

Detector-based Dose Verification System for Phantom-less Delivery Quality Assurance in Tomotherapy

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Purpose:

We developed a new technique, named TomoCHECK, to perform phantom-less delivery quality assurance (DQA) system in Tomotherapy using an exit detector and software-based QA platform.

Materials and Methods:

TomoCHECK was designed to generate a new digital imaging and communication in medicine (DICOM) dataset based on leaf open time (LOT)-measured detector data and to provide phantom-less DQA results using independent dose calculation platform. To evaluate the developed program, 20 phantom-less DQAs were performed using TomoCHECK with Mobius3D software, and the results were compared to conventional phantom-based QA results.

Results:

The results show no significant difference between TomoCHECK and conventional QA results within our acceptance criteria, excluding one case; the exception shall be raised due to the difference in the dose calculation algorithm in Mobius3D. From extra assessment, TomoCHECK successfully detected a failed case and showed approximately the same trends as the conventional approach.

Conclusions:

We have developed a new DQA system called TomoCHECK, which could perform phantom-less QA for Tomotherapy using the detector data. From our results, it was confirmed that TomoCHECK could be possible to provide reliable DQA results with 3D dose verification from heterogeneous patient geometry treated in Tomotherapy.

Keywords: Tomotherapy, delivery quality assurance, phantom-less quality assurance, leaf open time, Mobius3D