High Dose Rate Brachytherapy monotherapy versus External Beam Radiotherapy with HDR Brachytherapy Boost for Unfavorable Intermediate Prostate Cancer Patients

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Introduction

External beam radiotherapy treatment involves shooting high-energy photons or particle radiation through normal healthy tissue to hit the tumor directly. High-dose-rate brachytherapy involves inserting radioactive seeds into the tumor. For the treatment of unfavorable intermediate-risk prostate cancer, external beam radiotherapy with high-dose-rate brachytherapy boost was the accepted treatment but high-dose-rate brachytherapy as monotherapy has been proposed as a potential viable treatment option. There is currently a lack of data comparing toxicity profiles and relative outcomes between the two treatment options.

Aims and Objectives

This matched-pair analysis aims to compare biochemical outcomes and toxicity profiles of patients treated with HDR brachytherapy monotherapy or unfavorable intermediate-risk patients compared to similar risk group patients treated with combined EBRT and HDR boost.

Methods

A retrospective review of 51 matched pair patients who received External beam radiotherapy with High-dose-rate brachytherapy boost or High-dose-rate brachytherapy monotherapy was conducted.

The Kaplan-Meier method was used to estimate overall survival (OS), cause specific survival (CSS), loco-regional recurrence (LRR), disease-free survival (DFS), and Distant Metastases (DM).

Query Criteria NCCN UIR Prostate Cancer:

- [Gleason grade group 3, ≥ 50% biopsy cores positive, or ≥ 2 of the following: PSA > 10 and ≤ 20 ng/mL, Gleason score 7, or clinical stage T2b-T2c]
- Criteria for the matched pair analysis included:

  1) Age ± 3 years

  2) Gleason Score (minor and major)

  3) Clinical T stage

Brachytherapy Doses (current institutional standards

- 10.5 Gy x 2 for HDR-B and 13.5 Gy x 2 for HDR-M
- HDR-B patients received 45-46 Gy in 23-25 fractions EBRT to the prostate, proximal seminal vesicles, and pelvic lymph nodes

Biochemical Failure Definition:

- Phoenix Criteria (PSA nadir + 2)

Results

Table 1: Patient Characteristics N = 102

	HDR Boost N=51	Mono N=51	p
Age at Diagnosis (yrs)	63.57	64.04	0.738
Pre-tx PSA (ug/mL)	7.85	8.01	0.829
Nadir PSA (ug/mL)	0.479	0.809	
Gleason	7	7	1.000
Gleason Group			1.000
3+4	25 (49%)	25 (49%)	
4+3	26 (51%)	26 (51%)	
Race			0.180
Black	9 (18.8%)	11 (23.9%)	
White	32 (66.7%)	34 (73.9%)	
Other	7 (14.6%)	1 (2.2%)	
Clinical T stage			1.000
T1c	42 (82.4%)	42 (82.4%)	
T2a	6 (11.8%)	6 (11.8%)	
T2b	3 (5.9%)	3 (5.9%)	
Total Dose	6680.4	2700	<0.001
Implant Date	4/17/1998-3/08/2018	3/11/2009-11/6/2019	
FU time (yrs)	8.33	3.27	<0.001

Table 2: Clinical Outcomes 1-, 3-, 5-, 8-, and 10 years

	HDR Boost N=51	Mono N=51	p
OS	100%, 97.9%, 97.9%, 86.8%, 72.3%	100%, 100%, 100%, 85.7%, 68.6%	0.870
CSS	100%, 100%, 100%, 94.6%, 94.6%	100%, 100%, 100%, 100%, 100%	0.426
LRR	0%, 2%, 2%, 2%, 2%	4.1%, 7.5%, 7.5%, 7.5%, 7.5%	0.236
DM	2%, 6%, 6%, 6%, 6%	0%, 0%, 0%, 0%, 0%	0.117
DFS	82.4%, 76.2%, 76.2%, 76.2%, 76.2%	92%, 88.4%, 88.4%, 88.4%, 88.4%	0.092
Biochemical control	100%, 91.7%, 91.7%, 91.7%, 91.7%	95.7%, 92.1%, 92.1%, 92.1%, 92.1%	0.821

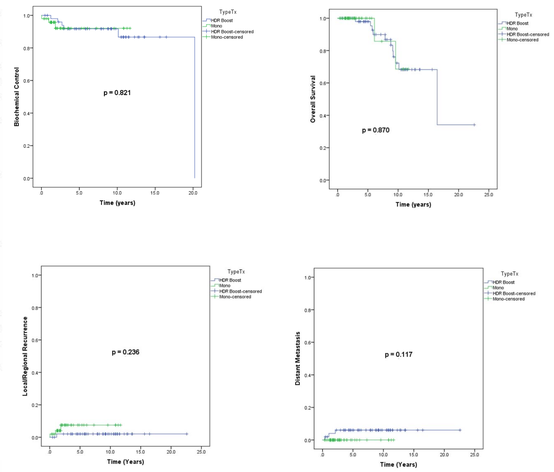

Figure 2A-2D:
The Kaplan-Meier method was used to estimate biochemical control (2A), overall survival (2B), rate of locoregional recurrence (2C), and rate of distant metastases (2D).

Follow-up time was calculated from the first HDR implant date to the last recorded follow-up.

Conclusions

There are no significant differences in overall survival, cause-specific survival, loco-regional recurrence, distant metastases, and freedom from biochemical failure between the patients treated with HDR brachytherapy monotherapy compared to EBRT with HDR boost.

HDR brachytherapy monotherapy can be an effective option for unfavorable intermediate prostate cancer patients without the toxicity of added pelvic radiation.

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