

Local Disease Control for Spinal Metastases Following "Separation Surgery" and Adjuvant Hypofractionated or High-Dose Single-Fraction Stereotactic Radiation Therapy: Outcomes Analysis in 186 patients

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Introduction

Decompression surgery followed by radiation is an effective therapy for preservation or recovery of neurologic function and achieving durable local disease control in patients suffering from metastatic epidural spinal cord compression. The authors examine the outcomes of postoperative image-guided intensity-modulated radiation therapy (IG-IMRT) delivered as single-fraction or hypofractionated stereotactic radiosurgery (SRS) for achieving local tumor control.

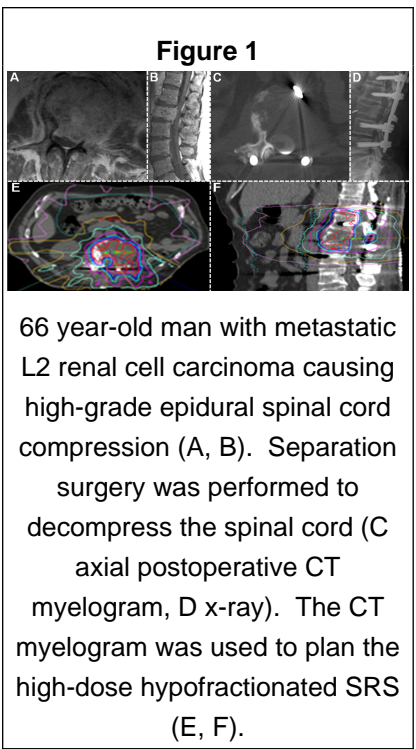


Figure 1
66 year-old man with metastatic L2 renal cell carcinoma causing high-grade epidural spinal cord compression (A, B). Separation surgery was performed to decompress the spinal cord (C axial postoperative CT myelogram, D x-ray). The CT myelogram was used to plan the high-dose hypofractionated SRS (E, F).

Methods

A retrospective chart review identified 186 patients with epidural spinal cord compression from spinal metastases who were treated with surgical decompression, instrumentation, and postoperative radiation (Figure 1) delivered as either single-fraction SRS (24 Gy) in 40 patients (22%), high-dose hypofractionated SRS (24-30 Gy in 3 fractions) in 37 patients (20%), or low-dose hypofractionated SRS (18-36 Gy in 5 or 6 fractions) in 109 patients (58%). The relationships between postoperative adjuvant SRS dosing and fractionation, patient characteristics, tumor histology-specific radiosensitivity, grade of epidural spinal cord compression, extent of surgical decompression, response to preoperative radiotherapy, and local tumor control were evaluated by competing risks analysis.

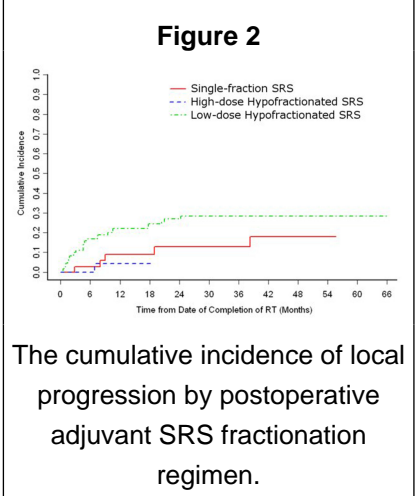
Table 1 - Tumor Histology

	Total	Local Progression	
		Yes	No
<i>Radiation Sensitive</i>	<i>n</i>	<i>n (%)</i>	<i>n (%)</i>
Breast	42	9 (21.4)	26 (61.9)
Prostate	11	1 (9.1)	9 (81.8)
Other	24	7 (29.2)	12 (50.0)
<i>Radiation Resistant</i>	<i>n</i>	<i>n (%)</i>	<i>n (%)</i>
Colorectal	7	1 (16.7)	5 (83.3)
Hepatocellular	144	25 (17.4)	103 (71.5)
Lung, non-small cell	15	1 (6.7)	10 (66.7)
Melanoma	6	1 (16.7)	4 (66.7)
Renal cell	15	3 (20.0)	10 (66.7)
Sarcoma	9	0 (0)	9 (100)
Squamous cell	41	8 (19.5)	31 (75.6)
Thyroid	33	7 (21.2)	25 (75.8)
Other	5	1 (33.3)	2 (66.7)
	3	2 (40.0)	3 (60.0)
	17	2 (11.8)	11 (64.7)

Table 2 - Local Progression and Survival

Patient Characteristics	Total	Local Progression	
		Yes	No
<i>n</i>	<i>n</i>	<i>n (%)</i>	<i>n (%)</i>
Total Patients	186	34 (18.3)	131 (70.4)
Median FU (mo, range)	7.6 (1.0-66.4)	4.8 (1.0-32.3)	6.8 (1.0-66.4)
Alive at last FU	54	5 (9.3)	49 (90.7)

FU, follow-up.



Results

The total cumulative incidence of local progression was 16.4% one year after SRS. Multivariate Gray's competing risks analysis revealed a significant improvement in local control with high-dose hypofractionated SRS (4.1% cumulative incidence of local progression at 1 year; hazard ratio = 0.12, p = 0.04) as compared to low-dose hypofractionated SRS (22.6% local progression at 1 year; HR = 1, Figure 2). Although univariate analysis demonstrated a trend towards greater risk of local progression for patients that failed preoperative cEBRT (22.2% local progression at 1 year, HR = 1.96, p = 0.07) compared to patients who did not receive any preoperative radiotherapy (11.2% local progression at 1 year, HR = 1), this association was not confirmed with multivariate analysis. No other variable significantly correlated with progression-free survival, including radiation sensitivity of tumor histology, grade of epidural spinal cord compression, extent of surgical decompression, or gender.

Conclusions

Postoperative adjuvant SRS following epidural spinal cord decompression and instrumentation is a safe and effective strategy for establishing durable local tumor control regardless of tumor histology-specific radiosensitivity. Patients who received high-dose hypofractionated SRS demonstrated one-year local progression rates less than 5% (95% CI: 0-12.2%), which were superior to the results of low-dose hypofractionated SRS. The local progression rate after single-fraction SRS was less than 10% (95% CI: 0-19.0%).

Learning Objectives

To evaluate the local disease control for spinal metastases following separation surgery and adjuvant hypofractionated or high-dose single-fraction radiation therapy.