Research team pioneers image-guided, high-dose approach to breast cancer

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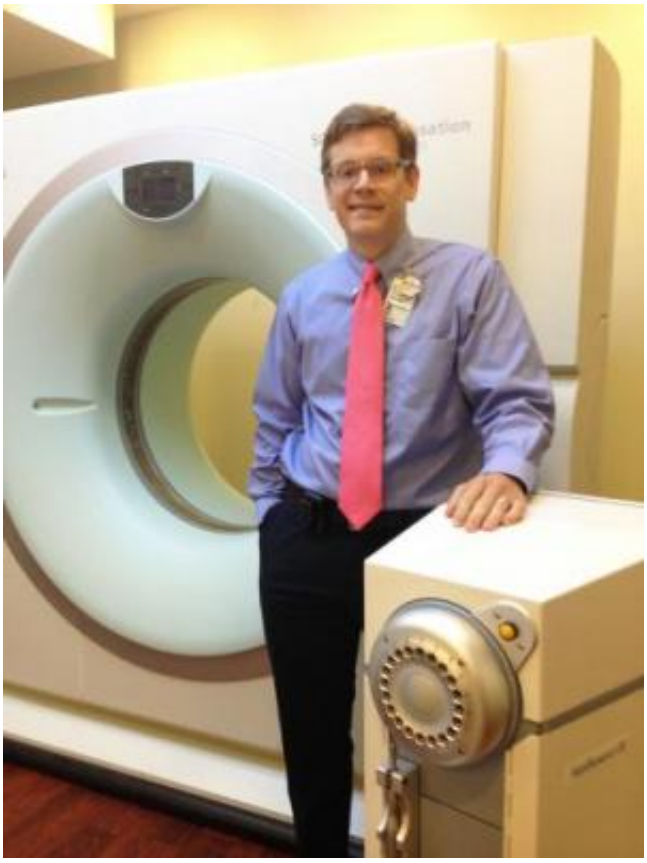

Dr. Timothy Showalter with the “CT on rails,” which allows surgeons to better view images of breast tissue during surgery and carefully target nearby tissue for high doses of preventive radiation. Credit: U.Va. Health System

An experimental approach to treating breast cancer being tested at the University of Virginia Health System allows doctors to administer

significantly higher doses of cancer-killing radiation where it's needed at the same time as tumor removal while sparing healthy tissue, an initial research study suggests.

The approach, known as image-guided, high-dose-rate brachytherapy, aims to overcome many of the limitations of other forms of intraoperative radiation therapy by using powerful imaging technology to visualize what's occurring inside the breast during treatment. The U.Va. team has developed an approach to perform breast cancer surgery and deliver image-guided, high-dose rate brachytherapy with the use of a CT-on-rails device – a CT scanner that slides across the floor to image the patient during the procedure. The use of image-guided brachytherapy allows the U.Va. researchers to sculpt the radiation to whatever shape is most effective – unlike other forms of intraoperative radiation therapy, which simply deliver radiation in a spherical shape.

"Shaping and targeting the dose lets us deliver a higher radiation dose to the area that's at the highest risk of reoccurrence, and it also reduces the amount of dose we're giving to the skin and chest wall, which we believe will reduce the rates of negative cosmetic outcomes or skin changes, such as skin darkening or scar tissue formation," said Dr. Timothy Showalter of the U.Va. Cancer Center.

That ability to shape the dose would allow doctors to customize treatment to each person, targeting cancerous cells more effectively while sparing healthy tissue.

"Because of the properties of high-dose brachytherapy and all the flexibility we have with shaping the dose, we can delivery a much higher prescription dose, or tumorcidal or cancer-killing dose, to the high-risk target line, the area that's at risk for cancer," Showalter said.

The U.Va. team has reported the results of an initial test of the new

approach in the journal Brachytherapy. The clinical trial showed that the approach offered superior targeting of cancer cells in nearly all instances, as compared with traditional intraoperative radiation therapy, without increasing toxicity.

"With the technology we have available, we recognized that we had the opportunity to address a lot of the limitations of other forms of [intraoperative radiation therapy]," Showalter said. "The prior criticism for IORT was that you can't image the lumpectomy cavity. Well, we can image the lumpectomy cavity because we have the benefit of a CT scanner. The criticism was that you can't optimize the dose, meaning that you can't adjust the shape of the dose, can't pull it away from the skin or pull it away from the chest wall. Well, we can do that, because we use an applicator that has multiple channels, pathways for the radiation to go through."

The ability to direct the treatment precisely also could spare the heart from unnecessary radiation exposure. "We demonstrated in our study that the dose received by the heart for left-sided breast tumors is very small, and this is less than we see with external-beam radiation," Showalter said.

It's important to note that the approach remains experimental and is not yet available as a standard treatment outside of a clinical trial. The researchers have launched a clinical trial at U.Va. to test the safety and effectiveness of the approach.

While the approach as tested so far requires leading-edge equipment and facilities such as are available at U.Va., the researchers will also work to develop versions of this technique that could be more widely available.

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