

CyberKnife Radiosurgery

Highlands Neurosurgery, in association with Bristol Regional Medical Center, has brought to the Tri-State region a revolutionary new technology for using radiation to treat tumors.

The CyberKnife offers non-invasive treatment for tumors in the head and spine, including some that were previously considered inoperable. CyberKnife is a robotic radiosurgery system that provides a painless alternative to traditional surgery. CyberKnife's computer-controlled robotic arm allows it to treat tumors unreachable by other stereotactic radiosurgery systems (SRS).

Major benefits of the CyberKnife include:

- Better quality of life during and after treatment
- More accurate radiation targeting
- Better access to hard-to-reach, larger or previously inoperable tumors
- Ability to treat multiple tumors at different locations during a single session
- Vastly better control for minimizing the dose delivered to normal tissue
- Reduces the risk for complications like infections and loss of hearing that are associated with traditional surgery

SRS Technology

For more than 30 years, SRS technology has been used to deliver high doses of focused radiation beams from multiple locations around the patient to destroy a tumor. Although this procedure does not physically remove a tumor, it can destroy tumor cells or stop the active growth of new tumor tissue. To date, more than 100,000 patients have been treated in SRS procedures worldwide.

The best-known SRS treatments have always required the use of a metal frame that is literally bolted to the patient's skull during the procedure. This head frame remains attached to the patient during the entire process - while initial imaging scans are taken, while doctors develop a treatment plan, and while they apply the radiation treatment. This can take half a day or longer. This lengthy procedure is extremely uncomfortable for the patient. The creators of CyberKnife set out to develop a better solution.

How CyberKnife works

CyberKnife is a revolutionary radiosurgery device that improves outcomes while providing unprecedented patient comfort. It takes a radically different approach from other SRS by using a miniature linear accelerator (LINAC) mounted on a robotic arm to deliver its therapeutic radiation. A real-time targeting system eliminates the need for the uncomfortable head frame.

Image guidance cameras locate the position of the patient and guide the robotic arm to deliver precisely targeted, small beams of radiation that converge at the tumor from multiple angles. The cumulative dose is high enough to destroy the cancer cells, while radiation exposure to surrounding healthy tissue is minimized. The level of accuracy achievable by this system allows higher doses of radiation to be used - resulting in greater tumor-killing effectiveness and a higher likelihood of radiosurgical success.

Prior to the CyberKnife treatment, CT images are taken to define the spatial relationship between the patient's bone anatomy and the tumor. During the actual treatment, patient movement is monitored in

real time by the system's low-dose X-ray cameras. The CyberKnife's computer-controlled robotic arm compensates for any changes in tumor position during treatment. Its accuracy is just under a millimeter.

Patient Treatment

A CT scan (and possibly an MRI scan) are performed prior to treatment. Some patients may require special markers called fiducials to be implanted prior to the initial setup. This procedure is done on an outpatient basis.

The actual CyberKnife procedure, which usually takes about an hour, also is performed on an outpatient basis. After treatment, the patient can return home immediately. If needed, more treatments can be scheduled at a later date.

With CyberKnife, there is a reduced risk of complications such as infections or hemorrhage that are sometimes associated with traditional surgery. Patients also experience a shorter recovery period than they would after surgery.

History of CyberKnife

CyberKnife was created to address some of the shortcomings of older radiosurgery technologies. The first CyberKnife prototype was installed for clinical use at Stanford University in 1994. It has now been used in more than 3,000 procedures. The device was cleared for commercial use by the federal Food and Drug Administration in August 2001. Currently, it is available at *nine* medical institutions across the country.

Scheduling Treatment

Our physicians need to carefully review each potential patient's clinical condition to determine whether CyberKnife is an appropriate treatment option. This is done in close consultation with a patient's personal physician. If you're interested in CyberKnife as a treatment option, ask your physician to contact our office at 423-844-5400.

Before actual treatment can be scheduled, our physicians will give you a comprehensive neurological examination. If you're coming to our center for this evaluation, you'll need to bring these items with you:

- most recent MRI scan, and prior MRI studies for comparison
- records of any prior tests, medical or surgical treatments, radiation treatments
- audiogram results (if applicable -- ask your physician)
- vision tests (if applicable)
- endocrine studies (if applicable)
- chemotherapy or radiation therapy reports (if applicable)

When you come to the Highlands Neurosurgery, our physicians will sit down with you to review your medical history in detail. Its best if you know the dates of any medical procedures (including surgery, radiation or chemotherapy) related to your condition.

If you have any questions about preparing for your consultation, call us at 423-844-5400, or ask your doctor.