

Focal prostate brachytherapy – our experience so far

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Overview

- Rationale for focal brachytherapy
- Our focal experience
- Future direction

Side effects from active prostate cancer treatment

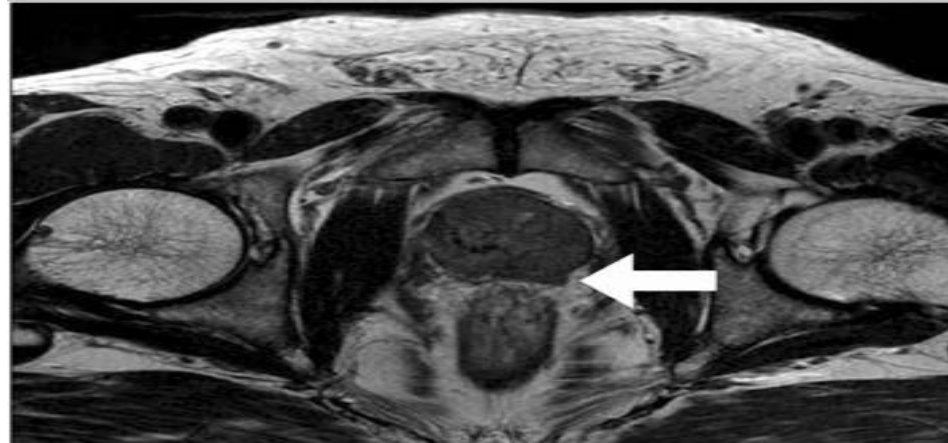
- **Radical Prostatectomy** – invasive, risk of impotence, urinary incontinence (1)
- **Radiation Therapy** – rectal injury, impotence, bladder dysfunction – post treatment QoL similar or worse than RP (1)
- **Hormone Therapy** – anaemia, osteoporosis, impotence, cognitive impairment and increases risk of sudden death (1)
- **Brachytherapy** – incontinence, impotence, retention, irritation (2)

Rationale for focal treatment

- Early prostate cancer should have a treatment that is ***curative, minimally or non invasive, single session*** without debilitating side effects
- “Lumpectomy” for favourable breast cancer
- Challenging in prostate cancer due to the multi-focal nature of the disease, ***although*** shown to be less of a concern than previously thought (1)
- Localised destruction of the largest focus area could potentially reduce local progression and metastasis (3)

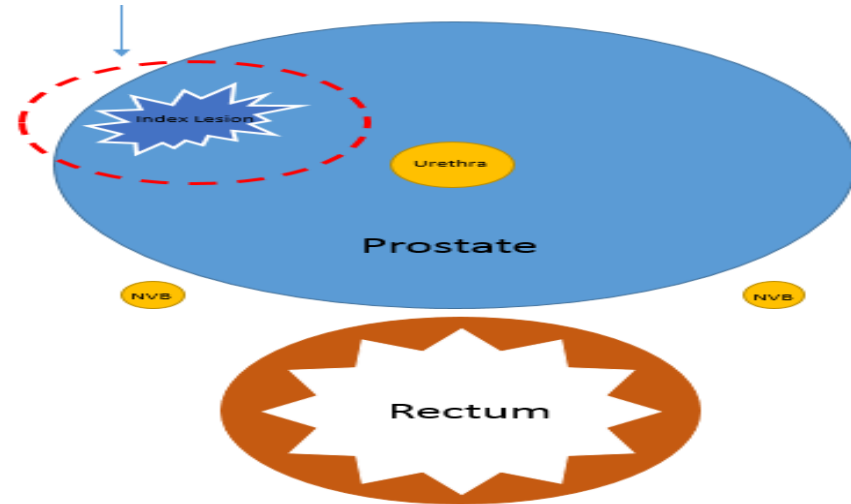
Rationale for focal treatment cont.

- Recent advances in medical imaging *may* have overcome these obstacles (2):
 - mpMRI used as non-invasive tool in intra-prostatic location of prostate cancer
 - T2 MRI is able to provide clinicians with a 3D map of the target tissue



What is focal brachytherapy

- An approach that maximises tumour control, minimises side effects
- Treating the only the portion of gland which contains significant cancer
- Has the potential to reduce injury to adjacent organs whilst maintaining excellent oncological outcome

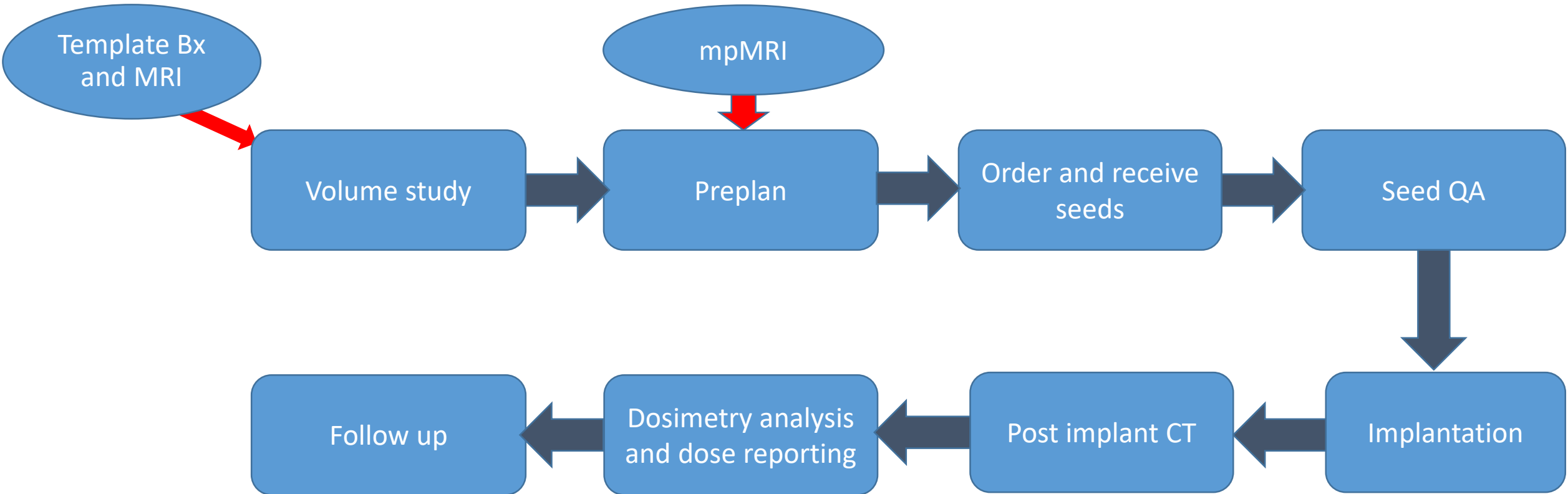


Patient selection

- Patients with low or moderate risk
- Index nodule identified on MRI – matches template biopsy
- Patients with dominate Gleason 4 or clinical stage T2b greater are ***excluded***

79 years old	68 years old	63 years old	75 years old
PSA 6.8	PSA 7.5	PSA 5.1	PSA 8.5
3 + 4 = 7	3 + 4 = 7	3 + 4 = 7	3 + 4 = 7
Left anterior zone	Right anterior TZ	Right anterolateral mid gland	Right anterior TZ

Focal process



Methodology

- 145Gy encompassing PTV
- Range of activities from 0.311mCi – 0.500mCi

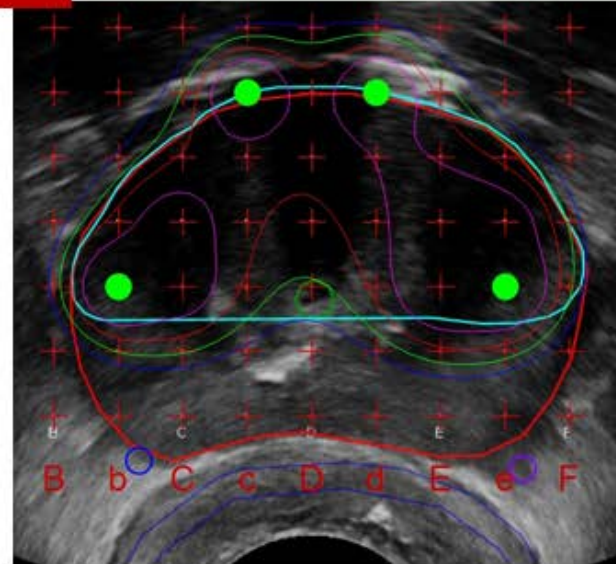
Priority	Target	Dose-volume objectives (145Gy)
1	PTV	V100% ≥ 98%
		V 150 ≤ 52-70%
		D90 > prescription dose

Normal tissue tolerance/ dose constraints

Priority	Normal tissue	Dose-volume constraints (145Gy)
1	Urethra	D10% < 150% of prescription dose
		D30% < 130% of prescription dose
2	Rectum	D2cc < 145Gy
		D0.1cc < 200Gy

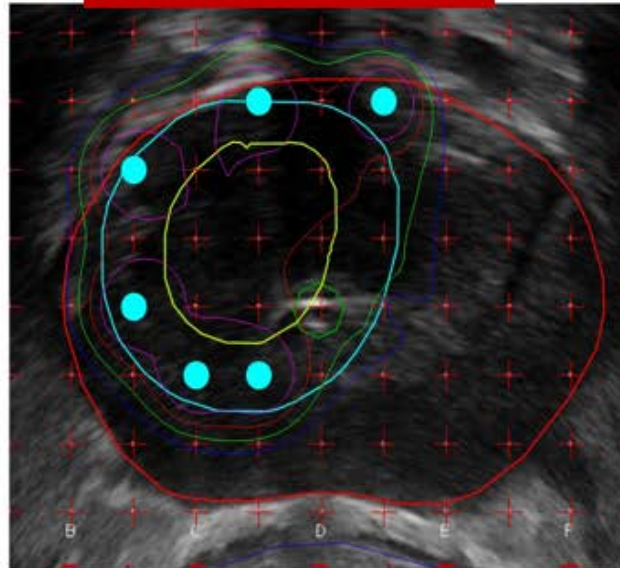
Preplan – PTV objectives

	Patient 1	Patient 2	Patient 3	Patient 4
V100	99.25%	100%	99.17%	99.46%
V150	76.25%	79.26%	91.3%	80.27%
D90	184Gy	199Gy	225Gy	195Gy



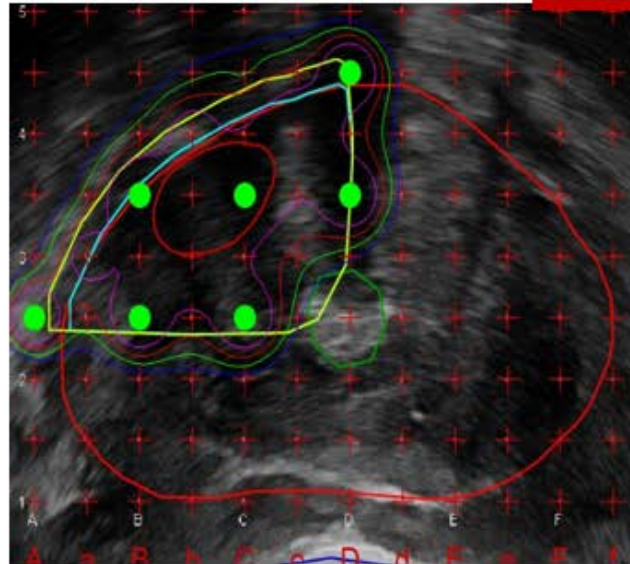
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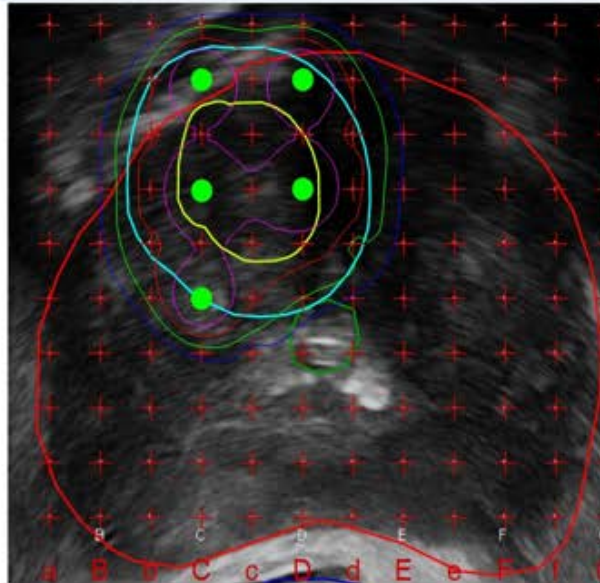
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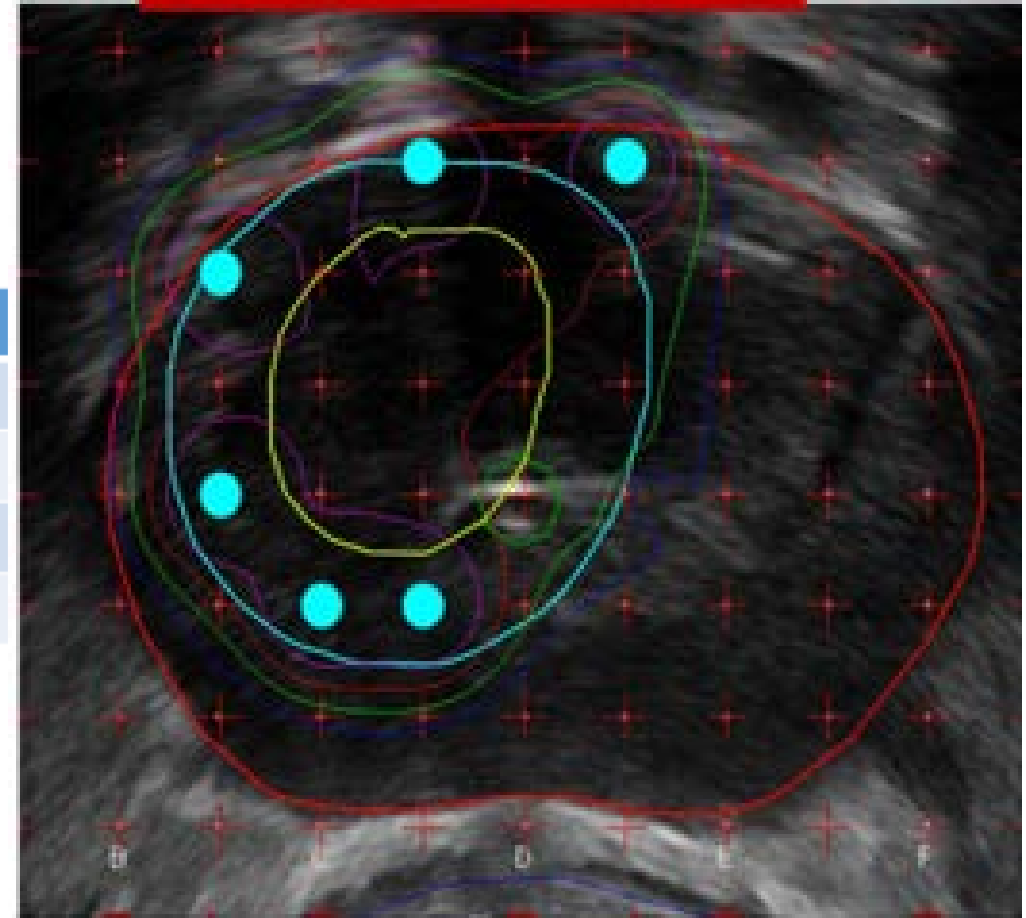


Preplan - OAR

	Patient 1	Patient 2	Patient 3	Patient 4
Urethra D10%	113.94%	148.72%	61.72%	117.62%
Urethra D30%	107.49%	140.44%	39.56%	93.59%
Rectum D2cc	21.13%	18.67%	5.37%	9.59%
Rectum D0.1cc	39.41%	32.53%	10.88%	13.22%

Preplan - OAR

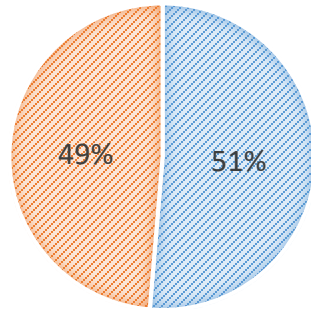
	Patient 1	Patient 2
Urethra D10%	113.94%	148.72%
Urethra D30%	107.49%	140.44%
Rectum D2cc	21.13%	18.67%
Rectum D0.1cc	39.41%	32.53%



Proportion of prostate treated

PATIENT 1

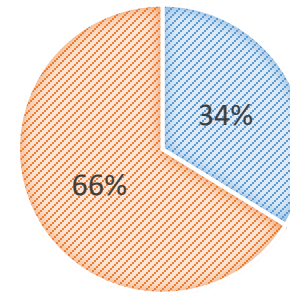
■ PTV ■ Untreated gland



No. of seeds = 41
Total activity = 15.85mCi

PATIENT 2

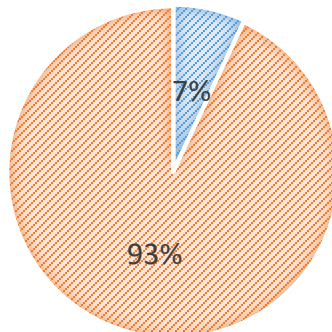
■ PTV ■ Untreated gland



No. of seeds = 33
Total activity = 13.53mCi

PATIENT 3

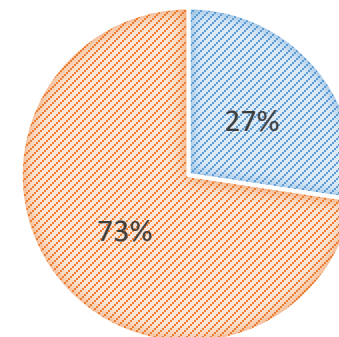
■ PTV ■ Untreated gland



No. of seeds = 24
Total activity = 10.07mCi

PATIENT 4

■ PTV ■ Untreated gland



No. of seeds = 46
Total activity = 19.30mCi

Post plan

Recommended evaluated postoperative dosimetric parameters:

- V100
- V150
- V200
- D90
- Urethral doses – should include UV125, UV150, UD50, UD30, UD5 and/or maximum and minimum dose
- Rectal doses – cubic centimeters of rectum which received \geq prescription dose (RV100)

Post plan results - PTV

	Patient 1	Patient 2	Patient 3	Patient 4
V100	89.59%	89.03%	91.70%	72.25%
V150	42.70%	47.70%	68.76%	48.49%
V200	19.97%	24.04%	47.23%	20.80%
D90	127Gy	143.14Gy	150.58Gy	96.99Gy

Post plan results - OARs

Urethra	Patient 1	Patient 2	Patient 3	Patient 4
UV150	26.34%	29.29%	0%	10.59%

Rectum				
V100 <1.3cm ³	0cm ³	0.04cm ³	0cm ³	0cm ³

PSA response

Patient	Baseline PSA	3	6	9	12	15	18	21	24	FU in 27months
1	6.800		0.560	0.440	0.300	0.210	0.090	0.050	0.070	0.060
2	7.500		2.190		1.400					
3	8.100		1.490		0.920				1.000	
4	5.100		1.900		1.400		1.500			

Conclusion

- Valid option
- Our experience has been positive – smooth and straight forward process with the aid of technology that incorporates MRI and ultrasound fusion
- Routine follow up with PSA, MRI and repeat template biopsy
- Challenges remain in how to interpret PSA result and surveillance of the untreated gland

Future direction

- The success of focal therapy relies upon the accuracy of pre-intervention diagnostics
- Prostate specific membrane antigen (PSMA) scan has the ability to highlight the presence of active local disease (4)
- Formalise a phase II trial employing focal LDR brachytherapy targeting the index lesion incorporating the use of PSMA scans

Acknowledgments

- All at Icon Cancer Centre
- All work conducted at Epworth Radiation Oncology

References

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- 2. (104) Onik G, Miessau M et al. **Three dimensional prostate mapping biopsy has a potentially significant impact on prostate cancer management**. Journal Clinical Oncol. 2009;27:4321-4326
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- 4. Afshar-Oromieh A, et al. **The diagnostic value of PET/CT imaging with the ⁶⁸Ga-labelled PSMA ligand HBED-CC in the diagnosis of recurrent prostate cancer**. European Journal of Nuclear Medicine and Molecular Imaging. 2015.