

AbstractID: 13616 Title: Dosimetric effect of the source position uncertainty for the mammosite-based brachytherapy

Purpose: To study the dosimetric effect of the source position at axial dimension for the mammosite-based brachytherapy.

Method and Materials: Four typical patients with different mammosite-balloon catheters and PTVs were included: 1) ellipsoidal balloon and PTV is breast tissue of 1cm expansion from balloon surface; 2) ellipsoidal balloon and PTV is 1cm expansion but limited to 5mm from the skin surface and excluded from the chest wall; 3) spherical balloon with the same PTV as patient 1; 4) spherical balloon with the same PTV as patient 2. The treatment plans were evaluated based on the criteria of RTOG protocol 0413: %PTV coverage \geq 90%, maximum skin dose \leq 145% prescription dose, V150<50cc, V200<10cc, and V50<60% of normal breast. Five dwell positions 1cm apart with middle one at the center of balloon were used for ellipsoidal balloon catheter, while one position at the center of balloon was used for spherical balloon. For each patient, the dwell position was intentionally displaced \pm 1mm, \pm 2mm, and \pm 3mm, then new plans were compared to the original plan. The change was also compared among four patients.

Results: Within 3mm displacements, all plans were still acceptable. %PTV coverage and hotspot V200 were most sensitive to the dwell position change. With 1mm displacement, the %PTV coverage/V200 was decreased/increased by 0.3%/0.6cc, 1.2%/0.2cc, 1.4% /0.2cc, and 1.6% /0.9cc for patient 1, 2, 3, and 4 respectively. With 2 mm displacement, the %PTV/V200 coverage was decreased/ increased by 1.3%/1cc, 2.9%/0.8cc, 4%/1.1cc, and 4.3%/2.4cc. With 3 mm displacement, the %PTV coverage/V200 was decreased/ increased by 3%/1.8cc, 5%/1.7cc, 7.7%/2.9cc, and 7.4%/3.9cc. The other criteria changes were ignorable compared to the large tolerance. The plan with ellipsoidal balloon catheter was more robust than spherical one.

Conclusion: The dwell position for mammosite-based brachytherapy may tolerate more than 1mm, especially for the ellipsoidal balloon with five dwell positions.