Purpose: To compare plan quality between fixed-gantry IMRT plans generated by a treatment planning system (TPS) based on biological constraints (Monaco, Elekta CMS) and rotational IMRT plans produced by a TPS based on dose-volume constraints (TomoTherapy) for prostate irradiation.

Methods: Five previously treated TomoTherapy (Ver. 3.1.4.7) plans with a prescription dose of 7560 cGy in 42 fractions to prostate PTV were selected. TomoTherapy plans were generated using 2.5 cm field width, a typical pitch of 0.43, and a mean modulation factor of 2.20. Monaco (Ver. 2.03) plans were generated for these five cases using 9 equispaced beams, 2 mm grid spacing, 2 mm beamlet width, and a Monte Carlo algorithm for final dose calculation with 3% variance. Because greater PTV dose heterogeneity was anticipated, Monaco plans that did not meet a “<1% of PTV receives >110% of the prescribed dose” criterion were rejected. Two sets of Monaco plans were generated for 58- and 160-leaf Siemens MLC beam models. Various plan quality metrics were compared by the paired t-test.

Results: In all five cases, it was possible to obtain Monaco plans that met the PTV dose homogeneity criterion and equaled or exceeded the TomoTherapy plans in terms of rectal and bladder sparing. A small, but statistically significant, improvement in rectal V45 (-1.3%) and V70 (-2.4%) and in bladder V45 (-3.7%) was observed in Monaco 58-leaf MLC plans compared to the TomoTherapy plans. In Monaco 160-leaf MLC plans, a trend toward further improvement in critical structure sparing and PTV dose homogeneity was observed.

Conclusions: Fixed-gantry IMRT prostate plans generated by the Monaco TPS have identical or slightly improved critical structure sparing in comparison with the TomoTherapy plans, but are characterized by greater, albeit clinically acceptable, heterogeneity in target volumes.