

# Single Fraction and Fractionated Radiosurgery compared to Conventional Radiotherapy for Management of Spinal Metastases: A Systematic Review and Meta-Analysis of Clinical Outcomes

Raj Singh<sup>1</sup>, Eric J. Lehrer<sup>2</sup>, Basem A. Dahshan<sup>3,4</sup>, Shiyu Song<sup>1,1</sup>, Joshua D. Palmer<sup>5</sup>, Nicholas G. Zaorsky<sup>6</sup>, Daniel M. Trifiletti<sup>7</sup>

1. Department of Radiation Oncology, Virginia Commonwealth University, Richmond, USA 2. Department of Radiation Oncology, Ichan School of Medicine at Mount Sinai, New York, USA 3. Department of Radiation Oncology, Marshall University, Joan C. Edwards School of Medicine 4. Department of Radiation Oncology, West Virginia University School of Medicine 5. Radiation Oncology, The James Cancer Hospital at the Ohio State University, Columbus, USA 6. Department of Radiation Oncology, Penn State University, Hershey, USA 7. Department of Radiation Oncology, Mayo Clinic Florida, Jacksonville, USA

**Corresponding author:** Raj Singh, rsingh1492@gmail.com

**Categories:** Radiation Oncology

**Keywords:** stereotactic radiosurgery, conventional radiotherapy, spinal metastases

## How to cite this abstract

Singh R, Lehrer E J, Dahshan B A, et al. (April 02, 2020) Single Fraction and Fractionated Radiosurgery compared to Conventional Radiotherapy for Management of Spinal Metastases: A Systematic Review and Meta-Analysis of Clinical Outcomes . Cureus 12(4): a484

## Abstract

**Objectives:** Prospective randomized trials comparing different radiotherapy approaches to guide clinical practice for spinal metastases are lacking. As such, we aimed to perform a systematic review and meta-analysis for patients with spinal metastases treated with stereotactic radiosurgery (SRS) (either single fraction (SF-SRS) or multiple fraction (MF-SRS)) or conventional radiotherapy (RT) and compare outcomes with different fractionation schedules.

**Methods:** Thirty-four studies were identified via a PICOS/PRISMA/MOOSE selection protocol including patients with spinal metastases treated with SF-SRS, MF-SRS, or RT with information on dose and fractionation. The primary outcomes were 1-year local control (LC) and acute and late Grade 3-5 toxicities (including vertebral compression fracture (VCF) rates) per the Common Terminology Criteria for Adverse Events (CTCAE) or Radiation Therapy Oncology Group (RTOG), and a secondary outcome of 1-year overall survival (OS). Weighted random effects meta-analyses were conducted using the DerSimonian and Laird methods to characterize summary effect sizes for the primary and secondary outcome measures.

**Results:** A total of 3,237 patients with 4,911 lesions were analyzed; 2,152 lesions (43.8%) received SF-SRS, 969 lesions (19.7%) received MF-SRS, and 1,790 lesions (36.5%) received RT. Patients treated with SF-SRS had significantly higher 1-year LC (92.9% (95% CI: 86.4-97.4%);  $p=0.007$ ) as compared to RT (81.0% (95% CI: 69.2-90.5%)) with no difference between MF-SRS (82.1% (95% CI: 76.9-86.8%);  $p=0.86$ ) or RT. On subgroup analysis of de novo metastases, superior 1-year LC following SF-SRS (95.5% (95% CI: 87.4-99.6%)) was maintained compared to RT (83.6% (95% CI: 70.4-93.5%);  $p=0.007$ ), though again with no difference noted between MF-SRS (82.7% (95% CI: 68.3-93.4%);  $p=0.88$ ) and RT. On examination of dose-response for SRS, a

## Open Access

### Abstract

Published 04/02/2020

## Copyright

© Copyright 2020

Singh et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Distributed under

Creative Commons CC-BY 4.0

4.7% increase in LC was noted for each 10 Gy increase in BED10 ( $p < 0.001$ ). There was no difference in toxicity rates between SF-SRS (0.4%), MF-SRS (0.2%), or RT (0%). No significant dose-response was identified with regards to VCF rates. One-year OS estimates were 57.2%, 67%, and 32.3% for SF-SRS, MF-SRS, and RT, respectively.

Conclusions: SRS was well-tolerated with minimal severe toxicities. SF-SRS resulted in superior LC for spinal metastases as compared to RT. A significant dose response was found suggesting a roughly 5% increase in LC for every 10 Gy increase in BED10 without a subsequent increase in VCF rates.