Peer Reviewed

Title:
Retrobulbar Hematoma from Warfarin Toxicity and the Limitations of Bedside Ocular Sonography

Journal Issue:
Western Journal of Emergency Medicine, 11(2)

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Publication Date:
2010

Publication Info:
Western Journal of Emergency Medicine, Department of Emergency Medicine, UC Irvine

Permalink:
http://escholarship.org/uc/item/3fk8n9vq

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Keywords:
ultrasound, retrobulbar, hematoma, ocular

Preferred Citation:

Abstract:
The following case describes a 26-year-old female who presented to the emergency department with a nontraumatic retrobulbar hematoma associated with warfarin toxicity. The application and limitations of focused bedside ocular sonography for this condition are discussed. [West J Emerg Med 2010; 11(2):208-210.]

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1. REPORT DATE
20 MAR 2010

2. REPORT TYPE

3. DATES COVERED
00-00-2010 to 00-00-2010

4. TITLE AND SUBTITLE
Retrobulbar Hematoma from Warfarin Toxicity and the Limitations of Bedside Ocular Sonography

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Madigan Army Medical Center, Department of Emergency Medicine, Tacoma, WA, 98431

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR’S ACRONYM(S)

11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT
unclassified

b. ABSTRACT
unclassified

c. THIS PAGE
unclassified

17. LIMITATION OF ABSTRACT
Same as Report (SAR)

18. NUMBER OF PAGES 5

19a. NAME OF RESPONSIBLE PERSON

Standard Form 298 (Rev. 8-98)
Prepared by ANSI Z39-18
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**Supporting material:**
1. Video 1. Ultrasound video of Left (symptomatic) eye in axial plane
2. Video 2. Ultrasound video of Left (symptomatic) eye in sagittal plane
3. Video 1. Ultrasound video of Left (symptomatic) eye in axial plane with audio narration
4. Video 2. Ultrasound video of Left (symptomatic) eye in sagittal plane with audio narration
Retrobulbar Hematoma from Warfarin Toxicity and the Limitations of Bedside Ocular Sonography

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The following case describes a 26-year-old female who presented to the emergency department with a nontraumatic retrobulbar hematoma associated with warfarin toxicity. The application and limitations of focused bedside ocular sonography for this condition are discussed.

association with sudden elevation of cranial venous pressure and venous congestion (self-strangulation, induced by labor and scuba diving), and systemic diseases associated with bleeding tendencies (coagulopathy from liver disease, scurvy). In the elderly it has been postulated that vascular lesions, such as atherosclerosis or small aneurysms, could cause seemingly spontaneous hemorrhage, although a subacute presentation is more suggestive of venous bleeding. Occasionally, no associated etiology is found.

Without prompt recognition and treatment, RBH can lead to complications such as secondary optic atrophy, secondary strabismus, permanent choroidal folds, infection, hematoma enlargement and vision loss. Bedside ocular ultrasound is an appealing modality for rapid identification of this emergent condition and may obviate the need for CT scan if the diagnosis can be made.

In this case, the CT scan demonstrates a fairly significant RBH (Figure 2), yet the focused bedside ultrasound (Figure 1) failed to demonstrate a hypoechoic fluid collection in the retro-ocular region, as expected based on previous reports. Interestingly, in the emergency medicine literature no reports describe the sonographic diagnosis of RBH in a clinical setting. In 2000, Blaivas described the expected sonographic findings in a case series of ocular pathology identified with bedside ultrasound, although a specific case detailing the diagnosis of RBH was not reported. Also in 2000, an abstract published by Estevez et al. described accurate identification of simulated retrobulbar hematomas in bovine models with sonography, although the specific findings were not revealed. CT scan was used as a gold standard and the sonographers correctly identified 15/18 hematomas (83%) and 4/4 orbits without hematomas.

In this case, potential explanations for the paucity of findings on bedside ultrasound include: 1) incomplete evaluation of the retro-ocular region, 2) subsequent progression of the RBH following the ultrasound, 3) inexperience of the sonologist and 4) echogenicity incompatible with visualization of the RBH. These possibilities will be explored in further detail.

Incomplete ultrasound evaluation of the retro-ocular structures is possible considering the eccentric location of

**Figure 1.** Ultrasound images of left (symptomatic), which failed to demonstrate a hypoechoic fluid collection in the retro-ocular region & right (asymptomatic) orbits.

**Figure 2.** Computed tomography demonstrating left retrobulbar hemorrhage with proptosis.
Retrobulbar Hematoma

In patients with proptosis and suspected retrobulbar hemorrhage, timely orbital decompression is essential to preserve the ocular nerve and visual acuity. While bedside ultrasound may be useful when positive, the diagnostic accuracy of this modality requires further investigation.

**Video 1.** Video in axial plane of the left (symptomatic) orbit with audio narrative available at www.westjem.org.

**Video 2.** Video in sagittal plane of the left (symptomatic) orbit with audio narrative available at www.westjem.org.

**CONCLUSION**

In patients with proptosis and suspected retrobulbar hemorrhage, timely orbital decompression is essential to the RBH relative to the globe, as evidenced by CT (Figure 2). However, the sonologist spent approximately 15 minutes at the bedside performing a careful examination of the retro-orbital structures. Although the complete study was not recorded, two video clips were taken demonstrating interrogation of the symptomatic eye in both axial and sagittal planes [Videos 1, 2 (online at www.westjem.org)]. It should be noted that the sonologist feels these clips do not justify the full interrogation of the orbit actually performed at the time of the study. Regardless, an important point of emphasis is that a thorough ultrasound evaluation entails scanning all three dimensions of the structure(s) of interest.

Progression of the RBH in the brief period of time between the ultrasound evaluation and the CT is unlikely. It is clear that some progression of the RBH occurred during the hospital course. However, given the close proximity of the bedside ultrasound evaluation relative to the CT, and the fact that the patient’s condition remained unchanged during her stay in the ED, it is unlikely that significant change occurred during this time.

Inexperience of the sonologist for this technically challenging examination is worthy of consideration, although his reported comfort level with the examination was moderate to high.

Finally, echogenicity of the RBH may have played a factor. It is well known that acute blood often appears anechoic on ultrasound but over time becomes more echogenic. It seems likely, based on the onset of eye pain and swelling that the RBH occurred between a few hours and one day prior to presentation. This would suggest an isoechoic or hyperechoic RBH relative to the surrounding retro-ocular structures, composed of bone, fat and air (sinuses), all of which are echogenic structures. Yet, with such an extreme coagulopathy (INR = 25), this explanation is challenged.

The authors feel the most likely explanation for the false-negative ultrasound is similar echogenicity of the RBH and the surrounding retro-ocular tissues. Future investigations should explore the echogenicity of RBH of various ages (acute, subacute, chronic) and degrees of coagulopathy. Additional factors worth considering are the volume of blood necessary to produce a mass effect on the globe (notably this was not present in our patient), the ability to discern this finding on ultrasound, and correlation with patient symptoms.

Along with the expansion of bedside ultrasound in emergency departments worldwide, the applications of bedside ocular ultrasound are also increasing. For safe implementation, the strengths and limitations need to be elucidated. Although bedside ultrasound is helpful in the diagnosis of various ocular conditions in emergency medicine, further reports and/or studies are needed to determine the value for the diagnosis of RBH. 

**REFERENCES**


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**Conflicts of Interest:** By the WestJEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias.