Image-guided positioning in intracranial non-invasive stereotactic radiosurgery for the treatment of brain metastasis

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ABSTRACT

Aims and background. The aim of the study was to examine the feasibility of non-invasive image-guided radiosurgery to improve patient comfort and quality of life in stereotactic radiosurgery planning and treatment of patients with brain metastasis. Precise immobilization is a rule of thumb for stereotactic radiosurgery. Non-invasive immobilization techniques have the potential of improved quality of life compared with invasive procedures.

Methods and study design. A total of 92 lesions from 42 patients with brain metastasis were included in the study. After immobilization with a thermoplastic mask and a bite-block unlike the invasive frame-based procedure, planning computed tomography images were acquired and fused with magnetic resonance images. After contouring, intensity-modulated stereotactic radiosurgery (IM-SRS) planning was done, and the patients were re-immobilized on the treatment couch for the therapy procedures. While patients were on the treatment couch, kilovoltage-cone beam computed tomography images were acquired to determine setup errors and achieve on-line correction and then repeated after on-line correction to confirm precise tumor localization. The patients then underwent single-fraction definitive treatment.

Results. For the 92 lesions treated, mean ± SD values of translational setup corrections in X (lateral), Y (longitudinal), and Z (vertical) dimensions were 0.7 ± 0.7 mm, 0.8 ± 0.7 mm, and 0.6 ± 0.5 mm, and rotational set-up corrections were 0.5 ± 1.1°, 0.06 ± 1.1°, and -0.1 ± 1.1° in X (pitch), Y (roll), and Z (yaw), respectively. The mean three-dimensional correction vector was 1.2 ± 1.1 mm.

Conclusions. Non-invasive image-guided radiosurgery for brain metastasis is feasible, and the non-invasive treatment approach can be routinely used in clinical practice to improve patientís quality of life.

Key words: brain metastasis, stereotactic radiosurgery.

The authors declare that there is no conflict of interest.

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