

AbstractID: 9789 Title: Interstitial Breast Brachytherapy Using Multiple Catheters.

Theory and Criterion. Accelerated Partial Breast Irradiation (APBI) for breast cancer patients with High Dose Rate brachytherapy has shown promising results. Patients with the following criteria are well suited for this modality: 1) T1, T2 tumors < 4cm, 2) <3 positive nodes 3) Negative surgical margins, 4) No multi-center disease 5) Negative post-lumpectomy mammogram and 6) Surgical clips or seroma needed for target volume delineation.

Procedure. Catheters are placed by two methods: 1) Ultrasound-guided supine position and 2) Template guided prone position. In both the cases the seroma volume is first mapped either on the skin for the ultra sound method or on a digital mammography in the prone technique. A 2 cm margin is added to determine the implant volume and the catheters implanted as homogeneously as possible. During simulation process each catheter is trimmed, numbered and its length measured. CT scan with CT-compatible wires in each catheter is obtained and transferred to the treatment planning system.

Dosimetry. First the lumpectomy cavity is delineated in each CT slices. Target volume is defined as the lumpectomy cavity + 2cm margin, modified to 5mm deep to the skin surface and also along the pectoral muscle. Each catheter is reconstructed and the dwell positions auto activated by the treatment plan with some additional margins. Geometric optimization for volume implant is done and an isodose line selected to cover the entire target. Manual optimization is then done to cover the target volume optimally and at the same time minimizing the hot spots. Each catheter length is then entered manually. Defining Dose Homogeneity Index (DHI) as $(V_{100} - V_{150})/V_{100}$, where V_{100} and V_{150} are the volume covered by the 100% and 150% isodose lines, an ideal implant will have a DHI value of 1.0. The primary objective of the dosimetry is the followings: 1) to cover 100% of the target volume by the prescription isodose line, 2) Target volume = V_{100} and 3) DHI as high as possible.

Quality Management. A Dose Volume Histogram is done to find the volume of the implant covered by the prescription dose. Time for this volume is then calculated from the original Manchester volume implant corrected for modern units and elongation factor, and is then compared to the total treatment time from the computer plan. Length of each catheter in the plan is also compared to the length measured in the simulator.

Discussion. CT based interstitial breast implants with stepping source allows improved treatment volume conformality. It also produces optimal coverage and is much easier and accurate than the conventional orthogonal film dosimetry.