Original Paper

A simple protocol for in vivo dosimetry in radiotherapy of head and neck tumor using portal imaging

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Abstract

Background and Objective: Several organization such as AAPM (American Association of Physicist in Medicine), ACR (American College of Radiology), ACMP (American College of Medical Physics) and ESTRO (European Society for Therapeutic Radiology and Oncology) recommended the need for periodic quality control procedure in radiation oncology. One of the best methods for quality control is in vivo dosimetry, while radiotherapy is performed. The aim of this study was to design and optimiz a protocol for the quality control of radiation treatment of patients with head and neck malignancy.

Materials and Methods: In this case series study midle line dose was measured in vivo in conjunction with portal imaging in 19 patients that were treated using a Co-60 unit, in August and December 2007. Distribution of entrance and exit dose was determined using two diodes, off axis ratios and portal imaging together with a user code written in MATLAB. User code was applied to convert optical intensity of portal film to optical density. Midline dose was calculated in one centimeter intervals using entrance and exit dose with the Huyskens algorithm method.

Results: The midline dose was calculated in 165 points. The mean and standard deviation between measured and prescribed dose was about 4.27±3.61%. In 110 points (66.66%), the deviation was less than 5% (2.27±1.37), in 41 points (24.84%) the mean deviation was between 5 and 10% (6.51±1.2) and in 14 points (8.48%) mean deviation was more than 10% (13.37±2.34). The maximum and minimum deviations were found in center of the field (2.6±1.63) and 5cm away from center of the field (7.24±4.86) respectively. Maximum and minimum deviations correspond to the equivalent field of $14cm^2$ (5.08±3.53) and $8cm^2$ (2.95±2.13) respectively.

Conclusion: This study showed that using a portal detector in conjunction with two diodes is a simple and accurate method for daily quality control in radiotherapy. The data is acquired in this way can be used for evaluating the accuracy of treatment steps including; determination of output of a treatment machine, quality control of a treatment planning system and precision of calculations and patient setup.

Keywords: Head and neck cancer, Quality control in radiotherapy, Portal imaging, In vivo Dosimetry

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