ORIGINAL ARTICLE

EFFECTS OF BRACHYTHERAPY BOOST ON PROSTATE CANCER TREATED WITH EXTERNAL BEAM RADIOTHERAPY: A PILOT STUDY

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ABSTRACT

Background: Prostate cancer is the leading cause of cancer amongst men in Nigeria. External beam radiotherapy (EBRT) and high-dose rate brachytherapy (HDR-BT) play a significant role in the management of localised prostate cancer.

Objective: This study compared the treatment outcome of the management of intermediate and high-risk localised prostate cancer patients using EBRT alone and EBRT + BT.

Methods: A pilot study was conducted at the University College Hospital, Ibadan, and the Lagos University Teaching Hospital. Thirty-eight (38) patients were recruited, with 19 patients in both EBRT alone and EBRT+BT arms. Biochemical-free survival (BFS), late side effects, and quality of life (QoL) were assessed and compared across both arms. Biochemical free survival was calculated using the Kaplan-Meier survival curve and compared using log log-rank test, quality of life was assessed using the EORTC quality of life questionnaire and mean compared using the t-test. Late side effects were assessed using the RTOG questionnaire and compared using chi-square. Ethical approval was obtained from both institutions.

Results: Twenty-seven percent (23%) of the patients recruited had intermediate-risk disease, while seventy-three percent (73%) had high-risk disease, with ADT used before radiotherapy in 71.1%. The mean EQD2 in the EBRT arm and EBRT+BT arm was 63.0Gy and 81.5Gy, respectively. BFS at 12 months was 81.8% and 88.2% for EBRT and EBRT+BT, respectively. Mean time to biochemical recurrence was 11.46 months and 11.82 months for EBRT and EBRT+BT, respectively (p=0.625). All biochemical failures occurred among the high-risk group, with BFS at 12 months being 71.4% and 84.6% for EBRT and EBRT+BT, respectively (p=0.468). Grade 1 and 2 late Genitourinary toxicities were more in the EBRT arm (10.5% and 52.6% respectively) compared to the EBRT+BT arm (5.3% and

15.8% respectively) (P=0.03). Comparison of Gastrointestinal late toxicities, QoL, and sexual function in both arms was not statistically significant.

Conclusion: BFS was similar in both treatment arms; however, the EBRT+BT arm had fewer genitourinary side effects than the EBRT arm. Gastrointestinal toxicities, QoL, and sexual dysfunction had comparative incidence in both arms.

Keywords: Prostate Cancer, PSA, High-dose Brachytherapy, External Beam Radiotherapy, Biochemical Recurrence-Free Survival, Late side effects, and Quality of life.

INTRODUCTION

Prostate cancer is the most frequently diagnosed cancer in men in over half (112 of 185) of the countries of the world, estimated at 1.4 million new cases and 375000 deaths globally.[1] In Nigeria, Prostate cancer is the most common cancer among men, with 15,306 new cases in 2020, as well as the second leading cause of cancer mortality in both sexes.[2]

In the treatment of prostate cancer, the radiation used may come from an external source (external radiotherapy) or a source located close to the tumour or placed inside the body (brachytherapy). External beam Radiation Therapy is a treatment option for localised prostate cancer. It could be the only modality of treatment or used alongside brachytherapy boost in unfavourable intermediate and high-risk prostate cancer groups according to NCCN guidelines.[3]

High-dose-rate or low-dose-rate brachytherapy can deliver a high radiation dose to the tumour with good biochemical control of the disease.[4,5] High dose rate brachytherapy can be used as monotherapy or in combination with external beam Radiotherapy.[4,5] HDR brachytherapy as a monotherapy is effective in men with low-risk prostate cancer.[5] In intermediate and high-risk prostate cancer, HDR brachytherapy alone may not suffice to treat potential peri-prostatic disease extension, but is usually optimal as a boost in combination with EBRT.[4] However, with HDR Brachytherapy and EBRT, higher radiation doses can be achieved with good tumour control in localised prostate cancer, and reduced gastrointestinal and genitourinary side effects.[6] Due to paucity of such studies comparing the treatment outcome of the varying modalities of treatment for localised prostate cancer in our environment and increased financial burden of prostate cancer treatment, this study aims to compare External beam Radiotherapy with High dose rate brachytherapy and External beam radiotherapy alone among prostate cancer patients with intermediate or high-risk localised disease.

MATERIALS AND METHODS

This is a two-institution-based retrospective cohort study, carried out among histologically confirmed prostate cancer patients who were treated with high-dose rate brachytherapy and External beam Radiotherapy or External beam Radiotherapy alone at the Department of Radiation Oncology, University College Hospital, Ibadan, Nigeria, or NSIA -LUTH Cancer Centre, Idi-Araba.

Patients with histologically confirmed adenocarcinoma of the prostate who had Intermediate or High-Risk were recruited.

Treatment

The mean EQD2 for planning target volume for patients recruited in external beam radiotherapy with brachytherapy boost was 81.5Gy, while EQD2 for EBRT alone was 63.5Gy. Patients were treated with high-dose

rate brachytherapy (HDR-BT) using a Cobalt-60 source from a remote after loading a SagiNova® 25-channel HDR brachytherapy machine. Further details of the brachytherapy procedure are as published by Abdus-Salam et al.[7] External beam radiotherapy was delivered using a cobalt-60 machine with 2D treatment planning or a linear accelerator with a 3D treatment planning technique.

Biochemical recurrence-free survival (BRFS): This was defined as biochemical recurrence 12 months post-treatment. The Phoenix definition of biochemical failure was adopted (an increase in the level of serum prostate-specific antigen (PSA) >2 ng/mL above the nadir after radiotherapy). [8,9]

Late side effects were defined as toxicities experienced by patients after 90 days of treatment. Toxicities were graded using the RTOG questionnaire.
The EORTC questionnaire was used to assess the quality of life in the two treatment arms.

Data Collection
Patients' age, clinicopathologic characteristics (initial PSA, use of ADT, TNM staging, Gleason score, grade group and risk group), brachytherapy and teletherapy dates and doses, PSA results during 3-6 monthly follow-up visits up to 12 months after radiotherapy and side effects at least 90days post treatment were extracted from the patients' case notes and treatment records. Quality of life using the EORTC questionnaire was recorded during the patient's follow-up visit or via phone calls in patients who could not be reached physically. Patients lost to follow-up were contacted using their telephone numbers or that of their next of kin recorded in the case notes to ascertain their current status.

Data Analysis
SPSS version 22 was used for data analysis. Results were summarised in prose, tables, and graphs. Mean and median were used as measures of location, while standard deviation and range were used as measures of dispersion. Chi-squared test or Fisher's exact test was used to test for association between categorical data. Biochemical free survival was calculated using the Kaplan-Meier survival curve and compared using log log-rank test, quality of life was assessed using the EORTC quality of life questionnaire, and mean compared using the t-test. Late side effects were assessed using the RTOG questionnaire and compared using chi-square. The level of significance was 5%.

Ethical Consideration
Ethical approval for the study was obtained from the Joint Ethical Review Committee of the University of Ibadan and University College Hospital, Ibadan, as well as Lagos State Teaching Hospital (LUTH), Idi-Araba.

RESULTS

Sociodemographic, Medical and Social Characteristics
Thirty-eight (38) patients with histologically diagnosed prostate cancer with localised disease were recruited. The mean age for all the patients was 66.1 years. The mean age was 66.1 years for the EBRT arm and 66.2 years for the EBRT+BT arm. Most of the patients were married (86.8%), with over half of the patients from the Yoruba tribe (63.2%). The majority of the patients had tertiary level of education (81.6%). Hypertension and Diabetes were the most common comorbidities reported among patients recruited, with 68.4% and 34.2% respectively (Table 1).

Disease and Treatment Characteristics

The mean PSA value among patients who had EBRT was 84.1ng/ml±188.9 with a range of 4.3-751.0ng/ml, while patients who received EBRT +BT had a mean PSA of 42.0ng/ml ± 42.9 with a range of 6.2-175.3ng/ml. Over half of the patients (63.9%) were TNM stage 1 and 2, 58.8% had PSA >20ng/ml, 82.4% had a Gleason score of 7, 73.0% were high-risk group, and the remaining 27.0% were intermediate risk group. Most of the patients (71.1%) had ADT before radiotherapy. The mean EQD2 for patients who had EBRT alone was 63.4Gy, while EQD2 for EBRT+BT was 81.5Gy (Table 2).

Biochemical Free Survival

Biochemical free survival was 81.8% and 88.2% at 12 months for EBRT and EBRT+BT, respectively, in both the intermediate and high-risk groups (P-value = 1.00). Mean time to biochemical recurrence was 11.46 months and 11.82 months for EBRT and EBRT+BT, respectively. (p=0.625) (Figures 1 and 2). Biochemical free survival for the high-risk group was 71.4% and 84.6% at 12 months for EBRT and EBRT+BT, respectively. The mean time to biochemical recurrence in the high-risk group was 11.14 months and 11.77 months for EBRT and EBRT+BT, respectively (p=0.468), while the overall mean time to biochemical recurrence among the high-risk group was 11.55 months. The Biochemical failure was similar in both arms of treatment (EBRT=18.2% and EBRT+BT = 11.8%) (p=1.00).

Side Effects of Treatment

Gastrointestinal (GI) toxicities were reported in both arms of treatment. Grade 1 and 2 GI toxicities occurred in 21% of EBRT patients, while Grade 2 and 3 GI toxicities were seen in 26.3% of EBRT+BT patients (two patients had rectal fistula in the EBRT+BT arm). Genitourinary toxicities were reported more in patients who had EBRT alone (12 patients) compared with EBRT+BT (4 patients). Grade 2 toxicities were seen in 10 patients (52.6%) and grade 1 toxicities in 2 patients (10.5%) for the EBRT treatment arm, while 1 patient (5.3%) reported grade 1 GU toxicities and 3 patients (15.8%) with grade 2 GU toxicities in the EBRT+BT arm. Urinary frequency was the most common late grade 2 toxicity in the EBRT arm (p=0.03). Genitourinary toxicities as a long-term side effect were more in the EBRT alone arm of treatment than EBRT+BT arm (p=0.03). (Table 4).

Quality of Life

The Quality of life for all the patients recruited (EBRT alone and EBRT+BT) was similar in both treatment arms, but the Sexual activity and sexual function domains were reduced. Sexual function in the EBRT arm (65.9) is improved when compared with the EBRT+BT arm (54.2), though not statistically significant (Table 3).

Table 1. Sociodemographic, Medical, and Social Characteristics

Variables	EBRT (n=19)	EBRT+BT (n=19)	Total (n=38)	P-Value
Age (years)				
Median(range)	68.0(52-77)	67.0(47-82)	67.5(47-82)	0.977
Mean (SD)	66.1(7.5)	66.2(8.6)	66.1(7.9)	0.968
Age Range				
<65 years	8 (42.1%)	8 (42.1%)	16 (42.1%)	
≥65 years	11 (57.9%)	11 (57.9%)	22 (57.9%)	1.000
Marital Status				
Married	15 (78.9%)	18 (94.7%)	33 (86.8%)	
Widower	2 (10.5%)	1 (5.3%)	3 (7.9%)	
Divorced	1 (5.3%)	0 (0.0%)	1 (2.6%)	
Single	1 (5.3%)	0 (0.0%)	1 (2.6%)	0.406
Tribe				
Yoruba	15 (78.9%)	9 (47.4%)	24 (63.2%)	
Igbo	4 (21.1%)	10 (52.6%)	14 (36.8%)	**0.044**
Level of education				
Tertiary	15 (78.9%)	16 (84.2%)	31 (81.6%)	
Secondary	4 (21.1%)	1 (5.3%)	5 (13.2%)	
Primary	0 (0.0%)	1 (5.3%)	1 (2.6%)	
No formal	0 (0.0%)	1 (5.3%)	1 (2.6%)	0.340
Religion				
Christian	18 (94.7%)	16 (84.2%)	34 (89.5%)	
Islam	1 (5.3%)	3 (15.8%)	4 (10.5%)	0.604
Employment status				
Employed	11 (57.9%)	11 (57.9%)	22 (57.9%)	
Retired	8 (42.1%)	8 (42.1%)	16 (42.1%)	1.000
Hypertensive				
Yes	12 (63.2%)	14 (73.7%)	26 (68.4%)	
No	7 (36.8%)	5 (26.3%)	12 (31.6%)	0.485
Diabetic				
Yes	5 (26.3%)	8 (42.1%)	13(34.2%)	
No	14 (73.7%)	11 (57.9%)	25(65.8%)	0.305
Alcohol				
Yes	10 (52.6%)	14(73.7%)	24 (63.2%)	
No	9 (47.4%)	5 (26.3%)	14 (36.8%)	0.179
Smoking				
Yes	2 (10.5%)	5 (26.3%)	7 (18.4%)	
No	17 (89.5%)	14 (73.7%)	31 (81.6%)	0.405

Table 2. Disease and Treatment Characteristics

Variables	EBRT (n=19)	EBRT+BT (n=19)	Total (n=38)	P-value
PSA (ng/ml) (n=34)				
Median	23.0(4.3-751.0)	29.0(6.2-175.3)	25.6(4.3-751.0)	0.560
Mean	84.1(188.9)	42.0(42.9)	60.5(128.8)	0.352
PSA range (n=34)				
<10 ng/ml	3 (20.0%)	2 (10.5%)	5 (14.7%)	
10-20 ng/ml	4 (26.7%)	5 (26.3%)	9 (26.5%)	
>20 ng/ml	8 (53.3%)	12 (63.2%)	20 (58.8%)	0.886
TNM Stage (n=36)				
Stage 1- 2	12 (70.6%)	11 (57.9%)	23 (63.9%)	
Stage 3	3 (17.6%)	5 (26.3%)	8 (22.2%)	
Stage 4A	2 (11.8%)	3 (15.8%)	5 (13.9%)	0.797
Grade (n=34)				
Well-Differentiated	2 (13.3%)	4 (21.1%)	6 (17.6%)	
Moderately Differentiated	7 (46.7%)	10 (52.6%)	17 (50.0%)	
Poorly Differentiated	6 (40.0%)	5 (26.3%)	11 (32.4%)	0.726
Risk Group (n=37)				
Intermediate Risk	6 (33.3%)	4 (21.1%)	10 (27.0%)	
High Risk	12 (66.7%)	15 (78.9%)	27 (73.0%)	0.319
ADT				
Yes	14 (73.7%)	13 (68.4%)	27 (71.1%)	
No	5 (26.3%)	6 (31.6%)	11 (28.9%)	0.721
EBRT Doses (n=27)				
30Gy in 10#		1 (10.0%)	1 (3.7%)	
30Gy in 15#		1 (10.0%)	1 (3.7%)	
36Gy in 18#		1 (10.0%)	1 (3.7%)	
40Gy in 12#		1 (10.0%)	1 (3.7%)	
45Gy in 12#		4 (40.0%)	4 (14.8%)	
45Gy in 25#	1 (5.9%)		1 (3.7%)	
50Gy in 20#	1 (5.9%)		1 (3.7%)	
52.25Gy in 19#		1 (10.0%)	1 (3.7%)	
60Gy in 20#	12 (70.6)		12 (44.4%)	
60Gy in 30#		1 (10.0%)	1 (3.7%)	
70Gy in 35#	2 (11.8%)		2 (7.4%)	
74Gy in 37#	1 (5.9%)		1 (3.7%)	
BT Doses (n=19)				
9Gy in 1#		1 (5.3%)	1 (5.3%)	
18Gy in 2#		11 (57.9%)	11 (57.9%)	
21.5Gy in 2#		1 (5.3%)	1 (5.3%)	
27Gy in 2#		6 (31.6%)	6 (31.6%)	
EQD2 (Gy)				
Median	63.4	80.0	66.4	**< 0.00001**
Mean	63.0	81.5	70.3	**<0.00001**

Table 3. Treatment Outcomes

Variables	EBRT (n=19)	EBRT+BT (n=19)	Total (n=38)	P-value
Biochemical failure (n=28)				
Yes	2 (18.2%)	2 (11.8%)	4 (14.3%)	
No	9 (81.8%)	15 (88.2%)	24 (85.7%)	1.000
Biochemical failure (High risk; n=20)				
Yes	2(28.6%)	2(15.4%)	4(20.0%)	
No	5(71.4%)	11(84.6%)	16(80.0%)	0.587
EORTC QLQ-C30 Function mean (SD)				
Global health status	79.4(11.9)	68.9(24.0)	74.1(19.5)	0.096
Physical Function	97.2(5.1)	88.1(22.8)	92.6(17.0)	0.098
Role Function	98.2(5.2)	87.7(26.0)	93.0(19.2)	0.092
Emotional Functioning	90.4(13.7)	84.6(29.0)	87.5(22.6)	0.444
Cognitive Function	93.0(11.5)	85.1(25.4)	89.0(20.0)	0.225
Social Function	78.9(22.8)	85.1(26.0)	82.0(24.3)	0.444
EORTC QLQ-C30 Symptoms (mean (SD))				
Fatigue	11.11(13.9)	16.37(30.8)	13.7(23.7)	0.502
Nausea and vomiting	0.9(3.8)	1.8(7.6)	1.3(6.0)	0.657
Pain	7.0(10.1)	19.3(32.0)	13.2(24.2)	0.120
Dyspnoea	3.5(10.5)	3.5(15.3)	3.5(12.9)	1.000
Insomnia	7.0(17.8)	19.3(30.1)	13.2(25.2)	0.134
Loss of appetite	1.8(7.6)	5.3(16.7)	3.5(12.9)	0.411
Constipation	8.8(21.8)	7.0(17.8)	7.9(19.7)	0.787
Diarrhoea	7.0(14.0)	0(0.0)	3.5(10.4)	**0.035**
Financial difficulties	36.8(35.0)	22.8(31.5)	29.8(33.6)	0.202
EORTC QLQ-PR25 Symptoms (mean (SD))				
Urinary symptoms	21.9(19.6)	20.8(26.8)	21.4(23.1)	0.886
Bowel symptoms	4.4(7.5)	7.5(18.0)	5.9(13.7)	0.497
Hormone treatment symptoms	15.5(12.5)	11.1(11.4)	13.3(12.0)	0.266
EORTC QOL QLQ-PR25 Function (mean (SD))				
Sexual Activity	30.7(23.1)	35.1(36.8)	32.9(30.4)	0.663
Sexual Function	65.9(22.2)	54.2(35.6)	60.3(29.2)	0.371

Table 4. Side Effects

Variables	EBRT (n=19)	EBRT+BT (n=19)	Total (n=38)	P-value
Diarrhoea				
Absent	16 (84.2%)	19 (100.0%)	35 (92.1%)	
Grade 1	1 (5.3%)	0 (0.0%)	1 (2.6%)	
Grade 2	2 (10.5%)	0 (0.0%)	2 (5.3%)	0.230
Rectal Bleeding				
Absent	18 (94.7%)	16 (84.2%)	34 (89.5%)	
Grade 1	1 (5.3%)	0 (0.0%)	1 (2.6%)	
Grade 2	0 (0.0%)	3 (15.8%)	3 (7.9%)	0.230
Fistula				
Absent	19 (100.0%)	17 (89.5%)	36 (94.7%)	
Grade 3	0 (0.0%)	2 (10.5%)	2 (5.3%)	0.486
Frequency				
Absent	7 (36.8%)	15 (78.9%)	22 (57.9%)	
Grade 1	2 (10.5%)	1 (5.3%)	3 (7.9%)	
Grade 2	10 (52.6%)	3 (15.8%)	13 (34.2%)	**0.030**
Haematuria				
Absent	18 (94.7%)	19 (100.0%)	37 (97.4%)	
Grade 1	1 (5.3%)	0 (0.0%)	1 (2.6%)	1.000
Dysuria				
Absent	17 (89.5%)	17 (89.5%)	34 (89.5%)	
Grade 1	1 (5.3%)	0 (0.0%)	1 (2.6%)	
Grade 2	1 (5.3%)	2 (10.5%)	3 (7.9%)	1.000
GI Toxicities				
Absent	15(78.9%)	14(73.7%)	29(76.3%)	
Grade 1	2(10.5%)	0(0.0%)	2(5.3%)	
Grade 2	2(10.5%)	3(15.8%)	5(13.2%)	
Grade 3	0(0.0%)	2(10.5%)	2(5.3%)	0.419
GU Toxicities				
Absent	7(36.8%)	15(78.9%)	22(57.9%)	
Grade 1	2(10.5%)	1(5.3%)	3(7.9%)	
Grade 2	10(52.6%)	3(15.8%)	13(34.2%)	**0.030**

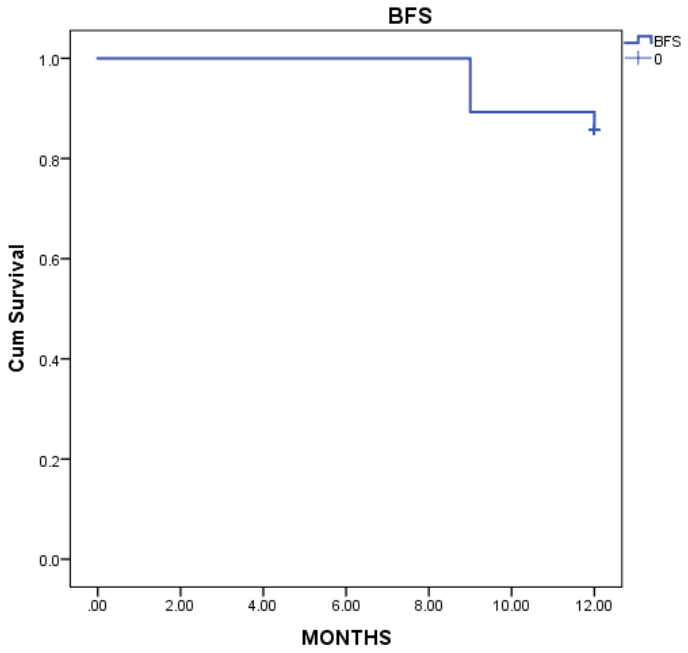

Figure 1: Biochemical Free Survival in Both Treatment Arms

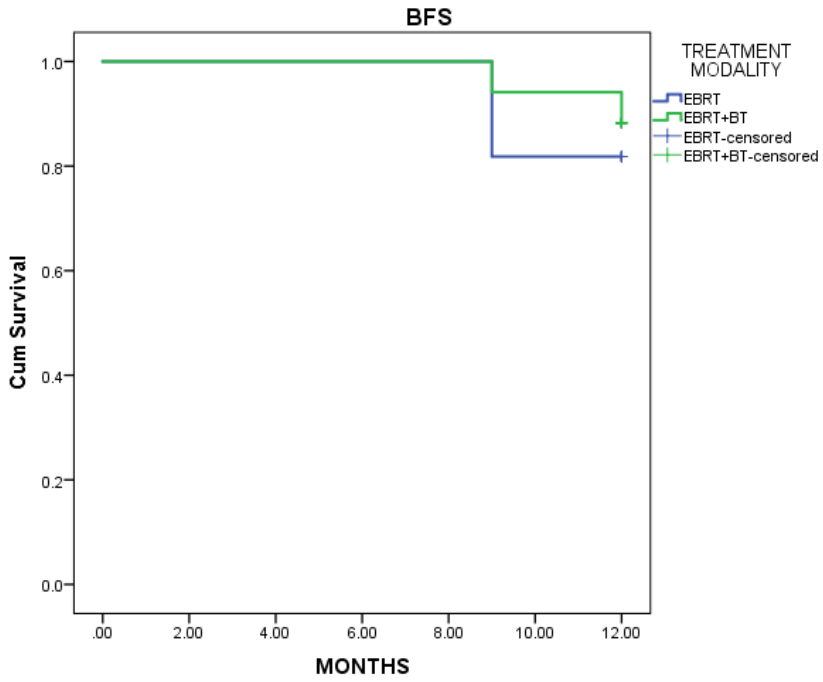

Figure 2. Biochemical Free Survival Vs Treatment Modality

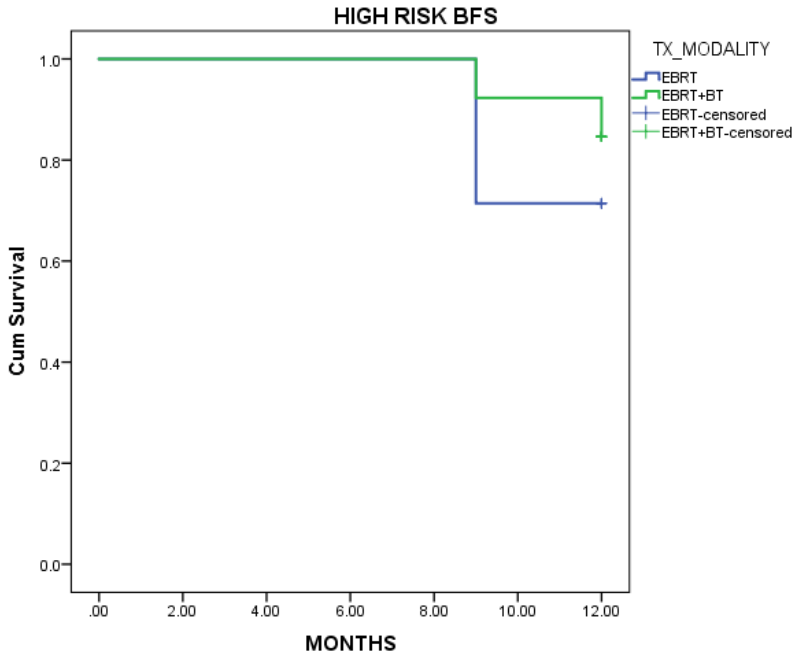

Figure 3. Biochemical Free Survival Vs Treatment Modality among High-Risk Group

DISCUSSION

The mean initial PSA for patients with EBRT alone was 84.1ng/mL ± 188.9ng/mL and ranged from 43-751ng/mL, while the mean initial PSA for EBRT+BT was 42ng/mL ± 42.9ng/mL and ranged from 6.2-175.3ng/mL. This is significantly higher than studies done in Australia and Japan.[10,11] Richard Khor et al (Australia) reported mean initial PSA of 13.1ng/mL and 11.3ng/mL for patients who had EBRT alone and EBRT+BT respectively[10] while Tomoya Oshikane et al (Japan) reported median initial PSA of 18.4ng/ml (with range of 5.5-135.9ng/ml) and 16.4ng/ml (range of 3.2-138.2ng/ml) in patients who had EBRT and EBRT+BT respectively.[11] Other studies carried out among prostate cancer patients with African descent revealed higher PSA as reported by Stephen Odunayo et al (Lagos),[12] Anegbor et al (Togo)[13] and Gueye et al (Senegal).[14] Majority of the patients had stage 1 and 2 disease in both treatment arms (70.6% and 57.9% for EBRT arm and EBRT+BT arm respectively) and this finding was similar to that reported in a study done in the UK which revealed that 77% and 69% of patients had T1 and T2 disease in EBRT alone and EBRT + BT treatment arm respectively.[15] High-risk group were seen in majority of the participants as it accounted for 73% while the intermediate risk group were 27% which is in contrast with a study done in the UK with high-risk group accounted for 41% and the intermediate group was 59%.[15] This, however, supports another study done in Nigeria that reported that most of the prostate cancer patients had high-risk disease at presentation.[16] The use of androgen deprivation therapy before radiotherapy was seen in 71.1% of all the patients in this study, which was similar to other studies conducted by Richard Khor et al and Peter J Hoskin, who reported the use of ADT before radiotherapy among prostate cancer patients to be 59% and 76% respectively.[10,15]

This study compared the treatment outcome of EBRT alone with EBRT+BT amongst prostate cancer patients with localised disease. After a follow-up time of one year, the Biochemical free survival at 9 months was 89.3% and 85.7% at 12 months, with a mean time to biochemical recurrence of 11.68 months for all participants recruited during the study. The biochemical free survival was slightly better in EBRT+ BT (88.2%) as compared to EBRT alone (81.8%), though not statistically significant. This is in tandem with similar studies done in Japan and the UK. Tomoya et al (Japan) noted that biochemical free survival was higher in EBRT+ BT (98.9%) over a median follow-up of 5years, while EBRT alone had biochemical free survival of 90.7%.[11] Likewise, Peter J Hoskin et al (UK) reported biochemical relapse-free survival of 75% and 61% among prostate cancer patients who had EBRT+BT and EBRT alone, respectively.[17]

The mean time to biochemical recurrence in our study was similar in both arms in our study (11.46 months vs 11.82 months in EBRT alone arm vs EBRT+BT arm [p=0.625]) which is different from findings from a study by Tomoya et al which reported mean time to biochemical recurrence of 3.9 years in patient in the EBRT+BT boost while 1.9 years to biochemical recurrence in EBRT group. This could be attributed to the 12-month follow-up period in our study as compared to Tomoya et al, with a study period of 5years. Radiation dose escalation could explain the improved biochemical free survival and delayed mean time to biochemical recurrence reported in the EBRT+BT arm. The mean EQD2 in the EBRT+BT arm was 81.5Gy, while the mean EQD2 of the EBRT arm of 63.4Gy. Late genitourinary side effect was reported to be increased in the EBRT arm (p=0.03), which is in contrast to similar studies that reported more urinary symptoms in EBRT+BT over a follow-up period of at least 5years.[11,17] Amit Roy et al reported no significant difference in acute GI/GU toxicity and late Gastrointestinal and genitourinary toxicity in EBRT alone or EBRT + BT over a two-year follow-up[18]. A follow-up study is encouraged in our study, as early side effects could persist for a longer time than is expected, as previously reported.[18] The quality of life of all the patients post radiotherapy over the 12months of follow-up was positive in both arms, similar to what is reported in patients post several sessions of radiotherapy[19] in almost all the domains except sexual function and activity.

LIMITATIONS

The identifiable limitation of the study is the short period of follow-up and small sample size in this pilot study. The retrospective nature of the study also resulted in missing data and loss to follow-up of patients recruited initially. The modality of EBRT varies from 2-dimensional treatment to intensity modulated radiotherapy (IMRT), as the study was carried out in two different centres in the country. Patients who received HDR-BT boost either had EBRT delivered through two-dimensional radiotherapy or IMRT, while all patients who received EBRT alone used IMRT.

CONCLUSION

This study revealed that biochemical outcomes were comparable in EBRT+BT and EBRT alone in the treatment of localised prostate cancer in intermediate-risk and high-risk patients, with lesser genitourinary toxicities in

the EBRT+BT group than in the EBRT-only group. The quality of life was similar in both arms, with reduced sexual function and activity. A follow-up prospective study with a larger sample size is advised.

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REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3):209-249. doi: 10.3322/caac.21660
2. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines). Prostate cancer. Version 1.2023-September 16,2022. Available at www.nccn.org/patients
3. Mendez LC, Morton GC. High dose-rate brachytherapy in the treatment of prostate cancer. Transl Androl Urol. 2018 Jun;7(3):357–70.
4. INTERNATIONAL ATOMIC ENERGY AGENCY, Strategies for the Management of Localised Prostate Cancer: A Guide for Radiation Oncologists, IAEA Human Health Reports No. 11, IAEA, Vienna. 2014
5. Hayden AJ, Martin JM, Kneebone AB, Lehman M, Wiltshire KL, Skala M, et al. Australian & New Zealand Faculty of Radiation Oncology Genito-Urinary Group: 2010 consensus guidelines for definitive external beam radiotherapy for prostate carcinoma. Journal of medical imaging and radiation oncology. 2010: 54(6);513–525.
6. Abdus-salam AA, Takure OA, Akinlade BI, Idowu OK, Folorunso SA, Olabumuyi AA, et al. Early Experience of High-Dose Rate Interstitial Brachytherapy for Prostate Cancer in Nigeria. Journal of Radiation Medicine in the Tropics. 2023;4(1): 1-5.
7. Roach M 3rd, Hanks G, Thames H Jr, Schellhammer P, Shipley WU, Sokol GH, Sandler H. Defining biochemical failure following radiotherapy with or without hormonal therapy in men with clinically localized prostate cancer: recommendations of the RTOG-ASTRO Phoenix Consensus Conference. Int J Radiat Oncol Biol Phys. 2006;65(4):965-74.
8. Thames H, Kuban D, Levy L, Horwitz EM, Kupelian P, Martinez A, et al. Comparison of alternative biochemical failure definitions based on clinical outcome in 4839 prostate cancer patients treated by external beam radiotherapy between 1986 and 1995. Int J Radiat Oncol Biol Phys. 2003;57(4):929-43.
9. Khor R, Duchesne G, Tai KH, Foroudi F, Chander S, Van Dyk S, et al. Direct 2-arm comparison shows benefit of high-dose-rate brachytherapy boost vs external beam radiation therapy alone for prostate cancer. Int J Radiat Oncol Biol Phys. 2013;85(3):679-85.
10. Oshikane T, Kaidu M, Abe E, Ohta A, Saito H, Nakano T, et al. A comparative study of high-dose-rate brachytherapy boost combined with external beam radiation therapy versus external beam radiation therapy alone for high-risk prostate cancer. Journal of radiation research. 2021;62(3):525–532.

11. Ikuerowo SO, Omisanjo OA, Bioku MJ, Ajala MO, Mordi VP, Esho JO. Prevalence and characteristics of prostate cancer among participants of a community-based screening in Nigeria using serum prostate-specific antigen and digital rectal examination. Pan Afr Med J. 2013 Aug 10;15:129.
12. Amegbor K, Seddoh TY, Tengue K, Songne-Gnamkoulamba B, Napo-Koura G, James K. Epidemiologie et histopronostic du cancer de la prostate au Togo: a propos de 202 cas diagnostiques au laboratoire d'anatomie pathologique du CHU Tokoin de Lome. Progres en urologie. 2009;19(2):112–115.
13. Gueye SM, Jalloh M, Labou IE, Niang L, Kane R, Ndoye M. Profil clinique du cancer de la prostate au Senegal. Afr J Urol. 2004;10(3):203–207.
14. Hoskin PJ, Rojas AM, Bownes PJ, Lowe GJ, Ostler PJ, Bryant L. Randomised trial of external beam radiotherapy alone or combined with high-dose-rate brachytherapy boost for localised prostate cancer. Radiother Oncol. 2012;103(2):217-22.
15. Abdus-Salam AA, Jimoh MA, Folasire AM, Ntekim AI, Ojo OT, Ehiedu CG, et al. Sociodemographic and clinicopathologic characteristics of patients treated with high dose rate prostate brachytherapy in Nigeria. Ecancermedicalscience. 2024;18:1740.
16. Hoskin PJ, Motohashi K, Bownes P, Bryant L, Ostler P. High dose rate brachytherapy in combination with external beam radiotherapy in the radical treatment of prostate cancer: initial results of a randomised phase three trial. Radiother Oncol 2007;84:114–20.
17. Roy A, Brenneman RJ, Hogan J, Barnes JM, Huang Y, Morris R, et al. Does the sequence of high-dose rate brachytherapy boost and IMRT for prostate cancer impact early toxicity outcomes? Results from a single institution analysis. Clinical and translational radiation oncology. 2021;29:47–53.
18. Ahmadsei M, Christ SM, Seiler A, Vlaskou Badra E, Willmann J, Hertler C, Guckenberger M. Quality-of-life and toxicity in cancer patients treated with multiple courses of radiation therapy. Clin Transl Radiat Oncol. 2022;34:23-29.
19. Maiwand Ahmadsei, Sebastian M. Christ, Annina Seiler, Eugenia Vlaskou Badra, Jonas Willmann, Caroline Hertler, Matthias Guckenberger (2022). Quality-of-life and toxicity in cancer patients treated with multiple courses of radiation therapy, Clinical and Translational Radiation Oncology,34, 23-29.