AbstractID: 3949 Title: Shifting MLC shapes to adjust for daily motion of the prostate in the concurrent treatment of pelvic lymph nodes and prostate

Purpose:
To determine if adjusting the multileaf collimator (MLC) leaf positions to follow daily motion of the prostate is a feasible alternative to moving the patient, and to apply this adaptive strategy to concurrent treatment of the prostate and pelvic lymph nodes

Method and Materials:
A leaf-shifting algorithm was proposed to adjust MLC leaf positions to follow prostate movement while keeping the MLC portal shape unchanged. The MLC shift for each segment was calculated based on the beam direction, and the direction and magnitude of prostate movement. A computer program was written to implement this algorithm. The shifted MLC shapes were subsequently imported back into a commercial treatment planning system for the final dose calculation. For prostate-only plans, isodose distributions were compared between the shifted MLC plans and shifted isocenter plans, which mimic the adjustment of patient position. For plans including the prostate and pelvic lymph nodes, isodose distributions were compared between the partially shifted MLC plans and shifted isocenter plans.

Results:
For prostate-only plans, the isodose distributions were the same for shifted MLC positions and for shifted isocenters. For pelvic lymph node plans, shifting patient treatment position to follow prostate movement significantly reduced the dose coverage to the pelvic lymph nodes. Shifting MLC leaves associated with the prostate while keeping the MLC leaves associated with the lymph nodes unchanged resulted in improved dose coverage to both the prostate and the pelvic lymph nodes.

Conclusion:
Shifting MLC portal shapes is equivalent to shifting patient treatment position. In order to concurrently treat the prostate and pelvic lymph nodes, with the prostate moving independently, shifting the MLC shape is a better adaptive strategy than shifting the patient.

Conflict of Interest (only if applicable):
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