

1: Neurosurgery. 2001 Oct;49(4):838-46.

## **Image-guided hypo-fractionated stereotactic radiosurgery to spinal lesions.**

**Ryu SI, Chang SD, Kim DH, Murphy MJ, Le QT, Martin DP, Adler JR Jr.**

Department of Neurosurgery, Stanford University Medical Center, 300 Pasteur Drive, Stanford, CA 94304, USA.  
seoulman@stanford.edu

**OBJECTIVE:** This article demonstrates the technical feasibility of noninvasive treatment of unresectable spinal vascular malformations and primary and metastatic spinal tumors by use of image-guided frameless stereotactic radiosurgery.

**METHODS:** Stereotactic radiosurgery delivers a high dose of radiation to a tumor volume or vascular malformation in a limited number of fractions and minimizes the dose to adjacent normal structures. Frameless image-guided radiosurgery was developed by coupling an orthogonal pair of x-ray cameras to a dynamically manipulated robot-mounted linear accelerator that guides the therapy beam to treatment sites within the spine or spinal cord, in an outpatient setting, and without the use of frame-based fixation. The system relies on skeletal landmarks or implanted fiducial markers to locate treatment targets. Sixteen patients with spinal lesions (hemangioblastomas, vascular malformations, metastatic carcinomas, schwannomas, a meningioma, and a chordoma) were treated with total treatment doses of 1100 to 2500 cGy in one to five fractions by use of image-guided frameless radiosurgery with the CyberKnife system (Accuray, Inc., Sunnyvale, CA). Thirteen radiosurgery plans were analyzed for compliance with conventional radiation therapy.

**RESULTS:** Tests demonstrated alignment of the treatment dose with the target volume within +/-1 mm by use of spine fiducials and the CyberKnife treatment planning system. Tumor patients with at least 6 months of follow-up have demonstrated no progression of disease. Radiographic follow-up is pending for the remaining patients. To date, no patients have experienced complications as a result of the procedure.

**CONCLUSION:** This experience demonstrates the feasibility of image-guided robotic radiosurgery for previously untreatable spinal lesions.

PMID: 11564244 [PubMed - indexed for MEDLINE]