Purpose: To assess the dose distribution and delivery efficiency on two different Volumetric Modulated Arc Therapy (VMAT) planning techniques for breast cancer. The beam-on time (BOT) was measured for the possibility of incorporating patient motion management system with VMAT.
Methods: Three treatment scenarios were assessed: Whole Breast Irradiation (WBI), WBI plus supraclavicular lymph node (WBI+SC) and bi-lateral WBI (BL-WBI). Six partial arcs (P-ARC) (50 degree per arc for WBI and WBI+SC; 80 degree per arc for BL-WBI) and two full arcs (F-ARC) planning techniques were compared. The targets and organs-at-risk (OAR) were contoured on the CT images. All plans were optimized with the same objectives in Eclipse treatment planning system and were normalized to V95% equal to 95% on PTV in 50.4Gy prescription dose.
Results: For all the plans, the PTVs received 55.44Gy were less than 1c.c.. P-ARC technique has superior dose distribution to the F-ARC in terms of V20Gy for lungs, V25Gy for hearts and mean doses for right breast. The volume received the low integral dose on the P-ARC (V5Gy ~50%) is approximately half in comparison to the F-ARC (V5Gy =100%) on the ispli-lateral lung and heart. The total BOT and the MU per plan was less in P-ARC than in F-ARC, especially the BL-WBI. The BOT per arc is 13 seconds (P-ARC) and 40 seconds (F-ARC) respectively on the WBI and WBI+SC scenarios. For the BL-WBI, average BOT per arc was 20 seconds (P-ARC) and 85 seconds (F-ARC).
Conclusions: Our P-ARC achieved excellent PTV coverage while maintaining extremely low doses to OARs in comparison to the F-ARC. If the breathing holding technique is applied, the patient is able to achieve one breath holding per arc using the P-ARC technique. The efficiency of the P-ARC technique could provide the patient comfort and achieve precise treatment.