CyberKnife Radiosurgery

CyberKnife radiosurgery is a treatment option for tumors or other abnormalities of the brain, neck and spine. It is used on some tumors which previously were thought to be inoperable. It is also used on tumors in other parts of the body. CyberKnife treatment is a painless, outpatient radiation treatment. It does not have the risks and complications of open surgery. It's *non-invasive* (this means you are not cut open). It does not use the head frame used by older radiosurgery methods such as the Gamma Knife.

The CyberKnife uses computer software which allows your doctors to locate and *irradiate* (give x-ray treatment to) very small tumors or growths. With the Cyber Knife, a surgical cut (*incision*) is not required. The usual risks of open surgical procedures (hemorrhage, infection, CSF leakage, etc.) can be avoided. The radiosurgical device works by stereotactic localization. This means that multiple beams of radiation are all focused precisely on a small spot such as a tumor. Where those beams of radiation meet, the tumor receives a very high dose of radiation. The other portions of the brain the radiation passes through will receive about one third as much radiation. This helps prevent damage to tissues around the tumor. This would kind of be like aiming three water hoses at one bucket. That one bucket would receive three times as much water than if just one hose was aimed at the bucket. When aimed properly, the ground in between buckets would be dry.

CyberKnife's accuracy is a major advance in radiosurgery. Pictures of the tumor and its surroundings (*digital radiographic images*) are used to precisely target the radiation. Physicians can treat complex shaped tumors with accuracy that is as good as, if not better than, the frame-based system. Frame-based systems require screws to be placed into the skull. This holds the reference frame in place and prevents movement by the patient during the treatment.

The CyberKnife combines robotics and modern image guidance to give a very advanced treatment for cancer. CyberKnife integrates two revolutionary technologies:

- **An image-guidance system** shows the tumor location. If there is movement during the treatment, the computer is able to adjust for this and keep its aim on the tumor.
- **A six-jointed robotic arm** gives great movement for targeting tumors. A high-energy X-ray source mounted on the robotic arm delivers pinpoint radiation from more than 1,200 angles with great accuracy. It allows for the treatment of tumors that previously were thought to be inoperable. CyberKnife overcomes the limits of previous radiosurgery systems.

WHO IS A CANDIDATE?

Many things are considered during the first meetings with the radiation oncologist and thoracic surgeon. Generally, only lesions considered to be inoperable are considered for CyberKnife radiosurgery. If the tumor is small enough and/or not located near critical body structures, the patient may be a good candidate for conventional surgery. Lung function must also be good enough to allow the removal of the tumor and surrounding normal tissue. If the conditions are not good for surgery, destroying tissue with radiation (*ablating*) is an excellent option.

PROCEDURE

- Radiosurgery using CyberKnife generally requires one to five treatments.
- Before your surgery, a non-invasive, customized face mask or a body mold is prepared to help position the body. What devices are used will depend on where the tumor is located. It will be set up in a comfortable manner so that a similar set up is reproduced for each treatment. Computerized pictures of the tumor and tissue around it are made. Patients having treatment for spine or other tumors outside the head may need placement of “markers” near the tumor. Markers are little metallic screws placed around a tumor by a physician. They are like putting a global positioning device on the tumor so the treatment can be focused exactly on the area to be treated.
- On the day of treatment, the patient lies on a table and wears the face mask or immobilizer while the

CyberKnife delivers radiation. Treatments commonly take one hour per lesion. When finished, patients can go home.

COMFORT AND CONVENIENCE FOR YOUR PATIENTS

CyberKnife technology provides a number of advantages over conventional radiotherapy for patients, including:

- Improved comfort. No need for the head frame.
- Short hospital stays although this may be an out-patient procedure.
- Short recovery periods.
- Treatment in one to five sessions.
- The ability to treat multiple tumors at different locations during a single treatment.
- Focused, maximum radiation to the tumor with little affect on healthy tissue.
- Treatment for tumors that are inoperable by conventional surgery and other stereotactic radiosurgery methods. Reduced risk of complications such as infections, hemorrhage and the loss of hearing and feeling.

Your caregiver will discuss this treatment at length with you and will decide if this treatment would be the best available for you.

Most of this Information is courtesy of Accuray which produces CyberKnife, an advanced stereotactic radiosurgery system.

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