SHORT COMMUNICATION

Optical Coherence Tomography Angiography of Early Stage 1a Retinal Hemangioblastoma in Von-Hippel-Lindau

Ananya Goswami, Abhidnya Surve, Pradeep Venkatesh

Vitreo-retina, Trauma and Uvea Services, Dr. Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

Abstract

Von-Hippel-Lindau (VHL) syndrome is characterized by focal vasoproliferative tumors of retinal capillaries called retinal capillary hemangioblastomas (RCH). These tumors are initially small and can be easily missed if not looked for carefully. As they grow, these tumors are more demanding to treat and hence the importance of detecting them early and treating them. Herein, we describe and review the optical coherence tomography angiography (OCTA) of the early-stage lesion, which suggested the involvement of superficial and a deeper retinal capillary plexus. In addition, to helping us detect these lesions earlier, OCTA may also help to understand the in vivo changes occurring at an earlier phase.

Keywords: hemangioblastoma; OCTA; retinal capillary hemangioblastoma; VHL

Introduction

Von-Hippel-Lindau (VHL) syndrome is an exceedingly rare, multi-organ disease with a prevalence of one in 230,000, characterized by the development of focal benign or malignant vasoproliferative tumors (hemangioblastoma). The syndrome occurs because of the mutation in the VHL gene (chromosome 3) and consequent increased expression of vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), erythropoietin (EPO), and transforming growth factor (TGF). Systemic manifestations of VHL include hemangioblastomas in the brain and spinal cord, renal and pancreatic cysts, pheochromocytoma, islet cell tumors, epididymal cystadenomas, endolymphatic sac tumor of the inner ear, and adnexal papillary cystadenoma of probable mesonephric origin (AMPO) of the broad ligament. All the systemic features are manifested in only a few cases with VHL, whereas only 50% of patients display only one systemic feature. Many of these manifestations may occur years after the initial presentation and evolves over a long period (complete penetrance of VHL is seen by 65 years of age) (1).

Retinal capillary hemangioblastoma (RCH) is a clinically visible pathology that develops in 44%–66% of patients, usually in the third decade. These tumors develop denovo...
from the retinal vascular plexus and progress from an occult angioma to huge angiomas with subsequent complex retinal detachments (2). New lesions develop over a variable time frame and are also detected in the fifth decade of life.

In the early stages, the lesions develop away from the fovea, without any visual disturbances. Hence the chances of them getting undetected is high. The various treatment modalities for retinal angioma are laser photocoagulation, cryotherapy, plaque radiotherapy, external beam radiation, proton beam radiation, photodynamic therapy (PDT), trans-pupillary thermotherapy, intraocular injection of anti-VEGF drugs or triamcinolone acetonide (TA), and vitreoretinal surgery (if associated with retinal detachment).

Laser photocoagulation is the most common modality used because of its ease of use, fewer side effects, and results. The different photocoagulation techniques are direct photocoagulation of angioma, treatment of the feeder's vessel, or a combination of both. Smaller lesions are more amenable to regress with treatment, whereas larger lesions require numerous treatment sessions. However, it is effective in lesions up to 4.5 mm size only and is used for peripheral and juxtapapillary lesions. Apart from laser therapy, trans-scleral cryotherapy is effective for the destruction of these lesions, even in the presence of simultaneous exudation, hemorrhage, or fibrosis. Thus, if we detect these lesions early, they are more amenable to treatment. Therefore, periodic screening is recommended for all patients with VHL (3).

There are various imaging modalities for the diagnosis of retinal angioma. Fluorescein angiography is the most pivotal because of the tumors rich vascularity. On the arterial phase of fluorescein angiography, there is a prominent dilated feeder arteriole along with an adjacent homogenously hyperfluorescent tumor because of a fine capillary network. The venous phase demonstrates an enlarged draining venule. Throughout the late phase of the angiogram, dye leaks into the surrounding tissues (1). While treatment planning, angiography helps to differentiate arteriole from venule. Indocyanine green angiography (ICG) is an adjunct to differentiate

Table 1: Studies on optical coherence tomography angiography findings of retinal capillary hemangioblastoma.

| Reference          | Number of cases | Type of lesion                                      | Stage                      | Main observations                                                                 |
|--------------------|-----------------|-----------------------------------------------------|----------------------------|----------------------------------------------------------------------------------|
| Lang et al. (8)    | 10 eyes         | Untreated RCH - stage B2a and stage B2c             | No detailed description of the lesion. Mainly post laser. Suitable to monitor immediate post laser response. |
| Chou et al. (9)    | 1 eye           | Untreated solitary RCH                               | B scan OCT-A shows destruction of all layers of the retina with underlying shadowing. Appears like a hyperreflective mass but individual capillaries not seen. |
| Sagar et al. (10)  | 4 eyes          | Untreated RCH                                       | Case 2– Early RCH OCT-A is not described in detail and not correlated with corresponding B-scan. Emphasized of easier identification of feeder vessels and distinctness of lesions. Relation to various retinal layers not attempted. |
| Sagar et al. (11)  | 1 eye           | Untreated RCH                                       | Tumor vascular density shown for one lesion. No detailed description of lesion on OCT-A. No correlation made with corresponding B-scan image. |
| Chun et al. (12)   | 2 eyes          | Untreated RCH                                       | Early lesions. No detailed description. No twin vessels seen. |

RCH: retinal capillary hemangioblastoma; OCT-A: optical coherence tomography angiography.
Optical coherence tomography angiography of early stage 1a retinal hemangioblastoma in Von-Hippel-Lindau

Figure 1: Fundus images shows lasered areas, multiple RCH, and localized retinal detachment. One of these lesions is a barely visible early stage 1a lesion (A- white arrow). B-scan OCT image (B) through this lesion showed the angioma is entirely intra-retinal, well defined, and vertically oval. At the lower end, there is basal hypo-reflectivity with absence of an ellipsoid zone and an external limiting membrane. At the upper end, there is a focal hump but with maintained architecture of overlying inner retinal layers. En face structural appearance of the lesion on OCTA (C). An enface image of the superficial retinal layer (D), a focal increase in density and irregularity of the superficial capillary network with no prominent feeder vessels is seen. Adjacent capillary network is normal. An en face image of the deep retinal layers; a relatively more compact, well defined hyperreflective lesion is seen (E). VHL: Von-Hippel-Lindau; RCH: retinal capillary hemangioblastoma; OCTA: optical coherence tomography angiography.
Fundus examination showed lasered areas, multiple RCH, and localized retinal detachment. One of these lesions was a barely visible early-stage 1a lesion (Figure 1A).

A B-scan OCT lesion image revealed that the angioma was entirely intra-retinal, well defined, and vertically oval. The lower end had a basal hypo-reflectivity with the absence of an ellipsoid zone and an external limiting membrane. The upper end exhibited a focal hump with an intact overlying inner retinal layers (Figure 1B).

On the en face image of superficial retinal layers (Figure 1C-E), a focal increase in density and irregularity of the superficial capillary network with no prominent feeder vessels and the normal adjacent capillary network was seen. En face imaging of deeper retinal layers showed a more compact and well defined lesion. This OCTA of early-stage lesion suggests probable focal involvement of superficial and deep capillary plexus of the retina. In addition to early detection, a further compilation of OCTA findings of early-stage lesions may also help us in understanding in-vivo changes and pathogenesis associated with RCH.

Conflict of Interest
The authors declare no potential conflicts of interest with respect to research, authorship, and/or publication of this article. The manuscript is not being considered for publication elsewhere and has been reviewed and approved by all named authors. The criteria for authorship have been met, and each author believes that the manuscript represents honest work.

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