Thieme

Bacillary Layer Detachment (BALAD) in Macular Choroidal Metastasis of a Low-grade Rectal Adenocarcinoma

Bazilläre Schichtablösung (BALAD) in einer makulären Aderhautmetastase eines niedriggradigen rektalen Adenokarzinoms

Introduction

Choroidal metastases are the most common intraocular malignant tumors in adults [1]. Because of its large vascular network, the choroid is the most frequently involved ocular layer. The majority of patients with choroidal metastasis have been previously diagnosed with systemic cancer. In one-third of the patients, the choroidal metastasis is found before the primary tumor [1]. Breast (45%) and lung cancer (25%) are the most common primary neoplasms [1]. The gastrointestinal tract (4%), in particular, the rectum (< 0.5%), is an unusual site of origin [1, 2].

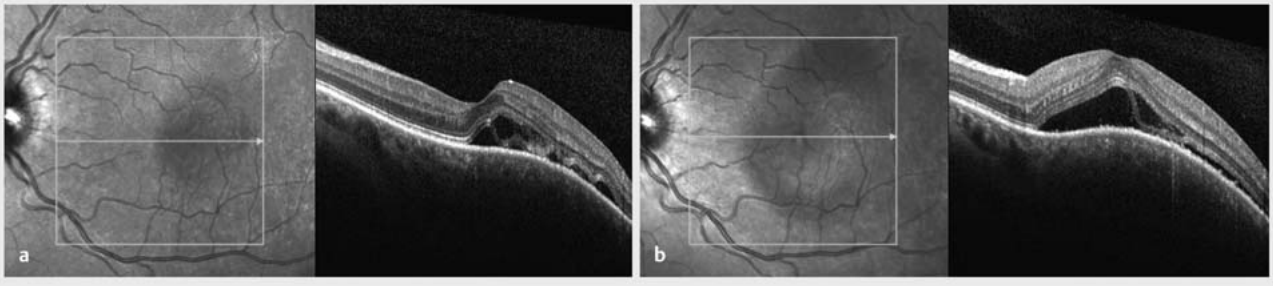
Management of choroidal metastases is an emergency and requires close multidisciplinary teamwork, often involving radiation therapy, to avoid blindness and neovascular glaucoma because of total retinal detachment secondary to rapidly growing tumors. Multimodal imaging in the ophthalmic workup of these patients is essential, and optical coherence tomography enhanced depth imaging (OCT-EDI) has become an important tool in ocular oncology, especially in macular tumors.

Bacillary layer detachment (BALAD) is a novel OCT terminology and is defined as a split at the level of the photoreceptor inner segment myoid, creating a distinct intraretinal cavity [3]. The photoreceptor inner segments are divided into two parts: the proximal myoid, near the external limiting membrane, and the distal ellipsoid zone (near the outer segment) [3]. The first OCT description of BALAD was made by Maruyama and Kishi [3] in a series of 21 patients with Vogt-Koyanagi-Harada (VKH) disease as "intraretinal fluid accumulation in the outer retina". Rhamtohul et al. proposed a novel acronym "BALAD" (BAcillary LAyer Detachment) [3].

Case Report

A 35-year-old woman, with a recent diagnosis of low-grade rectal adenocarcinoma, complained of a rapidly progressive scotoma in the left eye (LE). At presentation, best-corrected visual acuity (BCVA) was 1.0 in both eyes. The anterior segment was unremarkable with a normal intraocular pressure on both sides. On fundus examination (LE), a nonpigmented lesion occupied the posterior choroid. Macular B-scan OCT revealed a slight choroidal bulging with subretinal and intraretinal fluid between the inner photoreceptor segments and the ellipsoid layer, evocative of a "bacillary layer detachment", which increased within 5 days (▶ **Fig. 1 a, b**). The patient was referred to the Ocular Oncology Unit with the suspicion of a choroidal metastasis. Nine days following the initial examination, BCVA had dropped to 0.5 (LE). On B-scan OCT, a rapid growth of the macular tumor could be observed. While the secondary retinal detachment had increased, the bacillary layer was completely reattached (▶ **Fig. 2 a, b**). The tumor height was 2.1 mm on 20 MHz B-scan ultrasonography (▶ **Fig. 2 c**). On fluorescein angiography, multiple pinpoints were present at the surface of the lesion, surrounded by subretinal fluid (▶ **Fig. 2 d**). On panoramic indocyanine green angiography (ICG-A) (HRA 150°), the tumor provoked a masking defect, without evidence of any other lesions (▶ **Fig. 2 e**). The clinical suspicion of a single choroidal metastasis was confirmed.

Trans-vitreal biopsy was contraindicated due to the macular localization. A total body PET-CT (positron emission tomography–computed tomography) scan found no primary neoplasia other than the known rectal tumor, but revealed two liver metastases, compatible with the diagnosis of an oligometastatic rectal cancer, with a single choroidal metastasis. Stereotactic radiation therapy of the left posterior



▶ **Fig. 1** Macular B-scan OCT reveals a choroidal bulging, subretinal fluid, and a detachment between the inner segments of the photoreceptors and the ellipsoid layer, termed "bacillary layer detachment (BALAD)", at presentation (**a**), which increased over the 5 following days (**b**).

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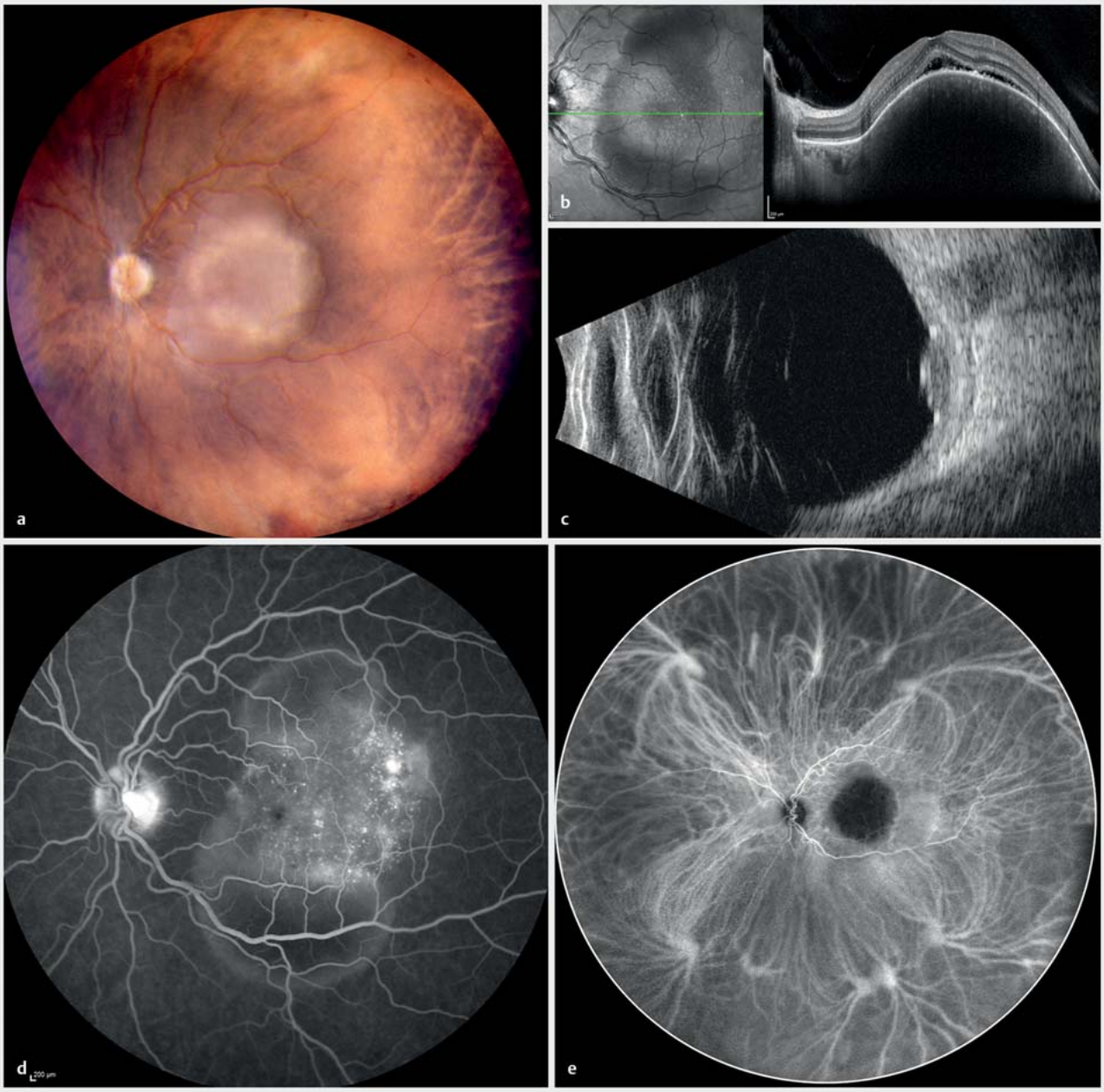
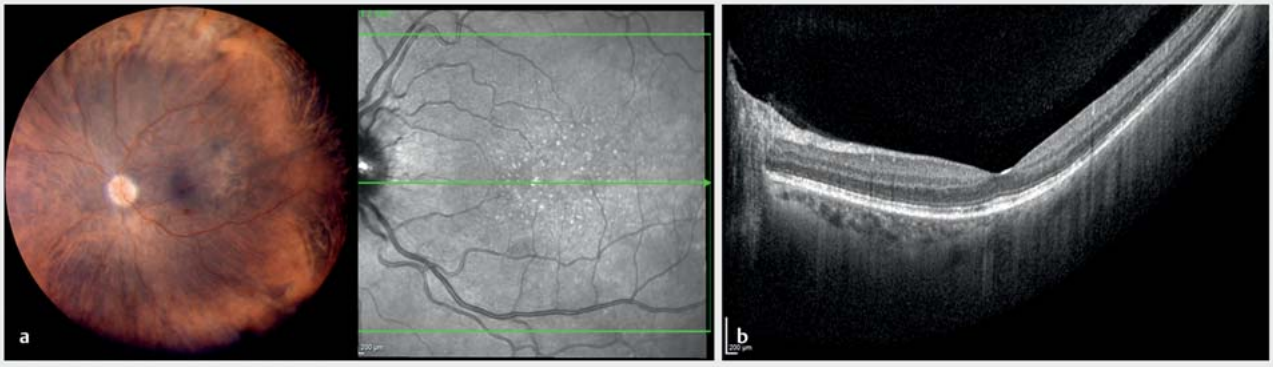


▶ **Fig. 2** **a** Panoramic color fundus picture (Panoret-1000 camera) illustrating a nonpigmented lesion within the posterior choroid. **b** Nine days following initial presentation, macular B-scan OCT documents a further increase of the choroidal tumor, the resolution of the bacillary layer detachment, and a progressive retinal detachment. **c** On 20 MHz B-scan ultrasonography, the tumor height is 2.1 mm. **d** On fluorescein angiography, multiple pinpoints are present at the surface of the lesion, surrounded by subretinal fluid. **e** On panoramic ICG-A (HRA 150°), the tumor provokes a masking defect, without evidence of any other lesions.

choroid was initiated (10 × 3 Gy) 3 days later, immediately followed by neo-adjuvant chemo-immunotherapy (type FOLFIRINOX + Avastin) in view of later surgery of the primary tumor and its remaining metastases. Three months later, BCVA had recovered to 1.0 (LE), with a flat tumor scar in the fundus (▶ **Fig. 3 a, b**).

Discussion and Conclusion

Adenocarcinoma is the most common histological type of colorectal cancer (95%), 20% of them being metastatic at diagnosis. Ocular metastases are most frequently choroidal, are either unilateral or bilateral, and represent approximately 4% of the colorectal cancer metastasis sites [4]. The age of our patient lies within the younger range (30–79 years) of these patients, of whom about two-thirds are men, with an average age of 54 years [5]. Colorectal cancer, mainly rectal cancer, is showing a tendency to increase in the young population, possibly due to obesity, diet, and a



▶ **Fig. 3** On the panoramic color fundus picture (**a**) and macular B-scan OCT (**b**), a flat tumor scar can be seen, 3 months following stereotactic radiation therapy.

lack of screening in these age groups [6]. Once choroidal metastases are diagnosed, the vital prognosis of these patients becomes unfavorable, with a mean survival time of less than 6 months (1–12 months) [5]. In consequence, visual prognosis following radiation therapy will mainly depend upon the initial damage to the macula by both the choroidal metastasis and secondary retinal detachment. Radiation-induced side effects such as optic neuropathy and maculopathy tend to appear after at least 1 to 2 or even after several years, i.e., after the currently expected survival time of these patients. Once targeted therapies or immunotherapy will hopefully improve their vital prognosis, one could imagine using intravitreal anti-VEGFs (vascular endothelial growth factors) in analogy to the current treatment of radiation-induced maculopathy in uveal melanoma [7].

Our case illustrates the importance of multimodal imaging in the ophthalmic workup of patients with choroidal metastases. Panoramic color fundus photography, using scleral transillumination, remains unparalleled with regard to its color reproduction of unpigmented choroidal tumors [8]. Panoramic ICG-A allows for screening of the entire bilateral choroid for lesions invisible on fundus examination [9]. B-scan ultrasonography remains the gold standard to determine the tumor's thickness and shape [1].

OCT-EDI is a highly sensitive tool for confirming the diagnosis and enabling monitoring of very small choroidal metastases [9]. Most choroidal metastases are localized posterior to the equator, making OCT imaging easy to perform [10]. It has been suggested that 20% of choroidal metastases are visible only on OCT-EDI [9]. OCT-EDI may show a "lumpy bumpy" surface of the choroidal metastasis in 64% of cases, with thickening of the retinal pigment epithelium (RPE) (78%) and subretinal fluid (86%). A hyperintense irregularity of the photoreceptor layer ("shaggy photoreceptors") can also be observed. Compression of the choriocapillaris is found in 93% of cases [10].

In our patient, early OCT-EDI revealed a bacillary layer detachment, which resolved spontaneously over 9 days, without treatment. BALAD has been identified in inflammatory and, more rarely, infiltrative lesions, where the choroidal thickening decreases the perfusion of the outer retina [3, 11]. Rhamtohul et al. identified 22 etiologies, all associated with subretinal exudation, including VKH disease (47%), acute posterior multifocal placoid pigment epitheliopathy (11%), sympathetic ophthalmia (7.3%), choroidal neovascularization (6.2%), and others, including choroidal metastasis from lung and breast carcinoma (1.8%) [3, 12]. The presence of a BALAD in metastatic disease might be a witness of its inflammatory component.

Rhamtohul et al. postulate that BALAD occurs when outwardly directed forces, promoting the attachment of photoreceptor outer segments to the RPE, exceed the tensile strength of the photoreceptor inner segment myoid. The main pathophysiological mechanism in the BALAD genesis is comparable with that of exudative retinal detachment, involving a breakdown of the RPE outer blood-retina barrier [3]. Subsequently, a progressive restoration of the ellipsoid zone and then the interdigitation zone is observed, providing evidence that injured photoreceptors may show some degree of spontaneous inner and outer segment regeneration [3].

In conclusion, we present a rare case of solitary choroidal metastasis from a rectal adenocarcinoma in a young female, illustrating the importance of multimodal imaging in the ophthalmological workup, requiring emergency treatment with stereotactic radiation therapy, and with, to our knowledge, the first description of an associated BALAD on OCT in a choroidal metastasis originating from a primary gastrointestinal carcinoma.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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