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Abstract

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Kaile Li ¹

1. Radiation Oncology, John R Marsh Cancer Center, Martinsburg, USA

Corresponding author: Kaile Li, goolkl@gmail.com

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Abstract

Objectives:

Single isocenter approach for multiple-metastatic lesion brain tumor have attained high level usage for its efficiency factor, and the assumption was based on the brain rigidity. However, there is potential of location variation with single isocenter or multiple isocenter method to locate the target during multi-met brain SBRT/SRS. A method was developed to evaluate the quantitative geometric discrepancy of multi-isocenter localization based on a in vivo imaging with Electronic Portal Imaging Device (EPID) in LINAC SRS system.

Methods:

Multiple metastatic targets in a patient were treated with three isocenters methods in 3 fraction-course. And these lesions were located at left frontal, right parieto-occipital and cerebellar region. The three isocenters from the treatment planning system were selected as a reference, then the in vivo record of the 3 isocenter treatment plan were delivered and their exit dose was recorded by the EPID system. The match of individual isocenter images were compared with alignment method to compute the displacement of the transverse directions in different isocenter treatments without considering the rotation in the projecting 2-dimensional plane. After correction of EPID mechanical perturbation, these average displacements between images in different fractions were used to compute and evaluate the variation at different isocenters delivery.

Results:

In this study, given the distances between cerebellum and left frontal target, cerebellum and right parieto-occipital target, and left frontal and right parieto-occipital target at 9.09cm, 6.55cm and 5.34cm, the corresponding distances in the projected EPID image coordinate system were 0.26cm, 0.31cm and 0.06cm. And the ratios between these treatment plan isocenter distance and corresponding average exit fluence displacements were at 2.9%, 4.7% and 1.1%.

Conclusion(s):

An in vivo imaging method displayed the potential displacements of dose delivery fluence variation for multi-metastatic lesion SRS. With improvement in coordinate system transfer algorithm, this information could provide adaptively approach for multiple fraction treatment course and variable for clinical outcome evaluation.