AbstractID: 13365 Title: X-ray Plus Electron Radiotherapy with an extendable MLC

Purpose: To demonstrate precision treatments with mixed electron and x-rays beam without moving the patient or room re-entry, focusing on concomitant electron boost and Intensity Modulated Photon and Electron Radiotherapy (IMPERT), the latter to reduce integrated dose to reduce secondary malignancies **Method and Materials:** X-ray Plus Electron Radiotherapy (XPERT) utilizes an extendable multi-leaf collimator (MLC) and accurate dose calculation. A commercial add-on x-ray MLC was used for shaping 6-21 MeV electron fields at source-to-collimator distances of 71.6 cm and 81.6 cm, projecting a maximum field size, with 8.6 cm air gap, of 19x17 cm^2. The electron part of the treatment was forward planned using Monte Carlo simulation, validated with measurement. The x-ray part was planned on a commercial planning system. IMPERT treatment of stylized phantoms were planned to give insight into choice of electron energy and dose, and IMRT optimization parameters for different sizes, shapes and positions of targets and organs-at-risk (OAR). IMPERT plans of patients were compared to the IMRT plan used to treat the patient. **Results**: 20-80% penumbra with 8.6 cm gap increased from 1-2.3 cm with decreasing energy. MLC scatter was 4-9% of the dose with decreasing energy and had a modest effect on the penumbra. A plan consisting of strip fields of increasing energy showed depth modulation of 2.0-6.5 cm at 80% of the maximum dose. In the stylized cases and the pediatric patient, IMPERT achieved comparable target coverage to IMRT with x-rays alone, with reduced energy deposition in OAR and in normal tissue. **Conclusions:** XPERT treatment with a commercial add-on x-ray MLC and Monte Carlo dose calculation is clinically feasible. The thick leaves added manageable scatter while essentially eliminating leakage. IMPERT can be used to reduce integrated dose without compromising OAR avoidance and target coverage.

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