

Article 1

Treatments of Prostate Cancer

From Uncertainty to Triumph: A Journey of Strength and Recovery.

Understanding the treatments for prostate cancer is vital as it guides the patients to choose effective options.

Fig.1 :An image illustrating all the treatments for prostate cancer in one pic.

SUMMARY/ABSTRACT:-

Prostate cancer is a type of cancer that is found only in male. As it originates in the prostate gland, which is a part of the male reproductive system that sits below the bladder and in front of the rectum.[5]

It is a disease that occurs when cells in the prostate gland grow out of control.[1]

The exact cause of prostate cancer is unknown, but it's linked to genetic changes in the DNA. Some genetic changes are inherited, while others occur during a person's lifetime. Age is also a factor, as the risk of developing prostate cancer increases with age.[5]

This type of cancer can be limited to the prostate or it might spread beyond the prostate or to other parts of the body like bones, organs, lymph nodes etc.[5]

Whether prostate cancer spreads beyond the prostate depends on factors such as the stage of cancer, the aggressiveness of the tumor and certain bio-markers. The spread often occurs when cancer cells break away from the prostate and travel through the bloodstream or lymphatic system.[4][5]

After an individual is diagnosed with prostate cancer, doctors create a personalized treatment plan based on how advanced the cancer is and the person's overall health. This plan may include a combination of therapies such as Active Surveillance, surgery, chemotherapy, radiation therapy, hormone therapy, and targeted therapy.[2]

However, the specific order and number of these treatments vary from one patient to another. These differences can be due to various factors such as stages, different types and grades of prostate cancer and a patient's age and overall health status.[5]

For early-stage cases, treatments may aim for a complete cure, while advanced stages may focus on managing symptoms and improving quality of life. However, these treatments can have significant side effects, including fatigue, hormonal changes, and emotional stress. Patients should be aware and ready for these challenges and work closely with their healthcare team to manage them.[3][4][5]

The important thing to note here is that prostate cancer is a highly treatable cancer type when it is detected early or in initial stages. The goal is not only to treat the cancer but also to help the patient maintain a high quality of life during and after treatment. Therefore below we've listed the treatment options for prostate cancer to help individuals understand the treatments they may undergo and what to expect and take prompt actions for the betterment of their health.[5][4]

BODY:-

Does everyone receive the same treatment ?

Treatments for prostate cancer vary based on its stage, growth rate, and the patient's overall health .Let's understand these terms:[1][3][4]

- **Stage of prostate cancer**(the size of the cancer and whether it has spread.) helps primarily to determine whether treatments like surgery and radiation (which target the specific area) or treatments like chemotherapy (which affect the whole body) are better options.[1][3][4]
- **Different types of prostate cancer** i.e the area where the cancer has started growing like gland cells(where fluid is mixed with sperms) ,transitional cells(lining of tube),etc.[1][3][4]
- **Different grade of cancer** i.e. how abnormal the cancer cells look under the microscope.[1][3][4]
- **A patient's age and overall health status** can impact their ability to tolerate certain treatments and the risks of side effects. For example, older patients or those with other medical conditions may be less able to withstand the side effects of intensive chemotherapy treatment.[1][3][4]

Options ranging from active monitoring to advanced therapies are available, with the goal of eliminating cancer while minimizing side effects while keeping all the above parameters into consideration.[1][3][4]

Lets understand how the Prostate Cancer is differentiated in to its types :

The Grade Group and PSA level are used to stage prostate cancer.

The stage of the cancer is based on the results of the staging and diagnostic tests, including the prostate-specific antigen (PSA) test and the Grade Group. The tissue samples removed during the biopsy are used to find out the Gleason score which ranges from 2 to 10 and describes how different the cancer cells look from normal cells and how likely it is to spread. The lower the number, the more cancer cells look like normal cells and spread slowly.[1][3][4]

(A reference can be provided for the above)

Understanding Prostate Cancer Treatment Options

Surgery:

Treatment options for prostate cancer depend on the stage and extent of the disease. For localized prostate cancer, where the cancer is confined to the prostate gland, surgery is often a key treatment option. This treatment involves removing the prostate gland and sometimes surrounding tissues.[5][4]

Localized prostate cancer refers to cancer that has not spread beyond the prostate, while non-localized or advanced prostate cancer, involves cancer that has spread to other parts of the body, such as the bones, lymph nodes, or distant organs.[5][4]

Fig.2 An image illustrating the surgery treatment being performed.

- **Radical Prostatectomy:** This is the main type of surgery which includes the removal of the entire prostate gland and seminal vesicles. It can be performed through the following methods depending upon the size of the tumor and its aggressiveness. This surgery is used to remove localised cancer.[5]
 - **Open Prostatectomy:** A traditional approach using a single large incision. It is often used to remove larger and advanced stage cancer cells. [5]
 - **Laparoscopic Prostatectomy (Robotic-Assisted Prostatectomy):** A minimally invasive surgery where surgeons use robotic arms for precision where many small incisions are made. It is used to remove smaller and less advanced cancer cells.[5]
- **Orchiectomy(Castration):** The removal of testicles to significantly lower testosterone levels, as this hormone often fuels prostate cancer growth. While effective, this is usually reserved for advanced cancer and has emotional and

physical side effects. It is used for the advanced or metastatic (cancer which spreads) prostate cancer [5]

Ø **Risks and Side effects of surgery:-**

- o Reactions to anesthesia[1][5]
- o Bleeding from the surgery[1][5]
- o Blood clots in the legs or lungs[1][5]
- o Urinary incontinence (being unable to control urine) and loss of fertility[1][5]
- o Erectile dysfunction[1][5]
- o **Lymphedema:** fluid getting collected in the genital region over time, causing swelling and pain.[1][5]

Radiation Therapy:

Radiation therapy or Radiotherapy is a type of prostate cancer treatment that uses high x-ray and sometimes proton rays to kill the cancerous cell. Radiation therapy may also be recommended when a tumor can't be surgically removed due to the size or location.[1][5]

- **External Beam Radiation Therapy (EBRT):** Radiation is delivered from outside the body. It is used for treating early stage cancers, to clean up the remaining cancer cells outside the prostate after surgery. It is given for at least 5 days a week for several weeks to the patient.[1][5]

Techniques like **Intensity-Modulated Radiation Therapy (IMRT)** and **Stereotactic Body Radiation Therapy (SBRT)** allow precise targeting, minimizing damage to healthy tissues.[1][5]

Fig.3 An image illustrating the EBRT treatment method while being performed.

- **Brachytherapy (Internal Radiation):** Involves placing radioactive seeds directly in the prostate. It's suitable for early-stage cancer and has fewer side effects than external radiation. Some men may experience temporary urinary discomfort.[1][5]
- **Radiopharmaceuticals :** Radiopharmaceuticals are drugs that contain radioactive elements which are injected into a vein (bloodstream) to reach cancer cells that have spread to other parts of the body which then give off radiation that kills the cancer cells

and can reach anywhere inside the body unlike others. (The type of radiation they use travels only a short distance, which helps limit side effects). [1][5] **Prostate-specific membrane antigen (PSMA)** is a protein that is often found in large amounts on prostate cancer cells. **Lutetium Lu 177 vipivotide tetraxetan (Pluvicto)** is a radiopharmaceutical that attaches to PSMA, bringing radiation directly to the prostate cancer cells. [1][5]

To address the comment and provide clarity, we can expand the section to include a discussion on **the conditions, criteria, and differences between patients** when selecting a specific type of radiation therapy for prostate cancer. Here's the revised version, with the additional paragraph discussing patient-specific considerations:

Radiation Therapy for Prostate Cancer

Radiation therapy, also known as radiotherapy, is a key treatment option for prostate cancer that uses high-energy rays (like X-rays and sometimes protons) to kill or damage cancerous cells. Radiation therapy is particularly useful when a tumor cannot be surgically removed due to its size, location, or other complications. It is often employed in various forms depending on the stage of the cancer and the patient's health.

Types of Radiation Therapy

- **External Beam Radiation Therapy (EBRT):** In EBRT, radiation is delivered from outside the body using a machine that precisely targets the prostate. It is commonly used for **early-stage prostate cancer**, or as a follow-up to surgery, to eliminate any remaining cancer cells. Typically, it involves treatment five days a week for several weeks. Techniques like **Intensity-Modulated Radiation Therapy (IMRT)** and **Stereotactic Body Radiation Therapy (SBRT)** improve the precision of the radiation, minimizing damage to surrounding healthy tissues.
- **Brachytherapy (Internal Radiation):** Brachytherapy involves placing **radioactive seeds** directly into the prostate gland. This approach is typically used for **early-stage prostate cancer** and is associated with fewer side effects than external radiation. However, some men may experience **temporary urinary discomfort** as a result of the treatment.
- **Radiopharmaceuticals:** Radiopharmaceuticals are drugs containing radioactive elements that are injected into the bloodstream. These drugs target cancer cells that have spread to other parts of the body, delivering radiation directly to metastatic sites. This type of radiation is particularly useful for prostate cancer that has spread to distant organs or bones. A common radiopharmaceutical for prostate cancer is **Lutetium Lu 177 vipivotide tetraxetan (Pluvicto)**, which

targets the **prostate-specific membrane antigen (PSMA)** on prostate cancer cells.

Selecting the Appropriate Type of Radiation Therapy

The selection of a specific type of radiation therapy depends on several factors, including the stage of cancer, the location of the tumor, the patient's age, and overall health. Not all patients are candidates for every type of radiation therapy. For instance:[1][4][5]

- **EBRT** is commonly chosen for localized prostate cancer or when the tumor is confined to the prostate but needs to be targeted more precisely. It may also be used after surgery to remove the surrounding tissues to prevent the risk of recurrence.[1][4][5]
- **Brachytherapy** is generally considered for early-stage prostate cancer and is best suited for men with smaller, localized tumors. It may not be ideal for larger tumors, which can affect the placement of radioactive seeds.[1][4][5]
- **Radiopharmaceuticals** like **Pluvicto** are typically reserved for advanced or metastatic prostate cancer, particularly in cases where cancer has spread to the bones or other distant organs. Patients with extensive metastatic disease and high levels of PSMA on their cancer cells are ideal candidates for radiopharmaceutical treatment.[1][4][5]

Ø Risks and Side effects of Radiation therapy:-

- o The drugs can lower blood cell counts[1][5]
- o Nausea[1][5]
- o Loss of appetite[1][5]
- o Constipation[1][5]
- o The radiations cause Urinary problems[1][5]
- o Bowel problems[1][5]

- o Erectile Dysfunction[1][5]

Hormone Therapy:

Hormone Therapy also known as Androgen Deprivation Therapy(ADT) is a treatment used to reduce the male hormones called Androgens as they act as the fuel for prostate cancer cells and help them in growing.[5][4]

It is given along with radiation therapy as the first treatment for stopping the growth in other areas or before radiation to shrink the cancer area or cells.[5][4]

Below are the methods used to reduce the androgens.[5][4]

- **Orchiectomy:** (Testicles are removed surgically to diminish testosterone levels)[5][4]
- **Medications:** Luteinizing hormone-releasing hormone (LHRH) agonists are drugs that lower the amount of testosterone made by the testicles.LHRH agonists are injected or placed as small implants under the skin which reduces the androgen levels in the body .[5][4]

Triptorelin (Trelstar) , Goserelin (Zoladex) , Leuprolide (Lupron, Eligard) and leuprolide mesylate (Camcevi) are some agonists available .[5][4]

Ø Side Effects of Hormone Therapy:

- o Erectile dysfunction (impotence)[5][4]
- o Shrinkage of testicles and penis[5][4]
- o Hot flashes, which may get better or go away with time[5][4]
- o Growth of breast tissue (gynecomastia)[5][4]
- o Osteoporosis (bone thinning)[5][4]
- o Anemia (low red blood cell counts)[5][4]
- o Depression or mood swings[5][4]

Chemotherapy:

Chemotherapy (chemo) uses anti-cancer drugs injected into a vein or taken by mouth to reach cancer cells in most parts of the body.[1][5]

Chemotherapy is primarily used for prostate cancer that no longer responds to hormone therapy or has spread to other parts of the body. It involves drugs that kill rapidly dividing cancer cells.[1][5]

Some of the chemo drugs used to treat prostate cancer include:

Docetaxel , Cabazitaxel , Mitoxantrone , Estramustine and Carboplatin .[1][5]

Ø Side Effects of ChemoTherapy:

The side effects of chemo depend on the type and dose of drugs given and how long they are taken. Some common side effects can include:[1][5]

- o Hair loss[1][5]
- o Mouth sores[1][5]
- o Loss of appetite[1][5]
- o Nausea and vomiting[1][5]
- o Diarrhea[1][5]
- o Increased chance of infections (from having too few white blood cells)[1][5]
- o Easy bruising or bleeding (from having too few blood platelets)[1][5]
- o Fatigue (from having too few red blood cells)[1][5]

These side effects usually go away once treatment is finished.[1][5]

Newly Emerging Treatment Techniques

These treatment techniques offer new ways of targeting and treating prostate cancer, often with fewer side effects or more precise targeting than traditional methods. While

some of these treatments have been used for years in other countries or in specific settings, they are still relatively new in clinical practice in many places. Researchers continue to study and refine these approaches to determine their long-term effectiveness and to make them more widely available .They include:[2][5]

Cryotherapy:

Cryotherapy (**cryosurgery**) is the use of very cold temperatures to freeze and kill prostate cancer cells.

While some forms of cryotherapy have been around for decades, modern cryotherapy techniques are still new, so less is known about them.

Cryotherapy is sometimes used if the cancer has come back after radiation therapy.

It may be an option to treat men with low-risk, early-stage prostate cancer who can't have surgery or radiation therapy. However, most doctors don't use cryotherapy as the first treatment for prostate cancer.[5][2]

Side Effects include blood in the urine for some days and soreness in the area or swelling of penis and scrotum.[2][5]

Fig.5:This image illustrates the cryotherapy treatment done for prostate cancer.

High-intensity focused ultrasound (HIFU):

HIFU uses highly focused ultrasound beams to heat and destroy prostate tissue. This treatment is still fairly new in the United States, although it's been used in some other countries for many years.It is used sometimes when cancer comes back after radiation therapy.[2][5]

While HIFU devices have been approved by the US Food and Drug Administration (FDA) its not yet clear how the long-term effectiveness of HIFU compares to surgery or radiation therapy.[2][5]

Fig.4 An image illustrating the HIFU treatment method.

Immunotherapy:

Immunotherapy is the use of medicines to stimulate a person's own immune system to recognize and destroy cancer cells more effectively. Certain types of immunotherapy can be used to treat prostate cancer[2][5].

Notable options for prostate cancer is sipuleucel-T, a vaccine-like treatment designed to stimulate the immune system against prostate cancer cells. While not a cure, it may prolong survival in advanced cancer stages. Side effects are generally mild and include flu-like symptoms.[2][5]

Is Prostate Cancer Still Something to Fear?

Prostate cancer treatment is no longer a major issue. Prostate cancer care is advancing rapidly, offering more effective and less invasive options. With options ranging from active surveillance to cutting-edge therapies, patients have more control over their journey than ever. Consult your healthcare team to craft a personalized plan that balances effective cancer control with a high quality of life. Remember, with the right care and support, living well with or beyond prostate cancer is within reach.

Reference:

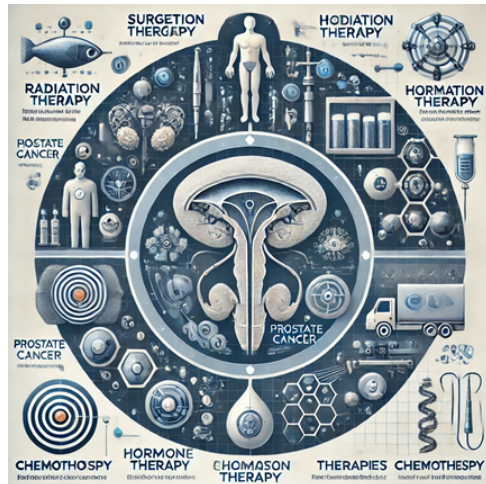
- [1] <https://www.cancer.gov/types/prostate/patient/prostate-treatment-pdq>
- [2] <https://www.cancer.gov/types/prostate/research>
- [3] <https://pmc.ncbi.nlm.nih.gov/articles/PMC3785898/>
- [4] <https://www.cancer.gov/types/prostate/research>
- [5] <https://www.cancer.org/cancer/types/prostate-cancer/treating.html>

Image section :

Fig.1: It is made using meta ai with reference to the article

<https://www.cancer.org/cancer/types/prostate-cancer/treating.html>

This image illustrates a combined image of all the treatments which are shown together for prostate cancer treatment awareness.



or



Fig 2: The image is taken from research article

<https://www.mayoclinic.org/diseases-conditions/prostate-cancer/diagnosis-treatment/drc-20353093#dialogId64747936>

The following diagram illustrates the Permanent prostate brachytherapy being performed.

Permanent prostate brachytherapy

Permanent prostate brachytherapy involves placing many radioactive seeds within the prostate to treat prostate cancer. During the procedure, an ultrasound probe is placed in the rectum to help guide the placement of seeds. The seeds emit radiation that dissipates over a few months

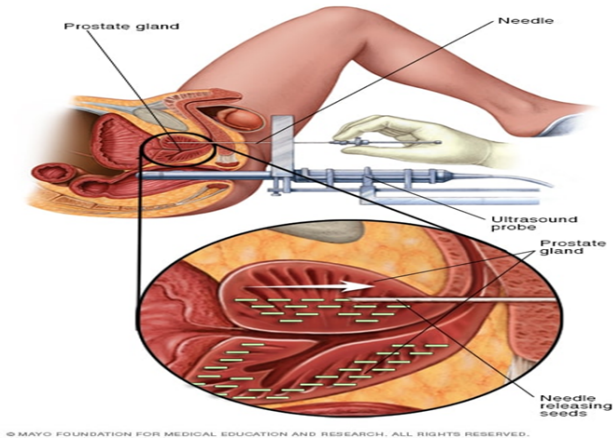


Fig.3 This image is taken from the site mayoclinic.org.

<https://www.mayoclinic.org/diseases-conditions/prostate-cancer/diagnosis-treatment/drc-20353093#dialogId64747936>

This figures illustrate the external beam radiation therapy used for the treatment.

During external beam radiation treatment for prostate cancer, you lie on a table while a linear accelerator moves around you to deliver radiation from many angles. The linear accelerator delivers the precise dose of radiation planned by your treatment team.

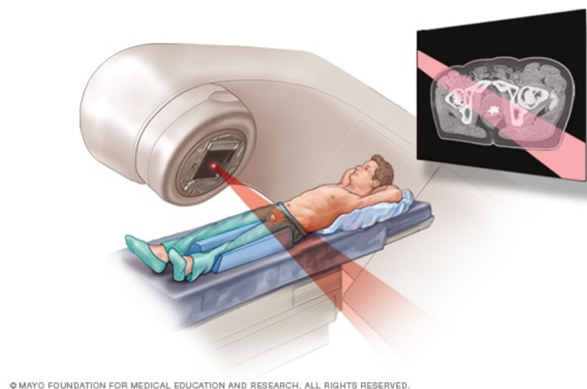


Fig.4 CancerResearchUK.org

<https://www.cancerresearchuk.org/about-cancer/prostate-cancer/treatment/high-intensity-focal-ultrasound>

This images illustrate the method High intensity focused Ultrasound method which is one of the new upcoming treatment.

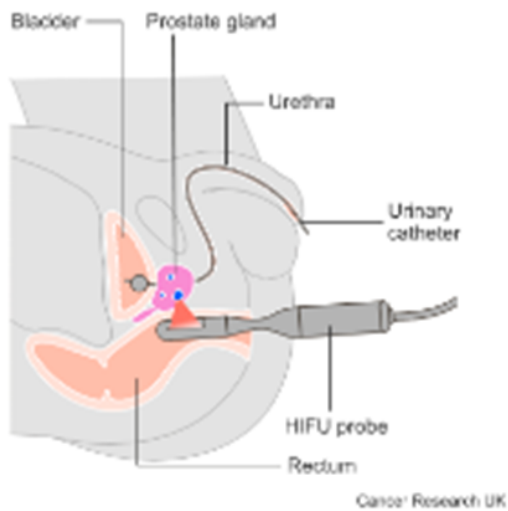


Fig.5: This image is taken from the article

<https://www.cancerresearchuk.org/about-cancer/prostate-cancer/treatment/cryotherapy>

The following diagram illustrates the cryotherapy treatment being performed.

