Povidone Iodine Intrarectal Cleaning versus Formalin Needle Disinfection for Minimizing Transrectal Prostate Biopsy-related Infections

Md. Asaduzzaman Rajib[1], Md. Faisal Islam[2], Imtiaz Enayetullah[3], Md. Abdul Baten Joarder[4], Adeeba Khanduker[5]

Abstract

Background: A most feared complication of transrectal prostate biopsy is post-biopsy infection and/or sepsis. Safe intraprocedural measures that complement the antibiotic prophylaxis are intrarectal povidone iodine instillation or formalin needle disinfection after every core of the biopsy. Both are more effective at preventing post-biopsy infection than performing antibiotic prophylaxis alone.

Objective: To assess the effectiveness of povidone-iodine intrarectal cleaning and formalin needle disinfection to prevent infection after prostate biopsy.

Methodology: This study was conducted from July 2021 to June 2022 with 90 patients who underwent prostate biopsy at NIKDU. Patients were randomized into 2 equal groups, 45 in each group, by lottery. Two groups were Group-F: Standard biopsy, where the needle is disinfected with 10% formalin after each core, and Group-P: intrarectal luminal instillation of 10 ml 10% povidone-iodine for 10 min before the biopsy. Endpoint of the study was the development of signs and symptoms of infection within 7 days of prostate biopsy.

Result: In terms of age, S. PSA & prostate volume, there was no significant difference between the two group. Infective complications within 7 days of the prostate biopsy were observed in 14 patients (15.6%), 3.67 times more in Group-F patients (p=0.03), and a higher incidence of UTI (72.73%) was observed in Group-F (p=0.03) than Group-P patients. The incidence of septicemia, epididymal-orchitis, and acute prostatitis was not statistically significant between the two groups. E. coli was the predominant organism found on urine culture, followed by Klebsiella pneumoniae, Enterococcus faecalis, and proteus species.

Conclusion: Along with prophylactic antibiotics, povidone iodine intrarectal cleaning is superior to formalin needle disinfection in preventing infective complications of prostate biopsy.

1.   Assistant Registrar, Department of Urology, NIKDU, Dhaka
2.   Associate Professor, Department of Urology, NIKDU, Dhaka.
3.   Assistant Professor, Department of Urology, NIKDU, Dhaka.
4.   Indoor Medical Officer, Department of Urology, DMCH, Dhaka
5.   Lecturer, Department of Microbiology, Anwer Khan Modern medical college, Dhanmondi, Dhaka-1205.

Correspondence : Md. Asaduzzaman Rajib, Assistant Registrar, Department of Urology, NIKDU, Dhaka, E-mail: rajib3434@gmail.com

Introduction

Indications for prostate biopsy include a positive digital rectal exam (focal nodule, stiffness, or asymmetry), clinical symptoms, high serum prostate-specific antigen (PSA), or PSA velocity to monitor in known prostate cancer patients on active surveillance[1]. More than one million prostate biopsies are performed annually in the United States of America. In our country, the number of patients undergoing prostate biopsy is increasing due to the PSA screening program. Therefore, a small percentage of post-biopsy complications significantly affect a large portion of the population's health. The most feared complication of transrectal prostate biopsy is post-biopsy infection and sepsis[2]. During a transrectal prostate biopsy, fecal matter may be introduced into the prostate causing infection. Infectious complications range from 0.1% to 7%, and sepsis from 0.3% to 3.1%, sometimes associated with mortality[2]. The mean proportion of patients with sepsis was 1.5 %, with the lowest rate of 0.6 % reported in 2011 and the highest rate of 2.9 % reported in 2013[1]. Infections after prostate biopsy are also rising because of fluoroquinolone-resistant/extended-spectrum beta-lactamases (ESBL) producing Escherichia coli. Hospitalization due to post-biopsy infections increases the burden on our country's healthcare system. American Urological Association guidelines recommend a fluoroquinolone or first, second, or third-generation cephalosporin combined with an aminoglycoside as a prophylactic antibiotic before prostate biopsy. Intrarectal povidone iodine instillation or formalin needle disinfection after every core of the biopsy is safe intraprocedural measures that complement antibiotic prophylaxis. Both are effective measures to prevent post-biopsy infection than performing prostate biopsy with antibiotic prophylaxis alone. Literature evidence proving enhanced efficacy of povidone-iodine instillation than formalin needle disinfection after every core of the biopsy is lacking[2]. So, this study has been designed to assess the effectiveness of these two methods for preventing infection during prostate biopsy.

Methodology

A total of 90 patients excluding as per exclusion criteria, underwent transrectal prostate biopsy at the urology department, NIKDU, between July 2021 and June 2022. Exclusion criteria were known allergy to povidone-iodine, co-morbidity (DM, HTN), chronic prostatitis, patients with UTI, recent catheterization, coagulopathy, and patients needing catheterization after biopsy. Local ethical committee approval was taken for the study. Patients were counseled about the treatment, and informed written consent was taken.

Patients were randomized into 2 equal groups, 45 in each group, by lottery. Two groups were assigned as Group-F: Standard biopsy, where the needle is disinfected with 10% formalin after each core, and Group-P: intrarectal luminal instillation of 10 ml 10% povidone-iodine for 10 min before the biopsy. Bowel preparation was not given to any patients. Patients were given 500 mg of oral cefuroxime once on the day of the procedure. All patients were placed in the lithotomy position, and 2% lidocaine was used as a peri-prostatic block 10 min before the procedure. Patients underwent a 12-core biopsy protocol, including six parasagittal and six laterally targeted cores covering the base, mid-zone, and apex in the daycare setting using spring-loaded 18G core biopsy needle. Post-biopsy infection definitions are: a) UTI: Bacteriuria with pyuria by microscopy within a week of biopsy with signs of chills, dysuria, frequency, urgency & temperature <100.4 °F b) Bacteremia: Bacterial growth in blood culture c) Sepsis: Systemic inflammatory response syndrome (presence of ≥ 2 of the following: Temperature $\geq 100.4°F$ or $<96.8°F$; tachycardia >90 beats/min; tachypnea >20 breaths/min or respiratory alkalosis $paCO2 \leq 32$ mmHg; leukocytosis ≥ 12000 or leukopenia ≤ 4000 due to infection)[2]. The Endpoint of the study was the development of signs and symptoms of infection within 7 days of prostate biopsy. All patients were interviewed over the telephone regarding their symptoms & daily temperature measurements for 7 days. Symptomatic patients underwent urine culture, and oral nitrofurantoin 100 mg SR capsule twice daily was initiated empirically. The further antibiotic course was dictated by urine culture sensitivity. Blood cultures were sent when patients had a temperature $\geq 100.4°F$. Results were analyzed using SPSS 25 (IBM Corp., Armonk, NY, USA). Continuous data were presented as mean ± standard deviation (SD), and categorical data were presented as frequency and percentage. Fisher's exact test analyzed variables in the contingency table. $p < 0.05$ indicated statistical significance.

Result

In terms of age, S. PSA & prostate volume, there was no significant difference between the two groups (Table I). Infective complications within 7 days of the prostate biopsy were observed in 14 patients (15.6%), 3.67 times more in Group-F patients (p=0.03), and a higher incidence of UTI (72.73%) was observed in Group-F (p=0.03) than Group-P patients. The incidence of septicemia, epididymal-orchitis, and acute prostatitis was not statistically significant between the two groups (Table II).

Table I: *Demographics of the patients.*

Variable	Group-F (n=45)	Group-P (n=45)	*p* value
Age (years)	62±12	64±11	0.41
S. PSA (ngm/ml)	12±5.6	12.8±6.1	0.52
Prostate volume (gram)	47±13.8	49±14.2	0.5

Group-F= Needle disinfection with formalin, Group-P= Rectal disinfection with povidone iodine.

Table II: *Rates of infective complications.*

Complications	Group-F (n=45)	Group-P (n=45)	Total	*p* value
1) Infective complications	11 (78.57%)	3 (21.43%)	14 (15.6%)	0.03*
UTI	8 (72.73%)	1 (33.33%)	9 (64.29%)	0.03*
Septicemia	2 (18.18%)	1 (33.33%)	3 (21.43%)	1.00
Epididymo-orchitis	0 (0%)	1 (33.34%)	1 (7.14%)	1.00
Acute prostatitis	1 (9.09%)	0 (0%)	1 (7.14%)	1.00
2) LUTS	5 (55.56%)	4 (44.44%)	9 (10%)	1.00

Group-F= Needle disinfection with formalin, Group-P= Rectal disinfection with povidone iodine.

Eleven out of 14 symptomatic patients had bacterial growth on urine culture, and none of the 3 septic patients had bacterial growth on blood culture. *E. coli* (54.55%) was the predominant organism found on urine culture, followed by *Klebsiella pneumoniae* (18.18%), *Enterococcus faecalis* (18.18%), and *proteus* (9.09%) species (Table 3). All culture-positive patients were treated with antibiotics according to sensitivity. No patient requires admission into the hospital. Complete resolution of infection occurred in all patients that were confirmed by negative urine culture.

Table III : *Bacteriogram of positive cultures.*

Bacteria	Positive urine culture	Positive blood culture
E. coli	6 (54.55%)	0
Klebsiella pneumoniae	2 (18.18%)	0
Enterococcus faecalis	2 (18.18%)	0
Proteus spp.	1 (9.09%)	0
Total	11	0

DISCUSSION

This study found that 10 ml 10% povidone-iodine disinfection of the rectum for 10 min before the prostate biopsy is superior to formalin needle disinfection after each core for infection prevention. A Cochrane systematic review established the benefits of prophylactic antibiotics before prostate biopsy[3]. Literature suggests that >50% of infections after prostate biopsy are due to fluoroquinolone-resistant *E. coli*, so cefuroxime was given in this study for antibiotic prophylaxis[4]. Within 3 days after biopsy, infection usually occurs, so our patients were followed up daily for 7 days after biopsy for signs of infection[5]. Nitrofurantoin is the empiric drug of choice for suspected infection because of its minimal effects on gut flora and local antibiogram showing high susceptibility to Nitrofurantoin[1]. Abughosh et al.[6] found an insignificant reduction of infection with povidone-iodine, but Park et al.[7]; Ryu et al.[8] found a reduction of infection with povidone-iodine. Infective complications within 7 days of the biopsy were 3.67 times more, and a higher incidence of UTI was observed in Group F than Group P patients in our study. Our study matched with literature that justifies using intrarectal povidone-iodine rather than formalin disinfection of needles for prostate biopsy. Bacterial virulence depends on bacterial density, determining the disinfectant to inhibit bacterial growth[5]. Formalin did not reduce the bacterial density, so bacterial virulence easily produces clinical infection, eliciting a systemic response and producing symptoms. Contrary

to formalin, povidone-iodine reduced bacterial density preventing systemic response & symptoms. So, it caused only localized infection leading to asymptomatic bacteriuria.

This study has some limitations. It was carried out in a single center, small sample size, number of cores taken during the biopsy was not considered a variable for analysis. Large-scale, multicenter studies & predictors of infective complications can be incorporated to increase their accuracy.

Conclusion
Along with prophylactic antibiotics, povidone iodine intrarectal cleaning is superior to formalin needle disinfection in preventing infective complications of prostate biopsy.

Acknowledgements

References
1. Salam MA, Kaiser I, Islam GS, Mamoon I. Prostate Biopsy wup Date. Bangladesh Journal of Urology. 2018;21(2):145-57.

2. Bajpai RR, Razdan S, Sanchez-Gonzalez MA, Razdan S. Minimizing transrectal prostate biopsy-related infections; A prospective randomized trial of povidone-iodine intrarectal cleaning versus formalin needle disinfection. Indian Journal of Urology: IJU: Journal of the Urological Society of India. 2021 Jul;37(3):254.

3. Zani EL, Clark OA, Netto Jr NR. Antibiotic prophylaxis for transrectal prostate biopsy. Cochrane Database of systematic reviews. 2011(5).

4. Feliciano J, Teper E, Ferrandino M, Macchia RJ, Blank W, Grunberger I, Colon I. The incidence of fluoroquinolone-resistant infections after prostate biopsy—are fluoroquinolones still effective prophylaxis? The Journal of Urology. 2008 Mar;179(3):952-5.

5. LaPlante KL, Rybak MJ. Impact of high-inoculum Staphylococcus aureus on the activities of nafcillin, vancomycin, linezolid, and daptomycin, alone and in combination with gentamicin, in an in vitro pharmacodynamic model. Antimicrobial agents and chemotherapy. 2004 Dec;48(12):4665-72.

6. Abughosh Z, Margolick J, Goldenberg SL, Taylor SA, Afshar K, Bell R, *et al*. A prospective randomized trial of povidone-iodine prophylactic cleansing of the rectum before transrectal ultrasound-guided prostate biopsy. J Urol 2013; 189:1326 31.

7. Park DS, Hwang JH, Choi DK, Gong IH, Hong YK, Park S, Oh JJ. Control of infective complications of transrectal prostate biopsy. Surgical Infections. 2014 Aug 1;15(4):431-6.

8. Ryu H, Song SH, Lee SE, Song KH, Lee S. A prospective randomized trial of povidone-iodine suppository before transrectal ultrasonography-guided prostate biopsy. Medicine. 2019 Mar; 98(12).