

**Purpose:**To compare treatment planning for left-sided breast cancer using the full spectrum of external beam delivery platforms: 3-dimensional conformal radiotherapy (3DCRT), TomoDirect (TD), fixed-beam intensity-modulated radiotherapy (IMRT), and rotational therapy including both volumetric modulated arc therapy (VMAT) and Tomotherapy helical (TH).

**Methods:**Ten left-sided breast cancer patients with and without positive lymph nodes treated with 3DCRT or fixed-gantry IMRT to the entire breast were re-planned with rotational Monaco VMAT, TH and TD. The dosimetric metrics, such as PTV coverage, organ-at-risk sparing, DVHs, minimum/maximum/mean doses are evaluated. The VMAT plans were delivered using an Elekta Synergy beam modulator accelerator, the treatment delivery parameters such as the total MUs and delivery time from different techniques are compared.

**Results:**For plans providing comparable PTV coverage, the VMAT plans (HI=1.13) were generally more inhomogeneous than the TH (HI=1.08) and TD (HI=1.04) plans, while TD is less conformal. For the cases with regional node involvement, averaged across the patient, the heart mean doses were 9.2 and 8.8Gy in the VMAT and TH plans, compared to 11.9 and 11.8 Gy for the 3DCRT and TD plans; the mean contra-lateral lung doses were 4.4 and 3.2Gy for the VMAT and TH, 3.8 and 1.3Gy for the 3DCRT and TD plans. VMAT plans require shorter delivery time compared to TH. On average, the total MUs for VMAT plans are approximately 11.6% of those TH plans.

**Conclusions:**Rotational VMAT and TH offer certain dosimetric advantages over the conventional breast treatment requiring regional nodal coverage at the cost of slightly higher doses to contra-lateral lung and/or breast. In comparison to TH, VMAT offers more efficiently dose delivery to achieve comparable dosimetric plans. For early stage breast cancer patients requiring no nodal coverage, 3DCRT and TD are potentially more beneficial in terms of heart, contra-lateral lung/breast sparing.