

Evaluation of Setup Errors in Three-dimensional Conformal Radiotherapy (3D-CRT) for Pelvic Sites by Using Electronic Portal Imaging Device (EPID)

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The setup error is defined as any deviation between the intended and actual treatment position, and it is determined by measuring the shift of the treatment field position by comparing the treatment image against its reference image. Dose distribution over target volume is heavily dependent on setup margins. It is essential to evaluate setup errors for each linear accelerator to reduce the treatment errors. The aim of this study is to evaluate systematic and random setup errors using EPID of patients with cancer in pelvic region treated by 3D-CRT. 1150 portal images of 115 patients were evaluated in this study and displacements between digitally reconstructed radiograph (DRR) and portal images were measured in the direction of right to lateral, superior to inferior in anteroposterior (AP) images and anterior to posterior, superior to inferior in lateral images by matching rigid bony landmarks. 78.17% of total deviations were less than 0.5 cm in all directions. Systematic errors were 0.242, 0.255, 0.227, 0.220 cm and random errors were 0.404, 0.367, 0.313, 0.337 cm in the direction of right to lateral, superior to inferior in AP images and anterior to posterior, superior to inferior in lateral images. The determined CTV (Clinical Target Volume) - PTV (Planning Target Volume) margin based on the international commission of radiation units and measurements (ICRU) was 0.4711, 0.4465, 0.3870, 0.4026 cm in order to the above directions. The determined setup errors of the present study are well matched with the published setup error data that corresponds to the pelvic radiotherapy practices. 0.5 cm safety margin is suggested for all patients treated with 3D-CRT in the pelvic region, which is recommended according to ICRU.

Keywords: *setup error, 3D-CRT, DRR, portal images, safety margin*