Pre-Operative Stereotactic Radiosurgery for Brain Metastases: A Prospective Observational Study

Revdahi C. Chelvarajah 1, Mark B. Pinkham 2, Matthew Foote 1, Mihir Shanker 1, Bruce Hall 3, Sarah Olson 2, Trevor Watkins 1, Anne Bernard 1, Michael Huo 1

1. Radiation Oncology, Princess Alexandra Hospital, Brisbane, AUS 2. Radiation Oncology, University of Queensland, Brisbane, AUS 3. Neurosurgery, Princess Alexandra Hospital, Brisbane, AUS 4. Radiology, Princess Alexandra Hospital, Brisbane, AUS 5. QCIF Facility for Advanced Bioinformatics, Queensland Cyber Infrastructure Foundation Ltd, Brisbane, AUS

Corresponding author: Revadhi C. Chelvarajah, revadhic@gmail.com

Categories: Radiation Oncology, Neurosurgery
Keywords: pre-operative srs, stereotactic radiosurgery, treatment of brain metastases

How to cite this abstract

Abstract

Objectives:

For brain metastases (BM) requiring surgery, pre-operative stereotactic radiosurgery (SRS) may have advantages compared to post-operative cavity SRS. The aim of this study was to prospectively assess outcomes for a cohort of patients receiving pre-operative SRS for BM treated at a single centre.

Methods:

Participants required a confirmed diagnosis of metastatic cancer prior to enrolment and had at least one BM for resection. Pre-operative SRS treatment was agreed to in a multidisciplinary forum and intended to be given no more than 2 days prior to surgery. SRS was delivered in a single fraction on the Leksell Gamma Knife ICON platform, with dose adjusted according to BM volume (<8.2cc received 18-20Gy, 8.2-14.1cc received 16-18Gy, ≥14.1-22.5cc received 14-16Gy and ≥22.5cc received 14Gy). Post-operative T1-weighted gadolinium-enhanced MRI was performed within 48 hours of surgery to assess extent of resection, followed by standard clinical and radiological MRI surveillance imaging every 2-3 months.

Results:

21 participants (a total of 22 BM treated on protocol) were recruited between January 2020 and August 2022. The most common primary histologies were non-small cell lung cancer (36%), melanoma (36%) and breast cancer (9%). The median BM volume prior to surgery was 6.8 cc (range 3-40); 10 BM were ≥10 cc volume and 5 BM were >20 cc. All participants received protocol treatment as planned. The median interval between pre-operative SRS and surgery was 1 day (range 0-15). Post-operative MRI confirmed gross total resection in all cases. The median duration of inpatient stay after surgery was 3 days (range 1-40). 15 patients restarted and/or commenced systemic therapy, with a median interval of 22 days from SRS (range 6-99). One local recurrence occurred, and was within 3 months of initial surgery. No cases of leptomeningeal recurrence, wound complications or radionecrosis were observed. The most common acute toxicities experienced within 3 months of SRS were headaches (9%) and fatigue (14%). Overall survival from date of pre-operative SRS was 67% at 1 year (95% CI: 48–93%) and median follow up was 14.7 months (range 2-29).

Conclusion(s):

SRS delivered before surgery for BM confers a high rate of local control and no apparent increase in the risk of acute wound complications. Compared to post-operative cavity SRS, pre-operative SRS may also help reduce the risk of leptomeningeal disease and radionecrosis, whilst facilitating prompt initiation of systemic therapy after surgery.