AbstractID: 13363 Title: Application of Non Flat Beams for Breast Radiotherapy using Direct Aperture Optimization

Purpose: Non-flat beam is attractive for SBRT and IMRT delivery. This study is to investigate whether non-flat beam can achieve uniform dose distribution for whole breast irradiation.

Method and Materials: A 6MV non-flat and flat beams were commissioned in an Oncor Linac (Siemens). Fifteen early-stage breast cancer patients were selected. For each patient, three plans were generated for comparison: (a) clinically approved forward planning (FP); (b) mixed open fields using flat beams with direct aperture optimized (DAO) IMRT fields using non-flat beams (mixed DAO); (c) both open and DAO IMRT fields using non-flat beams (non-flat DAO). All plans were prescribed for >95% of the breast volume receiving the prescription dose. Plan quality was evaluated according to homogeneity index (HI), conformality index (COIN), D95%, V105% and D1cc as well as V20Gy to ipsilateral lung, V1Gy to contralateral breast and V25Gy to heart for left breast. All treatment plans were created using Pinnacle 8.0.

Results:
No significant difference was observed for COIN among all plans (all $p>0.05$). Average HIs of FP, mixed DAO, and non-flat DAO were 0.88 ± 0.01, 0.88 ± 0.01 and 0.87 ± 0.01, respectively. The mixed DAO had significantly lower V105% than FP and non-flat DAO. For organs at risk (OAR), no significant difference was observed. For D1cc, non-flat DAO was significantly higher than FP and mixed DAO ($p<0.005$). The lowest MU required was FP plan without wedges, followed by mixed DAO, FP with wedges, and non-flat DAO plans.

Conclusion:
Both mixed DAO and non-flat DAO plans can achieve equivalent planning quality as the clinically approved flat-beam FP plans. In addition, the mixed DAO plan has smaller hotspot area than non-flat DAO and FP while dose to OARs is not significantly different. Overall, non-flat beams are applicable to breast RT.

Conflict of Interest (only if applicable): No