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1: [J Neurosurg](#). 2008 Dec;109 Suppl:99-105.



**Gamma Knife surgery for the treatment of melanoma metastases: the effect of intratumoral hemorrhage on survival.**

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**OBJECT:** Gamma Knife surgery (GKS) improves overall survival in patients with malignant melanoma metastatic to the brain. In this study the authors investigated which patient- or treatment-specific factors influence survival of patients with melanoma brain metastases; they pay particular interest to pre- and post-GKS hemorrhage. **METHODS:** Demographic, treatment, and survival data on 59 patients with a total of 208 intracranial metastases who underwent GKS between 1998 and 2007 were abstracted from treatment records and from the Connecticut Tumor Registry. Multivariate analysis was used to identify factors that independently affected survival. **RESULTS:** Survival was significantly better in patients with solitary metastasis ( $p = 0.04$ ), lesions without evidence of pre-GKS hemorrhage ( $p = 0.004$ ), and in patients with total tumor volume treated  $< 4 \text{ cm}^3$  ( $p = 0.02$ ). Intratumoral bleeding occurred in 23.7% of patients pre-GKS. Intratumoral bleeding occurred at a mean of 1.8 months post-GKS at a rate of 15.2%. Unlike the marked effect of pretreatment bleeding, posttreatment bleeding did not independently affect survival. Sex, systemic control, race, metastases location, whole-brain radiation therapy, chemotherapy, history of antithrombotic medications, and cranial surgery had no independent association with survival.

**CONCLUSIONS:** These data corroborate previous findings that tumor burden (either as increased number or total volume of lesions) at the time of GKS is associated with diminished patient survival in those with intracerebral melanoma metastases. Patients who were noted to have hemorrhagic melanoma metastases prior to GKS appear to have a worse prognosis following GKS compared with patients with nonhemorrhagic metastases, despite similar rates of bleeding pre- and post-GKS treatment. Gamma Knife surgery itself does not appear to increase the rate of hemorrhage.

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