

# A Patient's Guide to SRS

Stereotactic Radiosurgery



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## **INTRODUCTION**

You have this booklet because your doctor believes that you're a good candidate for stereotactic radiosurgery (SRS), an advance in the treatment of cancer, vascular abnormalities, and certain types of pain and movement disorders.

SRS painlessly shrinks or eliminates tumors and abnormalities, using focused beams of radiation. It enables doctors to deliver higher doses of radiation more precisely and in fewer treatment sessions than ever before.

Though it's called *radiosurgery*, the procedure does not involve the making of any incisions. Recovery and healing are fast, and you can resume normal activities shortly after treatment.

This booklet explains the basics of SRS and describes what you can expect throughout the treatment process. The information is intended to be a starting point for discussion. Your medical team can answer more fully any questions you may have.

## **SRS AND HOW IT WORKS**

In medicine, radiation has been used to treat cancer and other abnormalities with good results for many years. Today it is prescribed in one form or another for half of all cancer patients.

Radiation works by damaging the DNA of cancer cells so they can no longer reproduce. The physician prescribes the amount, or dose, of radiation and the method of administering it in much the same way as drugs are prescribed.

Stereotactic radiosurgery, or SRS is the most precise method of external beam radiation. It has been used for some time by neurosurgeons to treat vascular abnormalities and tumors in the brain, both benign

and malignant. Recent advances in imaging, patient positioning, and targeting have all made SRS appropriate for the treatment of cancers in other parts of the body as well.

Diagnostic images taken before treatment—including computed tomography (CT), positron emission tomography (PET), and magnetic resonance imaging (MRI)—help determine where to aim the radiation. The beams are shaped to match the contours of the tumor and are delivered from many different angles around the body, all converging precisely at the planned target location.

SRS's ultrahigh precision destroys tumors with high doses of radiation, while sparing the surrounding healthy tissue. In this way SRS provides a noninvasive alternative to surgery, allowing treatment of some otherwise inoperable tumors.

With some methods of radiation, it may take weeks of treatment sessions to deliver the full prescribed dose. With SRS, however, a single treatment is sufficient. (Another similar treatment method, stereotactic radiotherapy, or SRT, involves just a few treatment sessions.)

SRS is delivered as an outpatient procedure.

**SRS Treatment** | With SRS, the full radiation dose is delivered in one session. Because this is an outpatient procedure, patients can return home immediately after the procedure.

SRS is most often used to treat tumors or abnormalities in the brain and spine, although with new technologies for more precise targeting and for compensating for any tumor motion that occurs as a patient breathes during treatment, SRS is starting to be used more widely for treatments in other regions of the body.



With SRT, the full radiation dose is delivered over a course of several treatment sessions, instead of all at once. SRT is also known as *fractionated radiosurgery*, because a fraction of the total radiation dose is delivered at each session.

SRT is used to treat tumors or abnormalities in the brain, head, neck, and spine. It may also be used to treat tumors or abnormalities in other parts of the body—in the lungs, liver, kidneys, and pancreas, for example.

## **THE TECHNOLOGY INVOLVED**

SRS, SRT, or some other form of treatment: Your doctor decides which is best for you. In making this decision, physicians look at many factors, such as the size, location, and type of tumor, as well as your overall state of health.

Treatment requires certain key tools and technologies, such as specialized treatment planning software, a source of high-energy radiation, devices to shape the radiation beams, and quality assurance tools that check and fine-tune your position relative to the radiation beam before treatment begins.

**Software** | Sophisticated computer software and three-dimensional images of your lesion and surrounding anatomy indicate the optimal way of treating your condition. The resulting treatment plan—unique to you—specifies the number of radiation beams as well as the angles required to precisely deliver the radiation dose prescribed by your doctor without harming surrounding healthy tissue.

**Guidance System** | We take extra precautions to make sure that every patient receives minimal radiation exposure during treatment. We use AlignRT®, the premier radiation therapy guidance system, for Surface Guided Radiation Therapy (SGRT) for patients using frameless mask treatment with our state-of-the-art TrueBeam™ linear accelerator treatment machines. This system, from Vision RT, has been shown to reduce radiation exposure to healthy tissue. AlignRT tracks your body surface in real-time, detects any motion, and pinpoints your radiation treatment to the specific cancer area, dramatically lessening unwanted radiation exposure to any healthy tissue and reducing the risk of side effects. Another benefit of the guidance system being used is that it can eliminate the need for tattoos and skin marks for many patients. The technology projects a random series of patterns on your skin, acting like thousands of virtual tattoos. These images are input into a software program that monitors your positioning with sub-millimeter accuracy and ensures you are treated in the correct position. AlignRT can reduce the complexity of treatment setups and can track motion with better than 1mm accuracy. It is fully integrated into the treatment workflow, allowing for automatic beam pause if the patient moves during treatment delivery.

**Medical Linear Accelerator** | A specially equipped linear accelerator is used in your treatment. It is optimized to deliver high radiation doses to very small targets with extreme precision. It generates a radiation beam shaped to limit the dose to the region of abnormality. To do this it employs one of two beam-shaping devices.

**Beam-Shaping Devices** | A variety of different beamshaping devices, located in the head of the accelerator, shape the radiation beam. Your clinicians will select the best one for you. The radiation beam passes through such a device during treatment, and is shaped by it.

One device—for addressing relatively small tumors or abnormalities—is a cylindrical metal block called a cone. Cones have holes of various sizes down the middle. The size and shape of your abnormality determines the correct hole size.

A second device—for addressing larger tumors or abnormalities—is called a *multileaf collimator*, or *MLC*. The MLC has 120 computer-controlled tungsten metal plates, or *leaves*, that can be individually adjusted to create an aperture of almost any shape. During treatment, the leaves move automatically, blocking the beam in different places for different amounts of time, according to the treatment plan. This ability to change the beam shape over time gives the doctors very fine control over how, and where, the radiation dose is administered.

**X-Ray Imager** | With the radiation beam shaped so exactly, care must be taken to ensure that it is aimed at the targeted area with great precision. A special X-ray imager, mounted on the linear accelerator, is used to check your position relative to the radiation beam before treatment begins.

Adjustments can be made to the position of the treatment couch, if required, so that you are positioned for treatment with submillimeter accuracy.

## **THE TREATMENT PROCESS**

Stereotactic radiosurgery is a carefully controlled process that consists of a series of steps: consultation, positioning, imaging, treatment planning, treatment delivery, and follow-up care.

**Consultation** | Your initial visit will be with the physician leading your treatment team. This may be a radiation oncologist or a neurosurgeon. The physician will review your medical history and reports, make a recommendation about any further tests that may be required, discuss the options available to you, and work with you to choose an optimal course of treatment. If it is SRS, the entire treatment process will be completed in one day; if it is SRT, you will be scheduled for a series of appointments.

**Positioning** | In order to achieve the precision of a stereotactic treatment, it's important to be accurately positioned and carefully immobilized during treatment. The doctor will fit you with an immobilization device to ensure that you remain in the same position—as comfortably as possible—without moving during the procedure.

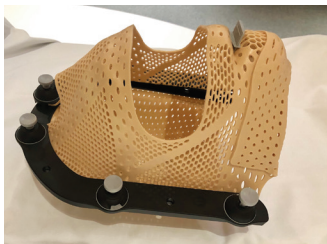


There are different methods for positioning and immobilization, depending on the area to be treated. Some single session treatments to the brain require a minimally invasive headframe.

The frame is fixed to the head using pins or screws, which are put in place under local anesthetic. The frame is then attached to the treatment couch.

A frameless system may be used in other instances, especially for SRT treatments delivered over several days.





Frameless systems are made of a lightweight mask and bite block that are individually formed to fit your face and head.

For stereotactic

treatments to regions of the body other than the head, various types of body frames or cushioning systems are available for patient positioning. Your physician will discuss with you the various options to determine which will work best, given your specific circumstances.

If you have been fitted with a headframe for SRS, you will need to remain at the clinic for the entire treatment process. With other types of positioning systems, you may have the option of going home after imaging, then returning for actual treatment on another day.

**Imaging** | You will be positioned on the CT couch so that a scan can be performed, generating images of the area to be treated. This scan—along with any other CT, PET, MRI, and X-ray images you may have had—provides information required not only to create a treatment plan but to ensure that you are positioned correctly at the time of treatment.

**Treatment Planning** | With the information gathered during the positioning and imaging steps, a dedicated medical team will design the best treatment plan for your situation. They will use a sophisticated software program to generate a customized plan for your treatment. This planning team may include experts from different disciplines, such as radiation oncology, neurosurgery, and medical physics.



**Treatment Delivery** | SRS treatments usually take about an hour. In some cases the treatment time can be longer. Most of the time is used to ensure that you are accurately positioned for your treatment.

You may see laser lights in the room; these help the therapist make sure you are level and straight on the treatment couch. You may see and hear the robotic arms of the imager as they extend from the linear accelerator and move into position.

Usually, two or more images are taken from different angles, or a complete rotation of the accelerator may be used to generate a three-dimensional image.

The therapist will use these images to guide adjustment of the treatment couch. You may also notice a camera on the ceiling; this is part of an optical guidance system that monitors and corrects for any movement during the treatment.

In some cases, a camera may also be used to monitor your breathing.

You will be alone in the room during the treatment, but the therapist can see and hear you at all times through intercom and closed circuit television systems. The therapist will control the accelerator, imagers, and treatment table from outside the room.

The linear accelerator emits a buzz as it produces the radiation beams. Although its effect on tumors is quite dramatic, the radiation itself is invisible. You will not feel it just as you do not feel chest X rays or CT scans. You may also hear the quiet whir of the beam-shaping device and see the leaves move. The accelerator will move around you to deliver beams from different angles, according to your treatment plan. Sometimes the couch will move as well. This is all normal and part of the treatment process.

## **FOLLOW-UP CARE**

After you complete your treatment, your doctor will monitor your progress with a series of follow-up visits. Blood tests, diagnostic X rays, and even additional CT and MRI scans may be requested at these appointments.

These appointments are your opportunities to discuss any problems and review how to stay healthy after treatment. Ask about nutrition, exercise, and other basics for maintaining a healthy lifestyle. You can also find out about support groups for survivors of cancer or neurological conditions.

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