

BACKGROUND

- The predominant modality of stereotactic radiosurgery (SRS) delivery for brain metastases is via Gamma Knife SRS (GKRS) or linear accelerator (LINAC)
- GKRS is typically administered in a single fraction in the outpatient setting, while LINAC administered in one to five fractions in either the inpatient or outpatient setting (*Andrews et al., Surgical Neurology, 2006*).
- Predictors of SRS modality use have been sparsely examined on a nationwide level.
- Such information increases in importance as SRS treatment modality becomes more diverse (*Park et al., Journal of Neurosurgery 2016*).
- We sought to address this void via a national analysis. fractionated radiation therapy in the management of meningioma. This study was performed to address this void.

MATERIALS AND METHODS

- An observational cohort study was performed on patients receiving SRS for brain metastases from non-small cell lung cancer (NSCLC) from 2010 to 2016 at Commission on Cancer-accredited hospitals in the United States (US).
- This study was performed using the National Cancer Database (NCDB), which provides data on radiation dosage, technique, and target, and contains de-identified data on 70% of newly diagnosed cancers in the US.
- The multivariate logistic regression model adjusted for patient age, dose, geographic location of treatment, facility type, and distance from treatment facility. Significance was defined as a two-sided P value < 0.05.

RESULTS

- A total of 2,684 patients received GKRS, while 1,643 patients received LINAC SRS.
- Univariate analysis revealed that age 55+, income, total dose, facility type, geographic region, and distance from treatment facility were associated with SRS modality receipt, while gender, race, insurance status, or Charlson-Deyo comorbidity score were not.
- Multivariate analysis revealed that treatment at non-academic facilities was associated with increased LINAC SRS receipt, most prominently in the Midwestern (OR= 6.23; p< 0.001), Northeastern (OR= 4.42; p< 0.001), and Southern US (OR= 1.96;p< 0.001).
- Administered doses of 18-19 Gy (OR= 1.42;p= 0.025), 20-21 Gy (OR= 1.82;p< 0.001), and 22-24 Gy (OR= 3.11;p< 0.001) were associated with increased LINAC SRS receipt,
- Finally, patients located within 20 miles of a radiation treatment facility were significantly more likely to receive LINAC SRS (OR= 1.27;p= 0.007).

Table 1: Multivariate logistic model for factors associated with treating NSCLC brain metastases with LINAC versus Gamma Knife SRS from 2010-2016

Term	levels	Odds	LL	UL	p-value (level)
Facility Type Stratified by Region†					< 0.001*
	Academic (ref)				
Northeast	Non-Academic	4.42	3.16	6.22	< 0.001
Midwest	Non-Academic	6.23	4.4	8.93	< 0.001
South	Non-Academic	1.96	1.42	2.7	< 0.001
West	Non-Academic	1.00	0.52	1.92	0.990
Dose levels (Gy)					< 0.001*
	12-17 Gy (ref)				
	18-19 Gy	1.42	1.05	1.94	0.025
	20-21 Gy	1.82	1.37	2.43	< 0.001
	22-24 Gy	3.11	2.33	4.19	< 0.001
Distance from treatment facility ‡					
	≥ 20 miles (ref)				
	< 20 miles	1.27	1.07	1.51	0.007
† Stratified due to the significant interaction effect between Facility Type and Facility Region					
‡ 'missing' omitted from analysis					
* reporting variable overall p-value					

CONCLUSIONS

- Despite Gamma Knife being more prominently used over LINAC for SRS, patients treated at non-academic facilities outside of the Western US were substantially more likely to receive LINAC over Gamma Knife.
- Patients located in the Midwest were 523% more likely, Northeast 342% more likely, and South 96% more likely to receive LINAC when treated at a non-academic facility.
- Increasing dose independently predicted LINAC over GKRS, indicating that smaller tumors – particularly those less than two centimeters (consistent with RTOG 90-05 recommendations) – are being treated with LINAC.
- Finally, patients residing in close proximity to a treatment center were 27% more likely to receive LINAC, likely indicative of the increased geographic accessibility of LINAC compared with GKRS.
- These findings should result in hypothesis-generating questions to further explore predictors of LINAC versus GKRS.

DISCLOSURES

McClelland – nothing to disclose
Degnin – nothing to disclose
Chen – nothing to disclose
Watson – nothing to disclose
Jaboin – nothing to disclose

Corresponding Author:
Shearwood McClelland III, M.D.
 (drwood@post.harvard.edu)