Acute Toxicity Outcomes From Salvage High-Dose-Rate Brachytherapy for Locally Recurrent Prostate Cancer After Prior Radiotherapy

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Introduction

Recurrence of prostate adenocarcinoma within the prostate after radiotherapy is challenging as the cure options pose significant risks of harm

Brachytherapy is a potential curative option[1,2], but supportive data are limited

This study aims to present the acute toxicity results from using salvage high-dose-rate brachytherapy (sHDR-BT) as a treatment in these cases

Methods

Eligible patients for sHDR-BT had imaging and biopsy proven local failure after curative intent prostate radiotherapy

Evaluation with the American Urological Association (AUA)[3] and Common Terminology Criteria for Adverse Events (CTCAE)[4] symptom assessments were performed

Treatment characteristics
- **Prior EBRT only:** 21Gy in 2 fractions to prostate; 27Gy in 2 fractions to dominant nodule(s) or biopsy proven regions of disease
- **Prior brachytherapy:** 27Gy in 2 fractions to dominant nodule(s) or biopsy proven region(s) of disease

Targets were delineated via cognitive fusion between intraoperative ultrasound and pre-brachytherapy 3T multiparametric MR. Patients were moved from the OR to the treatment delivery room following the method described in Elangovan et al.5

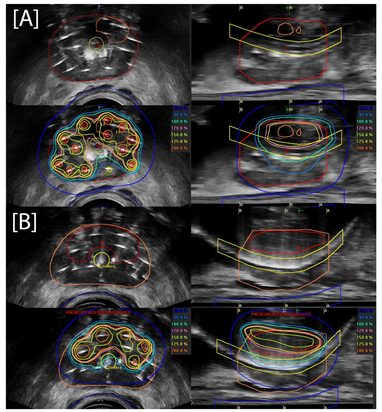

Figure 1: Example contours and isodose distributions for [A] patient receiving whole gland therapy with SIB to nodule and [B] patient receiving SIB only to prostate nodule.

Results

	1m Post sHDR-BT [N=17]	3m Post sHDR-BT [N=17]
Bladder Perforation		
0	16 (94%)	17 (100%)
1	1 (6%)	0 (0%)
Bladder Spasm		
0	5 (29%)	6 (35%)
1	2 (12%)	1 (6%)
2	10 (59%)	10 (59%)
Cystitis		
0	10 (59%)	12 (71%)
1	7 (41%)	5 (29%)
Dysuria		
0	13 (76%)	12 (88%)
1	4 (24%)	1 (6%)
2	0 (0%)	1 (6%)
Urinary Frequency		
0	5 (29%)	5 (29%)
1	12 (71%)	7 (41%)
2	0 (0%)	5 (29%)
Urinary Incontinence		
0	12 (71%)	9 (53%)
1	3 (18%)	7 (41%)
2	2 (12%)	1 (6%)
Urinary Retention		
0	14 (82%)	13 (77%)
1	3 (18%)	3 (18%)
2	0 (0%)	1 (6%)
Urinary Obstruction		
0	9 (53%)	8 (47%)
1	7 (41%)	9 (53%)
2	1 (6%)	0 (0%)
Urinary Pain		
0	14 (82%)	12 (71%)
1	3 (18%)	4 (24%)
2	0 (0%)	1 (6%)
Urinary Urgency		
0	4 (24%)	6 (35%)
1	9 (53%)	8 (47%)
2	4 (24%)	3 (18%)
Prostatic Pain		
0	16 (94%)	15 (88%)
1	1 (6%)	1 (6%)
2	0 (0%)	1 (6%)

Table 1: CTCAE reporting genitourinary toxicity scores at 1 month and 3 months after sHDR-BT.

17 patients treated with sHDR-BT salvage between 2019 and 2022 were prospectively evaluated
- Median age: 68 (66-74)

Median time from initial radiotherapy to biopsy confirmation of recurrent disease: 62 (52-106) months

	1m Post sHDR-BT [N=17]	3m Post sHDR-BT [N=17]
Anal Pain		
0	16 (94%)	16 (94%)
1	1 (6%)	0 (0%)
2	0 (0%)	1 (6%)
Diarrhea		
0	16 (94%)	17 (100%)
1	1 (6%)	0 (0%)
Flatulance		
0	16 (94%)	16 (94%)
1	1 (6%)	1 (6%)
Nausea		
0	16 (94%)	17 (100%)
1	1 (6%)	0 (0%)
Proctitis		
0	17 (100%)	16 (94%)
1	0 (0%)	1 (6%)
Rectal Mucositis		
0	15 (88%)	16 (94%)
1	2 (12%)	1 (6%)
Rectal Pain		
0	17 (100%)	16 (94%)
1	0 (0%)	1 (6%)

Table 2: CTCAE reporting gastrointestinal toxicity scores at 1 and 3 months after sHDR-BT.

Prior treatment modality:
- Prior EBRT monotherapy (74-78Gy): 8 (47%)*
- Prior LDR-BT monotherapy (144Gy): 8 (47%)
- Prior LDR-BT (110Gy) + EBRT (46Gy): 1 (6%)**

*3 received 46Gy elective nodal radiotherapy
**1 received 46Gy elective nodal radiotherapy

	Prior to sHDR-BT	1-month post sHDR-BT	p - value
Incomplete Emptying			
0 - 1	12 (71%)	10 (59%)	0.59
2 - 3	2 (12%)	5 (29%)	
4 - 5	3 (18%)	2 (12%)	
Frequency			1
0 - 1	9 (53%)	10 (59%)	
2 - 3	5 (29%)	4 (24%)	
4 - 5	3 (18%)	3 (18%)	
Intermittency			0.56
0 - 1	12 (71%)	10 (59%)	
2 - 3	2 (12%)	1 (6%)	
4 - 5	3 (18%)	6 (35%)	
Urgency			0.19
0 - 1	12 (71%)	6 (35%)	
2 - 3	1 (6%)	3 (18%)	
4 - 5	4 (24%)	8 (47%)	
Weak Stream			0.38
0 - 1	10 (59%)	6 (35%)	
2 - 3	3 (18%)	6 (35%)	
4 - 5	4 (24%)	5 (29%)	
Straining			0.82
0 - 1	14 (82%)	12 (71%)	
2 - 3	1 (6%)	1 (6%)	
4 - 5	2 (12%)	4 (24%)	
Nocturia			0.55
0 - 1	9 (53%)	4 (24%)	
2 - 3	3 (18%)	7 (41%)	
4 - 5	5 (29%)	6 (35%)	

Table 3: AUA symptom scores before and after sHDR-BT in cohort of 17 patients.

Pre sHDR-BT median AUA score: 7 (3-18)
1 month post sHDR-BT median AUA score:13 (8-21)

Maximum acute CTCAE gastrointestinal (GI) toxicity was 2. There was only one patient who experienced grade 2 anal pain.

Maximum acute genitourinary (GU) CTCAE toxicity was grade 2. The most common grade 2 GU toxicity was bladder spasms

	1st sHDR-BT Fraction	2nd sHDR-BT Fraction
Dominant Intraprostatic Lesion Volume [cc]	7 (6-11)	9 (8-16)
Dominant Intraprostatic Lesion D100% [Gy]	10 (10-11)	10 (9-11)
Dominant Intraprostatic Lesion D90% [Gy]	15 (14-15)	15 (14-15)
HDR-BT Prostate Volume [cc]	27 (22-32)	31 (26-33)
Prostate D100% [Gy]	8 (1-9)	8 (1-9)
Prostate D90% [Gy]	11 (5-11)	11 (7-12)
Rectum D100cc [Gy]	8 (7-9)	8 (7-9)
Rectum V10.8Gy [cc]	0 (0-0)	0 (0-0)
Urethra D10% [Gy]	12 (12-15)	12 (12-14)
Urethra Dmax [Gy]	15 (13-17)	15 (13-16)

Table 4: Dosimetry achieved during first and second fraction of sHDR-BT for patients with intraprostatic relapse of prostate cancer after initial radiotherapy treatment

Conclusion

The toxicity profile of sHDR-BT in this study of cognitive fusion of MR and intraoperative US was very acceptable

Majority of acute toxicities were limited to genitourinary domain

No CTCAE grade 3+ acute toxicity encountered

No statistically significant increase in AUA score (p=0.21) or any subscore 1 month after sHDR-BT

Future work is needed to determine long-term efficacy and toxicity of treatment.

Contact

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