



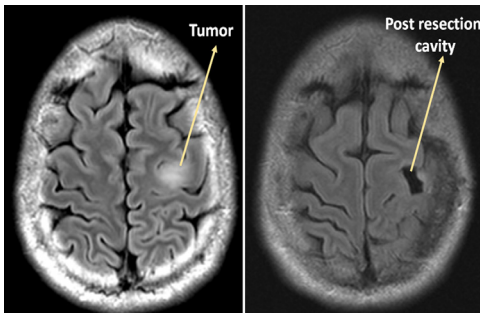
Awake Craniotomy of a Low Grade Glioma in the Motor Cortex

This patient presented with cramping of the right hand and a generalized tonic-clonic seizure. The patient also reported decreased appetite, fatigue, intermittent visual disturbance in the right eye, occasional headaches, difficulty with concentration and loss of balance. An MRI of the brain demonstrated a mass in the posterior left frontal lobe, in the motor cortex, just medial to the hand-knob which was suspected to be a low-grade glioma. The patient's work involved using his hands on a keyboard and was right side dominant. It was very important that we preserve function of his dominant right hand including small muscles of his hand. He plays the drums and was happy to use a drum kit during surgery to test his hand function and his motor skills.

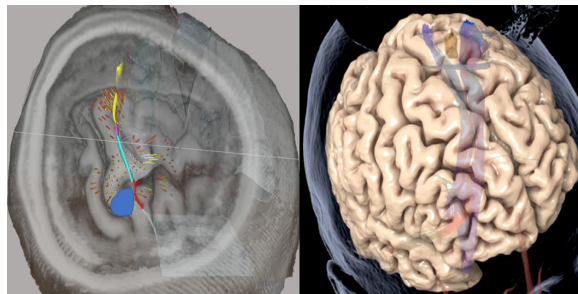
The patient consented to [awake craniotomy](#) and tumor resection, and prior to surgery, the patient had functional MRI and navigated transcranial magnetic stimulation for motor mapping and augmented reality (AR) study to further characterize functional activity.

On the surface of the brain, we placed a high-definition (HD) grid to characterize the motor and sensory areas and also identify parts of the motor gyrus (hand-knob) which controls fine movements of his right hand. Additionally, the patient was able to use his hands and wrists on a drum pad to generate a rhythm. This was used primarily to test fine motor coordination in his hand.

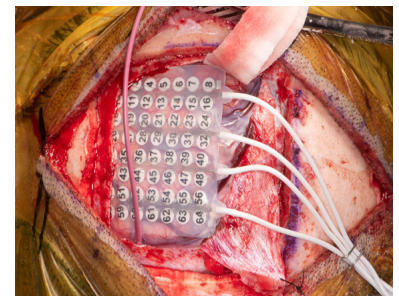
Using additional intraoperative technologies including intraoperative navigation and ultrasound, the tumor margins were identified. Tumor resection was then carried out in a piecemeal manner using a sulcal approach with the aid of an operating microscope, resulting in significant tumor debulking. Subsequent analysis of the tumor revealed that it was a WHO grade 2 astrocytoma. During the resection, the patient intermittently played the drums and continued to execute finger movements which allowed the surgeon to complete a safe and complete resection of the tumor.



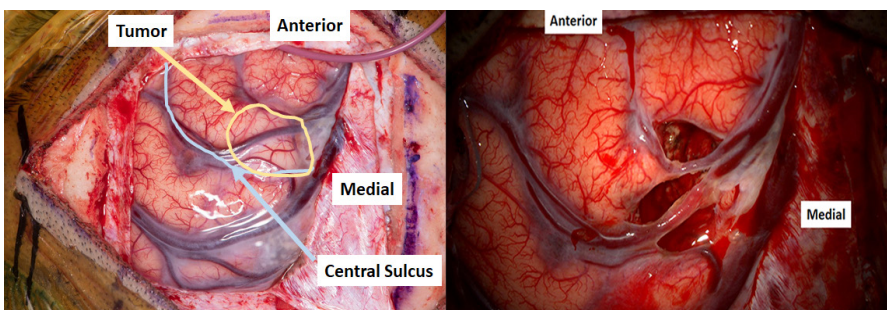
Preoperative and Postoperative Brain MRI



Augmented Reality View of Tumor (left) and nTMS generated CST (right)



High-definition grid



Intraoperative images before (left) and after (right) resection