



## Role of HDR High Dose Rate Temporary Brachytherapy for Prostate Cancer

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HDR temporary brachytherapy is a form of internal radiation therapy which is used in combination with external beam radiation therapy. The HDR iridium-192 radiation source is delivered through the metallic needles which are directly inserted in to the prostate gland by using TRUS guided. A computer controlled machine called a remote after-loader pushes a tiny radioactive iridium-192 source (0.9 mm. in diameter) in to a positioned at a number of dwell positions to deliver the radiation dose within the prostate. These dwell positions are determined with the aid of a planning computer allowing an optimal dosage to the prostate. The treatment can also be tailored and the various dwell positions of the radioactive source can be altered on the computer to give the best dose distribution within the prostate to minimize the dose to urethra and also to surrounding structure, in particular the rectum. The ability of radiation dose to be modified after the needles are placed within the prostate is one of the major advantages of HDR Brachytherapy. Other advantages of HDR brachytherapy include the lack

of radiation exposure to hospital personnel and family members and the ability to implant HDR catheters in **periprostatic** tissues so that patients at risk for **seminal vesicle** or **extraprostatic** disease can be adequately treated. Finally, recent radiobiological calculations (of a low  $\alpha/\beta$  ratio) for prostate cancer suggests that the use of HDR brachytherapy may increase the therapeutic ratio and lead to better tumor control.

At Bumrungrad international hospital began doing the HDR temporary Brachytherapy for prostate cancer since 2004. The probability that cancer has spread beyond the prostate gland can be estimated by the Partin tables. HDR brachytherapy program can be used for a wide range of prostate stages, PSA values, and tumor grade. Combined HDR brachytherapy and EBRT is used for patients with locally more advanced disease within or around the prostate, those with higher PSA levels or higher pathology (Gleason 8-10) grade. Delivery of EBRT expands the area of treatment beyond the prostate into other regions of the pelvis where microscopic

deposits of disease may be present but undetected. Combined HDR and EBRT therapy patients undergo two HDR implants a week apart with two HDR radiation treatments (also called fractions), approximately weeks later a short (5 weeks) course of EBRT (5 fractions per week) is given. This treatment can also certainly be used for many tumors which are considered too advanced for radical prostatectomy. As long as there is no obvious spread to distant areas of the body like the bones this treatment can be considered.

Eligible patients include:

Any tumor stage (T1 - T3)

- A wide range of sizes of prostate glands (large glands will require hormone therapy prior to brachytherapy)
- No known spread of cancer to other parts of the body, like the bones or lymph nodes
- No set PSA limit
- No set Gleason limit
- Previous trans-urethral resection of prostate (TURP / TUPR) is okay, but there is a higher chance of urinary control problems with any kind of treatment.
- Acceptable health

The advantages of HDR brachytherapy for prostate cancer are:

- Organ Preservation (structure and function)
- Accuracy and precision of radiation dose delivery
- Knowledge of radiation dose before treatment is given
- Ability to shape the radiation dose to fit the tumor and avoid normal tissue
- Fewer urinary, rectal and sexual side effects
- No radiation source (seeds) migration into other organs

- No radiation exposure to other people
- Short course of treatment measured in days to weeks rather than months (as with permanent seeds or external beam)
  - Excellent coverage of microscopic extension of cancer immediately beyond the prostate
  - Minimizes areas of radiation overdose (hot spots) or underdose (cold spots) within the prostate
  - Organ motion (target movement) is not an issue for HDR as it is with EBRT
  - It can be an effective treatment (termed "salvage") for cancer recurrence
  - Combined HDR brachytherapy offers several other advantages over the 7-8 week course of EBRT without HDR. It offers the best opportunity to control the distribution of radiation within and around the prostate (dosimetry). Control rates are correspondingly high and complication rates low with HDR brachytherapy. Simultaneous with the best dosimetry the HDR and EBRT treatment course is shorter (more accelerated) than EBRT alone. The radiobiologic advantages (as well as convenience) to shorter treatment courses in the treatment of prostate cancer are now well known.

## Results

We have treated approximately 100 patients with a wide range of stages. We have recently analyzed the result is a 5 year actuarial cancer-free rate of 95% for intermediate to high risk localized prostate cancer patients, nearly all our patients are currently free from cancer recurrence. The majority of our cancer recurrences to date have been in the bones or lymph glands in patients with aggressive high-risk prostate cancer. This is likely because the cancer had already spread in these patients by the time they were treated, but the metastases were still too small to be picked up on scans.

The side effects have been very favorable. It is

typical to have urethral, bladder, and rectal irritation for a few months following the HDR and external beam. However, we have had no cases of serious long term rectal injury. The chance of requiring urinary pads because of leakage is 2.5% overall. The risk of developing impotency is approximately 35 - 40% for those treated with HDR plus external beam.

This is similar to other forms of radiation or brachytherapy, but better than the risk with standard prostatectomy. If impotency develops, it can still usually be helped with Viagra or other drugs or devices. Studies show that the chance of becoming impotent is lower for those who are younger or more sexually active before treatment.