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LDR I-125 prostate brachytherapy

Introduction

Prostate brachytherapy is a modern, effective minimally invasive treatment appropriate for many men with early prostate cancer. It offers comparable survival and local control to surgery and external beam radiotherapy. Seed implantation normally takes about 1-2 hours to perform with most patients treated as day surgery or sometimes staying overnight after their procedure and resuming normal activities almost straight away. The seeds are placed directly into the prostate and can deliver approximately 50% more radiation to the prostate gland when compared with external beam radiotherapy with a very favourable side-effect profile compared to alternative treatments.

Eligibility criteria

Unlike the alternative treatments of external beam radiotherapy and radical prostatectomy, there are a number of eligibility criteria that have to be met. These relate to disease and prostate factors. Specifically, the Medical Benefits Schedule restricts rebates to men with a PSA of 10 or less and a Gleason Score of 7 or less. Brachytherapy is an effective treatment with a PSA up to 15 but at these levels it needs to be self funded though some private health funds will contribute towards the cost on an individual patient basis. Post implant voiding difficulty or even urinary retention is experienced more often in men with significant prostatic obstruction and so a reasonable voiding flow rate is required to qualify for brachytherapy. Men who are otherwise suitable for brachytherapy but have poor flow rates <13 mls/sec can be treated with surgical bladder neck incisions or minor transurethral prostate resection first. Prostate size is important and large prostates may need to be shrunk with hormonal treatment for a few months in order to meet the size restriction, ~50 cc.

History

Modern prostate brachytherapy was developed in Seattle USA in the late 1980's and has been practiced for a number of years interstate in Australia. The Adelaide Brachytherapy Group began implanting in March 2004 and is a joint venture between Urologists John Miller, Kim Pese, Alan Stapleton and Denby Steele, Radiation Oncologists Linda Swaney and Phoung Tran from Adelaide Radiotherapy Centre, Physicists Neill Molloy and Tim Williams and Calvary North Adelaide Hospital. A Brachytherapy service was started at the Royal Adelaide Hospital in September 2004 and Denby Steele works with Radiation Oncologists Eric Yeoh, Raghu Gowda and Scott Carruthers.

I-125 brachytherapy seeds

Prostate brachytherapy involves placing tiny titanium capsules containing radioactive Iodine-125 impregnated silver wires directly into the prostate gland. They continuously give off low level radiation that is biologically effective for approximately 6 months. The radiation continues to decay with a half life of about 60 days and eventually the effectively inert tiny seeds remain unnoticed in the prostate. Each seed is 4.5 mm in length, 0.7 mm thick and arranged in a strand of a dissolvable Vicryl suture.

Prostate volume study

Prior to a prostate brachytherapy seed implant, a flexible cystoscopy to inspect the urethra, prostate and bladder and a volume study need to be performed to finally confirm suitability and plan the implant. At Calvary North Adelaide Hospital these are performed as a brief day surgical procedure under a general anaesthetic after a minor bowel preparation using two microlax enemas on admission to clear the rectum. A transrectal ultrasound is performed with cross sectional images of the prostate down loaded into a computer program that makes a 3 dimensional model of the prostate. The number, position and dose of the seeds are planned, ordered from Chicago and shipped out preloaded in needles ready for implantation a month later. At the Royal Adelaide Hospital the flexible cystoscopy is done as part of the initial workup and only one admission to hospital is required with real time dose planning, manual needle loading and immediate seed implantation performed as one longer procedure.

Seed implantation

The implant procedure does not require a surgical incision. In the lithotomy position – lying face up with the legs elevated in stirrups and a urethral catheter in place, the needles with stranded seeds preloaded, are inserted into the prostate gland through the skin between the scrotum and the anus. As the needles pass through the prostate, they are imaged with the ultrasound and X-ray and can be guided to their final position. The needles are withdrawn, leaving the seeds accurately placed in the prostate. About 30 needles and up to 100 seeds are used depending on prostate size. The seeds produce radiation in a small area around them and very little radiation reaches the adjacent normal organs. Following the implant many men are not even aware anything has been done, it is certainly not a painful procedure. At Calvary North Adelaide Hospital, a urethral catheter is left in until a CT scan has been performed the same day or the next day if late and men are discharged as soon as voiding. At the Royal Adelaide Hospital, discharge is the same day or the next depending on timing but the post implant CT is a month later.

Immediately after the prostate seed implant

In recovery, an icepack is placed between the legs to help reduce swelling over the implant area. Antibiotics are given during the implant and may be given after the implant to prevent infection. After removal of the catheter there will probably be a mild burning sensation when passing urine perhaps with some blood for a while. Drinking plenty of water helps prevent blood clots by flushing the bladder. The smooth muscle relaxant flomaxtra or prazosin relaxes the smooth muscle of the bladder neck and the prostate and helps voiding in the face of prostate swelling after the implant. This will have been started just before the implant and should be continued as long as necessary to help voiding, usually 2-3 months. Driving is not restricted beyond 24 hours after the anaesthetic. A normal diet and activities can be resumed apart from avoiding heavy lifting or strenuous physical activity for the first 2 days.

Early side-effects after the seed implant

About a week after the implant, the radiation reaction from the seeds has caused sufficient swelling to cause urinary symptoms. This causes increased frequency (day and night) and urgency of urination. It is sometimes painful and the urine flow can become quite slow. About 2% of patients go into urinary retention and cannot pass urine sometime in the first few weeks after the procedure and require a catheter to be inserted. If unable to pass urine and in discomfort, advice should be sought from the implanting Urologist or Radiation Oncologist immediately. If a catheter is necessary, it may need to stay in for a few weeks before voiding is possible again. Rarely, it may need to stay in for some months, intermittent self catheterisation tried or a suprapubic catheter inserted. Some urinary symptoms may persist for 6-12 months.

A reduction in or even complete loss of semen on ejaculation may be noticed as the prostate and the adjacent seminal vesicles are responsible for the production of seminal fluid.

Occasionally the bowel can be affected with more frequent loose bowel actions, constipation or rarely bleeding.

Post implant advice: Radiation safety

Many patients are concerned about whether an implant poses any potential dangers of radiation exposure to their family and friends. Essentially nearly all of the radiation from the seeds is absorbed within the prostate and surrounding tissues and every 60 days the radiation dose is reduced by 50%. Patients are not considered to be radioactive following discharge from hospital and there are no restrictions on travel or physical contact with other adults, even sleeping or intercourse. However, precautions should be taken to avoid prolonged close contact with small children and pregnant women within the first 2 months after treatment.

Women who are, or may be pregnant may share a lounge but should not sit very close on the same lounge for any period but otherwise there are no restrictions.

Children should not be nursed or sit very close for long periods of time but may be cuddled or held briefly each day and they may stay the other end of a couch without restriction.

The seeds are permanently embedded in the prostate gland but there is a very remote chance of a single seed being passed during sexual activity. Patients are therefore advised to use a condom for the first two weeks after the implant. During this time, the semen may be discoloured brown or black. This is normal and is a result of bleeding that may have occurred during the operation and has now been released into the ejaculate. Sometimes ejaculation can also be painful but this tends to settle in time. Condoms should be disposed of by double wrapping and placing in the rubbish bin.

Follow up schedule

After the seed implantation, regular follow-up is shared by the Urologist and Radiation Oncologist. The post implant CT is used to assess actual dosimetry to see if the prostate has been satisfactorily treated with an adequate radiation dose. If this is thought to be sufficiently deficient, occasionally a second seed implant or external beam radiotherapy could be recommended. The first follow-up is usually with the Urologist in about 3 weeks and the next with the Radiation Oncologist at 3 months after treatment at Calvary North Adelaide Hospital or one month after treatment at the Royal Adelaide Hospital. PSA levels are checked every 3 months for 18 months then at 2 years and then yearly. Initially we will require completion of questionnaires to check symptoms. Following the implant the PSA should gradually fall, possibly taking a couple of years to fall to the lowest level, which should be <1.5. It is not uncommon for there to be a slight PSA rise or bounce at about 12 - 18 months and this should not cause concern. Should there be a sustained PSA rise after treatment, indicating either local failure or unrecognised occult metastatic disease; delayed hormone treatment would be the likely recommendation.

Side effects of prostate brachytherapy

The common side effects after brachytherapy have been mentioned above but a more detailed list follows, including the common mild and temporary side-effects, a few longer term risks and some more serious potential complications seen extremely rarely. These may seem daunting when spelt out but compare favourably with the side effects of the alternative treatments of localised prostate cancer.

Common mild early (<6 months) symptoms after brachytherapy

Coldness and nausea is often felt in recovery after having a general anaesthetic.
Some mild soreness in the perineal area
Bruising and discolouration between the legs
Constipation 20%
A poor stream, worse at night
Urinary frequency, urgency, and burning for up to 6 months
Blood in the urine
Reduced ejaculate volume is usual
Pain and/or bleeding with ejaculation for several months in 50%

Uncommon early (<6 months) symptoms and complications after brachytherapy

Significant perineal bruising, swelling and pain <5%
Prolonged urethral bleeding <5%
Infective prostatitis very rare
Urinary retention requiring catheterisation 10% in general literature, 2% in our experience
Proctitis with rectal bleeding in 2-12%, diarrhoea <10%
Loss of seeds in the ejaculate
Musculoskeletal aches and pains
Minor side-effects from the medication prescribed such as headache and dizziness from the flomaxtra and a rash from the trimethoprim
Extremely uncommon serious anaesthetic related complications including death

Delayed (>6 months) complications after Brachytherapy

Chronic cystitis 3-7%
Voiding difficulty including urethral strictures 5-6%
Urinary incontinence <1%
Urinary incontinence 25% if a past TURP
Urinary incontinence 40% if a subsequent TURP
Proctitis with ulceration <1%, fistula 0.5%
Urethral necrosis <1%
Erectile dysfunction – partial in 25-50%
Erectile dysfunction – complete in 20-25%

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