KJU
Korean Journal of Urology

www.kjurology.org
http://dx.doi.org/10.4111/kju.2014.55.11.732

Original Article - Urological Oncology

# Complications of Transrectal Ultrasound-Guided Prostate Biopsy: Impact of Prebiopsy Enema

**Sung Chul Kam, See Min Choi, Sol Yoon, Jae Hui Choi, Seong Hyun Lee, Jeong Seok Hwa, Ky Hyun Chung, Jae Seog Hyun**

*Department of Urology, Gyeongsang National University Hospital, Gyeongsang National University School of Medicine, Jinju, Korea*

**Purpose:** Transrectal ultrasound (TRUS)-guided biopsy of the prostate is usually safe. However, some patients are hospitalized owing to complications from TRUS biopsy. We identified the risk factors for complications and effective preventive measures for treating complications after TRUS biopsy.

**Materials and Methods:** Medical records and radiological images of 1,083 patients who underwent TRUS biopsy of the prostate over 10 years in Gyeongsang National University Hospital were examined retrospectively to investigate the correlation between complications after TRUS biopsy and preventive antibiotics, prebiopsy enema, number of biopsy cores, and pathological findings.

**Results:** Complications occurred in 69 patients (6.4%). The complication rates of the 1,008 patients who received antibiotics and the 75 patients who did not were 6.3% and 8.0%, respectively (p=0.469). Complication rates of the pre-biopsy enema group (n=658) and the group without prebiopsy enema (n=425) were 4.7% and 8.9%, respectively (p=0.007). Complication rates of the 6-core biopsy group (n=41) and the 12-core biopsy group (n=955) were 7.3% and 6.3%, respectively (p=0.891). Complication rates of the prostate cancer group (n=306) and the no prostate cancer group (n=713) were 6.2% and 6.6%, respectively (p=0.740).

**Conclusions:** A prebiopsy enema was associated with a reduced risk of complications after TRUS biopsy. Preventive antibiotics, number of biopsy cores, and pathological findings did not significantly influence the complication rate.

***Keywords:*** *Biopsy; Complications; Enema; Prostate*

**Article History:**
received 4 August, 2014
accepted 26 September, 2014



**Corresponding Author:**
Jae Seog Hyun
Department of Urology, Gyeongsang National University Hospital, Gyeongsang National University School of Medicine, 79 Gangnam-ro, Jinju 660-702, Korea
TEL: +82-55-750-8192
FAX: +82-55-750-8192
E-mail: hyunjs@gnu.ac.kr

## INTRODUCTION

By 2008, a total of 899,000 new patients with prostate cancer had been diagnosed worldwide, and it is estimated that up to 258,000 deaths occurred among these cases [1]. The prevalence of prostate cancer is increasing worldwide, including in Asia, and early diagnosis of prostate cancer by use of transrectal ultrasound (TRUS)-guided prostate biopsy is favored [2,3].

TRUS-guided prostate biopsy has been preferred as a standard prostate cancer diagnostic method since it was introduced in 1937. It is an easy, quick, and less painful procedure, particularly with the development of improved equipment and technology refinements related to biopsy [1,4,5]. However, because TRUS-guided prostate biopsy obtains tissues through the rectum, potential risks including infectious complications, such as pyuria, bacteriuria, and fever; hemorrhagic complications including hematuria; relatively minor complications such as vasovagal syncope due to the pain of biopsy; and major complications, such as structural damage to surrounding anatomical structures and infectious septicemia, can occur [4,6]. Bleeding after TRUS-guided biopsy is reportedly the most common minor complication [7]. However, one study reported that 6.6% of biopsied patients had major complications of acute prostatitis (3.8%), acute urinary retention

(2.1%), hematuria (1.9%), rectal bleeding (0.2%), epididymitis (0.2%), sepsis (0.05%), and vasovagal syncope (0.05%) [8].

Prophylactic antibiotic therapy and a prebiopsy enema are recommended for preventing infectious complications [1]. While these procedures generally reduce the incidence rate of infectious complications [9,10], the factors related to complications following TRUS-guided prostate biopsy are unclear.

We confirmed whether prophylactic antibiotic therapy and an enema are effective for reducing the incidence rates of complications and concurrently explored the relationships between prostate cancer and the incidence rate of complications and between the number of biopsy cores and the incidence rate of complications.

## MATERIALS AND METHODS

### 1. Subject selection and TRUS-guided prostate biopsy

This retrospective study was approved by the Institutional Review Board. We retrospectively studied 1,083 patients who underwent TRUS-guided prostate biopsy in Gyeongsang National University Hospital from May 2002 to April 2012. The analyses relied on an examination of patient electronic and paper-based medical records, radiological imaging data, and telephone interviews. Patients with urinary tract infection or chronic prostatitis were excluded before the procedure, and we determined the indication for biopsy as prostate-specific antigen (PSA) $\geq$ 4 ng/mL or a palpable nodule on a digital rectal examination. All biopsy procedures were performed by a dedicated urologist, and prebiopsy enema was done with glycerin or saline solution 1 hour before the procedure in patients scheduled for an enema. Patients scheduled for prophylactic antibiotics received an intravenous injection of 200-mg ciprofloxacin 1 hour before biopsy and 250-mg oral ciprofloxacin every 12 hours for 7 days after the biopsy. An 18-gauge automated reusable or disposable biopsy gun was used with the patient in the lithotomy position, following either the 6-core or 12-core TRUS-guided biopsy method with a transrectal transducer.

### 2. Complications and associated risk factors

Complications comprised all complications that typically occur after TRUS-guided prostate biopsy: acute and chronic prostatitis, vasovagal syncope, hematoma urinary retention, and nonhematoma urinary retention. Age, PSA level, and TRUS prostate volume were considered risk factors for complications, and the effectiveness of antibiotic therapy and the prebiopsy enema procedure, which are recommended when performing a prostate biopsy, and the incidence rates of complications were investigated. The impacts of pathological findings and the number of biopsy cores on complications were also investigated.

### 3. Statistical analyses

Chi-square and independent-sample t-tests were used to reveal differences in age, PSA, and TRUS prostate volume among the cases in which complications occurred after TRUS-guided prostate biopsy and the cases in which complications did not occur after the procedure. Cross-analysis with the chi-square test was done to confirm the incidence rates of complications and their correlation between the antibiotic therapy and prebiopsy enema groups. The chi-square test was also used to understand the incidence rate of complications and its correlation among pathological findings and the number of biopsy cores. All data analyses were performed with IBM SPSS Statistics ver. 20.0 (IBM Co., Armonk, NY, USA). Statistical significance was defined as $p < 0.05$.

## RESULTS

### 1. Complications and hospital admission

Sixty-nine of the 1,083 patients (6.8%) experienced complications, including acute prostatitis (n=41), nonhematoma urinary retention (n=14), hematoma urinary retention (n=4), and vasovagal syncope (n=4), excluding minor problems, such as gross and microscopic hematuria or hemospermia. Among the 69 patients, 53 (76.8%) were ultimately hospitalized after biopsy. Excluding some complications such as vasovagal syncope, cases with infectious complications or hematoma urinary retention almost always required hospital admission (Fig. 1).

### 2. Patient characteristics and demographics

The mean age of the 1,083 patients was 67.0 years, the patients' mean PSA value was 50.2 ng/mL, their median PSA value was 8.56 ng/mL (range, 0.07–5,000.00 ng/mL), and their TRUS prostate volume was 42.6 $cm^3$. No significant differences were observed between patients with and without complications (Table 1).

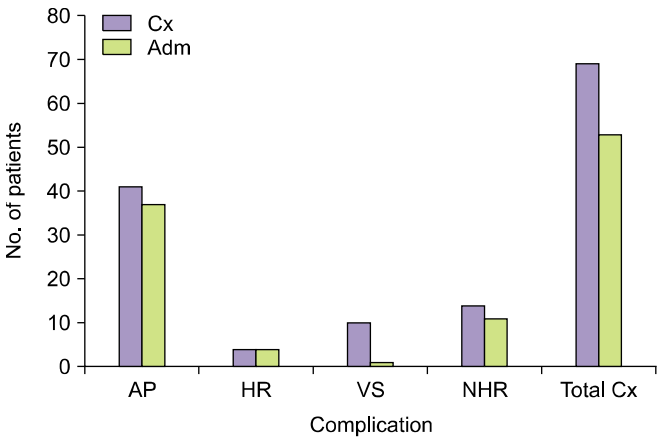


**FIG. 1.** Complications of transrectal ultrasound (TRUS)-guided prostate biopsy and the number of patients admitted. AP, acute prostatitis; HR, hematoma retention; VS, vasovagal syncope; NHR, nonhematoma retention; Cx, complication; Adm, admission.

**TABLE 1.** Characteristics and demographics of the patients

| Variable | Total | Complication, mean±SD | | p-value |
|---|---|---|---|---|
| | | No | Yes | |
| No. of patients | 1,083 | 1,014 | 69 | |
| Age (y) | 67.0±8.9 | 66.8±8.9 | 69.0±8.8 | 0.065 |
| PSA (ng/mL) | 50.2±285.4 | 46.5±249.9 | 104.2±602.6 | 0.432 |
| TRUS volume ($cm^3$) | 42.6±16.2 | 42.4±16.1 | 46.2±16.8 | 0.072 |

SD, standard deviation; PSA, prostate-specific antigen; TRUS, transrectal ultrasound.

**TABLE 2.** Analysis of complications in each group

| Group | Complication, n (%) | | Total | p-value |
|---|---|---|---|---|
| | Yes | No | | |
| Prophylactic antibiotic therapy | | | | 0.469 |
| Antibiotic group | 63 (6.3) | 945 (93.7) | 1,008 | |
| No antibiotic group | 6 (8.0) | 69 (92.0) | 75 | |
| Prebiopsy enema | | | | 0.007 |
| Prebiopsy enema group | 31 (4.7) | 627 (95.3) | 658 | |
| Prebiopsy no enema group | 38 (8.9) | 387 (91.1) | 425 | |
| No. of biopsy cores | | | | 0.740 |
| 6-Core biopsy group | 3 (7.3) | 38 (92.7) | 41 | |
| 12-Core biopsy group | 64 (6.3) | 955 (93.7) | 1,019 | |
| Pathologic findings | | | | 0.891 |
| Prostate cancer group | 19 (6.2) | 287 (93.8) | 306 | |
| No prostate cancer group | 49 (6.6) | 694 (93.4) | 743 | |

### 3. Prophylactic antibiotic therapy and complications

Among the 1,083 patients, 1,008 (93.0%) received prophylactic antibiotics. Among these, complications occurred in 63 patients (6.3%). Of the 75 patients (7.0%) who did not receive prophylactic antibiotics, six (8.0%) experienced complications (p=0.469) (Table 2).

### 4. Prebiopsy enema and complications

Among the 1083 patients, 658 (60.8%) had a prebiopsy enema. Among these, 31 (4.7%) experienced complications. A prebiopsy enema was not performed in 425 patients (39.8%), of whom 38 (8.9%) had complications (p=0.007) (Table 2).

### 5. Numbers of biopsy cores and complications

The TRUS-guided prostate biopsy method (6 cores or 12 cores) was confirmed for 1,060 of the 1,083 patients from the medical records. Among the 1,060 patients, 41 (3.9%) had a 6-core biopsy, and complications occurred in 3 patients (7.3%). The 12-core biopsy was done in 1,019 patients (96.1%), and 64 patients (6.3%) experienced complications. The lower incidence rate of complications in the 6-core group was not significant (p=0.740) (Table 2).

### 6. Pathological findings and complications

The pathological findings were confirmed by examining the medical records of 1,049 patients. Among them, 306 patients (29.2%) had a diagnosis of prostate cancer. Of these, 19 (6.2%) experienced complications. Benign pathological findings were recorded in 713 patients (70.8%). Of these, 49 patients (6.6%) had complications. The lower incidence rate of complications in those with prostate cancer was not significant (p=0.891) (Table 2).

## DISCUSSION

The total complication rate in this study was 6.8%, which necessitated hospitalization of 4.9% of the patients. A prior retrospective study of 1,687 patients treated from June 1994 to July 1996 examined the incidence rate of complications, excluding gross and microscopic hematuria and hemospermia findings [4]. In that study, the incidence rate of infectious complications was 4.2%. Another retrospective study of 927 patients who underwent TRUS-guided prostate biopsy from January 2012 to July 2012 also examined the incidence rate of complications [11]. In that study, the incidence rate of infectious complications was 4.1%, which was similar to our finding (3.8%).

However, the hospital admission rates of patients who underwent TRUS-guided prostate biopsy in the earlier studies (0.4% or 6.3%) were appreciably different from our finding. This may be because our patients had complications related to acute prostatitis and acute urinary retention, which are both main complications of TRUS-guid-

ed prostate biopsy, and they tended to be admitted to the hospital regardless of symptom severity.

Prophylactic antibiotic therapy and an enema are recommended prior to biopsy to prevent such complications of TRUS-guided prostate biopsy. We confirmed that prophylactic antibiotic therapy did not significantly decrease the complication rate after TRUS-guided prostate biopsy. Aron et al. [12] conducted a prospective randomized controlled trial (RCT) from June 1996 to September 1998 on 231 patients. They categorized the patients into a nonantibiotic group (n=75), a 1-day antibiotics group (n=79), and a 3-day antibiotics group (n=77) to confirm the incidence rate of complications. The groups receiving antibiotics had significantly lower incidence rates of infectious complications regardless of the duration of prophylactic antibiotic therapy than did the control group (p=0.003). These results differ from our study. This may be because it was difficult to limit the selection of study participants owing to the characteristics of our study and the lack of control of variables including changes in equipment and operators during the 10-year study period. Thus, a well-controlled prospective randomized study is needed.

Kanjanawongdeengam et al [13] conducted an RCT from August 2008 to March 2009 on 100 patients, categorizing them into either a group receiving a 10% povidone-iodine enema before prostate biopsy (n=50) or a group receiving no enema (n=50). They reported that the incidence rate of infectious complications in the enema group decreased significantly (p=0.025). Ghafoori et al. [14] also conducted a double-blind RCT on 208 patients by categorizing them into either a povidone-iodine enema group or a control (no enema) group. A significant decrease in infectious complications (p=0.001) was observed in patients who received an enema. These collective prior results [13-16] indicate that a prebiopsy povidone-iodine enema could reduce the risk of infectious complications after TRUS-guided prostate biopsy. We summarized and compared the results of prior studies with those of our study in Table 3.

Normal intrarectal flora are disseminated within the prostate owing to the insertion of biopsy equipment into the prostate through the rectum during TRUS-guided prostate biopsy, which causes infectious complications and can produce copious rectal bleeding that can be lethal [10,17]. In our study, a prebiopsy enema was done by using glycerin or saline, and this enema regimen was significantly effective for reducing the incidence rate of complications after TRUS-guided prostate biopsy. Another RCT in which 208 patients were categorized on the basis of povidone-iodine enema or saline enema did not reveal a difference in urinary tract infection rates [18]. Thus, the capability of prebiopsy enema to reduce infectious complications may involve maintenance of bacteriostatic conditions regardless of the enema regimen, which contributes to decreasing the incidence rate of complications.

It can be inferred that 12-core biopsy, which involves 12 biopsy needle insertions into the prostate during the procedure, would have a higher incidence rate of complications than 6-core biopsy, which has 6 biopsy needle insertions. The difference in the complication rates based on the numbers of biopsy cores was analyzed, but no significant difference was detected. Sugishita et al. [19] conducted a similar study from January 1999 to December 2003 on 150 patients by categorizing them into either a 6-core biopsy group (52 patients) or a 12-core biopsy group (98 patients). This retrospective analysis also revealed no difference in complication rates. However, another study prospectively studied complication rates on the basis of the difference in the number of biopsy cores (6-, 8-, and 12-core methods) used on 1,000 patients and reported that the rectal bleeding incidence rate, which was not included in our complication list, was high for the 8- and 12-core biopsy methods compared with that for the 6-core biopsy [20]. The number of biopsy cores might be related to hemorrhagic complications, although it had a low correlation with the increase or decrease of infectious complications. Therefore, the 12-core biopsy procedure should be done as quickly as possible by a well-trained doctor with advanced equipment. Well-controlled RCTs are needed to confirm the association between number of biopsy cores and complication rates.

We also assessed the correlation between pathological findings and the incidence rate of complications, but no correlation was detected. Therefore, the pathological findings of patients may not influence the incidence rate of complications due to age, PSA score, and prostate size, which are considered risk factors for complications, but are not re-

**TABLE 3.** Comparison of complications after transrectal ultrasound-guided prostate biopsy

| Source | AP | Retention | VS | No. of patients | Study design |
|---|---|---|---|---|---|
| Rietbergen et al. [4] | 52 (3.1) | 7 (0.4) | 15 (0.9) | 1,687 | Retrospective |
| Rudzinski et al. [11] | 4 (0.4) | 12 (1.3) | NA | 927 | Retrospective |
| Aron et al. [12] | 17 (7.4) | NA | NA | 231 | RCT |
| Kanjanawongdeengam et al. [13] | 2 (2.0) | NA | NA | 100 | RCT |
| Present study | 41 (3.8) | 18 (1.7)[a] | 4 (0.4) | 1,083 | Retrospective |

Values are presented as number (%).
AP, acute prostatitis; HR, hematoma retention; VS, vasovagal syncope; NHR, non-hematoma retention; RCT, randomized controlled trial; NA, Not assessed.
[a]: HR, 4; NHR, 14.

lated to the complication rate for TRUS-guided prostate biopsy.

There were several limitations in this study. This was a retrospective study based on medical records and phone interviews over a decade, many operators were involved during the prostate biopsies, and we did not consider the change in equipment related to TRUS biopsy during the study period.

In summary, patient age, PSA score, and prostate volume were not related to complication rates, and no significant difference in the incidence rate of complications was observed on the basis of whether prophylactic antibiotics were administered or the number of biopsy cores. A prebiopsy enema is an important method for preventing complications. Thus, a prebiopsy enema should be conducted as a preventive method to reduce complications during TRUS-guided prostate biopsy.

## CONCLUSIONS

A prebiopsy enema was effective for preventing complications due to TRUS-guided prostate biopsy. Age, PSA score, and prostate volume were not related to the complication rate. Prophylactic antibiotics, number of biopsy cores, and pathological findings also did not influence the complication rate. A prebiopsy enema is recommended to reduce complications during TRUS-guided prostate biopsy, although a definitive conclusion will require further well-designed RCTs.

## CONFLICTS OF INTEREST

The authors have nothing to disclose.

## REFERENCES


1. Rodriguez LV, Terris MK. Risks and complications of transrectal ultrasound guided prostate needle biopsy: a prospective study and review of the literature. J Urol 1998;160(6 Pt 1):2115-20.
2. Chan ES, Lo KL, Ng CF, Hou SM, Yip SK. Randomized controlled trial of antibiotic prophylaxis regimens for transrectal ultrasound-guided prostate biopsy. Chin Med J (Engl) 2012;125:2432-5.
3. Yip SKh, Sim HG. Robotic radical prostatectomy in east Asia: development, surgical results and challenges. Curr Opin Urol 2010; 20:80-5.
4. Rietbergen JB, Kruger AE, Kranse R, Schroder FH. Complications of transrectal ultrasound-guided systematic sextant biopsies of the prostate: evaluation of complication rates and risk factors within a population-based screening program. Urology 1997;49:875-80.
5. Wagenlehner FM, Pilatz A, Waliszewski P, Weidner W, Johansen TE. Reducing infection rates after prostate biopsy. Nat Rev Urol 2014;11:80-6.
6. Webb NR, Woo HH. Antibiotic prophylaxis for prostate biopsy. BJU Int 2002;89:824-8.
7. Anastasiadis A, Zapala L, Cordeiro E, Antoniewicz A, Dimitriadis G, De Reijke T. Complications of prostate biopsy. Expert Rev Anticancer Ther 2013;13:829-37.
8. Chiang IN, Chang SJ, Pu YS, Huang KH, Yu HJ, Huang CY. Major complications and associated risk factors of transrectal ultrasound guided prostate needle biopsy: a retrospective study of 1875 cases in taiwan. J Formos Med Assoc 2007;106:929-34.
9. Kim SJ, Kim SI, Ahn HS, Choi JB, Kim YS, Kim SJ. Risk factors for acute prostatitis after transrectal biopsy of the prostate. Korean J Urol 2010;51:426-30.
10. Brown RW, Warner JJ, Turner BI, Harris LF, Alford RH. Bacteremia and bacteriuria after transrectal prostatic biopsy. Urology 1981;18:145-8.
11. Rudzinski JK, Kawakami J. Incidence of infectious complications following transrectal ultrasound-guided prostate biopsy in Calgary, Alberta, Canada: a retrospective population-based analysis. Can Urol Assoc J 2014;8:E301-5.
12. Aron M, Rajeev TP, Gupta NP. Antibiotic prophylaxis for transrectal needle biopsy of the prostate: a randomized controlled study. BJU Int 2000;85:682-5.
13. Kanjanawongdeengam P, Viseshsindh W, Santanirand P, Prathombutr P, Nilkulwattana S. Reduction in bacteremia rates after rectum sterilization before transrectal, ultrasound-guided prostate biopsy: a randomized controlled trial. J Med Assoc Thai 2009;92:1621-6.
14. Ghafoori M, Shakiba M, Seifmanesh H, Hoseini K. Decrease in infection rate following use of povidone-iodine during transrectal ultrasound guided biopsy of the prostate: a double blind randomized clinical trial. Iran J Radiol 2012;9:67-70.
15. Gil-Vernet Sedo JM, Alvarez-Vijande Garcia R. Effect of intrarectal povidone-iodine in the incidence of infectious complications after transrectal prostatic biopsy. Arch Esp Urol 2012;65:463-6.
16. Pu C, Bai Y, Yuan H, Li J, Tang Y, Wang J, et al. Reducing the risk of infection for transrectal prostate biopsy with povidone-iodine: a systematic review and meta-analysis. Int Urol Nephrol 2014;46:1691-8.
17. Ozveren B, Turkeri L. Massive rectal bleeding after prostate biopsy controlled by endoclipping in a patient using acetylsalicylic acid. Can Urol Assoc J 2013;7:E442-4.
18. Sharpe JR, Sadlowski RW, Finney RP, Branch WT, Hanna JE. Urinary tract infection after transrectal needle biopsy of the prostate. J Urol 1982;127:255-6.
19. Sugishita K, Harabayashi T, Furuno T, Suzuki S, Shinohara N, Nonomura K. Transrectal biopsy of the prostate for the detection of non-palpable prostate cancer: a comparison of 6 versus 12 core biopsy. Nihon Hinyokika Gakkai Zasshi 2006;97:782-5.
20. Ghani KR, Dundas D, Patel U. Bleeding after transrectal ultrasonography-guided prostate biopsy: a study of 7-day morbidity after a six-, eight- and 12-core biopsy protocol. BJU Int 2004;94:1014-20.