WHAT IS GAMMA KNIFE STEREOTACTIC (SRS) RADIOSURGERY?

Gamma Knife® Stereotactic Radiosurgery is a well-established treatment method that is used to treat selected targets in and around the brain. Gamma Knife is not a knife in the normal sense of the word. The doctor makes no incision in the head. Instead, Gamma Knife radiosurgery is a unique treatment that delivers multiple beams of extremely focused cobalt radiation which converge on one target in the brain.

The radiation effect occurs over time since there is not a removal of brain tissue. The shape and dose of the radiation is focused to hit only the target, without damaging surrounding healthy tissue.

Gamma Knife radiosurgery allows for treatment to areas that may otherwise be inoperable, or can be used in patients who are not candidates for traditional brain surgery or in lieu of brain surgery.

GAMMA KNIFE RADIOSURGERY
Delivering superior clinical outcomes to more than 600,000 people over the last 40 years.

INDICATED FOR TREATMENT OF:

- **Brain Tumors** (Acoustic Neuroma/Vestibular Schwannoma, Glial tumor, Meningioma, metastatic brain tumor, pituitary tumor)
- **Functional Disorders** (Trigeminal Neuralgia or Parkinson’s disease)
- **Vascular Disorders** (Arteriovenous Malformation or AVM, Dural Fistula)

WHAT TYPES OF STEREOTACTIC RADIOSURGERY ARE AVAILABLE?

- **Gamma Knife®** – multiple beams of gamma rays
- **Linear Accelerator** – high energy x-rays (brand names include NovalisTx®, XKnife®, Axesse®, and CyberKnife®)
- **Proton Beam** – heavy-charged proton particles

Image courtesy of Elekta
WHAT HAPPENS DURING A GAMMA KNIFE TREATMENT DAY?

Prior to the treatment day, you will have met with members of the team in their office or at the Illinois Gamma Knife® Center. Gamma Knife requires multiple disciplines such as neurosurgery, radiation oncology, radiation physics, MRI and CT imaging, and nursing all working together to provide you with the best possible outcome. The nurse will review detailed instructions about the procedure with you at your initial consultation. You may be required to get some additional blood work done prior to the procedure to verify that your kidney function is adequate for the MRI contrast.

On the treatment day you will be required to arrive at the center very early in the day. You must have someone available to drive you home from the procedure as you will be given a mild sedative on the morning of the treatment day.

Your treatment consists of six steps:

1. Patient arrival
2. Placing the head frame
3. MRI, CT, or Angiography imaging
4. 3-D Treatment Planning
5. Gamma Knife Treatment
6. Removal of head frame and discharge

BENEFITS OF GAMMA KNIFE

Gamma Knife® Perfexion
- Designed exclusively for non-invasive brain surgery. Eliminates complications seen with open surgical procedures.

Closest Competitive Stereotactic Radiosurgery System (SRS)

- Measured radiological accuracy of 0.15mm.* As the most accurate of all SRS technologies, insures lowest dose to normal brain tissue.

- 1.1 mm accuracy; dose outside the target area is 2 to 6 times higher than with the Gamma Knife.**

- A lightweight stereotactic frame is placed on the head to provide rigid stabilization for maximum accuracy. Provides exact MRI and CT correlation from planning to treatment delivery in 3D.

- Non-rigid immobilization reduces head movement by using a thermoplastic face mask that is shrink-wrapped to the table during treatment. Provides relative MRI and CT correlation from planning to treatment delivery in 3D. Competitive Radiosurgery Systems are inherently less accurate because head positioning is optically guided, not head-frame based.

- Treatment delivered during one outpatient session. Patient comfort and well-being are priorities at every phase. Eliminates long hospital stays and extended recovery times.

- Single or multiple treatments, possibly over a period of days.

- Target is confirmed 10 times per second.

- Target is confirmed once every 10 seconds.

- Procedure is covered by most insurance. Cost is often 25%-30% less than traditional neurosurgery and often more cost effective than whole brain radiation.***

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* The Gamma Knife manufacturer, Elekta, guarantees that Gamma Knife systems will perform with a total radiological accuracy of 0.5mm or better. A study of 189 installed systems showed an average radiological accuracy of 0.15 mm.


PLACING THE HEAD FRAME

A key component in Gamma Knife® radiosurgery is the stereotactic head frame. The frame prevents your head from moving during treatment because it is secured to the Gamma Knife machine. This procedure does not require cutting or shaving of your hair, and there is no hair loss from the treatment.

Prior to placing the frame, you will be given a light sedative. The lightweight frame is held firmly in place with four pins, two on the forehead and two on the back of the head. Long acting local anesthetic is injected into the areas where the pins are placed to ensure comfort during the frame placement. You can expect to feel a temporary sensation of pressure as the frame is placed, but this sensation quickly passes as the skull adapts to the frame. The frame will remain on your head until the completion of the radiation.

MRI, CT OR ANGIOGRAPHY IMAGING

Once the head frame is in place, a magnetic resonance imaging scan (MRI) is performed. A computed tomography (CT) scan may be done in addition to the MRI or instead of the MRI if you have metal in the body not compatible with MRI such as a pacemaker. If you are being treated for an AVM you will also undergo a cerebral angiogram. Once the scan is complete the data is sent electronically to the Gamma Knife computers and the team will begin analyzing the information for treatment planning.

TREATMENT PLANNING

Gamma Knife Stereotactic Radiosurgery involves the entire team who utilize highly specialized computers and software to plan out the radiation treatment. Gamma Knife uses 3-D planning to form the radiation dose to the size and shape of the affected area. Every treatment plan is unique and optimized to the specific requirements of the individual patient. During the time that treatment planning is occurring, you may relax, visit with family, watch TV, and have something to eat in your treatment cubicle.

We are able to treat several patients in one day, the order of treatment will be determined after all scans are reviewed for complexity. As a general rule of thumb, we treat the shortest, least complex procedure first.
**TREATMENT**

Gamma Knife® radiation is completely painless. Once the computerized plan is complete you will enter the treatment room and lay down on the “couch”. The couch is a moveable table that holds the frame and your head motionless in a large, metal cylinder-type helmet. The helmet contains 192 precise holes that will allow the radiation sources to reach the targeted area in the brain. The couch will move you into place once the beams of radiation are ready to be delivered. You will be awake during the treatment and we can dim the lights and play music in the room for you to relax if you like. The Gamma Knife team will be monitoring the treatment via cameras at all times and we are able to converse with you, however we are not in the treatment room during your radiation. The treatment time will vary depending on the size and shape of the area to be treated.

**WHAT CAN I EXPECT AFTER TREATMENT?**

After the treatment, the head frame is removed. You may have a slight headache or discomfort in the spots where the head frame was placed. This will subside over time and most patients will only need some Tylenol® for the discomfort. The most common side effect from the treatment is swelling around the eyes. This is from the local anesthetic that was injected in your forehead for frame placement. This liquid later settles around the eyes over the next few days because of gravity. The body will naturally re-absorb this fluid over time. Many patients say the swelling is at its worst two days after treatment. Some patients also have a slight headache for the remainder of the treatment day. Tylenol is usually enough to control the discomfort. Your nurse will review the written discharge instructions with you before you leave.

Patients typically follow up with members of the Gamma Knife team with MRI studies to monitor the response to treatment. The full effects of Gamma Knife do not happen right away, that is why follow up appointments and scans are so important. You will be able to contact the staff at the Illinois Gamma Knife Center at 847-956-5428 for assistance with scheduling your scans and visits.
LEKSELL GAMMA KNIFE® PERFEXION™ TREATMENT WORKFLOW

Reduced treatment times with Perfexion.
4 brain metastases treated in less than 2 hours – radiation time only

Case: Four brain metastases eccentrically located.

Step 1
Patient arrival

Step 2
Frame placement for maximum stereotactic accuracy

Step 3
Imaging, Magnetic Resonance (MR)

Step 4
Treatment planning with Leksell GammaPlan® PFX

Step 5
Treatment

Step 6
Treatment completed – patient returns home
The Illinois Gamma Knife Center is located on the ground level of the Eberle Medical Office Building on the east side of the campus of Alexian Brothers Medical Center in Elk Grove Village, Illinois.

For more information on the Illinois Gamma Knife Center at Alexian Brothers Medical Center:

847-956-5428  
Fax: 847-956-5439

www.IllinoisGammaKnife.org