

What's the Best Radiation Therapy for Prostate Cancer?

Phase III trial finds IMRT and proton therapy offer equally high quality of life and tumor control for people with prostate cancer.

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People with low- and intermediate-risk prostate cancer treated with either of two types of contemporary radiation therapy — proton beam therapy or intensity modulated radiation therapy (IMRT) — achieved equally high rates of tumor control with no differences in patient-reported quality of life, according to a first-of-its-kind Phase III clinical trial comparing the two technologies. Findings of the PARTIQoL trial were presented at the [American Society for Radiation Oncology \(ASTRO\) Annual Meeting](#).

“We tested two contemporary, advanced forms of external beam radiation for a very common cancer, and we demonstrated that both are very safe, effective treatments that give patients excellent outcomes in terms of quality of life and cancer control,” said Jason Efstathiou, MD, PhD, FASTRO, principal investigator of the trial and vice chair of faculty and academic affairs in the department of radiation oncology at Massachusetts General Hospital.

Patients diagnosed with localized prostate cancer, in which the cancer has not spread outside the prostate and may grow slowly, have many treatment options. About 70% of new prostate cancer cases — more than 200,000 people in the U.S. each year — are diagnosed as localized disease. And since many of these patients will survive their cancer and live many years after treatment, their quality of life becomes particularly paramount when making treatment decisions, Dr. Efstathiou said.

External beam radiation therapy is a common option for patients with localized prostate cancer. Most types of this therapy use photon beams, the same radiation used in lower doses for x-rays. Photon beams can reach tumors deep inside the body but scatter bits of radiation along the way, which can lead to side effects in the area treated. IMRT, for example, is an advanced form of photon-based radiation that allows oncologists to shape and modulate the radiation beams to conform to the three-dimensional shape of a tumor.

Another external-beam option — proton therapy — uses protons rather than photon beams. These charged particles kill cancer by producing a sudden burst of energy once they stop inside a tumor. Because this release happens directly at the tumor site, protons deliver less radiation along their

path and are potentially less likely to harm surrounding healthy tissue. This increased precision also comes with significantly higher costs, however. The specialized equipment and facilities required for proton therapy are less widely available than those for IMRT and the treatment can be substantially more expensive.

“Patients now have many options for how they might manage their prostate cancer, but trying to sift through all of the information to understand the consequences for their quality of life can be confusing,” said Dr. Efstathiou, who is also professor of radiation oncology at Harvard Medical School. “To aid them in making these decisions, we compared two of the most advanced forms of external beam radiation, IMRT and proton beam therapy, head-to-head.”

Between June 2012 and November 2021, Dr. Efstathiou and his colleagues randomly assigned 450 patients with low- or intermediate-risk localized prostate cancer enrolled from 29 recruiting centers to receive either proton therapy or IMRT, without hormonal therapy. The median age was 68 years old. Patients were asked to self-report bowel, urinary and sexual functions via questionnaires at baseline and at multiple timepoints after treatment; median follow-up was 60.3 months.

No differences were observed between the IMRT and proton arms for any of the quality of life domains at any timepoint, and patients treated with either technique reported only small, clinically non-meaningful declines from baseline levels. For example, patients reported average bowel function scores of 93.7 (IMRT) and 93.5 (protons) out of 100 at baseline; after two years, the averages were 91.8 and 91.9, respectively, for a decrease of roughly 2% for each arm ($p=0.836$).

The groups also did not differ in progression-free survival. Five years after treatment, 93.7% and 93.4% of patients treated with IMRT and protons, respectively, had not experienced tumor progression ($p=0.706$).

“We can use either of these tools with comparably excellent outcomes,” Dr. Efstathiou said. “There have been so many advances in the delivery of contemporary radiation — such as the incorporation of scanned and modulated beams and in-room imaging — that I think the potential gaps between these technologies have narrowed over time.”

There also were no sustained differences in quality of life or survival between the arms for any pre-defined subgroups: low vs. intermediate risk disease, older vs. younger than 65, yes vs. no rectal spacer use and shortened vs. conventional fractionation schedule. Dr. Efstathiou explained that analyses are continuing on this large dataset, however.

“There may be subgroups that benefit from one technology over another, and we’re actively continuing analyses of that,” he said, noting that the study only compared the efficacy of each technology for patients with localized prostate cancer and not more advanced stages of the disease.

Dr. Efstathiou said the completion of this trial is also a win for the field, which relies on advanced technologies that can be difficult to assess in a randomized controlled trial.

“Providing the best evidence-based care calls for rigorously testing the tools we use for that care. We commonly use randomized controlled trials to evaluate new drugs, for example, but not necessarily for new technologies,” he said. “I hope that our work shows that randomized, controlled trials are critical in technology assessment.”

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