Clinical outcome of sacral chordoma patients treated with pencil beam scanning proton therapy

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Motivation
Chordomas in general are locally aggressive, radio-resistant tumors. Different studies showed the potential of Proton therapy to deliver high radiation doses, which improves the therapeutic ratio when compared to conventional radiation therapy with low toxicity induction. We assessed tumor control and radiation-induced toxicity in a cohort of sacral chordoma patients treated with definitive or postoperative pencil beam scanning (PBS) proton therapy (PT).

Material and Methods
Sixty patients with histologically proven sacral chordoma treated between November 1997 and October 2009 at PSI either by postoperative (n=50) or definitive PT (n=10) were retrospectively analyzed. The log-rank test was used to compare different functions for local control (LC), freedom from distant recurrence (FFDR) and overall survival (OS). Acute and late toxicity was assessed according to the Common Terminology Criteria for Adverse Events v4.03.

Results and Conclusion
Median follow-up was 48 months (range, 4-186 years). Local recurrence occurred in 20 patients (33%). At 4 years, LC, FFDR, and OS rates were 77%, 89%, and 85%, respectively. In univariate analysis, subtotal resection (P=0.02), tumor invasion of soft tissue (P=0.016), and gross tumor volume > 130 ml (P=0.04) were significant predictors of local recurrence. Four (7%) patients experienced acute Grade 3 toxicity. Five percent of patients suffer from late Grade 3 toxicity. Two patients developed secondary malignancies in the bladder, both partially treated with photons.

This series of 60 patients treated for sacral chordoma show that PBSPT is both safe and effective. Subtotal resection, tumors with soft tissue and bone involvement, and gross tumor volume are prognostic factors in this cohort.