

Stereotactic Radiotherapy for Metastatic Brain Tumors — SRS or SRT? —

Takashi Shuto

Yokohama Rosai Hospital, Yokohama, Japan

The efficacy of stereotactic radiotherapy (SRT) for metastatic brain tumors is well known, and various factors must be considered to avoid complications, such as radiation injury. One of the most important factors to consider is tumor volume. While single-session radiosurgery is a good strategy for relatively small tumors, a clear correlation has been demonstrated between target size and risk of adverse events. Therefore, fractionated SRT is recommended for large tumors to reduce the risk of radiation injury. It is thought that eloquent location (motor area, speech center, brain stem), patients expected to have long survival (good control of primary cancer, patients receiving targeting therapy), and retreatment after failed SRS are also good indications for SRT. To reduce the risk of radiation injury, our hospital usually applies 5 or more fractions of radiation. A total of 35 Gy is delivered in 5 fractions for 4-8 cc target volumes (diameter, 2-2.5 cm), and 40-42 Gy in 10 fractions for targets greater than 8 cc. Assuming a tumor α/β ratio of 10, this is equivalent to 50 Gy/25 fractions or 20 Gy/single session. However, the biological equivalent dose is not equal in the surrounding brain area. Assuming the α/β ratio of normal brain (late-responding tissue) is 2, a biological equivalent dose of 20 Gy/single session corresponds to 1.5-times of 40-42 Gy/10 fractions. This suggests SRT reduces the risk of long-term complications, such as radiation necrosis. Using this strategy, we achieved a tumor volume decrease of about 10% at the end of 10 SRT fractions. Moreover, the surrounding brain edema also decreased, and neurological symptoms improved in many cases. The disadvantage of 10 SRT fractions is that it takes about 2 weeks and bleeding or rapid increases in tumor volume can occur during the treatment period. With the development of better targeted molecular therapies, the number of patients with brain metastases surviving more than 5 years has increased. Thus, the importance of SRT is expected to increase in the future.