

## Repeat Stereotactic Radiosurgery for Recurrent Spinal Metastases Following Initial Spinal Radiosurgery

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## Abstract

**Objectives:** Stereotactic radiosurgery (SRS) is well established for the treatment of de novo spine metastases, and has been shown to be safe and effective in the re-irradiation of spinal metastases previously treated with conventional external beam radiation therapy (cEBRT). However, its role in the setting of prior SRS is less well known. We analyzed the outcomes of patients treated with repeat SRS for spinal metastases recurrent following initial spinal SRS.

**Methods:** We performed an IRB-approved, retrospective review of 40 recurrent spinal metastases in 36 patients who were treated with repeat SRS from 2005 to 2014. The EQD2 (biologically equivalent dose in 2 Gy fractions) was calculated using the linear quadratic model with  $\alpha/\beta = 10$  for tumor and  $\alpha/\beta = 2$  for spinal cord. Local failure was defined as imaging progression at the treated site. Cumulative incidence analyses were performed in R with death as a competing risk.

**Results:** The median time interval from initial SRS to repeat SRS was 15.7 months (range, 3-44), with median follow up after repeat SRS of 17 months (IQR, 4-32) and median OS after repeat SRS of 14 months. Three patients (8%) also had cEBRT (median 37.5 Gy in 15 fractions) prior to the initial SRS, and 2 patients (5%) had 3 total courses of spinal SRS to the same site. The most common repeat SRS prescription doses were a median of 18 Gy (range, 16-22) in 1 fraction (n=16, 40%) and 24 Gy (range, 18-30) in 3 fractions (n=16, 40%). The median EQD2 for repeat SRS and initial SRS were 42.4 Gy10 (range, 24-50) and 42.0 Gy10 (range, 24-59), respectively. The median values for spinal cord Dmax (EQD2) were 47.5 Gy2 (IQR, 42-49) for course 1, 45.4 Gy2 (IQR, 36-50) for course 2, for a total cumulative Dmax of 86.9 Gy2 (range, 73-105). The 1- and 2-year cumulative incidences of local failure after repeat SRS were 10% (95% CI 5-15%) and 20% (95% CI 6-34%), respectively. Of the 9 local failures, 5 (56%) were in field and 4 (44%) were in the epidural space. The crude incidence of vertebral compression fracture (VCF) was 7%. Other acute and late toxicities were infrequent (17%, all grade 1-3), with no cases of radiation myelopathy.

**Conclusions:** For local tumor failure following spinal SRS, we found that repeat spinal SRS to

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#### Abstract

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the same site results in a cumulative incidence of local control of 90% and 80% at 1- and 2-years, respectively. Although a cumulative spinal cord EQD2 Dmax of 86 Gy2 was safe in our series, and higher than previous reports, the true partial volume re-irradiation tolerance remain unknown.