

Purpose: To investigate the advantages of DAO (Direct Aperture Optimization) based IMRT planning for breast cancer

Method and Materials: The IMRT plans were generated, using a DAO algorithm implemented in a commercial planning system (Panther, PROWESS), for 5 breast cancer patients who were treated in our clinic with 3D conformal plans. These 3D plans were produced by the Xio planning system (CMS) employing 4-6 tangential beams of different energies and wedges. In addition, we generated another IMRT plan for each of these patients using a beamlet-based conventional IMRT planning system (Xio, CMS). Both the DAO and beamlet-based IMRT plans employed two opposite tangential beam directions with about 70% of the dose delivered with stationary fields covering whole breast with 2-3 cm of flash. The target volume for all plans was the whole breast tissue; boost PTVs were not considered. All plans were done with homogeneous density calculation. The three sets of plans, DAO IMRT, 3D and beamlet IMRT, were compared in terms of dose uniformity, hot spots, normal tissue sparing, number of segments and MUs.

Results: The results show that: 1) dose uniformity and coverage of breast is improved significantly with either IMRT methods compared to 3D, DAO method providing slightly better coverage than conventional beamlet method, 2) hot spots typical for an IMRT plan with a large number of segments are significantly reduced, for the DAO plan, 3) number of segments and MUs with the DAO plan were significantly less than those for beamlet IMRT plan. Also, the planning time for a DAO plan is short compared to a 3D plan which involves a search of multiple wedges and energies by a trial-and error method.

Conclusion: DAO based IMRT planning is capable of generating superior IMRT plans for breast irradiation, in terms of dosimetric criteria and delivery efficiency.