

Purpose: We studied the dosimetric impact of respiration motion and setup error on tangential whole breast irradiation for the Japanese patient. We compared between three different techniques; standard physical wedges (SW), electric compensator (EC), and field in field technique (FF).

Methods: We performed treatment planning for sixteen patients using each technique. To take the respiration motion and setup error into account, we made plans with the isocenters shifted by ± 5 mm vertically, longitudinally, and laterally. For the vertical direction, we added ± 10 mm isocenter displacement plan, because respiration movement in the anterior – posterior (AP) direction is the largest. Mean dose, D95, V95, homogeneity index for CTV, V20 for lung, and V105 for body were evaluated for these plans. For AP respiratory motion, we assumed that the isocenter moves as sine function and DVH parameters were averaged over one period. For the daily setup error, we assumed the distribution of isocenter shifts have the Gaussian form, and calculated setup frequency weighted DVH parameters.

Results: In all irradiation techniques, AP movement has a significant impact on the dose distribution. The effect of respiration motion and setup error on dose distribution is the largest for EC. Especially CTV V95 decrease by 4.5 % from original plan. But even if these movement effects are considered, target dose coverage using EC (CTV V95:94.8%), or FF (95.3%) is enough in clinically. For lung dose, the moving effect is almost same between these techniques.

Conclusions: In this study, EC and FF irradiation techniques is more sensitive for respiration and setup movement than SW. But these deviations from original plan are clinically negligible. Furthermore, EC or FF decreased hotspots dramatically. As a result, we conclude that EC or FF technique is more meaningful than SW in terms of dosimetric impact.