Rectal Swab Culture–directed Antimicrobial Prophylaxis for Prostate Biopsy and Risk of Postprocedure Infection: A Cohort Study

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OBJECTIVE To examine the effect of rectal swab culture–directed prophylaxis on the incidence of prostate biopsy–associated infections. Secondary objectives were to determine the rate of fluoroquinolone resistance and extended-spectrum beta-lactamase production in local rectal flora.

METHODS All men receiving prostate biopsies from February 2013 to February 2014 were included in a retrospective institutional review board–approved study. All received either a preprocedural rectal swab and culture-directed antimicrobial prophylaxis or routine fluoroquinolone antibiotics. Clinical information was collected on infectious complications treated within 30 days of biopsy. Chi-square test, Fisher exact test, and Welch *t* test were used for statistical analysis. Confounding variables were included in a multivariate logistic regression model.

RESULTS Of 487 total patients, 314 received preprocedure rectal cultures and 173 did not. Average ages were 62.7 and 64.1 years, respectively ($P = .07$). There was no difference in mean prostate-specific antigen value ($P = .9$), Charlson comorbidity score ($P = .8$), or ethnicity ($P = .1$). The rectal swab group was more likely to receive supplemental gentamicin ($P < .001$) and had fewer infectious complications (1.9% vs 2.9%; $P = .5$). On multivariate analysis, decreased odds of infection was associated with culture-directed antibiotics (odds ratio, 0.70; 95% confidence interval, 0.20-2.50; $P = .6$). However, the study was only powered to detect a 97% reduction in infections. The incidence of fluoroquinolone resistance and extended-spectrum beta-lactamase production was 12.1% and 0.64%, respectively.

CONCLUSION Our study was underpowered but suggests that there are lower odds of infection with rectal swab–directed antimicrobial prophylaxis. The local incidence of fluoroquinolone resistance is high. A prospective, randomized, controlled trial is warranted to further evaluate this intervention. UROLOGY 85: 8–14, 2015. © 2015 Elsevier Inc.

Transrectal ultrasonography–guided prostate biopsy (TRUSBx) is one of the most commonly performed outpatient urologic procedures, with over 1 million patients undergoing biopsy each year.[1] Infection is a well-established risk, including urinary tract infection (UTI), prostatitis, bacteremia, and sepsis. Hematuria, rectal bleeding, and hematospermia are also well-recognized complications.

Most postbiopsy infections are caused by *Escherichia coli* and arise from direct inoculation of bacteria from the rectal mucosa into the urinary tract and prostatic vessels.[2] Reported rates of postbiopsy UTI and sepsis range from 2% to 6% and 1% to 3%, respectively, whereas overall hospital admission has been reported as high as 6.3%.[1,2] Systematic reviews of several randomized, placebo-controlled trials have demonstrated the benefit of antimicrobial prophylaxis in reducing infectious complications after TRUSBx.[3,4] Current clinical guidelines recommend a fluoroquinolone, or a first-, second-, or third-generation cephalosporin perioperatively for 24 hours or less. The combination of an aminoglycoside and metronidazole or clindamycin is also an acceptable alternative.[4] Worldwide, fluoroquinolones remain the most commonly used antimicrobial agent for this purpose.[5]

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Despite routine antimicrobial prophylaxis, the incidence of infectious complications after TRUSBx has increased over the last 2 decades.[6-8] One large study based on Medicare Surveillance, Epidemiology, and End Results data found a significant increase in postbiopsy hospitalizations for infections from the years 1991 to 2007 among Medicare beneficiaries in the United States.[6] Another Canadian study demonstrated an increase in the incidence of TRUSBx infections from 1% in 1996 to 4.1% in 2005.[7]

Notably, a rising incidence of postbiopsy infections from fluoroquinolone-resistant *E coli* has been reported over the same time period, leading many to conclude that the recent rise in infectious complications is driven by growing fluoroquinolone resistance.[2,8,9] Postbiopsy infections from extended-spectrum beta-lactamase–producing (ESBL) organisms have also been increasingly reported, and coresistance to fluoroquinolones is common.[2,10,11] These organisms are resistant to third-generation cephalosporins as well as monobactams but not to cephamycins or carbapenems.[12]

Rectal swab cultures have been used to determine the presence of fluoroquinolone-resistant rectal flora before TRUSBx. Based on this practice, the rates of rectal carriage have ranged from 10.6% to 22% for fluoroquinolone-resistant bacteria and 1.3%-11% for ESBL-producing gram-negative bacilli.[13-17] Antibiotic susceptibilities of enteric gram-negative organisms isolated from rectal swab cultures can be used to direct decisions regarding appropriate antimicrobial prophylaxis for individual patients, a practice that has been suggested as successful and cost-effective by several reports.[17-19]

At our institution, oral fluoroquinolones are routinely prescribed as antimicrobial prophylaxis for TRUSBx. However, several urologists recently adopted the use of targeted antimicrobial prophylaxis based on prebiopsy rectal swab cultures. We aimed to determine whether this practice was effective in reducing the incidence of infectious complications after TRUSBx. Our secondary aim was to establish the local incidence of fluoroquinolone-resistant and ESBL-producing enteric gram-negative bacilli in rectal swab cultures.

METHODS

We performed an institutional review board (IRB)–approved (IRB ID: 522191-2) retrospective review of all adult patients who underwent TRUSBx from February 2013 to February 2014. Exclusion criteria included prisoner status or unavailable medical records. At the discretion of the individual urologist, rectal swabs were collected on each patient and cultured before prostate TRUSBx to direct the selection of antimicrobial prophylaxis. This practice has previously been described by several groups.[17,18,20]

Briefly, rectal swabs were collected in the clinic at the time of consent, typically <1 month before TRUSBx. For fluoroquinolone resistance testing, swabs were directly cultured on both MacConkey agar with 1 μg/mL ciprofloxacin and on blood agar plates and incubated at 35°C for 48 hours. Antibiotic susceptibilities were determined using the automated VITEK 2 machine (bioMérieux, Inc, Hazelwood, MO). If potential ESBL production was identified by this protocol, confirmatory testing was performed following Clinical and Laboratory Standards Institute standards. All samples were processed at the same facility (East Side Clinical Laboratory, East Providence, RI).

All patients were initially prescribed a standard empiric prophylactic regimen consisting of a Fleets enema (Fleet Laboratories, Lynchburg, VA) and 3 doses of an oral fluoroquinolone. Typically, this is 500 mg of ciprofloxacin taken for 3 doses perioperatively. Patients were instructed to wait 5 days before filling their fluoroquinolone prescriptions. Those with fluoroquinolone-resistant organisms on rectal swab culture were contacted and subsequently prescribed a new antibiotic based on culture sensitivities. Some urologists within the practice also routinely supplement this with 80 mg of intramuscular (IM) gentamicin given just before biopsy.

Basic demographic and clinical data were collected for patients undergoing TRUSBx during the study period. Comorbidities were quantified using the Charlson comorbidity score.[21] Medical records for each patient were reviewed for any documented infectious complications within 30 days of biopsy requiring treatment. Infections were defined clinically. Bacterial cystitis was defined by pyuria (>5 white blood cells per high-powered field or positive leukocyte esterase on urine dipstick) and bacteriuria ($\geq 10^5$ colony-forming units/mL) with symptoms of dysuria, urgency, frequency, or hematuria. Pyelonephritis was defined as pyuria and bacteriuria with symptoms of fever, flank pain, nausea, or vomiting. Bacteremia was confirmed by the presence of microbial growth in blood cultures. Criteria for sepsis, severe sepsis, and septic shock were used as previously defined.[22]

A secondary end point was to determine the incidence of fluoroquinolone-resistant microorganisms with and without ESBL production. The former were defined as those organisms that were resistant to third-generation cephalosporins such as cefotaxime, ceftriaxone, ceftazidime, as well as monobactams such as aztreonam, but not to cephamycins such as cefoxitin or cefotetan, or carbapenems such as imipenem, meropenem, or ertapenem.[12] Determination of ESBL production was performed as noted previously.

Data were analyzed with Stata 11.1 analysis software (StataCorp LP, College Station, TX). Fisher exact test and Welch *t* test were used to compare categorical and continuous variables, respectively. Any missing data points were excluded from analysis. Univariate analysis was performed for variables that were possible predictors of postbiopsy infection, including age, ethnicity, recent admission in our hospital network, history of prostate biopsy, and comorbidity score. Variables were considered eligible for inclusion in a multivariate logistic regression model if they had a *P* value of <.20 in univariate comparisons or were significantly different between those patients who received rectal swab culture–directed antimicrobial prophylaxis and those patients who did not. An a priori power analysis was not performed.

RESULTS

A total of 487 patients were included in the study, and 314 patients received a rectal swab and culture-directed antibiotics before TRUSBx. General patient characteristics are listed in Table 1. Compared with patients receiving standard antimicrobial prophylaxis, those receiving culture-directed antibiotics were more likely to receive supplemental IM gentamicin at the time of biopsy