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Serous Maculopathy Due to Aspecific Choroidopathy (SMACH)

Macular serous subretinal fluid (SRF) has a broad differential diagnosis.[1] Despite the fact that establishing a diagnosis may be challenging, the differentiation of causes of serous maculopathy is important in terms of therapeutic and prognostic consequences.[1] In this paper, we describe 3 patients (Fig. 1, Supplementary Digital Content Figs. 1, 2, http://links.lww.com/APJO/A206) with a serous maculopathy due to a striking aspecific choroidopathy (thickening and hyperreflective changes), which we named serous maculopathy due to aspecific choroidopathy (SMACH). Moreover, in these patients, changes in the retinal pigment epithelium (RPE) were parallel with the choroidal irregularity, with focal hyperplastic and hyperpigmented areas. Remarkably, neither drusen nor a choroidal neovascularization could be detected on multimodal imaging. Focal leakage on fluorescein angiography was absent as well.

Over time, the SRF in SMACH and the visual acuity in these patients have been found to be relatively stable. A relative equilibrium has been hypothesized to be reached in this disease, despite the physical and functional separation of the photoreceptors and adjacent layers, and molecular exchange between the neuroretina, RPE, and the choroid within the closed SRF compartment may still take place in that pathological situation.[1] Moreover, an alternative intraretinal visual cycle between the Muller cells and cone photoreceptors may support the function of these cells in SMACH patients.[2]

The cause of SMACH is currently not clear, but the disease most probably originates in the choroid, and therefore has features that overlap with diseases that are part of the pachychoroid spectrum. Choroidal abnormalities may be congenital, with progression on aging. However, abnormalities may also develop later in life due to an unknown cause. The SRF leakage may be due to increased hydrostatic pressure from the abnormal, thickened underlying choroid. Moreover, dysfunction of the RPE's pumping function may contribute to the persistence of SRF with no clear focal leakage, as focal hyperplastic and hyperpigmented areas have been found in that tissue.[1] An atypical staphylomatous component (seen in the case of patient 3) might also contribute to the pathogenesis of SMACH, due to which choroidal blood flow changes (choroidal turbulence) can occur.[3] The fact that we observed certain variants of choroidal folds in all 3 patients that were included in this paper, may indicate that ocular (choroidal) developmental anomalies may be important in the origin of SMACH. The transition area between normal and abnormal choroid could result in abnormal flow and subsequent RPE dysfunction, and occurrence of SRF in SMACH, which is also seen for example in cases with SRF associated with tilted disc and inferior staphyloma.[4,5]

Importantly, SMACH appears to be a newly identified macular disease entity, as it does not overlap with one of the following categories that have been recently included in a paper that described the broad differential diagnosis of serous maculopathy: neovascular diseases, vitelliform lesions, inflammatory diseases, ocular tumors, hematological malignancies, paraneoplastic syndromes, genetic diseases, ocular developmental anomalies, medication-related conditions and toxicity-related diseases, rhegmatogenous retinal detachment and tractional retinal detachment, and retinal vascular diseases.[1] Still, SMACH may have clinical features that can also be seen in other disease categories that can lead to a serous SRF accumulation.

Neither photodynamic therapy nor intravitreal anti-vascular endothelial growth factor receptor injections were effective in the patients that have been included in the current study. We hypothesize that SMACH patients do not respond to these injections because no neovascular abnormalities could be observed on multimodal imaging. Photodynamic therapy is presumably not effective because no active vascular leakage, as for example clearly present on indocyanine green angiography and found to be the origin of SRF in central serous chorioretinopathy and choroidal hemangioma, has been observed in SMACH.[6,7] Choroidal diseases in which PDT has been found not to be effective —and therefore resemble SMACH—are for example dome-shaped macula and tilted disc inferior staphyloma.[8]

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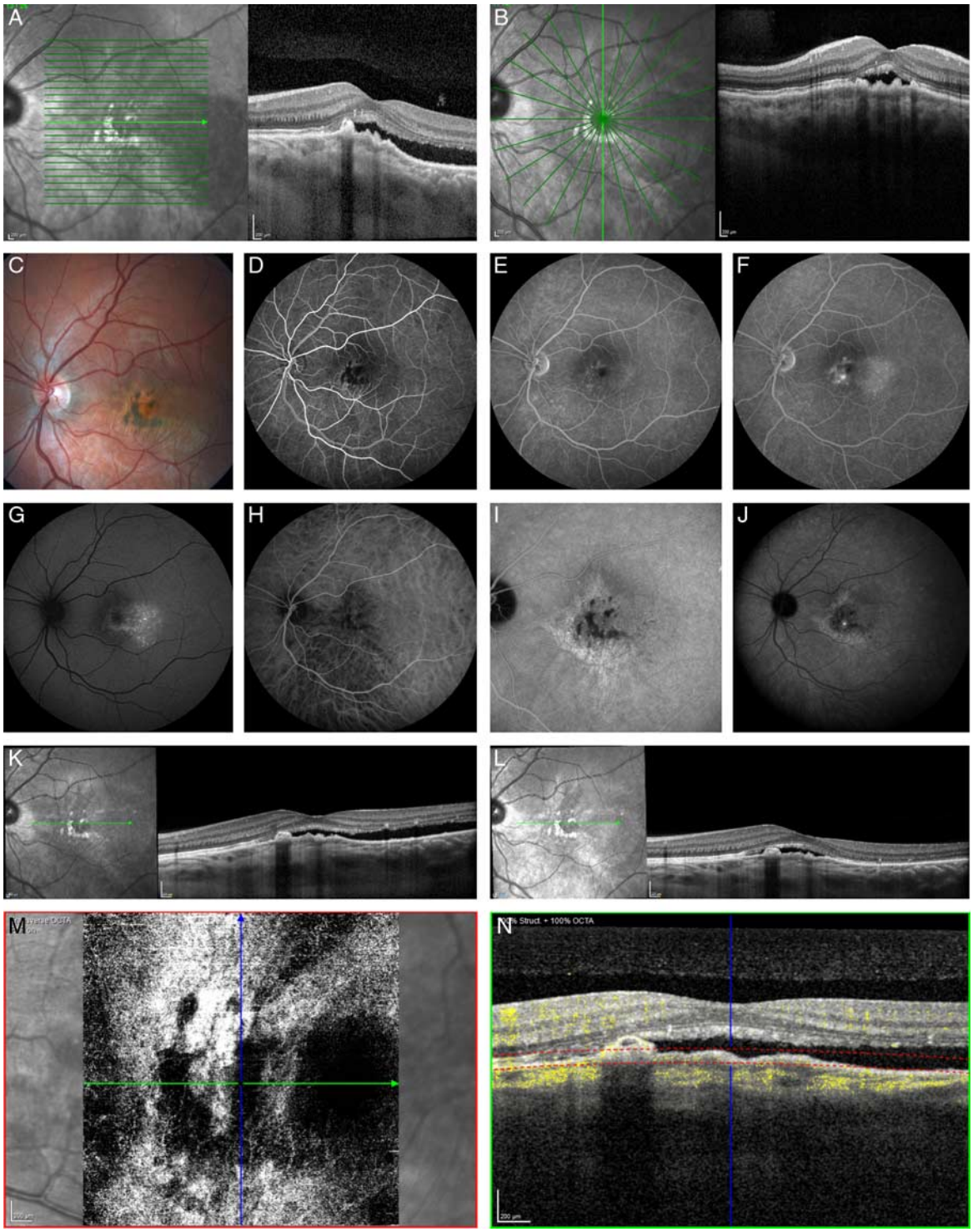

FIGURE 1. Multimodal imaging of a 19-year-old emmetropic otherwise healthy man with serous maculopathy due to aspecific choroidopathy (SMACH). A, At presentation at our outpatient clinic, the horizontal macular optical coherence tomography (OCT) scan of the left eye showed subretinal fluid (SRF), and an irregular retinal pigment epithelium (RPE) contour. A thickened choroid was present within the area of the irregular RPE. The thickening of the central choroid was most notable in the inner choroid (Sattler layer) and choriocapillaris, which were irregularly thickened and also appeared to contain relatively hyperreflective tissue. There was no clear scleral prominence, which could have been indicative of a dome-shaped macula. B, The vertical OCT scan did not reveal an inferior staphyloma. C, On fundoscopy, confluent darkly pigmented flecks were observed in the macula of the left eye, together with SRF. At this visit, visual acuity in his right eye was 20/10 and this was 20/20 in the left eye. On fundoscopy and extensive multimodal imaging, no abnormalities were seen in his right eye. D–F, Fluorescein angiography of the left eye showed fine punctate hyperfluorescent changes, without pronounced focal leakage. G, The fundus autofluorescence image mainly revealed hyperautofluorescent changes. H–J, Indocyanine green angiography showed a large wedge-shaped area of relative hypofluorescence, together with an area in which larger choroidal vessels were visible. Half-fluence photodynamic therapy in the left eye did not have any effect on the SRF accumulation and symptoms. No clear effect of intravitreal injections of several types of anti-vascular endothelial growth factor medication [bevacizumab (4 injections; K) and aflibercept (L) at monthly intervals] on SRF in the left eye was observed. After 12 months of follow-up, the visual acuity in the left eye was still 20/20 and visual symptoms were stable. M and N, Importantly, OCT angiography at baseline had not shown a choroidal neovascularization.

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