roid, corticosteroid, and sex hormone deficiencies). Radiation therapy greatly increases the lifelong risk of secondary malignant neoplasms (glioblastoma multiforme, malignant astrocytoma, meningioma, bone and soft-tissue sarcoma, and malignant melanoma) in children with TRB who are already predisposed to secondary cancers owing to their germline RB1 mutations. 

Treatment of TRB using the Toronto Protocol and intrathecal topotecan combined with cytarabine, followed by consolidation with autologous peripheral stem cell transplant after supralethal chemotherapy avoids the need for radiation therapy and, in some instances, extends survival.

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Acute Macular Outer Retinopathy (AMOR): A Reappraisal of Acute Macular Neuroretinopathy Using Multimodality Diagnostic Testing

Acute macular neuroretinopathy (AMNR) is a rare retinal condition that features the sudden onset of bilateral central scotomata, which may be preceded by a viral prodrome in some patients. Acute macular neuroretinopathy may be difficult to diagnose because of the subtle or even absent findings on funduscopic examination and fluorescein angiography. Bos and Deutman initially described AMNR in 4 patients with paracentral scotomata, slightly decreased visual acuity, and reddish, wedge-shaped intraretinal lesions directed toward the fovea. Because of the acute onset of the symptoms and based on their theory that the more superficial layers of macular retina were involved, the term AMNR was adopted.

Herein, we describe 2 patients with features of AMNR in whom Amsler grid testing, infrared imaging, spectral-domain optical coherence tomography (SD-OCT), fundus autofluorescence, and multifocal electroretinogram (mfERG) were useful in characterizing the precise structural and functional deficits of this condition. The localization of structural deficits to the outer retina and photoreceptor layer using SD-OCT and evidence of depressed cone amplitudes using mfERG in both patients were more consistent with photoreceptor and outer retinal dysfunction. Hughes et al previously reported 2 cases of AMNR that featured outer retinal structural changes using SD-OCT. The functional and anatomic deficits observed in our patients using multimodality diagnostic testing, combined with the previous structural characterization of AMNR,2,3 are supportive of the proposed nomenclature acute macular outer retinopathy (AMOR) to more accurately describe this unique clinical entity.2
Report of Cases. Case 1. A 24-year-old woman had severe fatigue, headaches, and intermittent photopsias, followed by bilateral central scotomata 1 week later.

Visual acuities were 20/25 OD and 20/20 OS. Amsler grid testing showed a well-defined boot-shaped scotoma in the right eye and a wedge-shaped scotoma in the left eye (Figure 1). Color vision with Ishihara plate testing was normal in both eyes. No relative afferent pupillary defect was seen. Slitlamp examination showed no anterior chamber or vitreous cells. Dilated funduscopic examination and fluorescein angiography were unremarkable.

Infrared imaging showed a well-defined boot-shaped image in the right eye and a wedge-shaped image in the left eye, which corresponded precisely to the scotomata defined by Amsler grid testing. Fundus autofluorescence imaging showed subtle hypoautofluorescence corresponding to these affected areas. The mfERG showed subnormal amplitudes of the central responses with normal implicit times consistent with a regional abnormality of local retinal responses in the form of central cone dysfunction (Figure 1). Spectral-domain optical coherence tomography showed thinning of the photoreceptor outer segments and irregularities of the outer retinal architecture (Figure 2). Fluorescein and high-speed indocyanine green angiography were unremarkable. The findings were most consistent with AMNR and no treatment was recommended.

At the final follow-up visit 4 months later, the patient’s symptoms were improved and visual acuities were 20/20 OU. Funduscopic examination showed brown discoloration of the parafoveal region and mild retinal pigment epithelial irregularities, which were more prominent than the findings on initial examination. Spectral-domain optical coherence tomography showed persistent abnormalities of the outer retina.

Case 2. A 17-year-old healthy girl had fevers and flulike symptoms for 3 days followed by visual photop-
sias and 2 discrete shadows in the left eye. She was asymptomatic in the right eye.

Visual acuities were 20/20 OU. Amsler grid testing showed 2 areas of visual blur; both areas were temporal to the fovea in the left eye. No relative afferent pupillary defect was observed. The anterior segment examination was unremarkable in both eyes. Dilated funduscopic examination was normal in the right eye. A subtle, slightly abnormal foveal reflex was seen in the left eye, but the funduscopic examination was otherwise unremarkable.

The infrared reflectance image highlighted 2 discrete abnormal images nasal to the fovea, which corresponded precisely to the patient’s scotomata (Figure 3). Spectral-domain optical coherence tomography revealed attenuation of the inner segment–outer segment junction in the abnormal parafoveal area identified by infrared imaging. A fluorescein angiogram showed subtle hyperfluorescence in these areas in the late frames of the angiogram. The mfERG showed subnormal amplitudes of the cone responses in the left eye to a greater degree than that observed in the right eye, with normal implicit times. At the 4-month follow-up, the patient’s symptoms remained stable. Her visual acuities were 20/20 OU and the funduscopic lesions in the left eye were more easily seen than on her prior examination. Specifically, there were 2 reddish-brown lesions nasal to the fovea, similar in size and character to the images previously seen by infrared imaging (Figure 4).

Comment. Our patients’ characteristic histories, clinical features, and findings were most consistent with the entity described as AMNR.1,3 Recent reports have suggested that infrared imaging is valuable in highlighting the macular lesions of AMNR3,4 and SD-OCT has facilitated identification of the anatomical abnormalities present.2,5

In our 2 patients, multimodality diagnostic testing allowed a precise diagnosis of AMNR and provided additional insight into the disease process. Infrared imaging and SD-OCT provided information about the structural defects corresponding to the patients’ scotomata. Fundus autofluorescence showed subtle areas of hypoautofluorescence in both patients. Although these changes were not as prominent as the infrared and SD-OCT abnormalities, the re-
Regional decrease in intrinsic tissue autofluorescence suggested pathologic changes at the level of the retinal pigment epithelium and possibly involving the outer retina. The additional use of mFERG highlighted the functional deficits of these patients despite better than 20/25 visual acuity. Specifically, bilateral reduction of central responses of outer retinal origin with normal implicit times was identified in both patients. This was especially helpful in identifying abnormal photoreceptor function in the asymptomatic eye of patient 2.

Our findings are consistent with prior reports of outer retinal architectural changes observed with SD-OCT in AMNR.2,5 The addition of mFERG to precisely identify cone photoreceptor dysfunction provided a correlation of a functional deficit to the structural changes observed in the outer retina. Although we did not identify a choroidal or retinal vascular perfusion defect by fluorescein angiography or indocyanine green angiography testing, focal hypofluorescence in the region of the macular lesions was observed on fluorescein angiography of patient 2. This could represent inner choroidal ischemia or blockage of choroidal fluorescence from a focal inflammatory accumulation with resultant overlying outer retinal architectural disruption.

The term AMNR was originally applied to this condition because of the acute onset of presentation and the theory that the superficial macular retina was involved; given our observations correlating functional and structural aspects of this disease, the term acute macular outer retinopathy may be more appropriate.

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