowheads), and disruption of the inner segment/outer segment (IS/OS) interface (arrows).

The visual field was normal on Goldmannperimetry and electroretinogram examinations. The visual findings did not change during the 6-month follow-up period. Based on these collective findings, we diagnosed our patient with reticular pattern dystrophy of the RPE.

DISCUSSION

Peculiar yellow-grey deposits in a reticular pattern were observed at the level of the RPE in this patient. According to a previous report, pigment granules accumulate at the fovea in the initial stage of disease [3]. A network gradually forms around the central accumulation and extends toward the peripheral retina. In more advanced cases, the shape of the network becomes irregular, and in still later stages, the pigment disappears gradually. In the present case, the reticular pattern deposits extended predominantly from the fovea toward the temporal peripheral retina. In addition, the temporal lesions exhibited a punctate pattern rather than a reticular pattern. Therefore, we considered these findings indicative of an advanced stage of disease.

Several reports have described the use of OCT and FAF for identifying retinal abnormalities in patients with reticular pattern dystrophy [4, 5, 13]. In the largest case series of reticular pattern dystrophy, Zerbib *et al*. [4] analyzed the retinal features of 13 patients using spectral-domain OCT. According to their report,in the foveal area, the RPE was normal in 45.5% of eyes, but small RPE elevations and RPE bumps were detected in 31.8% and 22.7% of eyes, respectively. In addition, the OCT scans showed disruption of the IS/OS junction in 54.6% of eyes, slight elevation in 59.1% of eyes, and absence in 45.5% of eyes. The outer limiting membrane appeared disrupted in 50.0% of eyes, absent in 22.7% of eyes, and elevated in 63.6% of eyes. Furthermore, accumulation of hyperreflectivesubretinal material and hyporeflectivesubretinal lesions in the retrofoveolar region were detected in 70% and 20% of eyes, respectively.On FAF, Zerbib *et al*. [4] described hyper-autofluorescence of the reticular material deposits, and near-infrared reflectance indicated that the reticular lesions were hyperreflective. Their findings are very similar to the results in the present case.

In the present case, the differential diagnosis included other peculiar retinal dystrophies such as Stargardt disease, adult-onset foveomacularvitelliform dystrophy, and tamoxifen retinopathy.

Patients with Stargardt disease exhibit central macular atrophy and yellow-white flecks at the posterior pole, primarily at the RPE level [13, 14]. It is generally characterized by hypofluorescent central macular lesions, which indicate chorioretinal atrophy, and flecked hyperfluorescence on FAF [13, 14]. Although foveal-sparing forms of Stargardt disease have been reported [15, 16], the reticular pattern deposits demonstrated in this case were not considered compatible with Stargardt disease. In adult-onset foveomacularvitelliform dystrophy, FAF is able to detect small amounts of vitelliform material, which are predominantly increased on FAF and decrease in later disease stages [13, 17, 18]. The material is thought to be located above the RPE [17, 18], and is prominent within the retinal layers, either hypo- or hyperreflective, likely depending on the disease stage. The material has been described as dome-shaped, with a shell surrounding the vitelliform lesion, and is often heterogeneous with clumps observed in the retinal layers [17, 18]. On OCT, the material in reticular pattern dystrophy appears different from that in adult-onset foveomacularvitelliform dystrophy [4, 5]. The material deposits are less prominent, and in most cases, the reflectivity is homogenous and hyperreflective. Heterogeneity and empty zones are rarely found in reticular pattern dystrophies, in contrast to adult-onset foveomacularvitelliform dystrophy [4]. In adult-onset foveomacularvitelliform dystrophy, the IS/OS junction is described as highly reflective with a shell-like

structure surrounding the vitelliform material [17]. This structure is not seen in reticular pattern dystrophy [4]. In the present case, OCT was used to examine the material deposits and alterations in the RPE and outer retinal layers. The lesions exhibited specific features distinct from those in other macular dystrophies.

Tamoxifen retinopathy is characterized by the presence of fine white refractile superficial opacities [6-10]. The material is concentrated in the macula, and cystoid macular edema (CME) may be present. The crystalline retinal deposits are classically confined to the nerve fiber and inner plexiform layers, and are hypothesized to represent areas of axonal degeneration [6]. Recently, OCT imaging was employed to localize the crystalline deposits to the inner retina [11, 12], which was also reported previously in a histopathologic analysis [6]. The presence of cavitary spaces or pseudocysts in the central macula in patients without typical CME has also been documented using spectral-domain OCT [11, 12]. However, in the present case, peculiar reticular pattern deposits were located at the RPE level, and pseudocystic lesions were absent. Generally, the toxic effects of tamoxifen appear to be dose-related and are less commonly seen in patients receiving lower-dose therapy for breast cancer [7-10]. In the largest series of patients receiving tamoxifen over a 3-year period, Tang *et al*. [10] demonstrated only three cases of retinal changes among 274 patients, resulting in an incidence of 0.9% and a 3-year cumulative dosage of less than 23.7 g. Our patient was receiving 20 mg daily and had a 2-year cumulative dosage of approximately 15 g, which is within the recommended dose. Therefore, we considered the lesions in our patient to be distinct from those observed in tamoxifen retinopathy.

Our findings were based on a single case; additional studies including long-term follow-up, additional cases and genetic examination are necessary to definitively characterize the changes that occur in reticular pattern dystrophy.

CONCLUSION

In conclusion, FAF and OCT were useful in visualizing peculiar reticular pattern lesions and in localizing retinal deposits in a patient with reticular pattern dystrophy of the RPE.

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