

The Linear Accelerator

The linear accelerator is the machine that administers targeted dosages of radiation to cancerous tumors, during radiation therapy.

We are in the process of replacing our old linear accelerator, which is 23 years old, with a more modern linear accelerator. The new linear accelerator—or LINAC—will provide more precise and effective treatments, in several ways.

- The new LINAC offers **computer-driven quality assurance**. The precise coordinates of a treatment area (tumor) are outlined on computer images, after having been determined by a CT scan. These parameters are then electronically downloaded to the linear accelerator, resulting in very streamlined, accurate treatment.

The current accelerator, by contrast, cannot "talk" to a computer.

- The **multi-leaf collimators** on the new LINAC are highly flexible, and can shape themselves precisely to the form of a tumor, thus ensuring that the radiation beam avoids healthy tissue surrounding the tumor. This translates to **more precise radiation distribution; more concentrated dosages of radiation to cancer cells; reduced risk to healthy cells and normal tissue**.

With the old LINAC, clinicians have had to shape individual lead-alloy blocks, to block parts of the radiation beam, so that only targeted areas would be exposed. This is extremely labor-intensive, because the lead-alloy blocks have had to be custom molded for each individual patient. Furthermore, the process of shaping these blocks could not be entirely exact, even with the most fastidious effort.

- The new LINAC has a **dual-energy photon beam** that permits more powerful and precise treatment of deep-seated tumors.
- The **electron beam** on the new LINAC permits treatment of surface tumors, or very shallow tumors, reducing danger to underlying normal tissue.
- The new LINAC system permits **portal imaging** during radiation treatment, allowing physicians to view what is taking place in the body *in real time*.

With the older equipment, a picture (called "port film") must be taken and developed, and then corrections made accordingly in the set-up of *subsequent* treatment. But with portal imaging, everything is recorded instantaneously, and changes in the treatment set-up can be effected *within seconds*.

- Procedures done on the new LINAC will be quicker and **less time-consuming**.

Using the older equipment, the therapist turns the machine to a certain angle, sets blocks in place, leaves the room, and then the machine emits a radiation beam. Then this process is repeated: the therapist reenters the treatment room, turns the machine to the next angle, places a new set of blocks, and so on. Often this process needs to be repeated four to five times per treatment.

The new LINAC, however, can be programmed to administer an entire treatment sequence, with no manual adjusting—or blocks—required. This is far simpler and **less traumatic for patients**.