What Is Gamma Knife Radiosurgery?

Gamma Knife radiosurgery treats selected areas in the brain. The Gamma Knife is not a knife. It is a machine that offers a precise way to aim beams of radiation at a target area. The radiation is painless.

While radiation kills diseased cells, it can also kill healthy cells nearby. The Gamma Knife helps protect the healthy tissue around the diseased area.

With this treatment, 201 beams meet at the target area, like the spokes on a bicycle tire. Each beam has a very small amount of radiation, so there is little risk to the healthy tissue it goes through. Only the point where the beams meet will receive a large dose of radiation.

What happens during the treatment?

The treatment takes place in a special room with a radiation chamber, helmets and a couch that moves.

Before the treatment we will give you a pill to help you relax. The neurosurgeon (doctor) will place a head frame on your head. The head frame fits into a helmet attached to the machine.

Holes in the helmet focus radiation beams on the target area. Only the target, where all the beams meet, receives a full dose.

Why do I need Gamma Knife treatment?

Your doctor will explain the reasons for choosing this treatment. Gamma Knife can treat brain tumors (both cancer and non-cancer), blood vessel defects and other problems.

How do I prepare for Gamma Knife treatment?

Here are a few things you must do before treatment.

- **8 hours** before treatment, stop all food, milk and chewing tobacco. Keep drinking clear liquids until **2 hours** before treatment. Clear liquids include water, clear juice, black coffee or clear tea without milk, Gatorade, clear soda. Do not drink alcohol for **24 hours** before treatment.
• Take all of your medicines the morning of your treatment. You may take them with enough water to swallow them easily.

Bring your medicines to the hospital if you need to take them throughout the day. If you use an inhaler, bring it with you. If you have diabetes, please bring your insulin, glucometer and sliding scale parameters.

What happens the day of treatment?

When you come to the hospital, you will go to the Gamma Knife room. This room is in the Radiation Oncology Department, on the first floor.

Up to three family members or friends may come with you. During times when they cannot be with you, they may stay in the waiting room. We will tell them how you are doing.

• You will change into a hospital gown and remove any jewelry, contact lenses, dentures, wigs or hairpieces.

• We will insert an IV line into your arm or hand, or into your port if you have one.

• We will give you medicine to help you relax before treatment begins. Children who have this treatment receive medicine to put them to sleep.

What happens in Gamma Knife radiosurgery?

There are four parts to Gamma Knife radiosurgery.

1. We attach the head frame.
2. We take images to locate the area to be treated.
3. We plan the correct dose of radiation.
4. We do your Gamma Knife treatment.
**Attaching the head frame**

The head frame is box-shaped and lightweight. We attach it to your skull with four special pins.

- We will wipe your head with rubbing alcohol. No hair will be shaved. If you have long hair, we will ask you to tie it back.

- We will inject a numbing medicine into the four places where we will put the pins: two in your forehead and two in the back of your head. This medicine will sting for about 15 to 20 seconds.

- When the four areas are numb, the neurosurgeon (doctor) will attach the frame to your skull with the pins. The pins go through your skin to the outer part of your skull. This holds the head frame in place. The pins do not normally leave scars (any scarring would be very small).

- You may feel pressure while we attach the head frame. This usually goes away once the frame is in place. If you feel any pain while the frame is being attached, tell the doctors or nurses.

- Next, we will place a clear plastic helmet on the head frame. The helmet measures the size of your head in relation to the head frame. This takes a few minutes.

- We will remove the plastic helmet. The head frame stays on your head until you complete your Gamma Knife treatment.

The frame is lightweight, so you will be able to move your head after it is in place. You will be able to lie back on a pillow as well.

**Taking X-ray images**

Next, we will take you to Radiology for X-ray images. We use these to plan your treatment. The X-ray images may include a CT scan, MRI or cerebral angiogram.

We attach a plastic box (called a localizer) to the head frame before taking the images. This helps the doctors to take precise pictures.

When we finish the images, we will remove the plastic box. We will move you to another room in the hospital.

**Planning the radiation dose**

While you wait, we will plan your treatment. We use a computer to map out the shape, size and location of the target area. Then we work out the exact doses of radiation needed. Planning time will vary with the size and shape of the target.

Your Gamma Knife team will check the plan carefully before starting treatments.
Radiation treatment

When the treatment plan is ready, we will take you to the treatment room. Your doctor will tell you the exact length of your treatment before it begins.

- We will place you on a couch that can move.
- The head frame attaches to the couch, which holds the head in place. The head fits into a special helmet. Holes in the helmet help focus the radiation beams.

You will lie on the couch, with the helmet around your head frame.

- The doctors and nurses will go into the next room where they can watch you during the treatment. We will use video cameras and a speaker system. You will be able to talk to the doctors and nurses during the treatment.
- The couch will move into the Gamma Knife chamber and the treatment will begin. The helmet will not cover your face. You will not feel the radiation.

There is no noise during the treatment. We can play your favorite radio station, or you can bring a CD from home. Part way through your treatment, we may need to enter the room and make some adjustments.

What happens after the treatment?

We will remove the head frame and put a bandage around the pin sites. Keep this bandage on until tomorrow morning.

The pin sites may bleed a little. Bleeding often stops after a few minutes of pressure.

We will remove your IV line and take your blood pressure and heart rate. Some people have a headache or upset stomach after treatment, but this is rare. We can give you medicine that will help.

If there are no problems, you can go home about 30 minutes after treatment. If you had an angiogram, you will be on bed rest for a couple hours before going home.

How long will the treatment take?

The time it takes varies depending on the problem we are treating. Bring something you enjoy to help you pass the time.

Do not make plans for the day of your treatment. You might be here until late afternoon. You may eat something after we attach the head frame and take X-ray images.

How should I care for myself after treatment?

You may go back to your normal activities and diet. Some people feel tired for a day or two.

- Keep the pin sites clean. It is normal for them to close the next day and heal in seven to 10 days.
- You may have swelling near the pin sites and near your eyes. This should go away within a few days. You may feel numbness or tingling in your scalp near the pin sites. This feeling should go away within a few weeks to a month.
- Very rarely, the pin sites may need stitches. If so, you should visit your family doctor in five to seven days to have them removed.
• You may shower and wash your hair the day after treatment. Do not scrub over the pin sites until they have healed. The first time you wash your hair, dried blood from the pins sites could make the water pink.

• Take your medicines as you did before the treatment. If your doctor feels any changes need to be made, he or she will discuss this with you.

• Do not drive for 24 hours.

**What symptoms should I watch for?**

Tell your doctor if you have any new problems, or if problems you had before treatment get worse. These may include:

• confusion

• severe headache

• weakness on one side or in the hands or feet

• problems speaking

• loss of balance

• visual problems

• seizures.

**How will I know if the treatment worked?**

It may take from several days to several years for the treatment to have the full effect. Your doctor will check you regularly to see how you are feeling. Also, he or she will take follow-up images (CT scan, MRI or angiogram). We will compare these images to those we took the day of the treatment.

**What are possible complications?**

People who have Gamma Knife treatment face fewer risks than people who have other brain surgeries. This is because Gamma Knife treatment does not involve any cutting.

Possible short-term complications include:

• pain and swelling at the pin sites

• a numb feeling around the pin sites

• headache, fatigue (feeling very tired), nausea (feeling sick to your stomach)

• swelling in the brain (this can be treated with medicine).

Long-term complications may include:

• brain damage

• swelling in the brain (this can happen months later)

• headaches

• seizures

• worsening of existing problems.

**Definitions of terms**

**Benign:** slow growing, not cancer

**Cerebral angiogram:** an X-ray of the brain's blood vessels, using special dye to make the vessels more visible

**CT scan (computed tomography):** an X-ray technique that uses a computer to show images of internal body structures

**Gamma:** a type of radiation

**IV:** intravenous; into a vein

**Malignant:** cancerous tumors that can grow out of control and can spread

**Metastasis:** spread of a disease from one part of the body to another

**MRI (magnetic resonance imaging):** a diagnostic test that uses magnetic fields and radio waves to show images of internal body structures
Radiosurgery: the use of beams of radiation to destroy diseased areas of the brain; an alternative to surgery with knives

Target: area of diseased tissue where radiation beams are precisely aimed

Tumor: an abnormal growth of tissue that may be benign or malignant

Vascular: refers to blood vessels, either arteries or veins

Specific problems that can be treated with Gamma Knife

Your doctor will let you know if Gamma Knife is the best treatment for your medical problem. Here are some examples of problems that can be treated by Gamma Knife radiosurgery.

Arteriovenous malformation (AVM): a tangle of abnormal vessels where the blood passes directly from arteries to veins; over time it can cause a brain hemorrhage

Acoustic neuroma: benign tumor that grows in the internal auditory canal; may cause hearing loss, headache, problems with balance or ringing in the ears

Brain tumor: a tumor that grows in the brain; it can be benign or malignant

Glioma: a tumor within the cells or fibers that support the tissue of the brain or spinal cord

Meningioma: a slow-growing tumor of the membranes around the brain and spinal cord

Pituitary adenoma: a benign tumor of the pituitary gland

Schwannoma: benign tumor of the nerve cells

Trigeminal neuralgia: severe shooting pains of the facial area, coming from facial nerves

Questions?

If you have any questions about the information in this booklet, contact your health care provider. We want you to be well informed going into your treatment.

For emergencies: Call 911.

For questions about your insurance coverage: Call your insurance company.

For questions about your bill: Call the Central Business Office of the University of Minnesota Medical Center at 612-672-6724.

To reach the Radiation Oncology Department at the University of Minnesota Medical Center: Call 612-273-6700 (Monday through Friday, 7:00 a.m. to 4:30 p.m.). The Gamma Knife nurse's hours will vary.

For health information and support: There are many groups to support you and your family, including:

- American Cancer Society (1-800-227-2345)
- NIH/National Cancer Institute (1-800-422-6237)
- American Brain Tumor Association (1-800-886-2282)

If you are deaf or hard of hearing, please let us know. We provide many free services including sign language interpreters, oral interpreters, TTYs, telephone amplifiers, note takers and written materials.