
Original Article

Application of CyberKnife Stereotactic Radiosurgery for Treatment of Spinal Tumors

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Abstract

Background and Purpose

This report summarizes our clinical experience with CyberKnife radiosurgery as a noninvasive treatment for spinal tumors.

Methods

Stereotactic radiosurgery delivers a high dose of radiation to the tumor and minimizes the dose to the adjacent normal structures. CyberKnife is a frameless radiosurgery system with robot controlled linear accelerator and image guided by two orthogonal x-ray cameras. Data obtained from patients with spinal tumors who underwent CyberKnife radiosurgery at Municipal Wan-Fang hospital between September 2005 and June 2006 was analyzed. Twenty-three patients with twenty-seven lesions were treated. There were sixteen metastatic and eleven primary lesions detected. All patients treated with CyberKnife were assessed individually according to the location of the tumor; extradural lesions were assessed with the visual analog scale (VAS) pain scale, intradural-extramedullary lesions with the McCormick scale and intradural-intramedullary lesions with the McCormick scale combined with tumor volume change.

Results

The follow-up period ranged from one to ten months. Most patients experienced an improvement of functional status. Pain improved in patients with extradural lesions. Neurological improvements with decrease in McCormick scale occurred in patients with intradural-extramedullary lesions. Both McCormick scale and tumor volume decreased in patients with intradural-intramedullary lesions. Tumor coverage index ranges from 89.45% to 99.65%. Prescription isodose was between 71 to 91%. Homogeneity index ranges from 1.1 to 1.43. Conformity index ranges from 1.14 to 1.87. One patient experienced radiation-induced spinal cord swelling and bleeding four weeks after radiosurgery and received emergent decompressive laminectomy with partial recovery. Two patients expired. Tumor volume ranged from 376 to 383099mm³. Tumor radiation dose was maintained at 1400 to 3000cGy divided into one to five fractions.

Conclusions

CyberKnife frameless stereotactic radiosurgery improves functional status and quality of life in patients with spinal tumors. It was found to be feasible, safe and effective. The major benefits of radiosurgical ablation of spinal lesions are short treatment time with rapid symptomatic response. Early adverse effects are infrequent. However, late complications require long-term follow-up.

Key Words: CyberKnife, spinal tumors, stereotactic radiosurgery

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