



SUMMARY OF SCIENTIFIC BREAKTHROUGHS FROM THE 2019 ASTRO ANNUAL MEETING

THE ROLE OF RADIATION THERAPY IN CANCER CARE

Introduction

Hearing a cancer diagnosis is scary. Overwhelming. Confusing. Many questions flood your mind when you learn you or a loved one have cancer. And trying to learn and understand all the treatment options can be daunting to say the least. At the American Society for Radiation Oncology (ASTRO), our mission is to advance the practice of radiation therapy by promoting excellence in patient care, which includes promoting radiation oncology research and disseminating results to both our members and patients.

For more than 100 years, doctors have been using radiation therapy, also known as radiotherapy, to treat patients diagnosed with cancer. Radiation therapy is often combined with other treatment options, like chemotherapy or surgery, or used as a stand-alone treatment. Radiation therapy is an effective option for many people faced with a cancer diagnosis. In fact, nearly two-thirds of all cancer patients are treated with radiation during their illness.

Radiation therapy targets cancer cells and damages the DNA of the cell. The radiation destroys the ability of the cancer cells to reproduce and repair, causing the cells to die. Once these cancer cells die, the body naturally eliminates them. Normal cells that surround the cancer cells are affected by the radiation treatment as well, but the normal, healthy cells can repair themselves far better than the cancer cells. Advances in radiation therapy have allowed doctors to better target the cancer to reduce the risk of side effects from radiation. Despite the name, radiation therapy does not cause a patient to become radioactive. Radiation therapy treatments allow most patients to continue with their typical daily activities. Side effects vary based on the location and type of cancer, and many patients continue to work or go to school while undergoing treatments.

With radiation therapy, research often focuses on this question: What is the right dose of radiation for each patient? Sometimes more intense therapy is needed, and in others, is it possible to reduce the amount and intensity of treatments while still achieving excellent outcomes for patients? How do radiation oncologists find the right balance between reducing treatment doses to improve patients' quality of life while making sure that the reduced treatment remains powerful enough to stop the cancer from spreading?

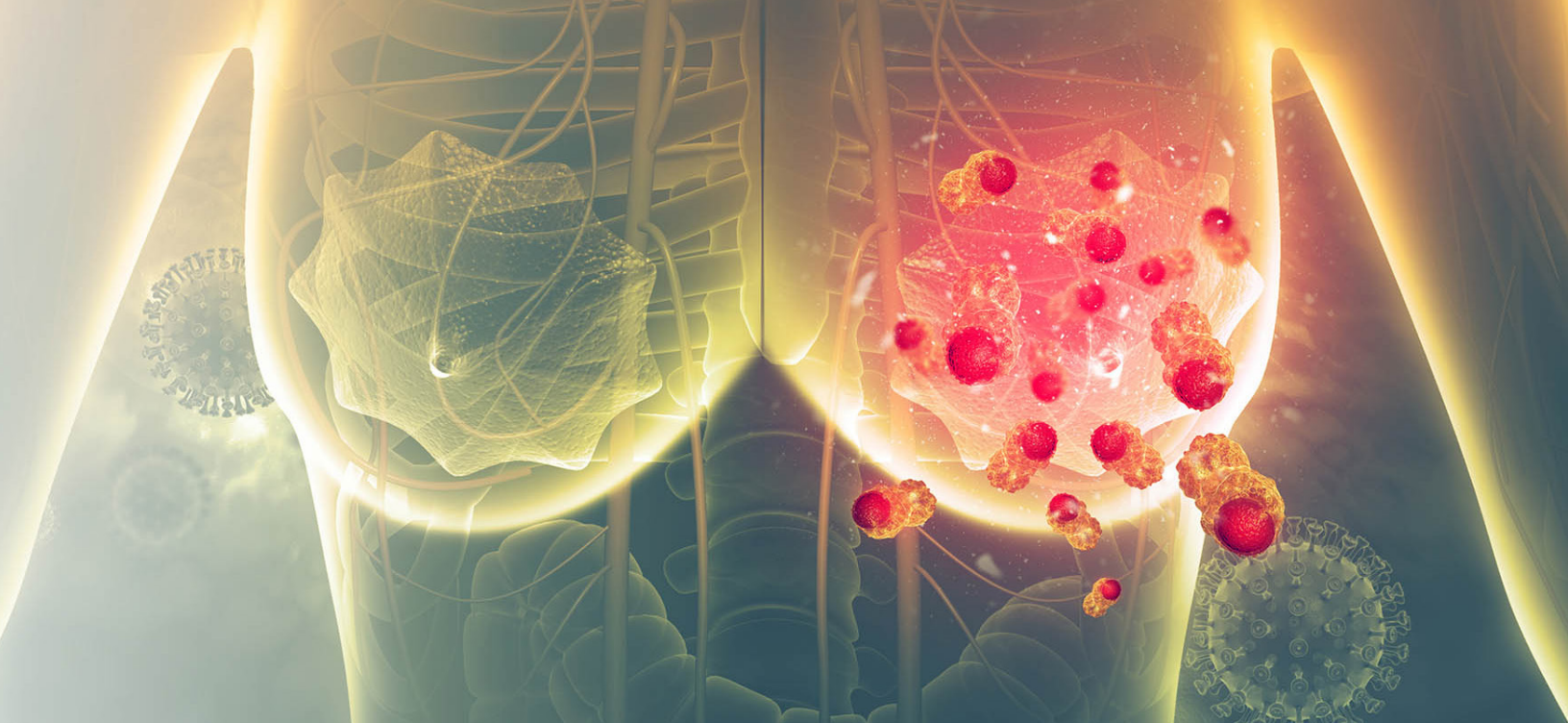
The answer is research, where scientists and physicians work together to discover new cancer treatments. Today, radiation oncologists are actively researching safe and effective radiation treatments, including more personalized approaches and studies of lower doses for a variety of cancers.

In an effort to disseminate the latest science related to radiation therapy, ASTRO prepared this pamphlet, which highlights some of the top research presented at our 2019 Annual Meeting.



We encourage you to review all of your treatment options, including radiation therapy, with your primary care physician before determining which option or combination of options is best for you and your lifestyle.

Theodore L. DeWeese, MD, FASTRO
Chair, ASTRO Board of Directors



Breast

Breast cancer affects both men and women, and it is the most common type of cancer among women worldwide according to the World Cancer Research Fund. Breast cancer can often be cured, and about 83% of all patients with breast cancer live at least 10 years after their diagnosis. Radiation therapy is a common treatment following mastectomy or lumpectomy, as it reduces the risk of the tumor recurring and improves the likelihood of survival.

Choosing the right therapy after lumpectomy

Women diagnosed with early stages of breast cancer (stage II or earlier) often undergo the removal of the cancer, known as lumpectomy, aiming to keep as much of their breast as possible, followed by radiation therapy to lower the risk of the cancer returning. Radiation destroys cancer cells or pre-cancerous cells in the breast that have not yet been detected. There are two primary radiation therapy choices: whole breast irradiation or partial breast irradiation, which targets a smaller area beside the lumpectomy site. Studies have shown that the two treatments are about the same when it comes to preventing the cancer from coming back, with no significant differences in overall survival, the time patients live without the cancer coming back, or the time patients live without the cancer spreading to another site.

An advantage of partial breast irradiation is that it takes several days, compared with three or four weeks for whole breast treatments. One question remains: Is one treatment better than the other from a cosmetic point of view? It turns out that they're about the same, according to a study from The Ohio State University. The researchers measured cosmetic outcomes for 900 women, of whom 477 had received partial breast treatment and the rest had received whole breast treatment. They asked both the patients and their physicians to rate the cosmetic outcome of the treated breast, compared with the untreated one, as either excellent, good, fair or poor at three different times (right after treatment, 12 months after treatment and three years after treatment).

The researchers also had the outcomes assessed independently by two teams of three physicians each. They took digital photos of the women's breasts at each time point and had the physicians rate them, without knowing which treatment the women received, or which breast was treated.

"We found that whether the women received whole breast radiation or partial breast radiation, there was an equal cosmetic outcome from the patients' perspective," said Julia White, MD, FASTRO, a professor of radiation oncology at The Ohio State University Comprehensive Cancer Center and lead author on the study. The pattern held when the patient had also received chemotherapy. In addition, patients' satisfaction with their treatment and cosmetic outcome were the same for whole breast and partial breast radiation. Three years after completing radiation therapy, 81% and 86% of patients said they were "totally satisfied" with partial breast or whole breast radiation, respectively; 14% and 11% were "somewhat satisfied"; 2% and 3% were neither "satisfied nor dissatisfied"; 1% and 2% were "somewhat dissatisfied"; and less than 1% of patients in each group said they were "totally dissatisfied" with their treatment.

Treating physicians rated cosmetic outcomes from partial and whole breast radiation as equal at one year after treatment, though they considered outcomes from partial breast radiation worse at three years after treatment. Like the patients, the independent observers saw no significant differences.

Dr. White said the findings were important for women facing difficult choices after being diagnosed with breast cancer. "If a patient chooses breast conservation [lumpectomy with radiation therapy versus an alternative option of mastectomy, which is removal of the entire breast] for her treatment, she generally wants the breast to feel and look as normal as possible. We were relieved that the partial breast and whole breast radiation cosmetic outcomes were equal."

Type of axillary surgery is a better predictor of lymphedema for breast cancer patients

Breast cancer patients have lymph nodes removed (along with cancerous breast tissue) if their lymph nodes have cancer or they are at high risk of containing cancer. Lymphedema — fluid accumulation and swelling around the lymph node surgical site and extending to the arm — is a common, disfiguring and sometimes disabling side effect of treatment. There's no cure for it, though it can sometimes be controlled with measures such as compression bandages, exercises and massage.

Previous research shows that having more underarm lymph nodes removed increases lymphedema risk. Axillary lymph node dissection (ALND), a procedure that removes many lymph nodes, is associated with higher risk than sentinel lymph node biopsy (SLNB), which may remove only one or two lymph nodes. According to the National Cancer Institute, between 5% and 17% of women who have SLNB develop lymphedema, whereas between 20% and 53% of women who have ALND will develop lymphedema, and the risk increases with the number of nodes removed.

One question is whether having radiation in addition to surgery increases the risks of developing lymphedema. A long-term study recently completed at Massachusetts General Hospital in Boston suggests that the main driving risk for lymphedema is the axillary surgery. That's good news for patients who have been advised to have radiation treatments but are worried about side effects. Investigators found that "while regional lymph node radiation slightly increases the risk of lymphedema, the main driving lymphedema risk factor is the axillary surgery."



Between 2005 and 2018, 2,758 patients intending to have surgery for breast cancer were enrolled in a lymphedema screening trial. All participants received either SLNB or ALND (in addition to lumpectomy, mastectomy or mastectomy with reconstruction). The largest group, 1,354, received only SLNB and the smallest, 87, received only ALND. The other two groups received either SLNB plus regional lymph node radiation (RLNR — also referred to as RNI, regional nodal irradiation) or ALND and RLNR.

The study, lead authored by G.E. Naoum, MD, measured the level of lymphedema using perometry, a new non-invasive technique that uses infrared light to measure the width of the affected arm and the volume of fluid. Patients received a baseline measurement before surgery. Breast cancer-related lymphedema was defined as a 10% or greater relative arm-volume increase arising more than three months after surgery. The five-year risk of breast cancer-related lymphedema was lower in patients treated with SLNB and RLNR (11.2%), compared with either ALND with RLNR (36%) or ALND alone (28%). Skipping radiation reduced the risk only slightly for women having SLNB (8.5%).

Hypofractionation results in fewer side effects for breast cancer patients who have had reconstructive surgery

Much of the clinical research done by radiation oncologists is devoted to determining the right amount, type and frequency of radiation given to treat a cancer. It also focuses on minimizing side effects, maximizing the anti-cancer effect and creating a treatment plan that's reasonably convenient for the patient. One desirable goal is hypofractionation, or delivering the optimal amount of radiation over fewer sessions and a shorter time. Studies of hypofractionation focus on whether it can control cancer as well by giving more standard radiation, delivered more frequently over four to five weeks, and whether there is a difference in side effects, compared to standard longer course radiation therapy.

Previous studies have shown that hypofractionation works well for breast cancer patients who have had mastectomies, have not had breast reconstruction and have had surgery to remove cancerous lymph nodes. A recent study led by Christine Fisher, MD, MPH, out of the University of Colorado extended that promising news, showing that hypofractionation also works well for patients who have had some type of breast reconstruction using either an implant or their own tissue.

A year later, patients treated with hypofractionated radiation had fewer side effects: 26% of the patients studied had experienced some type of negative event from the treatment, compared with the 40% that's expected with the standard treatment plan. The most common negative event was lymphedema, or accumulation of fluid in the area surrounding the lymph node surgery, defined as an increase of 10% in arm measurement and experienced by 22% of the studied patients.