Published in final edited form as:
Retina. 2006 ; 26(9): 1085–1087.

VITREOFOVEAL ATTACHMENT CAUSING METAMORPHOPSIA: AN ULTRAHIGH-RESOLUTION OPTICAL COHERENCE TOMOGRAPHY FINDING

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Keywords

metamorphopsia; optical coherence tomography; posterior vitreous detachment; retina

Optical coherence tomography (OCT) can be beneficial in visualization of the posterior hyaloid in both posterior vitreous detachment (PVD) and vitreomacular traction syndrome.^{1,2} PVD occurs as a normal phenomenon of aging, with 65% of healthy patients having PVD by their eighth decade of life.³ PVD is usually divided into partial and complete forms: complete detachment can often be detected with biomicroscopy and/or ultrasonography, while partial PVD is more difficult to detect. However, the use of OCT has allowed detection of partial PVD much more frequently; recently, OCT has been used to define several stages of partial PVD not seen biomicroscopically.¹

Vitreomacular traction syndrome occurs when the posterior hyaloid remains attached at the macula while the more peripheral vitreous separates, causing anatomical distortion of the macula. This has been demonstrated clearly with OCT.² However, to our knowledge, macular attachment of the posterior hyaloid without anatomical distortion of the retina has not been reported to cause visual symptoms. We describe four patients with visual distortion in whom the only abnormality at evaluation was a subtle OCT finding. Standard-resolution OCT, capable of 10- μ m axial resolution,⁴ shows the posterior hyaloid inserting into apparently normal foveal contour. Ultrahigh-resolution (UHR) OCT, capable of 3- μ m axial resolution,⁵ additionally demonstrates subtle distortion of the foveal contour not seen with standard OCT.

Case Reports

Case 1

A 65-year-old woman presented to the retina clinic with a 2-day history of a gray spot in the central visual field of the right eye that was not associated with flashing, eye pain, headache, or floaters. Anterior chamber examination was notable for a mild nuclear sclerotic cataract in the right eye but was otherwise normal. Dilated fundus examination was unremarkable.

Standard-resolution OCT demonstrated partial detachment of the posterior hyaloid in the right eye with continued attachment at the fovea, with what appeared to be normal foveal contour (Fig. 1A). Central foveal thickness was 246 μm using the standard OCT macular mapping software. UHR OCT was performed, which also showed partial detachment of the posterior hyaloid in the right eye but additionally showed mild distortion of the foveal contour not seen with conventional OCT (Fig. 1B, arrows).

Three weeks later, the patient returned reporting resolution of her symptoms. Visual acuity at that time was 20/25 in the right eye and 20/30+ in the left eye. Examination results were unchanged. Full separation of the posterior hyaloid from the fovea was demonstrated by standard OCT in the right eye (Fig. 2A). Central foveal thickness had decreased to 199 μm . UHR OCT additionally demonstrated return to normal smooth foveal contour in the right eye (Fig. 2B).

Case 2

A 72-year-old man, a retired optics researcher, presented to the retina clinic with the complaint of stable visual distortion in the left eye for the past several months. Visual acuity was 20/20 in the right eye and 20/20– in the left eye. Anterior chamber examination revealed a mild nuclear sclerotic cataract in the left eye but was otherwise unremarkable. Dilated fundus examination was unremarkable. Standard-resolution OCT demonstrated partial detachment of the posterior hyaloid in the left eye with continued attachment in the fovea and with normal foveal contour and thickness. UHR OCT confirmed partial detachment of the posterior hyaloid and showed normal foveal contour.

The patient was examined 10 months later, with an increase in visual distortion subjectively but no changes disclosed by physical examination. Repeated OCT showed that the posterior hyaloid was again partially attached to the fovea and the central foveal thickness remained normal. However, distortion of the foveal contour was noted with UHR OCT, which was not seen with standard OCT. The patient continued to have visual distortion, 20/20 vision, and similar standard- and ultrahigh-resolution OCT findings 21 months after initial presentation.

Case 3

A 74-year-old woman presented to the retina clinic with the complaint of decreased central acuity for the past 8 months in the left eye, after successful cataract surgery at an outside ophthalmologist's office 2 months before onset of symptoms. No macular edema had been noted; however, visual acuity had declined to 20/50 +1 in the left eye. A well-placed posterior chamber intraocular lens was noted during anterior chamber examination of the left eye. No posterior capsular opacities were noted. Dilated fundus examination was unremarkable. Fluorescein angiography showed no sign of macular edema. Standard-resolution OCT showed partial detachment of the posterior hyaloid in the left eye with continued attachment in the fovea and with normal foveal contour and thickness. UHR OCT showed distortion of the foveal contour not seen with standard OCT.

Case 4

A 64-year-old woman was referred to the retina clinic with the complaint of intermittent visual blurring and a blue haze in the vision of the right eye for the past 8 months, after successful cataract extraction 4 months before onset of symptoms. The patient had a history of floaters secondary to PVD. Visual acuity was 20/30 +2 in the right eye and 20/20 in the left eye. A well-placed posterior chamber intraocular lens was noted during anterior chamber examination of the right eye. No posterior capsular opacities were noted. Dilated fundus examination revealed a faint area of retinal pigment epithelium dropout temporal to fixation as well as scattered retinal pigment epithelium changes in the periphery. A fluorescein angiogram showed

no evidence of macular edema. Standard-resolution OCT disclosed partial detachment of the posterior hyaloid in the right eye with continued attachment in the fovea and with normal foveal contour and thickness. UHR OCT again showed distortion of the foveal contour not seen with conventional OCT.

Discussion

We report four cases of metamorphopsia in which the only significant abnormality was PVD with persistent vitreofoveal attachment (Table 1). Standard-resolution OCT was able to demonstrate subtle changes at the vitreomacular interface in all cases. In Case 1, there was slight thickening of the central fovea, which disappeared upon detachment of the posterior hyaloid. The other patients all had normal foveal thickness. The increased resolution of UHR OCT additionally permitted visualization of subtle changes in the foveal contour.

The diagnosis of partial PVD has been made easier by the use of OCT imaging of the retina, which can demonstrate partial separation of the posterior hyaloid from the retina in rare cases where no other abnormalities are found with clinical evaluation. Several stages of partial PVD have been defined using OCT.¹ Symptoms associated with PVD include photopsias and/or floaters. Other visual symptoms have been demonstrated in cases of vitreomacular attachment with anatomical distortion shown by OCT.² However, to our knowledge, visual symptoms have not been demonstrated in cases of vitreomacular attachment with apparently normal macular anatomy shown by OCT.

UHR OCT has recently been developed for retinal imaging in clinical use.⁵ This technique creates an image with an axial resolution of 2 μm to 3 μm (three to four times greater than standard-resolution OCT), giving a much more highly detailed picture of the retina. This technology therefore has the potential to image microscopic conditions not previously seen with standard OCT.⁵ In the cases reported here, UHR OCT showed mild foveal distortion that was not demonstrated clearly with standard-resolution OCT.

Attachment of the posterior hyaloid to the fovea does not necessarily explain the symptoms of the patients described here. Patient 4 had slight retinal pigment epithelium changes in the macula, which may explain visual symptoms. Patients 3 and 4 had visual symptoms after cataract extraction, suggesting the possibility of macular edema. However, the patients had been followed closely, and no macular edema had been found. In addition, as the first case demonstrated, the release of vitreofoveal attachment with restoration of smooth foveal contour shown by UHR OCT correlated with resolution of symptoms. It therefore seems logical that traction from the posterior hyaloid attachment was causing visual distortion in these patients, as well as a subtle anatomical distortion of the foveal contour seen with UHR OCT. This finding demonstrates that vitreofoveal attachment may cause metamorphopsia despite apparently normal foveal contour shown by standard-resolution OCT.

Acknowledgements

Supported in part by National Institutes of Health contracts R01-EY11289 and R01-EY13178, National Science Foundation contract ECS-01-19452, US Air Force Office of Scientific Research contract FA9550-040-1-0046, and Carl Zeiss Meditec, Inc. J.G.F. and J.S.S. receive royalties from intellectual property licensed by MIT to Carl Zeiss Meditec, Inc., and receive research support from Carl Zeiss Meditec, Inc.

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Fig 1. Case 1, initial presentation. Macular images of the right eye. Scale included for all images. **A**, Standard-resolution (10-μm axial resolution) optical coherence tomography (OCT) image. Partial detachment of the posterior hyaloid with continued attachment at the fovea. Note the apparently normal foveal contour and slightly thickened central fovea. The foveal thickness measured with standard OCT software was 249 μm. **B**, Corresponding ultrahigh-resolution (3-μm axial resolution) OCT image. Note distortion of the foveal contour (arrows).

Fig 2.
Case 1, 3-week follow-up. Macular images of the right eye. Scale included for all images. Images were taken after visual symptoms had resolved, 10 months after initial presentation.
A, Standard-resolution (10- μ m axial resolution) optical coherence tomography (OCT) image. The posterior hyaloid has released from the fovea, and the central foveal thickness has decreased slightly. The foveal thickness was 199 μ m as measured with standard OCT software.
B, Corresponding ultrahigh-resolution (3- μ m axial resolution) OCT image. Note return to normal foveal contour.

Table 1.

Summary of Patient Information at Initial Presentation

Case	Age (y)	Sex	Eye	Chief Complaint	Duration (mo) of Symptoms	Visual Acuity	IOP (mmHg)	Slit-Lamp Examination	Dilated Fundus Examination
1	65	F	OD	Gray spot in central vision	1 (resolved)	20/20–	12	NSC [†]	Unremarkable
2	72	M	OS	Visual distortion	20	20/20–	14	2+ NSC [†]	Hint of poor foveal reflex
3	74	F	OS	Decreased central acuity, improved by downward gaze	8	20/50 +1	10	PCIOL [‡]	Slight macular RPE changes ^{***}
4	64	F	OD	Visual blurring	8	20/30 +2	15	PCIOL [‡]	Slight macular and peripheral RPE changes ^{**}

IOP, intraocular pressure; NSC, nuclear sclerotic cataract; PCIOL, posterior capsule intraocular lens; RPE, retinal pigment epithelium.