Radiation therapy plays an important role for many patients with brain tumors. Radiation therapy is a series of high-energy x-ray treatments. These treatments damage the DNA in cancer cells remaining in the brain. Normal cells in our body are able to repair damage to their DNA better than cancer cells. This allows radiation treatments to affect the growth of cancer cells more than normal tissue.

**Uses for Radiation Therapy in Brain Tumors**
Radiation therapy is used to try to kill tumors, to control tumor growth, or to relieve tumor symptoms. Types of tumors treated with radiation therapy include:

- Grade 3 and 4 gliomas
- Meningiomas
- Pituitary adenomas
- Primary malignant lymphomas
- Primitive neuroectodermal tumors
- Craniopharygiomas

**Types of Radiation Therapy Used to Treat Brain Tumors**
Radiation therapy treatment for brain tumors may be used alone or in combination with chemotherapy. Types of brain radiation treatments include:

**External Beam**
- Conformal radiation therapy. This combines multiple treatment angles to deliver radiation beams to the patient's tumor.
- Intensity modulated radiation therapy (IMRT). This modifies the intensity of the radiation beam doses delivered to the tumor.
- Stereotactic radiation therapy (radiosurgery). This pinpoints high doses of radiation beams directly on the tumor.

**Internal Radiation (brachytherapy)**
A tube or balloon (catheter) inserted into the tumor cavity is used to deliver the radiation dose to the tumor site.

**Side Effects**
The side effects of radiation therapy vary due to the tumor site and the type of treatment. However, they include:

**Acute Side Effects**
- Scalp/skin dryness and redness
- Hair loss that may be permanent with higher treatment doses
- Fatigue that improves after the end of therapy
- Initial symptoms of the tumor may occur for a short time during treatment
• Headaches that may occur or increase in intensity during treatment
• Nausea
• Changes in taste

Late Side Effects
These will vary depending on the site of treatment and can include:
• Fatigue that may increase for 6 to 12 weeks after treatment but will improve over several months
• Hormonal problems such as low thyroid hormone
• Memory loss (uncommon). This depends on the site of your tumor and radiation dose given.
• Tissue destruction (rare) from the radiation that may cause symptoms similar to initial tumor symptoms. This happens in about 5% of those patients receiving higher doses of treatment.
• Visual or hearing loss (rare)

Managing Symptoms
Your nurse and doctor can help you manage symptoms if they occur. Please tell them if you develop any of the following symptoms:
• Nausea or vomiting
• Headaches or a headache that gets worse.
• Fatigue
• Seizures
• Scalp, forehead, or ear redness
• Changes in vision or hearing

Sources:
Dzibela M [2004]. Brain and Central Nervous System Tumors Chapter XII in Manual for Radiation Oncology Nursing Practice and Education 3rd edition. ONS, Pittsburgh


© 2005, University of Colorado Hospital, Denver
Radiation therapy plays an important role for many patients with metastatic brain tumors. Radiation therapy is a series of high-energy x-ray treatments. These treatments damage the DNA in cancer cells remaining in the brain. Normal cells in our body are able to repair damage to their DNA better than cancer cells. This allows radiation treatments to affect the growth of cancer cells more than normal tissue.

Types of Radiation Therapy Used to Treat Brain Tumors
Radiation therapy is used to try to control tumor growth or relieve tumor symptoms. Radiation therapy treatment for brain tumors may be used alone or in combination with chemotherapy. Types of brain radiation treatments include:

External Beam
- Conformal radiation therapy. This combines multiple treatment angles to deliver radiation beams to the patient's tumor.
- Intensity modulated radiation therapy (IMRT). This modifies the intensity of the radiation beam doses delivered to the tumor.
- Stereotactic radiation therapy (radiosurgery). This pinpoints high doses of radiation beams directly on the tumor.

Side Effects
The side effects of radiation therapy vary due to the tumor site and the type of treatment. However, they may include:

Acute Side Effects
- Scalp/skin dryness and redness
- Hair loss that may be permanent with higher treatment doses
- Fatigue that improves after the end of therapy
- Initial symptoms of the tumor may occur for a short time during treatment
- Headaches that may occur or increase in intensity during treatment
- Nausea
- Changes in taste
Late Side Effects
These will vary depending on the site of treatment and can include:
- Fatigue that may increase for 6 to 12 weeks after treatment but will improve over several months
- Hormonal problems such as low thyroid hormone
- Memory loss (uncommon)
- Tissue destruction (rare) from the radiation that may cause symptoms similar to initial tumor symptoms. This happens in about 5% of those patients receiving higher doses of treatment.
- Visual or hearing loss (rare)

Managing Symptoms
Your nurse and doctor can help you manage symptoms if they occur. Please tell them if you develop any of the following symptoms:
- Nausea or vomiting
- Headaches or a headache that gets worse
- Fatigue
- Seizures
- Scalp, forehead, or ear redness
- Changes in vision or hearing

Sources:
Dzibela M [2004]. Brain and Central Nervous System Tumors Chapter XII in Manual for Radiation Oncology Nursing Practice and Education 3rd edition. ONS, Pittsburgh
© 2005, University of Colorado Hospital, Denver
FRAMELESS STEREOTACTIC RADIOSURGERY

Stereotactic Radiosurgery (SRS) is a special form of focused, high-dose radiation therapy given in a single treatment. It is a form of treatment for certain types of brain tumors and for blood vessel irregularities called Arteriovenous Malformations (AVMs). SRS requires that the radiation be targeted very accurately. This requires the placement of a special face mask. The face mask gives your doctors a very stable point of reference on the outside of the brain. This helps to aim the radiation exactly where it needs to go inside the brain. During SRS it is important to provide an appropriate dose of radiation to the area being targeted. It is also important to keep the dose of radiation to nearby normal brain tissue and other important structures as small as possible.

Before Your Procedure

- You will have a special MRI done within one week of your treatment. This MRI is just like other MRIs but thinner slices are obtained to help the doctor get a better picture of the size and shape of your tumor.
- The day before your treatment, you will come to radiation oncology for a CT simulation. This is a cat scan that allows us to obtain images to plan your radiation treatments. During the simulation, a special face mask will be made for use during your treatment.
- Please make sure your hair is clean and without oil, hairsprays, mousse, or gel products when you come for this procedure and for your treatment.
- After your simulation you will be allowed to return home and the doctor and neurosurgeon will plan your treatment based on the MRI and CT images. This plan will be reviewed with you prior to your treatment.

The day of Your Procedure

- For the 2 hours before your SRS only drink clear liquids.
- Come to the Radiation Oncology Department at the scheduled time. The nurse will meet with you to check your vital signs and do a brief neurological assessment.
- Please bring your pain medications with you on the day of your treatment to take prior to treatment and as needed during treatment. If you are not on any pain medications, the doctor will give you a prescription for some on the day of your consultation.
- Your treatment usually takes 45-90 minutes. After your treatment, you will receive follow up instructions.

After the Procedure

Activity
Resume your normal activities with the following exceptions:
1. Do not drive a car on the day of the procedure.
2. Ask your doctor how soon you may return to work.

Diet
You may go back to eating your normal diet.
RADIATION ONCOLOGY

Pain or Discomfort
- You may have some discomfort from the pressure of the face mask used during radiosurgery.
- You may also have temporary numbness or tingling of the scalp, headaches, or muscle aches in your neck and shoulders.
- For pain or discomfort use Acetaminophen (Tylenol) 650 mg or Ibuprofen 400 mg every 6 hours. You may also use other pain medication your doctor had prescribed.
- Your physician may prescribe a short course of Dexamethasone or other steroidal medication to prevent swelling and headaches. Take the Dexamethasone or other steroid as instructed and take it with food.

Follow up Instructions
You should schedule a follow up appointment with Dr. ____________ in _______ weeks/months. Please call _____________ to schedule. You might need an MRI prior to this appointment. Please call ahead of time to get your MRI scheduled.

When to Call the Doctor
Notify the doctor if you experience any of the following signs or symptoms:
- Severe headache not relieved by medication or rest.
- Nausea and vomiting that doesn’t stop.
- A change in your level of consciousness (sleepy, hard to arouse).
- New onset of weakness or visual changes.

If at any time after the SRS you experience a problem that you believe is a serious, potentially life-threatening emergency, call 911.

For any questions or concerns (not an emergency) please call:
- (720) 848-0167 for the Radiation Oncology Clinic, Monday through Friday, 7 a.m. to 6 p.m.
- (303) 724-2305 for Neurosurgery, Monday through Friday, 8 a.m. - 4 p.m.
- (720) 848-2820 for the ENT clinic, Monday through Friday, 8 a.m. - 4 p.m.

For Emergencies:
After hours and on weekends, call (720) 848-0000 and ask for the Radiation Oncology Resident on call. Wait on the phone while the operator pages the doctor. If unable to reach a health care provider, call the Emergency Department at (720) 848-9111.
Stereotactic Radiosurgery (SRS) is a special form of focused, high-dose, radiation therapy given in a single treatment. It is a form of treatment for certain types of brain tumors and for blood vessel irregularities called Arteriovenous Malformations (AVM's). SRS requires that the radiation be targeted very accurately. This requires the placement of a special frame on your head, sometimes called a "halo". The head frame gives your doctors a very stable set of reference markers on the outside of the brain. This helps to aim the radiation exactly where it needs to go inside the brain. During parts of the treatment planning procedure and treatment setup, a plastic localization box is also temporarily attached to the frame. This provides an additional guide for accurate radiation delivery. During SRS it is important to provide an appropriate dose of radiation to the area being targeted. It is also important to keep the dose of radiation to nearby normal brain tissue and other important structures as small as possible.

Before Your Procedure
- Please make sure your hair is clean and without oil, hairsprays, mousse, or gel products when you come for your procedure. This makes it easier for the doctor to place the head frame safely and easily.
- Please bring all of your daily medications with you to take throughout the day as scheduled.
- For the 2 hours before your SRS only drink clear liquids. After placement of the head frame, check with your nurse to see if you may sip fluids.

The Day of Your Procedure
- Come to the Radiation Oncology Department at the scheduled time. The nurse will meet with you to check your vital signs, do a brief neurological assessment, and place an intravenous catheter (IV) in your arm.
- A neurosurgeon or ENT (Ear, Nose, Throat) surgeon will review with you the procedure for the head frame placement. It is important that you completely understand when giving your consent for the procedure (informed consent). The surgeon will then place the head frame using medicine to numb four areas of skin overlying your skull. Two areas are in the forehead and two in the back of the head. Once the head frame is in place, you will feel pressure, but not pain, at the pin sites.
- Next you will be taken to get a CT scan with the head frame in place. The images from the CT are important for planning your treatment.
- After the CT you'll be taken to a waiting area. You can then rest on a bed or in a chair while your treatment is planned. Treatment planning can take anywhere from 1 to 3 hours. During this time you may have visitors, read, watch TV, listen to music, and walk short distances.
- Once the plan has been planned, you will be taken back to the treatment machine to have your SRS. This usually takes 45 to 90 minutes. After your treatment, the head frame will be removed and we will treat the four pin sites. This whole procedure will take about 5 hours total.
After the Procedure

Activity
Resume your normal activities with the following exceptions:
• Do not drive a car on the day of the procedure.
• Ask your doctor how soon you may return to work.

Diet
You may go back to eating your normal diet.

Wound Care
• You may wash your hair the day following treatment. Use a mild shampoo, like Johnson’s Baby Shampoo™ for the next 3 to 4 days.
• Wash the pin sites gently with soap and water, and pat dry. You do not need to cover them in any way. Avoid rubbing the area around the pin sites for several days.
• Watch for drainage, redness, and pain at the pin sites.

Pain or Discomfort
• You may have some discomfort from the pressure of the frame used during radiosurgery.
• You may also have temporary numbness or tingling of the scalp, headaches, or muscle aches in your neck and shoulders.
• For pain or discomfort use acetaminophen (Tylenol®) 650 mg or ibuprofen 400 mg every 6 hours. You may also use other pain medication your doctor has prescribed.
• Your physician may prescribe a short course of dexamethasone or other steroidal medication to prevent swelling and headaches. Take the dexamethasone or other steroid as instructed and take it with food.

Facial or Forehead Swelling or Bruising
• You may have swelling or bruising that occurs 12 to 24 hours after your treatment. This is a result of the pins used during your procedure. This swelling might involve the face or eyelids. The swelling may keep the eyelids from opening fully.
• Apply a cold pack to the area for 30 minutes, 2 to 4 times a day for comfort. You might also reduce the chance of swelling by applying a cold pack to the pin sites the night after receiving SRS.
• Contact your doctor if the swelling doesn’t begin to go away in 2 to 3 days.

Follow up Instructions
You should schedule a follow up appointment with Dr. in ___ weeks/months. Please call ___ to schedule. You might need an MRI prior to this appointment. Please call ahead of time to get your MRI scheduled.

When to Call the Doctor
Notify the doctor if you experience any of the following signs and symptoms:
• Severe headache not relieved by medication or rest.
• Nausea and vomiting that doesn’t stop.
• A change in your level of consciousness (sleepy, hard to arouse).
• Redness, swelling, or drainage at the pin sites.
• New onset of weakness or visual changes.
If at any time after the SRS you experience a problem that you believe is a serious, potentially life-threatening emergency, call 911.

For any questions or concerns (not an emergency) please call:
- (720) 848-0167 for the Radiation Oncology Clinic, Monday through Friday, 7 a.m. to 6 p.m
- (303) 315-6635 for Neurosurgery, Monday through Friday, 8 a.m. to 4 p.m.
- (720) 848-2820 for the ENT clinic, Monday through Friday, 8 a.m. to 4 p.m.

For Emergencies:

After hours and on weekends, call (303) 372-0000 and ask for the neurosurgeon, ENT doctor, or Radiation Oncologist on call. Wait on the phone while the operator pages the doctor. If unable to reach a health care provider, call the Emergency Department at (303) 372-8911.


© 2004, University of Colorado Hospital, Denver