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ORIGINAL ARTICLE

Comparison of Prophylactic Methods to Prevent Clinical Infection After Trans-Rectal Prostate Needle Biopsy

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Abstract

Introduction: Studies have shown that infectious complications after trans-rectal prostate biopsy (TRUS-Bx) are increasing and various prophylactic methods have been developed to reduce these complications. This study aimed to compare the effectiveness of oral antibiotic and rectal Povidone-iodine usage for infection prophylaxis before TRUS-Bx.

Methods: Data of 280 patients who underwent prostate biopsy between July 2016 and October 2019 were reviewed retrospectively. Prophylaxis was achieved with 3 days of oral antibiotic therapy before biopsy in 147 patients and with 10% Povidone-iodine rectal application during biopsy in 133 patients. The groups were compared in terms of demographic data, PSA levels, prostate volumes, cancer detection rates, number of biopsy cores, and infectious complications such as urinary tract infection and fever within 1–2 weeks after TRUS-Bx.

Results: The mean age of patients receiving antibiotic prophylaxis was 62.2±8.8, while the mean age of patients receiving prophylaxis with rectal Povidone-iodine was 63.2±9.1 years (p=0.38). There was no significant difference in terms of prostate specific antigen level, cancer detection rates and age in both groups. About 15.6% had diabetes in the antibiotic prophylaxis group and 16.5% had diabetes in the Povidone-iodine group. In the group receiving antibiotic prophylaxis, acute prostatitis was seen in 7 (4.8%) patients, 2 of whom were sepsis and in the group receiving rectal Povidone–iodine prophylaxis, acute prostatitis was seen in 4 (3%) patients, 1 of whom was sepsis. The groups were not statistically different in terms of infective complications (p=0.45).

Discussion and Conclusion: The groups were not statistically different in terms of infective complications after prostate biopsy. Therefore, prophylaxis which was achieved with rectal Povidone-iodine application may be more appropriate in terms of both antibiotic resistance and cost.

Keywords: Acute prostatitis; antibiotic prophylaxis; povidone-iodine; prostate biopsy.

Prostate cancer diagnosing is increasing rapidly; therefore, the number of trans-rectal ultrasound-guided prostate biopsies (TRUS-Bx) is increasing simultaneously. Although prostate-specific antigen blood (PSA) testing and digital rectal examination (DRE) play an important role in diagnosis and screening, TRUS-Bx is the only way to diagnose histological tissue. TRUS-Bx involves placing an ultrasound probe in the patient's rectum and then taking a 12–14 biopsy of the peripheral region of the prostate, which is usually immediately placed anteriorly. Each needle biopsy

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requires an 18 G needle to pass from the rectal wall to the high vascular prostate. Thus, there is a risk of infection and bleeding due to trauma and bacterial translocation after the procedure. Therefore, it is important to prevent complications that may occur after TRUS-Bx.

Studies have reported that after TRUS-Bx approximately 5–10% of patients develop infectious and non-infectious complications (urinary retention, hematuria, etc.)[1]. In a study, infectious complications were observed in 4.2–5.1% of patients. Cases requiring hospitalization were observed in 81–100% of these patients. In some cases, sepsis has been observed[2]. After TRUS-Bx various attempts for reducing infectious complications, including antibiotic use, have been reported[3].

Antibiotic prophylaxis for TRUS-Bx is generally provided with quinolone-based antibiotics. However, despite prophylaxis, some studies points to an increase in infectious complications after TRUS-bx[4]. Some studies have linked this increase after TRUS-Bx to the emergence of quinolone-resistant microorganisms, especially Escherichia coli[5]. The rate of rising quinolone resistance suggests that alternative prophylaxis regimens are needed for TRUS-Bx procedures. To this end, several different ways have been explored. One approach involves administering an intramuscular or intravenous antibiotic with an oral quinolone during a biopsy[3]. While this application can reduce sepsis events after TRUS-Bx, a major limitation of this approach is the potential for further development of organisms resistant to this family of antibiotics. Another approach involves using a rectal swab culture before biopsy to screen patients who colonized with quinolone-resistant microorganisms[6]. If these organisms are detected in the rectal swab culture, a "targeted" antibiotic regimen can be used based on the susceptibility profile. Although the methodology seems reasonable, the process of obtaining rectal swab culture, selectively culturing on a quinolone-selective medium, and then adapting antibiotics requires a laboratory and clinical infrastructure that may be lacking in many clinics. The application of the local antiseptic to reduce the number of microorganism colonies in the rectal vault before performing biopsy may offer an alternative strategy to limit post-TRUS-Bx infections. Povidone iodine is an easily accessible and cheap agent that reduces the number of bacteria when applied to surgical sites. In this respect, applications of Povidone-iodine in both gynecological and colorectal surgeries are well known. Therefore, the use of Povidone- iodine at the preparation stage before biopsy will be a cost-effective and simple method to reduce TRUS-Bx infections without the need for additional prevention. There are studies showing that prophylaxis using Povidone-iodine can reduce infectious complications after prostate biopsy[7,8]. Povidone-iodine is used widely for the treatment and prevention of wound infections. Especially in gynecology, the use of Povidone-iodine suppositories is an accepted approach for many years[9]. Therefore, this study aimed to investigate the effect of Povidone-iodine prophylaxis as a proven and safe effective application in comparison with oral antibiotic usage before TRUS-Bx.

Materials and Methods

Institutional review board approval was obtained for this study (FSM EAH-KAEK 2020/56).

Data of 280 patients who underwent TRUS-Bx between July 2016 and October 2019 were reviewed retrospectively. Urinalysis, urine culture, prostate volume, serum PSA level, and demographic data results were recorded. All patients who underwent TRUS-Bx were initially seen at a special urology clinic for prostate cancer screening. This assessment required the performance of the DRE and the examination of the patient's serum PSA testing. Abnormality of DRE or PSA (patients who had PSA level more than 2.5) prompted TRUS-Bx recommendation. The procedure and associated risks such as urinary retention; bleeding and infection were discussed with patients. All urine cultures were sterile before biopsy. 147 participants received oral antibiotic prophylaxis containing quinolone (i.e., Ciprofloxacin) for 3 days before biopsy and prophylaxis was achieved only with 10% Povidone-iodine in133 patients. Glycerin enema was applied to all participants approximately 3 h before TRUS-Bx. An 18-gauge punch needle was used for all TRUS-Bxs and was performed as 12-core biopsies. When hypo-echoic lesions were detected on multi-parametric MRI, additional biopsies were performed up to a maximum of 3 cores. To maintain the consistency of TRUS-Bx, an experienced urologist has performed the procedure. After the TRUS-Bx, the participants did not use any antibiotics. In the first visit after biopsy, interviews were made with febrile complications and Povidone-iodine complications. The technique initially involves positioning the patient as standard manner for prostate biopsy.

Following the DRE, a commercially available 15 mL 10% Povidone-iodine solution in the Povidone-iodine group was mixed with 5 mL of 1% lidocaine jelly to form the slurry. A sterile 4 cm × 4 cm gauze pad was immersed in this slurry and then it was inserted into the rectal vault for 2 min, then it was removed. Then, a disposable cotton gynecological swab was used to dye both the rectal vault and the perianal area up to 3 cm from the anus.

Subsequently, the Povidone-iodine solution was allowed to dry for 2–3 min before proceeding with the biopsy. In the antibiotic regimen group 3 days of oral antibiotic therapy was given and no additional therapy was given. The primary aim of this study was to identify the incidence of infectious complications such as urinary tract infection and fever within 1–2 weeks after TRUS-Bx. As in the study of Ryu et al.,[10] infectious complication was defined as the application to our institution within 3 days after prostate biopsy, due to tympanic membrane temperature of ≥38.0°C, or urinary infection complaints such as high fever symptoms or pain or burning when urinating. The exclusion criteria were thyroid dysfunction, hypersensitivity to Povidone-iodine, dermatitis, radio iodine treatment, and renal failure.

Statistical Analysis

The IBM SPSS Statistics 22 (SPSS IBM, Türkiye) program was used for statistical analysis. Mean, median, standard deviation, minimum, maximum, and frequency were used as the descriptive statistical methods. For intergroup comparison, student t-test was used for continuous variables and Chi-square test was used for categorical variables. Results were evaluated at a 95% confidence interval, $p<0.05$ significance level.

Results

The mean ages were 63.2±9.13 and 62.2±8.84 years in the group receiving Povidone-iodine and antibiotic prophylaxis, respectively (p=0.38) (Table 1). There was no statistically significant difference in terms of PSA levels, number of biopsy cores, mean prostate volume, and prostate cancer detection rates between groups (Table 1). About 15% had diabetes in the antibiotic prophylaxis group and 16% had diabetes in the Povidone-iodine group. The patients did not have any complications such as severe bleeding or fever after TRUS-Bx. In the group receiving antibiotic prophylaxis, infectious complication as acute prostatitis was seen in 7 (4.8%) patients, 2 of whom were sepsis and in the group receiving rectal Povidone-iodine prophylaxis, acute prostatitis was seen in 4 (3%) patients, 1 of whom was sepsis. There was no significant difference between the groups in terms of infective complications (p=0.45). No Povidone-iodine application related side effects were reported by patients after or during biopsy.

Discussion

Infections that develop after TRUS-Bx develop as a result of translocation of rectal vault bacteria to the prostate, which has a high vascular structure. Application of rectal preparations and appropriate antibiotics before TRUS-Bx is widely used to reduce infection rates. However, antibiotic selection and regimen duration are controversial. The 2020 European Urological Association guideline recommends fluoroquinolone, aminoglycoside, and cephalosporin group antibiotics for TRUS-Bx[11]. Among these, the most widely used antibiotics are fluoroquinolones as we used for antibiotic prophylaxis in our study population. Although antibiotic prophylaxis shows a significant reduction in urinary infections after biopsy, many countries have been reported to have quinolone-resistant bacteria[12,13]. In the study conducted by Chung et al.,[13] the incidence of fluoroquinolone resistance was 48.1%. Increased quinolone resistance is associated with an increase in severe infection after biopsy[1,14]. Norwegian registration data show that in recent years there has been an increase in antibiotic resistance for both ciprofloxacin and TMP-SMX[15]. Risk factors for this antibiotic resistance include a history of the previous TRUS-Bx, an existing permanent catheter, urogenital infection, or hospitalization within the previous 6 months. To minimize the risk of serious infection from quinolone-resistant rectal flora, rectal swab culture, and then targeted antibiotic prophylaxis can be recommended to patients with any of these risk factors before TRUS-Bx[16]. Rectal disinfection with Povidone-iodine is another option[16]. For this reason, we

Table 1. Comparison of groups in terms of variables assessed in the study

	The group receiving antibiotic prophylaxis (n=147)	The group receiving rectal Povidone-iodine prophylaxis (n=133)	p
Age (years) mean±SD	62.2±8.84	63.2±9.13	0.38
DM (n, %)	23 (15.6)	22 (16.5)	0.84
Acute prostatitis (n, %)	7 (4.8)	4 (3)	0.45
PSA (ng/dL) Mean±SD	8.07±3.41	7.57±3.27	0.22
Prostate cancer detection rates (n, %)	59 (40.1)	49 (36.8)	0.661
Prostate volume (mL)	48.91±12.93	51.25±12.83	0.13
Number of biopsy cores	12.15±0.73	12.17±0.77	0.85

investigated the simple method of using an antiseptic such as Povidone-iodine to reduce the number of microorganism colonies before TRUS-Bx. There are many studies showing that Povidone-iodine application after TRUS-Bx reduces the incidence of complications related to infection.

In a systematic review, Povidone-iodine was found to be more effective for reducing infection after prostate biopsy[17]. In a meta-analysis conducted by Pu et al.,[18] bowel cleansing with Povidone-iodine has been shown to be effective in preventing complex infections, and it has been reported that Povidone-iodine usage before TRUS-Bx showed a reduction in complication rates approximately 80%. Raman et al.[19] hypothesized that the main factor underlying the reduction in systemic infections was a 97% reduction in rectal vault microorganisms.

In most studies, Povidone-iodine was used just before TRUS-Bx, as in our current study. We investigated the incidence of infectious complications between groups receiving antibiotic and Povidone-iodine prophylactics. According to the meta-analysis of Cochrane Cooperation, the incidence rates of infectious complications after prostate biopsy were 9% for urinary tract infection, 14% for bacteriuria, 10% for fever, and 18% for bacteremia[1]. In our previous study, the rate of urinary tract infection after ciprofloxacin prophylaxis was 5.04%[20].

In our current study, overall infectious complications occurred in approximately 3.9% of the entire patient population after TRUS-Bx. About 3% and 4.8% of infectious complications occurred in the group receiving Povidone-iodine and antibiotic prophylaxis, respectively. In addition to cleaning with Povidone-iodine produces a good acoustic window for prostate imaging by reducing the amount of rectal feces, many studies have shown that rectal cleaning with Povidone-iodine reduces infectious complications[13,21]. However, there is no consensus with when to start rectal cleaning with Povidone-iodine[22].

Some institutions perform enema 1 day before biopsy and restrict oral intake on the day of biopsy. Our routine was to perform enema 4 h before the biopsy and to restrict oral intake after breakfast on the day of the biopsy. Our prophylaxis results with topical Povidone-iodine administration had similar results with other studies. AbuGhosh et al.[23] prospectively randomized 865 men who received oral ciprofloxacin prophylaxis with rectal Povidone-iodine application or no rectal Povidone-iodine application before TRUS-Bx. In this study, infectious complications occurred in 11 (2.6%) patients who received Povidone-iodine prophylaxis and in 20 (4.5%) patients of the control group without Povidone-iodine prophylaxis, and sepsis was seen in 4 (1.0%) patients who received Povidone-iodine prophylaxis and in 7 (1.6%) patients without Povidone-iodine prophylaxis.

Povidone-iodine prophylaxis does not require systemic antibiotic therapy or additional preparation, and the technique is inexpensive at the minimum associated cost for commercially available Povidone-iodine purchasing applications. The method is simple; any urologist can perform the procedure by adding only 5 min to the biopsy procedure. Finally, the side effect profile of Povidone-iodine is low, and in our study, no patient had any side effects.

There were some limitations of our study. One of the limitations of this study was the absence of values such as white blood cell and CRP because of the data were not complete. These are indicative of inflammation before biopsy but still not specific for infection. Secondly, we used ciprofloxacin without knowing the resistance pattern as antibiotic prophylaxis. This may have affected the results. Because, there are some studies showing high resistance to quinolone[12,13]. Thirdly we did not make rectal-culture screening. Recent reports have also shown that antibiotic prophylaxis determined based on rectal culture screening results may be effective[24]. However, the realization of targeted rectal swab cultures has obvious difficulties depending on institutions and regions, which makes the empirical use of antibiotics clinically inevitable. Other limitations include selection bias of homogeneity of subjects selected from a single institution, while antibiotic resistance was reported to be highly variable across regions.

Conclusion

Prophylaxis made with Povidone-iodine before TRUS-Bx is simple, inexpensive and at least as effective as antibiotic prophylaxis in protecting against urinary infection. It also prevents the development of bacterial resistance by limiting antibiotic use. However, the number of available rectal vault counts following Povidone-iodine prophylaxis is 97% below the basal value, some persistent organisms remain, which may theoretically be a source of infection. And therefore, the probability of urinary infection continues even if it is low.

Ethics Committee Approval: Institutional review board approval was obtained for this study (FSM EAH-KAEK 2020/56).

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