THE UAB COMPREHENSIVE CANCER CENTER

To refer a patient to the UAB Radiosurgery Program or schedule appointments, contact UAB MIST at 1.800.822.6478.

For information about the UAB Radiosurgery Program, visit uabmedicine.org/radiosurgery or uab.edu/radonc
A Message From the Chairs

The 2012 UAB Radiosurgery Program Outcomes booklet continues our effort to communicate the strides our team has made in providing the best possible care to the citizens of Birmingham and beyond.

We believe that the innovative techniques being harnessed within our program make UAB a standout in patient care, research, and education. Advancing treatments for optimal patient care and outcomes, as well as contributing to the body of radiosurgery knowledge, is helping us work toward our ultimate goal of developing better cancer therapies.

Two of our most exciting and cutting-edge treatments are discussed in this booklet: triggered imaging technique for thoracic radiosurgery and Gamma Knife radiosurgery for pituitary tumors. Each of these care tactics builds on the Radiosurgery Program’s culture of collaboration and aim of providing our patients with care that is as individualized as they are.

Triggered imaging for thoracic surgery is the newest development in motion management at UAB and allows our care teams to even more accurately deliver treatment to our patients. Thoracic radiosurgery is a technologically complex procedure that requires advanced technologies and multidisciplinary care, which in Alabama are available uniquely at UAB.

For the treatment of pituitary adenomas that require salvage treatment, Gamma Knife radiosurgery offers a precise, successful treatment modality. This salvage therapy offers a high rate of controlling the tumor while minimizing potential radiation-induced damage to adjacent normal tissue—an advantage that decreases the risk of neurocognitive impairment and secondary malignancy.

These strides in patient treatment combined with our comprehensive team approach are a hallmark of our radiosurgery program. We strive to deliver these treatments with a patient-centered approach that allows for compassionate and superior care for each and every patient.

We welcome any questions and comments you may have. If you would like to learn more about the progress of our program, you may contact the Department of Radiation Oncology at 205.934.5670.

For more information about the UAB Radiosurgery Program, please visit our website at http://radiosurgery.uab.edu.

At UAB, a new technique called triggered imaging is being used to monitor tumor position in real-time during thoracic radiosurgery. Triggered imaging is improving the accuracy and precision of radiosurgery.

Radiosurgery is becoming an increasingly important tool for managing lung cancer in non or marginally operable patients, with outcomes comparable to surgery [8]. Numerous multi-institutional clinical trials are ongoing, with early results showing that this approach is safe and can result in cancer-free survivals at three years similar to surgery with less morbidity in the short term [8,10-13]. Reported control rates for thoracic tumors treated with radiosurgery have reached more than 90 percent [14].

Thoracic radiosurgery is technically challenging, requiring accurate targeting of the radiation beam so that the tumor receives the full, ablative radiation dose while dose to healthy tissue is minimized. To assure the best possible outcome, radiosurgery at UAB is performed by a multidisciplinary team comprised of thoracic surgeons, radiation oncologists, and medical physicists. Team members work in close collaboration throughout the entire treatment process, from initial consultation to the radiosurgical procedure, to patient follow up.

A particularly complex technical challenge facing thoracic radiosurgery is respiratory motion of the tumor. Tumor motion is highly variable; Tumors at the apex of the lung typically remain stationary, while diaphragmatic tumors can move as much as 4 cm [K. M. Langen, And D. T. L. Jones, “Organ motion and its management,” Int. J. Radiation Oncology Biol. Phys., Vol. 50, No. 1, pp. 365–378, 2001].

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The final and most critical step in motion management is treatment, usually one to five treatments over one to two weeks. Prior to starting radiation delivery, x-rays are taken to ensure that the tumor is in the correct position. The fiducial markers are easily seen in the x-rays and are compared with outlines of the expected position, derived from the 4D CT scan and the preparation by the medical physicist. If the outline and the image on the x-ray do not coincide, the patient is shifted until they do. When the patient is in the correct position and the tumor is centered in the radiation beam, the beam is turned on. During treatment, the same optical technique used during the CT scan is used to track the patient’s breathing. The optical system instructs the radiation beam to turn on at the end of expiration and to turn off as inspiration begins.

The newest development in motion management at UAB is triggered imaging. Using triggered imaging, we observe the fiducial marker during treatment delivery. At the beginning of each expiratory cycle, immediately before the radiation beam comes on, an x-ray image is taken. The image is displayed along with a circle around the expected position of the fiducial marker. The radiation oncologist and thoracic surgeon are thus able to monitor the position of the tumor in real time as the treatment progresses. If the patient moves or the breathing pattern changes, treatment is suspended, the position corrected, and treatment resumed.

Thoracic radiosurgery is a technically complex procedure requiring advanced technologies and multidisciplinary care, which in Alabama are available uniquely at UAB. The experienced team at UAB will continue to remain at the forefront of innovation as the technologies for thoracic radiosurgery continue to evolve.
Functional tumors, those that result in overproduction of hormones, often require multi-modality treatment. Prolactinomas are the most common functional pituitary tumors. For prolactinomas, medical therapy with dopamine agonists is the standard of care for first line treatment. However, for patients not controlled with medication or who do not tolerate medication, surgery and radiation may be utilized. Pituitary tumors resulting in acromegaly, from excess growth hormone and Cushing's disease from excess ACTH, require treatment regardless of size. Surgery is the first line of treatment for the majority of these tumors. In cases where a surgical cure is not achieved, additional therapy is paramount due to the significant increase in morbidity and mortality if hormone overproduction is not controlled. For patients with Cushing's disease, there is no available medical treatment to suppress steroid production. Radiosurgery offers a potential for cure.

In acromegaly, controversy exists regarding the timing of radiation therapy related to medical therapy. Medical therapy is often successful in normalizing growth hormone production, but at a significant yearly financial cost. Without controversy, is the use of radiation when patients are not controlled with medical therapy. However, there may be utility in radiation treatment in an attempt to shorten the length of time a patient requires medical therapy. Medical therapy is often required multi-modality treatment. Prolactinomas are the most common functional pituitary tumors. For prolactinomas, medical therapy with dopamine agonists is the standard of care for first line treatment. However, for patients not controlled with medication or who do not tolerate medication, surgery and radiation may be utilized. Pituitary tumors resulting in acromegaly, from excess growth hormone and Cushing's disease from excess ACTH, require treatment regardless of size. Surgery is the first line of treatment for the majority of these tumors. In cases where a surgical cure is not achieved, additional therapy is paramount due to the significant increase in morbidity and mortality if hormone overproduction is not controlled. For patients with Cushing's disease, there is no available medical treatment to suppress steroid production. Radiosurgery offers a potential for cure.

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For residual nonfunctional adenomas following surgery, Gamma Knife radiosurgery is considered if there is observed tumor growth over time or if the pathology is atypical pituitary adenoma, indicating a potentially higher chance of tumor recurrence. The recurrence rate of pituitary adenomas following surgery is reported around 20%. Recurrence is influenced by extent of resection and tumor pathology. Patients with pituitary adenomas are followed postoperatively with yearly imaging. The majority of tumor recurrence is seen in the first five to seven years postoperatively, but can occur later. Following any radiation to the sella, patients should have a yearly endocrine evaluation. Secondary hypopituitarism is the most common side effect of radiosurgery for pituitary adenomas. The incidence of secondary hormone deficits increases with time, thus necessitating long-term endocrine surveillance. Gamma Knife radiosurgery may have a decreased rate of endocrine dysfunction over fractionated radiation due to the ability to precisely deliver radiation to the tumor and limit radiation to the normal gland in some patients. (Taussky et al 2011) In addition to minimizing dose to the normal pituitary gland, radiosurgery allows for treatment delivery that minimizes radiation to adjacent normal brain cells. This precision decreases the risk of neurocognitive impairment and secondary malignancy from radiation.

Appropriate patient selection and experienced treatment planning help to minimize the risks of radiosurgery. The anatomical location of the pituitary tumor necessitates careful evaluation and planning to limit toxicity to critical structures. Gamma Knife, with frame based head fixation, offers the most precise method of radiation delivery. In this area, millimeters matter. At UAB, we feel strongly that Gamma Knife precision allows us to perform safe, successful radiosurgery for pituitary tumors.

For more information or to refer a patient to the Multidisciplinary Pituitary Clinic: Contact Michel Thomas, Office Assistant to Dr. Riley, at 205-996-2461.


Quality and Outcome Measure

CRANIAL RADIOSURGERY PROCEDURES

SBRT PROCEDURES

The Leksell Gamma Knife is a highly advanced technology that delivers 201 tightly focused cobalt radiation beams to one point in the brain. The radiation beams and doses are so precise they affect only the targeted tissue and generally spare the surrounding healthy tissue.

Stereotactic Body Radiation Therapy (SBRT) uses a high dose of radiation shaped to conform to the patient’s tumor. It delivers radiation to the intended target and avoids healthy tissue. Small tumors are accurately identified and located with precise coordinates.

2012 Radiosurgery Noteworthy Publications

Clark GM, Popple RA, Prendergast BM, Spencer SA, Thomas EM, Stewart JG, Guthrie BL, Markert JM, Fivensh JB: Plan quality and treatment planning technique for single isocenter cranial radiosurgery with volumetric modulated arc therapy. Practical Radiation Oncology. Published online February 1, 2012. Citation Pending.


### Visiting Institution

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<td>Hospital Médica Sur – Mexico City, D.F, Mexico</td>
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### UAB Radiosurgical Clinical Faculty

**James A. Bonner, MD**  
Radiation Oncology  
Specialties: Lung, Head and Neck

**Juan Duan, PhD**  
Medical Physicist  
Specialty: Physics

**Winfield S. Fisher, MD**  
Neurosurgery  
Specialties: Brain Tumors, Face Pain, Vascular

**Douglas J. Minnich, MD**  
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Specialties: Lung, Head and Neck

**Ivan Brezovich, PhD**  
Medical Physicist  
Specialty: Physics

**John Fiveseh, MD**  
Neurosurgery  
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**Richard Popple, PhD**  
Medical Physicist  
Specialty: Physics

**Prem Pareek, PhD**  
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Specialty: Physics

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Medical Physicist  
Specialty: Physics

**Juan Duan, MD**  
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**Robert Kim, MD**  
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**James A. Markert, MD**  
Neurosurgery  
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**Ruby Meredith, MD, PhD**  
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**Eddy Yang, MD**  
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Specialties: Lung, GI, Breast, Head and Neck