

# EPENDYMOMA: HIGH GRADE GLIOMA

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## CLINICAL PRESENTATION

A 28 year old female was diagnosed with a grade III anaplastic ependymoma (high grade glioma). She had a prior history of low grade ependymoma, with two resections in the previous ten years. She has also received stereotactic radiosurgery for a focal recurrence. The procedure did not yield permanent results, subsequently, the patient presented with loss of dexterity in the left hand along with immobility in her left thumb and index finger.

Pre-operative MRI findings revealed a new 4 cm cystic lesion within the right frontal lobe with an associated large enhancing nodule (Figure I). Her pathology results showed an anaplastic ependymoma with an MIB (labeling index) of 20%. The management of ependymomas is primarily surgical, which allows for tissue diagnosis, cytoreduction, and relief of mass effect.<sup>1</sup> A combination of Synaptive Medical's BrightMatter™ neurosurgical solutions were used to help guide surgical intervention to alleviate mass effect of the tumor and improve clinical outcomes.

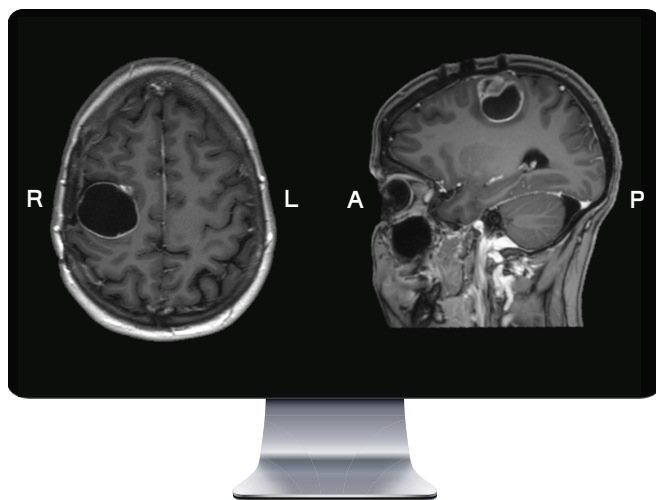
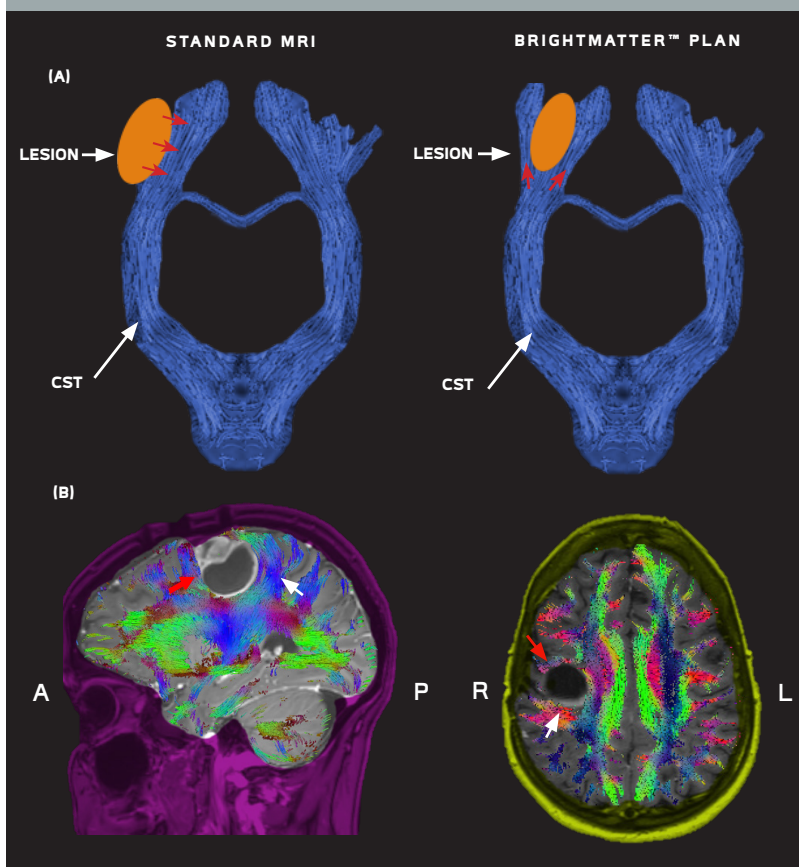


Figure I: Standard MR imaging visualizing tumor: Axial T1 with contrast (left) and sagittal T1 with contrast (right).

## LOCATION OF LESION : STANDARD MRI VS. BRIGHTMATTER™ PLAN



➔ ANTERIOR TO LESION   ➔ POSTERIOR TO LESION

Figure II: (a) Schematic diagram depicting surgeon's initial approach using standard MR imaging: lesion displacing tracts posteriorly only vs. altered trajectory after visualizing tracts using BrightMatter™ Plan. (b) Sagittal T1 (left) and axial T1 (right) views showing the lesion displacing the CST both anteriorly and posteriorly i.e. sandwiched within the motor strip.

## SURGICAL PLAN

Standard anatomical MR imaging showed that the tumor was a superficial surface lesion, accessible through a right open frontal craniotomy procedure. Based on the location of the lesion, it was initially thought that the tumor was displacing the corticospinal tracts (CST) posteriorly, and that caution must be taken when approaching the tumor especially on the posterior side (Figure II-a). By generating white matter whole brain tractography with BrightMatter™ Plan, the surgeon was able to make a more informed decision by locating the exact position of the CST tracts, showing that they were not strictly displaced posteriorly, but rather that the tumor was sandwiched in between the motor strip (Figure II-b). This additional information allowed the surgeon to be more cautious in his surgical resection, so as to not inadvertently damage healthy surrounding CST, and ultimately avoid traumatic loss of motor function.

## CASE HIGHLIGHTS

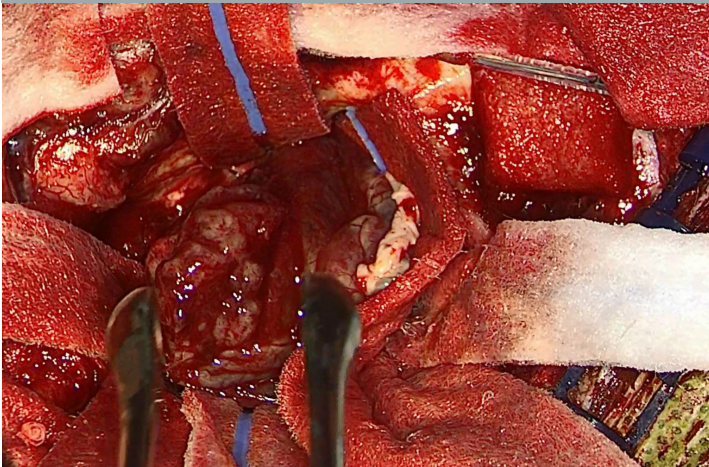
- BrightMatter™ Plan informed the surgeon of the tumor's location by visualizing the displacement of the CST both anteriorly and posteriorly to the lesion. Subcortical mapping confirmed tractography.
- BrightMatter™ Plan allowed the surgeon to conduct a more informed surgical plan by effectively defining tumor margins and preventing potential loss of motor function.
- Patient initially presented with no dexterity in left hand, unable to perform basic functions such as zipping up her jacket. Surgery allowed her to regain functionality in left hand after 24 hours.



## SURGICAL MANAGEMENT

The patient underwent an awake open craniotomy and was positioned supine on the intraoperative MRI bed. Anesthesia was delivered locally with IV sedation. The patient received a good intraoperative registration where boundaries of the tumor were marked. The surgical plan was imported into the stereotactic navigation system for real-time guidance during the case (Figure III), and the BrightMatter™ Drive system was used to visualize the field of view for resection of the tumor (Figure IV). Subcortical mapping confirmed the location of the CST, the extent of the surgical resection, and validated the tractography generated by BrightMatter™ Plan used to plan the surgical case.

### INTRA-OPERATIVE VISUALIZATION USING BRIGHTMATTER™ DRIVE (FIGURE IV)



## CLINICAL OUTCOMES

After resection of the tumor, post-operative MRI was obtained showing gross resection of the mass (Figure V). The patient had no residual tumor (as visualized on this post-operative MRI) and experienced a length of stay of two days. Immediately after surgery, the patient's motor exam was checked and she was able to slightly move her left hand. Within 24 hours, she regained full functionality in her left hand, and a week later was back to baseline. She experienced no post-surgical complications and was content with the awake surgical experience.

### SURGICAL TRAJECTORY WITH BRIGHTMATTER™ PLAN

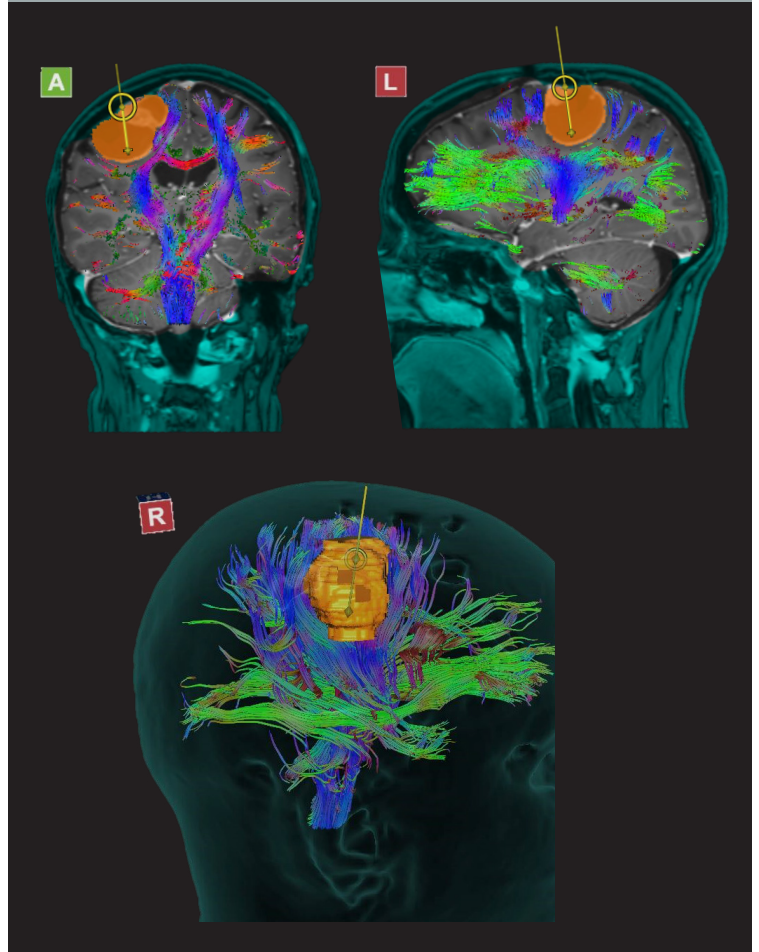


Figure III: Radial stacked view of surgical approach (top) and in-line view along surgical trajectory (bottom).

### PRE & POST-OPERATIVE IMAGES

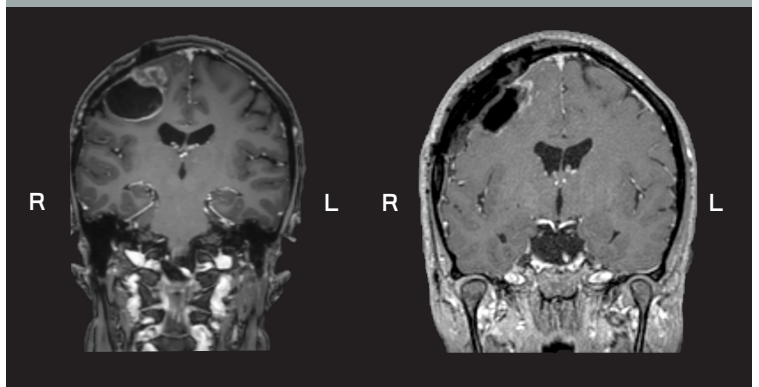


Figure V: Pre-operative coronal T1 (left) and post-operative coronal T1 (right).