Temporoinsular Glioma

Brain tumors can result in displacement or destruction of important white matter tracts such as the inferior fronto-occipital fascicle (IFOF). Diffusion tensor imaging (DTI) can assess the extent of this effect and potentially provide neurosurgeons with an accurate map to guide tumor resection; analyze IFOF displacement patterns in temporoinsular gliomas based on tumor grading and topography in the temporal lobe; and assess whether these patterns follow a predictable pattern, to assist in maximal tumor resection while preserving IFOF function.

Thirty-four patients with temporal gliomas and available presurgical MRI were recruited. Twenty-two had insula infiltration. DTI deterministic region of interest (ROI)-based tractography was performed using commercial software. Tumor topographic imaging characteristics analyzed were as follows: location in the temporal lobe and extent of extratemporal involvement. Qualitative tractographic data obtained from directional DTI color maps included type of involvement (displaced/edematous-infiltrated/destroyed) and displacement direction. Quantitative tractographic data of ipsi- and contralateral IFOF included whole tract volume, fractional anisotropy, and fractional anisotropy of a 2-dimensional coronal ROI on the tract at the point of maximum tumor involvement.

The most common tract involvement pattern was edematous/infiltrative displacement. Displacement patterns depended on the main tumor location in the temporal lobe and the presence of insular involvement. All tumors showed a superior displacement pattern. In lateral tumors, displacement tendency was medial. In medial tumors, displacement tendency was lateral. When we add insular involvement, the tendency was more medial displacement. A qualitative and quantitative assessment supported these results.

IFOF displacement patterns are reproducible and suitable for temporoinsular gliomas preoperative planning [1].

Temporoinsular gliomas are frequently large-sized tumors that require meticulous planning to ensure maximum surgical resection and minimal neurologic deficits in patients. Here, we demonstrate our technique encompassing multi-modal imaging guidance and awake brain mapping which enables maximum safe resection of such tumors. The patient, a 39-yr-old man, presented with depression and memory loss for 18 mo. Preoperative magnetic resonance imaging (MRI; MAGNETOM Verio, Siemens) revealed a nonenhancing lesion in the left dominant temporoinsular lobe. Three-dimensional magnetic resonance spectroscopy was used to analyze the choline/N-acetyl-aspartate index which suggested a low-grade glioma diagnosis. Informed patient consent was obtained. After craniotomy, the mouth motor, speech arrest, and word generation areas were mapped via direct cortical stimulation under awake mapping. A strip electrode was placed across the precentral gyrus for continuous motor evoked potential monitoring. Cortical incisions were made in nonfunctional cortical areas and tumor was resected in the temporal lobe. Following this, tumor at the inferior insular zone was carefully debunked with Cavitron Ultrasonic Surgical Aspirator (Integra Lifescience) also through the temporal window. The hippocampus was preserved since it was not invaded by tumor. Subcortical mapping combined with Diffuse Tensor Imaging tractography-based navigation (Medtronic Inc.) was performed to localize the motor and language pathways. Intraoperative MRI evaluation showed tumor resection extent of 95%. Pathological and molecular analysis revealed a diagnosis of Grade II IDH-mutant oligodendroglioma. After surgery the patient was administered chemotherapy (Temozolomide). He recovered without language or motor deficits [2].

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Camins À, Naval-Baudin P, Majós C, Sierpowska J, Sanmillan JL, Cos M, Rodriguez-Fornells A, Gabarrós A. Inferior fronto-occipital fascicle displacement in temporoinsular gliomas using diffusion tensor imaging. J Neuroimaging. 2022 Mar 30. doi: 10.1111/jon.12992. Epub ahead of print. PMID: 35352437.
2)
Gong F, Hameed NUF, Li Z, Kudulaiti N, Zhang J, Wu J. Temporoinsular Glioma Resection under Awake Mapping: 2-Dimensional Operative Video. Oper Neurosurg (Hagerstown). 2020 Jul 1;19(1):E54. doi: 10.1093/ons/opz295. PMID: 31674637.