# AbstractID: 10818 Title: Respiration induced heart motion and indications of gated delivery for Left-sided Breast irradiation

**Purpose**: To study dosimetric gain of respiratory gating to account for heart motion during left-sided breast irradiation and to determine indications for gating treatment during treatment planning.

**Methods and materials:** The 4DCT data acquired with free breathing for 13 (out of 68) left-sided breast cancer patients, who underwent whole breast irradiation with or without regional nodal irradiation, were analyzed retrospectively. Contours of the targets, lung and heart from the planning CT, selected to be the CT at 20% phase, were populated to 0- and 50%-phase CT using deformable registration. The 3D dose distributions were reconstructed in these three phases (0, 20 and 50%). The heart dislocation between the breathing phases was measured in three selected transverse CT slices for the three phases by the changes of $D_{LAD}$ [the distance from left ascending aorta (LAD) to a fixed line drawn on each slice], and maximal heart depth (MDH, the distance of the forefront of the heart to the line). These distances were correlated with the changes of mean heart dose (MHD) and $V_{25.2}$ for heart between the breathing phases.

**Results:** Significant respiration induced heart displacement was seen, which resulted in substantial variations in dose delivered to the heart. In particular, the heart appeared to move towards to the chest wall during respiration, $D_{LAD}$ changed up to 9 mm, and MDH changed 10.4 mm, 11.0 mm and 10.7mm, respectively, on the three transverse CT slices from superior to inferior. The MHD and $V_{25.2}$ varied up to 38% and 39%, respectively. These variations were reduced substantially with gating.

**Conclusion:** The respiration induced heart displacement can result in significant variation in heart dose during left-sided breast irradiation. A large variation in the distances: MDH and/or $D_{LAD}$, can be used as an indicator to trigger respiratory management, such as gating prior to the treatment delivery.