Original Article

Role of rectal swab culture in prevention of infectious complications following transrectal ultrasound guided prostate biopsy

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Abstract

Objective: To evaluate the efficacy of targeted antimicrobial prophylaxis in decreasing infectious complications in men who underwent transrectal ultrasound guided prostate biopsy based on rectal swab culture results.

Material and Method: Between July 2016 and September 2018 we compared the incidence of infectious complications in men who received a targeted versus a standard empirical prophylaxis antibiotic before undergoing a transrectal ultrasound guided prostate biopsy. The targeted prophylaxis antibiotic was selected from the cultures of the rectal swab plated on selective media containing ciprofloxacin to identify fluoroquinolone resistant bacteria. We identified men with infectious complications within 14 days after standard transrectal ultrasound guided prostate biopsy.

Result: Sixty-two patients received targeted antimicrobial prophylaxis based on the outcome of the rectal swab culture while a comparison group of 62 patients received empirical FQ prophylaxis. Fifty out of the 62 (80.6%) men in the targeted antibiotic group harbored FQ resistant organisms. Four (6.4%) had infectious complications, but at just a low level (fever, UTI). In contrast, 7 (12%) of the 62 men who received FQ prophylaxis had infectious complications, 2 of whom (4%) had sepsis. There was no statistically significant difference in infection rate between the groups.

Conclusion: Targeted antimicrobial prophylaxis based on the findings of a rectal swab culture had a tendency to decrease post TRUSBx infectious complications, but the differences were not statistically significant.

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Introduction

Transrectal ultrasound guided prostate biopsy (TRUSBx) is a commonly performed procedure used for the detection of prostate cancer. Infectious complications following TRUSBx Bx are well-described[1]. Puncture of the rectal wall with the potential for transfer of pathogens from the rectum into the sterile prostate gland or surrounding tissue during TRUSBx appears to be the principal occurrence leading to infection. A variety of infectious complications have been reported following TRUSBx, including urinary tract infection (UTI), prostatitis, blood stream infection (BSI), and severe sepsis and death[2].

The most common pathogen implicated in post TRUSBx infectious complications is E. coli, accounting for approximately 75%-90% of cases[3]. Antibiotic prophylaxis with fluoroquinolone (FQ) before TRUSBx has been shown to significantly decrease the rates of infectious complications compared to placebo (8% vs 25%)[4]. However, recent studies have highlighted an increasing trend in infectious complications due to FQ resistant organisms among men undergoing TRUSBx[3].

Prevalence rates for colonization with FQ resistant organisms in this population have been reported to be as high as 22%[5]. Nevertheless, more than 90% of urologists continue to use FQ empirically for antimicrobial prophylaxis before TRUSBx[6]. The increasing prevalence of infections with FQ resistant bacteria in men undergoing TRUSBx suggests that empirical FQ prophylaxis may be ineffective in some patients.

Rectal swab cultures obtained before TRUSBx allow for the isolation and identification of FQ resistant organisms present in the native intestinal flora of the patient. Several retrospective studies have suggested that rectal swab cultures before biopsy can prove useful in the selection of appropriate antimicrobial agents for prophylaxis and treatment of TRUSBx associated infections[5,7,8]. Although these studies have used this method to establish prevalence rates and risk factors for FQ resistant organisms, there have been no published randomized controlled studies to evaluate the use of rectal swab cultures to target appropriate antimicrobial prophylaxis. In this study we compared rates of post-TRUSBx infection in men who received targeted vs empirical antimicrobial prophylaxis.

Material and Method

Between July 2016 and September 2018, men who underwent TRUSBx at the Department of Surgery, Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University were recruited onto the study. Inclusion criteria were age >18 years with an elevated PSA level and/or abnormal digital rectal examination (DRE). Exclusion criteria were contraindications for TRUSBx, such as uncorrected coagulopathy, severe immunosuppression or recent UTI/prostatitis. All patients were informed about the study and written informed consents were obtained before TRUSBx. This study was approved by the Research Ethics Committee of the Faculty of Medicine, Chiang Mai University (Study code: SUR-2559-03810).

Randomization

The design of randomization used in this study was the block of four. Patients were randomized into 2 groups: receipt of standard empirical prophylaxis or targeted antimicrobial prophylaxis. Empirical prophylaxis included 500 mg of ciprofloxacin. The first dose was administered 2 hours before and the second dose 12 hours after the procedure. Targeted prophylaxis included antimicrobial choices based on rectal swab culture results.

Intervention

The swabs were cultured on McConkey agar plates containing ciprofloxacin 5 μg/ml at least 7 days before the procedure in order to enable the identification of FQ resistant organisms. All microbiological processes were conducted by the Department of Microbiology, Faculty of Medicine,

Chiang Mai University.

All patients received a Unison® enema the night before the procedure and were not obligated to fast beforehand. Biopsies were performed with the patient in the left decubital position using a biopsy gun with a disposable biopsy needle in conjunction with a medical ultrasound console. The specimens taken included 10-12 cores of needle biopsies from both the lateral and the medial part of the prostate base, middle and apex.

Following the TRUSBx procedure all patients were asked to return to the hospital if they had a fever higher than 38°C, severe pain, prolonged hematuria or exacerbation of lower urinary tract symptoms. The decision for readmission was considered in each case by a urological consultant.

Data collection

Telephone follow-up was used to identify patients who had complications within 14 days after TRUSBx. Information regarding the following symptoms and conditions was collected: hemospermia, hematuria, rectal bleeding, fever >38°C, prostatitis, epididymitis, UTI, sepsis, and other complications requiring hospitalization or ambulatory treatment. Infectious complications were defined as the secondary conditions that developed after TRUSBx, including fever, prostatitis, UTI or sepsis.

Statistical Analysis

Normally distributed continuous variables were analyzed using a Student's t test. The non-normally distributed variables were analyzed using a Mann-Whitney U test. A Chi-square test was used for the analysis of categorical data. Finally, univariable and multivariable analysis were performed by risk ratio regression to identify any correlation between the variety of risk factors and the incidence of post TRUSBx infection; $p<0.05$ was considered statistically significant. All statistical analyses were performed using standard statistical software (STATA version 12.0).

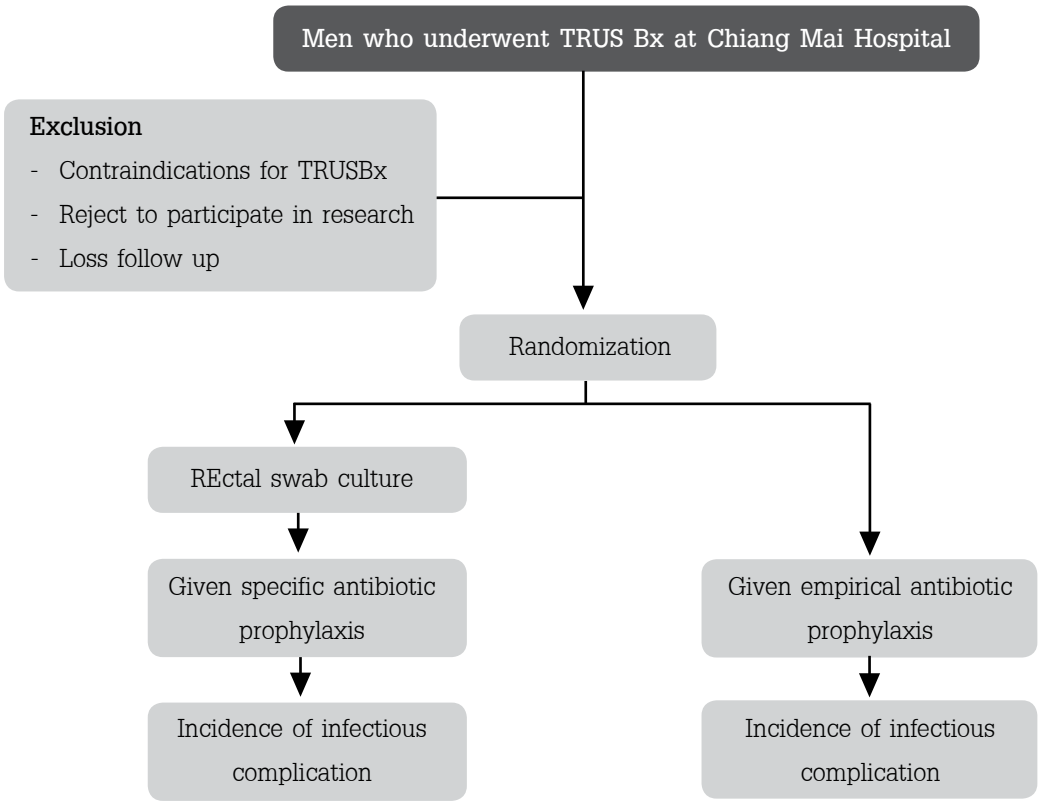

Figure 1. Flow diagram of Research.

Result

Background characteristics

A total of 124 patients who underwent TRUSBx were included in this analysis. Sixty-two patients underwent a rectal swab and 62 patients did not. Baseline characteristics are summarized in Table 1. There were no statistically significant differences between the baseline characteristics of the 2 groups.

In the group who had the rectal swabs before TRUSBx, 50 out of the 62 patients (80.6%) harbored FQ resistant organisms. All patients in this group received the targeted antimicrobial prophylaxis approach.

Post TRUSBx infection

Only 3 patients (5%) had infectious complication but just a low level (UTI). In contrast, 7 (12%) of the 62 men undergoing the procedure without culture had infectious complications; 2 of these (4%) had sepsis. Both patients had FQ resistant E.coli identified from the hemoculture.

Other complications in patients who underwent the rectal swab before TRUSBx were: 13 hematuria (21.3%), 3 hemospermia (4.9%), and 6 rectal bleeding (9.8%). In the non-rectal swab patient group, the complications were: 7 hematuria (14%), 1 hemospermia (2%), and 2 rectal bleeding (4%).

The correlation between rectal swab and post TRUSBx infection are shown in Table 2. There was no significant difference in infection rate between the 2 groups (rectal swab v.s non-rectal swab; p-value = 0.099) in both the univariate and multivariate analysis. Despite there being no statistically significant difference, a trend of preventing infectious complications in patients who received targeted antibiotics was observed.

Table 1. Clinical characteristics between rectal swab and non-rectal swab groups.

Parameter	No rectal swab N=62	Rectal swab N=62	P-value
Age, Meam ± SD	68.69 ± 7.69	66.39 ± 7.88	0.125
Prior urologic procedure, n(%)	14(22.58)	18(29.03)	0.539
Prior antibiotic in 6 mo, n(%)	14(22.58)	15(24.19)	1.000
Prior hospitalization in 6 mo, n(%)	8(12.90)	8(12.90)	1.000
Prior TRUSP, n(%)	7(11.29)	7(11.29)	1.000
No. of Core biopsy, Meam ± SD	9.97 ± 0.85	10.35 ± 1.52	0.082
Prostate volume, Meam ± SD	41.42 ± 26.02	36.89 ± 18.31	0.264
PSA level, Meam ± SD	86.65 ± 213.78	209.32 ± 738.0	0.839

Table 2. Correlation between infectious complication and additional parameters.

	Infectious complication	No infectious complication	Risk Ratio (95% CI)	p-value
Rectal swab	3 (5.08%)	59	0.33 (0.09-1.23)	0.099
Non rectal swab	7 (12.72%)	55		

Risk factors of post TRUSBx infection

Additional characteristics were analyzed in order to find any correlation with post TRUSBx infection, includ history of urologic procedure, antibiotic usage in 6 months, hospitalization in the previous 6 months, and prostate volume >30 ml. The correlation outcomes are summarized in Table 3. The only factor which had a significant correlation with post TRUSBx infectionwas a prostate volume >30 ml (0.26, CI 0.07-0.98; p-value = 0.047). The implication from this is that a prostate volume <30 ml is a significant risk factor for post TRUSBx infection.

Discussion

Previous studies have demonstrated that infectious complications in patients who underwent TRUSBx could be reduced by using targeted antimicrobial prophylaxis based on the findings from rectal swab cultures vs traditional empirical FQ prophylaxis. Symptomatic infectious complications including UTI rates of 2% - 8%[6] and sepsis of between 0.1% - 2.2% were reported among patients undergoing empirical prophylaxis with FQ[10]. In this study, the incidence of infectious complications was lower among patients undergoing targeted vs empirical prophylaxis (5% vs 12%). Sepsis, one of the most serious infectious complications, was found in the empirical FQ prophylaxis group (4%), but it was not found in the group with targeted prophylaxis based on a rectal swab culture. The overall rate of infectious complications, including sepsis, among patients undergoing empirical prophylaxis with fluoroquinolone in our study was higher than those in the published literature. That might be from the higher rate of FQ resistance in our study (50 out of 62 patients, 80.6%). Based on our findings, only 25 men needed to undergo a rectal swab culture to prevent potentially deleterious infectious complications. The benefit of carrying out a routine rectal swab before TRUSBx needs to be weighed against the cost of both the rectal swab culture and targeted prophylaxis (approximately 10 USD / case). One of disadvantages of the targeted approach is the delay required to obtain culture results (approximately 1 week), leading to a delay in the prostate biopsy.

A limitation of this study is the relatively small number of patients from a single institution. In addition, the true prevalence of FQ resistant organisms in the empirical population is unknown as these patients did not undergo rectal swab for screening.

Table 3. Correlation of rectal swab screening and post TRUSBx infections.

Parameters		Infectious complication	No infectious complication	Risk Ratio (95% CI)	p-value
Prior urologic procedure	Yes	2	30	0.57	0.475
	No	8	84	(0.12-2.62)	
Prior antibiotic used in 6 mo	Yes	3	26	1.09	0.895
	No	7	88	(0.29-4.03)	
Hospitalization in 6 mo	Yes	3	13	2.89	0.368
	No	7	101	(0.83-10.06)	
Prostate volume > 30 ml	Yes	3	66	0.26	0.047
	No	7	48	(0.07-0.98)	

Based on 80.6% of the rectal swabs in the empirical prophylaxis group being colonized with FQ resistant organisms before TRUSBx, It is reasonable to assume that there would have been infectious complications in many of these patients. However, intriguingly, only 7 patients (12%) experienced infectious complications. Possible reasons for the disparity between our observed and expected outcomes could include the differences in host immunity, procedural techniques, and bacterial inoculum. It is clear from our study and from the findings of other investigators that antimicrobial prophylaxis choice is not the only factor that determines whether infectious complications will develop after TRUSBx[11].

Conclusion

Targeted antimicrobial prophylaxis based on the outcome of rectal swab cultures was associated with a reduction in the incidence of infectious complications caused by FQ resistant organisms post TRUSBx. This suggests that the screening of rectal swab cultures before TRUSBx is beneficial and should be performed before this common procedure.

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Conflict of interest

The authors declare no conflict of interest.

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