Purpose: To investigate the feasibility of volumetric modulated arc therapy (VMAT) for post-mastectomy radiotherapy (PMRT) and to compare dual-arc VMAT treatment plans to helical tomotherapy (HT) plans on the basis of dosimetric quality, radiobiological calculations and delivery efficiency.

Methods: Dual-arc VMAT and HT treatment plans were created for fifteen patients previously treated at our clinic. Planning target volumes (PTV) included the chest wall (CW) and regional lymph nodes. The following metrics were used to compare treatment plans for each patient: dose homogeneity index (DHI) and conformity index (CI); coverage of the PTV; dose to organs at risk (OAR); tumor control probability (TCP), normal tissue complication probability (NTCP) and secondary cancer complication probability (SCCP); and treatment delivery time. Differences between treatment plans were tested for significance using the paired Student's t-test.

Results: Both modalities produced clinically acceptable PMRT plans. VMAT plans showed better CI (p < 0.01), and better OAR sparing at low doses than HT plans. For example, VMAT plans showed a 26% (p < 0.01) and 9% (p < 0.01) decrease in V5Gy in the lungs and heart respectively. On the other hand, HT plans showed better DHI (p < 0.01) and PTV coverage (p < 0.01). HT plans also showed slightly better OAR sparing at higher doses, including 8% (p < 0.01) and 9% (p < 0.01) lower maximum doses to the lungs and heart, respectively. Both modalities achieved nearly 100% tumor control and approximately 1% NTCP in the lungs and heart, with VMAT showing lower SCCP (p < 0.01). VMAT plans also required 66.2% less time to deliver.

Conclusions: Both VMAT and HT are suitable treatment options for PMRT. Our study showed that VMAT in addition to being significantly faster achieved better CI and low dose OAR sparing while HT achieved better DHI.

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