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Case report

Optical coherence tomography angiography in pediatric choroidal neovascularization

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ABSTRACT

Purpose: To report two cases of pediatric choroidal neovascularization (CNV) and the associated neovascular and retinal findings identified on Optical Coherence Tomography Angiography (OCTA) imaging.
Methods: A 14-year-old boy with handheld laser-induced maculopathy-related CNV and a 13-year-old boy with idiopathic CNV were evaluated with visual acuity testing, slit-lamp exam, fundus photography, fluorescein angiography, indocyanine green angiography, spectral domain optical coherence tomography, and OCTA.
Results: Macular CNV were identified in both pediatric patients using OCTA imaging. The first case demonstrated a classic pediatric type II CNV with a "tree-like" pattern and a single vessel in-growth site, while the second case demonstrated a type I CNV with a "glomerular" pattern.
Conclusion: Distinct choroidal neovascular patterns were visualized in these two cases of pediatric CNV when compared to adult subtypes. OCTA is a noninvasive imaging modality capable of evaluating and characterizing pediatric CNV and their associated vascular patterns.

1. Introduction

Choroidal neovascularization (CNV) is a serious cause of central visual loss, with subfoveal neovascularization increasing the risk of visual morbidity [1,2]. Although CNV is rare among children, blindness in this population can be more devastating due to its social and educational repercussions as well as greater disability-adjusted life years. In children, the cause of CNV is most often idiopathic, though rare causes include inflammatory etiologies, optic nerve head anomalies, traumatic choroidal rupture, retinal dystrophies, high myopia, angioid streaks, and choroidal osteoma [3]. In contrast, adult CNV is most commonly caused by age-related macular degeneration. Rarely, CNV have also been reported in handheld laser-induced maculopathy [4].

The gold standard for CNV diagnosis is fluorescein angiography (FA). However, general anesthesia is often necessary to obtain FA imaging in children, increasing the risk of the procedure. Optical Coherence Tomography Angiography (OCTA) provides a non-invasive imaging modality to study the morphology of neovascular membranes and vascular structure of CNV [5,6].

To our knowledge, this is the first report describing the utility of OCTA in the evaluation and characterization of pediatric CNVs.

2. Materials and methods

In this case-series, two children each with CNV in one eye were evaluated at Sant'Orsola-Malpighi Hospital, University of Bologna, Bologna, Italy. Written consent for the use of clinical information for research purposes was obtained from each patient. Each child underwent a best correct visual acuity measurement, anterior segment examination, dilated fundus biomicroscopy, color fundus photography, FA, indocyanine green angiography (ICGA), spectral domain optical coherence tomography (SD-OCT) B-scans, and OCTA. FA images were collected during the 5 minutes following

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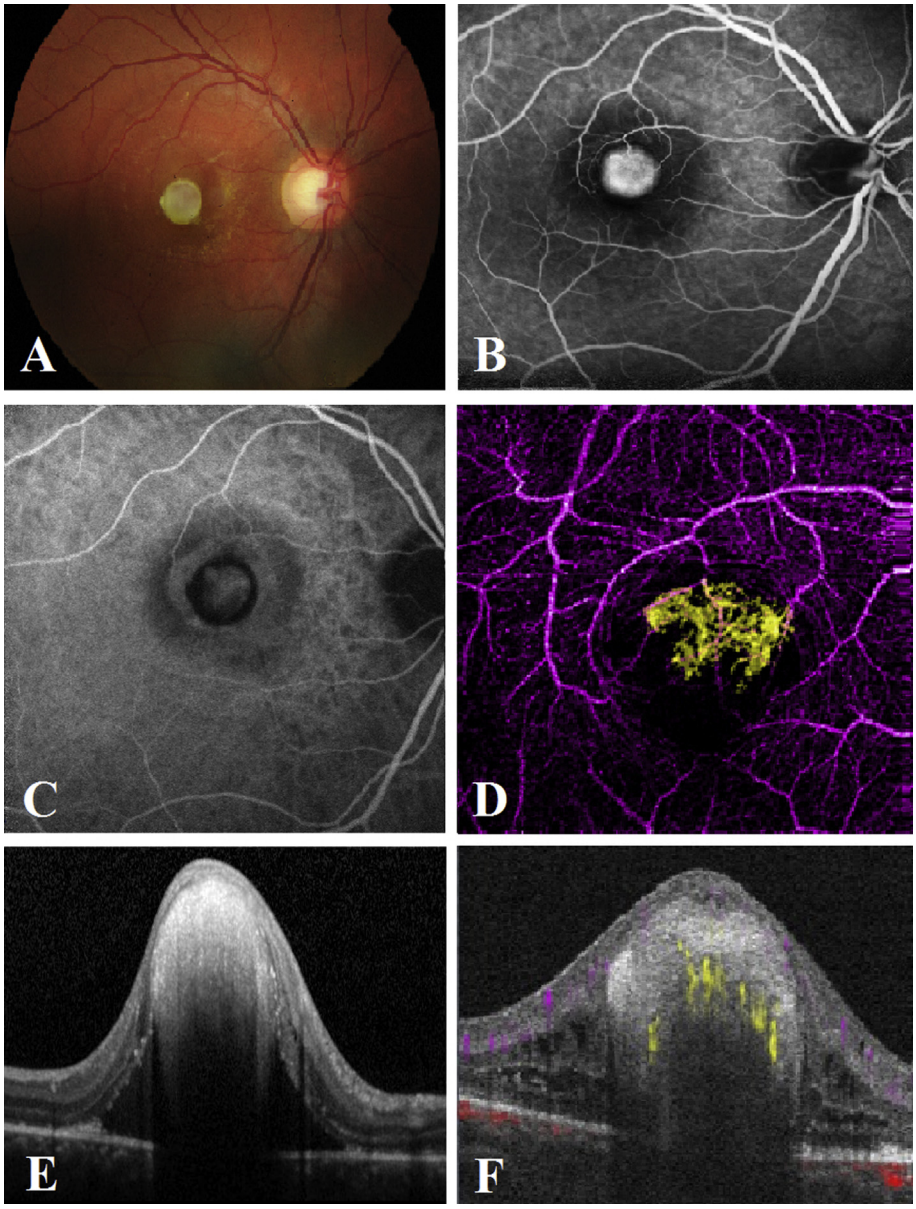

Fig. 1. Case of pediatric handheld laser-induced choroidal neovascularization. A, Color fundus photograph revealing a whitish subretinal lesion in the right macula with tenting of the internal limiting membrane. B, FA image showing macular lesion with surrounding hypofluorescence. C, ICGA image demonstrating subfoveal choroidal neovascularization. D, Color composite *en face* OCTA of retinal vessels (purple) and "tree-like" pattern CNV (yellow). E, Cross-sectional Spectral Domain-OCT image showing subfoveal lesion with subretinal fluid. F, Color-coded cross-sectional OCTA demonstrating a type 2 CNV. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

injection of dye. ICGA images were collected during the first 10 seconds after dye administration in order to best appreciate the CNV feeder vessel. Spectralis SD-OCT images (Spectralis Heidelberg Engineering, Heidelberg, Germany) and OCTA images (RTVue XR AVANTI, Optovue Inc, Fremont, CA, USA) were collected using methods that have been well documented [4,7]. OCTA angiograms were correlated with concurrently obtained FA, ICGA, and Spectralis SD-OCT B-scans. OCTA images were then color-coded to more carefully evaluate choroidal and retinal vasculature.

3. Results

3.1. Case 1

A 14-year-old boy previously in good health presented with blurred vision in the right eye following self-inflicted handheld laser exposure. He was treated in an outside hospital with one intravitreal bevacizumab injection and subsequently presented to our clinic for a second opinion. At presentation, his visual acuity was 20/50 OD and 20/20 OS. The anterior segment was normal. Fundus examination revealed a whitish subretinal lesion in the right macula with tenting of the internal limiting membrane and resolution of a hemorrhagic ring previously described upon fundus examination (Fig. 1A). FA imaging showed a macular lesion with surrounding hypofluorescence, suggestive of classic CNV (Fig. 1B). ICGA imaging demonstrated subfoveal CNV (Fig. 1C). Color-coded composite *en-face* OCTA imaging demonstrated a vascular complex (yellow) with a large main central feeder vessel radiating from one side of the lesion ("tree-like" pattern) (Fig. 1D). Spectral Domain Optical Coherence Tomography (SD-OCT) (Spectralis Heidelberg Engineering, Heidelberg, Germany) imaging showed a subfoveal lesion with subretinal fluid (Fig. 1E). Color-