Feasibility study of in-vivo dosimetry by electronic portal imaging device

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[Purpose] The aim of this study is to assess the feasibility of electronic portal imaging device (EPID) based in-vivo dosimetry with EPIgray software (DOSIsoft).

[Methods] Six physical characteristics of the EPID have been examined: reproducibility, linearity, ghost effect and dependence on dose-rate, field size and source-imager distance. All images were acquired as integrated images in each field with EPID. For clinical cases, reconstructed doses at the reference points within the patient body were calculated by EPIgray software from the acquired images and compared with planned doses for five treatment sites; brain, head and neck, lung, bone, and prostate.

[Results] Coefficient of variance of reproducibility was less than 0.1%. Linearity of the EPID was good performance. The difference of dependence on dose-rate was within ± 1.0% with normalization at 300 MU/min. The maximum difference of field size dependence normalized at 10x10 cm^2 between the EPID and the ionization chamber was 2.4% for a 4x4 cm^2 with 6 MV photon and -2.5% for 20x20 cm^2 with 15 MV photon. The ghost effect and dependence on source-imager distance were less than 1.0%. For clinical cases, dose differences between reconstructed and planned doses for brain, head and neck, lung, bone and prostate were -0.93 ± 0.42%, -1.76 ± 2.28%, -0.17 ± 0.95%, -2.26 ± 1.18%, 1.56 ± 0.62%, respectively(mean ±1 SD).

[Conclusion] The EPID based in-vivo dosimetry with EPIgray software was feasible with certain accuracy.