

TomoTherapy: Accurate treatment with fewer side effects



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Helical TomoTherapy is an advanced radiation oncology technology that can ease treatment regimens for patients, reducing costs and may, in some cases, yield better cancer control. The term TomoTherapy refers to both the technique and the trade name of the device.

Traditional methods of radiation focus on tumors from a limited number of angles and with wider beams of radiation, necessitating the delivery of small, divided doses of radiation over a long period of time in order to spare adjacent healthy tissue. TomoTherapy provides slice-by-slice treatment through the marriage of two technologies: spiral CT scanning and Intensity Modulated Radiation Therapy. Operating much like a CT scanner by rotating around the patient, the device provides radiation, produced and delivered by a linear accelerator, in a spiral delivery pattern. The division of beams creates dose distributions at more angles and with better precision than ever before.

The integration of imaging, treatment planning, patient positioning and treatment in one system can reduce the burden to patients by shortening the course of treatment and curtailing side effects.

Shorter and faster treatment

Oncology patients traditionally undergo daily radiation treatment for up to seven weeks. TomoTherapy allows for a condensed treatment period because each session involves delivery of a higher radiation dose.

For patients, this can mean a 50 percent or greater reduction in the number of treatment days. Moreover, most sessions last only 20 to 30 minutes. This type of schedule combined with reduced side effects results in significant benefits to patients.

“The whole treatment gets done faster,” says Patrick Kupelian, M.D., professor of radiation oncology and vice-chair of Clinical Operations and Clinical Research at UCLA. “For prostate cancer, instead of having seven or nine weeks of treatment, it can be done in a week or two weeks. It’s a tremendous convenience for patients.”

Fewer treatments also translates to lower costs. “For society, it’s a better way to approach radiation oncology treatment,” he says. “It’s a better fit for what we need to do moving forward.”

Protecting healthy tissue

Adaptive radiotherapy is a novel application that enables TomoTherapy to target high-dose radiation in cases where sparing healthy tissue is critical. Tumors change in size and anatomical formation throughout the course of radiation treatment. TomoTherapy differs from other tissue-sparing techniques with daily CT imaging used to plot the tumor's exact contours. This allows UCLA radiation oncologists to assess the tumor's size and shape in real time and make any necessary adjustments to further tighten the treatment field and conform to the tumor, resulting in greater protection to healthy tissue. This strategy is in contrast to the traditional practice of enlarging the treatment field to defend against missing any part of the tumor. TomoTherapy can expose normal tissues to less radiation than traditional radiation methods.

Advances in head and neck cancer radiotherapy

TomoTherapy can be used to treat a variety of cancers and for tumors of any size, from malignancies in confined areas, such as the prostate, to larger regions with multiple metastases. The technology is particularly well-suited to treating the head, neck, lungs and pelvis. Radiation for cancers of the tongue, throat and larynx is associated with damage to salivary glands and side effects such as dry mouth and pain. TomoTherapy's ability to provide image-guided sculpting of radiation in three dimensions within a complex anatomy prevents damage to adjacent tissues, which has been difficult to do in these cases using other radiation treatments.

TomoTherapy may also be advantageous in treating cervical and endometrial cancers in order to protect the bowel, bladder and rectum and reduce the risk of troublesome side effects. For lung cancer, the technology minimizes the risks of breathing problems and damage to the esophagus.

While TomoTherapy is most often associated with reducing side effects and shortening treatment time, it may also improve cancer control in some types of malignancies. Lung cancer outcomes may be enhanced with TomoTherapy because it allows for increasing daily radiation doses.

TomoTherapy can also be used to repeat radiation treatment to areas of the body that have been previously irradiated. This approach reduces the risk of scarring, ulceration and pain associated with repeat irradiation.

A new treatment paradigm

UCLA radiation oncologists are pursuing additional uses of TomoTherapy to improve cancer treatment. Advances in TomoTherapy are reviewed and applied in a timely manner and in close collaboration with the manufacturer. Moreover, as a complex treatment, TomoTherapy at UCLA is administered within sub-specialty oncology units to optimize the planning and delivery of treatment. Personalized patient care is augmented with the services of dietitians, social workers and specialized nurses.

Participating Physicians

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