

AbstractID: 2958 Title: Imaged-Based Simulation Technique To Determine Stepping Source Dwell Position For MammoSite® Brachytherapy Procedures

**Purpose:** Incorrect dwell position for the stepping source in MammoSite® radiation therapy system would result in severe dose error to the treated volume. In many centers, CT-simulators have replaced the fluoroscopic simulators. An alternative method must be developed for this purpose. This project evaluates the feasibility of CT-based simulation to determine the dwell position for the stepping source of the Nucletron® High-Dose Rate (HDR) unit.

**Methods and Materials:** A MammoSite® balloon applicator is placed in the surgical cavity intraoperatively at the time of segmented mastectomy for breast cancer. The balloon is inflated to near spherical shape with saline solution mixed with a small amount of radiographic contrast to aid in visualization. After recovery, the patient is brought to the radiation oncology facility to determine the quality of the implant and also to determine the stepping source dwell position. A dummy source train is initially inserted in the applicator and pushed to the distal end. The distance is measured using the Nucletron® measuring tool. CT scans of the breast was taken with 1 mm slice thickness. After the images have been acquired, a virtual 3-dimensional breast is generated. Based on the virtual breast, the path of the dummy source train inside the applicator is assessed.

**Results:** A digitally reconstructed radiography (DRR) that maximizes the projection of the pathway is created. A method is formulated to determine the center of the sphere and marks on the source pathway. The dwell position is determined by subtracting the difference of distance between the distal seed and center of the sphere from the maximum source distance as set on the HDR unit.

**Conclusion:** For institutions where the fluoroscopic simulator has been replaced by a CT-simulator, imaged-based simulation allows an effective method of determining the stepping source dwell position for MammoSite® brachytherapy procedures.