

AbstractID: 3637 Title: Tomotherapy megavoltage imaging for gynecological brachytherapy treatment planning and IMRT integration

Purpose: To demonstrate the use of the Tomotherapy IMRT system to image the standard shielded Fletcher-Suit applicator for CT based brachytherapy dose calculations and to integrate those dose distributions into Tomotherapy treatment plans.

Methods and Materials: A standard Fletcher-Suit gynecological applicator was placed in phantom and a megavoltage CT scan was done using the Tomotherapy unit. The images were exported in DICOM format to a Pinnacle treatment planning system. Cesium tubes representing a typical tandem and ovoid loading of the applicator were entered into the planning system, and the dose distribution was calculated. The binary dose matrix was then converted to a CT-like file by separating the dose values into individual planes, turning the floating point numbers into 12-bit integers, and adding a header file. Those image files were exported to a Focal Sim viewing station, where the isodose distribution was merged with a phantom CT and contours representing different isosurfaces were drawn. Those contours were exported to the Tomotherapy planning station, where a trial nodal boost volume was drawn in. An IMRT plan was done for this volume, and the resultant Tomotherapy binary dose file was converted to a Pinnacle format in order to be integrated with the brachytherapy plan.

Results: The megavoltage CT image accurately showed the source holders, tungsten shielding, and flange of the applicator. Exported dose distributions could be integrated with Tomotherapy IMRT.

Conclusion: The Tomotherapy IMRT system will be useful to accurately image Fletcher-Suit type applicators in actual patients in order to superimpose the dose distributions over the actual patient anatomy. IMRT delivered with Tomotherapy can easily be integrated with brachytherapy with the spread of DICOM dose export. Calculations which take the applicator shielding can be developed because the shielding position is clearly visible.