

# Dynamic Targeting® IGRT

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### DESCRIPTION AND OVERVIEW

IGRT - or image-guided radiotherapy - refers to the use of sophisticated imaging technologies to guide the delivery of precise forms of radiation therapy. Tumors can move during treatment (usually due to patient respiration) and between treatments (usually due to day-to-day variations in patient setup). Dynamic Targeting IGRT from Varian Medical Systems offers clinicians advanced imaging techniques to verify patient position and tumor position at the time of treatment. Knowing exactly where the tumor is allows clinicians to reduce the volume of tissue irradiated, targeting only the tumor and sparing the surrounding normal tissue. Irradiating less normal tissue reduces the toxicity of radiotherapy, improving the patient's quality of life, and may make it possible to deliver higher radiation doses to the tumor and thereby increase the likelihood of local tumor control.

### HOW IT WORKS

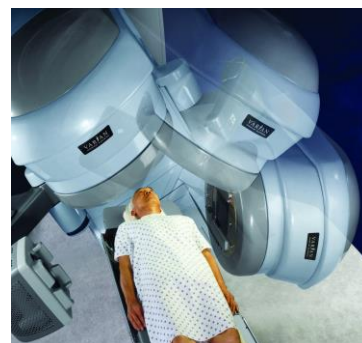
When patients are positioned on a treatment couch, an X-ray system mounted on a robotic arm is rotated around the body, to gather images that pinpoint a tumor's exact location. These images are then compared with existing images (MRI, CT or other kinds of scans) in order to determine if the tumor has moved since the last treatment. Because tissues and organs can settle around bones differently each time a patient lies down on a treatment table, tumors can end up in different positions from one treatment session to another. In addition, tumors can move several centimeters due to a patient's normal respiratory cycle.

For Dynamic Targeting IGRT, the medical linear accelerator, or treatment machine, is outfitted with a number of sophisticated imaging devices that provide the clinician with images that help to guide the treatment.

Central to this approach is Varian's On-Board Imager® kV imaging system, an imaging tool that is attached to the treatment machine on a pair of robotic arms, and produces low-dose, high-resolution kilovoltage X-ray images for pinpointing the position of the tumor immediately prior to treatment. The On-Board Imager can be operated in three distinct imaging modes to generate different types of images, including:

- Radiographic (two-dimensional)
- Fluoroscopic (moving, in real-time)
- Cone-beam CT (three-dimensional)

These distinct images types provide doctors with different information about the tumor and surrounding anatomy, revealing changes in tumor shape, size or position over a multi-week



Varian's On-Board Imager® kV imaging system gathers images, pinpointing the exact tumor location just prior to treatment.

course of treatment. Fluoroscopic images can be used to track tumor motion for a clear indication of exactly how a tumor will move during treatment due to respiration or other normal physiological processes. This enables doctors to design optimal treatments for their patients.

A system for delivering Dynamic Targeting IGRT also comprises additional tools—an electronic portal imaging device and a respiratory gating system—to enable clinicians to verify patient positioning and to synchronize treatment with the tumor motion caused by respiration. RPM™ respiratory gating system makes it possible to deliver bursts of radiation that coincide with a patient's natural breathing cycle, to further minimize exposure of surrounding healthy tissues. This enables doctors to safely treat lung and other cancers of the chest and abdomen, which move as a patient breathes in and out.



The heart is protected from unnecessary radiation during breast treatment with the RPM™ respiratory gating system.

## **PATIENT BENEFITS**

- Through more precise targeting of the beam, dosage levels can be increased and target volumes (the three-dimensional areas to receive treatment) can be reduced--so tumors get a higher dose of radiation and healthy surrounding tissues get very little. Higher doses have been shown to enhance treatment effectiveness. And better targeting reduces the possible side effects of radiotherapy.
- State-of-the-art motion management techniques allow patients to breathe naturally during treatment sessions, increasing treatment accuracy, reducing stress and increasing patient comfort.

For more information, please visit [www.varian.com](http://www.varian.com).