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MR-Anatomie des 3. Ventrikels beim Gesunden, bei Patienten mit Hydrocephalus und nach endoskopischer Ventrikulo-Cisternostomie

MR-anatomy of the third ventricle in normal brain, hydrocephalus, and after endoscopic ventriculo-cisternostomy

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Objective

Endoscopic procedures may represent an alternative to shunt operations in patients with hydrocephalus. However, the indication for ventriculo-cisternostomy can be difficult as well as the evaluation of sufficient cerebrospinal fluid (CSF) flow. Therefore, we developed a magnetic resonance (MR) protocol in order to compare the anatomical characteristics of the third ventricle before and after third ventriculostomy.

Methods

MR imaging was performed in 2 healthy adults and in 46 patients before and up to 4 years after ventriculo-cisternostomy. Beneath conventional axial T2-weighted turbo spin echo (TSE) sequences (TR/TE 2126/100 ms), T1-weighted spin echo (SE) sequences (TR/TE 450/15 ms), and phase-contrast-multi-heart-phase (PCMHP) sequences (TR/TE 18/9.5 ms), the MR protocol included sagittal and coronal T2-weighted TSE sequences in a volume technique (TR/TE 4000/180 ms) with a slice thickness of 1.4 mm and a slice overlapping of 50 %.

Results

In 44 out of 46 preoperative scans, all anatomical landmarks of the anterior third ventricle could be identified in thin-sliced T2-weighted scans. In obstructive hydrocephalus, the

lamina terminalis and the ventricular floor were bulged anteriorly and downwards, respectively. The infundibular recess was enlarged and the mamillary bodies were pressed and directed downwards. In 2 patients with chronic hydrocephalus due to aqueductal stenosis, the extremely thinned floor of the third ventricle could not be visualized. After third ventriculostomy, the anatomy normalized with an elevation and horizontal direction of the ventricular floor and a decrease of the infundibular angle. In 3 patients with an obstruction of the ventriculo-cisternostomy 1 week up to 3.5 years after endoscopy, beginning hydrocephalic configuration of the anterior third ventricle in T2-weighted sequences did proceed the loss of CSF flow in PCMHP sequences.

Conclusion

Using thin-sliced T2-weighted sequences in a volume technique, MR imaging of the third ventricle allows the detection of all anatomical landmarks relevant for indicating and planning an endoscopic fenestration of the third ventricular floor. Postoperatively, this technique provides detailed information about the sufficiency of a ventriculo-cisternostomy by normalization of the ventricular anatomy. Follow-up investigations may early indicate an insufficiency of a ventriculostomy.