

CHARACTERIZE PATIENT-SPECIFIC TARGET MOTION DURING THE EXTERNAL BEAM TREATMENT OF PROSTATE CANCER

Effective compensation for internal organ motion in the radiotherapy process requires better knowledge of motion characteristics. To do so, clinical target volumes (CTV) of 15 prostate cancer patients who had repeat daily CT scans were analyzed retrospectively. For the individual patient, the displacement of the center of mass (COM) of the CTV was calculated with respect to the initial reference position. The corresponding distribution was characterized and examined using the χ^2 good-fit test. In addition, the displacement was also analyzed as a function of treatment time and size of the CTV. The results demonstrate that distribution of the systematic displacement in the patient's anterior-posterior direction has variation significantly larger than the average of the random displacement. This suggests that clinical procedures in the pre-treatment CT imaging introduce extra variability in the target position. The patients were also divided into four separate groups based on the value of their random displacement. For each of the four groups, there is strong evidence that the Gaussian distribution could be applied to fit the distributions of the COM displacement. Furthermore, variability of the displacement did not systematically reduced as commonly expected as the treatment progressed. However, this could be due to the CTV shrinking during the treatment course as observed in our study. Our result demonstrates that the CTV shrinkage may cause large variation in the displacement of its COM. Supported in part by NCI grant #CA71785.