

Proton and Photon Radiation Therapy for Breast Cancer Preserve Quality Of Life

Patients report excellent outcomes after either treatment, with differences in preference favoring protons.

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The first randomized trial to compare photon- and proton-based radiation therapy for breast cancer finds that patients report equally strong health-related quality of life with either treatment. Patients who received proton therapy were more likely to say they would recommend or choose it again, but overall patient-reported outcomes were similar.

The Phase III Radiotherapy Comparative Effectiveness (RadComp) trial enrolled more than 1,200 patients, making it also the largest head-to-head comparison of photon and proton therapy for any cancer to date. The first results of the trial [were] presented today at the [American Society for Radiation Oncology \(ASTRO\) Annual Meeting](#).

“Patients should feel reassured that they can receive high-quality care with either photon or proton therapy,” said Shannon MacDonald, MD, FASTRO, clinical chair on the trial and medical director of at the Southwest Florida Proton Center. “More than a thousand patients in our trial have now shown that, with contemporary treatments, we can deliver curative radiation in a way that preserves multiple aspects of quality of life.”

Breast cancer is the [most common](#) cancer diagnosis in the U.S., with an estimated 320,000 individuals expected to be diagnosed in 2025. Locally advanced breast cancer occurs when the cancer has spread beyond the breast tissue but remains confined to nearby lymph nodes or the chest wall. Standard treatment for these patients often includes surgery followed by external-beam radiation therapy, which plays a critical role in preventing cancer recurrence and extending survival.

Photon therapy, the typical form of external-beam radiation, uses X-rays to target tumors precisely. It is highly effective in destroying cancer cells that may remain after surgery, but it can also deliver a small amount of radiation to nearby organs such as the heart and lungs, which may increase the risk of cardiac disease or pulmonary side effects over time.

Proton therapy instead uses charged particles that deposit most of their energy at a specific location, allowing radiation oncologists to essentially stop the beam at the tumor. This feature may limit incidental exposure to surrounding organs by reducing the so-called exit dose. Proton therapy requires specialized facilities and training, however, making it less widely available and substantially more expensive.

“Radiation oncologists have debated whether photon or proton therapy is the better choice for treating breast cancer, and there has been little high-quality evidence to guide those decisions,” Dr. MacDonald said. She and her colleagues designed RadComp to test prospectively whether proton therapy could reduce side effects while maintaining the high degree of cancer control achieved with photon therapy. This initial analysis examines patient-reported quality of life outcomes.

Researchers enrolled 1,239 patients with non-metastatic breast cancer at 32 centers across the U.S., randomly assigning them to receive either proton therapy (624 patients) or photon therapy (615 patients). The median age was 50, with most patients having undergone mastectomy (69.6%), having few cardiovascular risk factors (80.6%), and presenting with left-sided or bilateral cancer (61.8%). All participants received radiation to their internal mammary lymph nodes.

Patients completed several validated health-related quality-of-life questionnaires before treatment, at the end of their radiation, and at one and six months after treatment. They reported a wide range of physical, social, emotional and functional well-being measures, as well as side effects and satisfaction levels.

Both groups reported equally high quality of life and treatment satisfaction across nearly all measures, including cosmetic outcomes.

Patients treated with protons were somewhat more likely to say they would recommend their treatment ($p < 0.001$) or choose it again ($p < 0.001$). Because patients in the study knew which type of radiation therapy they received, Dr. MacDonald noted, this preference might reflect perceptions about receiving the newer or more expensive treatment.

A difference emerged in reports of shortness of breath, she said, with patients in the proton arm more likely to report no symptoms ($p < 0.01$). However, this difference did not remain statistically significant after researchers applied a correction of multiplicity to reduce the likelihood of false-positive findings given the large sample sizes and number of outcomes evaluated.

Dr. MacDonald said this finding, while not statistically significant, still may be hypothesis-generating and could warrant future investigations. “Quality-of-life research often gets overlooked, but patient-reported outcomes are an essential endpoint for modern trials,” she said. “They help us see how well our patients are living after treatment and can also reflect other important outcomes.”

When shortness of breath was grouped into categories of mild (grades 0-2) versus moderate to severe (grades 3-4), there was no difference between the treatment arms. Very few patients in

either group reported moderate or worse symptoms.

RadComp will ultimately compare long-term cancer control and cardiac outcomes between the two treatments to determine whether proton therapy reduces the risk of cardiac events while maintaining comparable cure rates. Dr. MacDonald said primary endpoint results are expected in several years.

Study and Presentation Details

- [Abstract LBA 01](#): Phase III randomized trial of proton vs. photon therapy for patients with non-metastatic breast cancer receiving comprehensive nodal radiation: A radiotherapy comparative effectiveness (RADCOMP) Consortium Trial: Health-related quality of life outcomes.
- [Dr. MacDonald's bio and disclosures](#)
- Funding for this study was provided by the Patient-Centered Outcomes Research Institute (PCORI).

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