

AbstractID: 3110 Title: Megavoltage CT imaging enables CT-based low-doserate brachytherapy planning without CT-compatible applicators

Purpose: To determine feasibility of megavoltage computed tomography (MVCT) imaging for low dose rate (LDR) brachytherapy for cervical carcinoma.

Method and Materials:

A helical tomotherapy treatment unit (Tomotherapy HiArt, Tomotherapy Inc., Madison, WI) using a nominal 3.5 MV x-ray beam was used to image a dosimetry phantom containing standard, non-CT compatible Fletcher-Suit applicators and dummy Cs-137 tube sources (3M Model 6500). The phantom contained several small steel BB markers which were used as dose points. The MVCT images were transferred to a commercially available treatment planning system (CMS XiO 4.2, Computerized Medical Systems, St. Louis, MO). Digitally reconstructed radiographs (DRRs) were generated from the MVCT data set, and doses (dose rates) were calculated at the phantom dose points using standard 2D, film-based dosimetry methods. Doses were also calculated using a CT-based, 3D dosimetry technique in which the brachytherapy source tips and ends were localized directly on MVCT images. Separate experiments were performed to verify the spatial accuracy of the MVCT image reconstruction in-phantom.

Results:

In-phantom localization accuracy was  $0.6 \pm 0.3$  mm, slightly less than the size of an axial MVCT image pixel and less than half of the MVCT slice thickness. Point doses in-phantom calculated by 2D and by 3D methods agreed within an average of 1.5%. The techniques developed for successful MVCT imaging in-phantom can be used to calculate 3D dose distributions in a human patient undergoing a traditional (non-CT compatible) Fletcher-Suit implant.

Conclusion:

MVCT imaging allows CT-based dosimetry planning without the use of special, "CT-compatible" applicators.

Conflict of Interest (only if applicable): Not applicable.