Influence of photon beam energy on IMRT plan quality for radiotherapy of prostate cancer
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SUMMARY

Background: Intensity-modulated radiation therapy (IMRT) has been widely used for prostate cancer treatments. 6MV photon beams were found to be an effective energy choice for most IMRT cases. The use of high-energy photons raise concerns about increased leakage and secondary neutron dose for the patients.

Aim: In this work, the effect of beam energy on the quality of IMRT plans for prostate radiotherapy was systematically studied for competing IMRT plans optimized for delivery with either 6 or 10MV beams.

Materials and Methods: A cohort of 20 prostate cases was selected for this study. All patients received full-course IMRT treatments to a dose of 79.2Gy to PTV in 44 fractions. For all of the cases we developed treatment plans using 6 MV and 10MV intensity-modulated beams with identical dose volume constraints.

Results: Percentage of doses received by the percentage volume of PTV was higher for 6MV photons compared to 10MV photons for 12 patients, less than or equal to 1% for 6 patients and 2.6%, 3.6% for the remaining 2 patients irrespective of the PTV volume. Percentage doses received by 15% of bladder volume were higher for 10 MV photons. Percentage doses received by 15% of rectum volume were also higher for 10 MV photons.

Conclusions: Since there is no greater advantage from 10MV photons as compared with 6MV photons in large volume pelvic IMRT dosimetry and also 10MV photons lie on the threshold energy border for the induction of photo neutrons from the accelerator components, we recommend the use of 6MV photons for IMRT of prostate cancer to achieve better results in tumour control and acceptable probability of complication rate.

Key Words: IMRT; prostate; radiotherapy