60 years) to 20% (60-70 years) up to 50% (patients over 70).

The Patients can benefit from a pharmaceutical oral rehabilitation cycle (Viagra).

During the first few incidences of sexual intercourse, the seminal fluid can appear dark.

This temporary aspect must not be considered alarming because it is due to the release of small quantities of clotted blood in the sperm. If erectile dysfunction should appear, a temporary rehabilitation treatment with Sildenafil (Viagra) or Prostaglandins can be prescribed.

It is important to underline, that, apart form the exceptional cases described above, neither the urine nor the sperm of the patients are radioactive.

What is HDR Brachytherapy ?

HDR temporary brachytherapy involves placing very tiny plastic catheters into the prostate gland, and then giving a series of radiation treatments through these catheters. The catheters are then easily pulled out, and no radiactive material is left in the prostate gland.

How Is HDR Brachytherapy Done?

HDR brachytherapy uses very high energy radioactive sources which are inserted into the prostate and then withdrawn a few minutes later.

What are the advantages of HDR Brachytherapy Over LDR Brachytherapy?

There is no radiation exposure to other people. With conventional implantable seed brachytherapy, the radioactive seeds remain in place permanently. In HDR brachytherapy, the radioactive sources are inserted and withdrawn after the treatment session, thus you carry no radioactivity with you when you leave.

HDR brachytherapy is preferable for locally advanced tumors.

Higher doses delivered are compared to when only in external beam radiation therapy.

HDR Brachytherapy Procedure

The procedure is performed in an operation theatre using general or spinal anesthesia as in LDR brachytherapy, the difference being that no seeds will be implanted, thin metallic needles inserted into the prostate will be retained in the gland for 2 days and a certain radiation dose will be delivered over both the days with a minimum interval of 6 hours in the HDR treatment room in the department of Radiation Oncology.

After the completion of radiation, patient is discharged on the following day.

The HDR system uses a single, tiny, (1 mm x 3 mm) highly radioactive source of Iridium-192 that is laser welded to the end of a thin, flexible stainless steel cable. The source is housed in a device called an Afterloader. The computer-guided Afterloader directs the source into the treatment catheters or applicator that has been placed in the patient by the brachytherapy physicians. The source travels through each catheter in 5 mm steps, called 'dwell positions'. The distribution of radiation dose is determined by the 'dwell positions' of the source and the length of time it dwells at a defined position.

After Implant

Refer after implant section in LDR Brachytherapy.

Compications of HDR Brachytherapy

The possible post-HDR acute side effects, like urinary frequency, dysuria, and urinary retention, usually last for two to four weeks. There may also be some usually transient rectal irritation or penile numbness (10% cases). The perineal area will be tender for a few days so activities like bicycle riding that put pressure on this area should be avoided.

Sexual complications are higher than LDR seed BT, because of the combination of external beam radiation therapy with BT.

Controls: Follow up Scheme

The patients are monitored with PSA test every 3-4 months for the first year after the implant and then every 6 months.

In the first 2 years following the implant, ups and downs in PSA levels can be recorded which do not have any pathological meaning.

The following results can be interpreted as possible indicators of treatment failure:

What if there are 3 consecutive increases in PSA values?

The Specialist can suggest a bone scan and prostatic biopsies under ultrasound guidance as well as an abdomen CT. If these tests show a relapse of the disease at prostate level, there are several treatment options: surgery to remove the prostate (radical prostatectomy) or hormone therapy (androgenic blockade).

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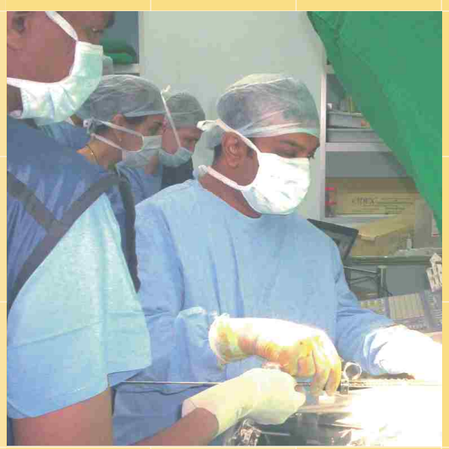
BRACHYTHERAPY IN PROSTATE CANCER



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There are two major methods of prostate brachytherapy, Low Dose Rate (LDR) - permanent brachytherapy (seed implantation) and High Dose Rate (HDR) temporary brachytherapy.

What is Permanent Brachytherapy ?

Permanent Brachytherapy (BT) is a form of radiotherapy, where small seeds containing radioactive sources (Iodine 125) are inserted into the prostate under ultrasound guidance. This is a minimally-invasive treatment completed in about 90 minutes.

Each seed continuously releases a small quantity of radiation to a limited portion of prostatic tissue. The 'short' range of action of each seed, and the very high accuracy of the implant, means no damage to the adjacent structures such as rectum, bladder and urethra, differing from external beam radiotherapy. Moreover, high number of sources are implanted in the prostate (on an average 60 -100), so that tumors can be treated with an extremely high dose of conformed radiation (14,500 rads or 145 Gy for I-125). Since the seeds are radioactive sources, the isotope decays in a specific time. Iodine 125 (half-life 60 days) dose is delivered over one year. The seeds will then be inactive in the prostate.

Treatment protocol	Monotherapy	Combined therapy (45 Gy EBRT + BT)
I-125	145 Gy	108 Gy
(EBRT- External Beam Radiation Therapy)		

Indications For Brachytherapy

Brachytherapy (BT) can and should be proposed as an alternative to radical prostatectomy for patients suffering from clinically-localized Prostate Adenocarcinoma.

BT is proposed as a monotherapy in localized Prostate Cancer with low risk of extracapsular extension. In patients with intermediate or high risk of extracapsular disease, it is proposed in conjunction with external beam radiotherapy.

Clinical Parameters	Brachytherapy	EBRT + Brachytherapy (LDR)	EBRT + Brachytherapy (HDR)
Clinical Stage	T1, T2a (T2b)	T2b, T2c	T 2-T3
PSA	<10ng/ml	>10-20ng/ml	>20ng/ml
Gleason's Score	< 7	≥ 7	≥ 7
Rectal Exam	Negative/ Nodule (T2a)	Nodule (>T2a)	Nodule (s)

Treatment Stages

Pre Implant Ultrasound Study of The Prostate

Three to four weeks prior to the implant, a transrectal ultrasound is performed as an outpatient to get an accurate morphology and volume of the prostate gland. The patient lies in the lithotomy position, and through an endorectal ultrasound probe, several images of the prostate are acquired to get a 3D view, which is then used by the Radiation Oncologist and the Physicist to determine the number and position of the radioactive seeds to be implanted (preparation of the treatment plan). The examination lasts about 30 minutes and is painless.

Implant Preparation

Prior to hospitalization for the implant, out patients undergo standard tests.

The implant is performed during a two day stay in the hospital. The procedure is performed in an operation theatre using general or spinal anesthesia and generally takes under 90 minutes.

The patient lies on the operating table adopting the lithotomy position. An ultrasound probe is then inserted into the rectum to show the prostate gland. The urinary bladder catheter serves as a marker for the urethra and the bladder.

By means of special, very thin needles, an average of 60-100 radioactive seeds are inserted into the prostate. Each seed is 5 mm long and 0.8 mm thick. The needles are inserted through the perineum, under ultrasound guidance, accurately into the gland using a special template applied to the ultrasound probe. The whole procedure is performed under constant ultrasound and radiological checks, as per the treatment plan drawn up by the Radiation Oncologist and the medical Physicist.

An Urethrocystoscopy is performed at the end of the procedure to remove any seeds displaced in the bladder and/or urethra. A temporary vesical catheter is placed and removed few hours later.

About 4 weeks after implant of I-125 sources, the quality of implant will be evaluated by pelvic CT and/or MRI. The diagnostic images allow for the reconstruction of the implant and check of the dosimetric coverage.

After Implant

Antibiotics are administered to prevent possible infections together with antibiotics, pain-killers and low-dosed steroids to reduce prostate edema. In most of cases, the vesical catheter is removed a few hours after the implant.

It is suggested, that the patient avoids intense physical activity for the first 2 days of recovery at home. After this, he will be soon able to resume normal daily activities

In acute complications blood may be present in the Urine :

- This phenomenon does not require specific treatment apart from sufficient liquid intake, and will disappear in a few days
- Patient may feel a temporary light tension under the scrotum, in the region where the needles have been used to place the seeds
- Patient may suffer from dysuria and irritative symptoms such as frequent or difficult micturitition with reduced urine flow, greater or smaller urethral and burning
- The patient may have rectal symptoms characterized by anal burning and discomfort during defecation (these are generally less frequent and can be controlled with the aid of medications)

These symptoms can be important, 4/5 weeks after the implant with I-125, but tend to regress gradually and spontaneously as the seeds lose their energy.

Late Complications

Late complications after BT are very rare.

Urinary complications

Urinary incontinence and urinary fistulas affect less than 1% of the treated patients. They can require corrective surgery.

The risk of urinary incontinence is greater in patients who have previously undergone deobstructive prostate surgery (TURP).

In patients with large prostates or a marked reduction in urine flow, urinary retention can appear and require endoscopic deobstruction, if prolonged. This intervention needs to be postponed for a few months to reduce possible risks of urinary incontinence.

Sexual complications

Some time after the implant, many patients note a reduced quantity and change in colour of the seminal fluid.

Erectile dysfunction is reported by a number of patients varying according to age group: from 10% (patients under