Journal of Clinical & Experimental Ophthalmology
ISSN: 2155-9570

Hu Y et al., J Clinic Experiment Ophthalmol 2011, 2:7
DOI: 10.4172/2155-9570.1000173

Case Report Open Access

Imaging Features of Varix of the Vortex Vein Ampulla：A Small Case Series

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Abstract

Background: Varix of the vortex vein ampulla is a rare, benign condition which may be occasionally found by fundus examination and sometimes mis-classified as visual threatening retinal choroidal diseases. Auxillary examinations such as ultrasonography, OCT, ICGA, and CDFI may help to make a differential diagnosis.

Methods: Three cases were reviewed. The imaging characteristics of varix of the vortex vein ampulla were discussed.

Results: Three cases of varix of the vortex vein ampulla (2 male, 1 female, 48-67 years-old, unilateral) were found occasionally by ultrasonography. The lesion was overlooked by three-mirror contact lens funduscopy in two cases. By ultrasonography, a dome shaped lesion of around 1.5mm wide 3mm height on the posterior equator eye wall with high reflective smooth surface and low internal reflectivity could be found. The lesion decreased under probe pressure. OCT showed that the neuralretinal layer and the retinal pigmental epithelial layer bulged into the vitreous with normal reflectivity and in good continuity. The reflectivity under the RPE layer was lowered. No features suggesting bleeding, exudation, edema, or CNV were found. During venous phase of ICGA, density diversions of filled choroidal vein were seen converging into enlarged vortex vein ampulla in the lesion. The dyeing faded in the late phase with no fluorescein leakage during the whole precess. By CDFI, vein flow signal could be found inside the lesion.

Conclusion: Varix of the vortex vein ampulla could be occasionally found by ultrasonography. Typical imaging features on ultrasonography, OCT, ICGA, and CDFI, especially the dynamic nature under pressure will help diagnosis.

Keywords: Varix of vortex vein ampulla; Imaging; Diagnosis

Introduction

Most of the blood from the iris, ciliary body and choroid is drained by the vortex vein lying behind the equator in each quandrant of the eye. About half of the vortex veins show dilatations of varying sizes and shapes which are referred to as the vortex vein ampullae [1]. Occasionally, an unusually large dilatation of the vortex vein ampulla can be found by fundus examination and sometimes mis-classified as visual threatening retinal choroidal diseases. Here we reviewed three cases of varix of the vortex vein ampulla which were found incidentally by B-scan ultrasonography and discussed their imaging features on various modalities, including ultrasonography, optical coherence tomography (OCT), Indocyanine green angiography (ICGA), and colour doppler flow imaging (CDFI).

Methods

Three cases of varix of the vortex vein ampulla were reviewed in detail.

Case 1

A 67-year old man visited our outpatient for floater symptom on both eyes suffering for 1 week. Visual Acuity was 20/25 bilaterally with no significant refractive error. The intraocular pressures were 19.7mmHg right and 19.1mmHg left. Besides slight opacities in the peripheral cortex of the lens, routine slit-lamp microscopic examination and direct ophthalmoscopy showed nothing significant so the patient was referred to a B-scan ultrasonography.

Ultrasound examination showed mild vitreous opacities with low reflectivity which attributed to his floater symptom. In addition, by a longitudinal scan on the 7 o'clock meridian with lower right gaze, we disclosed in right eye a dome shaped lesion of 1.4mm × 3mm on the posterior equator eye wall with high reflective smooth surface and low internal reflectivity (Figure 1A). Then we did midrasis funduscopy with three-mirror contact lens to confirm the lesion, and unexpectedly nothing was found significant.

Spectral domain OCT showed an elevated area in the inferiotemperal fundus measured around 2 disc diameters. The neuralretinal layer and the retinal pigmental epithelial (RPE) layer bulged into the vitreous with a 4067μm wide 790μm height dome shape, with normal reflectivity and good continuity. The reflectivity under the RPE layer was lowered. No features suggesting bleeding, exudation, edema, or CNV were found (Figure 1C).

Simultanous fluorescein (FFA) and indocyanine green angiography (ICGA) was done on a scanning laser ophthalmoscopy (Heidelberg Engineering, Heidelberg, Germany). Infrared fundus photo showed a slight uplift of retinal lesions with density vascular bundle. During venous phase, FFA showed no abnormal lesions (Figure 1D), but by corresponding ICGA photos, the enlarged vortex vein ampulla filled obviously (Figure 1E) and then gradually diminished untill the late phase (Figure 1F). No fluorescein leakage was found during the whole

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Received May 30, 2011; **Accepted** June 15, 2011; **Published** July 06, 2011

Citation: Hu Y, Wang S, Dong Y, Zhou X, Yu W, et al. (2011) Imaging Features of Varix of the Vortex Vein Ampulla: A Small Case Series. J Clinic Experiment Ophthalmol 2:173. doi:10.4172/2155-9570.1000173

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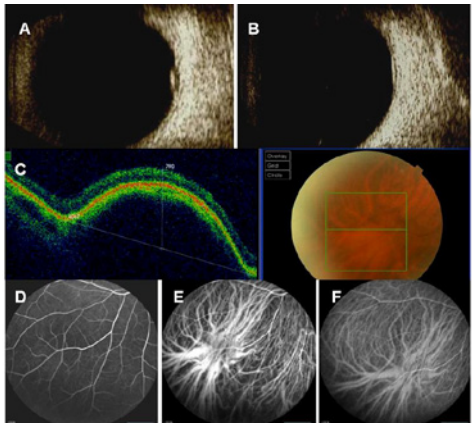

Figure 1: Ultrasonography, OCT, and Angiography in case 1. **A** By a longitudinal B-scan on the 7 o'clock meridian, a dome shaped lesion of 1.4mm × 3mm on the posterior equator eye wall with high reflective smooth surface and low internal reflectivity was found. **B** The lesion diminished seconds after probe pressure. **C** Spectral domain OCT showed an elevated area in the inferiotemperal fundus. The neuralretinal layer and the retinal pigmental epithelial layer bulged into the vitreous with a 4067μm wide 790μm height dome shape, with normal reflectivity and good continuity. The reflectivity under the RPE layer was lowered. **D** During venous phase, FFA showed no abnormal lesions. **E** Corresponding ICGA showed enlarged vortex vein ampulla filled obviously with density vascular bundle. **F** The filling gradually diminished untill the late phase. No fluorescein leakage was found.

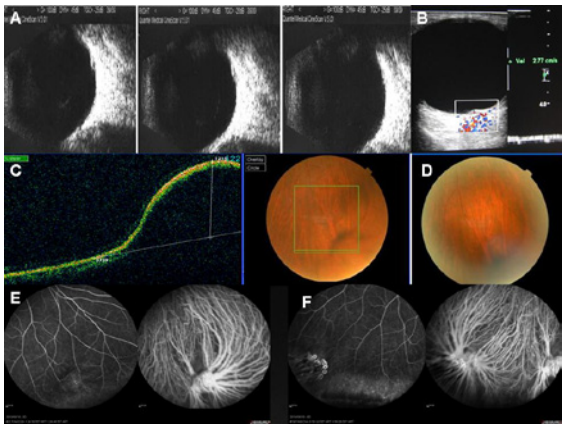

Figure 2: Ultrasonography, OCT, Angiography, and CDFI in case 2. **A** Ultrasound examination showed mild vitreous opacities and posterior vitreous detachment. **A** dome shaped lesion of 1mm × 3mm on the peripheral globe wall with high reflective smooth surface and low internal reflectivity could be found on the 5 o'clock meridian. From left to the right, the pictures showed the decreasing lesion height while a pressure was given to the globe. **B** By CDFI, vein flow signal with a velocity of 2.77cm/s was found inside the lesion.**C** Spectral domain OCT showed a crescent elevated area in the inferior fundus, large diversion of the choroidal veins could be seen converging toward this lesion. The intact neuralretinal layer and the retinal pigmental epithelial layer bulged into the vitreous in good continuity with a 1215 μm height dome shape. The reflectivity under the RPE layer was lowered. **D** When firm pressure was applied for seconds on the globe, the lesion collapsed. **E** During venous phase of ICGA, density diversions of filled choroidal vein were seen converging into a rope knot like enlarged vortex vein ampulla in the lesion. And in the corresponding FFA, slight uplift and fluorescence filling of the vortex vein ampulla could be seen. **F** At the area of coagulation, fluorescence dye and shelter could be found by FFA and density diversions of filled choroidal vein were also found by ICGA, but without bulging.

precess. Fundus outside this area and that of the opposite eye were normal. Varix of the vortex vein ampulla was diagnosed.

B-scan ultrasonography was reexamined to compare the lesion height before and after the probe pressure on the globe. We could see the lesion diminished in seconds after pressure (Figure 1B).

Case 2

A 48-year old woman visited our outpatient for photopsia on her right eye lasting for several days. The BCVA for right eye was 20/20 with -2.5D spectacle correction. The intraocular pressure was 15mmHg. Routine slit-lamp microscopic examination and direct ophthalmoscopy were normal.

Ultrasound examination found mild vitreous opacities and a thin low reflective membrane indicated posterior vitreous detachment. By a longitudinal scan on the 5 o'clock meridian with extremely downgaze, we disclosed a dome shaped lesion of 1mm × 3mm on the peripheral globe wall. The image feature was just like that of case 1. The lesion decreased while a digital pressure was given to the globe (Figure 2A). Midrasis funduscopy with pre-set lens found a fundus elevation just behind the equator when patient was told to extremely downgaze towards 5 o'clock meridian. The lesion was more difficult to be found by three-mirror contact lens. On the peripheral fundus of 7 o'clock meridian, we found an area of retinal lattice degeneration and endolaser coagulation was done immediataly.

Spectral domain OCT showed a crescent elevated area in the inferior fundus measured around 2 disc diameters, where large diversion of the choroidal veins could be seen converging toward this lesion. The intact neuralretinal layer and RPE layer bulged into the vitreous in good continuity with a 1215μm height dome shape (Figure 2C). The reflectivity under the RPE layer was lowered and no features suggesting bleeding, exudation, edema, or CNV were found. When firm pressure was applied on the globe, the lesion collapsed (Figure 2D).

During venous phase of ICGA, density diversions of filled choroidal vein were seen converging into a rope knot like enlarged vortex vein ampulla in the lesion. In the corresponding FFA, slight uplift and fluorescence filling of the vortex vein ampulla were seen (Figure 2E). At the area of coagulation, fluorescence dye and shelter were found by FFA, and density diversions of filled choroidal vein were also found by ICGA, but without bulging (Figure 2F). The dyeing faded in the late phase with some left on the area of coagulation. No fluorescein leakage was found during the whole precess. No abnormality outside this area or in the opposite eye were found. Varix of the vortex vein ampulla was diagnosed correspondingly.

We did color doppler flow imaging, and found vein flow signal with a velocity of 2.77cm/s inside the lesion (Figure 2B).

Case 3

A 60-year old man visited our outpatient for floaters on his left eye. The BCVA for left eye was 20/20 with -1.5D spectacle correction. The intraocular pressure was 14mmHg. Routine slit-lamp microscopic examination was normal.

Besides mild vitreous opacities, we found a dome shaped lesion of 1.5mm × 3mm on the middle peripheral wall of 4:30 o'clock by longitudinal ultrasound examination. The lesion had a smooth high reflective outline and low reflections inside and had a dynamic feature under pressure like in case 1 and case 2 (Figure 3A).

Spectral domain OCT confirmed a lesion of intact elevated neuralretinal layer and RPE layer in the lower temporal fundus. No bleeding, exudation, edema, or CNV were found (Figure 3B).

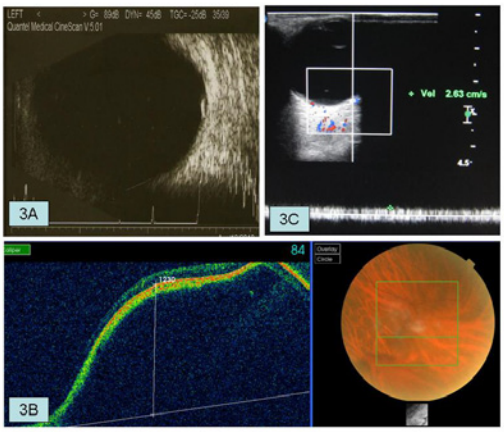

Figure 3: Ultrasonography, OCT, and CDFI in case 3. **A** A dome shaped lesion of 1.5mm × 3mm with a smooth high reflective outline and low inside reflections was found on the middle peripheral wall of 4:30 o'clock by ultrasound examination. **B** Spectral domain OCT confirmed a lesion of elevated neuralretinal layer and the retinal pigmental epithelial layer in the lower temporal fundus. The RPE layer was intact and no bleeding, exudation, edema, or CNV were found. **C** A signal of vein flow with a velocity of 2.63cm/s was found by CDFI.

According to its dynamic feature and imaging characters, varix of the vortex vein ampulla was diagnosed. CDFI was done, a signal of vein flow with a velocity of 2.63cm/s was found inside the lesion (Figure 3C).

Results

Three cases of varix of the vortex vein ampulla (2 male, 1 female, 48-67 years-old, emmetropia and slight myopia, unilateral) were found incidentally by ultrasonography. The lesion was overlooked by three-mirror contact lens funduscopy in two cases. All three cases have the similar imaging features on ultrasonography, OCT, ICGA, and CDFI. By a longitudinal B-scan with extreme gaze to the lesion, a dome shaped lesion of around 1.5mm wide 3mm height on the posterior equator eye wall with high reflective smooth surface and low internal reflectivity could be found. The lesion decreased while a digital pressure was given to the globe. OCT showed that the neuralretinal layer and the RPE layer bulged into the vitreous with normal reflectivity and in good continuity. The reflectivity under the RPE layer was lowered. No features suggesting bleeding, exudation, edema, or CNV were found. During venous phase of ICGA, density diversions of filled choroidal vein were seen converging into enlarged vortex vein ampulla in the lesion. The dyeing faded in the late phase with no fluorescein leakage during the whole process. By CDFI, vein flow signal could be found inside the lesion in two cases.

Discussion

Varix of the vortex vein ampulla is an uncommon finding. Its etiology is still unclear and it is thought to be benign and require no treatment. But we still need to recognize it and make a differential diagnosis with some visual threatening retinal choroidal diseases.

B-scan ultrasonography was the first step to find the lesion in all our 3 cases. Because of its peripheral position, a longitudinal scan with extreme gaze towards the lesion is a better way to find the lesion. The thick arch surface, low and dispersed internal reflectivity, were different from the typical image of melanoma and hemangioma or retinoschisis. But a small melanoma before it breaks through the Bruch's membrane, or a serosanguinous pigmental epithelial detachment (PED) with hemorrhage beneath the RPE layer may have the similar image. The collapse of lesion under pressure is valuable for differentiating it from the diseases as mentioned above [2-4].

OCT is also helpful for differentiating diagnosis. One case studied by R A Ismail, et al, disclosed a large hyporeflective elevated subretinal lesion [5], which appeared to be of choroidal origin. This was also found in our cases. Intact neuralretinal layer without edema or damage, continuous RPE layer, and the dynamic feature under pressure are important to differentiate the lesion from melanoma, choroidal hemangioma, and other diseases.

ICGA is particularly a useful examination to demonstrate the outline of the varix of the vortex vein ampulla [6,7]. Using ICGA, we can easily observe the dilation of vortex vein system and make a final diagnosis.

CDFI performed in one patient of varix of the vortex vein ampulla has been described by Gündüz K, et al. A vascular lesion of venous origin was found [8]. We also found venous origin flow signals in the lesion of two of our cases.

By former reports, the varix of the vortex vein ampulla is most commonly found in middle-aged patients as an asymptomatic finding. Most cases were found by fundus examination, usually in the nasal quadrants, showing dark red bulge and pigment change in the equator area suspecting melanoma or choroidal naevus [8-10], It can be unilateral or bilateral. Eyes can be hyperopic with a thicker sclera [4]. The patients in our report were all in their middle age. The chief complaint was floaters and photopsia, known as the symptom of vitreous opacity and posterior vitreous detachment which we don't think have any relationship with the varix of vortex vein ampulla. There was no systemic disease being found to be related to vascular varix. The lesions were unilateral. One case was emmetropia and two cases were low myopia. One of the lesions located in the inferior-nasal quandrant and two were in the inferior-temporal quandrant. No specific color change or pigment was found by fundus examination. Even after mydrasis, the lesion was still easily to be ignored by three-mirror contact lens, we believe the unconsciously pressure on the globe when using contact lens could be the reason.

In conclusion, we think the clinical demonstration may vary in varix of the vortex vein ampulla. The lesion could be incidentally found by ultrasonography and overlooked by funduscopy. The typical imaging features on ultrasonography, OCT, ICGA, and CDFI, especially the dynamic nature under pressure are useful for diagnosis. However, the etiology of varix of the vortex vein ampulla and its prognosis still needs further research.

Acknowledgement

This work is supported by the Shanghai Leading Academic Discipline Project, Project Number: S30205. The authors have no proprietary interest in any of the products mentioned in this paper.

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