View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Carolina Digital Repository

HHS Public Access

Author manuscript

Prostate. Author manuscript; available in PMC 2018 February 26.

Published in final edited form as:

Prostate. 2013 June ; 73(8): 865–872. doi:10.1002/pros.22632.

The Association Between Calcium Channel Blocker Use and Prostate Cancer Outcome

Michael A. Poch[1], **Diana Mehedint**[1], **Dawn J. Green**[1], **Rochelle Payne-Ondracek**[2], **Elizabeth T.H. Fontham**[3], **Jeannette T. Bensen**[4], **Kristopher Attwood**[5], **Gregory E. Wilding**[5], **Khurshid A. Guru**[1], **Willie Underwood**[1], **James L. Mohler**[1], and **Hannelore V. Heemers**[1,*]

[1]Department of Urology, Roswell Park Cancer Institute, Buffalo, New York

[2]Department of Cancer Prevention and Population Sciences, Roswell Park Cancer Institute, Buffalo, New York

[3]Department of Biostatistics, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

[4]Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

[5]Department of Biostatistics, Roswell Park Cancer Institute, Buffalo, New York

Abstract

BACKGROUND—Epidemiological studies indicate that calcium channel blocker (CCB) use is inversely related to prostate cancer (PCa) incidence. The association between CCB use and PCa aggressiveness at the time of radical prostatectomy (RP) and outcome after RP was examined.

METHODS—Medication use, PCa aggressiveness and post-RP outcome were retrieved from a prospectively populated database that contains clinical and outcome for RP patients at Roswell Park Cancer Institute (RPCI) from 1993 to 2010. The database was queried for anti-hypertensive medication use at diagnosis for patients with ≥1 year follow-up. Recurrence was defined using NCCN guidelines. Chi-Square tests assessed the relationship between CCB use and PCa aggressiveness. Cox regression models compared the distribution of progression-free survival (PFS) and overall survival (OS) with adjustment for covariates. Results for association between CCB usage and PCa aggressiveness were validated using data from the population-based North Carolina-Louisiana Prostate Cancer Project (PCaP).

RESULTS—48%, 37%, and 15% of RPCI's RP patients (n = 875) had low, intermediate, and high aggressive PCa, respectively. 104 (11%) had a history of CCB use. Patients taking CCBs were more likely to be older, have a higher BMI and use additional anti-hypertensive medications. Diagnostic PSA levels, PCa aggressiveness, and margin status were similar for CCB users and non-users. PFS and OS did not differ between the two groups. Tumor aggressiveness was associated with PFS. CCB use in the PCaP study population was not associated with PCa aggressiveness.

*Correspondence to: Hannelore V. Heemers, Department of Urology, Roswell Park Cancer Institute, Cell and Virus Annex, Rooms 142-144, Elm & Carlton Streets, Buffalo, NY 14263. hannelore.heemers@roswellpark.org.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

CONCLUSIONS—CCB use is not associated with PCa aggressiveness at diagnosis, PFS or OS.

Keywords

hypertension; beta-blocker; ACE inhibitor

INTRODUCTION

Hypertension has been proposed as a risk factor for the development of prostate cancer (PCa). The association between hypertension and elevated PCa risk has been attributed to common causes for both conditions, such as activation of the autonomic nervous system and the angiotensin–renin system [1–3]. Consequently, the possibility that use of antihypertensive drugs plays a role in the etiology of PCa has been explored by several groups. Some [1,4] but not all [5–8] studies indicated that use of such medication is associated with a reduced risk for developing PCa and have proposed the use of antihypertensives as a means to lower the incidence of PCa. Several antihypertensive drug classes have emerged for which the evidence for an association with decreased PCa risk is convincing. Specifically, population-based studies have reported on an inverse association between the use of calcium channel blockers (CCBs) and the probability of developing PCa [4]. More recently, a statistically significant decreasing trend in the risk for advanced PCa by cumulative dose and duration of CCB usage has been reported, which suggests that administration of CCBs can attenuate disease progression [9]. The latter findings are in line with conclusions from studies using preclinical PCa cell line models, which demonstrate that treatment of PCa cells with CCBs, either alone or in combination with other drugs, inhibits PCa cell proliferation and induces apoptosis [10–12]. These observations suggest that CCB usage may be advantageous for preventing PCa progression and could influence disease outcome. To date, no studies have been performed to determine whether using CCBs has an impact on the aggressiveness of PCa or disease outcome after RP. The association between CCB use and PCa aggressiveness, progression-free survival (PFS) and overall survival (OS) after RP was explored using two large data sets, a prospectively populated RP experience and a population-based PCa cohort.

MATERIALS AND METHODS

RPCI Study Population

Patients who undergo RP for treatment of clinically localized PCa at Roswell Park Cancer Institute (RPCI) are enrolled prospectively in an Institutional Review Board (IRB)-approved database that maintains clinical, pathological, and outcome data as part of a quality assurance program (IRB approval I198211). Eight hundred seventy-five patients who underwent RP between 1993 and 2010 and who have been followed ≥ 1 year were included in the study. Men who received androgen deprivation therapy or radiation therapy prior to RP were excluded. Routine follow-up consisted of office visits after 6 weeks, 6 months, and 1 year that included PSA tests and examination. If pathology was favorable patients were followed annually for 4 years. If pathology was unfavorable patients were followed every 6 months for 4 years then yearly for an additional 5 years. PCa recurrence was defined biochemically using NCCN criteria or clinically if adjuvant therapy was administered for

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

any reason [13]. Antihypertensive medication usage was collected via review of preoperative records in a manner that was blinded to the cancer-specific outcome. Antihypertensive medications that were assessed include CCBs, beta-blockers (BBs), and angiotensin-converting enzyme inhibitors (ACEs). Medication use was collected also at last follow-up visit to verify continued antihypertensive usage. Medication dosages were not recorded. The RPCI patient cohort was stratified by clinical stage, tumor aggressiveness, age, and preoperative serum PSA values. Tumor aggressiveness was defined as high (Gleason sum ≥8, or PSA > 20 ng/ml, or Gleason sum = 7 and stage cT3–cT4); low (Gleason sum < 7 and stages cT1–cT2, and PSA < 10 ng/ml); or intermediate (all other cases) [14]. The study and study protocol were approved by the RPCI IRB (IRB approval EDR194411).

PCaP Database

The relationship between CCB use and tumor aggressiveness was validated using information from the North Carolina-Louisiana Prostate Cancer Project (PCaP) database that contains data on 2,256 PCa patients of whom approximately half are Caucasian Americans and half are African-Americans. One of the primary goals of the population-based PCaP study is to investigate and compare the factors associated with PCa aggressiveness in African Americans and Caucasian Americans. The methodology of the PCaP study has been described [14]. Prescription medication, including anti-hypertensives, that was used by research subjects was recorded at an in home visit. PCa aggressiveness was assigned using the same criteria as for the RPCI cohort and medical information was gleaned from the medical record. Post-RP outcome data from PCaP study participants was not available for analysis.

Statistical Analysis

Patient characteristics for CCB users and non-users were compared using Fischer's Exact test and Wilcoxon Rank Sum tests. Chi-Square test was used to assess the relationship between CCB use and PCa aggressiveness. For secondary (subgroup) analyses, patient groups were compared using Mann–Whitney *U*-test or Kruskal–Wallis and Chi-Square or Fisher's exact tests for continuous and categorical variables, respectively. OS and PFS were summarized using Kaplan–Meier methodology. Log-Rank test was performed to compare PFS and OS. Cox regression models were used to adjust OS and PFS for covariates. All statistical analysis were conducted using SAS v9.3 (Cary, NC). A significance level of 0.05 was considered for all tests.

RESULTS

Mean age of RPCI RP patients was 60 years (SD ± 7) and mean serum PSA value was 7.4 ng/ml (SD ± 7.4). Mean BMI at time of surgery was 29 kg/m^2 (SD, 4.71). Four hundred and seventy-four (54%) patients had clinical Gleason sum (GS) ≤6, 305 (35%) had GS 7 and 96 (11%) patients had GS ≥8. Two hundred eighty-five (29%) patients reported family history of PCa. Median post-RP follow-up was 42 months.

One hundred and four (11%) patients reported using CCBs at the time of initial presentation. Twenty-three (3%) patients used CCB medication alone for the management of hypertension

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

while 81 (9%) patients combined CCB use with other hypertensive medications (BBs and ACEs). Two hundred sixty-seven (31%) patients were taking BBs or ACEs without concomitant CCB use. Seventy percent of patients reported CCB use at last follow-up. Patients taking CCBs were older ($P = 0.023$) and had higher BMIs ($P = 0.006$). CCB users were more likely to take other anti-hypertensive medications ($P < 0.001$). There was no difference in clinical stage and PSA at diagnosis between CCB users and non-users. CCB use did not affect PCa aggressiveness between the two groups ($P = 0.88$; Table I).

An independent analysis of data from the population-based PCaP study on 2,256 PCa patients was performed to validate these results. Compared to RPCI's RP cohort, the PCaP study contained more African-American patients (50% compared to 9%) and a higher percentage of CCB users (24% compared to 11%). CCB users in the PCaP cohort were more likely to be older ($P < 0.001$), to be African-American ($P < 0.001$) and to use other antihypertensive medications ($P < 0.001$). Similar to the RPCI RP cohort, there was no association between use of CCB medication and PCa aggressiveness ($P = 0.33$; Table II). Subgroup analysis on the African-American patient group of the PCaP cohort confirmed the association between use of CCBs and age ($P < 0.001$), BMI ($P < 0.001$), and use of other blood pressure medication ($P < 0.001$). A difference in tumor aggressiveness ($P = 0.51$) or Gleason sum ($P = 0.151$) was not noted between CCB users and non-users (Table III). In the small subgroup of African-American patients in the RPCI cohort no association was found between CCB usage and patient characteristics (data not shown). Secondary analysis on the PCaP cohort as a whole was done to evaluate also the association between CCB use, family history, and PCa aggressiveness. Patients were divided into four groups based on reported family history for PCa (present and absent) and CCB usage (users and non-users). CCB non-users without family history were more likely to present with high and low aggressive disease, whereas patients who used CCBs and had a family history of PCa presented with intermediate aggressive disease ($P = 0.032$; Table IV, data not shown). These associations were, however, not corroborated in the RPCI patient cohort (data not shown).

The association between use of CCBs and post-RP outcome was examined using RPCI cohort data. OS and PFS were similar between CCB users and nonusers (OS $P = 0.7195$, PFS $P = 0.818$) on univariate analysis (Fig. 1). No difference was found in OS and PFS between the two groups when adjusted for age and PCa aggressiveness (Fig. 2). PCa aggressiveness was associated with PFS ($P < 0.001$) but not OS ($P = 0.188$) in the multivariable model.

Subset analysis was performed following classification of the patients into four groups: those who used CCBs only (n = 23), those who were on other hypertensive medications (BBs and ACEs) only (n = 267), those who combined antihypertensive use (CCBs and BBs/ACEs; n = 81) and those who did not take any antihypertensive medication (n = 504; Table V). Patients who were not on antihypertensive medication were younger ($P = 0.001$) and had lower BMI ($P < 0.001$). Patients taking CCB medications alone had less aggressive disease compared to patients taking both CCBs and other hypertensive medications ($P = 0.035$). There was no difference in OS ($P = 0.37$) and PFS ($P = 0.234$) among the four groups (Figure 3). No difference in OS ($P = 0.499$) and PFS ($P = 0.438$) was found after adjustment for age and PCa aggressiveness.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

DISCUSSION

Many studies have sought a relationship between use of CCBs and the development of PCa but this study is the first to evaluate the association between CCB usage and PCa aggressiveness, PFS and OS. Perron et al. [6] found no association between use of CCBs and incidence of PCa in a case–control population study on 13,326 men. Debes et al. [4], on the other hand, reported an inverse relationship between CCB usage and the probability of developing PCa. Similarly, data from the Cardiovascular Health Study indicated a 40% reduced PCa risk in men taking CCBs [1]. While the Cancer Prevention Study II Nutritional Cohort study reported that patients on antihypertensive medications were at a decreased risk for low grade PCa, when data were stratified by CCB use, no significant association remained between the use of the CCB class of antihypertensives and PCa incidence or aggressiveness [7]. Data from the General Practice Research Database in the UK identified 1,093 patients with a new diagnosis of PCa over a 4-year period. When stratified by CCB use there was no difference in PCa incidence between the two groups [5]. Vezina et al. [8] evaluated the risk of PCa in Massachusetts tumor registry population and found no difference in incidence between CCB users non-users.

Independent analyses of two separate clinical databases, either containing information on men who underwent RP at RPCI or population-based data on men with newly diagnosed PCa, failed to reveal a link between use of these antihypertensives and PCa aggressiveness. In addition, no significant differences in PFS and OS were found between users and non-users in the RPCI patient cohort. Men on CCB, or antihypertensive medication in general, may have better access to health care than those who are not and therefore are more likely to be screened for and diagnosed with PCa [9]. A more intense interaction with the health care system could explain the conflicting results obtained in epidemiological studies that assessed the relationship between CCB use and PCa incidence [15]. Health care access difficulties that confound interpretation of epidemiologic study results are less likely to have influenced this analysis of PCa aggressiveness, PFS and OS: all patients in the PCaP and RPCI cohort had histologically confirmed PCa and follow-up for patients who underwent RP at RPCI was performed consistently.

CCB use in the RP cohorts was associated with an elevated BMI. This is not surprising as BMI has been reported to have a linear correlation with systolic blood pressure [16]. Obesity has been associated also with resistant hypertension, that is, refractory hypertension despite administration of three antihypertensive drugs at full dose [17]. The relationship between resistant hypertension and obesity would lead to an increase in the incidence of CCB usage in obese patients, and an increase in the incidence of concomitant CCB use with other medications, as was found in this study.

A strength of this study is the validation of the findings on PCa aggressiveness between two separate and robust data sets. While the patient populations differed significantly in CCB use (11% in RPCI cohort vs. 24% in the PCaP dataset), analyses of both databases failed to reveal an association between CCB usage and disease aggressiveness. The difference in proportion of patients on CCB may be due to the inclusions of fewer African American men in the RPCI cohort. Approximately half of the participants in the PCaP study were African

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

American, who are more likely to be prescribed CCB as first line treatment for hypertension, compared to only 9% of patients at RPCI. The consistency in the results obtained from a population-based dataset (PCaP) and an RP cohort from a tertiary referral center (RPCI) further strengthens these findings. The results indicate that patients taking CCB alone (n = 23) presented with less aggressive disease than those who combined use of CCB with other antihypertensive medication (n = 81). In view of the small number of patients in each group, the relevance and significance of these observations will need to be assessed in a larger cohort. Similarly, validation of the association between CCB use, family history and PCa aggressiveness that was observed in the PCaP cohort but not for RPCI patients, requires additional analyses of suitable patient cohorts.

The cross-sectional nature of data collection at the time of surgery prevented determination of the duration of CCB use prior to RP. This may have biased the results as patients who were on CCB medication for a short period of time prior to operation are considered CCB users without having experienced necessarily the physiological effects of long term CCB use. In theory, this could affect PCa aggressiveness at time of surgery, but should not affect evaluation of PFS and OS. In an attempt to mitigate this issue, patient records were reviewed to confirm use of CCB at the last follow-up visit. Approximately 70% of patients on CCB medications were still using them at last follow-up. This rate compares favorably to population-based studies. Van Wijk et al. [18] described 10-year discontinuation rates from a large population database of 2,325 antihypertensive users. At 4-year follow-up, approximately 53% of men in the study were using persistently the hypertensive medication prescribed originally. Additionally, data from NHANES demonstrate that in a PSA screening population, mean duration of CCB therapy was 5 years [19]. Therefore, despite the cross-sectional nature of the medication data collection, a large proportion of men in our study group should have had adequate exposure to observe any effect on PCa aggressiveness, PFS, and OS.

PCa aggressiveness was associated with PFS but not OS. The reason for disparity between PFS and OS is likely due to relatively short duration of follow-up. Since the median length of time from operation to PCa-specific mortality and all causes mortality is approximately 9 years, an association between tumor aggressiveness and OS was unlikely to be found [20]. Another limitation is the inability to determine whether there was a dose-dependent response to CCB medication use. Medication dosages were not collected at the time of RP and could not be used to stratify results based upon potential differences in CCB dosage.

CONCLUSIONS

This study was the first to explore the relationship between CCB use, which has been linked to PCa incidence, and PCa outcome. No association was found between usage of this class of antihypertensives and PCa aggressiveness at time of diagnosis, or post-RP PFS or OS.

Acknowledgments

This work was supported by the Roswell Park Alliance Foundation and NCI grant CA 016056. The North Carolina-Louisiana Prostate Cancer Project (PCaP) is supported by the Department of Defense (DoD) Prostate Cancer Research Program (DAMD 17-03-2-0052). This manuscript has been reviewed by PCaP investigators for scientific

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

content and consistency of data interpretation with previous PCaP publications and significant comments have been incorporated prior to submission for publication. The authors thank the staff, advisory committees and research subjects participating in the PCaP study for their important contributions. The authors acknowledge Alexandra Curtis for excellent assistance with data collection.

Abbreviations

ACE	angiotensin-converting enzyme inhibitor
BB	beta-blocker
BMI	body mass index
CCB	calcium channel blocker
DOD	department of defense
IRB	institutional review board
NCCN	National Comprehensive Cancer Network
OS	overall survival
PCa	prostate cancer
PCaP	North Carolina-Louisiana Prostate Cancer Project
PFS	progression-free survival
PSA	prostate specific antigen
RP	radical prostatectomy
RPCI	Roswell Park Cancer Institute
UK	United Kingdom

References

1. Fitzpatrick AL, Daling JR, Furberg CD, Kronmal RA, Weissfeld JL. Hypertension, heart rate, use of antihypertensives, and incident prostate cancer. Ann Epidemiol. 2001; 11(8):534–542. [PubMed: 11709272]
2. Martin RM, Vatten L, Gunnell D, Romundstad P. Blood pressure and risk of prostate cancer: Cohort Norway (CONOR). Cancer Causes Control. 2010; 21(3):463–472. [PubMed: 19949849]
3. George AJ, Thomas WG, Hannan RD. The renin-angiotensin system and cancer: Old dog, new tricks. Nat Rev Cancer. 2010; 10(11):745–759. [PubMed: 20966920]
4. Debes JD, Roberts RO, Jacobson DJ, Girman CJ, Lieber MM, Tindall DJ, Jacobsen SJ. Inverse association between prostate cancer and the use of calcium channel blockers. Cancer Epidemiol Biomarkers Prev. 2004; 13(2):255–259. [PubMed: 14973089]
5. Ronquist G, Rodriguez LA, Ruigomez A, Johansson S, Wallander MA, Frithz G, Svardsudd K. Association between captopril, other antihypertensive drugs and risk of prostate cancer. Prostate. 2004; 58(1):50–56. [PubMed: 14673952]
6. Perron L, Bairati I, Harel F, Meyer F. Antihypertensive drug use and the risk of prostate cancer (Canada). Cancer Causes Control. 2004; 15(6):535–541. [PubMed: 15280632]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

7. Rodriguez C, Jacobs EJ, Deka A, Patel AV, Bain EB, Thun MJ, Calle EE. Use of blood-pressure-lowering medication and risk of prostate cancer in the Cancer Prevention Study II Nutrition Cohort. Cancer Causes Control. 2009; 20(5):671–679. [PubMed: 19067188]
8. Vezina RM, Lesko SM, Rosenberg L, Shapiro S. Calcium channel blocker use and the risk of prostate cancer. Am J Hypertens. 1998; 11(12):1420–1425. [PubMed: 9880123]
9. Kemppainen KJ, Tammela TL, Auvinen A, Murtola TJ. The association between antihypertensive drug use and incidence of prostate cancer in Finland: A population-based case–control study. Cancer Causes Control. 2011; 22(10):1445–1452. [PubMed: 21769492]
10. Rybalchenko V, Prevarskaya N, Van Coppenolle F, Legrand G, Lemonnier L, Le Bourhis X, Skryma R. Verapamil inhibits proliferation of LNCaP human prostate cancer cells influencing K+ channel gating. Mol Pharmacol. 2001; 59(6):1376–1387. [PubMed: 11353796]
11. Fraser SP, Grimes JA, Djamgoz MB. Effects of voltage-gated ion channel modulators on rat prostatic cancer cell proliferation: Comparison of strongly and weakly metastatic cell lines. Prostate. 2000; 44(1):61–76. [PubMed: 10861759]
12. Sugimoto K, Simard J, Haagensen DE, Labrie F. Inverse relationships between cell proliferation and basal or androgen-stimulated apolipoprotein D secretion in LNCaP human prostate cancer cells. J Steroid Biochem Mol Biol. 1994; 51(3–4):167–174. [PubMed: 7526888]
13. Mohler J, Bahnson RR, Boston B, Busby JE, D'Amico A, Eastham JA, Enke CA, George D, Horwitz EM, Huben RP, Kantoff P, Kawachi M, Kuettel M, Lange PH, Macvicar G, Plimack ER, Pow-Sang JM, Roach M III, Rohren E, Roth BJ, Shrieve DC, Smith MR, Srinivas S, Twardowski P, Walsh PC. NCCN clinical practice guidelines in oncology: Prostate cancer. J Natl Compr Canc Netw. 8(2):162–200.
14. Schroeder JC, Bensen JT, Su LJ, Mishel M, Ivanova A, Smith GJ, Godley PA, Fontham ET, Mohler JL. The North Carolina-Louisiana Prostate Cancer Project (PCaP): Methods and design of a multidisciplinary population-based cohort study of racial differences in prostate cancer outcomes. Prostate. 2006; 66(11):1162–1176. [PubMed: 16676364]
15. Holmes JA, Carpenter WR, Wu Y, Hendrix LH, Peacock S, Massing M, Schenck AP, Meyer AM, Diao K, Wheeler SB, Godley PA, Stitzenberg KB, Chen RC. Impact of distance to a urologist on early diagnosis of prostate cancer among black and white patients. J Urol. 2012; 187(3):883–888. [PubMed: 22248516]
16. Dyer AR, Elliott P, Shipley M. Body mass index versus height and weight in relation to blood pressure. Findings for the 10,079 persons in the INTERSALT Study. Am J Epidemiol. 1990; 131(4):589–596. [PubMed: 2180281]
17. Singer GM, Setaro JF. Secondary hypertension: Obesity and the metabolic syndrome. J Clin Hypertens (Greenwich). 2008; 10(7):567–574. [PubMed: 18607142]
18. Van Wijk BL, Klungel OH, Heerdink ER, de Boer A. Rate and determinants of 10-year persistence with antihypertensive drugs. J Hypertens. 2005; 23(11):2101–2107. [PubMed: 16208154]
19. Chang SL, Harshman LC, Presti JC Jr. Impact of common medications on serum total prostate-specific antigen levels: Analysis of the National Health and Nutrition Examination Survey. J Clin Oncol. 28(25):3951–3957.
20. Dorin RP, Daneshmand S, Lassoff MA, Cai J, Skinner DG, Lieskovsky G. Long-term outcomes of open radical retropubic prostatectomy for clinically localized prostate cancer in the prostate-specific antigen era. Urology. 79(3):626–631.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

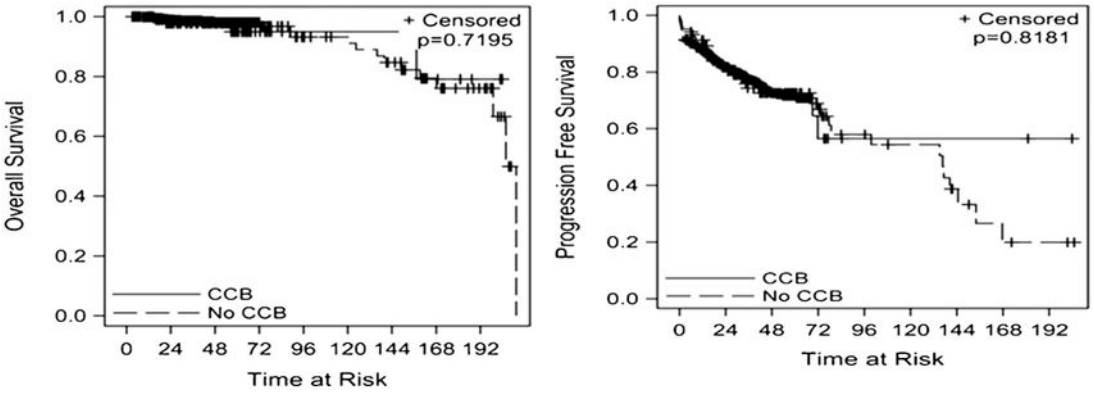

Fig. 1.

Unadjusted PFS and OS for RP RPCI cohort separated by CCB use.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

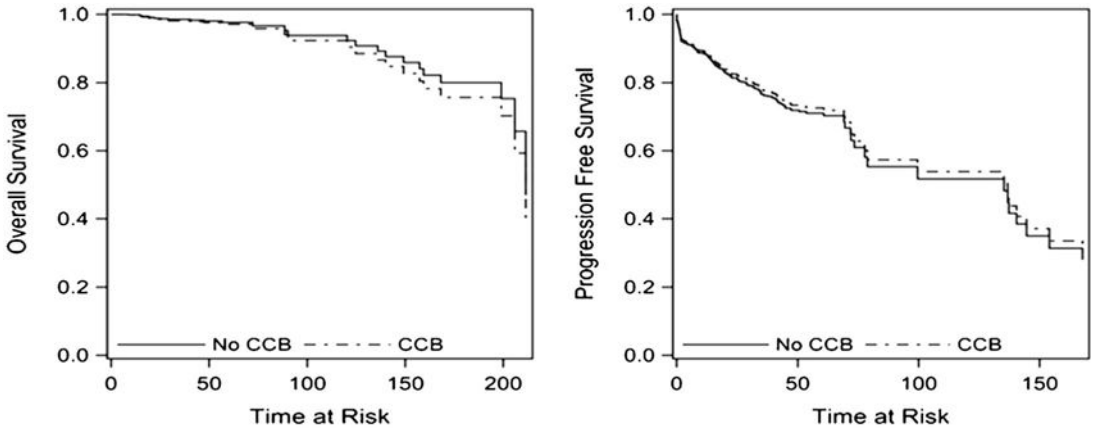

Fig. 2.

PFS and OS for RP RPCI cohort separated by CCB use and adjusted for age and tumor aggressiveness.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

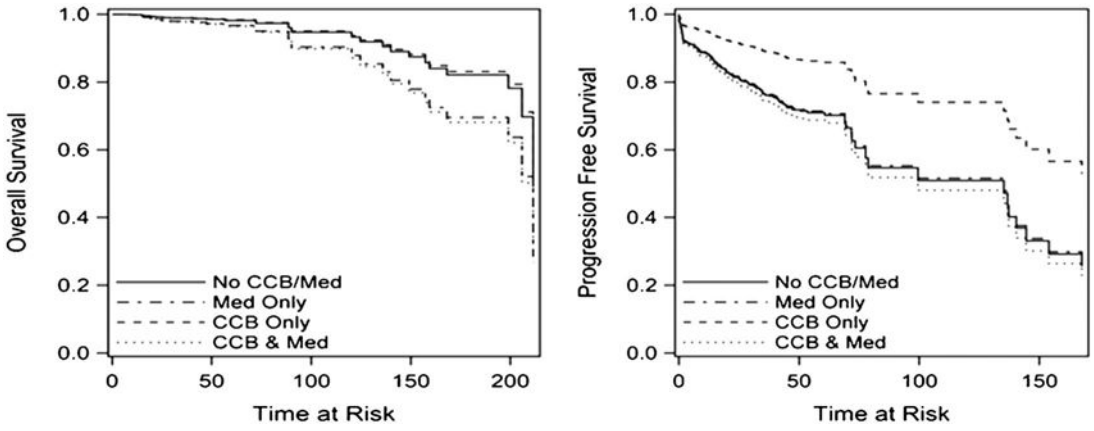

Fig. 3.

PFS and OS for RP RPCI cohort separated by antihypertensive medication use and adjusted for age and tumor aggressiveness.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

TABLE I

Baseline Characteristics of the RPCIRP Cohort Separated by CCB Use

	No CCB	CCB	*P*-value
Overall			
N (%)	771 (88)	104 (11)	
Age			
Median (range)	60 (41–80)	62 (44–74)	0.023
BMI			
Median (range)	28 (19–49)	30 (20–51)	0.006
Family history of prostate cancer			
No	490 (70%)	72 (76%)	
Yes	209 (30%)	22 (23%)	0.23
Race			
White	699 (91%)	87 (85%)	
Other	72 (9%)	16 (15%)	0.56
Other antihypertensive medications			
No	504 (65%)	23 (22%)	
Yes	267 (35%)	81 (78%)	<0.001
PSA			
Median (range)	5.44 (0.23–90)	5 (1.50–29)	0.97
Gleason sum			
<7	422 (55%)	52 (50%)	
7	266 (35%)	39 (37%)	
>7	83 (11%)	13 (12%)	0.61
Tumor T stage			
1	506 (66%)	66 (64%)	
2	249 (32%)	36 (35%)	
3–4	12 (1.6%)	1 (1.0%)	0.88
Tumor aggressiveness			
Low	373 (48%)	48 (46%)	
Intermediate	283 (37%)	41 (39%)	
High	115 (15%)	15 (14%)	0.88

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

TABLE II

Baseline Characteristics of the PCaP Cohort Separated by CCB Use

	No CCB	CCB	P Value
Overall			
N (%)	1,720 (76)	538 (24)	
Age			
Median (range)	63 (41–79)	64 (41–79)	<0.001
BMI			
Median (range)	28 (15–59)	30 (17–66)	<0.001
Family history of prostate cancer			
No	1,170 (74%)	362 (75%)	
Yes	420 (26%)	121 (25%)	0.55
Race			
White	928 (54%)	200 (37%)	
Black	792 (46%)	338 (63%)	<0.001
Other antihypertensive medications			
No	1,133 (66%)	206 (18%)	
Yes	587 (34%)	332 (61%)	<0.001
PSA			
Median (range)	6 (0–4,520)	6 (0–2,000)	0.44
Gleason sum			
<7	1,036 (60%)	295 (55%)	
=7	487 (28%)	168 (31%)	
>7	197 (11%)	75 (14%)	0.07
Tumor T stage			
1	958 (57%)	274 (52%)	
2	689 (41%)	243 (47%)	
3–4	32 (2%)	6 (1%)	0.06
Tumor aggressiveness			
Low	853 (52%)	249 (48%)	
Intermediate	505 (31%)	170 (33%)	
High	295 (18%)	101 (19%)	0.33

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

TABLE III

Baseline Characteristics in African-American PCaP Patients Separated by CCB Use

	No CCB	CCB	*P*-value
Overall			
N (%)	792 (70)	338 (30)	
Age			
Median (range)	61 (41–79)	63 (41–79)	<0.001
BMI			
Median (range)	28 (16–49)	30 (17–67)	<0.001
Family history of prostate cancer			
No	530 (73%)	219 (72%)	
Yes	194 (27%)	87 (28%)	0.59
Other antihypertensive medications			
No	521 (66%)	132 (39%)	
Yes	271 (34%)	206 (61%)	<0.001
PSA			
Median (range)	6.0 (0.0–4,520.0)	6.0 (0.0–411.0)	0.54
Gleason sum			
<7	455 (57%)	173 (51%)	
7	237 (30%)	117 (35%)	
>7	100 (13%)	48 (14%)	0.15
Tumor T stage			
1	441 (57%)	173 (64%)	
2	311 (41%)	152 (35%)	
3–4	17 (2%)	3 (1%)	0.09
Tumor aggressiveness			
Low	353 (47%)	142 (44%)	
Intermediate	240 (32%)	115 (35%)	
High	160 (21%)	68 (21%)	0.51

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

TABLE IV

Baseline Characteristics of the PCaP RP Cohort Separated by CCB Use and Family History

	CCB (−) and history (−)	CCB (−) and history (+)	CCB (+) and history (−)	CCB (+) and history (+)	*P*-value
Overall					
N (%)	1,170 (56)	420 (20)	362 (18)	121 (6)	
Age					
Median (range)	63 (41–79)	61 (41–79)	65 (41–79)	63 (47–79)	<0.001
BMI					
Median (range)	28 (15–52)	28 (16–59)	30 (18–67)	30 (17–47)	<0.001
Race					
White	640 (55)	226 (54)	143 (40)	34 (28)	
Black	530 (45)	194 (46)	219 (60)	87 (72)	<0.001
PSA					
Median (range)	6.0 (0.0–4,520.0)	6.0 (0.0–1,826.0)	6.0 (0.0–2,008.0)	6.0 (1.0–181.0)	0.56
Gleason sum					
<7	698 (60)	259 (62)	200 (55)	61 (50)	
=7	327 (28)	123 (29)	102 (28)	51 (42)	
>7	145 (12)	38 (9)	60 (17)	9 (8)	0.001
Tumor T stage					
1	662 (58)	231 (56)	186 (52)	57 (48)	
2	458 (40)	173 (42)	163 (46)	61 (52)	
3–4	22 (2)	9 (2)	5 (2)	0 (0)	0.100
Tumor aggressiveness					
Low	585 (52)	206 (51)	169 (48)	52 (45)	
Intermediate	332 (30)	130 (32)	105 (30)	50 (43)	
High	206 (18)	70 (17)	78 (22)	14 (12)	0.032

Prostate. Author manuscript; available in PMC 2018 February 26.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

TABLE V

Baseline Characteristics of the RPCIRP Cohort Separated by Antihypertensive Use

	No CCB, BB, or ACE	BB or ACE only	CCB only	CCB + ACE or BB	*P*-value
Overall					
N (%)	504 (57)	267 (31)	23 (3)	81 (9)	
Age					
Median (range)	59 (41–79)	61 (41–76)	63 (50–71)	62 (44–74)	0.001
BMI					
Median (range)	28 (19–48)	29 (21–49)	28 (24–42)	30 (20–51)	<0.001
Family history of prostate cancer					
No	305 (69)	185 (72)	14 (78)	58 (76)	
Yes	139 (31)	70 (27)	4 (22)	18 (24)	0.446
Race					
White	458 (91)	241 (90)	21 (91)	66 (82)	
Other	46 (9)	26 (10)	2 (9)	14 (18)	0.51
PSA					
Median (range)	5.5 (0.23–87)	5.4 (0.4–82)	5.1 (2.9–12)	5.7 (1.5–28)	0.958
Gleason sum					
<7	175 (35)	85 (32)	10 (43)	20 (25)	
=7	282 (56)	161 (60)	11 (48)	51 (63)	
>7	47 (9)	21 (8)	2 (9)	10 (12)	0.42
Tumor T stage					
1	332 (66)	174 (65)	15 (68)	51 (63)	
2	161 (32)	88 (33)	7 (32)	29 (36)	
3–4	8 (2)	4 (1)	0	1 (1)	0.994
Tumor aggressiveness					
Low	257 (51)	116 (43)	16 (70)	32 (40)	
Intermediate	168 (33)	115 (43)	6 (26)	35 (43)	
High	79 (16)	36 (14)	1 (4)	14 (17)	0.028

Prostate. Author manuscript; available in PMC 2018 February 26.