

LARGE-FRACTION REMOTE RADIOTHERAPY IN PROSTATE CANCER.

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Abstract: *Radiation therapy is an effective treatment that kills prostate cancer cells by using high energy rays or particles. The radiation can be delivered in several ways, including brachytherapy (using seeds that are implanted in the patient's body) and external beam radiation that projects the energy through the skin. Radiation therapy for prostate cancer is best delivered by experienced radiation oncologists who work in high volume centers of excellence.*

Keywords: *prostate cancer, biomarker, protein, prostate gland, prostate cancer cells.*

Advanced form of 3D-CRT therapy, is the most common type of external beam radiation therapy for prostate cancer. It uses a computer-driven machine that moves around the patient as it delivers radiation. While a variety of dose and fractionations have been used, a single 15 Gy HDR combined with 40–50 Gy external beam radiotherapy results in a disease-free survival of over 90% for intermediate risk and 80% for high risk. LDR brachytherapy involves permanently or temporarily placing radioactive seeds in the prostate to deliver radiation over an extended period of time, while HDR involves inserting flexible needles into the prostate to deliver a high dose of radiation over a period of a few minutes.

The FDA-approved drug, called Pluvicto (lutetium Lu 177 vipivotide tetraxetan), is a new radiation pharmaceutical that is administered through injection or infusion. The drug travels throughout the body and targets cancer cells with the PSMA biomarker, a protein found on most prostate cancer cells. Radiation therapy can: Treat both early stage cancers of the prostate gland and more advanced cancers that may have spread beyond the prostate. Be used alone or with other treatments such as hormone deprivation. Treat recurrent prostate cancer following surgery. During a global pandemic, the benefit of routine visits and treatment of patients with cancer must be weighed against the risks to patients, staff, and society. Prostate cancer is one of the most common cancers radiation oncology departments treat, and efficient resource utilization is essential in the setting of a pandemic. Herein, we aim to establish recommendations and a framework by which to evaluate prostate radiation therapy management decisions.

Recommendations were provided by the National Comprehensive Cancer Network risk group regarding clinical node-positive, postprostatectomy, oligometastatic, and low-

volume M1 disease. Across all prostate cancer stages, telemedicine consultations and return visits were recommended when resources/staff available. Delays in consultations and return visits of between 1 and 6 months were deemed safe based on stage of disease. Treatment can be avoided or delayed until safe for very low, low, and favorable intermediate-risk disease. Unfavorable intermediate-risk, high-risk, clinical node-positive, recurrence postsurgery, oligometastatic, and low-volume M1 disease can receive neoadjuvant hormone therapy for 4 to 6 months as necessary. Ultrahypofractionation is preferred for localized, oligometastatic, and low-volume M1, and moderate hypofractionation is preferred for postprostatectomy and clinical node positive disease. Salvage is preferred to adjuvant radiation.

Prostate cancer is frequently treated with radiation. It is the most common solid tumor in men; it is a heterogeneous disease for which timely therapy is indicated for some cases and watchful waiting, active surveillance, or deferral of treatment could be acceptable for others.^{3,4} Given the current epidemic crisis, delaying radiation therapy treatment (which requires multiple visits to health care facilities) for patients with prostate cancer may potentially reduce the risk of iatrogenic exposure to COVID-19.

At the health care system level, when clinically appropriate, reducing visits conserves limited hospital resources (eg, personal protective equipment [PPE]) for use by health care workers who will have to care for the potentially vast number of hospitalized patients with COVID-19. The decision to delay life-saving cancer treatment in a time of a resource-intensive pandemic represents a clinical conundrum without modern precedent. In these exigent circumstances, guidelines for managing patients who present with prostate cancer would be valuable for the practicing clinician. This article attempts to provide guidance based on rapid expert opinion regarding how to manage patients with prostate cancer requiring radiation therapy during the COVID-19 pandemic.

Radiation therapy can:

- treat both early-stage cancers of the prostate gland and more advanced cancers that may have spread beyond the prostate
- be used alone or with other treatments such as hormone deprivation
- treat recurrent prostate cancer following surgery
- treat men with limited spreading (oligometastatic) prostate cancer to reduce the tumor's size and improve survival and quality of life
- slow cancer growth, reduce fracture risk
- be used as a palliative treatment to address pain from advanced cancer

This is a sophisticated form of external beam radiation, which is delivered by linear accelerators (LINACS). Oncologists can change the intensity and shape of the radiation beams to better target radiation delivered to the prostate while limiting radiation to nearby bladder and rectal tissue. Because of the treatment planning involved with this

type of radiation therapy, the doctor can deliver far more precise, intense and effective doses of radiation with less risk of damaging surrounding tissue.

Proton Beam Therapy

Proton therapy is an alternative form of EBRT that is being used more frequently now that there are more specially equipped centers that can offer it. The process has evolved from a passive scattering approach to scanning proton beam therapy.

The main benefit of proton therapy is that, because of the beam's physical properties, the beam stops at the borders of the tumor, preventing an "exit dose" that could affect nearby, healthy tissues in areas outside of the prostate target, such as the bladder and rectum. Current evidence suggests that it is equally effective as other radiation techniques in eliminating prostate cancer.

Guided by advanced imaging techniques, SBRT (or SABR) delivers large doses of radiation over a short period of time to a precise area. SBRT is commonly referred to by the names of the machines used to deliver the radiation. SBRT can offer some patients with localized prostate cancer the convenience of fewer treatments while maintaining treatment effectiveness and safety. SBRT may also be used to treat metastases for some patients to reduce tumor mass and potentially enhance survival.

IGRT refers to the use of daily imaging to check the tumor target's position. Most often, this may include a low dose X-ray (kV) or CT scan (cone beam CT). For some patients, gold or platinum fiducial markers may be placed in the prostate before treatment. These markers show up on imaging scans and help the radiation oncologist see the tumor's position, which helps prepare the patient for treatment each day.

Brachytherapy

Brachytherapy is also called seed implantation, interstitial radiation therapy or internal radiation therapy. For permanent (low dose rate) brachytherapy, tiny radioactive seeds (about 0.8 millimeters thick and 4.5 millimeters long) are inserted into the prostate using needles that enter the skin just behind the scrotum. The seeds give off radiation to destroy the cancer cells immediately around them for several months, until the radioactivity has disappeared. The seed enclosure is made of titanium, which is safe to remain in the body. Ultrasound, CT scans and MRI scans can be used to ensure that the seeds are placed in the proper locations. For some patients, temporary (high dose rate) brachytherapy is used to administer higher doses of radiation through catheters placed in the prostate for a short time. The term "high dose rate" refers to the time over which the radiation is delivered, not the amount of radiation given.

Compared to earlier radiation methods, these modern techniques reduce the chance of urinary and bowel problems. With several treatment options available, your doctor will work with you to develop and oversee a treatment plan that precisely addresses your prostate cancer while minimizing the risk to surrounding tissues.

This is why it is important to choose an experienced radiation oncologist who specializes in the management of prostate cancer. High volume centers where

practitioners have significant experience and treat large numbers of patients with prostate cancer may be associated with good outcomes and fewer lasting problems related to treatment. The majority of patients who undergo radiation do not have permanent effects on bowel or urinary function, and patients who develop erectile difficulty after these therapies can often be treated successfully with medications such as sildenafil or tadalafil.

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