

AbstractID: 5398 Title: Advanced Mixed Beam Radiotherapy for Breast and Head and Neck

Purpose: This work investigates advanced mixed beam radiation therapy (MBRT) treatment of breast and head and neck cancer using energy- and intensity-modulated electron (MERT) and photon (IMRT) beams.

Methods and Materials: The new MBRT system consists of MLCs for both photon and electron beam modulation and associated software for dose calculation, treatment optimization, and beam delivery to ensure superior target coverage and normal tissue sparing. Accurate and efficient dose calculation tools for Monte Carlo based treatment planning, and effective treatment optimization and leaf sequencing algorithms for efficient and accurate beam delivery for advanced MBRT have been developed with the use of existing MLCs. This technique is being implemented clinically for breast and head and neck treatment through pilot studies and clinical trials that are specially designed for dose escalation and hypofractionation. Partial breast treatment is also investigated using advanced MBRT as it is being developed.

Results: MBRT uses IMRT to achieve lateral dose conformity and MERT for conformity in the depth direction, which provides excellent target coverage for treatments involving shallow target volumes such as breast and head and neck. Our preliminary results based on 76 patients showed that grade II skin complications were significantly reduced in a hypofractionated breast trial. The whole breast received 20 fractions of 2.25Gy and the tumor bed received an additional 0.55Gy/day concurrent electron boost. The elimination of 10% hot spots in the whole breast volume ensures the whole breast dose to be under 2.5Gy beyond which significant skin complications have been reported in the literature.

Conclusions: A set of software and hardware tools have been developed for conformal radiation therapy of shallow targets with much improved target dose conformity and uniformity, adequate skin coverage/avoidance and significant reduction in the dose to the adjacent normal organs and critical structures.