bk medical

Case Study

Optimize Extent of Resection in Glioblastoma Surgery with Real-Time Active Imaging

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A 74-year-old female patient presented at St. Luke's with worsening memory loss and headaches. An MRI revealed a right parietal peri-ventricular mass extending across corpus callosum, suspicious for a high-grade glioma (HGG).

Deep-seated HGGs represent a unique surgical challenge because they reside under the surface and require traversing potentially eloquent cortical tissue and avoiding injury to critical subcortical structures, and they often infiltrate functional areas of the brain. Obtaining gross total or near total resection of deep-seated HGGs is challenging and often associated with significant morbidity.

Determine Tumor Depth and BrainPath® Trajectory

For this patient, a right parietal tubular approach was chosen for tumor resection with 5 ALA-fluorescence and intraoperative ultrasound for guidance. Before the surgery, the patient was given Gleolan™, an optical imaging agent indicated in patients with glioma (WHO Grade III and IV), as an adjunct for the visualization of malignant tissue during surgery.

Prior to opening the dura, bkActiv was used to confirm the accuracy of the trajectory with real-time imaging using the Burr Hole Transducer N11C5s. The scan confirmed the tumor's depth of 65 mm [See fig. 1].

Confirm Tumor Location with BrainPath®

The next step in the procedure was opening the dura and advancing the BrainPath® (13.5 mm). The Minimally Invasive Transducer N20P6* was then used for real-time guidance to determine the location of the tumor at the end of the BrainPath® [See fig. 2]. The Minimally Invasive Transducer fits into most endoports** with its small footprint of 6x7mm.

The contralateral ventricle was clearly visualized, which Dr. Duckworth commented would be a great image marker to evaluate extent of resection (EOR) in compare mode at the end of the case, due to the tumor's complexity and involvement with the right ventricle.

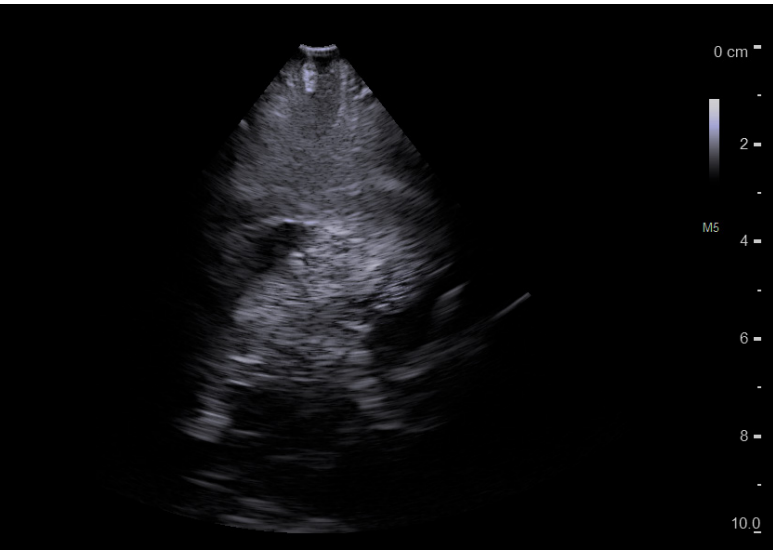

Fig. 1
Deep-seated HGG visualized with Burr Hole Transducer N11C5s

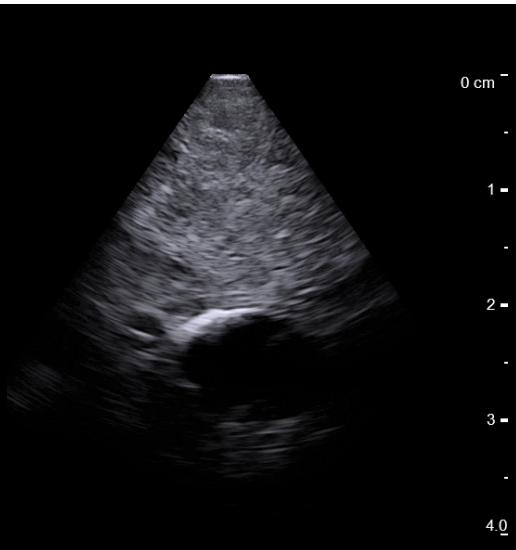

Fig. 2
Tumor location visualized using the Minimally Invasive Transducer N20P6

Monitor Resection Progress

The compare modes of bkActiv were used to assess the extent of resection [See figs. 3 and 4]. The intraoperative ultrasound helped improve the visualization of the HGG because the tumor and the brain tissue were both clearly visualized. Dual Live Compare [See fig. 3] and Picture-in-Picture [See fig. 4] features were utilized to assess the extent of resection in landscape orientation.

Some residual tumor was visualized when comparing the post resection images in real-time. However, no further surgical intervention could be made intra-operatively due to the tumor's involvement in the right ventricle and surrounding edema.

Conclusions

Glioblastomas constitute some of the most difficult to treat primary brain tumors due to their highly invasive and destructive nature.[1] For this case, bkActiv's Dual Live Compare feature enhanced visualization to assess the extent of resection in real-time.

"bkActiv's new user interface is now more like the technology we are all used to," Dr. Duckworth commented, comparing the new portrait and landscape orientation feature to the autorotate feature on his cell phone.

Overall, the active imaging provided reassurance that could not be achieved with 5 ALA-fluorescence and intraoperative guidance with stereotactic navigation alone.

Dual Live Compare

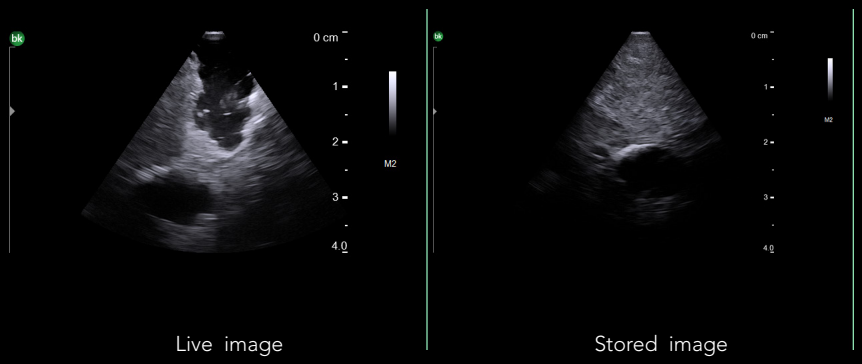

Fig. 3. HGG and brain tissue visualized with Minimally Invasive Transducer N20P6

Picture-in-Picture

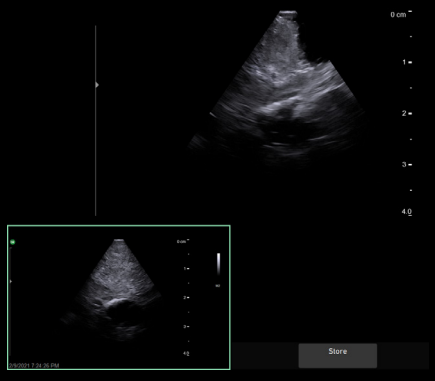

Fig. 4. Extent of Resection visualized with Minimally Invasive Transducer N20P6

[1] Velander, A. J., DeAngelis, L. M., & Navi, B. B. (2012). Intracranial Hemorrhage in Patients with Cancer. Current Atherosclerosis Reports, 14(4), 373–381. doi:10.1007/s11883-012-0250-3

* The Minimally Invasive Transducer N20P6 has not been licensed by Health Canada or CE-marked

**The Minimally Invasive Transducer N20P6 is compatible with NICO BrainPath® (diameters 11-13.5 mm; lengths 50-95 mm) , Vycor ViewSite™ Brain Access System (widths: 12-28 mm; heights: 8-20 mm; lengths: 3-7 cm), and Neuroendoport® (diameters greater than 13 mm; lengths: 5.5-8.5 cm).

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