

AbstractID: 3437 Title: Combined Electron and Photon Intensity Modulated Radiotherapy for the Management of Malignant Pleural Mesothelioma

Purpose: This study investigated the feasibility and potential benefits of combining electron and photon intensity modulated radiotherapy (IMRT) for patients with malignant pleural mesothelioma (MPM). Complex-shaped MPMs are difficult to treat by conventional radiotherapy due to low tolerance doses of the surrounding normal tissues. Even with recent treatment techniques employing photon IMRT, doses to the critical structures are difficult to keep within tolerance.

Methods and Materials: Two MPM patients after extrapleural pneumonectomy were studied. The patients were planned with photon IMRT alone and photon IMRT combined with electrons. The latter approach incorporated the electron component into the inverse planning optimization. The resulting doses to the planning target volume (PTV) and relevant critical structures were compared. For both plans, 54 Gy was delivered to the PTV that includes non-uniform margins along the clinical target volume (CTV), ranging from 3 mm along the spine to 6 mm near the ribcage.

Results: Target dose coverage for both techniques was optimal (D_{95} , $V_{95} > 98\%$) while the doses to the critical structures were minimal (liver $D_{50} < 27$ Gy, contralateral lung and kidney $D_{80} < 15$ Gy, ipsilateral kidney D_{50} within 15-18 Gy). However, combined electron and photon IMRT exhibited an advantage in reducing the doses to the liver and ipsilateral kidney by an additional 10% while the PTV hot spot was reduced by 10%. The planning and setup time with the addition of electrons is expected to be longer.

Conclusions: This study showed that photon IMRT alone or combined with electrons are viable treatment modalities for MPM patients. Both plans can provide excellent target coverage and normal tissue sparing, but with the addition of electron beams the critical structures can be further spared. Additional investigation to optimize the electron contribution to these complicated plans would be expected to result in further improvement.