

Ultrasound in Emergency Medicine

PITFALLS IN THE USE OF OCULAR ULTRASOUND FOR EVALUATION OF ACUTE VISION LOSS

Meghan L. Schott, MD,* Jessica E. Pierog, DO,† and Sarah R. Williams, MD, FACEP, FAAEM†

*Stanford/Kaiser Residency Program and †Department of Surgery, Division of Emergency Medicine,
Stanford University School of Medicine, Stanford, California

Reprint Address: Meghan L. Schott, MD, Stanford/Kaiser Residency Program, Stanford Hospitals and Clinics,
300 Pasteur Dr., Alway Building, Room 121, Stanford, CA 94305

Abstract—Background: Retinal detachment is a true medical emergency. It is a time-critical, vision-threatening disease often first evaluated in the Emergency Department (ED). Diagnosis can be extremely challenging and confused with other ocular pathology. Several entities can mimic retinal detachment, including posterior vitreous detachment and vitreous hemorrhage. Ocular ultrasound can assist the emergency physician in evaluating intraocular pathology, and it is especially useful in situations where fundoscopic examination is technically difficult or impossible. Accurate and rapid diagnosis of retinal detachment can lead to urgent consultation and increase the likelihood of timely vision-sparing treatment. **Objectives:** This case demonstrates both the utility of ocular ultrasound in the accurate and timely diagnosis of retinal detachment and potential pitfalls in the evaluation of intraocular pathology in the ED. **Case Report:** A 38-year-old woman presented with acute onset of bilateral visual loss that was concerning for retinal detachment. Rapid evaluation of the intraocular space was performed using bedside ocular ultrasound. Bedside ocular ultrasound correctly diagnosed retinal detachment in the right eye. Posterior vitreous detachment in the left eye was incorrectly diagnosed as retinal detachment. **Conclusion:** This case illustrates the importance of bedside ocular ultrasound and highlights some of the pitfalls that can occur when evaluating for retinal detachment. Following is a discussion regarding methods to distinguish retinal detachment from vitreous hemorrhage and posterior vitreous detachment. © 2013 Elsevier Inc.

Keywords—ocular ultrasound; retinal detachment; posterior vitreous detachment; vitreous hemorrhage

INTRODUCTION

Eye complaints are common in the Emergency Department (ED), composing approximately 2% of all visits (1). Evaluation for retinal detachments in patients with acute visual change are of particular importance, as immediate identification and treatment of this disease is imperative to prevent deterioration to permanent, complete visual loss. Without treatment, all cases of retinal detachments will spread and involve the macula, causing blindness (1).

The retina is composed of two layers: the neuronal layer, and the supportive choroid layer. Detachment occurs when these two layers separate (2). Patients with retinal detachment often complain of acute onset of floaters or flashes of light in their visual field. This is often followed by acute painless visual loss beginning peripherally and progressing to the central visual field, commonly described as a curtain being pulled over the field of vision, or a sensation of seeing cobwebs (1).

Diagnosis of retinal detachment has been traditionally performed via fundoscopic examination. However, this type of examination is technically challenging, and cannot completely rule out retinal detachment. Additionally, fundoscopic examination may be impossible in certain situations where visualization of the posterior surface of the eye is challenging, such as in vitreous hemorrhage or dense cataracts. Ultrasound has been used by ophthalmologists to evaluate the orbits for over 50 years;

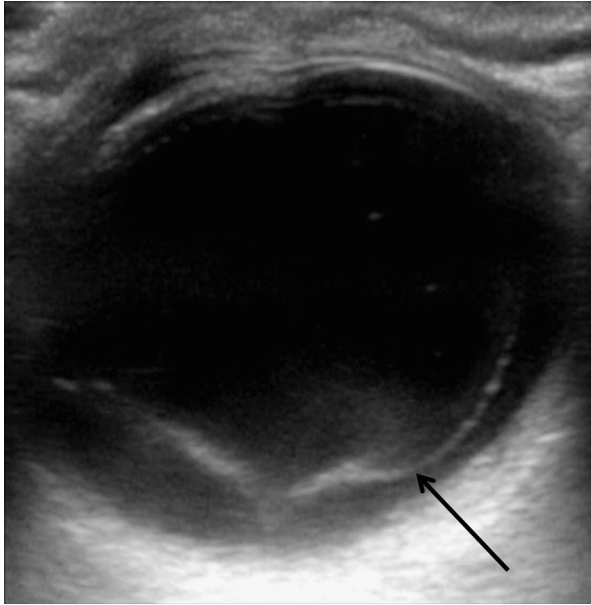


Figure 1. Ultrasound of the left eye with black arrow depicting retinal detachment.

however, it has only gained traction in the hands of emergency physicians in the past decade (3).

Ocular ultrasound has been shown to be quick, accessible, and accurate for the assessment of ocular pathology when performed by emergency physicians (4,5). In particular, ultrasound is highly sensitive in the detection of retinal detachment in the ED (6). The globe is an amazingly facile organ to evaluate with ultrasound. To perform

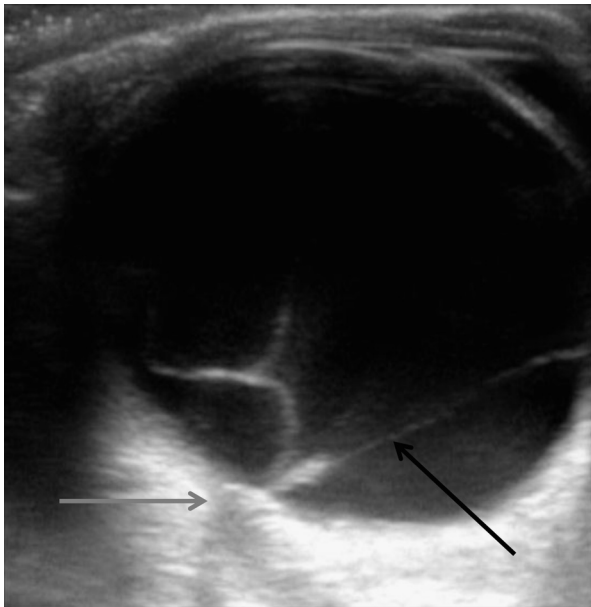


Figure 2. Additional view of the left with black arrow depicting retinal detachment and gray arrow depicting the optic nerve.

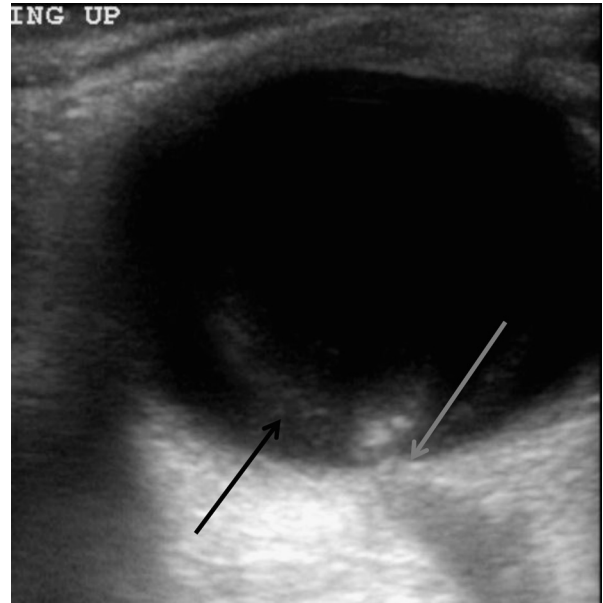


Figure 3. Additional view of the left eye with black arrow depicting retinal detachment and gray arrow depicting attachment to the optic nerve.

this examination, linear 7.5- to 10-MHz probes are ideal for taking a detailed look at the orbit. With the eyelids closed, a generous amount of conducting gel is applied to the lid (7). For patient comfort and to facilitate clean-up, a transparent dressing can be placed on the lid before applying gel (8). The probe is then placed gently perpendicular to the orbit while fanning cephalad to caudad (7). For further instruction on the use of sonogram to

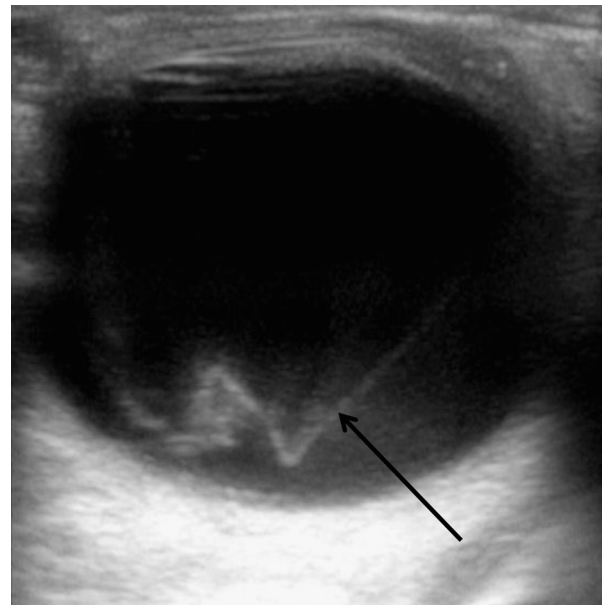


Figure 4. Ultrasound of the right eye with black arrow depicting posterior vitreous detachment.

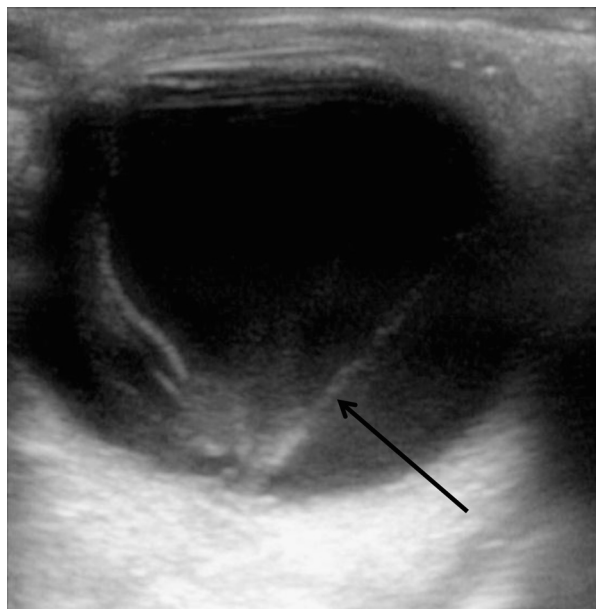


Figure 5. Additional view of the right eye with black arrow depicting posterior vitreous detachment.

perform ocular ultrasound, please see <http://emedicine.medscape.com/article/1401982-overview> (7). We present a case that demonstrates both the utility of, and the pitfalls in, the use of ocular ultrasound in the ED.

CASE REPORT

A 38-year-old woman presented to the ED at 5:19 p.m. with a chief complaint of acute bilateral vision loss 6 h



Figure 6. Additional view of the right eye with black arrow depicting posterior vitreous detachment and gray arrow depicting the shadow of the optic nerve.

before presentation. Associated symptoms included a sharp stabbing pain located bilaterally behind the orbits, with radiation in a band distribution around her head. Past medical history included poorly controlled diabetes and previous bilateral vitreous hemorrhage. Her only medication was Metformin. She denied smoking, alcohol, or illicit drug use. Initial vital signs were: heart rate 84 beats/min, blood pressure 123/64 mm Hg, temperature 36.5°C, and finger-stick blood glucose was 443 mg/dL.

Physical examination was remarkable for absent light reflex bilaterally and decreased visual acuity to OD (right eye): counting fingers 1 foot and OS (left eye): counting fingers 1 foot. Upon inspection, there were no external signs of trauma or infection, conjunctivitis, or evidence of corneal abrasion. Extraocular movements were intact. Afferent pupillary defect was absent. Bilaterally there was dense vitreous hemorrhage making direct visualization of the optic disc, macula, and associated vessels impossible despite pupillary dilatation.

Bedside ocular ultrasound revealed vitreous hemorrhage bilaterally. Both eyes had hyperechoic linear densities with a funnel-shaped morphology, appearing to be connected with the optic nerve disc posteriorly (Figures 1–6). The initial working diagnosis was likely bilateral retinal detachments accompanied by bilateral vitreous hemorrhage.

An immediate emergent Ophthalmology consult was obtained. Fundoscopic evaluation of the retina was deemed impossible secondary to dense bilateral vitreous hemorrhage. With bedside ultrasound, a retinal detachment of the left eye was confirmed by the Ophthalmology consult (Figure 1). The ophthalmologist was unable to confirm the exact pathology occurring in the right eye beyond the diagnosis of vitreous hemorrhage. The patient was referred for outpatient follow-up with a retinal specialist the next day.

The retinal specialist confirmed the diagnosis of retinal detachment on the left, accompanied by dense vitreous hemorrhage (Figures 1–3). In the right eye, there was posterior vitreous detachment with posterior attachment to the optic disc, mimicking retinal detachment (Figures 4–6). The patient was scheduled for vitrectomy of the right eye.

DISCUSSION

Over a lifetime, 1:300 people will experience retinal detachment. Of these people, 15% will also experience retinal detachment in the contralateral eye (9). Time is extremely critical for these patients, and rapid, accurate diagnosis and treatment is paramount. Emergency physicians trained to evaluate for retinal detachment with ocular ultrasound are highly successful (5).

With ocular ultrasound it can be difficult to distinguish between retinal detachment, vitreous hemorrhage, and posterior vitreous detachment. A dense posterior vitreous detachment that remains attached to the optic disk can mimic retinal detachment (10). Additionally, vitreous hemorrhage may layer to form a hyperdense linear array that can be confused with retinal detachment. It is important to distinguish between these pathologies as they carry a different sense of urgency, treatment, and prognostic implications.

When distinguishing posterior vitreous detachment from retinal detachment, it is important to understand that they both may appear funnel shaped, and remain attached to the optic disk posteriorly, as seen in this case. The posterior hyaloid surface, however, is less dense than the retina, and often fades when the ultrasound gain is reduced (5). This is useful for differentiation from a highly reflective retinal detachment (9). The vitreous is very mobile with eye movement, resulting in a “swaying seaweed” appearance with ocular motion (5,11). In contrast, the retina is a stiffer entity, and with eye movement, recent retinal detachment results in a characteristic undulating movement that is slower than the movement of the vitreous humor (12).

Vitreous hemorrhage, similar to the posterior hyaloid surface, is less dense than retinal detachment. Again, decreasing the gain causes the vitreous hemorrhage to fade (12). Characteristic features of vitreous hemorrhage include rapid, staccato motion of the hemorrhage with ocular movement, and layering of blood dependent on patient positioning (12,13).

CONCLUSIONS

Bedside ocular ultrasound is an important adjunct in evaluating patients with visual changes in the ED. This case highlights some of the pitfalls when assessing for retinal

detachment. Posterior vitreous detachment and vitreous hemorrhage can be distinguished from retinal detachment by the differences in echogenicity and kinetics with eye movement. The rapid evaluation of retinal detachment in the ED is vital for improving outcomes and minimizing morbidity. However, given the potential for blindness with misdiagnosis, it is better to assume retinal detachment in questionable cases and obtain appropriate ophthalmologic consultation.

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