Ultrasound Evaluation of Intracranial Pressure
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Introduction
Increased intracranial pressure (ICP) is a highly symptomatic and life-threatening condition associated with high mortality and morbidity. The most common modalities used for evaluating increased ICP include brain imaging (e.g., CT, MRI) and surgical monitoring options (e.g., external ventricular drain). A newer, non-invasive method to evaluate increased ICP includes the use of ultrasound to measure the optic sheath nerve diameter (ONSD). The clinical utility of ONSD for the assessment of intracranial hypertension is well established, with a meta-analysis determining a pooled sensitivity of 0.90 and specificity of 0.85 [1]. Physicians with previous bedside US experience are able to learn how to measure ONSD relatively quickly with as few as ten subjects, of whom three have abnormal results [2]. The technique is easily reproducible and has good overall reliability, with median intra-observer reliability of 0.2 mm and median inter-observer reliability of 0.2 to 0.3 mm [3].

Ultrasound
Use a linear high frequency transducer probe with the patient in the supine position. Two ONSD measurements are obtained for each eye, one in the sagittal plane and the other in a transverse plane. The following steps can be used as a guide for this measurement:

1. Set the depth to 4 cm prior to initiating the scan.
2. Apply a thin layer of US gel to the upper eyelid.
3. Gently place the probe upright, over the upper eyelid, such that the 2D plane of the US image is perpendicular to the horizontal palpebral fissure (imaginary line connecting the medial and lateral canthi) – this represents the sagittal plane.
4. Capture the entire posterior chamber and retina. Locate a section that clearly demonstrates the retina giving rise to optic nerve at its widest.
5. Freeze the desired image for measurement of ONSD.
6. Using the scale feature, calculate the width of the optic nerve (between the outer margins of the nerve) at a depth of 3 mm from the retina or posterior edge of the eye.
7. Once the measurement in sagittal plane is completed, rotate the probe 90 degrees clockwise such that the 2D plane of US is roughly parallel to the palpebral fissure – this represents the transverse plane.
8. Measure the ONSD as done previously.
9. Use the average of the four measurements (two measurements for each eye).

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References

