

Radiation Oncology At Sylvester

Power Meets Precision

Radiation therapy is a highly effective treatment for many types of cancer. Radiation – delivered in several different ways – damages the DNA, or genetic “blueprint,” of both healthy and cancerous cells. However, cancer cells usually are much less able to repair DNA damage, which often leads to the destruction of tumor cells.

Radiation administration in small doses each day is designed to take advantage of this difference between cancer cells’ and normal cells’ ability to repair themselves. For this reason, radiation therapy is often administered over a period of several weeks. At Sylvester, we have embraced new technology that works to expose as few healthy cells to the radiation as possible, while precisely targeting cancer cells.

There are two main ways of administering radiation therapeutically: *externally* or *internally*. Your Sylvester radiation oncologist, working closely with the other specialists on your cancer treatment team, will customize a radiation treatment plan and advise you on which approach is best for you.

To plan your treatment, we use state-of-the-art *molecular and functional imaging using positron emission tomography (PET)* and/or *magnetic resonance imaging (MRI)*. These techniques are capable of measuring vascular, metabolic, and molecular abnormalities in tumors that aid in finely tailoring the delivery of radiation to different areas in the body (such as nearby lymph nodes) as well as regions within the main tumor.

INTERNAL RADIATION THERAPY

There are several ways of delivering radiation internally. The most commonly used methods involve implanting radiation sources in tumor tissue (*interstitial brachytherapy*) or into a cavity (*intracavitary brachytherapy*). Interstitial brachytherapy is commonly used for the treatment of prostate, breast, and head and neck cancers, and may be accomplished using permanently implanted low dose rate radioactive seeds or needles, or temporary high dose rate catheters containing radioactive material. Intracavitary brachytherapy is often used in the treatment of cervix, endometrial, and lung cancers, and more often today involves the use of high dose rate radioactive sources. There are a number of variations on how brachytherapy is accomplished and the methods continue to evolve.

For both low dose rate and high dose rate brachytherapy, sophisticated computer planning is used to optimize the placement of the radioactive sources so the tumor is precisely treated, while sparing the surrounding normal tissues as much as possible. *This is a fundamental tenet of radiotherapy and applies equally to the use of external beam radiation.*



EXTERNAL BEAM RADIATION THERAPY

In external beam radiotherapy, the patient lies on a treatment couch while a *linear accelerator gantry* rotates around the patient to administer the radiation from outside the body. Linear accelerator (LINAC) machines have greatly improved in terms of automating the process and allowing for better targeting of the tumor. At Sylvester, we often use *intensity-modulated radiation therapy (IMRT)* and *stereotactic radiosurgery (SRS)* with image guidance; these are unparalleled methods for the precise delivery of radiation.

Intensity-modulated Radiation Therapy

Intensity-modulated radiation therapy, or IMRT, uses 3D-imaging from computed tomography scans (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) scans to design the optimal approach for treating a particular cancer.



Sylvester Treatment Room

For IMRT, the radiation beam is broken down into many “beamlets.” The intensity of the radiation can be controlled and varied for each “beamlet.” Once the physician defines the target amount of radiation he or she wants to deliver, the computer will calculate how best to distribute the intensity of the radiation to each “beamlet” so the radiation builds up around the tumor and we reduce exposure of normal tissues. In fact, now we can create very high differences or a “high gradient” between the amount of radiation around the tumor and the adjacent normal tissue – to a degree never before possible.

Sylvester’s radiation oncology team leads the region in new technology for IMRT. In fact, Sylvester was the first facility in South Florida to offer this treatment. We now incorporate new, unique techniques for tracking the natural movement of a tumor in real time (*Calypso™ 4D Localization System*) and use *RapidArc™* to



administer the treatment in less than one-third the time a standard IMRT treatment would take. Moreover, we are pioneering an effort to incorporate advanced imaging methods to better delineate the tumor in this process.

Stereotactic Radiosurgery/Radiotherapy

Stereotactic radiosurgery (SRS) and *stereotactic radiotherapy* (SRT) take the technology to another level of precision and allow us to increase the dose of radiation we deliver. Small brain, lung, and liver tumors are effectively treated with this technology. The role of stereotactic radiosurgery/radiotherapy is rapidly expanding as we discover new applications that are yielding significant gains in tumor control. Very high radiation doses can be administered to very focused areas that

destroy the tumor. Sometimes only one treatment is given (SRS), while in other cases the radiation may be split into 2 to 5 doses (SRT).



Alan Pollack, M.D., Ph.D.
Chairman, Radiation Oncology

Sylvester uses the latest technology for SRS/SRT: the Gamma Knife, which focuses over 200 radiation beams on a single tumor; the Cyber Knife®, a similar machine mounted on a robotic “arm;” and LINAC-based techniques.

Advanced Technology For Prostate Cancer Treatment

Sylvester has a team of specialized physicians that have published many papers about prostate cancer and are known world-wide as experts in prostate cancer and other genitourinary malignancies. The approach they currently use builds on decades of experience, combining the most advanced technologies to improve the precision of IMRT for patients with prostate cancer. And increasing the precision allows us to safely deliver the highest possible doses of radiation to the cancer cells with less damage to surrounding tissue.

“Applying this combination of technological advances to the treatment of prostate cancer will minimize side effects, while simultaneously enhancing cure rates,”

says **Dr. Alan Pollack, M.D., Ph.D., Chairman of Radiation Oncology at Sylvester Comprehensive Cancer Center.**

FDA-approved for treatment of prostate cancer, the Calypso™ acts as a “GPS” tracking device. Electromagnetic transponders implanted into the prostate send signals to the Calypso which tracks every tiny body movement, making sure the radiation targets the prostate. This allows us to focus the beam for portions of the treatment on the cancer specifically.

Prostate cancer specialists in imaging, urologic oncology, and radiation oncology at Sylvester are using new and unique MRI imaging techniques to identify the dominant tumor region in the

prostate to better design treatment. In radiotherapy, these functional imaging methods are invaluable in the planning process. Given the greater precision of IMRT and the ability to track the motion of the tumor during radiotherapy, the use of functional imaging opens the door to unique methods that build up radiation doses in the tumor – and only the tumor.

Sylvester also uses the Varian Trilogy System with RapidArc™ technology that helps deliver IMRT much more rapidly. For instance, a treatment that used to take 15 to 20 minutes now takes less than 3 minutes. Therefore, the prostate has less time to move and the patient is much more comfortable. There are additional, radiobiological reasons for wanting to give the radiation in a shorter period of time that are advantageous to the goal of complete tumor eradication.

SYLVESTER: A LEADER IN TECHNOLOGY

Pioneers at Sylvester

Sylvester is the only academic Radiation Oncology department in South Florida, attracting top clinicians and researchers.

- The Department of Radiation Oncology was a major contributor to a national 3-D Radiation Treatment study for prostate cancer.
- Members of our department pioneered the development of linear accelerator-based stereotactic radiosurgery.
- Members of the Sylvester team patented an innovative technology called the Wolfson-Wu applicator, used to deliver radiotherapy to treat gynecological cancers.
- Members of our department lead national clinical trials that enroll patients from around the country.

Facilities and Tools

We maintain state-of-the-art facilities and technologies for our patients. We offer resources such as:

- Three linear accelerators, including two with IMRT capabilities and image-guidance.
- Calypso system for tumor tracking.
- RapidArc for more rapid delivery of radiation
- Integration of functional imaging into radiation treatment planning to better define the tumor volume.
- A Siemens 40-slice 4D-CT scanner for crystal-clear imaging
- Low dose rate and high dose rate brachytherapy that is administered by site disease specialists.
- Multidisciplinary site disease teams that design an integrated approach with their surgical and medical oncology colleagues.

For more information on radiation therapy at Sylvester, our technologies and facilities, or to schedule an appointment, call 305-243-4200 or visit www.sylvester.org.

Sylvester Comprehensive Cancer Center
1475 N.W. 12th Avenue, Miami, FL 33136
305-243-4200 • www.sylvester.org