AbstractID: 8848 Title: Using CT Scout Images for Fletcher-Suit Brachytherapy Treatment Planning

Purpose: CT images of Fletcher-Suit applicators contain artifacts that prevent accurate determination of reference points for treatment planning. CT scout-views cannot be used directly because they have an anisotropic magnification. An algorithm was developed to calculate coordinates of required points from scout images.

Method and Materials: A Styrofoam phantom was constructed containing 30 embedded ball bearings arranged in a pattern with adjacent balls 40 mm apart. Another phantom contained six ball bearings randomly distributed around a Fletcher-Suit applicator. Scout and axial CT images of the phantoms were obtained using a Philips Brilliance CT scanner. The phantoms were then scanned using Tomotherapy™ megavoltage-CT (MVCT), and also imaged using a conventional simulator. A treatment planning system (TPS) was used for 3D image reconstruction from axial CT and MVCT slices to extract coordinates of the ball bearings. The TPS brachytherapy module was used to extract point coordinates from orthogonal simulator images. An in-house software package was developed to reconstruct locations of the ball bearings from scout images. The resulting x-y-z coordinates were compared with those obtained from axial CT, MVCT, and simulator images.

Results: The measured distance between 49 ball bearing pairs on the scout image was 39.95±0.59 mm with an expected distance of 40mm. Accuracy of the scout method compared favorably with the other imaging modalities. For randomly distributed ball bearings the differences between the measured distances were 0.78 ±0.82 mm, 0.29±0.75 mm and 0.81±0.70 mm for Scout vs. CT, Scout vs. MVCT, and Scout vs. Simulator respectively.

Conclusions: CT scout images can be used to determine the coordinates of radiation sources and reference points for brachytherapy treatment planning. Our method is easy to implement and its accuracy is comparable to that of other imaging modalities available in a clinical setting.

Research sponsored by Philips Medical Systems Corporation