Fractionated Gamma Knife surgery

Fractionated Gamma Knife surgery (FGKS) has recently been used to treat large brain metastases. However, little is known about specific volume changes of lesions during the course of treatment.

Lee et al., investigated short-term volume changes of metastatic lesions during FGKS.

They analyzed 33 patients with 40 lesions who underwent FGKS for Non small cell lung cancer intracranial metastases (NSCLC; 25 patients with 32 lesions) and breast cancer (8 patients with 8 lesions). FGKS was performed in 3-5 fractions. Baseline MRI was performed before the first fraction. MRI was repeated after 1 or 2 fractions. Adaptive planning was executed based on new images. The median prescription dose was 8 Gy (range 6-10 Gy) with a 50% isodose line.

On follow-up MRI, 18 of 40 lesions (45.0%) showed decreased tumor volumes (TVs). A significant difference was observed between baseline (median 15.8 cm3) and follow-up (median 14.2 cm3) volumes ($p < 0.001$). A conformity index was significantly decreased when it was assumed that adaptive planning was not implemented, from baseline (mean 0.96) to follow-up (mean 0.90, $p < 0.001$). The average reduction rate was 1.5% per day. The median follow-up duration was 29.5 weeks (range 9-94 weeks). During the follow-up period, local recurrence occurred in 5 lesions.

The TV showed changes with a high dose of radiation during the course of FGKS. Volumetric change caused a significant difference in the clinical parameters. It is expected that adaptive planning would be helpful in the case of radiosensitive tumors such as NSCLCs or breast cancer to ensure an adequate dose to the target area and reduce unnecessary exposure of normal tissue to radiation [1].

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Lee MH, Kim KH, Cho KR, Choi JW, Kong DS, Seol HJ, Nam DH, Lee JI. Volumetric changes of intracranial metastases during the course of fractionated stereotactic radiosurgery and significance of adaptive planning. J Neurosurg. 2019 May 31:1-6. doi: 10.3171/2019.3.JNS183130. [Epub ahead of print] PubMed PMID: 31151111.