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## Optic Nerve Ultrasound for the Detection of Raised Intracranial Pressure.

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### Abstract

**BACKGROUND:** Optic nerve ultrasonography (ONUS) may help identify raised intracranial pressure (ICP). The optimal optic nerve sheath diameter (ONSD) cut-off for the identification of intracranial hypertension has not been established, with some clinical studies suggesting a higher cut-off than may be expected on the basis of prior laboratory investigation.

**OBJECTIVE:** To validate ONUS performed by neurointensivists as a technique for the detection of intracranial hypertension and identify the optimal ONSD criterion for the detection of ICP > 20 mmHg.

**METHODS:** Prospective blinded observational study. Patients in the ICU with either external ventricular drains or intraparenchymal ICP monitors at risk for intracranial hypertension were enrolled. The ONSD was measured by neurointensivists at the bedside with simultaneous invasive ICP measurement. An ROC curve was constructed to determine the optimal ONSD for the detection of ICP > 20 mmHg.

**MEASUREMENTS AND RESULTS:** A total of 536 ONSD measurements were performed on 65 patients. Diagnoses included subarachnoid hemorrhage, traumatic brain injury, intracerebral hemorrhage, ischemic stroke and brain tumor. ROC curve analysis revealed area under the curve (AUC) = 0.98 (95% CI 0.96-0.99; P < 0.0001 for AUC = 0.5). Optimal ONSD for detection of ICP > 20 mmHg was  $\geq 0.48$  cm sensitivity 96% (95% CI 91-99%); specificity 94% (92-96%). Sensitivity of the higher cutoff of  $\geq 0.52$  cm proposed by some authors was only 67% (58-75%), with specificity 98% (97-99%).

**CONCLUSIONS:** Bedside ONSD measurement, performed by neurointensivists, is an accurate, non-invasive method to identify ICP > 20 mmHg in a heterogeneous group of patients with acute brain injury. ONSD  $\geq 0.48$  cm has the greatest accuracy, however, internal validation of ONSD criteria may be required.

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