CLINICAL PRACTICE

A Study of Bedside Ocular Ultrasonography in the Emergency Department

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Abstract

The use of ocular ultrasonography for the evaluation of emergency patients has recently been described in the emergency medicine (EM) literature. There are a number of potential uses that may greatly aid the emergency physician (EP) and avoid lengthy consultation or other diagnostic tests. **Objective:** To examine the accuracy of bedside ultrasonography as performed by EPs for the evaluation of ocular pathology. **Methods:** This prospective, observational study took place in a high-volume, suburban community hospital with an EM residency program. All patients arriving with a history of eye trauma or acute change in vision were eligible to participate in the study. A 10-MHz linear-array transducer was used for imaging. All imaging was performed through a closed eyelid, using water-soluble ultrasound gel. Investigators filled out standardized data sheets and all examinations were taped for review. All ultrasound examinations were followed by orbital computed tomography or complete ophthalmologic evaluation from the ophthalmology service. Statistical analysis included sensitivity, specificity, and positive and negative predictive values. **Results:** Sixty-one patients were enrolled in the study; 26 were found to have intraocular pathology on ultrasound. Of these, three had penetrating globe injuries, nine had retinal detachments, one had central retinal artery occlusion, and two had lens dislocations. The remaining pathology included vitreous hemorrhage and vitreous detachment. Emergency sonologists were in agreement with the criterion standard examination in 60 out of 61 cases. **Conclusions:** Emergency bedside ultrasound is highly accurate for ruling out and diagnosing ocular pathology in patients presenting to the emergency department. Further, it accurately differentiates between pathology that needs immediate ophthalmologic consultation and that which can be followed up on an outpatient basis. **Key words:** emergency ultrasonography; ultrasound; ocular ultrasound; ocular emergencies; ocular trauma; emergency medicine. ACADEMIC EMERGENCY MEDICINE 2002; 9:791–799.

Ocular emergencies account for 3% of all emergency department (ED) visits and can range from simple conjunctivitis to organ-threatening diseases such as central retinal artery and vein occlusion or globe rupture.[1] The evaluation of ocular emergencies can be limited by lack of specialized equipment and training. However, full ophthalmologic backup is not always available and decisions regarding disposition may have to be made with limited information. Further, other testing such as computed tomography (CT) of the orbit, magnetic resonance imaging (MRI), or angiography may be time-consuming and costly as well as not being readily available at all times and in all settings.[2]

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The recent spread of ultrasound technology and adaptation of it at the bedside by emergency physicians (EPs) has led to exploration of a number of applications outside of the original six specified by Mateer et al. in the 1994 article regarding emergency ultrasound training.[3] These applications have included a number of useful bedside tests such as ultrasound-guided central line placement, lower-extremity Doppler, testicular ultrasound, and, recently, ocular ultrasound.[4–7]

Ocular ultrasound can be potentially useful to the EP in several conditions. Blunt trauma to the eye often results in considerable soft-tissue swelling that can make it difficult to retract the lids.[1] Ultrasound can, noninvasively, evaluate for lens dislocation, globe rupture, and retrobulbar hemorrhage.[5] Other applications include evaluation of the eye with new-onset visual change, such as that in retinal detachment or central retinal artery or vein occlusion. If proven to be accurate and safe, bedside ocular sonography in the ED could streamline the evaluation and treatment of a small but important segment of the ED population.

We evaluated the accuracy of bedside emergency ultrasound for the diagnosis of ocular pathology in the ED setting. All ultrasound examinations were performed by EPs at the bedside with a standard ultrasound machine available in the ED. Ophthalmologic evaluation and CT were used as the criterion standards for comparison.

METHODS

Study Design. This was a single-blinded, prospective observational study of patients presenting with ocular complaints to our EDs. The study used a convenience sample of patients. The institutional review board approved this research.

Study Setting and Population. The study was conducted in a large suburban teaching ED with an emergency medicine (EM) residency program. The ED has a census of approximately 70,000 visits per year and full specialty backup. All patients presenting to the ED with complaints of ocular trauma or visual changes between October 2000 and September 2001 were included in the study.

The ED is staffed by board-certified EM attending physicians as well as residents. Residents and attending physicians perform bedside ultrasound examinations. An intradepartmental credentialing system is in place to allow EPs to make clinical decisions based on the results of their ultrasound examinations. An active ultrasound education program exists in the department.

A 10-MHz linear-array transducer used for vascular imaging is available on a Philips Image Point HX ultrasound machine capable of color Doppler imaging (Philips Medical Systems, Palo Alto, CA). Attending physicians and residents perform ocular ultrasound examinations. The radiology department does not perform ocular ultrasound examinations. Ophthalmologic consultation is available on a 24-hour-per-day basis from private ophthalmologists who respond in less than two hours. Emergency physicians are credentialed to perform ultrasound examinations by the hospital as consistent with resolution 802 by the American Medical Association. All of the ultrasound examinations were performed by one of three attending physicians or one of five residents. The attending physicians did not have specific training in performing ocular ultrasound examinations and had performed between 15 and 75 each, prior to the beginning of the study. The five residents each received one hour of lecture and one hour of hands-on instruction on ocular sonography from one of the attending physicians.

Patients presenting to the ED were eligible for study enrollment if they complained of ocular trauma or acute change in vision. Pathology that was scanned for included vitreous hemorrhage, vitreous detachment, retinal detachment, central retinal artery and vein occlusion, globe rupture, intraocular foreign bodies, lens dislocation, and retrobulbar hematomas. It is the ultrasound policy that bedside testing should not interfere with patient care and no ultrasound examinations can be performed that would delay formal testing or surgical intervention.

Only patients who received an ocular bedside ultrasound and then a confirming study, such as CT or formal ophthalmologic evaluation, were enrolled into the study.

Study Protocol. One hundred thirty-four patients with complaints of ocular trauma or acute visual change potentially consistent with the etiologies listed above were seen during this period. Acute-onset visual change was defined as visual change within 48 hours of presentation. Patients with binocular double vision (an entity not likely to be related to the globe itself) were excluded from enrollment. All examinations were recorded on a standardized ultrasound log and taped on SVHS tape for review by the department ultrasound quality assurance (QA) committee. The QA committee consisted of the director and associate director of emergency ultrasound. Both were fellowship-trained in emergency ultrasonography with scan experience ranging from 600 to 4,000 scans. The QA committee met weekly to review all ultrasound examinations performed by EPs. Ultrasound examinations were performed following an established protocol using a closed-lid technique. The power output and gain were turned down to the minimum possible settings to achieve acceptable imaging. The eye was then scanned in sagittal and transverse planes. Ophthalmologic consultants were not informed of ultrasound scan results.

Measures. Resident and attending physicians saw all patients. Bedside ultrasonography was performed immediately after initial physical examination. Radiologic testing or ophthalmologic consultation was not delayed for bedside scanning. Initial complaint, bedside ultrasound results, criterion standard study results, and diagnosis upon leaving the ED were recorded.

All ultrasound examinations were performed with a 10-MHz linear-array ultrasound probe using a closed-eye technique (Fig. 1). Confirmatory testing consisted of thin-section CT of the orbits or ophthalmologic evaluation in the ED.[8,9] The EP obtained ophthalmologic consultation on patients at their discretion. All ophthalmologists consulted were board-certified in their specialty.

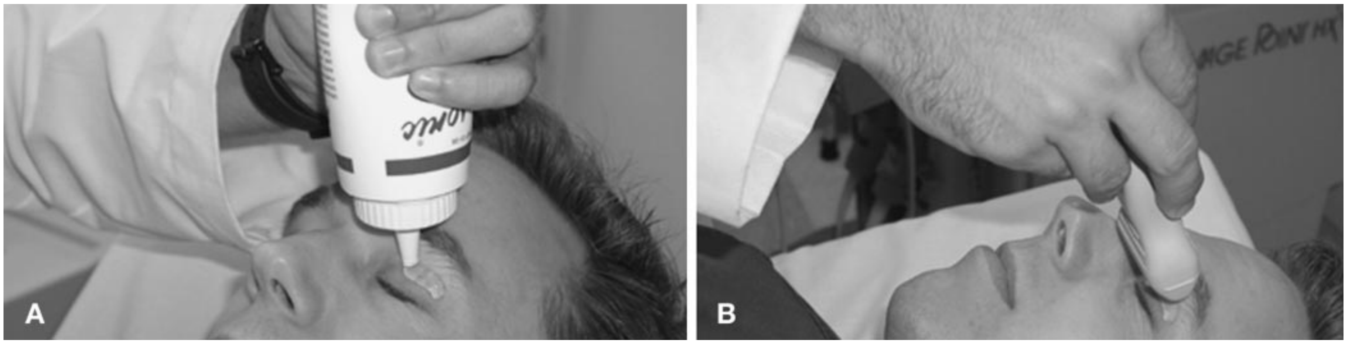

Figure 1. Gel is shown being applied to the closed eye, **A**. A high-resolution linear-array probe is shown in transverse over the eye, **B**.

Data Analysis. All patient information was entered into a Microsoft Excel 5.0 spreadsheet (Microsoft Corporation, Redmond, WA). Data were analyzed using statistical calculators from a commercially available software package (Analyse-it 1.44, Analyse-it Inc., Leeds, Great Britain). Sensitivity, specificity, and positive and negative predictive values with 95% confidence intervals (95% CIs) were calculated.

RESULTS

Out of a total of 134 eligible patients, 61 received bedside ultrasound examinations for evaluation of ocular pathology between October 2000 and December 2001 and were enrolled into the study. Seventy-three potential study patients were missed due to lack of available EPs to perform the ultrasound examinations. Of those enrolled, 26 (43%) patients were found to have intraocular pathology other than soft-tissue swelling. All ultrasound examinations were followed by orbital CT, complete ophthalmologic evaluation, or both (Table 1). The EP ultrasound examinations agreed with confirmatory studies in 60 out of 61 patients, resulting in a sensitivity of 100% (95% CI = 94% to 100%) and a specificity of 97.2% (95% CI = 89% to 99%). The positive predictive value was 96.2% (95% CI = 88% to 99%) and the negative predictive value was 100% (95% CI = 94% to 100%). The range of pathology identified is listed in Table 1.

Emergency medicine residents and attendings performed all ocular ultrasound examinations. One ultrasound examination of an elder woman presenting with a complaint of worsening vision starting four hours prior did not agree with the follow-up evaluation by ophthalmology. The ultrasound diagnosis was of a small vitreous hemorrhage. However, the complete ophthalmologic evaluation was negative (patient 35 in Table 1). Review by the ultrasound QA committee concurred with the bedside diagnosis of vitreous hemorrhage. This case was then shown to a board-certified ophthalmologist with considerable ocular ultrasound experience, who agreed the hemorrhage was present and thought it could have been missed on initial evaluation.

Of the three patients with globe rupture, one was taken for emergency surgery, while the other two were sent home to return the next day for outpatient surgery. The patient taken directly to the operating room did not recover vision. The patient confirmed to have central retinal artery occlusion was given thrombolytics, and progressively improved over several hours. She was admitted to the intensive care unit and recovered most of her vision. Of the two patients with lens dislocation, one was taken to the operating room that evening and the other was asked to return the following morning for outpatient surgery. Two patients with massive vitreous hemorrhages from facial trauma were lost to follow-up after discharge from the hospital where both received CT and evaluations by ophthalmology consultants.

DISCUSSION

Ocular emergencies account for approximately 3% of all visits to the ED.[1] While complaints such as conjunctivitis or chronically worsening vision are not a diagnostic challenge, other complaints may place considerable burden on the EP to disprove vision-threatening pathology. Such pathology includes globe penetration, foreign-body retention inside the eye, acute glaucoma, retrobulbar hematomas, lens dislocation, central retinal vein and artery occlusion, retinal detachment, and vitreous hemorrhage. Many of these diagnoses can be difficult to make without proper ophthalmic tools and training. Further, making the diagnosis can be time-consuming. Ophthalmologic consultation is not available in all settings, or it may be delayed if a busy consultant is not in-house. This can potentially lead to treatment delays and misdiagnosis. An addi-

TABLE 1. Results of the Ultrasound (US) Examinations

Patient	Complaint	Duration	US Finding	Confirmatory Test*	Results Agree?	Notes
1	Facial trauma	30 min	Soft-tissue swelling	CT	Yes	Fist to eye
2	Visual change	4 hr	Normal eye	Ophthalmology	Yes	History of detachment
3	Facial trauma	45 min	Soft-tissue swelling	CT, ophthalmology	Yes	Ejected from vehicle
4	Facial trauma	2 hr	Normal eye	CT, ophthalmology	Yes	Head bleed
5	Facial trauma	1 hr	Normal eye	CT	Yes	Head bleed
6	Facial trauma	2 hr	Soft-tissue swelling	CT, ophthalmology	Yes	Baseball to head
7	Facial trauma	30 min	Normal eye	CT	Yes	Fall
8	Facial trauma	45 min	Vitreous hemorrhage	CT, ophthalmology	Yes	Motor vehicle collision (MVC)
9	Facial trauma	45 min	Lens dislocation	CT, ophthalmology	Yes	Air bag injury
10	Foreign body to eye	2 hr	Anterior chamber collapse	Ophthalmology	Yes	Perforation of globe
11	Visual loss	24 hr	Normal art and vein flow	Ophthalmology, MRA	Yes	Positive angiography outside
12	Facial trauma	30 min	Soft-tissue swelling	CT, ophthalmology	Yes	Head bleed
13	Facial trauma	45 min	Papilledema	CT	Yes	Large head bleed
14	Facial trauma	40 min	Soft-tissue swelling	CT, ophthalmology	Yes	Admitted for observation
15	Visual change	4 hr	Normal eye	Ophthalmology	Yes	Seeing flashes/spots
16	Visual change	2 days	Retdinal detachment	Ophthalmology	Yes	Seeing flashes/spots
17	Visual change	12 hr	Normal art and vein flow	CT, ophthalmology	Yes	Visual loss
18	Facial trauma	45 min	Soft-tissue swelling	CT, ophthalmology	Yes	Fist to eye
19	Facial trauma	60 min	Soft-tissue swelling	CT	Yes	MVC
20	Facial trauma	2 hr	Soft-tissue swelling	CT	Yes	Blow to head with bat
21	Visual change	18 hr	Retinal detachment	Ophthalmology	Yes	Small detachment, centrally
22	Facial trauma	30 min	Soft-tissue swelling	CT, ophthalmology	Yes	MVC
23	Visual change	3 days	Retinal detachment	Ophthalmology	Yes	Seeing flashes/spots
24	Visual change	12 hr	Retinal detachment	Ophthalmology	Yes	Seeing flashes/spots
25	Visual change	2 days	Retinal detachment	Ophthalmology	Yes	Seeing flashes/spots
26	Visual change	2 hr	Retinal detachment	Ophthalmology	Yes	Blindness in affected eye
27	Visual change	2 days	Normal eye	Ophthalmology	Yes	Chronic cataract
28	Visual change	2 days	Normal eye	Ophthalmology	Yes	Chronic cataract
29	Facial trauma	30 min	Globe rupture	CT, ophthalmology	Yes	Head bleed
30	Visual change	2 days	Normal eye	Ophthalmology	Yes	Blindness from enophthalmos
31	Facial trauma	40 min	Soft-tissue swelling	CT, ophthalmology	Yes	MVC
32	Facial trauma	30 min	Soft-tissue swelling	CT	Yes	MVC
33	Facial trauma	45 min	Soft-tissue swelling	CT, ophthalmology	Yes	Fall from ladder
34	Facial trauma	60 min	Soft-tissue swelling	CT, ophthalmology	Yes	Head bleed
35	Visual change	2 hr	Vitreous hemorrhage	Ophthalmology	No	Unilateral decreased vision
36	Visual change	2 hr	Vitreous detachment	Ophthalmology	Yes	Near complete blindness
37	Visual change	14 hr	Normal eye	Ophthalmology	Yes	Complete blindness resolved
38	Visual change	6 hr	Central retinal artery occlusion	Ophthalmology, angiography	Yes	Thrombolytics given
39	Facial trauma	60 min	Normal eye	CT	Yes	Head bleed
40	Visual change	12 hr	Retinal detachment	Ophthalmology	Yes	Old laser surgery
41	Visual change	8 hr	Vitreous detachment	Ophthalmology	Yes	Small and hard to detect
42	Visual change	5 hr	Vitreous hemorrhage	Ophthalmology	Yes	Near complete blindness
43	Facial trauma	60 min	Soft-tissue swelling	CT	Yes	Head bleed
44	Facial trauma	20 min	Soft-tissue swelling	CT	Yes	Intubated, no head bleed
45	Facial trauma	100 min	Vitreous hemorrhage	CT, ophthalmology	Yes	Massive hemorrhage
46	Facial trauma	60 min	Vitreous hemorrhage	CT, ophthalmology	Yes	Massive hemorrhage
47	Visual change	8 hr	Retinal detachment	Ophthalmology	Yes	Near complete blindness
48	Facial trauma	60 min	Globe rupture	CT, ophthalmology	Yes	Small rupture
49	Visual change	2 days	Vitreous hemorrhage	Ophthalmology	Yes	Small bleed

continued

TABLE 1. Results of the Ultrasound (US) Examinations (*cont.*)

Patient	Complaint	Duration	US Finding	Confirmatory Test*	Results Agree?	Notes
50	Visual change	2 hr	Normal eye	Ophthalmology	Yes	Cataract
51	Facial trauma	45 min	Normal eye	CT	Yes	MVC
52	Facial trauma	90 min	Globe rupture	CT, ophthalmology	Yes	Air bag injury
53	Visual change	18 hr	Retinal detachment	Ophthalmology	Yes	History of detachment
54	Visual change	5 hr	Normal eye	Ophthalmology	Yes	No change in testing from prior results
55	Facial trauma	2 hr	Normal eye	CT	Yes	Concussion
56	Facial trauma	60 min	Lens dislocation	CT, ophthalmology	Yes	Air bag injury
57	Visual change	24 hr	Normal eye	Ophthalmology	Yes	Unilateral decreased vision
58	Ocular trauma	30 min	Intraocular foreign body	CT, ophthalmology	Yes	Operating room
59	Visual change	6 hr	Normal eye	Ophthalmology	Yes	No change in testing from prior results
60	Visual change	2 days	Normal eye	Ophthalmology	Yes	Chronic cataract
61	Visual change	24 hr	Normal eye	Ophthalmology	Yes	Progressive macular degeneration

*CT = computed tomography; MRA = magnetic resonance angiography.

tional diagnostic tool that is accurate, safe, and easy to use at the bedside could prove to be of considerable utility in the diagnostic armamentarium of the EP.

Ocular ultrasonography was initially investigated in the clinical setting in the late 1960s and early 1970s. The limitations placed on resolution by primitive equipment greatly restricted the evaluation of ocular diseases until the 1990s.[10] Further dampening interest in ocular ultrasound was the rapid development and high popularity of CT and MRI.[11] Interestingly, ocular ultrasound is usually not performed by radiologists but rather by ophthalmologists or specialized technologists in ophthalmology clinics. Typically a single-purpose ultrasound machine is used that cannot perform other functions such as those required in the EM setting. The ultrasound transducer used also differs from anything commonly encountered in emergency ultrasonography (Fig. 2).

Ocular ultrasonography as performed in an ophthalmology clinic setting is typically used to evaluate the eye for more chronic pathology such as tumors, anterior chamber disease, extraocular muscle disease, and retinal pathology. Recently ophthalmologists have also used their ultrasound technology to evaluate trauma to the globe: we have witnessed ophthalmology residents leave the ED with patients on whom they are consulting in order to perform ultrasound examinations in a nearby clinic.

The ability to evaluate the eye and the immediate surrounding tissues in a rapid, safe, and noninvasive manner is of tremendous value in the EM setting. History taking, direct visual inspection, visual acuity testing, visual field testing, and direct ophthalmoscopy provide only limited information, especially in the presence of facial trauma, when eyelids can be so swollen that the examination is extremely painful and sometimes nearly impossible. To the best of our knowledge, one publication in the EM literature describes the use of ocular ultrasound by EPs for diagnostic evaluation.[5] This was a brief report describing several cases and the potential diagnostic use of emergency ocular ultrasound.

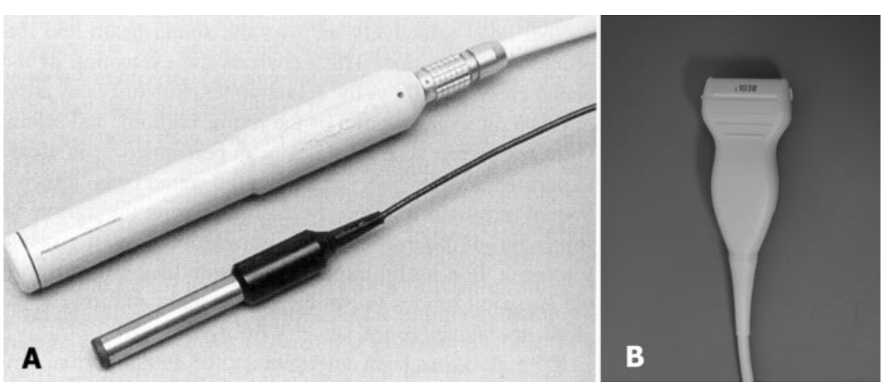

Figure 2. Typical transducers used with dedicated ocular ultrasound machines, **A**. A linear transducer commonly available on conventional ultrasound machines for lower-extremity duplex examinations and small parts scanning, **B**.

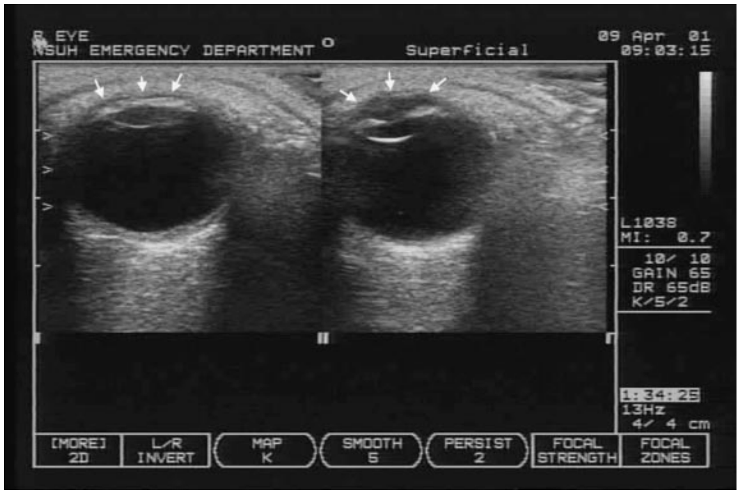

Figure 3. The anterior chamber cannot be defined in the injured eye (left), *arrows.* In the contralateral and uninjured eye (right), a normal anterior chamber is seen, *arrows.*

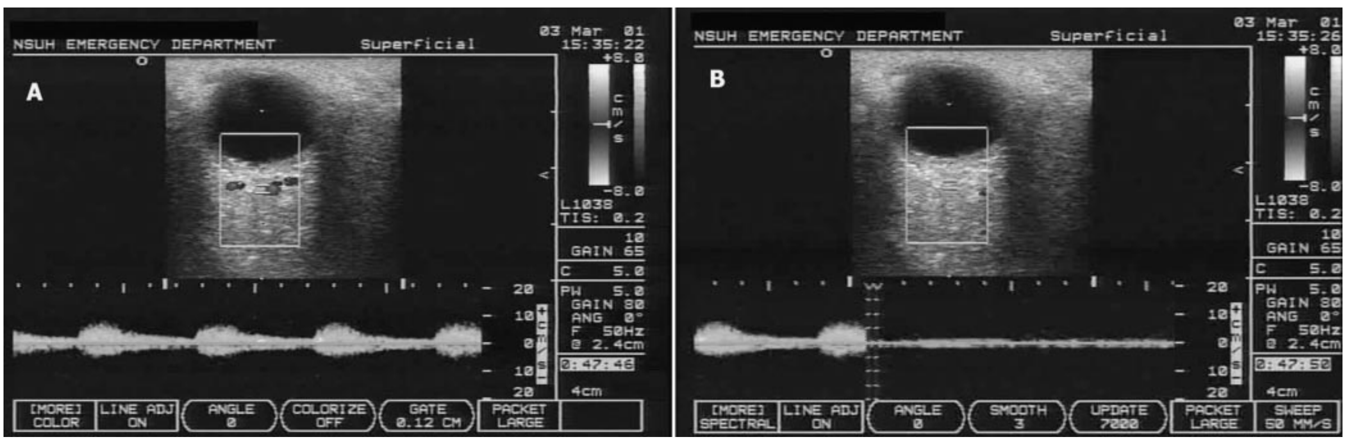

Figure 4. The typical arterial pattern of the central retinal artery of spectral Doppler is seen at the bottom of the screen, which is sampling above just deep to the globe, **A**. A flat venous pattern of the central retinal vein is seen just after the arterial flow as the sample gate is shifted slightly, **B**.

In our study, all ocular ultrasound examinations were followed by either CT of the orbits or evaluation by ophthalmology, at the discretion of the evaluating physician. Significant portions of the eyes scanned were found to have pathology that was later confirmed by these methods. Most notable was the ability to identify penetrating globe injuries without any manipulation of the eyelid. In some patients with potential penetrating eye injuries, lid manipulation should be avoided to decrease the risk of expressing vitreous fluid from the perforated globe. Classic signs such as a distorted pupil or distortion of the anterior chamber are nonspecific and require manipulation of the patient's eyelids. In subtle cases, CT of the orbits is required. Orbital CT requires the patient to lie flat, while ocular ultrasound can be performed with the patient sitting upright. One case in our study involved a very subtle globe penetration that was noted only as a collapsed anterior chamber on ultrasound (Fig. 3). The orbital CT revealed only soft-tissue swelling. The patient refused to have his eyelids manipulated until he was told that he had a penetrating globe injury. It is important to note again that with any suspicion for globe penetration, a large quantity of gel should be applied to the closed lid so that the transducer does not actually have to make contact with the eyelid.

Three patients were evaluated specifically for complete visual loss with color and spectral Doppler of the central retinal artery and vein. One patient was transferred to our ED with a central retinal artery occlusion that had been diagnosed with angiography three hours prior. She had a long history of psychiatric disease and had told her sister that morning that she was blind in the right eye. Evaluation with bedside emergency ultrasound revealed normal flow in the central retinal artery and vein (Fig. 4). This was confirmed by the ophthalmology consultants with a repeat angiogram. The patient was later determined to have significant visual deficit that was probably chronic. The second patient presented with sudden and painless loss of vision in the left eye and was found to have no flow in the central retinal vein. This was confirmed and treated by ophthalmology consultants. The third patient also presented with acute loss of vision and was examined with ultrasound at the beside. She was found to have normal flow in both the central retinal artery and vein. An MRI later revealed a suspicious lesion and the patient was given a diagnosis of suspected multiple sclerosis.

Retinal detachment can also be difficult to detect on physical examination, especially when the detachment is small. Small detachments can even challenge an experienced ophthalmologist. However, detection of retinal detachment is important in order to ensure that appropriate follow-up is arranged, and intervention is available when necessary. A patient included in this study presented with a complaint of new onset of greatly decreased vision in her left eye. This had been noted on an examination at an optician's office just five hours earlier, and she had already been seen by an ophthalmologist prior to arrival in our ED. A bulging optic cup was thought to have been visualized without other pathology noted. The patient was directed to our ED for a head CT and lumbar puncture. On evaluation in the ED, bedside ultrasonography revealed no papilledema and she was found to have a small perimacular serous detachment (Fig. 5). This was confirmed by an ophthalmologic consultant specializing in retinal pathology to be central serous chorioretinopathy, an entity where the neurosensory retina detaches in the region of the macula.

Vitreous hemorrhages can interfere with vision and, if they are large, can lead to apparent blindness. However, in the presence of significant facial trauma, it may be difficult to determine the precise cause of decreased visual acuity. Significant vitreous hemorrhage, globe rupture, retrobulbar hematomas, or lens dislocation can all result in visual loss. Five patients in our study were found to have large vitreous hemorrhages as the sole cause of visual loss after significant facial trauma (Fig. 6).

As with fetal ultrasound, it is important to limit the duration of the examination as much as possible, especially when using spectral and color Doppler, which are thought to produce increased levels of mechanical energy. Although there is still no evidence of harm to human tissues with properly set diagnostic medical ultrasound, the most conservative approach is justified. Original recommendations about power output levels for ocular ultrasound date back to 1976 and it is unclear whether they have any relevance to modern ultrasound equipment.[12] However, a recent study evaluated ocular tissue for any negative effects of very-high-frequency ultrasound. Rabbit corneas and retinas were exposed to ultrasound frequencies ranging from 10 to 60 MHz for up to 30 minutes. No deleterious effects were noted on both slit lamp examination and pathology sections.[13] The typical examination time for emergency ultrasound of the eye can be less than 60 seconds, with more difficult ones requiring 90 seconds. Only short samples of blood flow in the central retinal artery and vein are taken with color and spectral Doppler to further decrease emergency exposure. Power levels and gain are turned to near minimum as a necessity in order to decrease image distorting echoes caused by the closed eyelid. These precautions, along with built-in low power levels in modern ultrasound machines, placed energy exposures for our examinations well below maximal tolerance levels.

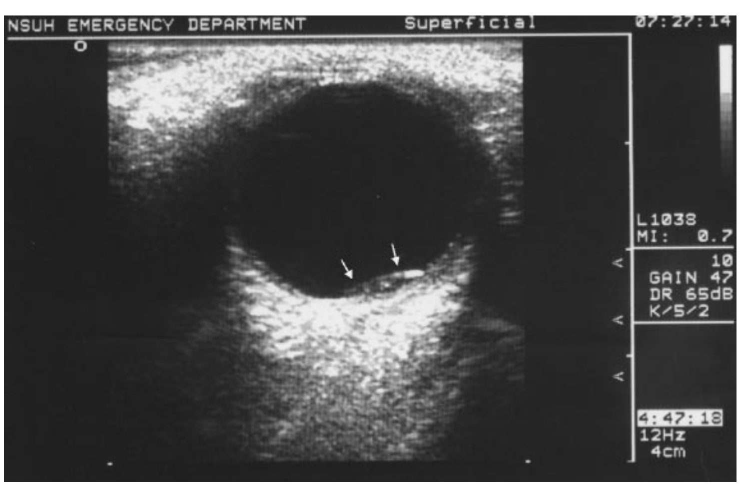

Figure 5. A small perimacular serous detachment is seen as a result of central serous chorioretinopathy, *arrows.*

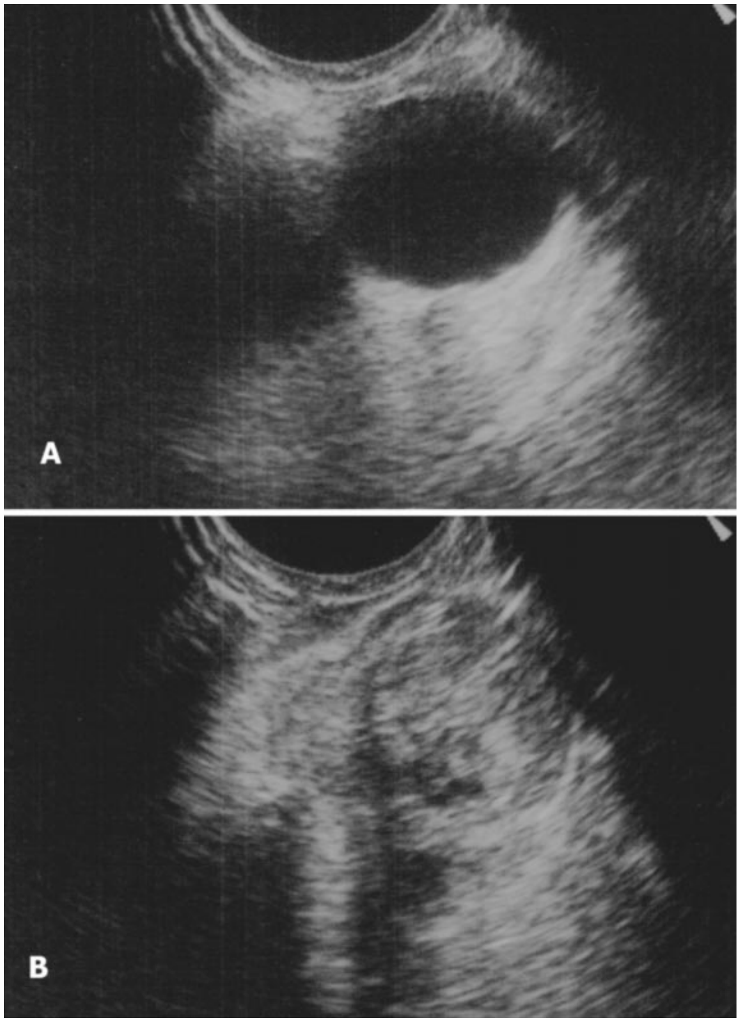

Figure 6. A normal eye is shown with no evidence of hemorrhage, **A**. The entire globe is filled with blood (*bright echoes*) in this patient who presented with unilateral blindness after facial trauma, **B**. This scan was performed with a high-resolution curved faced probe, as compared with the other images presented.

LIMITATIONS

The major limitation to this study is its small sample size. However, to the best of our knowledge, this is the first study of its kind, and it showed great accuracy on the part of the EPs utilizing this technology. The study captured less than half of the patients with the type of ocular complaints that would lend themselves to ultrasound diagnosis. However, this does not lessen the impact of our findings using this new diagnostic tool. The validation of this technology, although on a limited scale, should prompt its use by emergency ultrasonographers, and larger studies will soon be possible.

We did not evaluate how the performance of emergency ocular sonography changed the decision-making process of the treating EP. This is best suited for a larger prospective study. Other limitations include the technology used during the study. This type of ultrasound machine is considered higher end for EDs, and although it is becoming much more common, not all emergency sonologists will have such technology available to them. This is likely to change as the availability of inexpensive portable ultrasound units capable of high-resolution scanning with linear transducers (10 MHz) increases.

CONCLUSIONS

Emergency physicians performing ocular ultrasound examinations at the bedside can accurately detect a range of pathological disorders and rule out emergent conditions that would otherwise require immediate ophthalmologic consultation.

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REFLECTIONS

Consecutive Patients on a Fabled Shift

Age two, adrenal insufficient, Mom comprehended
The need to double his Florinef and Cortisol
Since onset of gastroenteritis over the weekend.
Her efforts were wasted from my eyeball-to-eyeball
Analysis of his blunted affect and scaphoid belly.
When verbal, he complained of a painful "turtle."
Following boluses of normal saline, fluid expelling
From his urethra made UTI an accurate provisional.
Next came a 16-year-old with "lower extremity complaint."
He was about to explode into a protective Trojan
When his cupid shifted per pubis on his penetrant.
Unreined pain, detumescence and bruise expanded.
I had this hare bypass ortho for an amorous fracture.
Aesop's slow and steady fable is what I conjured.

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