**INTRODUCTION**

Metastases to the spinal column are a relatively common manifestation of cancer accounting for approximately 70% of bone-related metastases and can lead to significant morbidity and mortality. Spinal column disease presentation can cause severe pain, lead to fracture and drastically reduce patients' quality of life and functional ability.

Studies have shown stereotactic body radiotherapy (SBRT) shows high levels of local control and toxicity and pain relief. A fracture risk relief from the treatment.

**MOTIVATION / PURPOSE**

Current studies of spine SBRT suffer from low statistics, lack of quantitative dosimetric data and no patient reported outcomes. This study includes a relatively large patient cohort, detailed dosimetric data and patient-reported pain relief from the treatment.

The purpose of this investigation aimed to evaluate and understand any dosimetric factors associated with local control, toxicity and pain relief. A fracture risk parametrization was formulated based on the data.

**METHODS**

A single institution, retrospective analysis of 124 spine metastases from 89 patients treated with SBRT between 2010 and 2017 were identified. Patient characteristics, follow-up data and current treatment parameters - including target and spinal cord dosimetric data - were collected. Treatment related outcomes including freedom from fracture rate, myelitis, and freedom from local recurrence were assessed radiographically.

Fracture risk and patient-reported pain relief were fit using multivariate linear regression analysis. The dependent variables were similar to previous studies. In addition, presence of epidural extension, target maximum dose, number of vertebral levels treated and circular involvement (angular extent around spinal cord) were included.

Statistical significance was defined by a p-value < 0.05.

The dose-response of fracture risk was obtained by dividing the dose data into five bins with equal entries, averaging fracture risk in these dose bins and fitting a logit function.

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A previously published model of SBRT myelitis probability using dose-volume histogram (DVH) data was also used to assess an individuals theoretical risk versus realized myelitis.

**RESULTS**

Patient characteristics are shown in Table 1: 17 out of the 124 patients had prior treatment and 74% had pain at presentation with an average pain level of 3 (range 1-10) on a scale of 1 to 10. Eighty three patients had pain relief after treatment with an average reduction of pain by 2.4 ± 3.1. There were 71 patients treated with a single fraction, 20 treated with 3 fractions and 32 treated with 5 fractions.

**CONCLUSIONS / FUTURE WORK**

SBRT treatment for spine metastases was associated with acceptable toxicity profile and vertebral compression fracture while achieving high local control. Greater BED and maximum point target dose were associated with patient-reported pain relief and fracture. The extracted dose-dependent fracture risk shows agreement with other studies present in the literature. The data set will be used to test existing and further develop models to ensure safe SBRT practice.

Applying previously reported knowledge-based planning methods (Ziemer, AAPM2018) to this data set could reduce multiple dosimetric variables yielding lower fracture risk and rates of treatment related toxicity by reducing both the target maximum dose and the dose to the spinal cord. This is being studied currently with hopes to report this at a later date.

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**REFERENCES**


