

AbstractID: 7029 Title: A software tool for on-line real-time verification of gated delivery using megavoltage fluoroscopy

Purpose: To test and to explore the application of a software tool developed for on-line real-time treatment verification for 4D/gated radiation delivery using megavoltage fluoroscopy (MVF) acquired with treatment beams.

Method and Materials: MVF images were acquired with a flat panel detector installed on a Siemens Linac using 6MV photon beams for phantoms with moving structures and for thoracic cancer patients. A previously developed software, RTReg4D, was used to register acquired MVF with digitally reconstructed radiographs (DRRs) from 4DCT. The MVF frame grabber can be synchronized with the gating signal from Anzai gating device to capture target motion in selected gating window. The isocenter and target contours were transferred from a planning system into RTReg4D and were overlaid on the MVF images, verifying whether the target with residual motion is adequately covered during the gated delivery. Appropriate actions can be initiated should the verification fail.

Results: The software tool can effectively and accurately register MVF images with DRRs. The MVF images acquired with a dose as low as 1 cGy were adequate for the registration. In addition, the registration can be performed between the averaged MVF frame of all frames acquired within gating window and the corresponding DRR, further reducing dose required. The accuracy of registration can be better than 3 mm. The entire process is fast.

Conclusion: MVF achieves adequate image quality at a low dose. It is practically feasible to use the software tool with MVF for real-time (prior or during) treatment verification of 4D/gated radiation delivery.

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