

DOSE CALCULATION FOR TISSUE INHOMOGENEITY IN LUNG CANCER BASED ON 6 MV PHOTON BEAMS

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Purpose : To evaluate the accuracy of dose calculation in lung cancer treatment planning using Two-dimensional radiotherapy (2D-RT) without inhomogeneity correction, with inhomogeneity correction by use of Power Law Tissue-Air Ratio Method (Power Law Method), and Three-dimensional conformal radiotherapy (3D-CRT) with inhomogeneity correction. The latter method takes into account in convolution algorithm.

Materials and Methods : Treatment was planned based on Alderson-Rando phantom held in an immobilization device. Doses were calculated on FOCUS release 2.0 planning system both for 2D-RT and 3D-CRT, and irradiation were performed on Varian C-Series 600C linear accelerator, 6MV x-ray. Thermoluminescent dosimeters (TLDs) were placed inside the target to compare the dose based on each method. The prescribed dose was 180 cGy in isocenter.

Results : The delivered doses by using 3D-CRT planning and 2D with Power Law Method correction were closer to the prescribed dose (173 cGy, 172 cGy in a 5 x 5 cm² field and 175 cGy, 174 cGy in a 10 x 10 cm² field). The delivered dose by using 2D-RT planning without heterogeneity correction was significantly higher (212 cGy and 216 cGy).

Conclusion : Dose variation between measurement and calculation is due to tissue inhomogeneity, especially in the lung. Power Law Method accounts with tissue inhomogeneity but not with the 3D shape of inhomogeneity tissue. 3-D treatment planning with inhomogeneity correction based on CT image, delivers more accurate dose. Use of 3-D planning in lung cancer should reduce the risk of radiation side effects while optimizing delivery to the tumor.

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Key words: Inhomogeneity, 2D-RT, 3D-CRT, Power Law Method, Prescribe dose, TLDs

INTRODUCTION

Radiotherapy for lung cancer can be given alone or in combination with surgery or chemotherapy, and a variety of protocols have

been established (Table1). Small-cell lung cancer is mainly treated with chemotherapy. Depending on the stage, non-small-cell lung cancer may be treated surgically along with neoadjuvant or adjuvant chemotherapy. For

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