

Right Frontal and Insular Glioblastoma Multiforme

Lawrence Dickinson, MD, Neurosurgery, Castro Valley, California

Clinical Presentation

The patient is a 70-year-old male with a known non-enhancing right fronto-temporal mass located in the rostral external and extreme capsule. The patient presented with severe episodic suboccipital headaches, nausea, vomiting, increased fatigue and difficulty focusing on specific tasks. Radiographic follow-up revealed a slight growth in the tumor to 4.2 x 3.2 x 3.8 cm over 4 months along with a small area of contrast uptake. The patient continued to work. His other medical problems, all well controlled, included diabetes mellitus and hyperlipidemia. Detailed cognitive assessment demonstrated below average verbal memory task performance.

Surgical resection was recommended. Pre-operative MRI included DTI, and fMRI for finger tapping, sentence completion, and verb generation. There were no fMRI-defined areas of eloquence in the left insular cortex. BrightMatter Plan™ was used to automatically generate whole brain tractography. The anterior limb of the internal capsule/corticospinal tract was compromised and the genu and posterior fiber tracts in this structure were distorted medially and posteriorly. More interestingly was the distortion to the external capsule fibers medially, but the volume of the tract appeared mostly preserved when compared to the unaffected right external capsule.

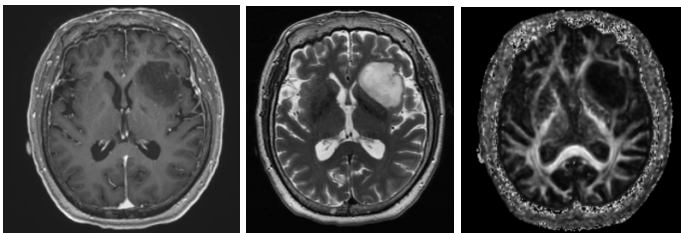


Figure 1: Left: Pre-op T1+C, Middle: Pre-op T2, Right: Pre-op FA.

Surgical Plan

The obvious approach to the neoplasm was transylvian, through the most anterior portion of the insular cortex. BrightMatter Plan greatly assisted in creating a safe surgical corridor to access the tumor,

avoiding disruption of the distorted fiber tracts and ventral aspect of basal ganglia.

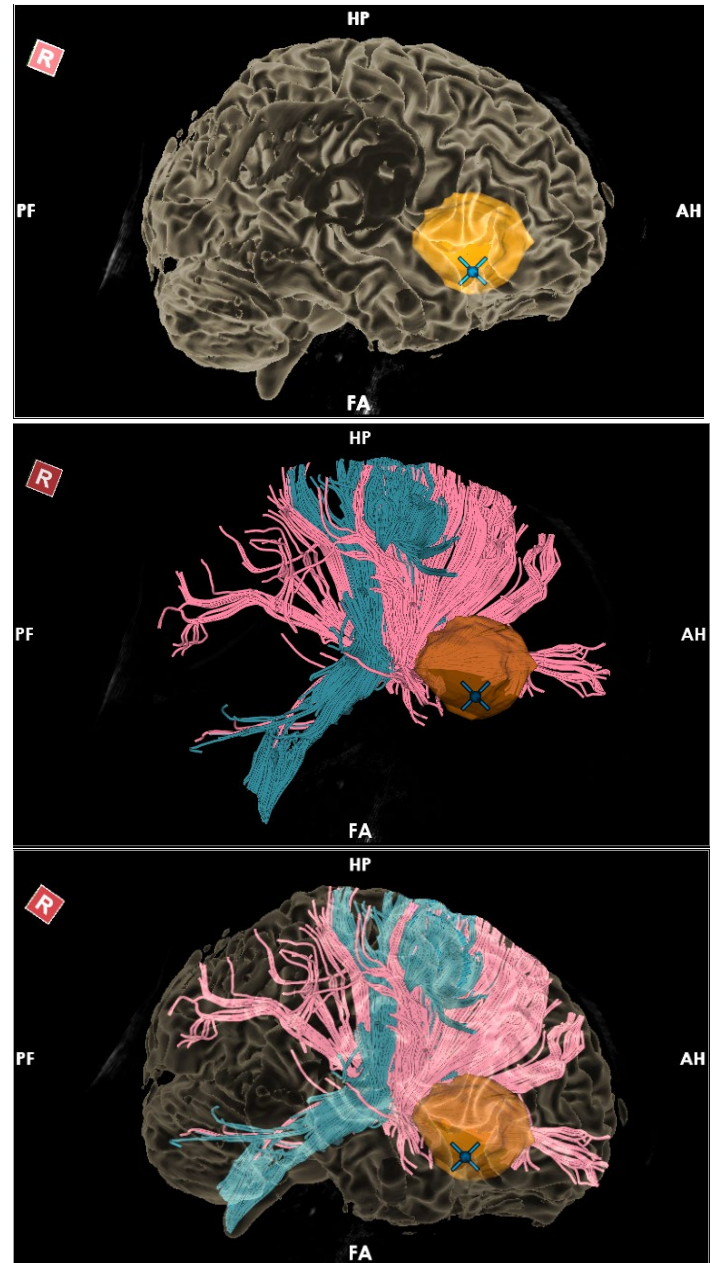


Figure 2: Segmented tracts; Pink: external/extreme capsule, blue: CST.

Surgical Management

The surgical plan was exported to the BrightMatter Guide™ for real-time navigation. A 3.5 cm bone flap

MKT-00722 Rev B

Synaptive

© Synaptive Medical Inc. 2019. Prepared in Canada. All rights reserved. Errors and omissions excepted. SYNAPTIVE, the Synaptive logo, and BrightMatter are trademarks of Synaptive Medical Inc., or its subsidiaries. Other trademarks are the property of their respective owners. Patents Pending. Permission has been obtained to use all anonymized images in this case study for publication purposes. Please contact Synaptive for information on the regulatory clearance status in your jurisdiction.



was opened in the inferior frontal and superior temporal region, staying within the confines of the temporal fascia margin. Using BrightMatter Guide the margins of the neoplasm deep to the insula were projected onto the cortex. Under the high-powered optics of Modus V™, microdissection technique exposed the internal carotid and middle cerebral artery, as well as the two insular branches over the tumor.

The tumor tissue had definitive visible differentiation from normal tissue, which helped with resection. The tumor was piece-meal resected with preservation of cellular integrity. The tumor cells were subsequently successfully cultured for determination of best adjuvant therapeutic agents in a precision medicine trial. After debulking, the margin of the tumor was dissected from the edematous white matter and the brain was dramatically more relaxed.

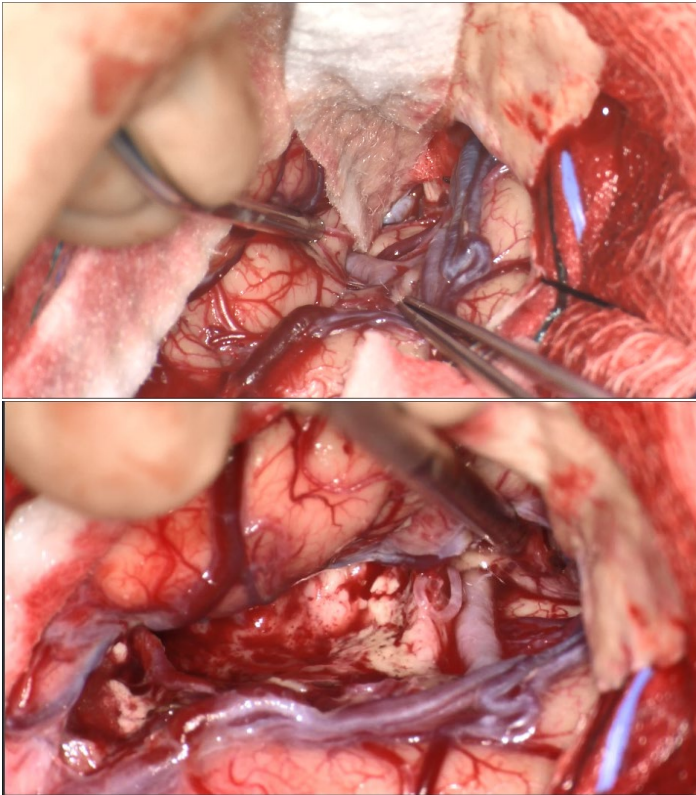


Figure 3: Modus V images of the surgical field.

Clinical Outcomes

Pathology report confirmed that the mass consisted of areas of Grade II, III and IV astrocytoma. The patient had resolution of his headache and somatic complaints, with improvement, but not resolution, of forgetfulness. Deficit in verbal memory task performance persisted on retesting at three and twelve months. He remains free from disease progression at one-year follow-up and continues to work part-time.

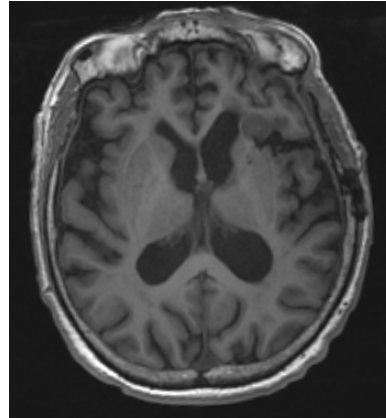


Figure 4: Post-op T1.

Highlights

- BrightMatter Plan tractography greatly assisted in creating a safe surgical corridor to access the tumor, while avoiding disruption of fiber tracts
- Synaptive trackable suction allowed for easy hands-free movement of the Modus V arm for optimal views of the surgical cavity throughout the case
- The depth of field of Modus V facilitated navigation to the depth of the cavity and yet still allowed for appreciation of the critical superficial vascular structures, like the middle cerebral artery, to preserve them