CyberKnife Radiosurgery

The CyberKnife® Robotic Radiosurgery System is a non-invasive alternative to surgery for the treatment of both cancerous and non-cancerous tumors anywhere in the body, including the prostate, lung, brain, spine, liver, pancreas and kidney. The treatment – which delivers beams of high-dose radiation to tumors with extreme accuracy – offers new hope to patients worldwide.

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Though its name may conjure images of scalpels and surgery, the CyberKnife treatment involves no cutting. In fact, the CyberKnife System is the world's first and only robotic radiosurgery system designed to treat tumors throughout the body non-invasively. It provides a pain-free, non-surgical option for patients who have inoperable or surgically complex tumors, or who may be looking for an alternative to surgery.

The CyberKnife® System is a one-of-a-kind device for several reasons.

First, the CyberKnife System uses image guidance software to track and continually adjust treatment for any patient or tumor movement. This sets it far ahead of other similar treatments. It allows patients to breathe normally and relax comfortably during treatment.

Second, some forms of radiosurgery require rigid head-frames that are screwed into the patient's skull to minimize any movement. The CyberKnife System does not require such extreme procedures to keep patients in place, and instead relies on sophisticated tracking software, allowing for a much more comfortable and non-invasive treatment.

Third, unlike some radiosurgery systems, which can only treat tumors in the head, the CyberKnife System has unlimited reach to treat a broad range of tumors throughout the body, including the prostate, lung, brain, spine, liver, pancreas, and kidney.

And finally, the CyberKnife System's treatment accuracy is unrivaled. Its ability to treat tumors with pin-point accuracy is unmatched by other radiation therapy and radiosurgery systems. The CyberKnife System can essentially "paint" the tumor with radiation allowing it to precisely deliver treatment to the tumor alone, sparing surrounding healthy tissue.

Indications

CyberKnife Radiosurgery

CyberKnife Radiosurgery for brain metastases.

Glioblastoma

Sato et al., studied CK treatment of glioma and glioblastoma, and analyzed frequency and risk factors of radiation necrosis. Of 61 patients with glioma and glioblastoma treated with CyberKnife, four patients showed symptomatic radiation necrosis. All of these patients were treated with stereotactic radiotherapy, varying from 3 to 6 fractions without previous radiation therapy. Two patients required necrotomy through craniotomy. Two patients were treated conservatively. Our four patients with radiation necrosis were not specific in terms of tumor volume and dose delivery. Glioma cells invade the normal brain tissue and over-radiation to this intermingling area is one of the risk factors for injury to normal endothelial cells. The homogeneity of the maximum dose area is an important factor to reduce over radiation to the normal brain parenchyma. The dose volume effect has been discussed in terms of risk factor; however, the number of fractions and dose per fraction should be considered to avoid radiation necrosis. We consider that conformal treatment with inverse algorism, fractionated stereotactic radiotherapy and precise anatomic targeting reduce the risk of radiation necrosis [1)].

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Sato K, Baba Y, Inoue M, Omori R. Radiation necrosis and brain edema association with CyberKnife treatment. Acta Neurochir Suppl. 2003;86:513-7. PubMed PMID: 14753497.