Vitreoretinal Disorders

Sumit Sharma, BS[a], Alexandre A.C.M. Ventura, MD[b], Nadia Waheed, MD, MPH[b,*]

KEYWORDS

• Retinal ultrasonography • Retinal detachment
• Vitreous hemorrhage • Posterior vitreous detachment

Vitreoretinal diseases are the most common indication for ultrasonographic imaging of the posterior segment. Although most conditions of the posterior segment can be viewed directly, in situations where there is media opacity (eg, because of vitreous hemorrhage), echography allows for evaluation of the vitreous, retina, and choroid that otherwise would be impossible.[1,2] Using ultrasound, it is possible to identify, evaluate, and follow numerous posterior segment conditions such as retinal tears,[3,4] vitreous and retinal detachments,[5–8] retinoschisis,[9] retinal pigment epithelium (RPE) detachment,[10] subretinal hemorrhage,[11] and eccentric disciform lesions.[12]

Although descriptions of the methods of ultrasonographic evaluation of the posterior segment are beyond the scope of this article, it is imperative to conduct a thorough examination of all the quadrants to avoid missing any pathology, and to evaluate the vitreous body, posterior hyaloid, subvitreal space, retina, choroid, sclera, optic disc, and macular region.

VITREOUS HEMORRHAGE

The vitreous is an avascular structure. Vitreous hemorrhage (VH) occurs by the extravasation of blood into the space limited anteriorly by the posterior lens capsule, posteriorly by the internal limiting membrane, and laterally by the ciliary body and lens zonular fibers. VH can be caused by bleeding from normal, diseased, or abnormal new retinal vessels, traumatic insult, or extension of hemorrhage from any other source. The incidence of vitreous hemorrhage in the general population is 7 cases per 100,000 population per year.[13] The most common causes of VH vary based on the population studied, with the two most common causes being posterior vitreous detachment (PVD) with or without retinal tear and proliferative diabetic retinopathy, followed by ocular trauma and neovascularization secondary to retinal vein occlusion.[14–17]

Dynamic A- and B-scan ultrasound exams should be performed to rule out retinal tears, detachment, or other intraocular pathology as the source of VH. A fresh VH appears as diffuse opacities of low to medium reflectivity on B-scan, with multiple low intensity spikes on A-scan (**Fig. 1**A).[18] As the blood organizes, it forms pseudomembranous surfaces on B-scan, corresponding to slightly higher intensity spikes on A-scan (**Fig. 1**B). Signal intensity on both A- and B-scan directly correlates with the density of the hemorrhage (**Fig. 1**C). Layering of blood inferiorly results in very high reflectivity on B-scan and in a static examination may be mistaken for a retinal detachment (RD) (**Fig. 1**D). In a vitrectomized eye, blood can remain in a liquefied state and often requires the use of high-gain settings to visualize the hemorrhage (**Fig. 1**E, F).

If a PVD is absent, a retinal tear or rhegmatogenous RD is unlikely; therefore, other causes of the VH must be explored. If a PVD is present and a RD is not observed, PVD is most likely not the cause of the VH. A small anterior retinal detachment, however, may not be detected by an inexperienced ultrasonographer.[19] In addition, presence of a PVD does not exclude other causes of VH, because the PVD may have been present before VH.

POSTERIOR VITREOUS DETACHMENT

PVD is a common degenerative process of the vitreous in which the vitreous gel loses its

[a] Cleveland Clinic Lerner College of Medicine, Cleveland, Ohio
[b] Cole Eye Institute, Cleveland Clinic, 9500 Euclid Avenue, Desk i32, Cleveland, OH, USA
* Corresponding author.
E-mail address: waheedn@ccf.org (N. Waheed).

Ultrasound Clin 3 (2008) 217–228
doi:10.1016/j.cult.2008.04.003
1556-858X/08/$ – see front matter

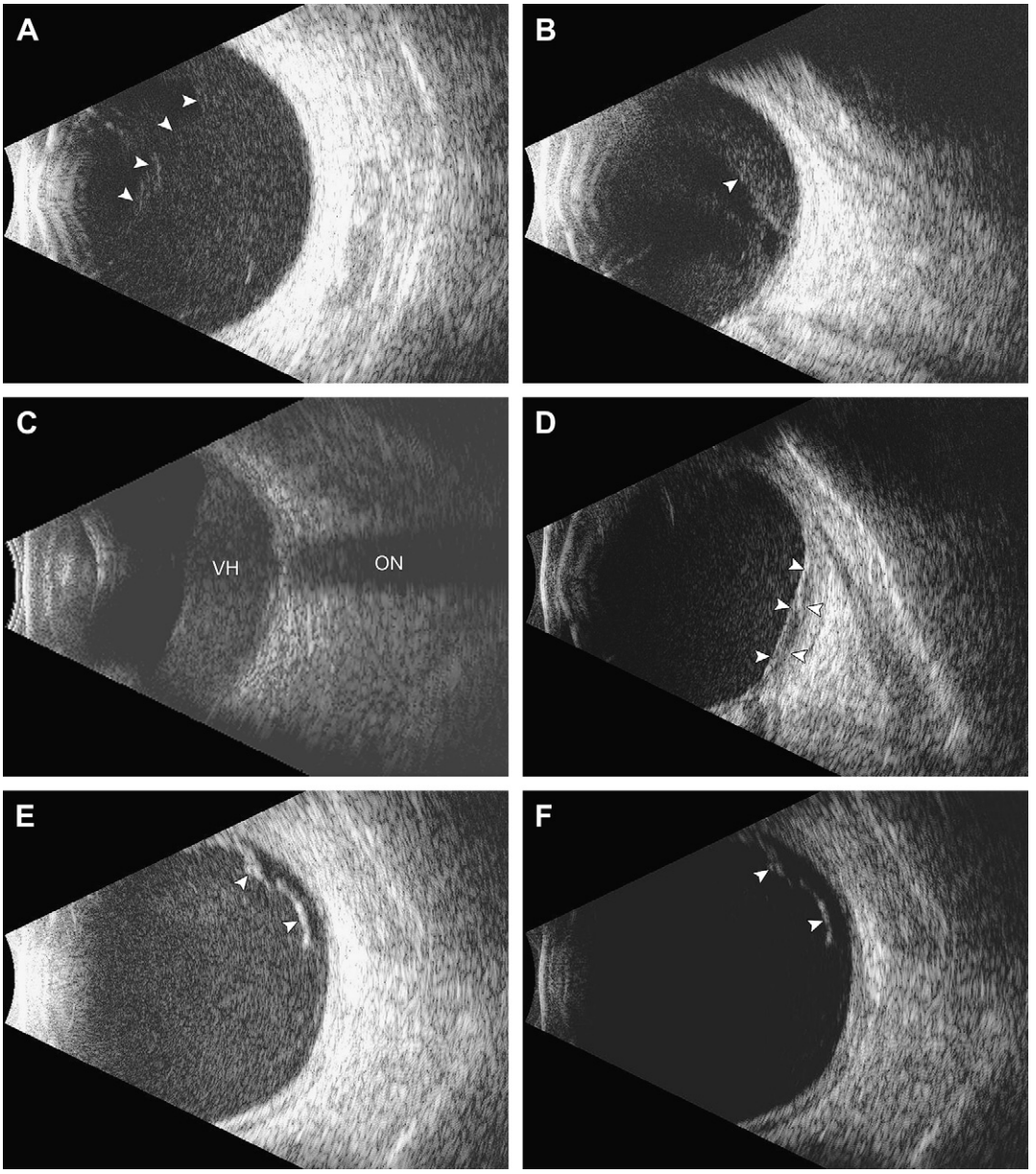

Fig. 1. *(A)* Fresh vitreous hemorrhage. Longitudinal B-scan showing diffuse low-to-medium reflective opacities in the vitreous cavity *(arrowheads)*. *(B)* Organized vitreous hemorrhage. Note pseudomembranous surfaces *(arrowhead)* within the vitreous cavity representing the organization of blood. *(C)* Moderately dense vitreous hemorrhage *Abbreviations:* ON, optic nerve; VH, subhyaloid hemorrhage. *(D)* Layered vitreous hemorrhage mimics retinal detachment *(arrowheads)*. *(E)* Vitreous hemorrhage in a vitrectomized eye (high gain, arrowheads—vitreous skirt). *(F)* Same patient on low gain. The vitreous hemorrhage is not visible, as it does not organize in a vitrectomized eye. Note discontinuities in the vitreous skirt *(arrowheads)*.

attachment to the internal limiting membrane. The causative factor for PVD can vary, but is most commonly senile degeneration of the vitreous gel. The vitreous is attached (vitreous base) in a band extending 360° around the anterior limits of the retina (ora serrata) and only weakly adherent to the macula and optic disc. Thus the site of detachment is usually located in the posterior pole.[20] In nearly half of patients, the PVD is incomplete, and some portions of the vitreous remain attached to and can exert traction on the retina.[21] Retinal tears often occur just posterior to the vitreous base, because of traction placed on the retina as the vitreous pulls away from the retina.