AbstractID: 7349 Title: Characterization of respiratory motion of the breast

Purpose: The precise definition of breast PTV is required if IMRT is to be performed in radiotherapy of the breast. There is no equivalent of "flash" to account for intra- and inter-fraction variation. Respiratory motion is one component of that PTV variation. The purpose of this study is to characterize respiratory motion of the breast.

Method and Materials: Eight healthy female volunteers aged 29 to 53 were placed in a vac-lock bag on a wing board with both arms up on a Varian Exact couch. The BrainLAB Body system with stereoscopic infra-red cameras and spherical infrared reflectors was used to monitor motion. Reflectors were positioned in the four quadrants of the breast and a central point. Prior to each acquisition the table was moved a known distance to confirm system accuracy. The motion was tracked for 3 minutes and the coordinates were sampled at half-second intervals. The mean position was determined for each patient and each axis (vertical, longitudinal and lateral) and the difference from that point was plotted over time. The standard deviations and maximum excursions were determined.

Results: The plots showed between ~20 and ~80 respirations with regular motion in the anterior-posterior and super-inferior directions, with the occasional larger movement of short duration, and some variation from volunteer to volunteer reflecting relaxation over time. The standard deviations for all volunteers were 1.0 mm (vertical), 0.9 mm (longitudinal), and 0.3 mm (lateral). The maximum recorded excursions were 10.1 mm (vertical), 10.3 mm (longitudinal), 2.8 mm (lateral).

Conclusion: The respiratory component of breast PTV positional variation can be accommodated 95% of the time with a margin of ~2 mm (two standard deviations) in this cohort. Set up accuracy, PTV shape variation, intra-fraction non-respiratory movement and other factors also need to be addressed.