Gamma Knife Radiosurgery Treatment

What is Gamma Knife radiosurgery?

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

What are the benefits of the Gamma Knife?

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 Gamma Knife radiosurgery 192 beams of radiation meet at the target area, like the spokes on a bicycle wheel. 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.

How is the treatment done?

The radiosurgery treatment takes place in a special room with a radiation chamber and a bed that moves and docks into the machine. This starts the radiation beams, which focuses on the target area. During the actual radiation treatment, you will either have a frame on your head or wear a plastic mask that has been molded to your entire face. Each device attaches to the treatment bed to decrease head movement. Your care team will choose the best option to meet your needs.

Why do I need Gamma Knife radiosurgery?

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

If you have any questions, contact your care team. We want you to be well informed going into your treatment.
Gamma Knife Radiosurgery with a Head Frame

How do I prepare for treatment with a frame?

On the day of treatment:

- We suggest not making plans for the day of your treatment. You might be here until late afternoon.

- Continue taking all of your medications as usual. (It is okay to take your usual medications with enough water to swallow them easily.)

- 24 hours before you arrive for treatment: Do not drink alcohol after this time.

- 8 hours before your arrive for treatment: Switch to a clear liquid diet up until 2 hours before you arrive for treatment. Clear liquids include water, black coffee, Gatorade, and clear juice, tea, and soda—no milk or food.

- 2 hours before you arrive for treatment: Stop all liquids, including clear liquids. (If you need to take any medicines, it is okay to have a small amount of water.)

What should I bring to the hospital?

Bring these medications with you:

- Any of your usual medications that need to be taken with food or taken throughout the day.

- Inhaler, if you use one.

- Diabetes supplies, if you have diabetes (insulin, glucometer, sliding scale parameters).

What happens the day of treatment?

When you arrive for treatment with a frame

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

- Up to 3 family members or friends may come with you. During times when they can't be with you, they can stay in the waiting room. We will tell them how you are doing.

- You will change into a hospital gown and remove any jewelry, glasses, dentures, wigs, hairpieces or head scarves.

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

- Before treatment, we will give you a pill to help you relax. Children receive medication to put them in a sleeping state.

Step 1: Attaching the head frame

- We will wipe your head with rubbing alcohol and Betadine antiseptic. 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. The 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).
Step 1: Attaching the head frame

- You may feel some 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 doctor or nurse.

- The head frame stays on your head until you complete your Gamma Knife radiosurgery treatment.

- The frame is lightweight, so you will be able to move your head around and lie back on a pillow up until treatment begins.

Step 2: Taking X-ray images

- We will take images, which will be used to plan your treatment. Images may include a CT scan, MRI or cerebral angiogram.
  - We will attach a plastic box called a *localizer* to the head frame before taking MRI images. This helps us take more precise pictures. We will remove it when we finish.

- Once your images are done, we will move you to another room in the hospital where you will have a light breakfast.

Step 3: Planning your treatment

The doctor will review your images and plan your treatment. We map out the shape, size, and location of the target area(s) on a computer. Then we work out the exact doses of radiation needed. Our planning time will vary based on the size, number, and shape of the target(s).

Step 4: Radiation treatment

- When the treatment plan is ready, we will take you to the treatment room. You will be told the exact length of your treatment before it begins.

- We will place you on a bed that moves. The head frame attaches to the bed, which holds your head in place.

- We will go into the next room, where we can watch you during treatment. We will use video cameras and a speaker system.

- You’ll be able to talk to the doctor, nurse, and technician during the treatment. You can take a break if you need one.

- The bed will move into the Gamma Knife chamber, and the radiosurgery treatment will begin. You will not feel the radiation.

- There is no noise during the treatment. We can keep it quiet in the room or play your favorite music or podcast.
Step 5: After treatment with a frame

- We will remove the head frame.
- We will put a bandage around your head to cover the pin sites.
  - Keep the bandage on until the next day.
  - The pin sites may bleed a little. Bleeding often stops after a few minutes of pressure.
  - Very rarely, the pin sites may need stitches. If so, you should visit your family doctor in 5 to 7 days to have them removed.
- We will remove your IV line and check your blood pressure and heart rate.
- Some people have a headache or upset stomach after treatment, but this is rare. We can give you medication 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 of hours before going home.

How will I feel?

- You may have swelling or bruising near the pin sites and near your eyes. This should go away within a few days.
- You may feel numbness and tingling in your scalp. This could last for 1 to 2 weeks.

How should I care for myself at home?

- You may resume all normal activities and diet on the day of treatment with two exceptions:
  - Do not drive until the next day.
  - Do not bend and put your head below your heart level until the following day.
- Take your medications as you did before the treatment. Your doctor will discuss any needed changes with you.
- Keep the pin sites clean.
- You can 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 pin sites could make the water pink.
- The pin sites typically close by the next day and heal in 7 to 10 days.
Gamma Knife Radiosurgery with a Mask

How do I prepare for treatment with a mask?

- If you are claustrophobic, tell your care team well before the treatment. We will discuss taking medicine to help you relax. If you take this medicine, you'll need someone to drive you home after treatment.

- On the day of treatment:
  - Take your medications as usual. If you have any medications that need to be taken around or during your treatment time, bring those with you. This would include any oral medications, inhalers and insulin.
  - Wear a shirt that doesn't have a hood or collar.
  - You may eat and drink as normal.

What happens the day of treatment?

When you arrive for treatment with a mask

- When you come to the hospital, you will go to the Gamma Knife suite. It is located in the Radiation Oncology department on the first floor.

- Up to 3 family members or friends may come with you. During times when they can’t be with you, they can stay in the waiting room. We will tell them how you are doing.

- We’ll ask you to take off your wig, hairpiece or head scarf before we start your treatment.

- Tell your nurse if you have taken any medicine for pain or relaxation in the 12 hours before arriving.

Step 1: Making the mask

Before your first day of treatment, we will make a mask that molds to your entire face (from the top of your forehead to the bottom of your chin). It is made out of a flexible plastic that, when warmed, allows us to form it to your face. This mask will be used for all of your treatments (between 1 and 5 treatments).

- To make the mask:
  - You will lay on your back on the treatment bed.
  - We will place a warm, soft mask on your face and attach it to the treatment table.
  - We will mold the mask to the shape of your face using our hands. You will need to remain as still as possible.
  - The mask will cool down quickly.

- We will place a sticker on the tip of your nose. This allows a camera system to track any head movements.

- The mask will remain in place for about 10 minutes as it cools and we observe you.

Step 2: Taking images

We will take images to locate the area(s) to be treated. This will include a CT scan and MRI.
Step 3: Planning your treatment

Your care team will plan the correct dose of radiation. We use a computer to map out the shape, size, and location of the target area(s). Then we work out the exact dose of radiation needed.

The length of treatment can vary, depending on what we are treating. After your care team reviews your images they will be able to tell you the length of each treatment you are scheduled for.

Step 4: Radiation treatment

- We will place you on a bed that moves
- We will attach the mask to the bed, which holds your head in place. The goal is for you to stay as still as possible during your treatment.
- We will place a sticker on the tip of your nose. This helps us track any head movements.
- We will go into the next room where we can watch you on a video camera.
- Due to having the mask on, you will not be able to talk to us during the treatment. You will have a call button that you can push if you need us. We will stop treatment and enter the room to address your needs.
- The bed will move into the Gamma Knife chamber, and the treatment will begin. You will not feel the radiation. There is no noise during the treatment. We can play your favorite music or podcast.

Step 5: After treatment with a mask

**How should I care for myself at home?**

- You may continue your normal activities and diet.
- Take your medications as usual (just as you did before treatment). Your doctor will discuss any needed changes with you.
Frequently asked questions
(for frame and mask patients)

How will I know if the treatment worked?

It may take several days to years for the treatment to have the full effect, depending on the cause of illness. You will have follow-up image(s) and appointments with your physician. They 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 of complications than people who have other brain surgeries. This is because Gamma knife treatment does not involve any cutting.

Possible short-term and long-term complications include:

- Headaches
- Fatigue (feeling very tired)
- Nausea (feeling sick to your stomach)
- Brain swelling (can be treated with medication)
- Confusion
- Weakness on one side or in the hands or feet
- Problems speaking
- Loss of balance
- Visual problems
- Seizures

Tell your doctor if you have any of the problems above or develop any new concerns.

What else do I need to know?

Glossary of terms

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

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

Benign: slow growing, not cancer

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

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

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

IV: intravenous; into a vein

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

Metastasis: spread of a disease from one part of the body to another
Meningioma: a slow-growing tumor of the membranes around the brain and spinal cord

MRI (magnetic resonance imaging): a diagnostic test that uses magnetic fields and radio waves to show images of internal body structures

Pituitary adenoma: a benign (non-cancerous) tumor of the pituitary gland

Radiosurgery: the use of beams of radiation to destroy diseased areas of the brain; an alternative to surgery with knives

Schwannoma: benign tumor of the nerve cells

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

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

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Phone numbers

**Gamma Knife Department**

Gamma Knife nurse: 612-273-8637
Gamma Knife radiation therapist: 612-273-6016
Gamma Knife main number: 612-273-6700
(24 hours, 7 days a week)

**For billing questions:**

Business Office: 612-672-6724
(For insurance questions, call your insurance company.)

**Health information and support**

American Cancer Society
1-800-227-2345

NIH/National Cancer Institute
1-800-422-6237

American Brain Tumor Association
1-773-577-8750