AbstractID: 8886 Title: Skin dose determination for photon beam breast IMRT patients using Monte Carlo Simulations and TLD measurements

Skin dose determination for photon beam breast IMRT patients using Monte Carlo Simulations and TLD measurements

Purpose:

The skin dose is one of the major concerns for breast patient treated with intensity-modulated radiotherapy (IMRT). According to the ICRU and ICRP recommendations, skin dose was defined as the dose measured at 0.07 mm depth. The skin dose is difficult to be determined because the voxel size in CT scan is much bigger than this depth. In this study, Monte Carlo simulations and TLD measurements were combined to determine the breast IMRT patient skin dose for 6 MV photon beams.

Method and Materials:

Surface dose on a water phantom calculated using the Monte Carlo method was first validated by comparing the results with the measurements using TLD-100 chips (3.2 mm x 3.2 mm x 0.38 mm). The doses at a 0.07 mm and 0.89 mm depth on a solid water phantom were then calculated respectively using the Monte Carlo method with two opposite beams for different separations from 5cm to 20cm. A curve of dose-ratio as function of separations was obtained for 6MV photon beam. The tissue at skin with a 0.89 mm thickness was contoured on the patient phantoms which were converted from patient CT images, Monte Carlo dose calculations for IMRT plans were performed for 4 patients. Skin doses at 0.07mm depth for these 4 patients were then determined by applying the dose ratio between 0.07 mm depth and 0.89 mm depth.

Results:

The Monte Carlo simulation results for the TLD agreed very well with measurements (4%). The dose ratio between 0.07mm depth and 0.89 mm depth for different separations were obtained. For a given dose of 200 cGy, the deduced skin doses for 4 breast IMRT patients were calculated in different locations on breasts.