

38- Comparison of patient setup error effect on target evaluation parameters in 3D-CRT, IMRT and VMAT for glioblastoma

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Abstract

Purpose: Radiotherapy is one of the bases for glioblastoma (GBM) standard treatment. Three-dimensional conformal radiotherapy (3DCRT) is most common technique to treat GBM, but Intensity-modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT) are becoming widely used. This study compares patient setup error effect on target dose evaluation parameters [target mean dose, homogeneity index (HI), conformity index (CI) and conformity number (CN)] for different techniques.

Patients and methods: 9 GBM patients with target prescribed dose 60 Gy are selected. The accepted plans by different techniques were recalculated after applying a simulation setup error by shifting the isocenter 3mm, 5mm, 7mm. Recalculation and analysis of target evaluation parameters of all accepted plans (27 origin plans) and new simulation setup error plans (81 plans) to compare the effect of patient setup error.

Results: Measurements of the setup error effect for shifting isocenter till 7mm between 3DCRT, IMRT and VMAT show that the planning target volume (PTV) mean dose has a percentage error (0.5%, 2.1%, and 1.9%), for HI (1.9%, 22.2%, and 16.5%), for CI (2.6%, 11%, and 15.3%), while for CN (3.7%, 41.6%, and 39%) respectively.

Conclusions: For GBM patients the setup error effect on delivered dose appeared clearly in HI, CI and CN which more sensitive to patient setup error that appears in VMAT and IMRT technique while effect decreases with 3DCRT technique. So IMRT and VMAT are more complex techniques than 3DCRT which need more accurate verification for target position by using advanced imaging techniques to avoid any setup errors.

Key words: Setup errors, HI, CI, CN, 3DCRT, IMRT, VMAT, GBM