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A Case of Elevated Intracranial Pressure Diagnosed With Point-of-Care Ocular Ultrasound

To the Editor: Under current guidelines from the Choosing Wisely Campaign, imaging is not recommended for the majority of headaches encountered in general medicine.1 These recommendations have raised concerns about missed diagnoses, especially of the serious and perhaps life-threatening causes of secondary headaches. Non-imaging strategies for headache workup include direct fundoscopic examinations assessing for elevated intracranial pressure (ICP), but general internists report very low confidence in their skills with this procedure (2.5 of 5, the lowest of 13 core physical examination maneuvers).3

Point-of-care ultrasound (POCUS) of the eye is an ideal alternative tool for headache workup. Elevated ICP impacts ocular structures in predictable ways: the optic disc bulges anteriorly, and the optic nerve sheath diameter (ONSD) expands. When used to detect these changes, ocular POCUS shows good agreement with lumbar puncture

(77% sensitivity and 92% specificity).4 However, the exact ONSD diameter and optic disc height that should be used as a cutoff for diagnosis of elevated ICP remains undetermined.

Recently, a 32-year-old female presented to our primary care clinic for the management of acute on chronic headaches. Previously, the etiology of the patient’s headache was multifactorial due medication overuse, probable obstructive sleep apnea, and migraine headaches. On the basis of photophobia, she declined fundoscopic examination; therefore, ocular POCUS was performed with the patient in the supine position. The patient was instructed to look straight ahead and ultrasound gel was applied directly to the closed eyelid. The field of view was adjusted to visualize the optic nerve sheath, a linear and hypoechoic structure that sits posterior to the retina (Figure).

An increased ONSD of 6.1 mm indicative of high ICP was clearly visualized. Previous cranial imaging ruled out other causes of increased ICP. Idiopathic intracranial hypertension (IIH) was strongly considered. A lumbar puncture was performed, which yielded a 30 cmH2O opening pressure and normal cerebrospinal fluid composition. These findings supported the diagnosis of IIH as supported by the modified Dandy criteria. Carbonic anhydrase inhibitor therapy was initiated; this improved her daily symptoms. A 9-month follow-up exam confirmed that the patient’s headaches had resolved.

Finding an ONSD of 6.1 mm correlating with an opening pressure of 30 cmH2O may be a useful contribution to the emerging literature examining the relationship between ONSD and ICP.1,6 Previou


A 5.8 mm cutoff for ONSD as a diagnostic criteria for IIH previously yielded a sensitivity of 90% and specificity of 84%; however, this criterion may need to be refined as elevated ONSD and optic disc height may also indicative of neuritis, orbital cellulitis, and cranial shunt failure. A systematic review previously reported that ONSD ranging from 4.5 to 5.8 mm had varying sensitivity and specificity compared to reference standards of computed tomography, ICP monitor, or lumbar puncture (4.5-4.8 mm, 94% sensitivity and 94% specificity; 5.0-5.3 mm, 91% and 82%; 5.5-5.8 mm, 97% and 89%). Additionally, the cutoff values may vary for pediatric and adult patients.

The case presented here confirms that POCUS is a useful tool for the workup of chronic headache in an ambulatory setting when traditional examination methods are limited (in this case, by the patient’s photophobia). Additionally, use of POCUS can facilitate compliance with the reduced imaging recommendations from the Choose Wisely Campaign, while also soothing some concerns these conservative recommendations may cause missed diagnoses for severe or life-threatening conditions.

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**FIGURE.** A, Essential structures of the eye visualized with ocular point-of-care ultrasound. Ocular point-of-care ultrasound (POCUS) can be used to visualize the dimensions of critical ocular structures (A) at the bedside. This representative image (B) shows an ocular POCUS image taken at the bedside using a 7.5-MHz linear probe through a closed eyelid on a supine patient. The diameter of the optic nerve should be measured at a point 3 mm posterior to the retina. Increased height of the optic disc and expanded diameter of the optic nerve are indicative of papilledema, which may be indicative of elevated intracranial pressure.


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