Summary

Proximity of tumor to critical areas of the cerebral cortex and of white matter such as the motor, somatosensory, language, and visual functions areas .

The possible shifting of WMT has to be taken into account after major tumor parts are resected. Thus, the knowledge of tract position during surgery helps to prevent postoperative neurological deficits. Functional MRI allows surgeons the ability to localize critical cortical areas and WMT and can thereby reduce the risk of their inadvertent injury.

DTI-MRI fiber tractography can provide unique quantitative and qualitative information to aid in visualizing and in studying fiber tract architecture in the brain. In particular, DTI MRI with a fiber tracking algorithm is a method for preoperative and intraoperative localization of WMT, allowing delineation of white matter major tracts and showing their position after substantial tumor removal. The validation of DTI data with intraoperative electrical monitoring enhances the affordability for pyramidal tract localization.

Preoperative and intraoperative fiber tracking was used to plan and guide neurosurgical procedures of excision of intracranial tumors in the vicinity of functionally important areas of the brain. In approximately half of cases, the neurosurgeons involved in surgical procedures judged tractography useful in selecting the safer surgical approach, helpful in defining the borders of tumor resection in relation to WMT and relevant in enhancing the “surgical confidence” of the neurosurgeon with the procedure.

In conclusion, compared with the information provided by conventional MRI, DTI-MRI provides superior quantification and visualization of relationships between an intracranial tumor and WMT. In particular, preoperative and intraoperative DTI-MRI with fiber tracking (tractography) allows visualization of WMT, showing their position after removal of parts of intracranial tumor, especially if guidance is needed for further resection. Three-dimensional visualization of white matter fibers such as corticospinal (pyramidal) tract, optic radiation, and arcuate fasciculus with relationship to intracranial tumors was extremely helpful for preoperative and intraoperative evaluation of WMT position, reducing surgical morbidity , and postoperative tracts reorganization .