

R2 Block 4 CAT
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Block 4

Reference: Hassen, Bruck, Donahue, Mason, Sweeney, Saab, Weedon, Patel, Perry, Matari, Jaiswal, Kalantari. Accuracy of Optic Nerve Sheath Diameter Measurement By Emergency Physicians Using Bedside Ultrasound. Journal of Emergency Medicine pp 1-8, 2014; 30 September 2014

Question: Can ER providers accurately measure optic nerve sheath diameter with ultrasound when compared to CT, in turn indirectly measuring intracranial pressure?

Introduction: Ultrasound measurement of optic nerve sheath diameter has been validated as an indirect assessment of the ICP when performed by trained ultrasonographers. ICP is traditionally measured by invasive procedures such as lumbar puncture and ventriculostomy. This partially retrospective study whether or not emergency physicians, after a short introductory course on ocular ultrasonography by an EP who is a registered diagnostic medical sonographer, are capable of measuring the ONSD (Optic Nerve Sheath Diameter) as accurately by US as CT scan measurement of ONSD by a board certified radiologist.

Methods: A retrospective measurement of ONSD on CT scan patients from the ED compared the measurements with that of ultrasound. The patients in the ED required a CT scan of the head or facial bones for medical reasons. Verbal consent was undergone under which an U/S was performed. Three measurements were recorded in the coronal/sagittal/transverse planes and compared to the CT scan, which was read by a radiologist. For this study, a difference in ONSD measurement of $>0.5\text{mm}$ between the two modalities was considered significant. The same radiologist reviewed every CT scan in this study.

Results: A mixed linear model was constructed with the measurement mode introduced as a fixed effect and subjects as a random effect estimated separately for each mode. 61 CT scans were reviewed. All but 4 patients' ONSD were above 5 mm but below 6 mm. None were above 6 mm. Only 3 of 61 patients with facial trauma had discrepancies more than the predetermined cutoff value. The correlation coefficient between CT and U/S in every plane had a p-value of $<.0001$.

Discussion: This paper suggests that ED providers with minimal training can accurately measure ONSD. The results suggest that ocular ultrasonography provides a rapid and cost effective method of ONSD measurement and hence an indirect measure of ICP. While this study was a small sample size and the majority of the cases were within normal limits, it does show that CT does correlate with U/S measurements. Most of the patients were not significantly injured so compliance was easy. I will say that if a patient sustains a significant head injury prompting them to come into the ER, he or she will most likely obtain a head CT anyway. It does however suggest that U/S can quickly be used to evaluate ICP in patients with pre-eclampsia, ocular trauma, head trauma and most likely could be extended to ICU patients whom are too unstable to go to CT scan.
