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CyberKnife frameless single-fraction stereotactic radiosurgery for tumors of the sacrum.

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OBJECT: The role of stereotactic radiosurgery for the treatment of intracranial lesions is well established. The experience with radiosurgery for the treatment of spinal and sacral lesions is more limited. Sacral lesions should be amenable to radiosurgical treatment similar to that used for their intracranial counterparts. The authors evaluated a single-fraction radiosurgical technique performed using the CyberKnife Real-Time Image-Guided Radiosurgery System for the treatment of the sacral lesion.

METHODS: The CyberKnife is a frameless radiosurgery system based on the coupling of an orthogonal pair of x-ray cameras to a dynamically manipulated robot-mounted linear accelerator possessing six degrees of freedom, which guides the therapy beam to the intended target without the need for frame-based fixation. All sacral lesions were located and tracked for radiation delivery relative to fiducial bone markers placed percutaneously. Eighteen patients were treated with single-fraction radiosurgery. Tumor histology included one benign and 17 malignant tumors. Dose plans were calculated based on computerized tomography scans acquired using 1.25-mm slices. Planning treatment volume was defined as the radiographically documented tumor volume with no margin. Tumor dose was maintained at 12 to 20 Gy to the 80% isodose line (mean 15 Gy). Tumor volume ranged from 23.6 to 187.4 ml (mean 90 ml). The volume of the cauda equina receiving greater than 8 Gy ranged from 0 to 1 ml (mean 0.1 ml). All patients underwent the procedure in an outpatient setting. No acute radiation toxicity or new neurological deficits occurred during the mean follow-up period of 6 months. Pain improved in all 13 patients who were symptomatic prior to treatment. No tumor progression has been documented on follow-up imaging.

CONCLUSIONS: Stereotactic radiosurgery was found to be feasible, safe, and effective for the treatment of both benign and malignant sacral lesions. The major potential benefits of radiosurgical ablation of sacral lesions are relatively short treatment time in an outpatient setting and minimal or no side effects. This new technique offers a new and important therapeutic modality for the primary treatment of a variety of sacral tumors or for lesions not amenable to open surgical techniques.

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