

AbstractID: 12917 Title: A feasibility study on Monte Carlo-based organ dose reconstructions for patients treated by external beam radiotherapy

Purpose: To develop a Monte Carlo-based technique to reconstruct organ doses for patients treated by external beam radiotherapy

Methods and Material: To explore a feasibility to use Monte Carlo simulation method for organ dose reconstructions for radiotherapy patients, five medical records of patients diagnosed as breast cancer after Hodgkin Lymphoma (HL) treated by Co-60 therapy unit were obtained from the previous epidemiologic study of second breast cancer risk. Breast tumor site and ovarian doses were previously estimated by using measurement-base approach. Eldorado Co-60 machine (Best Theratronics, Ltd, Ontario, Canada) including Co-60 source and collimation system were modeled by using MCNPX2.6 code based on the schematic diagram obtained from the manufacturer. The 15-year and adult female hybrid computational phantoms were employed to model the five different female patients by adjusting body weight and height of the phantoms to match the sizes from medical records. Treatment settings including beam characteristics (e.g. field size, location, and direction) as well as lung blocks were accurately simulated based on the treatment records and drawings/pictures. Absorbed doses per launched photon to breast tumor site and ovaries were calculated by MCNPX2.6 and multiplied by the number of photons required to obtain prescribed dose at a certain treatment planning depth.

Results: Absorbed doses to breast tumor site and ovaries were calculated for five different patients and compared with the results from measurement-based method. Both breast tumor site and ovarian doses from the simulation were up to 40% different from the values from measurement-base estimation.

Conclusion: Breast site doses are very sensitive to the locations of lung block and breast tumor which showed research needs of dose sensitivity analysis associated with those parameters. This feasibility study opened door to improved dose reconstruction method for radiotherapy patients using Monte Carlo technique.