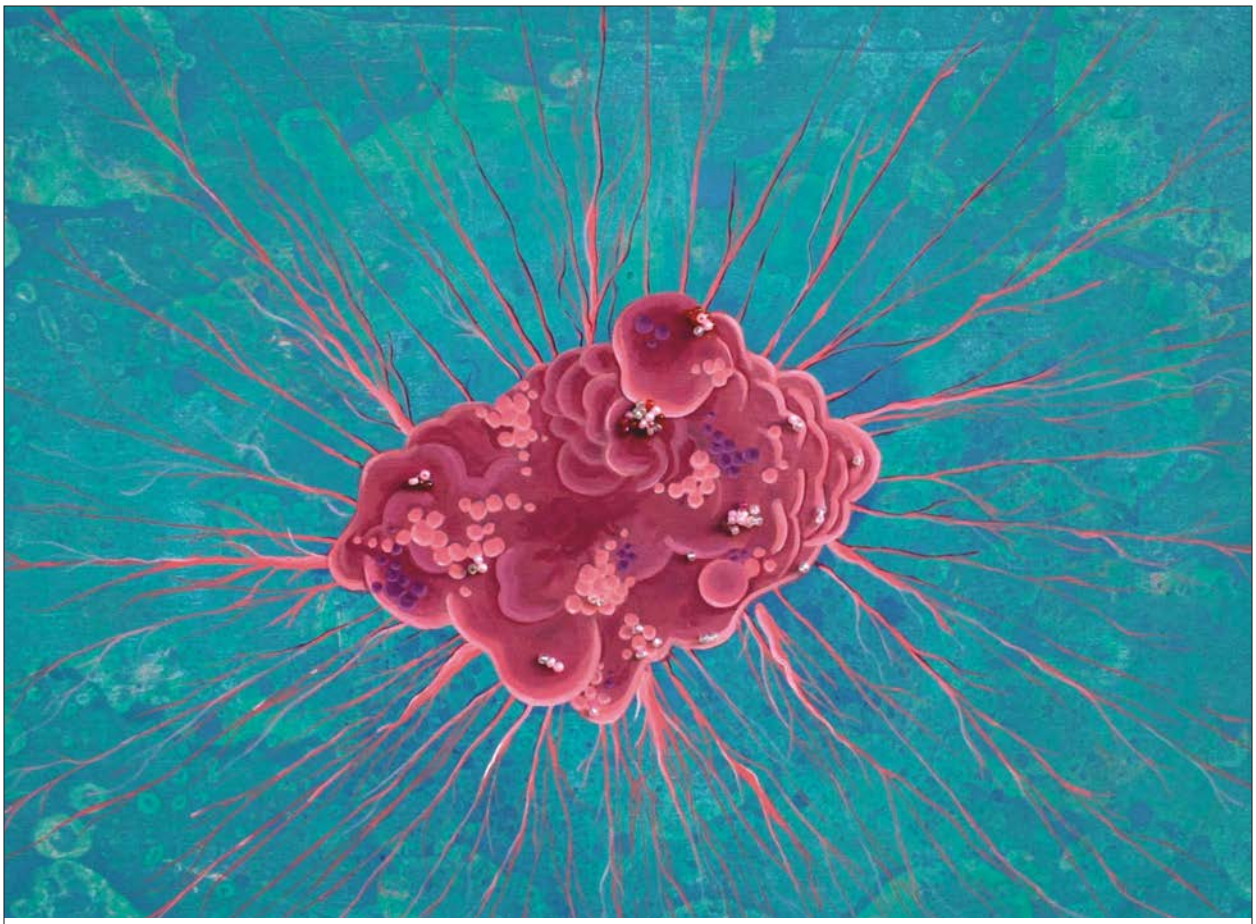

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Novel Imaging Technique May Reduce Lymphedema in Breast Cancer Patients

With guidance from a specialized scan, radiation oncologists at Mayo Clinic were able to reduce by 55 percent the number of lymph nodes critical for removing fluid from the arm that received damaging radiation doses.

The researchers report that integrating Single Photon Emission Computed Tomography (SPECT) with the computerized tomography(CT) scans utilized for breast cancer radiotherapy planning may offer patients substantial protection against lymphedema, an incurable, chronic swelling of tissue that results from damage to lymph nodes sustained during breast cancer radiation. The SPECT-CT scan pinpoints the precise locations of the lymph nodes that are critical for removing fluid from the arm, allowing physicians to block them, as much as possible, from X-ray beams delivered to the chest.

These findings were presented at the 33rd Annual CTRC-AACR San Antonio Breast Cancer Symposium.

"In an effort to deliver therapeutic doses of radiation to the breast, lymph nodes under the arm are innocent bystanders that often are irrevocably harmed. Minimizing harm to these nodes during breast cancer treatment is the most effective way we have seen to reduce women's risk of developing lymphedema," says the study's lead investigator, Andrea Cheville, M.D., a consultant in Physical Medicine and Rehabilitation at Mayo Clinic in Rochester, Minn., who specializes in lymphedema management.

"Lymphedema is a critical concern of breast cancer survivors, so developing a more individualized approach to irradiation is greatly needed," she adds.

This ongoing prospective cohort study includes 30 women with early-stage, low-risk breast cancer who had completed surgery to remove tumors and were scheduled for radiotherapy to the affected breast. These patients either had no lymph nodes that were known to be positive (meaning the cancer had not spread to these sites), or had only micrometastasis to lymph nodes. Thus, radiation to the lymph nodes in the armpit was not warranted in these patients.

The technique the researchers developed to shield lymph nodes from radiation involved merging SPECT scans with the CT images utilized in radiation treatment planning.

"We can know exactly where the critical lymph nodes are under the armpit," Dr. Cheville says, adding that critical nodes are the ones that drain the arm. "While a person can have as many as 62 lymph nodes under the arm, only a few are responsible for that function."

"We can use this information to personalize the fields of radiation such that the tumor bed in the breast is therapeutically treated while the lymph nodes that drain the arm are maximally blocked from radiation and thereby spared," she says.

The researchers created two treatment plans for each patient -- a standard plan and one adapted for lymph node sparing based on the SPECT-CT scans. When they compared lymph node radiation between the plans, they noted dramatic reductions in radiation to critical lymph nodes in the SPECT-CT-adapted plans.

Using the SPECT-CT images, the researchers identified all of the critical lymph nodes in the patients. They found that 65 percent of these nodes would have been located within the standard radiation treatment fields if they were not blocked.

They also found that among the 25 patients with at least one critical lymph node within the radiation treatment field, at least some blocking was possible for all of them. Researchers calculated that the number of lymph nodes receiving a moderate dose of radiation was reduced from 26 percent to 4 percent with blocking.

Because lymphedema development can take a matter of years, the researchers will continue to monitor these patients. No cases of lymphedema have yet been reported.

Dr. Cheville says that the technique of locating critical lymph nodes and blocking them from radiation may prove most useful for patients who require surgical removal of the lymph nodes in the armpit but do not require radiation targeting any remaining nodes. These patients' risk of developing lymphedema may be as high as 50 percent without blocking, and measures that preserve the function of their lymphatic systems may be critical to their long-term quality of life, she says.

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Story Source: The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Mayo Clinic.