

Approaching In vivo Dosimetry for Kilovoltage X-Ray Radiotherapy

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Abstract : Recently a new kilovoltage radiotherapy unit model Xstrahl 200 - donated to the INOR's Department of Radiotherapy (DR-INOR) in the framework of a IAEA's technical cooperation project- has been commissioned. This unit is able to treat shallow and low deep laying lesions, as it provides 8 discrete beam qualities, from 40 to 200 kV. As part of the patient-specific quality assurance program established at DR-INOR for external beam radiotherapy, it has been recommended to implement in vivo dose measurements (IVD), as they allow effectively discovering eventual errors or failures in the radiotherapy process. For that purpose a radio-photoluminescence (RPL) dosimetry system, model XXX, -also donated to DR-INOR by the same IAEA project- has been studied and commissioned. Main dosimetric parameters of the RPL system, such as reproducibility, linearity, and field size influence were assessed. In a similar way, the response of radiochromic EBT3 type film was investigated for purposes of IVD. Both systems were calibrated in terms of entrance surface dose. Results of the dosimetric commissioning of RPL and EBT3 for IVD, and their pre-clinical implementation through end-to-end test cases are presented. The RPL dosimetry seems more recommendable for hyper-fractionated schemes with larger fields and curved patient contours, as those in chest wall irradiations, where the use of more than one dosimeter could be required. The radiochromic system involves smaller corrections with field size, but its sensibility is lower; hence it is more adequate for hypo-fractionated treatments with smaller fields.

Keywords : glass dosimetry, in vivo dosimetry, kilovoltage radiotherapy, radiochromic dosimetry

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