

Intraoperativer Nachweis atemabhängiger Bewegungen eines intraspinalen Neurofibroms mittels Sonographie: Konsequenzen für die präoperative Bildgebung

Intraoperative demonstration of respiratory-induced motions of an intraspinous neurofibroma by ultrasonography and its impact of preoperative neuroradiological imaging

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Introduction

Imaging of intraspinal tumors has been improved with the introduction of magnetic resonance imaging (MRI), which has proved to be more effective in resolving fine anatomic details of the intraspinal components than fine-cut CT-myelographie. However, respiratory-induced movements of intraspinal tumors have so far not been demonstrated in vivo and there are no reports about their influence on the quality of preoperative MRI.

Case report

We report about a 46 years old male patient with a severe paresis of foot and toe extension but without sensible dysfunction. MRI diagnosis of the lumbar spinal canal comprised of sagittal and transversal T1 and T2 weighted images with gadolinium enhancement and revealed an intraspinal and intradural tumor beneath the conus medullaris with displacement of the nerve roots of the cauda equina. Differential diagnosis comprised a neurofibroma but an ependymoma could not be ruled out. Removal of the tumor was indicated for both, definitive diagnosis as well as prevention of further neurological deterioration. After removing the lamina of the first lumbar vertebra, an extradural intraoperative real time ultrasonography (Siemens Ellegra) was performed. A roundly, clearly demarcated tumor with solid and cystic components and respiratory-induced oscillating motions over a distance of 2.5 cm was visualized. After opening of the dura and the arachnoidea, the tumor appeared between the nerve roots of the cauda equina.

After dissection of the nerve root, the tumor was removed in toto. Histopathological examination confirmed the diagnosis of a neurofibroma.

Discussion

In vivo documentation of tumor movements has not been described in neurosurgery, until now. Cerebrospinal fluid (CSF) is a circulating bidirectional moving medium that transfers its movements directly to components within it. Beneath the conus medullaris, the nerve roots can move freely in the CSF until they reach their neuroforamen. Therefore, the respiratory-induced pulsations of CSF can induce movements of the nerve roots of the cauda equina and adherent tumors. In this case report, we were able to prove the respiratory-induced movements of a spinal neurofibroma arising from the dorsal L1 nerve root. These movements had an impact on the quality of preoperative MRI, making it difficult to differentiate between a neurofibroma and an ependymoma and, furthermore, to precisely image anatomic details like the relationship of the tumor to the conus medullaris and the cauda equina.

Conclusion

Intradural neurofibromas arising beneath the conus medullaris show respiratory-induced movements. These movements can cause artifacts and reduce the quality of preoperative MRI. Therefore, we recommend to use respiratory-triggered MRI sequences for the preoperative imaging of intraspinal intradural tumors beneath the conus medullaris.