

Assessment of optimal interval of follow up MR examination for metastatic brain tumor after stereotactic radiosurgery

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Introduction:

The control of metastatic brain tumor is the main prognostic factor for patients who have advanced cancer. Before the introduction of stereotactic radiotherapy, most of the patients were died within six months. Accuknife (Direx, Japan) is one of the new stereotactic radiotherapy systems using LINAC with micro multi-leaf collimator, and speculated an effective and safe treatment method. Many patients are alive over six months without hospitalization. Therefore, in view of safety and assessment of the treatment, optimal protocol of follow-up MR examinations is important. The purpose of our study was to determine optimal interval of follow-up MR examinations for metastatic brain tumor after Accuknife.

Method and materials:

From June 2001 to April 2004, 99 patients with 339 brain metastases were treated by stereotactic radiotherapy systems using LINAC with micro multi-leaf collimator (Accuknife). Among these patients, 25 patients, who underwent monthly MR imaging over 6 months were included (men: 10, women: 15, age range: 52-83, mean age: 64). Primary tumor sites of these patients were lung: n=15, breast: 7, colon: n=2, and uterine: n=1, respectively. Number of Irradiated sites was one sites: n=15, two sites: n=6, three sites: n=2, four sites: n=1, respectively. Average dose of Accuknife was 272 Gy (ranged from 24 Gy to 36 Gy). We evaluated each one tumor for each patient, or total of 25 tumors. MR imaging protocol was as follows: 1) transverse T1-weighted spin-echo imaging; TR/TE 500/8, slice thickness/ gap: 5 mm/ 2 mm, matrix: 256x256, FOV: 22 cm, 2) transverse T2-weighted fast-recovery fast spin-echo imaging; TR/TE: 2500/ 38, echo train length: 12, other protocol was same as that of T1-weighted imaging. 3) Diffusion-weighted echo planer imaging; TR/TE: 8000/79.3, b factor: 1000, matrix: 256*128, FOV: 44 cm, other protocol was same as that of T1-weighted imaging. 4) Gadolinium enhanced transverse Fast SPGR imaging; TR/TE: 19/2, slice thickness/ gap: 3.4 mm/ 0.6 mm, matrix: 256x192, other protocol was same as that of T1-weighted imaging. 5) Gadolinium enhanced coronal T1-weighted spin-echo imaging; TR/TE 600/8, slice thickness/ gap: 5 mm/ 2 mm, matrix: 256x256, FOV: 22 cm, other protocol was same as that of T1-weighted imaging. With these images, we evaluated interval changes of each tumor.

Results:

In two patients, hemorrhage into the tumor was observed within one months after Accuknife. These bleedings did not extend beyond the tumor, and tumor size was not changed. In 9 patients no enhanced components of the tumor, which suggested complete response after the therapy (CR), were observed from 2 weeks to 2 months after Accuknife, and of these patients with CR, local recurrence was observed in one patient at 9 months after treatment. In 7 patients, tumor growth was observed in 6 months. However, growth speed of these tumors was slow and mass effects were minimally observed. In the other 9 patients, size and signal of the tumor was not changed in 6 months.

Conclusion

Changes of the tumor after Accuknife were mild. Thus, MR imaging may be performed 1, 3, 6 months after Accuknife for evaluation of tumor, in order to evaluate and monitor the tumor size and response after the therapy.