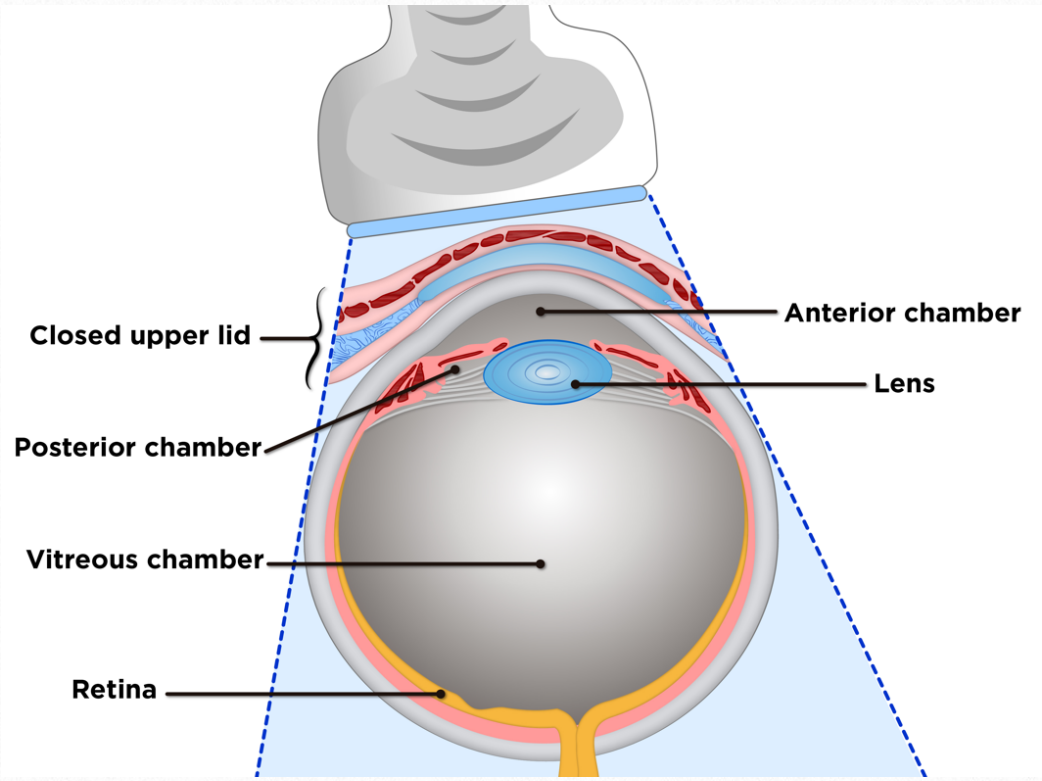
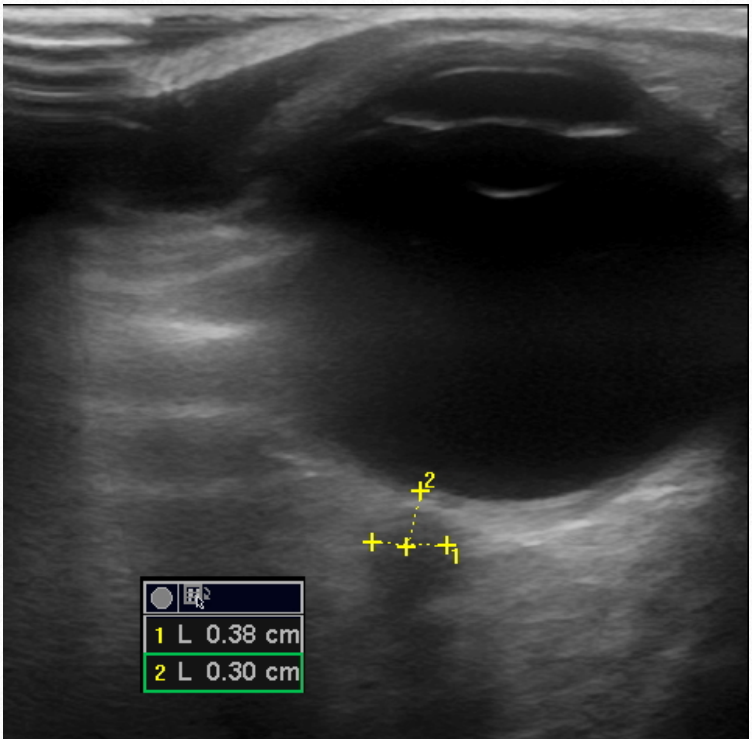
15

Ultrasound for Optic Nerve Diameter for Intracranial Pressure

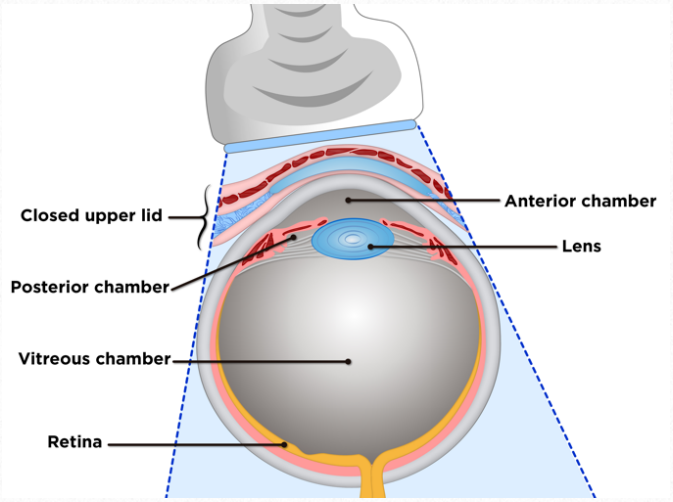




V. Additional Topics – Optic Nerve Diameter A.

Optic Nerve Diameter: Elevated intracranial pressure (ICP) is a challenging and potentially fatal complication of acute head trauma. Early intervention in the form of either surgical evacuation of the space-occupying hematoma or medical management of the raised ICP is vital to improve outcome. Unfortunately, the ability to detect elevated intracranial pressure by physical examination alone is difficult. Diagnosis is often made by cranial CT. However, CT has some disadvantages: 1) it involves transporting the critically ill pt., 2) the scanner is often situated away from the resuscitation room, and 3) transport to CT is not feasible during acute hemodynamic instability.

Recently, point of care (POC) ultrasound (US) of the optic nerve sheath diameter (ONSD) has been suggested as a possible indicator of elevated ICP. Studies have shown that the measurement of the optic nerve sheath diameter has a sensitivity of 98.6% and specificity of 92.8%. The following CT findings in clinically significant elevated ICP normally include (used traditionally to identify elevated ICP): significant edema, midline shift, mass effect, effacement of sulci, collapse of ventricles, or compression of cisterns. The ability to correlate the ONSD with ICP is possible because the optic nerve sheath includes the subarachnoid space around the optic nerve, which enlarges in situations of elevated ICP (see pic below). Therefore, POC US of ONSD provides a reliable, rapid, bedside, non-invasive test for raised ICP. **The upper limit of normal ONSD is 5 mm for adults, 4.5 mm for children aged 1—15 years and 4.0mm for infants up to 1 year of age.**



Probe type: high frequency linear probe only

Image acquisition: Place the high frequency probe transversely (indicator at the 9 o'clock position) to the patient eyelid. Keep the probe over the top part of the eyelid and aim the probe in a slightly caudad direction such that the probe makes a 60 to 70 degree angle with the eyelid. Remember, the optic nerve exits the eye posteriorly approximately at the middle of the eyeball. One should keep increasing and decreasing the axis angel of the probe to the eyelid to **MAXIMIZE** the diameter of the optic nerve sheath (=ONSD). **Measurements of the ONSD should be done approximately 3 mm behind the optic disc (see below).**

Place high freq.
probe transversely over upper part of eyelid. Measure
the optic nerve 3mm behind the optic dis