AbstractID: 9488 Title: Optimization Tools for Modulated Electron Radiotherapy

Purpose: To devise optimization tools to plan Modulated Electron Radiotherapy (MERT) and to compare MERT plans to conventional or IMRT plans. **Method and Materials:** There are no commercially available treatment systems to plan or deliver MERT. Tertiary electron MLCs for MERT has been met with practical limitations. We've investigated use of the inherent photon MLCs. We optimized MERT plans for a left sided post-mastectomy breast cancer patient. From CT images, target organs such as chest wall, axillas, inter-mammary nodes were contoured. The MERT plan was performed in a three-step optimization process. Distances from the external contour-to-distal location of the PTV were calculated in transverse CT images. Energies were selected for efficient target coverage and energy bins were generated. Optimization of the energy bins was accomplished using a custom MERT Planning graphic user interface (MERTgui). Monte Carlo simulations were then performed using different MLC instructions for each segment generated by the MERTgui. Dose distributions of each segment were imported to CERR. Finally we used a custom built dose superposition GUI to combine doses for each segment using different weights which yields their relative MUs. The resulting dose distribution was used to calculate DVHs using CERR and compared to the conventional plan. **Results:** The MERT plan resulted in good target organ coverage and less dose to the organs at risk than the conventional plan. The dose that 20% of the ipsilateral lung received was reduced from 45Gy (conventional) to 26Gy (MERT). Using MERT, 80% volume of both axilla and IM received the prescription dose without consequence of excess dosage as with the conventional plan. Contralateral breast dose decreased significantly to 1/10 the dose of the conventional plan. **Conclusion:** MERT is ideal for treatment of shallow targets such as post-mastectomy chest wall. We have devised optimization tools to facilitate the MC based planning.