RapidArc
Frequently Asked Questions

What is RapidArc?

RapidArc™ radiotherapy technology is a new form of image-guided, intensity-modulated radiation therapy (IMRT). Image guidance improves tumor targeting, and IMRT shapes the radiation dose so that it conforms closely to the three-dimensional shape of the tumor. This means more dose to the tumor, and less to surrounding healthy tissue.

RapidArc quickly delivers a complete IMRT treatment with a single rotation of the treatment machine around the patient. The entire tumor volume receives the radiation dose during this one revolution of the machine.

RapidArc involves varying (or modulating) the intensity of the radiation (in this case, high-energy X-rays) being used as therapy for cancer.

To administer a RapidArc treatment, clinicians use computer-generated images to plan and then deliver tightly focused radiation beams to cancerous tumors. Using RapidArc technology, clinicians can deliver a precise radiation dose that conforms to the shape of the tumor, while limiting the amount of radiation that reaches surrounding healthy tissues.

A significant benefit provided by RapidArc is the speed of a treatment. A RapidArc treatment is delivered with a single 360-degree rotation of the linear accelerator, which takes less than two minutes.

Why would I want to be treated with RapidArc?

RapidArc is an extremely fast and precise form of radiation therapy. It allows clinicians to quickly and accurately deliver dose to cancer cells while keeping the dose to surrounding tissues as low as possible.

Faster treatments are not only more comfortable, they may also be more accurate. Since a patient will spend less time holding still, it will be easier to avoid movements that could compromise the accuracy of the treatment. RapidArc delivers treatments two to eight times faster than earlier forms of radiotherapy.

What kind of radiation is used in RapidArc?

Photons (X-rays) are used to deliver RapidArc. The radiation is generated by a machine called a medical linear accelerator. This machine stands approximately nine feet tall, is nearly 15 feet long and can be rotated around the patient with amazing precision. Operationally, microwave energy, similar to that used in satellite television transmission, is used to accelerate electrons to nearly the speed of light. As they reach maximum speed they collide with a tungsten target, which in turn releases photons, or X-rays.

Very small beams with varying intensities can be aimed at a tumor from multiple angles to attack the target in a complete three-dimensional manner. In fact, RapidArc can be delivered with beams the size of 2.5 x 5-millimeter pixels—the size of a pencil tip—each with varying intensity. The idea is to deliver the lowest dose possible to the surrounding healthy tissue, while still delivering the maximum dose to the tumor.

How does radiation therapy work?

Cancer cells grow and divide more rapidly than many of the normal cells around them. High doses of radiation can kill cells or keep them from growing and dividing, and they have proven to be particularly effective in killing cancer cells and shrinking tumors – cells that divide and grow quickly. Although some normal cells are affected by radiation, most normal cells recover more fully from the effects of radiation than do cancer cells.

Does radiation therapy expose people to radioactive substances?

Many people, when they hear the word "radiation," think immediately of radioactive substances. However, no radioactive substances are involved in the creation of X-rays or electrons by a medical linear accelerator. When a linear accelerator is switched "on," radiation is produced and aimed directly at cancer cells. Then, like a flashlight, when the machine is switched off, the radiation is gone – it no longer exists.

What happens when a person is treated with RapidArc?

RapidArc treatment involves three basic steps: diagnosis, treatment planning and delivery. As part of diagnosis, the medical team generates three-dimensional diagnostic images (usually CT or MRI) of the patient's anatomy and uses these images to specify the dose of radiation needed to treat the tumor. In some cases, treatment planning includes a simulation session to further localize the cancer and finalize the radiation treatment plan.

Patients receive RapidArc treatments according to various schedules, usually five days a week for six or seven weeks. During a RapidArc treatment, the linear accelerator rotates around the patient to deliver the radiation from nearly every angle. The radiation is shaped and reshaped as it is continuously delivered from virtually every angle in a 360-degree revolution around the patient. Treatment consisting of a 360-degree revolution takes less than two minutes.

What is the RapidArc treatment process like?

The RapidArc process is similar to a typical radiation treatment. The individual processes of a hospital may vary slightly, so please consult with your local hospital or clinic.

Treatment Preparation

Most cases require a treatment preparation session. Special molded devices that help the patient maintain the same position every day are sometimes developed at this point. Colored, semi-permanent ink is often used to mark the patient's skin, to assist in aligning the radiation equipment with the target area. X-rays may be taken in preparation for a treatment planning CT scan. The treatment preparation session might take from thirty minutes to an hour and the CT scan might take an additional 15-30 minutes.

Following the CT scan, the RapidArc planning process usually takes several days. When the treatment plan is complete, radiation treatments can begin.

Treatment Delivery

The first RapidArc treatment session is sometimes longer than subsequent ones so that additional X-rays and checks can be done. A typical RapidArc treatment lasts less than 2 minutes.

In the treatment room, the medical team uses the marks on the patient's skin to locate the treatment area. The patient is then positioned on a treatment table. Sometimes, special molded devices are used to help with immobilization to assure correct positioning.

The radiation therapist can also use the On-Board Imager® kV imaging system (OBI), an X-ray imager that is mounted on the treatment machine to position patients for sub-millimeter accurate treatment. The therapist will use the OBI to produce high-resolution X-rays of the targeted area before the daily treatment is delivered, making sure the patient is in the optimal position before administering the treatment.

The radiation therapist leaves the treatment room before the machine is turned on. The machine rotates around the patient to deliver the radiation beams, which are shaped by a special attachment called a multileaf collimator, a device with 120 computer-controlled mechanical "leaves" or "fingers" that can move to create apertures of different shapes and sizes. During a RapidArc treatment, specialized software algorithms will vary three parameters simultaneously: the speed of rotation around the patient, the shape of the MLC aperture, and the dose delivery rate.

The therapist will leave the treatment room. When the treatment begins, patients do not see the radiation. If a patient becomes uncomfortable, however, the machine can be stopped at any time.

Who are the professionals I may typically encounter?

1) **Radiation oncologist** is a doctor who has had special training in using radiation to treat diseases and prescribes the type and amount of treatment that best suits a particular patient's needs. The radiation oncologist may work closely with other doctors and typically heads a highly trained health care team.
2) A **radiation physicist** participates in the planning process and ensures that the machines deliver the right dose of radiation.
3) A **dosimetrist**, plans the treatment with the oncologist and the physicist.
4) A **radiation therapy nurse**, provides nursing care and may help patients learn about treatment or how to manage any side effects.
5) A **radiation therapist**, sets the patient up for treatment and runs the equipment that delivers the radiation.

How long is a course of RapidArc treatment?

Treatments vary depending on your diagnosis, ask your medical professional for information about your specific diagnosis. Generally, radiation therapy usually is given five days a week for six or seven weeks. When radiation is used to alleviate pain or other symptoms, the course of treatment lasts for two to three weeks. For each radiation therapy session, the patient is in the treatment room for about 10 minutes. These types of schedules, which use small amounts of daily radiation rather than a few large doses, help protect normal body tissues in the treatment area. Weekend rest breaks allow normal cells to recover. The total dose of radiation and the number of treatments a patient needs depend on the size and location of the cancer, the type of tumor, the patient's general health and other factors.

Do I become radioactive after treatment?

External radiation therapy does not cause a patient's body to become radioactive. Patients need not avoid being with other people because of treatment. Even hugging, kissing, or having sexual relations with others pose no risk to them of radiation exposure.

Side effects of radiation therapy most often are related to the area that is being treated. See your medical professional to discuss your specific diagnosis, prognosis and possible side effects from radiation treatment, if any.

Is RapidArc expensive?

Treatment of cancer with radiation can be costly. It requires very complex equipment and the services of many health care professionals. The exact cost of your radiation therapy will depend on the type and number of treatments you need.

Many health insurance policies cover charges for radiation therapy. It's a good idea for patients to talk with their insurer or with their doctor's office staff or the hospital business office about their policy and how expected costs will be paid.

What is Varian's RapidArc radiation therapy?

The main advantages of Varian's RapidArc are precision and speed.

RapidArc treatments focus the radiation on the tumor while protecting surrounding healthy tissues. A computerized tool called a multileaf collimator (MLC) shapes the beam in accordance with the optimized treatment plan. Varian offers the highest resolution MLC on the market today, one that can deliver unique doses to very small areas.

In addition, treatment with Varian's RapidArc is fast. A daily treatment can be delivered in less than two minutes.

It is believed that faster treatments may also be more accurate. Since a patient will spend less time holding still, it will be easier to avoid movements that can compromise the accuracy of the treatment.