External Beam Therapy (EBT)

This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is external beam therapy and how is it used?

External beam therapy (EBT) is a method for delivering a beam of high-energy x-rays to a patient's tumor. The beam is generated outside the patient (usually by a linear accelerator) and is targeted at the tumor site. These high energy x-rays can deposit their dose to the area of the tumor to destroy the cancer cells and, with careful treatment planning, spare the surrounding normal tissues. No radioactive sources are placed inside the patient's body.

External beam therapy can be used to treat the following diseases as well as many others:

- Breast Cancer
- Colorectal Cancer (Bowel Cancer)
- Head and Neck Cancer
- Lung Cancer
- Prostate Cancer
- Brain Tumors

Who will be involved in this procedure?

Delivery of external beam therapy requires a treatment team, including a radiation oncologist, radiation physicist, dosimetrist and radiation therapist. The radiation oncologist is a physician who evaluates the patient and determines the appropriate therapy or combination of therapies. He or she determines what area to treat and what dose to deliver. Together with the radiation physicist and the dosimetrist, the radiation oncologist determines what techniques to use to deliver the prescribed dose. The physicist and the dosimetrist then make detailed treatment calculations and quality assurance checks prior to treatment delivery.

The radiation therapists are specially trained technologists who deliver the daily treatments.

What equipment is used?

Radiation oncologists use linear accelerators or cobalt machines to deliver external beam therapy. Your radiation oncologist will determine the equipment most suited to your treatment. The linear accelerator is the most commonly used device for external beam therapy.

Linear Accelerator

Who operates the equipment?

The equipment is operated by a radiation therapist, a highly trained technologist. The overall treatment plan is created by the radiation oncologist, a highly trained physician specializing in treating cancer with radiotherapy.

Is there any special preparation needed for the procedure?

The process of external beam therapy can be divided into three parts:

- Simulation
- Treatment Planning
- Treatment Delivery

The goal of simulation is to determine the treatment position that will be used daily, to make devices that will help the patient maintain that position, and to obtain the necessary images for treatment planning. The radiation therapist places the patient in the treatment position on a special x-ray machine or CT scanner. Masks, pads or other devices may be used to help the patient to hold still and in a specific position during the simulation. These devices will be used for the treatment to achieve the same position daily, so it is important that the patient can maintain that position. Images of the treatment area are taken in the treatment position. The radiation therapist places small marks on the patients to help guide the daily treatments. Marker seeds may be placed in the target tumor or organ at simulation or during a separate surgical procedure.

For treatment planning the dosimetrist, radiation physicist and radiation oncologist use a special computer to calculate the radiation dose that will be delivered to the patient's tumor and the surrounding normal tissue. The radiation oncologist will determine the volume of the tumor and other areas that needed to be treated and outline those on the treatment planning films. He or she will also outline normal structures that should be avoided or considered in devising the treatment plan. Together, the oncologist, dosimetrist and physicist will generate a treatment plan that delivers the appropriate dose to the tumor while minimizing dose to surrounding normal tissues. In certain cases, this process may employ such techniques as three-dimensional conformal therapy or intensity-modulated radiation therapy. This planning is based on CT, MRI and PET/CT scans which may be done in the Radiology Department or the Radiation Oncology Department.

After the simulation and treatment planning have been completed, the treatment itself can begin.

How is the procedure performed?

The radiation therapist brings the patient into the treatment room and places him/her on the treatment couch of the linear accelerator in exactly the same position that was used for simulation using the same immobilization devices. The therapist carefully positions the patient using the alignment lasers and the marks that had been placed on the patient during simulation. Some form of imaging is often used prior to the treatment delivery to verify the accuracy of the patient setup. Some of the types of imaging that can be used include x-rays, ultrasound, and cone beam CT. The therapist goes outside the room and turns on the linear accelerator from outside. Beams from one or more directions may be used and the beam may be on for as long as several minutes for each field.

The treatment process can take 10 to 30 minutes each day and most of the time is often spent positioning and imaging the patient. The duration of a patient's treatment depends on the method of treatment delivery such as IMRT and the dose given. The length of each treatment will usually be the same from day to day.

Patients usually receive radiation treatments once a day, five days a week for a total of two to nine weeks. The patient's diagnosis determines the total duration of treatment. Occasionally, treatments are given twice a day.

What will I feel during this procedure?

External beam therapy is painless but you will hear a buzzing noise during treatment. You feel nothing out of the ordinary. Patients may sometimes smell an odd smell during treatment that is caused by the ozone produced by the linear accelerator. Some patients may also see a colored light when they receive their treatment; this event is especially true for patients having their brain treated.

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