NEURO-ONCOLOGY TODAY

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Determining Best Options for Brain Tumor Treatment

Decision making in treatment of brain cancer is complex. But care for these neoplasms has become more effective with improved analysis of tumors and more-precise, less-invasive interventions.

"A highly collaborative approach to these cancers is the differentiator for our team," said Pat Connolly, MD, a fellowship-trained and board-certified neurosurgeon with the Penn Medicine | Virtua Health Neurosciences Program. "We sequence treatment on a case-by-case basis, using the best options for each patient's unique needs."

What Comes First: Radiation or Surgery?

First treatment for brain tumors is often surgery. Determining the amount of tumor tissue that can be safely removed is critical. A patient's functional deficiencies may start to define tumor location, but imaging characterizes the burden of disease in planning next steps, where mapping and navigation become important.

Adding to current imaging approaches is diffusion tensor tractography, a 3D MRI modeling technique that measures the rate of water diffusion between cells to reveal the location and direction of white matter bundles near a tumor in the brain. Virtua also performs frameless MRI-based stereotactic biopsy, intraoperative CT, and ultrasound guided resections. *(More on surgery on page 2.)*

For small metastases or benign tumors, radiation may be a first recourse, with the prospect of avoiding craniotomy and with surgery as a backup—though radiation serves as a secondary treatment for most patients.

Targeted Therapies, Exacting Delivery

"Many patients, particularly those with unresectable tumors, benefit from precision radiation therapy, guided by imaging-based simulation," said radiation oncologist David Wilson, MD, with the Penn Medicine | Virtua Health Cancer Program. The team employs both highly targeted conventional radiation and high-dose stereotactic radiosurgery incorporating Brainlab's ExacTrac® system. This advanced patient-positioning and monitoring platform uses infrared surface tracking. The technologies permit treatment of more metastases and more tumors in a single session—reducing treatment time and protecting normal brain tissue.

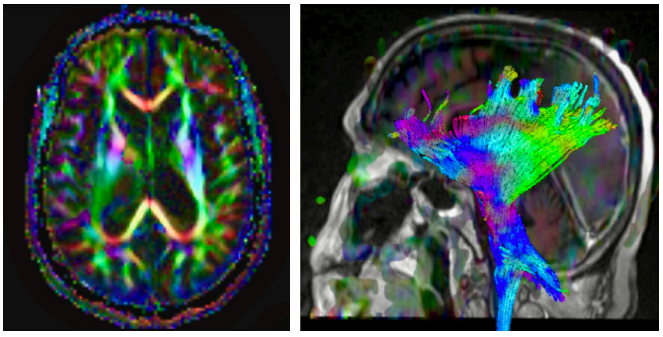
Proton therapy is also an important option, especially applicable to primary brain tumors. It offers potential for less neurocognitive toxicity that comes from irradiation of off-target areas, thus minimizing side effects, and safeguarding brain function.

For patients who aren't candidates for precision radiotherapy, Virtua offers a hippocampal-avoidance approach to whole-brain therapy that protects against potential memory problems.

Team Orchestrates Variety of Options

In addition, the Optune® tumor treating fields system, delivered via scalp electrodes, has shown improved survival in patients with recurrent glioblastomas. Immunotherapy, other targeted biologics, and newer chemotherapeutics have improved medical oncology for brain cancers as well.

The neuro-oncology tumor board includes Virtua and Penn clinicians who oversee care for brain cancer cases. The program's research nurse evaluates patients for clinical trials, and its nurse navigator guides the patient experience in closely monitored treatment plans.



Images generated by Virtua Radiology

Tractograms measure anisotropic diffusion to estimate the axonal and neural-tract organization of the brain surrounding tumors.

For emergency neurosurgical referral, call the Virtua Transfer Center at 856-757-3284.
For neurosurgical consultation, call 267-582-0955.

Virtua Health

Virtua Health

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Smart Technologies and Precision Approaches Advance Brain Surgery

Penn neurosurgeons at Virtua employ several new technologies for difficult-to-reach tumors to achieve minimal collateral impact on healthy brain tissue and gain prompter characterization of brain tumors. Most importantly, these advanced options offer hope for patients with brain cancers that would previously have been inoperable.

Minimally-Invasive Neuroendoscopy

Virtua continues to invest in neuroendoscopy equipment that permits removal of brain tumors not resectable through a craniotomy. Via a small burr-hole opening, the surgeon achieves high-resolution visibility and minimally invasive surgical access to challenging brain sites.

BrainPath

Neurosurgeons are constantly challenged to avoid healthy brain tissue, particularly when resecting deeper-seated brain tumors. To address this need, the Virtua team will soon introduce BrainPath®, a system enabling the surgeon to navigate between the natural folds and neural structures of the brain to create a safer corridor to the tumor site while avoiding disruption of additional brain tissue.

This innovation features a cone-shaped sheath, with navigational probes, that slips between the dense and sensitive white matter tracts. The device permits surgeons to set a cannula channel about the diameter of a pencil that gives them a path for high-powered optics and access for resection of the tumor. By displacing tissue rather than disturbing or damaging it, the technique reduces the invasiveness of the operation and decreases surgical morbidity as compared to traditional retraction, while also producing high gross total resection rates.

Genetic Characterization of Brain Tumors

Also on the forefront is greater use of genetic characterization of brain tumors. Among 125 types of primary brain tumors, glioblastomas are most common, aggressive, and deadly. Cancer teams can tailor treatment by determining the subvariant type of these cancers. However, current genetic sequencing may take days or weeks to return results.

Under development, new smart genomic-profiling technology—offering real-time results—can provide surgeons indications of the future behavior of tumors and their likely response to treatment. This rapid decoding of a brain tumor's DNA during surgery helps teams to decide how exhaustively to pursue surgical removal and whether instilling tumor-targeting drugs directly into the brain will be effective.

Clinical trials of this intraoperative characterization of primary brain tumor subtype are at the tip of a broad movement toward bringing more molecular precision to intervening with primary brain cancers.

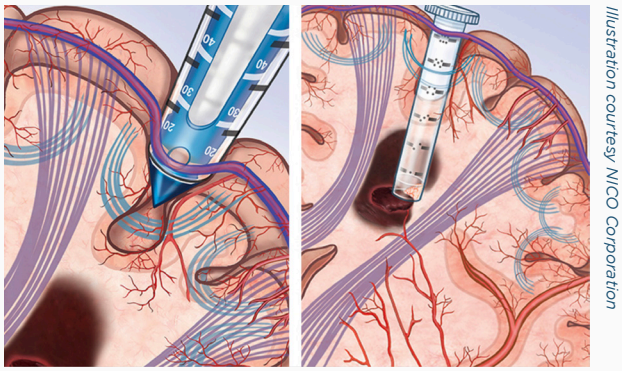

Illustration courtesy NICO Corporation

The atraumatic tip of the BrainPath device allows surgeons to better access lesions through the natural infold of a brain suci in order to preserve the nearby gyral cortex and projection fibers *(above in purple)* to achieve tumor removal with minimal neurologic and vascular injury.