Comparison of Intraoperatively Built Custom Linked (IBCL) Seeds to Free Seeds for Permanent Prostate Brachytherapy

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Purpose/Objectives

- Our prostate brachytherapy technique at the Medical University of South Carolina evolved from implanting free seeds using a Mick Applicator® (Mick Radio-Nuclear Instruments, Inc.) (MA) to using intra-operatively built custom linked (IBCL) seeds constructed with the QuickLink® device (C.R. Bard, Inc.). We compare dosimetric and early clinical outcomes using free seeds and IBCL seeds.

Materials/Methods

- From April 2005 to July 2012, 198 patients with clinically localized prostate cancer underwent brachytherapy using real-time ultrasound-guided seed placement and intraoperative dosimetry to optimize target coverage based on the approach of Stock. All patients underwent post-operative CT-based dosimetric analysis.
- From April 2005 through February 2007, free seeds were placed using a MA.
- Starting in March 2007, brachytherapy was performed with IBCL seeds constructed using the QuickLink® device in the OR as needed during the implant.
- Percent biochemical disease free survival (bDFS) was calculated using Kaplan-Meier using the Phoenix definition as the definition of failure.
- Post-operative dosimetry for the two methods was compared with the Wilcoxon rank-sum test.
- Specific endpoint analyses were biochemical disease free survival (bDFS), and CTACE 4.03 toxicity criteria grades three or greater, urinary retention requiring catheter placement, any hematuria, and any rectal bleeding.

Results

- Median follow-up was 6.3 years for GA and 2.7 years for IBCL patients. See Table 1 for full patient characteristics and Table 2 for post-implant dosimetry .
- IBCL had significantly higher V100 (p=0.008) and D90 with I-125 (p=0.008) than for free seeds (Table 2).
- Five-year bDFS was 90.6% for intermediate/high-risk patients and 96% for low risk patients (Figure 1 and 2)
- Five year bDFS was significantly higher in the low risk group with IBCL at 100% compared to free seeds at 90.2% (p=0.031).
- The rate of rectal bleeding with radiation (RT) changes on colonoscopy was 1.8% at 5 years.
- All hematuria resolved on its own with no RT changes on cystoscopy.

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Table 1

Characteristics	GA (N=50)	IBCL (N=148)
Age – Range (Median)	50-76 (62.7)	45-77 (64.4)
Race		
White	34 (68)	97 (66)
African American	15 (30)	48 (32)
Other	1 (2)	3 (2)
Gleason Total		
6	40 (80)	79 (53)
7	9 (18)	58 (39)
8	1 (2)	9 (6)
9	0	2(1)
Clinical Stage		
T1c	38 (76)	124 (84)
T2a	12 (24)	15 (10)
T2b	0	8 (5)
T3b	0	1 (1)
PSA– Range (Median)	0.7-12.2 (6.38)	1.3-108 (5.73)
NCCN Risk Group		
Low	40 (80)	67 (45)
Intermediate	9 (18)	68 (46)
High	1 (2)	13 (9)
Isotope		
I-125	42 (84)	73 (51)
Pd-103	8 (16)	72 (49)
Hormonal Therapy		
Yes	37 (74)	66 (45)
No	13 (26)	82 (55)
External Beam		
Yes	8 (16)	71 (48)
No	42 (84)	77 (52)

Figure 1

Kaplan-Meier Analyses

	IBCL			GA			*p* Value
	N	Events	5-yr bDFS%	N	Events	5-yr bDFS%	
NCCN Risk Group							
Low	67	0	100	40	7	90.2	0.031
Intermediate/High	81	5	88.1	10	1	100	0.259
	N	**Events**	**5-yr toxicity%**				
Toxicity	148			50			
≥ Grade 3		5	3.8		1	2.4	0.87
Catheterization		6	5.3		2	4.4	0.92
Any Hematuria		12	12.2		2	5	0.1
Any Rectal Bleeding		12	13.7		3	7.1	0.56

Figure 2

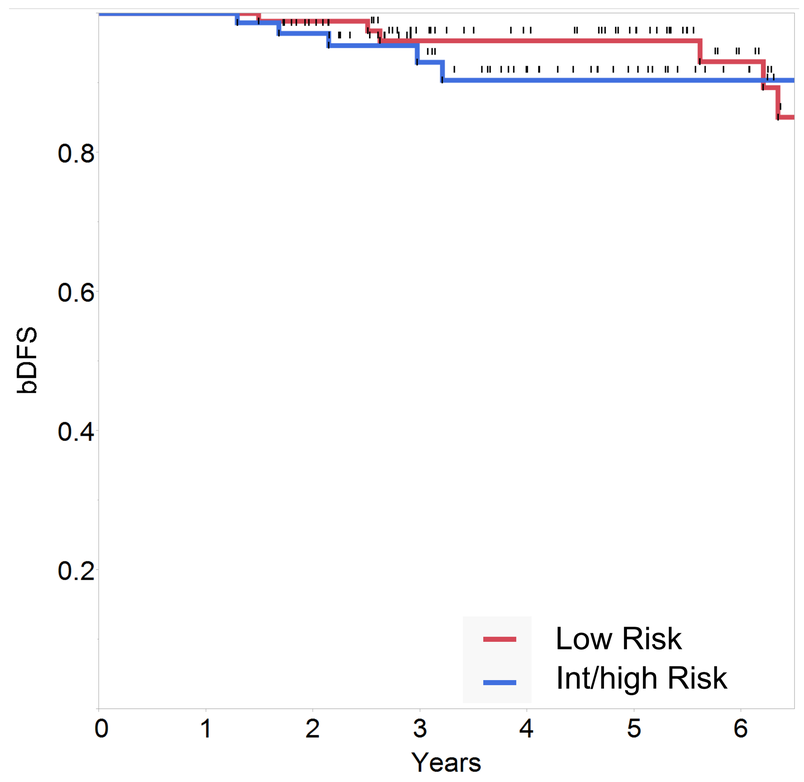

Table 2

Post-Implant Dosimetry

	GA Median	IBCL Median	*p* Value
Prostate Volume			
Prostate D90			
I-125	164.0 Gy	176.6 Gy	0.008
Pd103	98.8 Gy	109.7 Gy	0.31
Prostate V100	91.1%	94.2%	0.008
Urethra D30	127.6%	133.5%	0.44
Rectal V100	0.57 cc	0.55 cc	0.65

Conclusions

- Prostate implants using free seeds or IBCL seeds provide low rates of early biochemical failure and toxicity in patients with clinically localized prostate cancer.
- IBCL was associated with a higher D90 in patients receiving I^{125}.
- Patients with low risk disease had better bDFS with IBCL seeds compared to patients treated with free seeds, but longer follow-up is needed to confirm these findings.

Disclosures: Dr. Marshall – C.R. Bard, Inc. and Medicon/Bard Japan: honoraria for developing and delivering educational programs regarding prostate brachytherapy. No other potential conflicts of interest exist.