

# Gamma Knife Radiosurgery

Gamma Knife technology continues to revolutionize neurosurgery. Stereotactic radiosurgery delivers high intensity, focused radiation to patients with brain and pituitary tumors, arteriovenous malformations, acoustic neuromas, trigeminal neuralgia, movement disorders and other conditions. This approach leads to improved outcomes and shorter recovery times for patients, most of whom are able to receive Gamma Knife radiosurgery on an outpatient basis.

Advantages to Gamma Knife radiosurgery include:

- Treatment often performed in a single outpatient setting
- Rapid recovery time compared to traditional open neurosurgery
- Avoidance of open surgery risks such as hemorrhage, infection and cerebral spinal fluid leak
- Optimized radiation dose, minimizing the risk of damage to the brain and, in turn, preserving normal brain function

We have a long history of excellence in Gamma Knife radiosurgery. The University of Virginia Gamma Surgery Center opened in 1989 as one of the first five Gamma Knife centers in the world and the second center in the United States. Since then, we have treated more than 10,000 patients from 54 countries and every state in the U.S.

## Advanced Care

We do not rest on our reputation in the field of Gamma Knife radiosurgery. Instead, we continuously hone our skills, providing training for tomorrow's neurosurgeons and radiation oncologists.

We also ensure our Gamma Knife technology is the best in the field. In the last decade alone, we introduced the Gamma Knife Perfexion™ and Gamma Knife Extend™ systems to ensure we offer patients the most advanced avenues of care. In fact, in 2016, we were also among the first hospitals in the world to install the Gamma Knife Icon™, the most precise radiosurgery device on the market. This innovative technology features microradiosurgery capabilities that provide our neurosurgeons with increased flexibility and enhanced precision, making Gamma Knife radiosurgery suitable for more patients than ever before.

Our Gamma Knife program has also developed a national patient registry for stereotactic radiosurgery. The data collected by this registry helps doctors plan the safest and most effective treatment approach possible, ultimately reducing costs and improving results for patients.

## Collaboration with Referring Providers

We value our collaboration with the primary and specialty care providers that refer patients for Gamma Knife consultations at UVA. Our referral process typically proceeds as follows:

- We will call your patient for preregistration and to discuss what he or she can expect at the first visit.

- We will send an orientation packet to your patient prior to the appointment with pertinent information about their visit and logistical information, such as location, directions and parking.
- We will contact you and provide a copy of any written notes on your patient's procedure.
- Patients will be directed back to you, as the referring physician, for follow-up care. The faculty and staff of the center will work with you to monitor the effectiveness of the therapy and encourage your participation in every phase of your patient's care.

Our physicians welcome your calls. Together, we can review your patient's medical history, discuss your patient's needs and determine the best course of action.

To learn more about our program, visit [uvahealth.com/gammaknife](http://uvahealth.com/gammaknife). To refer a patient, call **800.552.3723**.

## Conditions Treated

**At UVA, we use the minimally invasive and noninvasive Gamma Knife techniques to treat a number of neurological conditions, including:**

### Acoustic Neuroma (Vestibular Schwannoma)

Patients with this benign, typically slow-growing tumor on the eighth cranial nerve often present with gradual hearing loss, tinnitus, difficulty with balance, vertigo and facial numbness. In cases where tumor growth continues, acoustic neuroma can eventually cause permanent hearing loss. In some cases, the tumors cause brainstem compression.

Stereotactic radiosurgery allows for the precise delivery of radiation to the acoustic neuroma. The procedure aims to stop the growth of the tumor, preserve the function of the facial nerve and, when possible, preserve hearing.

### Arteriovenous Malformation (AVM)

These abnormal blood vessel masses in the brain are usually congenital, though they can form later in life and are rarely genetic. Patients may experience headaches, seizures or brain hemorrhages prior to diagnosis. If left untreated, AVMs can cause brain damage or stroke. Stereotactic radiosurgery is typically indicated for small to moderately sized AVMs that are positioned in difficult-to-reach locations in the brain and for AVMs that have previously caused a brain hemorrhage. The procedure narrows the AVM blood vessels, which then slowly clot, eventually eliminating the patient's risk of stroke or hemorrhage.

### Brain Cancers

Stereotactic radiosurgery provides precise, effective treatment for various cancers of the brain, including astrocytomas — which arise in the brain's supportive tissue — and brain metastasis, which are tumors that spread from cancer outside of the brain. Our Icon™ system for Gamma Knife is especially helpful for this latter type of tumor.

### Pituitary Adenomas

Gamma Knife radiosurgery can provide a viable treatment option for patients with pituitary region tumors, including pituitary adenomas and craniopharyngioma, a tumor emerging from pituitary gland embryonic tissue that occurs in children and in middle-aged adults. Tumors often impact the optic nerve and pituitary gland. Symptoms can include obesity, developmental delay, vision impairment and swelling of the optic nerve. Gamma Knife radiosurgery is often a follow-up treatment when the full visible tumor cannot be removed through traditional surgical methods.

Gamma Knife stereotactic radiosurgery can be an effective treatment for a wide array of additional neurologic conditions, including:

- Dural malformations
- Epilepsy from hypothalamic hamartomas
- Hemangioblastomas
- Meningiomas
- Glomus tumors
- Chordomas

- Schwannomas
- Hemangiopericytomas
- Movement disorders such as essential tremor
- Obsessive compulsive disorder (OCD)
- Trigeminal neuralgias
- Uveal (i.e., eye) melanomas
- Cavernous malformations

## Pediatric Gamma Knife Radiosurgery

Because of its minimally invasive approach and exceedingly low dose of radiation to normal brain structures, Gamma Knife is an important tool for treating pediatric patients with different brain conditions. Our expert physicians carefully consider each pediatric patient to determine if Gamma Knife radiosurgery is the appropriate choice. The Gamma Knife radiosurgery technique is similar between adult and pediatric patients. However, children often receive general anesthesia and remain in the hospital overnight.

## Clinical Trials

**Currently enrolling trials include:**

**Stereotactic Radiosurgery with Nivolumab and Valproate in Patients With Recurrent Glioblastoma**  
(NCT02648633; IRB-HSR 18574)

**Description** | The purpose of this pilot study is to determine the safety and effectiveness of Gamma Knife (also called stereotactic) radiosurgery, valproate (an antiseizure drug), and nivolumab (an FDA-approved for treatment of other cancers) in patients with recurrent glioblastoma (GBM).

Adults who have evidence of regrowth of a GBM tumor and have not previously received bevacizumab (also called Avastin) may be eligible to participate in this study. Participation will last approximately seven months and includes receiving nivolumab for six, 28-day cycles and taking daily valproate. Nivolumab is an investigational agent in this study, meaning it is not yet FDA-approved for the treatment of glioblastoma. Valproate is administered orally (a pill you take at home), radiosurgery is a one-time

concentrated burst of radiation delivered directly to the tumor as an outpatient procedure, and nivolumab is administered by IV infusion every two weeks.

Participants will have routine neurological and physical exams, blood sampling for safety, and tumor evaluations done by MRI. Participants will receive the drugs (valproate and nivolumab) as long as the tumor doesn't grow significantly and they do not experience unacceptable drug effects. Routine care expenses will be billed to the insurance provider and then to the patient if not covered. The nivolumab (investigational drug) will be provided free of charge. Participants must be adults (age 18+).

UVA Principal Investigator | Benjamin Purow, MD  
UVA Contact: Cara Hanby  
Phone: **434.243.9900**

**Effect of Tumor Treating Fields (TTFields) in Non-small Cell Lung Cancer (NSCLC) Patients With 1-10 Brain Metastases Following Radiosurgery (METIS)**  
(NCT02831959; IRB-HSR 19212)

**Description** | The study is a prospective, randomized controlled phase III trial to test the efficacy, safety and neurocognitive outcomes of advanced NSCLC patients, following stereotactic radiosurgery (SRS) for 1-10 brain metastases, treated with NovoTTF-100M compared to supportive treatment alone. The experimental, portable, battery-operated device provides chronic administration of alternating electric fields (TTFields or TTF) to the region of the malignant tumor, by means of surface, insulated electrode arrays.

UVA Principal Investigator | Jason Sheehan, MD, PhD  
UVA Contact: Joe Farrar  
Phone: **434.982.6455**

We invite referring providers to consider enrolling their eligible patients in one of our clinical trials. Please visit [uvahealth.com/neurosurgerytrials](http://uvahealth.com/neurosurgerytrials) for up-to-date information on our ongoing studies and trials.

## Our Team

In addition to our industry-leading experience, training and technology, Gamma Knife radiosurgery at UVA taps into a wide array of specialists to provide integrated care to our patients, including:

- Neurosurgery
- Radiation oncology
- Neuroradiology
- Neuro-oncology
- Endocrinology
- Anesthesiology
- Neuro-ophthalmology
- Neuro-otology
- Medical physics

Specialty trained providers at the University of Virginia Gamma Knife Center include:

**Jason Sheehan, MD, PhD**

Director, University of Virginia Gamma Knife Center  
Neurosurgery

**Zhiyuan Xu, MD**

Neurosurgery

**UVA Gamma Knife Center**

Primary Care Center  
1221 Lee St.  
Charlottesville, VA 22903

Refer a patient: **800.552.3723**

Transfer a patient: **844.XFERUVA (933.7882)**

Learn more about the UVA Neurosciences  
and Behavioral Health Center:

[neurosciences.uvahealth.com](http://neurosciences.uvahealth.com)