

The Latest in Radiation Therapy for Gynecologic Cancers

Advances in external and internal radiation therapies allow for better-targeted dosing of tumors while minimizing exposure of normal tissues

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Radiation therapy, or radiotherapy, is often one component of treatment for gynecologic malignancies such as [cervical](#), [vaginal](#), and [endometrial](#) cancer.

The goal of radiation therapy is to administer an effective dose of radiation to a patient's cancerous area while minimizing exposure of tissues that could be harmed, such as the bladder, bowel, and rectum. Radiation is delivered in one of two ways: from the outside, using external beam radiotherapy (EBRT), or internally, which involves inserting a radioactive source within a natural cavity or implanting radioactive seeds into tissue near or within the tumor — called [brachytherapy](#).

External beam radiotherapy is often delivered in the form of intensity modulated radiation therapy (IMRT), a highly precise technique that distributes the radiation dose according to the three-dimensional shape of the tumor, and avoids radiation exposure to neighboring normal tissues. An even more advanced version of IMRT, known as “dose painting,” delivers additional boost doses to small specific areas, such as lymph nodes, within a larger radiation field.

This method enables a standard dose to treat microscopic disease and shrink tumors “while giving a little extra dose to an enlarged lymph node without extending the number of radiation treatments,” says [Larissa Lee, MD](#), director of Gynecologic Radiation Oncology at [Dana-Farber Cancer Institute](#).

Brachytherapy is frequently employed in treating cervical, vaginal cancer, and endometrial cancer. For patients treated with brachytherapy after hysterectomy, the brachytherapy applicator, called a vaginal cylinder, is placed directly in the vagina. A tiny radioactive seed delivers the radiation dose through the cylinder during an outpatient visit. For other cancers, hollow needles (known as catheters) are inserted in the tissue adjacent to and inside the tumor with the patient under anesthesia. For each brachytherapy treatment, the radioactive seed travels through the catheters, which are left in place for several days during a hospital admission.

The most recent advance in this area is image-guided brachytherapy, which is performed with CT

and ultrasound imaging in the Radiation Oncology Department at Dana-Farber, or with MRI and ultrasound in the AMIGO (Advanced Multimodality Image-Guided Operating) suite at Brigham and Women's Hospital. In many hospitals, brachytherapy applicators, including needle placement, are inserted into the patient while they are in an operating room; a CT scan or MRI afterward shows the positioning of the applicator and needles and is used for brachytherapy planning.

With image-guided brachytherapy, the use of ultrasound and CT and MRI scans during the procedure, the physician can immediately check the applicator placement and make needle adjustments to best deliver the brachytherapy dose to the tumor, while avoiding normal tissues.

"In the AMIGO suite, we now place the applicator and needles with ultrasound scanning, perform an initial MRI scan, then adjust the needles with additional MRI scans while the patient is under anesthesia," says Lee. "With real-time MRI-guidance, we can adjust the needle position to improve our brachytherapy treatment," she further explains, adding that a clinical trial carried out in France shows that cervical cancer brachytherapy using CT scans provided an improvement in tumor control and a lower rate of complications in patients.

As MRI is a better tool for imaging tumors in the pelvis, MRI-guided brachytherapy performed in the AMIGO suite may lead to further improvements in cancer control for patients.

Another advance in image-guided brachytherapy is being studied in a clinical trial using the AMIGO suite, Lee says. This trial involves the development of a new technology in which each of the brachytherapy needles is equipped with a tracking device that enables the MRI scanner to "see" exactly where the needle is located in real time. The aim is to improve the quality of the seed implants and make the procedure time shorter, explains Lee.

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