Stereotactic Radiosurgery for Brain Metastases Secondary to Peripheral Neural Crest Tumors: A Single Institution Retrospective Experience

Ahed H. Kattaa, MD[1], Amit R. Persad, MD[1], David J. Park, MD, PhD[1], Yusuke S. Hori MD[1], Sara C Emrich, NP[1], Louisa Ustrzynski, DNP MBA[1], Armine Tayag, NP[1], Xuejun Gu, PhD[2], Elham Rahimy MD[2], Erqi Pollom, MD[2], Scott G Soltys, MD[2], Steven D. Chang, MD, MBA[1]

Department of [1]Neurosurgery and [2]Radiation Oncology, Stanford University School of Medicine, Stanford, CA, United States

INTRODUCTION

- **Intracranial brain metastases of peripheral neural crest tumors (PNCTs)** are rare, and portent a poor prognosis.
- Surgery and conventional radiation have been traditionally used.
- There are few prior studies examining treatment of brain metastases from PNCTs, and no standard treatment has been established to date.
- Especially only a few case reports describe **the usage of stereotactic radiosurgery (SRS)** in brain metastases associated with PNCTs.

OBJECTIVES

- This study aims to evaluate **the efficacy of SRS** as a therapeutic modality for the treatment of brain metastases secondary to PNCTs.
- Additionally, **a comparison between SRS** and **other treatment modalities** has been conducted.

METHODS

- We retrospectively reviewed all patients diagnosed with brain metastases from PNCTs between 2001 and 2024 at our institution. We collected demographic, clinicopathologic, and treatment information for the cases. Our outcomes of interest were months of local tumor control (LTC) and overall survival status (OS).
- Local tumor control was defined as a reduction/ stable in tumor size, with no recurrence or new growth or hemorrhage or other complications as evidenced by radiological assessment.

RESULTS

- Among the 8 patients (15 BM) identified, 3 with 6 BM underwent SRS, and 5 with 9 BM underwent other treatments (radiotherapy, craniotomy, both or none).
- Amongst the patients treated with SRS, the median age was 4.0 years (IQR: 1.8-4.0 years) at diagnosis and 100% were male. The median follow-up was 5.5 months (IQR: 2-7 months).
- Amongst the patients not treated with SRS, the mean age was 2.5 years (Std. deviation: 1.4 years) at diagnosis and 60% were female. The median follow-up was 28 months (IQR: 1- 85 months).

Pt#	Age	Sex	Location	Tumor Volume (cc)	Dmax (GY)	Margin dose (GY)	Isodose Line (%)	BED (GY)	Surgical resection	Prior RT	Prior Chemotherapy	Other treatment	Mutation, Biomarker	Follow-up duration (m)	OS (m)
1	4	M	L Parietooccipital Dura	16.72	37.5	27	72	51.3	N	Y	Y	Immunotherapy and 131-MIBG	MYCN Amplified and ALK Mutated	2	7
			L Frontotemporal Lobe	3.16	29.03	20	69	60	N	Y				4	
			L Post Parietal Lobe	1.08	27.62	20	72	60	N	Y				7	
			L Parietal RC	1.9	27.62	20	72	60	Y	Y				7	
2	1.8	M	L Frontal Lobe	0.05	25.41	20	79	60	N	N	Y	Immunotherapy and Autologous Stem Cell Transplant		53	53
3	1	M	L Temporal Lobe	6.7	23.68	18	76	28.8	N	N	Y	Autologous Stem Cell Transplant and 131-MIBG	MYCN Amplified	2	2

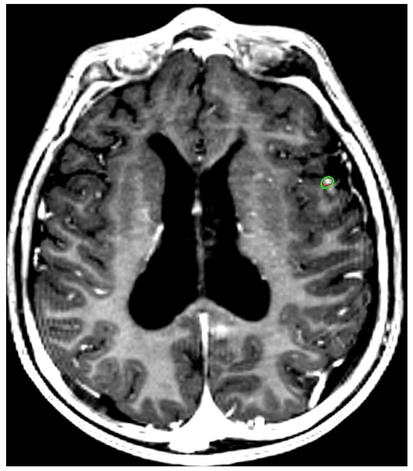
- The group treated with **SRS** had LTC rate of **100%** with no complications and a survival rate of 33.3% at one year follow up.
- LTC rate in the group treated with **other modalities** was **55.6%**, with a survival rate of 60% for a one year follow up.
- There was no significant difference in LTC and survival between groups ($p > 0.05$).

CONCLUSION

- SRS provides a **LTC** rate of **100%** within **one year of follow up** for BM from PNCTs. We do suggest that there is similarity of outcomes between SRS and other treatment modalities. SRS may be an alternative to more invasive treatments such as craniotomy or conventional radiation in these patients.

Table 2. Clinical and radiological outcome

Variable	SRS	Other Tx Modalities
OS (mos)		
Mean	19	23.6
Standard deviation	25.2	36.7
LTC		
3-Mos FU	100%	66.7%
6-Mos FU	100%	55.6%
1-yr FU	100%	55.6%
Survival rate		
3-Mos FU	66.7%	80%
6-Mos FU	66.7%	60%
1-yr FU	33.3%	60%



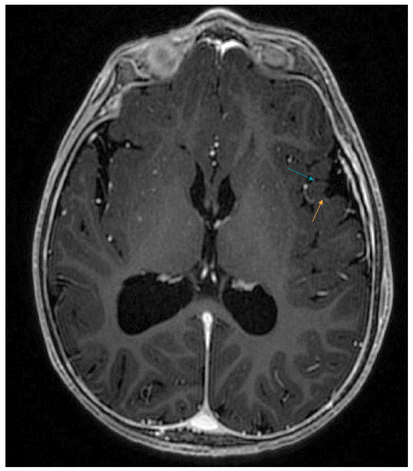


Figure 1. MRI studies of patient #2.
A: CyberKnife radiosurgery plan for the left frontal lesion. The tumor volume was 0.05 cc. A marginal dose of 20 Gy, with the maximum dose of 25.41 Gy, was delivered in a single fraction to 79% isodose line (T1-Weighted with Contrast Enhancement).
B: MRI study of 53-month follow-up demonstrates no residual of the left frontal metastasis where SRS was delivered (AX 3D T1(BRAVO)).