AbstractID: 9349 Title: Electron Intensity Modulation for Mixed-Beam Radiation Therapy with an X-Ray Multi-leaf Collimator

Purpose: To explore the use of mixed-beam therapy (MBT), i.e., combined intensity-modulated electron and x-ray beams using the x-ray multileaf collimator (MLC), in the treatment of head and neck and breast cancers. For shallow head and neck and partial breast targets, the addition of electrons has the potential of improving target coverage and sparing of critical structures and reduction of integral dose due to rapid dose falloff with depth and reduced exit dose. **Method and Materials:** Dose calculations for electron beams collimated by the MLC were performed with Monte Carlo methods and integrated into a commercially-available treatment planning system. Energy and intensity modulation of the electron beams was accomplished by dividing the electron beams into 2x2-cm^2 beamlets, which were beam-weight optimized along with intensity modulation of x-ray beams. MBT treatment plans were created for 8 shallow head and neck and 9 partial breast irradiation cases, and optimized to obtain equivalent target dose coverage compared to the original IMRT plans. MBT treatment plans were evaluated with respect to target conformality and integral dose in comparison with original clinical plans. **Results:** The shallow head and neck targets were shown to have reduced integral dose with MBT, on average 8% less than IMRT, as well as reductions in doses to critical structures distal to the target along the electron beam direction. MBT partial breast plans had an average reduction in integral dose of 14%, and also showed improvement in target conformality by an average of 24%. **Conclusion:** MBT shows promise for improving normal structure sparing and reducing integral dose, while maintaining target coverage and increasing target dose conformality.