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Original article

Targeted antimicrobial prophylaxis for transrectal ultrasound-guided prostate biopsy during active surveillance: Effect on hospitalization

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Abstract

Objectives: We investigated the effect of targeted antibiotic prophylaxis using rectal swab cultures on hospitalization for infectious complications after transrectal ultrasound-guided prostate biopsy (TRUSP).

Materials and methods: A cohort of men (1995–2016) with prostate cancer on active surveillance receiving annual TRUSP biopsies was surveyed to determine the incidence of hospitalization for suspected postbiopsy sepsis. We compared biopsy events (i.e., unique biopsies) in the era of empiric prophylaxis to those in the era of targeted prophylaxis based on culture. The effect of fluoroquinolone resistant organisms (FQ-R), and other demographic and clinical factors, on hospitalization was assessed using logistic regression.

Results: Of 1,167 men on active surveillance, 825 responded for a total of 3,361 biopsy events; 7 (0.79%) of 886 biopsies preceded by rectal swab culture resulted in hospitalization compared to 24 (0.97%) of 2,475 biopsies without culture (OR = 0.81, 95% CI: 0.35–1.89, $P = 0.63$). Among 886 cultures performed, FQ-R organisms were identified in 194 (21.9%); 6 out of 194 (3.1%) biopsies with swabs positive for FQ-R resulted in admission compared to 1 out of 692 (0.14%) biopsies with fluoroquinolone sensitive swabs (OR = 22.1, 95% CI: 2.6–184.3, $P < 0.01$). Smaller prostate volume at diagnosis was significantly associated with hospitalization (OR = 2.57, 95% CI: 1.04–6.31) for <45 g vs. ≥45 g, $P = 0.039$).

Conclusion: Targeted antibiotic prophylaxis is not associated with a significant reduction in hospitalization for suspected post-TRUSP biopsy sepsis. FQ-R and prostate volume exhibited strong associations with risk of hospitalization and could be included in a risk-adapted approach to prophylaxis, but better prophylactic strategies are needed for patients identified to be at high risk of subsequent hospitalization.

Keywords: Prostate Cancer; Biopsy; Infection; Sepsis; Prophylaxis

1. Introduction

Over 1 million prostate biopsy procedures are performed annually in the United States with a potential rise in infectious complications in recent years [1]. Transrectal ultrasound-guided prostate (TRUSP) biopsy is the most common approach with the rate of sepsis after prostate biopsy reported to be around 1% to 3% [1–3]. Additionally, patients hospitalized for an infectious complication following biopsy may be at an increased risk of death [1,2]. The use of broad spectrum antibiotics, such as fluoroquinolones (FQ), for prophylaxis may have led to a rise in serious infections caused by FQ resistant (FQ-R) organisms. An increasing prevalence of FQ-R in the rectal carriage of men receiving TRUSP biopsy has been observed [3,4]. Although prevalence varies by hospital and region with some reported rates as high as 50%, resistance is usually seen in about 20% to 25% of cases [4–6]. Targeted prophylactic antimicrobial therapy has been implemented at some centers in an effort to reduce the incidence of serious infectious complications, especially sepsis [4,6–8].

The current evidence on the use of targeted prophylaxis is mixed, with some studies noting reductions in the rate of infections, whereas others show minimal difference

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compared to empiric therapy [5–10]. Part of the variation may be due to studies inconsistently defining what constitutes a relevant outcome, inadequate patient follow-up to estimate hospitalization or septic events, and incomplete data when relying solely on electronic medical records. In order to better estimate the effect, we performed a survey of a large cohort of patients followed on active surveillance (AS) for prostate cancer (PC) to determine the effect of rectal swab culture-based targeted prophylaxis on inpatient hospitalization for infection.

2. Materials and methods

2.1. Cohort

From 1995 to 2016, men with very low-risk and low-risk PC have been followed on AS at our institution monitored by digital rectal examinations, prostate-specific antigen (PSA) measurements, and surveillance biopsies as previously described in detail [11]. Institutional Review Board approval was obtained for the AS program. Before October 2012, patients received standard empirical prophylaxis with an oral FQ (ciprofloxacin) at 24 hours before, the day of, and 24 hours after TRUSP biopsy per AUA recommendations [12]. Since October 2012, all urologists at our institution were required to prescribe targeted antimicrobial prophylaxis using rectal swab culture results. All sequential patients had rectal swabs performed after this policy change in 2012.

2.2. Rectal swabs and cultures

Rectal swabs were performed no later than 2 weeks before the biopsy. One week before the biopsy, patients were contacted with the results of their rectal swab cultures and the appropriate antibiotics were administered. In addition, patients were instructed to use Fleet enemas during the day of the biopsy.

The swabs were cultured on plates with nonselective and selective media containing ciprofloxacin. The plates were incubated, and plates with growth in nonselective media but no growth in selective media after were considered to contain FQ sensitive organisms. The plates with growth of gram-negative bacteria on both selective and nonselective media underwent identification of the organism and antimicrobial susceptibility testing. If the bacteria were resistant to ciprofloxacin, alternative antibiotics were chosen in the following succession according to the recommendations of our infectious diseases department and the results of antibiotic sensitivity testing: trimethoprim-sulfamethoxazole, cefazolin, or gentamicin/ceftriaxone.

2.3. Statistical analysis

A total of 1,167 eligible men in the program were mailed a survey questionnaire to determine patient-reported hospitalization for infection following a TRUSP biopsy. Hospital of admission and year of infection were also obtained. Demographic and clinical characteristics for all patients were obtained from the prospective AS cohort including age, race, PSA, prostate volume, number of prostate biopsies performed, and performance and results of rectal swabs. Total number of biopsy events was used as the primary denominator for analyses, but analyses were also repeated at the patient level. The rate of hospitalization for suspected episodes of sepsis following TRUSP biopsy was compared between the targeted prophylaxis and empiric prophylaxis groups. Rates of FQ resistance and risk factors for hospitalization were also explored using univariable and multivariable logistic regression. Estimated hospital charges for rectal swab cultures were obtained and literature values for cost-to-charge ratios and cost of hospital admission were applied to estimate the net cost per patient [13,14]. Statistical analyses were performed using STATA v.12.0 (STATA Corp, College Station, TX, 2011).

3. Results

Of 1,167 men mailed a questionnaire, 825 (70.7%) responded and were included in the study. Demographics and clinical characteristics are given in Table 1. The overall number of biopsy events among patients was 3,361, of which 886 (26.4%) were preceded by a rectal swab culture and received targeted prophylaxis. The mean age, total

Table 1
Demographic and clinical characteristics of the cohort

Variable	Total patients (n = 824)				Hospitalized (n = 31)				Not hospitalized (n = 793)				P value
	Mean	Median	SD	IQR	Mean	Median	SD	IQR	Mean	Median	SD	IQR	
Age (y)	65.4	66	5.9	62–69	65.8	66	5.1	62–69	65.4	66	5.9	62–69	0.707
PSA (ng/dl)	5.2	4.8	2.7	3.6–6.2	4.7	4.5	3.5	2.3–5.9	5.2	4.8	2.7	3.7–6.3	0.367
Total biopsies	4.1	3	2.4	2–5	4.7	3	3.0	2–6.5	4.0	3	2.4	2–5	0.132
Number of positive cores	1.4	1	0.8	1–2	1.4	1	0.9	1–1	1.4	1	0.8	1–2	0.866
Max percentage of positive cores	10.8	5	14.5	0–15	8.0	1	14.0	1–7.5	10.9	5	14.5	1–15	0.276
Prostate volume (g)	49.9	49	23.0	35–60	40.4	36.8	21.0	27–45	50.3	45	23.0	35–60	0.032

IQR = interquartile range; SD = standard deviation.