

Point of care ultrasound in recognising papilloedema and raised intracranial pressure on the acute medical unit

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Aims

This project aims to study the feasibility of using ophthalmic ultrasound to detect papilloedema and raised intracranial pressure (ICP) by measurement of optic nerve sheath diameter (ONSD), and correlating this to lumbar puncture opening pressures, where applicable, on the acute medical unit.

Methods

An observational pilot study was performed using a sample patients referred from the regional eye centre (Birmingham Midland Eye Centre) with papilloedema. Scanning was performed using a linear ultrasound probe, with measurements of the ONSD, averaged from two planes, where possible. For those patients who then underwent lumbar puncture with measurement of opening pressures, Spearman rank correlation of ONSD with opening pressures was performed.

Results

Ten ultrasound scans have been performed on patients who were referred with papilloedema for further evaluation. All 10 of these patients had easily identified papilloedema on ultrasound imaging, and of the three who underwent lumbar puncture, increased ONSD correlated with increased opening pressures, with a Spearman rank correlation coefficient of 1.0.

Conclusion

Bedside ultrasound scanning (USS) is being increasingly utilised on acute medical units to aid in the diagnosis and management of many medical conditions. USS at the front door can impact on diagnosis, length of stay and quality of care as well as patient journey. Neurological examination in particular is often neglected and a number of recent audits suggest that large numbers of patients are failing to be assessed properly with a risk of patient harm, costly, unnecessary or inappropriate investigations, or delayed diagnosis.

Ocular ultrasonography is one application that can potentially aid in the recognition and management of papilloedema and raised ICP. Fundoscopy is rarely completed on admission for

many reasons due to complexity, from lack of experience to poor visualisation. The optic nerve sheath is in contiguity with the subarachnoid space and therefore raised ICP is transmitted and measurable at the nerve sheath.

Evaluation of the ONSD has been shown to have a sensitivity of 100% and specificity of 95% for raised ICP compared with computed tomography (CT). Comparisons between ONSD and invasive ICP monitoring methods have shown that there is a significant relationship between ICP and ONSD, and multiple studies have shown that a diameter threshold of more than 5 mm can detect an ICP >20 cm H₂O.

In this pilot study, bedside ultrasound scanning can reliably detect papilloedema and raised ICP via measuring ONSD, and can provide a safe and rapid alternative to more invasive techniques or CT scanning, or when fundoscopy is not possible. We aim to create a portfolio of cases and collate data with lumbar puncture opening pressures, and aim to demonstrate the utility of this skill at the front door. Point of care ultrasound is a rapidly growing field, and has great potential to influence diagnosis and management. This key skill will not just empower clinicians but will also lead to improved care for our patients.

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