

AbstractID:9618 Title:Verification of Gated Radiation Therapy: Dosimetric Shift and Target Coverage due to Residual Motion

In gated radiation therapy, a window of beam delivery is selected, which typically incorporates residual motion. Consequently, beam delivery is to irradiate not only the true extent of disease, but also neighboring normal tissues. It is desired that the delivery cover the true target as a minimum, although inhibiting factors exist, that includes intermittent beam delivery and potential irreproducibility in breathing pattern. The intermittent can cause time delays as well as dose rate variation during delivery. The objectives of our study are therefore to validate if the intended dose is surely delivered to the true target and to understand the trend of dose delivery on the true target and the normal tissues around it while they move. To meet these objectives, an experimental study has been performed. For experiments, we have executed the entire process of radiation therapy by using a custom-made phantom with rectangular- and pyramid-shaped targets. On a moving platform, they were scanned for imaging. Various gating windows were selected and image integration was performed to generate targets for planning and delivery. These targets include the true target and the neighboring tissues. The planning was done conventionally for the rectangle target and IMRT optimization was done for the pyramid target. We have then performed evaluation of beam on a diode array after all beams were realigned at 180° . We have evaluated the dose profiles, and observed a systematic shift of them between treatment planning and delivery from gated beams for both targets. We have observed sufficient dose coverage on the true targets. The profile analysis also shows the amount of dose to the neighboring normal tissues receive during gated delivery. This study proves that gated beam delivery is secure in spite of discontinuous delivery and target motion. Computational modeling is underway, that explains the systematic shift mentioned above.