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## **Combination kyphoplasty and spinal radiosurgery: a new treatment paradigm for pathological fractures.**

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**OBJECT:** Patients with symptomatic pathological compression fractures require spinal stabilization surgery for mechanical back pain control and irradiation for the underlying malignant process. The authors evaluated a treatment paradigm of closed fracture reduction and fixation involving kyphoplasty and subsequent spinal radiosurgery.

**METHODS:** Twenty-six patients (six men and 20 women, mean age 72 years) with pathological compression fractures (16 thoracic and 10 lumbar) were prospectively evaluated. Histological diagnoses included 11 lung, nine breast, four renal, one cholangiocarcinoma, and one ocular melanoma. Seven lesions had received prior external-beam radiation therapy. All patients underwent kyphoplasty that involved the percutaneous transpedicular technique. Fiducial markers allowing for image guidance during CyberKnife treatment were placed, at time of the kyphoplasty, in the pedicles at adjacent levels. Patients underwent single-fraction radiosurgery (mean time after kyphoplasty 12 days) in an outpatient setting. The tumor dose was maintained at 16 to 20 Gy (mean 18 Gy) to the 80% isodose line. The treated tumor volume ranged from 12.7 to 37.1 cm<sup>3</sup>. No acute radiation-induced toxicity or new neurological deficit occurred during the follow-up period (range 11-24 months, median 16 months). Axial pain improved in 24 (92%) of 26 patients.

**CONCLUSIONS:** The combined kyphoplasty and spinal radiosurgery treatment paradigm was found to be clinically effective in patients with pathological fractures; there was no significant spinal canal compromise. In this technique two minimally invasive surgical procedures are combined to avoid the morbidity associated with open surgery while providing both immediate fracture fixation and administering a single-fraction tumoricidal radiation dose.

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