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# Proton therapy, IMRT demonstrated similar toxicity profiles in prostate cancer

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Patients with prostate cancer who underwent proton beam therapy experienced similar gastrointestinal and genitourinary side effects as those who underwent intensity-modulated radiation therapy, according to study results.

"The relative merits of proton beam therapy compared to so-called conventional photon-based therapy for cancer treatment is a topic of great interest lately, a debate almost entirely driven by the higher costs and reimbursements historically associated with the former," researcher **Neha Vapiwala, MD**, associate professor of radiation oncology at the Hospital of the University of Pennsylvania, told *HemOnc Today*. "Prostate cancer is a common disease for which both proton beam therapy and intensity modulated radiation therapy (IMRT) have been used for some time, yet the literature that has been published to date comparing these technologies with actual medical records (as opposed to insurance claims or billing codes) has been notably lacking."

Vapiwala and colleagues thus sought to compare the adverse events associated with these two types of radiation therapy using prospectively collected data from patient charts and stringent patient-matching criteria.



Neha Vapiwala

"Although a randomized trial would be the ideal way to compare two treatments, and such a study is currently accruing, it will be a while before we have any results from it," Vapiwala said. "In the meantime, this study provides some data where there is currently a dearth."



The analysis included 394 patients with localized prostate cancer who received 79.2 Gray relative biologic effectiveness through treatment with proton beam radiation ( $n=181$ ) or IMRT ( $n=213$ ). Researchers matched patients according to their risk group, age and prior gastrointestinal and genitourinary disorders to create 94 matched pairs.

Bladder and rectum dosimetry variables, such as the mean and total dose to target, were significantly lower among patients who underwent proton beam radiation ( $P \leq .01$ ).

Median follow-up was 47 months (range, 5-65) in the IMRT cohort and 29 months (range, 5-50) in the proton beam radiation cohort.

Most patients experienced maximum grade 1 acute gastrointestinal toxicity (IMRT, 86.2%; proton beam, 95.7%) and genitourinary toxicity (IMRT, 71.2%; proton beam, 78.7%). More patients who underwent IMRT experienced grade  $\geq 2$  gastrointestinal toxicity (13.8% vs. 4.3%) and genitourinary toxicity (28.7% vs. 21.3%).

Results of a univariate analysis indicated patients who underwent proton beam radiation were less likely to experience acute gastrointestinal toxicity than patients who underwent IMRT ( $OR=0.25$ ; 95% CI, 0.07-0.89).

The risk for acute gastrointestinal toxicity was higher among patients who had a history of hypertension ( $OR=8.62$ ; 95% CI, 1.29-57.4), whereas the risk for genitourinary toxicity was higher among those who received androgen deprivation therapy ( $OR=3.02$ ; 95% CI, 1.1-8.34) and in those with higher International Prostatic Symptom Scale scores ( $OR=1.08$ ; 95% CI, 1.01-1.15).

Grade  $\geq 2$  late gastrointestinal toxicities occurred in 10.8% of patients who underwent IMRT and 12.8% of patients who underwent proton beam radiation. Grade  $\geq 2$  late genitourinary toxicities occurred in 18.3% of patients in the IMRT cohort and 12.8% in the proton beam radiation cohort.

Researchers then conducted multivariate analyses that accounted for case matching, confounders and significant independent predictors.

Overall, the risks for acute gastrointestinal toxicities ( $OR=0.27$ ; 95% CI, 0.06-1.24) and genitourinary toxicities ( $OR=0.69$ ; 95% CI, 0.32-1.51) were comparable between the arms. Patients who underwent IMRT vs. proton beam radiation also experienced similar risks for late gastrointestinal toxicities ( $HR=1.24$ ; 95% CI, 0.53-2.94) and genitourinary toxicities ( $HR=0.56$ ; 95% CI, 0.22-1.41).

"We will continue to follow these patients and analyze longer-term side effects, as well as other critical outcomes such as cancer control and secondary cancer rates," Vapiwala said. "Potential clinical advantages resulting from the superior radiation dose distributions typically associated with proton beam therapy can take many years to manifest, and so ongoing follow-up of our patients is critical. In particular, proton beam therapy may confer a lower risk of late side effects occurring 5 to 10 years after treatment and a reduced risk of radiation-induced cancers. As an increasing proportion of the men we treat for prostate cancer are under the age of 65 years, these endpoints carry particular import."

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