

**Introduction**

Radiation therapy is a known risk factor for leukoencephalopathy and ventriculomegaly in patients with brain metastasis (BM). However, whether repeat stereotactic radiosurgery (SRS) contributes to these complications remains poorly studied. The question is pertinent since the cerebrum is exposed to a variable amount of radiation during each round of SRS.

**Methods**

We performed a retrospective analysis of patients who underwent SRS for BM between 2007 and 2017 at our institution and had >3 months of MRI follow-up. MRIs were assessed for ventriculomegaly based on published morphometric criteria. Statistical analysis was accomplished using Student's t-test, Pearson's chi-squared test, and univariate and multivariate logistic regression.

**Results**

We identified 214 patients who underwent 1,106 SRS for BM. Sixty-three patients (29%) presented with ventriculomegaly prior to SRS. Risk factors for presenting with ventriculomegaly prior to first SRS were female sex (odds ratio (OR) 0.373, 95% CI 0.176 - 0.767,  $p=0.008$ ) and older age (OR 1.096, 95% CI 1.06 - 1.137,  $p<0.001$ ). Of the other 151 patients with normal ventricular size at the time of SRS, 29 patients (19%) developed ventriculomegaly after SRS. Of the 29 patients who developed ventriculomegaly, ten patients (34%) required operative CSF diversion for symptomatic relief. We identified two risk factors that were associated with increased odds of ventriculomegaly: receiving >4 rounds of SRS (OR 4.1, 95% CI 0.8 - 20.6,  $p=0.038$ ) and prior history of whole-brain radiation therapy (WBRT, OR 5.6, 95% CI 2.3 - 13.9,  $p<0.001$ ). The association between >4 rounds of SRS and ventriculomegaly remained robust in patients without prior history of WBRT, which suggests that both forms of radiation contribute to the risk of developing new ventriculomegaly.

**Conclusions**

Our results suggest that prior history of WBRT and >4 rounds of SRS independently contribute to the risk of ventriculomegaly in SRS-treated BM patients.

**Learning Objectives**

1. Know which patients are most likely to have presented with ventriculomegaly prior to SRS
2. Know which patients are at greatest risk of developing new ventriculomegaly after SRS
3. Understand that both the number of rounds of SRS and receipt of any WBRT independently contribute to the risk of developing new ventriculomegaly

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