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Intraoperative MRI-guidance in pediatric low grade glioma surgery – Advantages and challenges

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Introduction: Complete tumor resection carries a high likelihood of permanent cure in pediatric low grade glioma surgery. While advantages of intraoperative MRI guidance in the surgical therapy of gliomas are well described for adults, only scarce evidence is available on its value in pediatric low grade tumors.

Methods: 1.5T iMRI-guided operations of children and adolescents with low grade gliomas were analyzed retrospectively. Main parameters included feasibility, extent of resection, histology, perioperative data, clinical outcome, as well postoperative blood chemistry.

Results: 28 pediatric patients (mean 11.7 y (2-17)) underwent iMRI-guided resection of 9 gangliogliomas, 9 pilocytic astrocytomas, 5 diffuse astrocytoma, 3 DNET, 1 oligodendroglioma and 1 cortical dysplasia). Quality of iMR imaging with closed and open skull had full diagnostic quality in all cases. Resection was continued due to residual tumor findings in 65% of cases. Electrophysiological changes demanding termination of resections was given priority over tumor residual in imaging. In 17 of 20 cases (85%) with intended total resections no residual tumor was found in diagnostic imaging 3 months postoperatively. No neurological deficits at discharge were found in 15, mild in 11 (mostly preoperatively present) and severe in 2 patients. Postoperative blood chemistry revealed no changes caused by extended surgery times (mean 418 (201-610) minutes) or repeat contrast medium application. No ferromagnetic incidents and no postoperative infections were noticed.

Conclusion: iMRI-guided glioma surgery in pediatric patients is safe and effective to increase the rate of intended total resections in low grade gliomas with diffuse tumor margins close to 90%. Due to the easy integration of all surgical tools and high flexibility in positioning of patients, there are no drawbacks compared to conventional operations. Acquisition of preoperative planning as well as postoperative MRI eliminates in small children the need for additional anesthesia to perform these examinations pre- and postoperatively.