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SHORT COMMUNICATION

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Concentric retinal pigment epithelium atrophy after a single photodynamic therapy

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Abstract *Purpose:* To report a case with concentric retinal pigment epithelium (RPE) atrophy after a single photodynamic therapy (PDT). *Methods:* We report a case of a 33-year-old female patient who developed RPE atrophy after a single standard PDT for treatment of a juxtafoveal, predominantly classic choroidal neovascularization (CNV). *Results:* After a single PDT treatment, visual acuity increased from 20/50 to 20/20. Six weeks after PDT, a concentric area of RPE atrophy was clearly visible on fluorescein angiogram. This circular area corresponded to the 3500 μm diameter of the laser spot used in the PDT treatment. The visual acuity and the RPE atrophy remained stable over the follow-up period of 3 years. *Conclusions:* We are unable to explain the exact mechanism of the observed RPE changes; however, they did not lead to loss of visual acuity. Different reasons for the RPE atrophy such as collateral damage of the choriocapillaris with a subsequent secondary RPE atrophy, a direct photochemical effect due to the early localization of the photosensitizer in the RPE, or a depigmentation or photobleaching of the RPE, which led to a window defect in the fluorescein angiogram without loss of the major functional properties of the RPE, are possible mechanisms involved in the development of the documented lesion.

Case report

We report a case of a 33-year-old female patient who developed retinal pigment epithelium (RPE) atrophy after a single photodynamic therapy (PDT) for treatment of a secondary juxtafoveal, predominantly classic choroidal neovascularization (CNV). The patient presented with metamorphopsia and a recent loss of visual acuity in her left eye. Visual acuity at this time was 20/50 and the clinical examination showed a maculopathy with macular edema (Fig. 1a) and two unrelated areas of depigmentations at the posterior pole.

Fluorescein angiogram revealed a juxtafoveal predominantly classic CNV with small retinal bleedings. In the late phase of the angiogram, an increasing leakage from the classic CNV could be observed. This area was surrounded by a faint hyperfluorescence, which probably represents a partially organized RPE detachment (Fig. 1b, c).

There was no history of any other eye or general diseases and the patient had not lived in an area where histoplasmosis is endemic. Despite the fact that no inflammatory cells in the vitreous could be observed, the differential diagnosis included multifocal choroiditis, punctate inner choriodopathy (PIC) or idiopathic CNV.

The underlying condition could not be fully clarified but the presence of an active CNV with leakage was obvious. Because the lesion was located very close to the center of the fovea, PDT as opposed to thermal laser was selected as a treatment.

We performed a single PDT with Verteporfin (Visudyne®) and used the standard parameters of 10 min intravenous infusion of 6 mg Verteporfin per square meter of body surface in glucose solution, a laser wavelength of 689 nm at 50 J/cm^2, a light intensity of 600 mW/cm^2, an exposure time of 83 s and a spot size with a diameter of 3500 μm. The light energy was applied using a contact lens (Area centralis, Volk, USA).

Six weeks after PDT, the macula edema had resolved and the visual acuity improved to 20/20. No metamorphopsia had been noted by the patient at this time or at any other follow-up visit. The fundus photograph (Fig. 2a) showed a subretinal fibrosis and pigmentation at the site of the previous CNV. The fluorescein angiogram (Fig. 2b, c) showed no leakage of the previous CNV, but a concentric area of hyperfluorescence, which represented RPE atrophy, was clearly visible. This circular area corresponded to the 3500 μm diameter of the laser spot used in the PDT treatment.

The subsequent follow-up examinations, as well as the last examination 3 years after treatment, showed a stable visual acuity

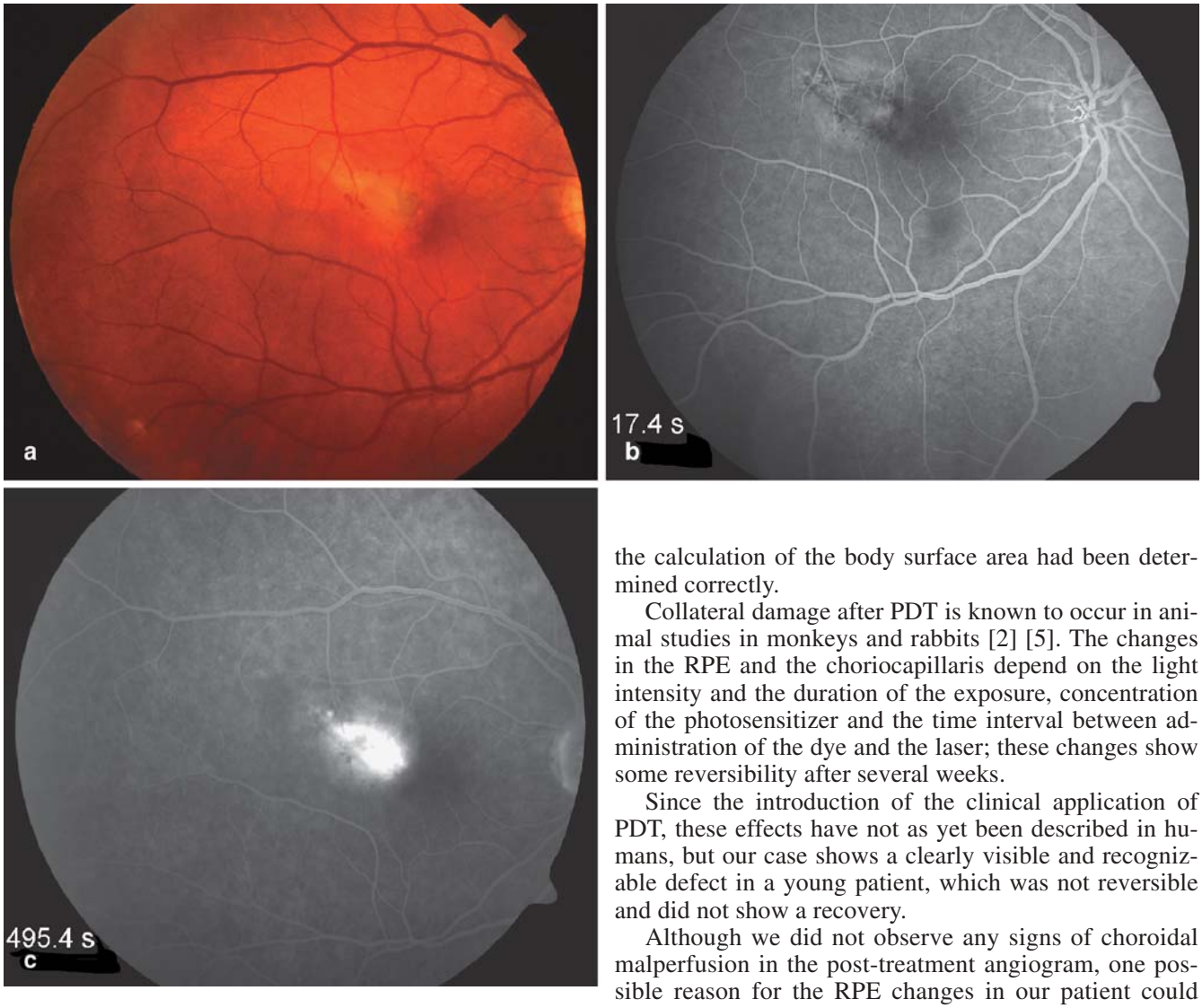

Fig. 1 Fundus photograph and fluorescein angiogram revealed a juxtafoveal, predominantly classic CNV with retinal bleedings (**a**) and with leakage in the late phase (**b**). This area was surrounded by a faint hyperfluorescence, which could represent a partially organized RPE detachment. Visual acuity was 20/50 at this time

of 20/20 without any visual complaints. The circular area of retinal pigment epithelial atrophy remained stable in size (Fig. 3a, b). The patient refused any further examination. Therefore, autofluorescence, static perimetry and multifocal ERG, which might be helpful, could not be obtained.

Discussion

We cannot fully explain why the RPE changes are so pronounced in this patient. A technical malfunction could be excluded, and the concentration of the dye and all time and laser settings were accurate at the time of the treatment. The weight and length measurements and the calculation of the body surface area had been determined correctly.

Collateral damage after PDT is known to occur in animal studies in monkeys and rabbits [2] [5]. The changes in the RPE and the choriocapillaris depend on the light intensity and the duration of the exposure, concentration of the photosensitizer and the time interval between administration of the dye and the laser; these changes show some reversibility after several weeks.

Since the introduction of the clinical application of PDT, these effects have not as yet been described in humans, but our case shows a clearly visible and recognizable defect in a young patient, which was not reversible and did not show a recovery.

Although we did not observe any signs of choroidal malperfusion in the post-treatment angiogram, one possible reason for the RPE changes in our patient could be a simultaneous closure of the CNV and damage of the choriocapillaris with a subsequent secondary RPE atrophy in the treated area. Histological examinations of human eyes after experimental PDT have revealed such a dose dependent effect on choroidal vessels and the RPE [4] [6]. When treatment was performed with 100 J/cm^2, a more pronounced obliteration of the choriocapillaries and a focal vacuolar degeneration of the RPE had been observed. However, the RPE did not show any abnormalities at the clinically used dose of 50 J/cm^2.

Another reason for the damage of the RPE could be a direct photochemical effect due to the early localization of the photosensitizer Verteporfin in the RPE, which was shown in animal studies [1].

As the clearly visible RPE atrophy did not lead to visual complications 3 years after treatment, another explanation for these findings could be a depigmentation or photobleaching of the RPE, which led to a window de-

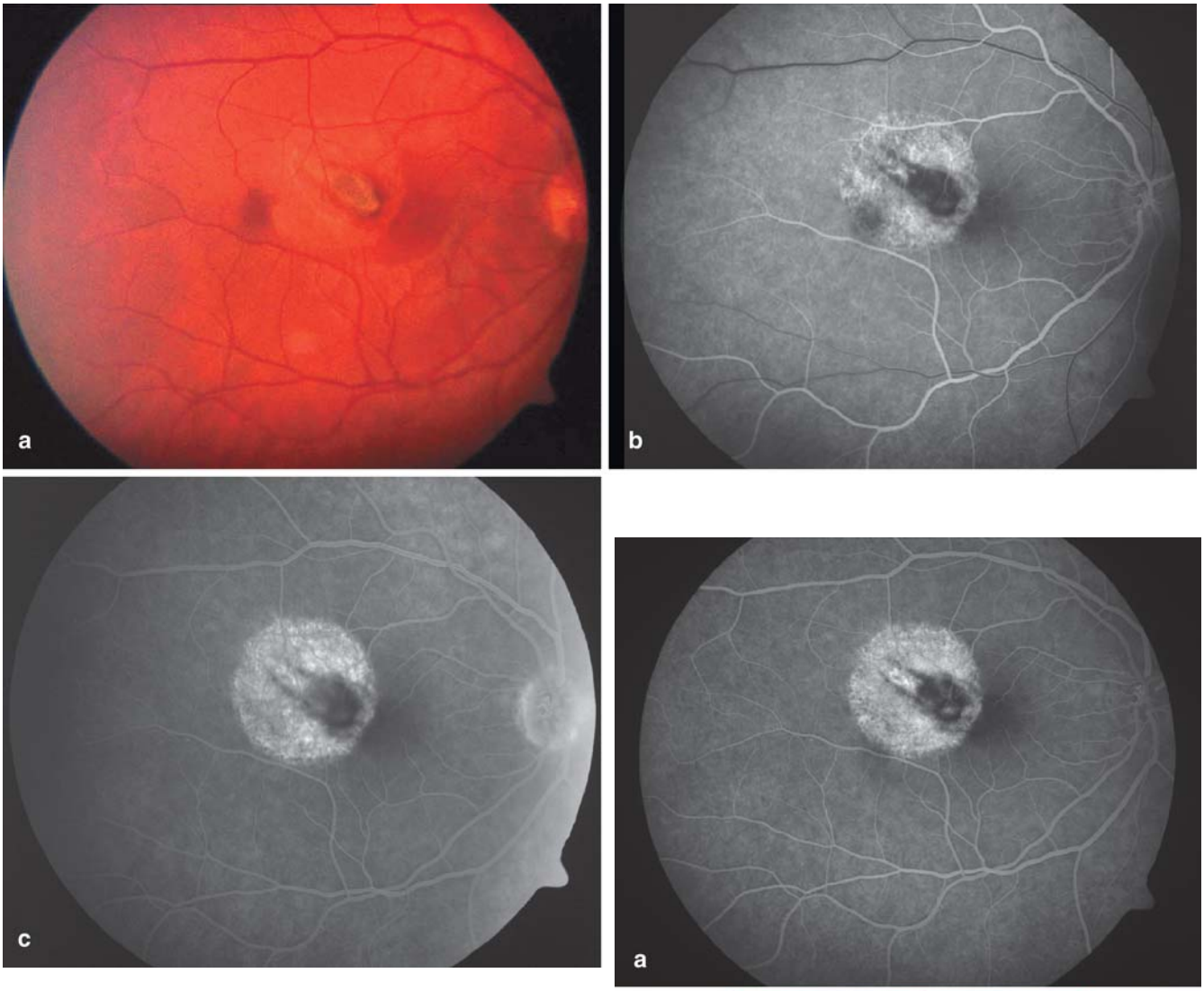

Fig. 2 Six weeks after PDT, the fundus photograph (**a**) shows a subretinal fibrosis and pigmentation at the border of the previous CNV. Visual acuity was 20/20 and the angiogram (**b, c**) shows a concentric area of hyperfluorescence, which represents retinal pigment epithelial atrophy without leakage, corresponding to the 3500 μm diameter of the laser spot used in the PDT treatment.

fect in the fluorescein angiogram, without loss of the major functional properties of the RPE.

In summary, we are unable to explain the exact mechanism of the observed RPE changes, but experimental data [3] suggest that other factors such as ocular pigmentation, intraocular pressure and region of treatment may influence PDT results. Further experience with PDT and experimental research will provide further insight into other factors that may affect the results and the outcome after PDT.

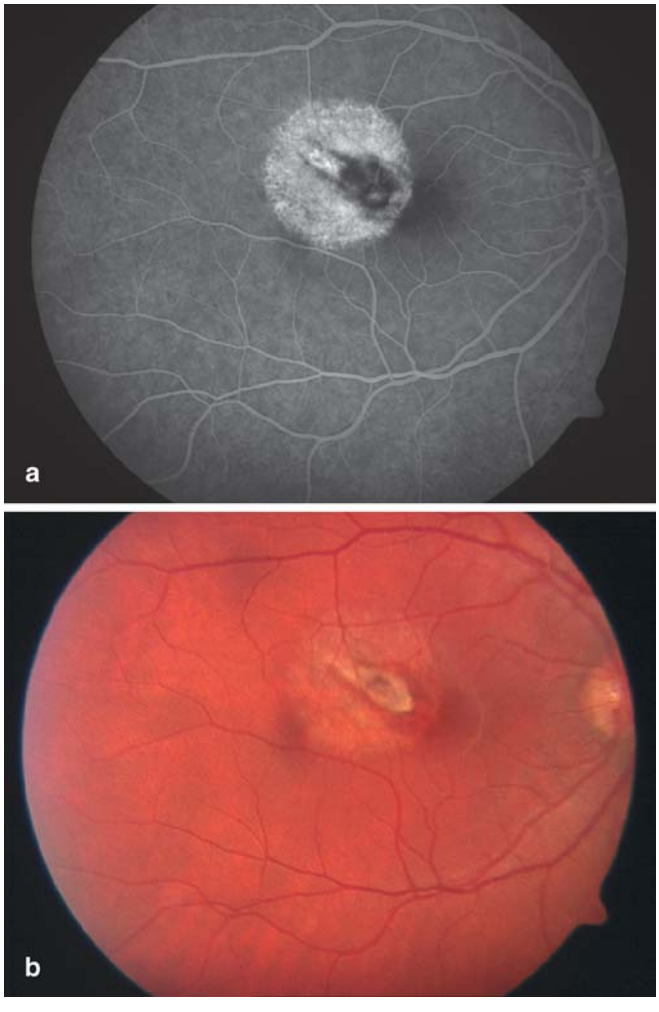

Fig. 3 Fluorescein angiogram 2 years after PDT (**a**) and last examination 3 years after PDT (**b**). Visual acuity was still 20/20. The circular area of RPE atrophy remained stable in size

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