

## SURFACE DOSE MEASUREMENT IN INTENSITY MODULATED RADIOTHERAPY

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***Purpose*** : The purpose of this study is to evaluate the accuracy of dose measurements in buildup region for high energy photon beams by using the thermoluminescence dosimeters. The method in evaluation of surface dose in intensity modulated radiotherapy for head and neck cancer has also been developed in this study.

***Materials and Methods*** : The measurements included: (1) measurements of buildup dose in phantom by plane-parallel ionization chamber; (2) measurements of buildup dose in phantom by thermoluminescence dosimeters; (3) measurements of surface dose on head and neck Rando phantom by using thermoluminescence dosimeters. Experiments were performed for 6 MV x-ray beams generated by a Varian 21EX linear accelerator. The instruments included the Markus plane-parallel ionization chamber and thermoluminescence dosimeters with 0.89 mm, 0.38 mm, and 0.1 mm in thickness, respectively. For normal incident beams, the dose measured in buildup region were corrected with suitable correction equations for plane-parallel ionization chamber and then evaluated the accuracy of the dose measurements in buildup region by using various thickness thermoluminescence dosimeters. The dose at phantom surface for obliquely incident beams were also measured and evaluated by the ultra-thin (0.1 mm) thermoluminescence dosimeters and plane-parallel ionization chamber for small field size (5 cm × 5 cm). For surface dose on the head and neck Rando phantom, the ultra-thin thermoluminescence dosimeters measurements were compared with the treatment planning system calculations.

***Results*** : The dose measured in buildup region by using the ultra-thin thermoluminescence dosimeters and Markus chamber are in good agreement and the former is suitable for surface dose measurements in clinical application. The underestimation of surface dose was found in treatment planning system calculation results in comparison with ultra-thin thermoluminescence dosimeters measurements on head and neck Rando phantom.

***Discussion*** : The dose measured in buildup region is markedly different by using TLDs in different thickness. The ultra-thin TLD is suitable for surface dose measurement, and provides the comparable reference in clinical treatment planning.

[Therapeut Radiol Oncol 2007; 14(2): 113-121]

Key words: Intensity modulated radiotherapy, Plane-parallel ionization chamber, Thermoluminescence dosimeters, Surface dose.