HeadSense HS-1000

The HeadSense HS-1000 nICP monitor seems sufficiently accurate to measure the ICP in severe TBI patients, is patient-friendly, and has minimal risk of complications [1)]

In a study a new method of NI-ICP monitoring performed using algorithms to determine ICP based on acoustic properties of the brain was applied in patients undergoing invasive ICP (I-ICP) monitoring, and the results were analyzed.

In patients with traumatic brain injury and subarachnoid hemorrhage who were undergoing treatment in a neurocritical intensive care unit, the authors recorded ICP using the gold standard method of invasive external ventricular drainage or intraparenchymal monitoring. In addition, the authors simultaneously measured the ICP noninvasively with a device (the HS-1000) that uses advanced signal analysis algorithms for acoustic signals propagating through the cranium. To assess the accuracy of the NI-ICP method, data obtained using both I-ICP and NI-ICP monitoring methods were analyzed with MATLAB to determine the statistical significance of the differences between the ICP measurements obtained using NI-ICP and I-ICP monitoring. RESULTS Data were collected in 14 patients, yielding 2543 data points of continuous parallel ICP values in recordings obtained from I-ICP and NI-ICP. Each of the 2 methods yielded the same number of data points. For measurements at the ≥ 17-mm Hg cutoff, which was arbitrarily chosen for this preliminary analysis, the sensitivity and specificity for the NI-ICP monitoring were found to be 0.7541 and 0.8887, respectively. Linear regression analysis indicated that there was a strong positive relationship between the measurements. Differential pressure between NI-ICP and I-ICP was within ± 3 mm Hg in 63% of data-paired readings and within ± 5 mm Hg in 85% of data-paired readings. The receiver operating characteristic-area under the curve analysis revealed that the area under the curve was 0.895, corresponding to the overall performance of NI-ICP monitoring in comparison with I-ICP monitoring.

This study provides the first clinical data on the accuracy of the HS-1000 NI-ICP monitor, which uses advanced signal analysis algorithms to evaluate properties of acoustic signals traveling through the brain in patients undergoing I-ICP monitoring. The findings of this study highlight the capability of this NI-ICP device to accurately measure ICP noninvasively. Further studies should focus on clinical validation for elevated ICP values [2)].

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2)
Ganslandt O, Mourtzoukos S, Stadlbauer A, Sommer B, Rammensee R. Evaluation of a novel noninvasive ICP monitoring device in patients undergoing invasive ICP monitoring: preliminary results. J Neurosurg. 2018 Jun;128(6):1653-1660. doi: 10.3171/2016.11.JNS152268. Epub 2017 Aug 8. PubMed PMID: 28784032.