AbstractID: 13850 Title: Mixed electron and photon beams modulated by the xMLC for Partial Breast Irradiation

Purpose: To present a modulated radiation therapy technique as a more accurate alternative to current approaches for the planning of partial breast irradiation (PBI). This technique is based on the use of modulated electron beams alone or in combination with intensity modulated photon radiation therapy (MERT+IMRT), delivered with the same collimation device (xMLC). **Method and Materials:** A Monte Carlo treatment planning system based on BEAMnrc/DOSXYZnrc code, named CARMEN, was developed by our group. A Linear Programming (LP) optimization procedure calculates the weight for each beamlet generated from phase space data below the jaws. An algorithm to reduce beamlets and voxels was developed to make possible the LP formulation and to solve the problem in operative times. A specific sequencer capable to consider electron and photon beams was also developed by taking into account previous full MC simulations of the xMLC. Four PBI cases were planned with CARMEN following the recommendations from the RTOG-0413/ NSABP-B39 trial protocol for 3D-CRT PBI. Two cases were planned by MERT alone and the other two by MERT+IMRT as a function of PTV position in depth. **Results:** More than 90% of PTV volume received 90% of prescribed dose with a maximum dose ≤ 110%. A reduced dose to ipsilateral breast, lung and heart, was also achieved, especially in the low-dose range. The addition of IMRT to MERT improved PTV coverage in depth diminishing overdosed superficial areas. MERT and MERT+IMRT solutions improved PTV homogeneity compared with the other techniques evaluated and in most of the cases reduced dose to normal tissues. **Conclusions:** An improved PBI plan was obtained with MERT+IMRT solution compared with 3D-CRT and brachytherapy techniques. The accuracy of this technique by means of the xMLC opens the chance to implement the accelerated partial breast irradiation in the clinical practice.