Baptist Hospital

Radiation Oncology
Physician Supervision
Education

BAPTIST HEALTH CARE

Department of Radiation Oncology

Baptist Health Care offers radiation oncology at two locations:

Baptist Medical Towers
Kugelman Cancer Center
Monday – Friday: 8:00 AM – 4:30 PM
(dependent upon census)

Gulf Breeze Hospital
Ciano Cancer Center
Monday – Friday: 8:00 AM – 2:00 PM
(depending on census)

BAPTIST HEALTH CARE

Department of Radiation Oncology

- Radiation Oncology is the field of medicine focused on the treatment of cancer with high energy and precise beam radiation therapy. Radiation can be given either alone or in combination with surgery and/or chemotherapy. It may be used to heal patients with curable cancers or relieve symptoms in patients with incurable cancers.

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Radiation Therapy depends on the use of a linear accelerator “lin ac” for the delivery of radiation therapy. ***Click here*** for video of “How a linear accelerator works::

http://www.youtube.com/watch?v=jSgnWfbEx1A

Department of Radiation Oncology

- Radiation therapy is commonly applied to the cancerous tumor because of its ability to control cell growth. Ionizing radiation works by damaging the DNA of exposed tissue leading to cellular death.

- To spare normal tissues (such as skin or organs which radiation must pass through to treat the tumor), shaped radiation beams are aimed from several angles of exposure to intersect at the tumor, providing a much larger absorbed dose there than in the surrounding, healthy tissue.

- Besides the tumor itself, the radiation fields may also include the draining lymph nodes if they are clinically or radiologically involved with tumor, or if there is thought to be a risk of sub clinical malignant spread.

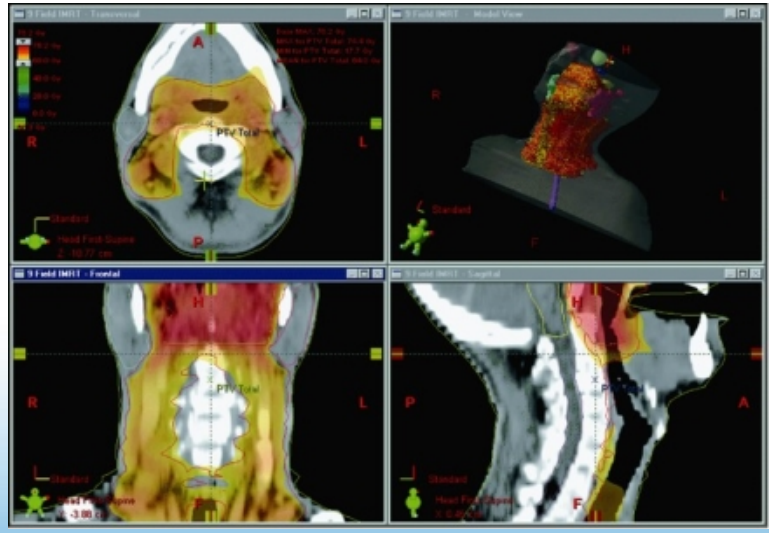
- It is necessary to include a margin of normal tissue around the tumor to allow for uncertainties in daily set-up and internal tumor motion. These uncertainties can be caused by internal movement (for example, respiration and bladder filling) and movement of external skin marks relative to the tumor position.

Radiation Oncology Team

- **Radiation Oncologist:** A physician who specializes in the treatment of cancer patients, using radiation therapy as the main modality of treatment. They work closely with other physicians such as surgeons, internal medicine specialists and medical oncologists as part of the multi-disciplinary cancer team.

- **Radiation Medical Physicist**: Responsible for the calibration and maintenance of sources and equipment, quality assurance. Works with the physician to assure the accurate delivery of all aspects of a treatment prescription.

- **Radiation Oncology Nurse:** Works with the physician to assess the patient and monitor side effects while providing education and support to the patient and family, while coordinating the overall patient treatment plan.



Radiation Oncology Team

Radiation Dosimetrist:

- Radiation **dosimetry** is the measurement and calculation of the radiation dose. Medical dosimetrists specialize in the planning of optimal radiation treatment techniques and dose calculations in collaboration with the medical physicist and radiation oncologist.
- The dosimetrist uses computer software to calculate treatment plans to distribute the radiation ensuring that damage to surrounding tissues are minimized.

Radiation Therapist:

- Radiation therapists use high tech machines, called linear accelerators, to administer beams of radiation directly to the patient's tumor.
- First, the radiation therapist must identify the location of the tumor using imaging equipment, such as a CT scanner.
- Once the tumor location has been pinpointed, the radiation therapist operates the linear accelerator from a separate room where they are not exposed to the radiation.
- Each treatment session is about 20 minutes, and is delivered regularly, sometimes daily, over the course of several weeks.
- The radiation therapist is the person who is hands on with the patient and actually delivers the prescribed dose of radiation to the patient daily, using advanced computer systems to operate the linear accelerators.

Radiation Doses and Treatment

- The amount of radiation measured in gray (Gy), and varies depending on the type and stage of cancer being treated. For curative cases, the typical dose for a solid epithelial tumor ranges from 60 to 80 Gy, while lymphomas are treated with 20 to 40 Gy.

- Many other factors are considered by radiation oncologists when selecting a dose, including whether the patient is receiving chemotherapy, patient co-morbidities, whether radiation therapy is being administered before or after surgery, and the degree of success of surgery.

- Delivery parameters of a prescribed dose are determined during treatment planning (part of dosimetry). Treatment planning is generally performed on dedicated computers using specialized treatment planning software.

- The total dose is fractionated (spread out over time) for several important reasons. Fractionation allows normal cells time to recover, while tumor cells are generally less efficient in repair between fractions. Fractionation also allows tumor cells that were in a relatively radio-resistant phase of the cell cycle during one treatment to cycle into a sensitive phase of the cycle before the next fraction is given.

- Typically a patient will receive a 15-20 minute appointment. The actual beam is “on” for 5-10 minutes. They may receive from 1-40 daily treatments in their radiation treatment course.

Common Types of Radiation Therapy

- **External beam radiation therapy:** Treatment using linear accelerators that produce high energy ionizing radiation focused to a particular part of the patient's body. Photons are used to treat deep seated tumors and electrons are used to treat superficial tumors such as skin cancer.

- **Intensity-modulated radiation therapy (IMRT)** is an advanced type of high-precision radiation that is the next generation of 3D treatment. IMRT improves the ability to conform the treatment volume to concave tumor shapes,for example when the tumor is wrapped around a vulnerable structure such as the spinal cord or a major organ or blood vessel. Computer-controlled x-ray accelerators distribute precise radiation doses to malignant tumors or specific areas within the tumor.

- **Brachytherapy** (internal radiation therapy)

Common Types of Radiation Therapy

- **Stereotactic radiation** uses focused radiation beams targeting a well-defined tumor, relying on detailed imaging scans, computerized three-dimensional treatment planning and precise treatment set-up to deliver the radiation dose with extreme accuracy. Radiation oncologists perform stereotactic treatments, often with the help of a neurosurgeon for tumors in the brain or spine. It is best for very small tumors.

- The planning procedure normally takes a total of 4 hours including 'free time' breaks, but may take longer due to the CT scans

- The patient receives a high dose of radiation to the tumor in a short amount of time, therefore treatment can be completed in one to five days rather than over several weeks.

Side Effects of Radiation Therapy

- Patients can not feel, smell or tell when they are being treated.
- There is not an immediate reaction to the XRAY beam that would cause immediate emergent symptoms such as an anaphylactic reaction.
- Radiation therapy is in itself painless. Many low-dose palliative treatments (for example, radiation therapy to bony metastases) cause minimal or no side effects.
- Higher doses can cause varying side effects during treatment (acute side effects), in the months or years following treatment (long-term side effects), or after re-treatment (cumulative side effects).
- The nature, severity, and longevity of side effects depends on the organs that receive the radiation, the treatment itself (type of radiation, dose, fractionation, concurrent chemotherapy) and the patient.
- Chemotherapy can be given in conjunction with radiation to “hyper-sensitize” cancers to radiation. They are often given together when treating small cell lung, non small cell lung, head & neck, GI and GYN cancers. The organs involved are also hyper-sensitized and decrease patient tolerance. The Med Onc and Rad Onc would determine if a break in chemotherapy and or radiation is needed to improve tolerance.

Side Effects of Radiation Therapy

•Some radiation patients may be very ill, especially those with advanced cancer and those also receiving chemotherapy. Those who are dehydrated, neutropenic or have other co-morbidities may require an evaluation by the medical oncologist or the Emergency Room physician.

•Radiation to one or all sites being treated may need to be temporarily held depending on the condition of the patient.

•If the patient needs a break in treatment, the Radiation Oncologist and radiation oncology team will determine the length of the interruption of the treatment.

•Side effects from radiation are usually limited to the area of the patient's body that is under treatment.

•Modern radiation therapy aims to reduce side effects to a minimum and to help the patient understand and deal with side effects that are unavoidable.

•Most side effects are predictable and expected.

Possible ACUTE Side Effects of Radiation

Acute reactions are defined as those occurring "during the course" of treatment. Most occur after a few weeks of treatment.

Skin Breakdown

•Typically the skin starts to become pink and sore after two weeks into treatment and increase until the end of treatment. Moist desquamation is uncomfortable, recovery is usually quick.
•May be worse if chemotherapy is being given at the same time.
•Tends to be worse in areas where there are natural folds in the skin, such as underneath the female breast, behind the ear, and in the groin.
➢***Treatment:*** Minimize trauma to the area (loose fitting clothes). Manage with topical medications, prescription steroid creams or Silvadene depending on severity.

Intestinal discomfort/Enteritis

•From radiation to the intestines. Cramping or diarrhea may occur after a few weeks of treatment.
➢***Treatment:*** Immodium, Lomotil. May need hydration fluids.

Paradititis

•May occur within hours after radiation to the parotid. It is rare and non emergent.
➢***Treatment:*** Anti-inflammatory treatment, ENT consult to rule out obstruction

Possible ACUTE Side Effects of Radiation

Mucositis

- When the head and neck area is treated, temporary soreness and ulceration commonly occur in the mouth, pharnyx, esophagus.
- ***Treatment:*** Carafate, Magic Mouthwash, Lidocaine.
- Treat the underlying candidias with Diflucan.
- If severe, and affecting swallowing, the patient may need pain medications and nutritional support/food supplements.

Nausea and vomiting

- Not a general side effect of radiation therapy, associated with radiation to the stomach or abdomen. When the GI tract is treated, the stomach more so than the intestines cause nausea.
- ***Treatment:*** Anti-emetics. Occasionally with gastric, pancreatic or large abdominal radiation fields, the patient may need to be pre-medicated with Zofran. Anticipatory nausea for any reason can be treated with medication such as Ativan.

Cerebral Edema

- Brain radiation may increase existing intracranial pressure caused by pressure from the tumor(s). Symptoms may be headaches, nausea or worsened neurologic deficits such as lethargy.
- ***Treatment:*** Responds to Dexamethasone, increase the dose if patient is already receiving. An acute neurological worsening would require possibly stopping treatment, CT scan to rule out bleed or other CNS event. May need ER evaluation.

Possible LATE Side Effects of Radiation

Late side effects occur months to years after treatment and are generally limited to the area that has been treated. They are often due to damage of blood vessels and connective tissue cells.

Fibrosis: Tissues which have been irradiated tend to become less elastic over time due to a diffuse scarring process.

Dryness: Dry mouth, dry eyes, sweat glands in treated skin (such as the armpit) tend to stop working, and the naturally moist vaginal mucosa is often dry following pelvic irradiation.

Lymphedema, the most commonly reported complication in breast radiation therapy patients who receive adjuvant axillary radiotherapy following surgery to clear the axillary lymph nodes.

Cancer and secondary malignancies are seen in a very small minority of patients – usually less than 1/1000. It usually occurs 20 – 30 years following treatment.

Heart disease has potentially excess risk of death from heart disease seen after some past breast cancer RT regimens.

Radiation proctitis long-term effects on the rectum including bleeding, diarrhea and urgency and is associated with radiation therapy to pelvic organs. Pelvic radiation therapy can also cause radiation cystitis when the bladder is affected.

Spinal Cord Compression – Emergent Radiation Treatment

- **Spinal cord compression** develops when the spinal cord is compressed by bone fragments from a vertebral fracture, a tumor, abscess, ruptured intervertebral disc or other lesion.

- It is regarded as a medical emergency independent of its cause, and requires swift diagnosis and treatment to prevent long-term disability due to irreversible spinal cord injury.

- Symptoms suggestive of cord compression are back pain, paralysis of limbs below the level of compression, decreased sensation below the level of compression, urinary and fecal incontinence.

- Diagnosis is by (MRI) of the whole spine.

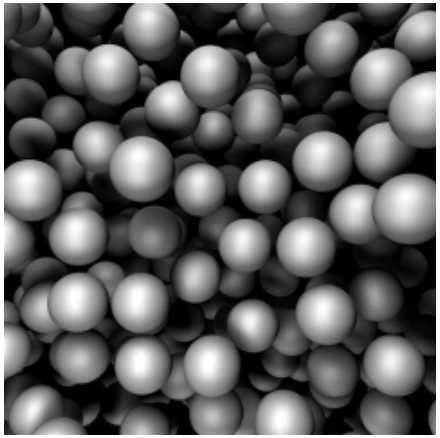
- Tumors that commonly cause cord compression are lung cancer (non-small cell type), breast cancer, prostate cancer, renal cell carcinoma, thyroid cancer, lymphoma and multiple myeloma.

BAPTIST HEALTH CARE

Spinal Cord Compression – Emergent Radiation Treatment

- Dexamethasone doses of 16 mg/day may reduce edema around the lesion and protect the cord from injury. It may be given orally or intravenously for this indication.
- Emergency radiation therapy (usually 20 Gray in 5 fractions, 30 Gray in 10 fractions or 8 Gray in 1 fraction) is the mainstay of treatment for malignant spinal cord compression.
- Radiation is very effective as pain control and local disease control.
- Surgery is indicated in localized compression as long as there is some hope of regaining function. It is also occasionally indicated in patients with little hope of regaining function but with uncontrolled pain.
- Postoperative radiation is delivered within 2-3 weeks of surgical decompression.
- Some spine tumors are highly sensitive to chemotherapy (e.g. lymphomas, small-cell lung cancer) and may be treated with chemotherapy alone.
- Once complete paralysis has been present for more than about 24 hours before treatment, the chances of useful recovery are greatly diminished, although slow recovery, sometimes months after radiotherapy, is well recognized.
- The median survival of patients with metastatic spinal cord compression is about 12 weeks, reflecting the generally advanced nature of the underlying malignant disease.

Other procedures in Radiation Therapy

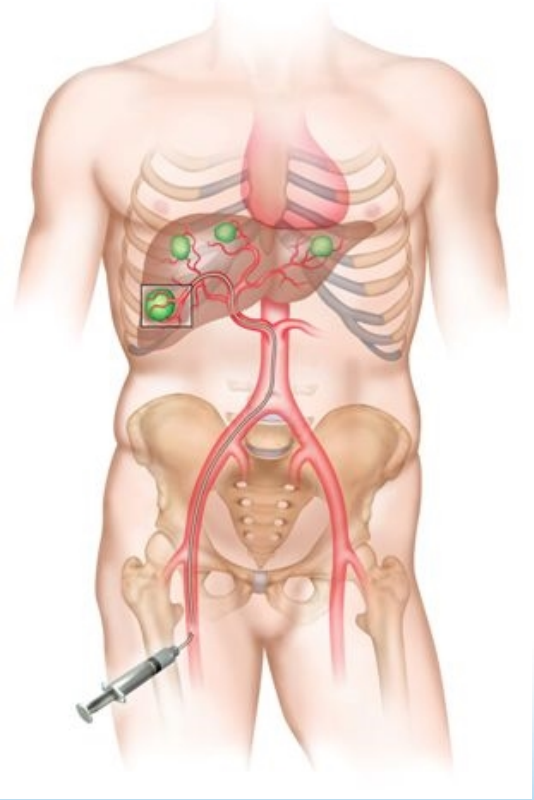


SIR-Spheres® Microspheres

SIR-Spheres microspheres are used to treat **metastatic liver cancer which is one of the deadliest forms of cancer.** Colorectal cancer is the second leading cause of death in the US. The liver is the most common site for the cancer to metastasize or spread. Of the nearly 150,000 Americans diagnosed with colorectal cancer every year, at least 60 percent will see their cancer spread to the liver.

SIR-Spheres microspheres *(pictured left)* are microscopic polymer beads that contain the radioactive element yttrium-90 (Y90) and emit beta radiation to kill cancer cells. Due to their small size, they travel easily through the bloodstream directly to the liver. The microspheres become lodged in the small blood vessels supplying the tumor and kill the cancer cells. SIR-Spheres microspheres and SIRT are considered a safer and more effective method of using radiation to treat metastatic liver cancer and are often used in conjunction with chemotherapy.

Other procedures in Radiation Therapy



- Insertion of the spheres is performed as an outpatient procedure in an interventional radiology suite and requires the placement of a transfemoral microcatheter *(pictured left)* that is positioned into the femoral artery near the groin.
- Using the liver's unique vascular supply, millions of tiny resin microspheres charged with yttrium-90 (beta radiation) are released to the hepatic circulation *(pictured left)*.
- The radioactive microspheres are selectively implanted in the microvascular supply of the tumor where they become trapped. The microspheres emit beta radiation for a period of two weeks.
- The treatment normally takes about 60 to 90 minutes and after careful monitoring, the patient may return home four to six hours after the procedure.
- The reported side effects are few; most patients experience flu-like symptoms for a period of one to three weeks. Patients can resume their chemotherapy treatments soon after the procedure and depending upon the patient's performance status, chemotherapy may be administered concurrently with the SIRT procedure.

Other procedures in Radiation Therapy

- Keloids and hypertrophic scars can be troublesome not only due to their aesthetic effects, but also due to functional disturbance they may cause.
- Hypertorphic scars are wide and thick scars that grow within the borders of the original incision.
- Keloid scars, on the other hand, grow beyond the confines of the original skin incision or scar. Keloids can grow to become massive, causing emotional harm and functional damage in affected patients.
- Recurrent or large keloids may require surgical excision followed by radiation therapy.

Quality Assurance

Certain quality assurance checks in place that may result in the need to temporarily alter the patient treatment plan:

QA for Clinical Assessment: The patient is assessed weekly by the radiation RN (and as needed) for any adverse reactions. The information will be presented to the physician in case the treatment plan needs to be altered. In addition, monthly trends are recorded and reported to the department director and the medical director and quarterly to the hospital quality review team.

Weekly Physics Chart Checks: To ensure the accuracy of daily charting of the treatment prescription and weekly monitoring of the physician prescription, all charts under treatment will be checked weekly by the Medical Physicist. Any errors in calculations, missed dose or field changes and improper charting of information will be reported to the Medical Director in case treatment needs to be altered.

Digital portal imaging acquisition and review: The linear accelerator has the ability to take an x-ray of beam placement on the patient prior to treatment. Portal imaging (on-board x-ray) helps ensure treatment plan recording and verification, accurate patient setup, effective treatment delivery, and more successful patient outcomes. All patients receive initial and ongoing portal images during their entire course of treatment. The images are reviewed by the radiation therapist and the physician. If the image shows beam placement that is different than the prescribed treatment plan, treatment may be altered.

Radiation Therapy Accidents & Emergencies

There are rigorous procedures in place to minimize the risk of accidental overexposure of radiation therapy to patients. Although medical errors are exceptionally rare, radiation oncologists, medical physicists and other members of the radiation therapy treatment team work to eliminate them.

For true emergencies:

- At the Baptist Medical Towers, a code will be called and responded to by the ER and code team.
- At the Gulf Breeze Ciano Cancer Center, the staff will call 911.

This concludes the education for Baptist Hospital Radiation Oncology.