Purpose:

To evaluate dosimetric variations of planning target volume (PTV) on critical organs such as rectal wall, bladder and femoral head, when the patient size changes due to weight loss in prostate volumetric modulated arc therapy (VMAT).

Methods:

Three patients with small (32.0 cm³), medium (48.4 cm³) and large (86.5 cm³) prostate, selected from a group of 30 were planned for prostate VMAT using the 6 MV photon beam. Patient size reduction due to weight loss was modeled by contracting the external body contour with reduced depths (0.5 â€“ 2 cm) in the anterior and both lateral directions. Original normal tissue excluded from the contracted body contour was replaced by air. Dose calculation was repeated with the same planned beam geometry and dose prescription. Dose-volume histograms, dose-volume points of the PTV, clinical target volume (CTV) and critical organs were calculated with variations of reduced depth.

Results:

D99% of the PTV and CTV were found to have increased 2.65 Â± 0.03% per cm and 2.75 Â± 0.15% per cm of reduced depth in the range of 0.5 and 2 cm. D30% of the rectal wall and bladder increased 2.29 Â± 0.12% per cm and 2.31 Â± 0.83% per cm, respectively. D5% of the femoral head increased by 3.30 Â± 0.11% per cm of reduced depth. Moreover, there was more than 5% increase of minimum, maximum and means doses for the PTV, CTV and critical organs when the reduced depth reached 2 cm.

Conclusions:

This study provided estimated results of dosimetric changes due to variation of patient size in prostate VMAT. The dosimetric information should help radiation oncology staff to justify changes of dose distribution, when patient weight loss occurs during prostate VMAT. Dose variations of more than 5% were found when the patient’s reduced depth was equal to 2 cm.

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Actual or potential conflicts of interest do not exist.