ELSEVIER

CrossMark

Urologic Oncology: Seminars and Original Investigations 34 (2016) 254.e15–254.e21

UROLOGIC ONCOLOGY

Original article

The significance of anterior prostate lesions on multiparametric magnetic resonance imaging in African-American men

Michael Kongnyuy, M.S.[a], Abhinav Sidana, M.D.[a], Arvin K. George, M.D.[a], Akhil Muthigi, B.S.[a], Amogh Iyer[a,1], Michele Fascelli, B.S.[a], Meet Kadakia, M.D.[a], Thomas P. Frye, M.D.[a], Richard Ho, B.S.[a], Francesca Mertan, B.S.[b], M. Minhaj Siddiqui, M.D.[c], Daniel Su, M.D.[a], Maria J. Merino, M.D.[d], Baris Turkbey, M.D.[b], Peter L. Choyke, M.D.[b], Bradford J. Wood, M.D.[e], Peter A. Pinto, M.D.[a,*]

[a] *Urologic Oncology Branch, National Cancer Institute, National Institutes of Health, Bethesda, MD*
[b] *Molecular Imaging Program, National Cancer Institute, National Institutes of Health, Bethesda, MD*
[c] *Department of Urology, University of Maryland Medical School, Baltimore, MD*
[d] *Laboratory of Pathology, National Cancer Institute, National Institutes of Health, Bethesda, MD*
[e] *Center for Interventional Oncology, National Cancer Institute & NIH Clinical Center, National Institutes of Health, Bethesda, MD*

Received 5 December 2015; accepted 26 December 2015

Abstract

Introduction: African-American (AA) men tend to harbor high-risk prostate cancer (PCa) and exhibit worse outcomes when compared to other groups. It has been postulated that AA men may harbor more anterior prostate lesions (APLs) that are undersampled by the standard transrectal ultrasound guided-biopsy (SBx), potentially resulting in greater degree of Gleason score (GS) upgrading at radical prostatectomy. We aimed to evaluate the detection rate of anterior PCa significance of APLs in AA men on multiparametric magnetic resonance imaging (mpMRI) and compare it to a matched cohort of White/Other (W/O) men.

Materials and methods: A review of 1,267 men who had an mpMRI with suspicious prostate lesions and who underwent magnetic resonance transrectal ultrasound fusion-guided biopsy (FBx) with concurrent SBx in the same biopsy session was performed. All AA men were matched to a control group of W/O using a 1:1 propensity score-matching algorithm with age, prostate-specific antigen, and prostate volume as matching variables. Logistic regression analysis was used to determine predictors of APLs in AA men.

Results: Of the 195 AA men who underwent mpMRI, 93 (47.7%) men had a total of 109 APLs. Prior negative SBx was associated with the presence of APLs in AA men (Odds ratio = 1.81; 95% CI: 1.03–3.20; $P = 0.04$). On multivariate logistic regression analysis, smaller prostate ($P = 0.001$) and rising prostate-specific antigen ($P = 0.007$) were independent predictors of cancer-positive APLs in AA men. Comparative analysis of AA (93/195, 47.7%) vs. W/O (100/194, 52%) showed no difference in the rates of APLs ($P = 0.44$) or in cancer detection rate within those lesions or the distribution of GS within those cancers ($P = 0.63$) despite an overall higher cancer detection rate in AA men (AA: 124/195 [63.6%] vs. W/O: 97/194 [50.0%], $P = 0.007$). In cases where APLs were positive for PCa on FBx, the GS of APL was equal to the highest GS of the entire gland in 82.9% (29/35) and 90.9% (30/33) of the time in AA and W/O men, respectively.

Conclusion: Cancer-positive APLs represented the highest risk GS in most cases. AA men with prior negative SBx are twice as likely to harbor a concerning APL. In our cohort, AA and W/O men had comparable rates of APLs on mpMRI. Thus, differences in APLs do not explain the higher risk of AA men for deahth due to PCa. However, targeting of APLs via FBx can clinically improve PCa risk stratification and guide appropriate treatment options. © 2016 Published by Elsevier Inc.

Keywords: Anterior prostate lesion; African-American; Multiparametric MRI

[1] Amogh Iyer is a high school student who did summer work with us at the NCI.

* Corresponding author. Tel.: +1-301-594-2809; fax.: +1-301-480-5626.
E-mail address: pintop@mail.nih.gov (P.A. Pinto).

http://dx.doi.org/10.1016/j.urolonc.2015.12.018
1078-1439/

1. Introduction

African-American (AA) men are known to be at a higher risk of prostate cancer (PCa) with a 30% higher mortality compared with other races [1,2]. AA men tend to get diagnosed at an earlier age and present more often with higher Gleason grade and advanced-stage disease [3–7]. In addition, several complex factors such as inadequate access, socioeconomic status, genetic susceptibility, and location of cancer may contribute to higher mortality risk in this population [8–12]. Although most of these factors have been studied extensively in the past, location of cancer contributing to survival difference has been a matter of interest to researchers in recent years.

It was recently theorized that the tendency of AAs to harbor more anterior prostate lesions (APL) when compared with other races may explain their poorer outcomes on active surveillance. These lesions were shown to be of higher grade on whole-mount histopathology compared with results from preoperative standard biopsy [10]. As most PCa occur in peripheral posterior zone of prostate, the anterior prostate is less commonly biopsied [11,13]. Furthermore, the side-fire ultrasound probe routinely used for systematic biopsy poorly visualizes the anterior prostate making the biopsy of that region even more challenging. End-fire transrectal ultrasound (TRUS) probes or the transperineal biopsy approach can be used to access the anterior prostate but are not routinely used in the United States [14–16].

Researchers have reported increased rates of APLs in AAs by using prostatectomy and autopsy whole-mount pathology. With multiparametric magnetic resonance imaging (mpMRI), a high-resolution image allows for visualization of anterior PCa lesions preoperatively [10,13,17] and MRI-Ultrasound fusion-guided biopsy (FBx) allows accurate targeted biopsies of these lesions [18]. Herein, we report the detection rates of APLs in our cohort of AA men who underwent FBx. We also compare the rates of APL in AA men with a controlled group of White/Other (W/O) men.

2. Patients and methods

2.1. Multiparametric MRI

In this institutional review board–approved study, we retrospectively reviewed all patients who received an mpMRI at our institution followed by FBx from 2007 to 2015. The mpMRI was performed using a 3.0 T scanner (Achieva; Philips Healthcare, Best, The Netherlands) in combination with an endorectal coil (BPX-30; Medrad, Pittsburgh, PA), and a cardiac surface coil (SENSE; Philips Healthcare) positioned over the pelvis. MR sequences assessed included triplanar T2-weighted, and axial dynamic contrast-enhanced images, as well as axial diffusion-weighted images with apparent diffusion coefficient mapping. Well-circumscribed, round or ellipsoid areas of low intensity were considered to be suspicious for cancer on T2-weighted and apparent diffusion coefficient maps of diffusion-weighted imaging. On dynamic contrast-enhanced imaging, a suspicion of cancer arose if there was focal early and intense enhancement followed by rapid washout. The MRI protocol has been previously described [19]. Each prostate MRI was evaluated in consensus by 2 experienced genitourinary radiologists both blinded to patient race, serum prostate-specific antigen (PSA) levels and TRUS biopsy history, and any previous biopsy histopathological findings [19,20]. Included regions were those deemed "anterior" in both the peripheral and transition zones of the prostate [21].

2.2. MRI/US fusion–guided biopsy

Patients with suspicious lesions in the prostate underwent FBx. Preparation included a Fleet enema (Fleet Labs, Lychburg, VA) and antibiotic prophylaxis as per American Urological Association guidelines. A periprostatic regional lidocaine block was administered. All patients underwent systematic 12-core extended sextant TRUS-guided biopsy (SBx) and FBx with electromagnetic tracking (UroNav, In Vivo, FL) in the same session. Systematic biopsies were taken from medial and lateral aspects of the apex, mid, and base of the prostate on both sides. FBx consisted of at least 2 cores from each targeted lesion, 1 each in the axial and sagittal planes [22]. A single experienced genitourinary pathologist interpreted all pathology results.

2.3. Statistical analysis

In all, 195 consecutive AA men who had suspicious lesions of the prostate on mpMRI were, thus, included in the study. A control group of W/O men ($n = 194$) with suspicious lesions was selected using a 1:1 propensity score-matching algorithm with age, PSA, and prostate volume as matching variables. The matching was performed using Python extension on IBM SPSS (version 21). A lesion was considered positive for cancer if 1 of the FBx cores revealed adenocarcinoma on pathology. The diagnosis of PCa was also made if 1 of the TRUS-guided systematic biopsy cores was positive for adenocarcinoma. Demographic data (age, race, body mass index, most recent PSA at the time of biopsy, MRI prostate volume, Cancer of the Prostate Risk Assessment Score (CAPRA), and biopsy history) were collected from a prospectively collected database and institutional electronic medical records.

Statistical analysis was performed using JMP 11.0 (SAS Institute Inc., Gary, NC), GraphPad Prism 6 (GraphPad software, La Jolla, CA), and IBM SPSS (version 21, Chicago, IL.). The differences in medians of nonparametric continuous data between AA and W/O men were analyzed