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Detailed functional and structural characterization of a macular lesion in a rhesus macaque
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Abstract: Animal models are powerful tools to broaden our understanding in disease mechanisms and to develop future treatment strategies. Here we present detailed structural and functional findings of a rhesus macaque suffering from a naturally occurring bilateral macular dystrophy (BMD), partial optic atrophy and corresponding reduction of central V1 signals in visual fMRI experiments when compared to data in a healthy macaque (CTRL) of similar age. Fluorescence and indocyanine green angiography showed reduced macular vascularization with significantly larger foveal avascular zones (FAZ) in the affected animal (FAZBMD = 8.85 mm2 vs. FAZCTRL = 0.32 mm2). Optical coherence tomography showed bilateral thinning of the macula within the FAZ (total retinal thickness, TRTBMD = 174 ± 9 µm) and partial optic nerve atrophy when compared to control (TRTCTRL = 303 ± 45 µm). Segmentation analysis revealed that inner retinal layers were primarily affected (inner retinal thickness, IRTBMD = 33 ± 9 µm vs. IRTCTRL = 143 ± 45 µm), while the outer retina essentially maintained its thickness (ORTBMD = 141 ± 7 µm vs. ORTCTRL = 160 ± 11 µm). Accordingly, a strong central reduction in the multifocal electroretinography and a specific attenuation of cone-derived signals in Ganzfeld electroretinography was found, whereas rod function remained normal.

We provided detailed characterization of a primate macular disorder. This study aims to stimulate awareness and further investigation in primates with macular disorders eventually leading to the identification of a primate animal model and facilitating the preclinical development of therapeutic strategies.