AbstractID: 9021 Title: Treatment planning of prone position Accelerated Partial Breast Irradiation customized for Magnetic Resonance Imaging guidance

Purpose: It is important to deliver an optimized dose distribution to an accurately delineated target volume for a successful accelerated partial breast irradiation (APBI) treatment. Breast magnetic resonance imaging (MRI) could improve lumpectomy delineation. We investigated treatment plans for CyberKnife and conventional C-arm LINAC delivery of MRI-guided APBI in prone position.

Method and Materials: We acquired a CT scan of a patient positioned on a mechanical assembly with the same geometry as the dedicated MR coil to simulate the position during breast MRI acquisition. Ellipsoidal virtual PTV's of 4 cm were defined in the anterior part and in the lower outer quadrant of the right breast. Treatment plans were generated by inverse planning techniques for each system. For CyberKnife, we minimized beam directions from posterior to anterior to protect critical normal tissues (heart, lung and contralateral breast) and normalized the maximum dose to 120% of the prescription dose (38.5 Gy). For the conventional LINAC, we excluded any beams directed towards the critical normal tissues and normalized the plan to achieve 99% of the prescription coverage for 99% of PTV.

Results: LINAC-based plans resulted in maximum doses of 41.6 Gy in PTV and $\leq$ 0.5 Gy in the critical normal structures. CyberKnife-based plans led to 90% of the prescription dose coverage for 95% of PTV. Maximum doses were $\leq$ 0.5 Gy in contralateral breast, $\leq$ 1.9 Gy in heart, and $\leq$ 4.2 Gy in both lungs. The fraction of normal ipsilateral breast tissue receiving $\geq$ 37 Gy was 1% and 5% for CyberKnife and LINAC plans respectively.

Conclusion: CyberKnife and LINAC generate treatment plans for MRI-guided prone position APBI with acceptable dose distributions. The standard LINAC requires careful beam configuration to secure clearances between equipments. CyberKnife results in better conformity and slightly higher doses in the critical normal tissues.