Background

The physiological interplay behind the intracranial pressure (ICP) curve morphology is not fully understood. Studies have shown that arterial inflow, venous outflow, movements of the cerebrospinal fluid all seem to have an impact on the ICP. Arterial blood pressure and fluctuations in central venous pressure have also been implied. Understanding of the physiological causes of the ICP curve could allow interpretation of the curve, possibly making it possible to estimate cerebral blood flow (CBF), intracranial elastance and provide information about the physiological status of the patient. All of which could enhance the treatment of neurosurgical intensive care patients.

Methods

We have examined arterial cerebral inflow, cerebral venous outflow and CSF movements using cine phase contrast MRI methodology, with concurrent ICP registration and measurements of intracranial elastance. The examinations had been done in patients admitted to the neurosurgical intensive care department in Lund. The data have been analyzed in order to find correlations between the ICP curve morphology and the flows and from the intracranial compartment. Changes in intracranial volume has been calculated.

Preliminary results

In our first study we tried to find a link between the pulsatile component of the CBF and the pulsatile part of the ICP curve. This was done by calculating the area under the curve of the ICP curve and transforming it into a volume curve, using elastance and knowledge about the relationship between intracranial volume and intracranial pressure. A relationship between these two entities was found. The article describing this is accepted for publication in Journal of Clinical Monitoring and Computing.

In our second study, published in Acta Neurochirurgica, we examined the changes in intracranial volume and the total flow into and out from the intracranial compartment. These were linked to different parts of the ICP curve, the first part correlating to the flow and the latter part correlating to intracranial volume.

Conclusion

Our studies have provided information about how the ICP curve is shaped, linking it to parts of the cerebral blood flow and the intracranial volume changes. Further studies will address the methodology and provide deeper understanding of the variations of cerebral blood flow in this patient category.

Published study: