

Purpose:

To verify the accuracy of treatment planning calculations indicating increased testicular doses from pelvic lymph node irradiation

Methods:

IMRT prostate plans with and without lymph node irradiation were created on an anthropomorphic phantom (RANDO®, The Phantom Laboratory) using Pinnacle3 version 8.0m treatment planning software (Philips Medical Systems). Nine beam plans were generated for a Siemens Oncor linear accelerator using 6 and 15 MV energies. For the prostate with lymph node irradiation plan, the prostate PTV and lymph node CTV were prescribed 45 Gy followed by a 34.2 Gy boost to the prostate PTV. For the prostate only plan, the prostate PTV was prescribed 79.2 Gy. Plans were normalized such that 95% of the prostate PTV received the same dose or greater in 1.8 Gy fractions. Measurements were acquired at locations on the phantom that corresponded with where the testicles would have been located on a human. MOSFET detectors (Best Medical) and a 0.6 cm³ farmer ion chamber (PTW) provided a total of ten measurements per plan. Measured doses with lymph node irradiation were compared to those without lymph node irradiation. Measurements were then compared with calculations from the respective treatment plans.

Results:

Both measurements and treatment planning calculations resulted in a dose increase to the testicular region in the IMRT prostate plan with lymph node irradiation. MOSFET measurements showed a 40% dose increase with lymph node irradiation (3.65 ± 0.21 Gy) compared to prostate irradiation alone (2.61 ± 0.17 Gy). Ion chamber readings also showed a similar percent increase (42%). The increase in calculated doses provided by the treatment plan was 50% (3.43 Gy with lymph node irradiation versus 2.28 Gy without).

Conclusions:

Phantom measurements have verified treatment planning calculations that indicate an increase in testicular dose for IMRT prostate treatments due to the addition of lymph node irradiation.