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The diagnostic accuracy of noninvasive methods to measure the intracranial pressure:
a systematic review and meta-analysis

Background:

Although invasive monitoring is the standard method for intracranial pressure (ICP) measurement, it is not without potential for serious complications. Non-invasive methods have been proposed as alternatives to invasive ICP monitoring. The study aimed to investigate the diagnostic accuracy of the currently available non-invasive methods for intracranial hypertension (ICH) monitoring.

Methods:

We searched 5 databases for articles evaluating the diagnostic accuracy of non-invasive methods in diagnosing ICH in PubMed, Institute of Science Index, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL), and Embase. The quantitative analysis was conducted if there were at least 2 studies evaluating a specific method. The accuracy measures included the sensitivity, specificity, likelihood ratios, and diagnostic odds ratio.

Results:

We included 134 articles. Ultrasonographic optic nerve sheath diameter (US ONSD) had high diagnostic accuracy (estimated sensitivity of 90%; 95% confidence interval [CI], 87–92, estimated specificity of 88%; 95% CI, 84–91) while the magnetic resonance imaging (MRI) ONSD had estimated sensitivity of 77%; 95% CI, 64–87 and estimated specificity of 89%; 95% CI, 84–93, and computed tomography (CT) ONSD had estimated sensitivity of 93%; 95% CI, 90–96 and estimated specificity of 79%; 95% CI, 56–92. All MRI signs had a very high estimated specificity ranging from 90% to 99% but a low estimated sensitivity except for sinus stenosis which had high estimated sensitivity as well as specificity (90%; 95% CI, 75–96 and 96%; 95% CI, 91–99, respectively). Among the physical examination signs, pupillary dilation had a high estimated specificity (86%; 95% CI, 76–93). Other diagnostic tests to be considered included pulsatility index, papilledema, transcranial Doppler, compression, or absence of basal cisterns, and ≥10 mm midline shift. Setting the cut-off value of ICH to ≥20 mmHg instead of values <20 mmHg was associated with higher sensitivity. Moreover, if the delay between invasive and non-invasive methods was within 1 hour, the MRI ONSD and papilledema had a significantly higher diagnostic accuracy compared to the >1 hour subgroup.

Conclusion:

Our study showed several promising tools for diagnosing ICH. Moreover, we demonstrated that using multiple, readily available, non-invasive methods is better than depending on a single sign such as physical examination or CT alone.

نوع البحث:

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المشرفين على البحث حسب الترتيب:

د. عمرو سلام، د. أحمد عبد العال أحمد، د. محمد جمعة كامل، د. محمد خالد حمزة، د. هاني محمود يسين، د. هشام حسني عبد الوهاب، د. محمد يونس، د. إسلام رمضان، د. هيثم زين الجميل، د. محمد عبد الحق، د. محمد عبد القادر، د. كيري ميليس، د. حسن محمد.

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