



## **RADIATION THERAPY**

Radiation therapy can be an effective treatment for certain tumors. A beam of energy is focused at the tumor region, and the exposed cancer cells are gradually eliminated with a series of radiation doses. Radiation is often used with surgery and chemotherapy.

### **RADIATION RECOMMENDATIONS**

Radiation may be recommended in either a definitive setting or a palliative setting. With definitive therapy, our goal is to use radiation to rid the patient of cancer cells. The goal of palliative therapy is to treat pain and inflammation associated with the tumor, helping the patient become more comfortable. Common settings for radiation therapy include the following.

**Surgery in conjunction with radiation:** Due to the location and behavior of some tumors, removing the entire tumor with enough normal tissue to collect every cancer cell is not always possible. Surgery specimens are examined by a veterinary pathologist to measure the margins (normal tissue surrounding edge of the cancer). Definitive radiation therapy is used to treat microscopic cancer cells that may be left behind after surgery is performed. For some patients, definitive radiation is used to treat these extensions around the tumor prior to surgery. A radiation oncologist will consider the tumor size, location, type and other factors to decide when radiation will be best.

**Radiation alone:** Definitive radiation therapy is recommended for tumors that cannot be removed without great risk or complications for the patient. Some tumors that are commonly treated with radiation alone include tumors inside the nasal passage, perineum and brain, and some soft tissue sarcomas.

**Palliative radiation:** Palliative radiation is given to reduce pain and swelling for some tumors. The goal of palliative therapy is not to cure the patient's disease, but to improve the patient's quality of life. Many tumors will decrease in size with palliative radiation. The benefits often last two to four months, and pain control may start within days of the first radiation dose. Improvement does not occur for every patient, while in others the effects can last longer than four months. When symptoms of the cancer return, palliative therapy may be repeated for most patients that responded to the first course of therapy.

Radiation Therapy utilizes high energy photons or electrons to target cancer cells and is used in the treatment of some types of cancer. Radiation therapy treats a specific tumor location and kills rapidly growing cancer cells and can be used either by itself or in conjunction with surgery and/or chemotherapy.

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**LOS ANGELES**  
**(310) 558-6120**

**ORANGE COUNTY**  
**(949) 552-8274**

**SAN FERNANDO VALLEY**  
**(818) 888-6882**

**SOUTH ORANGE COUNTY**  
**(949) 262-5150**

**[www.VetCancerGroup.com](http://www.VetCancerGroup.com)**

## **RADIATION OPTIONS**

**Conventional definitive radiation:** Conventional radiation therapy utilizes multiple doses of small increments of high-energy x-rays to target a tumor and is usually given on a Monday through Friday daily schedule over a period of 3 weeks to 1 month. Because the radiation passes through normal tissue surrounding the tumor, multiple doses of radiation are given to maximize the damage to the abnormal cancerous tissue while minimizing the damage to the surrounding normal tissue. Conventional radiation therapy is mainly utilized for specific tumors that have tiny tendrils of cells extending from the tumor that are not possible to see with the human eye (microscopic disease) or with any specific imaging, and can be very successful in achieving adequate treatment “margins”. Depending on the location of the tumor, detailed imaging modalities such as a CT or MRI as well as a computerized three-dimensional treatment planning may also assist in the radiation planning.

**Stereotactic radiosurgery (SRS) or Stereotactic Body Radiation Therapy (SBRT):** SRS (used to treat the brain or spine) or SBRT (used to treat structures outside the brain) uses focused radiation beams to target a well defined tumor, relying on detailed imaging, computerized three-dimensional treatment planning, and precise treatment set up to deliver the radiation dose with extreme accuracy (stereotactically). Because of the accuracy of the treatment, normal surrounding tissue is mostly avoided and therefore the entire radiation dose can be delivered in 2 or 3 sessions, thus minimizing the need for multiple anesthesia episodes. Radiation side effects are rare to absent, and treatment is usually completed within one week. Different types of machines are capable of treating tumors stereotactically, including Veterinary Cancer Group’s own **on-site** Varian Trilogy Linear Accelerator (the only private veterinary practice to offer such an option) or an off site CyberKnife robotic radiosurgery machine.

**Intensity modulated Radiation Therapy (IMRT):** Like conventional radiation therapy, IMRT utilizes multiple doses of small increments of high-energy x-rays to target a tumor and is also usually given on a Monday through Friday daily schedule over a period of 3 weeks to 1 month. IMRT is another complex and precise technique of delivering radiation therapy that like SRS or SBRT relies on detailed imaging, computerized three-dimensional treatment planning, and precise treatment planning in order to obtain the accuracy needed to minimize radiation side effects. Due to its precision, IMRT allows for minimal dose to be delivered to the surrounding normal tissues and is beneficial for tumors in the nasal cavity or regions where normal radiosensitive structures need to be avoided. The radiation oncologist determines if IMRT would be more beneficial than conventional radiation therapy or stereotactic radiosurgery.

**Palliative Radiation Therapy:** Palliative radiation therapy is used to treat pain and inflammation associated with tumors, and is utilized for patient comfort measures. It is a short course of therapy usually given over 3-5 days with minimal to no side effects, and may also benefit in decreasing the tumor size or slowing its progression.

**Strontium Plesiotherapy:** Strontium plesiotherapy uses a small dime-sized radioactive probe to deliver radiation therapy to superficial tumors of the skin, eyelids, and ears. Side effects are rare because the radiation only travels to a depth of about 4 mm, thus avoiding underlying structures from receiving any radiation. Treatment is usually completed in 1 or 2 short sessions lasting between 5-10 minutes.

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## **TREATMENT SCHEDULE**

When radiation is given to control pain, treatments are given once every 3-4 weeks, or over five consecutive days (not including weekends). The radiation oncologist determines the number of treatments after considering the tumor type and location. Each treatment requires that your pet remain completely still for 10-20 minutes, so a short-acting general anesthetic is given each time. A small but real risk is associated with the anesthesia, and blood tests, x-rays (radiographs) and careful monitoring minimize this risk for your pet.

## **SIDE EFFECTS**

As with any type of cancer therapy, certain side effects can occur with radiation therapy. Since radiation therapy is limited to one region of the body, side effects are also restricted to that area. With stereotactic radiosurgery or palliative radiation therapy, side effects rarely occur but are usually more common with conventional radiation and IMRT. If side effects occur, most begin after 10 to 12 treatments and heal approximately 2 to 5 weeks after therapy ends. If acute side effects occur, we keep our patients as comfortable as possible with pain medications and anti-inflammatories.

If radiation includes the mouth or nose, ulceration of the moist tissue of the mouth can occur (called mucositis). Oral rinses, soft foods, and topical numbing agents can reduce discomfort. Since radiation can temporarily decrease taste and smell, warmed "smelly" foods such as pureed meat baby foods and fishy cat foods can increase appetite. The skin covering a tumor treated with radiation therapy may become dry and flaky or moist and red, somewhat like severe sunburn. The radiation oncologist can recommend safe ointments and gels to prevent irritation. If one or both eyes are near the radiation field (common for nasal and brain tumors), tear production may decrease, and your pet may require eye drops during and after therapy.

Radiation therapy can also cause long-term effects. Hair loss, which is limited to the treatment area, may be permanent. Any hair that returns will typically be a different color. Other delayed effects from radiation can occur in bone, spinal cord, and brain tissue, as well as the lens and retina of the eye. These changes may not occur for months or even years following the radiation treatments. Because these effects can be permanent, a radiation oncologist must carefully supervise the dose and method of radiation for your pet.

## **PROGNOSIS**

Radiation therapy can slow or prevent local recurrence of many types of cancer. Your pet will be scheduled for follow-up visits to re-evaluate the tumor and treatment site.

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