Gamma Knife radiosurgery has been widely used to treat multiple brain metastases. One controversial issue is that if there should be a limit on number of metastases, beyond which the metastases should not be treated by Gamma knife. Besides economical and biological reasons, one underline argument is that in treating large number of metastases, the dose to normal brain tissue will approach the prescribed tumor dose and therefor does not have dosimetry advantage comparing to whole brain external beam radiotherapy.

To answer this argument, this study systematically investigated the normal brain tissue dose when a large number of brain metastases were treated by Gamma knife. Models with multiple, different size metastases were chosen, and the doses in whole brain were calculated. The volume of significant dose vs. number of metastases, and vs. size of the metastases will be presented. The results have shown that even for large number of and large size metastases, the majority volume of normal tissue dose is still significantly lower than the prescribed dose. While in whole brain external radiotherapy, the brain dose is essentially homogeneous in the treatment region.