

## Customer Perspective

# Leksell Gamma Knife® Icon™ allows NYU Langone to further expand their advanced radiosurgery program

## Contributors

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# About

## The Center for Advanced Radiosurgery NYU Langone Health



### Location

New York, New York, USA



### Staff

Multidisciplinary care from various departments, including:

- neurosurgeons
- neurologists
- radiation oncologists
- neuropathologists
- interventional neuroradiologists
- physicists
- radiation therapists
- nurses



### Technology

Leksell Gamma Knife® Icon™ (brain)

Leksell GammaPlan®

Varian Edge linear accelerator (spine)

GE CT simulator

Siemens MRI



### Patients

500–600 patients per year



#### Dr. Douglas Kondziolka

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#### Dr. Joshua Silverman

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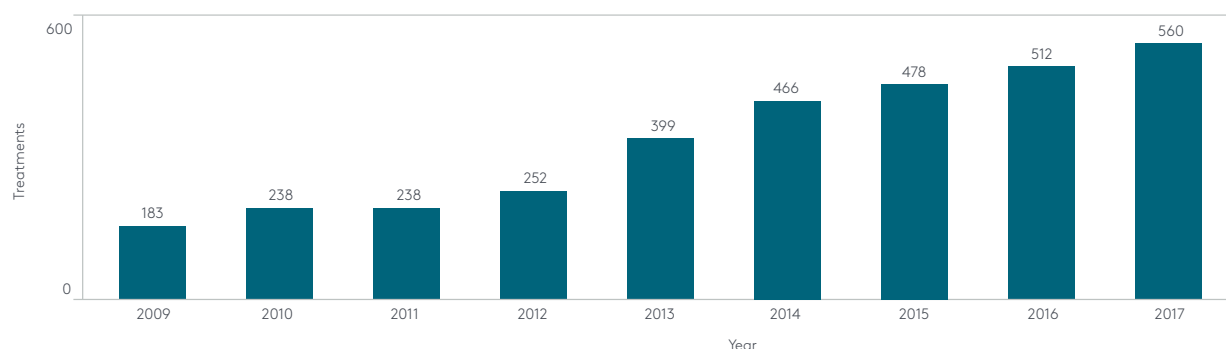
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“Leksell Gamma Knife is highly effective with a limited toxicity profile.”

**Dr. Douglas Kondziolka**

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**Figure 1.** Growth of Gamma Knife radiosurgery at NYU Langone

## Background

NYU Langone Health is a premier academic medical center and one of the top-ranked hospitals in the United States, serving the Northeast and beyond. The NYU Langone Center for Advanced Radiosurgery, home to the organization's Gamma Knife® program, offers stereotactic radiosurgery (SRS) treatment for a range of neurological conditions, including brain tumors, metastases, blood vessel malformations and functional disorders, treating 500–600 patients every year. Leksell Gamma Knife® is the treatment delivery system of choice for all brain SRS indications, while linac-based SRS is used to treat spinal lesions.

The Gamma Knife program, which was established in 1997, is a collaboration between a number of NYU Langone departments, including neurosurgery, neurology and radiation oncology, providing multidisciplinary care and a wealth of expertise for patients with certain types of brain SRS indications. The team has one of the largest published experiences of Gamma Knife treatment in the world and receives referrals from a wide range of specialists in disciplines such as oncology, neurology, ENT and others—as well as from patients themselves.

Previously Chief of Stereotactic and Functional Neurosurgery at the University of Pittsburgh and a leading expert in Gamma Knife radiosurgery, Dr. Douglas Kondziolka joined NYU Langone in 2012.

Building on the quality of the team and the Gamma Knife program, the number of cases treated using Gamma Knife radiosurgery at NYU Langone has doubled in the past five years (Figure 1). The center is an active member of the International Gamma Knife Research Foundation (IGKRF)—generating publications, pooling resources and sharing experiences with other academic centers around the world.

“The IGKRF allows us to collaborate with other leading Gamma Knife centers,” explains Dr. Joshua Silverman, Radiation Oncologist. “This is particularly important for gathering information about the treatment of rare indications. Combining our shared experiences of such cases as a group allows for analysis with greater statistical power to draw more meaningful conclusions.”

## Benefits of Leksell Gamma Knife

Leksell Gamma Knife® Icon™ enhances NYU Langone's ability to offer comprehensive care for many brain disorders. Patients are referred to the NYU Langone Gamma Knife program for all Gamma Knife indications, including benign and malignant brain tumors, arteriovenous malformations (AVM) and functional indications—such as trigeminal neuralgia.

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“Since Leksell Gamma Knife Icon was installed and we have the ability to fractionate deliveries, we now perform radiosurgery for larger tumors, metastatic tumor resection sites and selected larger skull base tumors”

**Dr. Douglas Kondziolka**

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“Gamma Knife provides the team with the confidence to treat these conditions due to the low morbidity and effective tumor control associated with Gamma Knife radiosurgery,” comments Dr. Kondziolka, Professor of Neurosurgery, Professor of Radiation Oncology and Director of the Center for Advanced Radiosurgery.

“The GammaPlan treatment planning software is elegant and anatomy-based, producing highly conformal plans quickly and efficiently. The alternatives for these patients might be surgical resection, with the risks and long recovery associated with this option, or conventional radiotherapy, which can result in more dose to normal brain tissue.

“As a non-invasive alternative to surgery, it is also more convenient for patients. They usually receive treatment as an outpatient, with no need for an overnight hospital stay, and they recover better and faster,” he adds.

## Introducing Leksell Gamma Knife Icon

In July 2016, the NYU Langone Center for Advanced Radiosurgery upgraded to Leksell Gamma Knife Icon, to further expand the number of cases they could treat using Gamma Knife radiosurgery.

“The additional capabilities of Leksell Gamma Knife Icon—such as stereotactic Cone Beam CT (CBCT), the infrared-based High Definition Motion Management (HDMM) system for patient tracking during treatment and the option to use the thermoplastic mask system for frameless stereotactic treatments—allows us to perform both single-session and multiple-session radiosurgery,” reports Dr. Kondziolka.

“This allows us to benefit from the biology of hypofractionation when appropriate and have the ability to use radiosurgery for selected larger tumors.”

The stereotactic CBCT of Leksell Gamma Knife Icon ensures highly precise patient positioning and dose delivery, while the system’s integrated HDMM monitors the patient in real time during treatment with 0.15 mm accuracy. Together with the inherent dosimetric and healthy tissue-sparing advantages of Gamma Knife radiosurgery, these capabilities ensure unrivalled precision with frame-based and frameless immobilization.

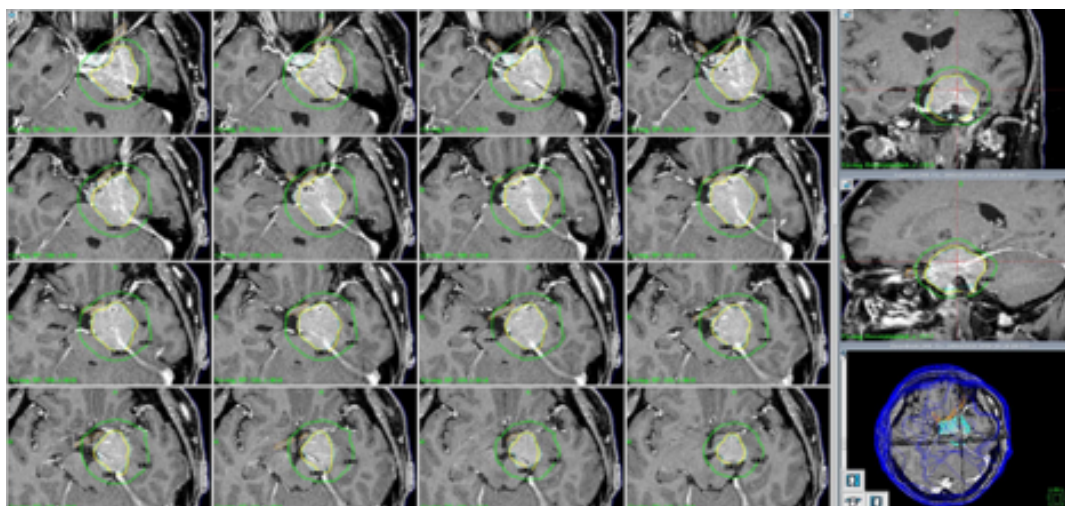
“Leksell Gamma Knife Icon allows us to manage many challenging neurological conditions and offer these patients efficient and effective care. We find that patients tolerate the procedure well and most return to their normal activities almost immediately,” says Dr. Kondziolka.

“Leksell Gamma Knife Icon allows us to offer different fractionations when required and to tailor SRS deliveries to specific patients and their needs,” Dr. Silverman explains. “Certain tumors and resection cavities were previously too large to treat safely with a single fraction. The ability to fractionate allows for better sparing of adjacent healthy tissue. It may be beneficial for skull base tumors located close to optic structures, since the delivery of the prescribed dose in several smaller fractions may reduce the risk of vision impairment compared to single-fraction SRS.”

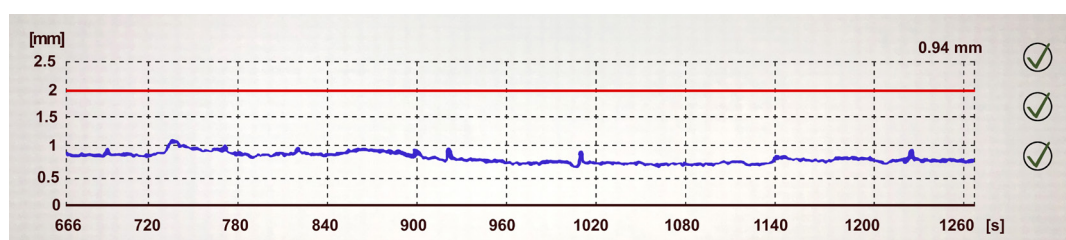
## Example 1: Large Meningioma

A 66-year-old woman presented with left facial numbness. An MRI revealed a large meningioma, 35 x 39 x 33 mm and close to the optic nerve and chiasm (Figure 2). We were able to treat this patient in five fractions of 4 Gy using the frameless capabilities—including CBCT and HDMM—of Leksell Gamma Knife Icon. The HDMM trace demonstrated the stability of the patient during treatment (Figure 3).

**Figure 2.** Treatment of a large meningioma using Leksell Gamma Knife Icon (Example 1), showing the tumor and conformity of the Icon treatment plan



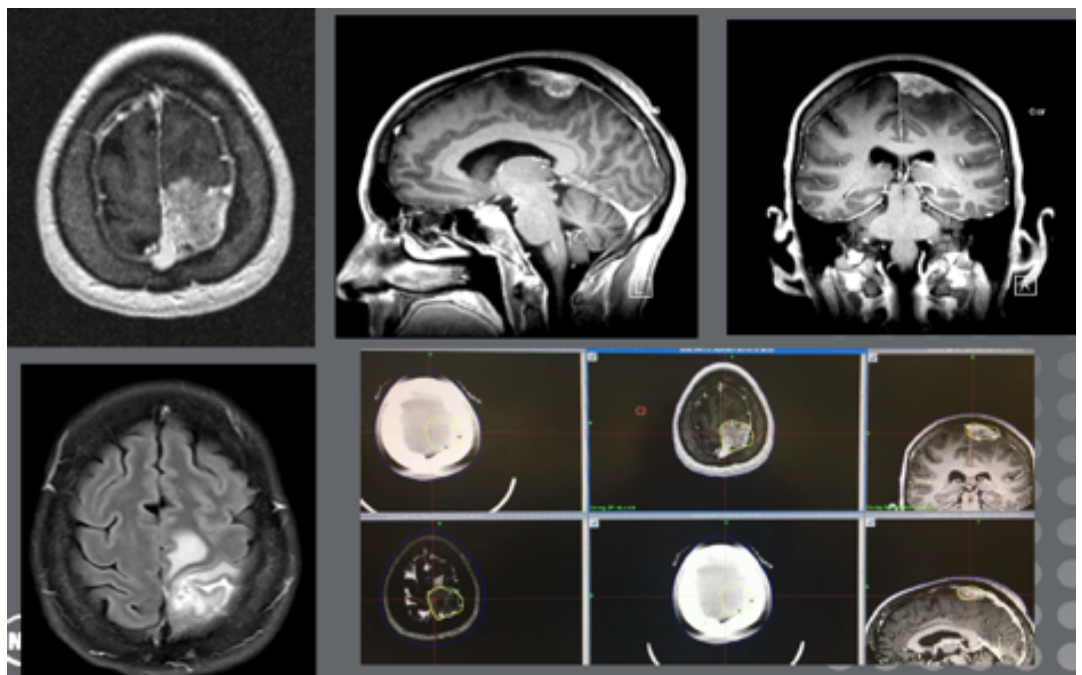
**Figure 3.** HDMM trace for patient (Example 1) treated with Leksell Gamma Knife Icon





## Example 2: Brain Metastasis

A 50-year-old woman who had received treatment for triple-negative breast cancer developed a left parietal metastasis (Figure 4). The location of this tumor over the motor and sensory cortex was associated with an increased risk of neurological deficit with resection. The ability to perform a frameless, fractionated delivery allowed this patient to be treated safely using three fractions of 7 Gy without new neurological worsening.

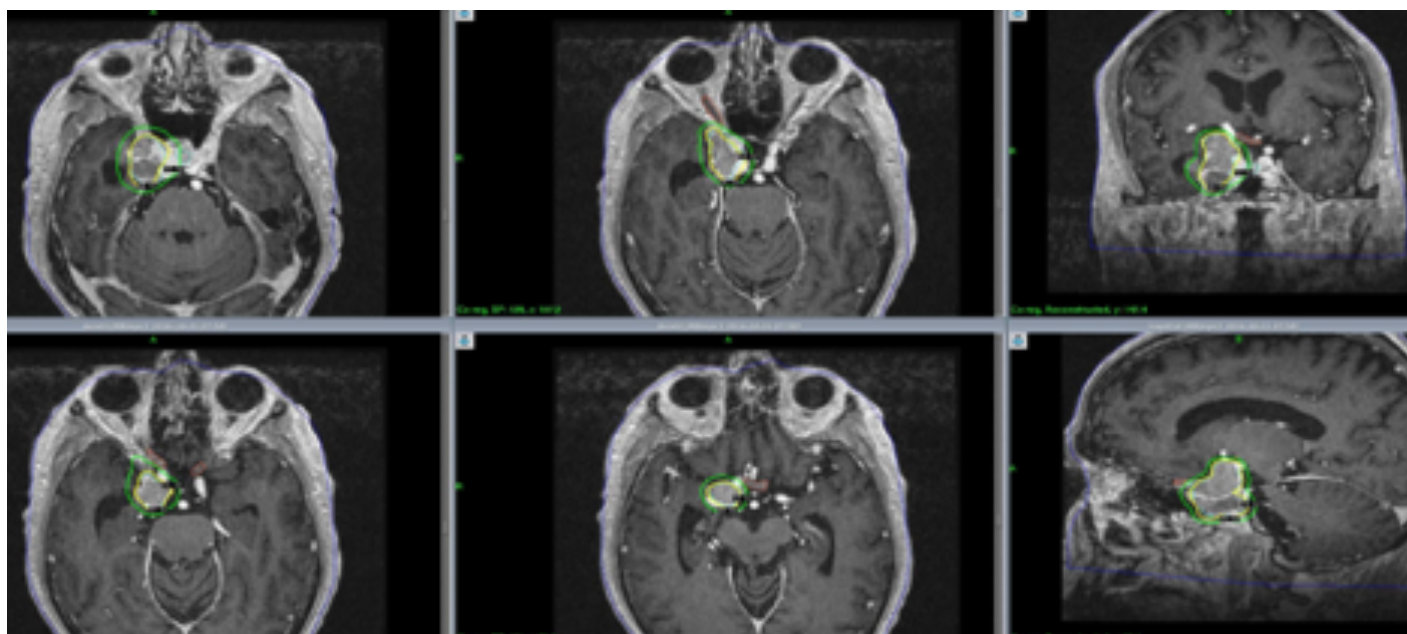


**Figure 4.**  
Upper panel: axial, sagittal and coronal imaging of a left frontal/parietal brain metastasis  
Lower panel: Flair image, CBCT and MRI images at the time of radiosurgical planning (both panels Example 2)

## Example 3: Recurrent Prolactinoma

A 71-year-old man presented with a large recurrent prolactinoma following treatment with bromocriptine and cabergoline (Figure 5). This patient was not suitable for single-fraction SRS due to the proximity of the tumor to the optic chiasm and the risk of visual impairment. Leksell Gamma Knife Icon allowed the patient to be treated safely using five fractions of 4 Gy delivered on five consecutive days. CBCT was used to verify actual skull position on the day of treatment and automatic coregistration determined daily translational and rotational shifts. The TPS performed automatic recalculation of dose distribution according to the daily position.

The patient felt well after radiosurgery. His prolactin level reduced post-surgery and there was significant tumor regression.



**Figure 5.** A large recurrent prolactinoma treated using Leksell Gamma Knife Icon

## Driving further advances in patient care

"Leksell Gamma Knife Icon allows us to perform the complete spectrum of radiosurgery indications for our patients," Dr. Kondziolka notes. "We also continue to collect and share data on techniques and outcomes in order to drive further improvements in the treatment and care of radiosurgery patients. We collect data on all our patients, their clinical conditions, the radiosurgery treatment parameters and their outcomes. With prospectively collected outcomes data for over 2,000 patients, we are the leading center contributing to the AANS/ASTRO national radiosurgery registry."

"At NYU Langone, we use this data as a valuable clinical tool as well as for research," comments Dr. Silverman. "It holds treatment parameter and follow-up details for all our patients, and we can look up any indication easily to see expected patient outcomes and toxicity."

"This is extremely helpful when patients have questions during a consultation," he continues.

"For example, if a patient comes to the clinic with a vestibular schwannoma and is concerned about expected hearing outcomes, we are able to look it up there and then, showing our outcome statistics and even comparing them to other centers."

"Leksell Gamma Knife Icon has added to the flexibility of our practice," Dr. Silverman reports. "Patients can now receive very precise cranial radiosurgery with or without a frame, and it has expanded our indications from a single fraction platform, providing a useful tool for certain cases that require fractionation."

"The role of fractionation in radiosurgery remains to be fully established, but this is an area of interest and research for us at NYU Langone," Dr. Kondziolka concludes. "We will continue to study the long-term tumor control and clinical patient outcomes for such cases."

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## Disclaimer

According to Leksell Gamma Knife intended use, limitation of tumor sizes is from a few millimeters to several centimeters.

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**We are healthcare technology innovators, specializing in radiotherapy treatments for cancer and brain disorders.**

We help clinicians to improve patients' lives through our forward-thinking treatment solutions and oncology informatics, creating focus where it matters to achieve better outcomes.



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