

AbstractID: 13046 Title: Influence of the multileaf collimator step size in step&shoot IMRT prostate treatments

Introduction

Reducing the beamlet size during step&shoot IMRT planning may lead to improve dose conformity. The beamlet length can be adjusted in the treatment planning system (TPS) with the leaf step-size along the MLC travel direction. The aim of this paper was to analyse the step-size influence during prostate treatments.

Materials and methods

Ten patients treated for prostate cancer with 6MV-IMRT fields were selected. Each treatment was calculated with the Konrad v2.2, Siemens, TPS using leaves step sizes of 3, 5 and 10mm, and delivered with a Primus, Siemens, linac associated to an Optifocus MLC (10mm leaf width). For each step-size, the plans were calculated so as to equal the dose received by 95% of the PTV. Plans were compared in terms of PTV dose uniformity, organ-at-risk doses, treatment time and MU number.

For each plan, the beams were imported in a water-equivalent phantom and the doses calculated were compared with Farmer (0.6cc) and Pinpoint (0.015cc) ion chambers measurements.

Results

Reducing the step-size from 10 to 5 or 3mm leads to a better PTV dose uniformity (31.2% and 35.8% dose standard deviation increase) and higher prostate minimum dose (+0.2% and +0.6%).

Rectum V40 (V65) decreased of 3.2% (3.6%) and 6.9% (12%) for 5mm and 3mm. Bladder V65 and femoral heads V50 decreased of 9.5% and 26% for 5mm and 18% and 42% for 3mm. The treatment time and MU number increased of about 10% and 27% for 5mm and 20% and 48% for 3mm.

The dose measurement verification showed that both chambers can be used for all step-sizes with errors less than 1.3%. However, the PinPoint chamber use for 3mm beamlet sizes decreases the error from 1.3% to 0.3%.

Conclusion

Using 5mm step-size seems to be a good compromise by improving the IMRT plan quality without treatment time increase.