Brain Metastases Treated by Stereotactic Radiotherapy: Real-Time Surveillance of Acute and Delayed Toxicities via Enterprise-Wide Standardized Radiation Oncology OIS Platform

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Objectives: Explore feasibility of analyzing clinical, operational, and quality metrics data of patients receiving stereotactic radiotherapy (SRS) for brain metastases using a large standardized and consolidated radiation oncology information system (ROIS) of community-based US radiation oncology centers.

Methods: Within one healthcare system, radiation oncology centers serving communities in urban and rural regions in 11 US states underwent consolidation of the ROIS. All patient and treatment data from these centers are aggregated into a centralized data repository. Enacting a unified "gold standard" build of the ROIS at each clinic, the

consolidated data enables systematized workflows, tumor staging (AJCC and FIGO), toxicity definitions (CTCAE), with toxicities captured on the first day of SRS until last date of follow up, physics and dosimetry recording, and delivered dose and radiation techniques. Structured data facilitates generation of real-time, on-demand reporting of key performance and outcomes indicators from a commercial analytics platform. For this report, toxicities reviewed were headache, nausea/emesis and seizures, Grade 3 and higher, from first fraction delivered to last clinic visit. Acute events were those occurring within 30 days of completing SRS.

Results: Investigation of the ROIS for patients with brain metastases receiving stereotactic radiotherapy treatment (January 2015-January 2024) yielded helpful insights, including: a total of 4,243 individual patients (9.8%) out of 42,938 patients treated overall. The five most common primary tumor sites leading to brain metastases were lung, breast, prostate, colon, and kidney. Additional courses of SRS involved 1098 patients (26%). Number of fractions per SRS course were single 1670 (39.3%), three 1023 (24.1%), five 2715 (63.9%), and 2 or 4, 410 (9.6%) with some patients receiving multiple fractionation approaches in a single course. There were 24,837 individual toxicity assessments comprised of acute 10,183 (41.1%) and delayed 14,654 (59.9%) type. There were 1098 (26%) patients receiving more than one SRS course.

Conclusion(s): It is feasible to utilize a standardized ROIS platform for a community-based radiotherapy network to analyze clinical, quality and operational metrics in real-time via a centralized database. The ROIS allows exploration of clinical questions expeditiously for insights into outcomes in patients with brain metastases treated with stereotactic radiotherapy. Toxicity assessments can be

used to predict when to anticipate symptoms and to potentially mitigate G3 or higher issues following SRS for brain metastases.