Dokumenttyp: journal article

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Titel des Beitrags: A method for improved verification of entire IMRT plans by film dosimetry.

Abstract: BACKGROUND AND PURPOSE: In one entire intensity-modulated radiation therapy (IMRT) plan, beams coming from different directions have different penetration depths in the phantom. Therefore, verifying an entire IMRT plan with a calibration curve for a single depth is error-prone. The aim of this study is to improve the quality of the dose verification of entire IMRT plans with film dosimetry.

MATERIAL AND METHODS: The dose response of the Kodak EDR2 film to 6-MV photon beams was investigated in a solid-water phantom for different field sizes and depths. A method is proposed for evaluating measurements of the optical density with a calibration curve that takes the response at different depths into account. The described method was tested for three entire IMRT plans. For this purpose, calculated and measured dose distributions were compared, where the measured dose distribution was evaluated using a calibration curve for one depth (5 cm) and a calibration curve derived according to the proposed method.

RESULTS: All measurements suggest that the dose response significantly depends on the depth in the phantom, while dependencies on field size and off-axes distance are smaller. For tested plans, gamma index< 1 (using 3 mm distance and 3% dose as constrains) was reached for 81% and 91% of the points for one plan (prostate), 81% and 86% for the second plan (prostate), and 74% and 85% for the third plan (liver) when using two calibration curves, respectively. CONCLUSION: The
method described here corrects for the change of the film response due to the variation of the scattered radiation with the penetration depth. This is achieved by a modified calibration curve, which can enhance the accuracy of the verification of entire IMRT plans.