Clinical results of an EPID-based in-vivo dosimetry for Prostate cancer treated by Volumetric Arc Therapy

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OBJECTIVES

In-vivo dose verification is the last step of a quality assurance procedure to ensure that the dose delivered during treatment is in agreement with the prescribed one. This work reports the in-vivo dosimetry (IVD) results obtained by the SOFTDISO software (Best Medical Italy) during the Volumetric Arc Therapy (VMAT) prostate cancer treatments.

METHODS

The SOFTDISO [1-2] was used to reconstruct in quasi-real time (i) the dose at the isocenter (D$_{iso}$) in the patient from the transit signal acquired by the EPID and (ii) the comparison between EPID images obtained during the fractions of the therapy. For each beam and fraction, the R ratios between D$_{iso}$ in single-arc (179-181°) VMAT plans for prostate targets and the dose calculated by the treatment planning system D$_{iso,TPS}$ (Oncentra Masterplan), were computed. The acceptance criteria was: 0.95 ≤ R ≤ 1.05. Moreover the γ-analysis (3%-3 mm) between portal images supplied useful index about the beam delivery reproducibility with the P$_{γ<1} > 95\%$ and γ mean<0.4. 15 patients with prostate cancer were treated with 6 MV photon beam delivered by an Elekta Synergy Agility (Elekta, Crawley). Our protocol required, for each patient, the IVD in the first three treatment sessions after a cone beam CT (CBCT) based set-up correction and the IVD test once weekly afterwards for the rest of the treatment course when the CBCT scan was not acquired.

RESULTS

The IVD procedure supplied 105 tests and the average R was equal to 1.003 ± 0.028 (1SD), in a range between 0.949 and 1.058. The global R value for each single patient was well-within the 5% tolerance level. The γ-analysis between EPID images supplied P$_{γ<1} > 97\%$ in 80% of the tests. 20% of the tests supplied 93% ≤ P$_{γ<1} < 95\%$ due probably to small setup variations. In fig. results from DISO for one patient are displayed.

CONCLUSIONS

The IVD results supported the protocol about the CBCT carried out in the first three treatment sessions of the VMAT prostate cancer treatment. The facility of the real time test supplied by SOFTDISO allows a CBCT scan requirement after the daily-fraction that supplies IVD off tolerance level. The authors intend to apply this procedure to estimate protocols about the use of the CBCT scans for other pathologies as the head-neck tumors where the morphological changes occurs frequently during the therapy and are responsible of heavy dose variations [3].

REFERENCES: