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Abstract

SBRT for Benign Primary Spine Tumors: Is Dose De-Escalation Appropriate?

Ronny Kalash [1] , Dwight Heron [2] , Scott Glaser [3] , John C. Flickinger [4] , Steven A. Burton [5]

1. Department of Radiation Oncology, University of Pittsburgh Cancer Institute, UPMC 2. Radiation Oncology, University of Pittsburgh School of Medicine and Upmc Hillman Cancer Center, Pittsburgh, USA 3. UPCI, UPMC CancerCenter 4. Department of Radiation Oncology, University of Pittsburgh Medical Center 5. Department of Radiation Oncology, UPMC Hillman Cancer Center

Corresponding author: Ronny Kalash, kalashr2@upmc.edu

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Objectives: Akin to the non-operative management of benign intracranial tumors, SBRT has emerged as a non-operative treatment option for non-infiltrative primary spine tumors such as meningioma and schwannoma. The majority of initial series used higher dose of 16-24Gy in 1-3 fractions. Similar to dose de-escalation used for intracranial radiosurgery in acoustic neuroma or meningioma, we hypothesize that lower doses such as 12-13Gy in 1 fraction may provide similar efficacy and lower risk of toxicity.

Methods: We identified 38 patients with 47 lesions treated with definitive SBRT for benign primary spine tumors from 2004-2016 as a part of our prospectively maintained institutional radiosurgery database. SBRT consisted of 9-21Gy in 1-3 fractions using either the Cyberknife (n=11), Synergy (n=21), or TrueBeam (n=15) platforms. For comparison of SBRT dose, patients were dichotomized into 2 groups, "low" versus "high", using a cutoff of BED10Gy of 30Gy. Tumor control was calculated from date of SBRT to last follow-up using Kaplan-Meier analysis. Group comparisons were completed using a log-rank method. To account for potential indication bias, a propensity score analysis was completed based on the conditional probabilities of SBRT dose selection. Toxicity was graded per CTCAE version 4.0.

Results: Of the included 38 patients, the most common histologies were: meningioma (n=15), schwannoma (n=13), and hemangioblastoma (n=7). The median age at SBRT was 58 years (range: 25-91). The 47 treated lesions were located in the cervical (n=18), thoracic (n=19), and lumbosacral (n=10) spine. Five lesions (11%) were lost to follow-up after SBRT. The median follow-up for remaining 42 lesions was 54 months (range: 1.2-133 months). Six patients (15%) had a pain flare following SBRT, no significant predictors of pain flare were identified. No grade 3+ acute or late complication were noted; 1 patient who suffered local recurrence requiring salvage SRS and surgery had grade 1 myelitis manifested as imbalance and impaired proprioception. The 5-year local control was 76% (95%CI 61-91%). There was no significant difference in local control by dose (low versus high), fractionation (single versus multi), prior radiation, prior surgery, tumor histology, age, treatment platform, PTV volume, or spine level treated. No significant difference in baseline patient or tumor characteristics were identified between high and low dose groups other than increased use of the CyberKnife® platform in the high dose group. The 5-year local control for low versus high dose was 73% (95CI 53-93%)

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versus 83% (95% 61-100%), p=0.52. On propensity score adjusted multivariable analysis no difference in local control was identified (HR=0.30, 95%CI 0.02-5.40, p=0.41).

Conclusions: Long-term follow-up of patients treated with SBRT for benign spine lesions demonstrates no significant difference in local control, pain flare rate, or long term toxicity with low (BED10Gy <30) versus high dose stereotactic body radiation therapy.