

## Modified Bowel Preparation to Reduce Infection after Prostate Biopsy

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**Background:** Infectious complications after ultrasound guided prostate biopsy are an important issue of concern. We found a higher infection rate with traditional bowel preparation, the phosphate enema, for prostate biopsy and so we modified our technique. In addition, we tried to assess the efficacy of this modified method for aged patients in an agricultural area who have poor compliance or inaccuracy when self-administering bowel preparations.

**Methods:** Between April 2002 and May 2005, all patients who received prostate biopsy were reviewed retrospectively. Exclusion criteria included patients who had an indwelling Foley catheter, symptomatic urinary tract infection or suspected prostatitis before prostate biopsy. Group I consisted of patients who self-administered a phosphate enema at home. Group II had a phosphate enema combined with povidone-iodine administered by a doctor at the hospital. All patients took oral fluoroquinolone (500 mg) twice daily for a period of one day before the procedure. Both groups received trimethoprim (160 mg) with sulfamethoxazole (800 mg) twice daily for three days after the biopsy. Post-operative infection was defined as an oral temperature higher than 37.7 centigrade or any episodes of chills with painful digital rectal examination.

**Results:** There were 65 patients in Group I and 157 patients in Group II. Within Group I, six patients (9.23%) were found to have a symptomatic infection with leukocytosis or chills; none were found in Group II. Between Group I and II, different bowel preparation was the only parameter shown to have statistical significance on the infection rate.

**Conclusions:** Bowel preparation before prostate biopsy is not standardized among urologists. Phosphate enema with povidone-iodine administered at the hospital is an effective way to reduce the infection rate for agricultural people who have poor compliance or inaccuracy when self-administering bowel preparations. (*Chang Gung Med J 2006;29:395-400*)

**Key words:** prostate biopsy, enema, ultrasound, infection.

Transrectal ultrasound guided prostate biopsy is a standard procedure to diagnose and stage prostate cancer.<sup>(1)</sup> Different pre-biopsy protocols for

bowel preparation have been raised but there is no standardized consensus among urologists.<sup>(2-6)</sup> The most serious complication of prostate biopsy is bac-

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terial sepsis.<sup>(7)</sup> We found a high infection rate after traditional bowel preparation, the self-administered phosphate enema. Therefore, we added povidone-iodine to the traditional phosphate enema and the bowel preparation was conducted by doctors at the hospital. This modification is for agricultural people who usually have poor compliance or inaccuracy when self-administering bowel preparations.

This study assessed the efficacy of self-administered phosphate enema versus phosphate enema with povidone-iodine administered by doctors at the hospital. To our knowledge, this is the first report on the application of combined regimens of phosphate enema with povidone-iodine for prostate biopsy preparation.

## METHODS

Between April 2002 and May 2003, all patients who received prostate biopsy were reviewed retrospectively. Within this period, the bowel preparation used was phosphate enema, without povidone-iodine, administered by the patients themselves. Thereafter, a modified bowel preparation was introduced. This group was studied from June 2003 to May 2005. Two senior urologists in training performed all biopsies randomly. Biopsies were scheduled as an inpatient or outpatient procedure according to the attending physician's preference. All but one of the urologists performed biopsies as an inpatient procedure. The exclusion criteria were patients who had an indwelling Foley catheter, urinary tract infection, prostatitis or inpatients who were given systemic antibiotics before prostate biopsy. Age, prostate specific antigen (PSA) level and prostate volume were recorded and analyzed. Prostate biopsy was conducted after patients signed an informed consent. Oral fluoroquinolone 500 mg was prescribed before the procedure twice daily for a period of one day. The patients were divided into two groups by time. Before May 2003, patients (Group I) only received phosphate enema (118 ml per bottle contains sodium biphosphate 19 gm and sodium phosphate 7 gm.) self-administered at home on the morning of the prostate biopsy. After June 2003, patients (Group II) received phosphate enema with povidone-iodine (about 100 ml, 10%) administered by a doctor at the hospital on the morning of the biopsy.

After receiving the cleansing enema and gas or

feces in the rectal ampulla were completely evacuated, the patient was placed in the dorsal lithotomy position and sterilized with standard prepping and draping. Two percent lidocaine jelly was used as local anesthesia and lubricant. Digital rectal examination was performed before intromission of the ultrasound probe. Ultrasound (model 2102, B & K) consoled with a 7.5 MHz endorectal probe was applied. Periprostatic nerve block was conducted with 2% lidocaine (3 ml per side). The spring-driven biopsy gun (Bard Co., Covington, GA, USA) loaded with an 18-gauge core needle was advanced about 1.5 cm under the guidance of transrectal ultrasound. Systematic sextant biopsies plus two extra cores of specifically focused biopsies were taken. Subsequently, the prostatic urethra and bladder were checked with cystoscopy to find any concealed injuries. Five minutes of digital compression from the anus in all patients was performed immediately after the biopsy. All patients were carefully informed about hematuria and hematochezia. They were also notified about the possibility of fever or chills and asked to call for medical help immediately if these symptoms arose. Trimethoprim (160 mg) plus sulfamethoxazole (800 mg) were given twice daily for three days after the prostate biopsy. The patients left hospital when they had smooth micturition. They were encouraged to drink more than 3000 ml of water after the biopsy.

Clinically significant complications were defined as an unexpected treatment or procedure or even hospitalization for associated symptoms. According to Harrison's principles of internal medicine, infection was defined as an oral temperature of more than 37.7°C (99.9°F) or any episode of chills within seven days after the biopsy.<sup>(8)</sup> Major or minor morbidities were verified if they occurred within one month after the biopsy. Results were analyzed with unpaired t and Fisher's exact test.

## RESULTS

There were 65 patients in Group I and 157 patients in Group II. Preoperative and postoperative antibiotics prescribed, the number of biopsy cores and biopsy technique were the same for Group I and II. There was no significant difference in patients' mean age, PSA or prostate volume between the two groups (Table 1). Prostate cancer was found in

**Table 1.** Group I and II Patient Demographic Characteristics

	Group I (n = 65)	Group II (n = 157)	p value
Age (yrs)	67.83 ±9.6 (35~82)	68.15 ±10.2 (29~89)	0.832
PSA (ng/ml)	36.70 ±84.7 (2.2~519.8)	74.20 ±214.7 (0.5~1922.1)	0.1742
Volume (ml)	39.43 ±9.3 (12.6~159.0)	44.58 ±19.2 (11.0~163.3)	0.1029
Infection Rate (%)	9.23% (6/65)	0% (0/157)	0.001

**Abbreviations:** PSA: prostate-specific antigen; yrs: years.

32.9% (73 out of 222) of all biopsies.

Among Group I, 9.23% (6 out of 65) patients were found to have symptomatic infection and leukocytosis. However, none of the 157 patients in Group II were found to have post-operative infection. This difference in infection rate was statistically significant ( $p = 0.001$ ). The six infected patients were all admitted for systemic antibiotic treatment and all recovered completely. Both blood and urine cultures were performed for these patients. Four patients had positive culture findings (Table 2).

Repeated biopsies were performed on fifteen patients who had persistently high PSA levels or gradually rising PSA levels. These biopsies were excluded from our data analysis, since they may have a higher infection rate. In our series, there was no intra-operative complication such as a vasovagal episode or significant bleeding.

## DISCUSSION

Prostate biopsy is considered a safe procedure.<sup>(9)</sup> However, there are still 64% to 78% of patients who experience at least one minor complication, such as

infection, rectal bleeding, hematuria, urinary retention, hematospermia and vasovagal reaction.<sup>(10,11)</sup> Major complications (0.6% to 3.3%) such as sepsis, needle tract seeding and mortality are less frequently noticed.<sup>(3,4)</sup>

There is no consensus of infectious symptoms such as fever, chills, dysuria or voiding symptoms. According to Harrison's principles of internal medicine, we defined infection as an oral temperature of more than 37.7°C or any chills that developed after the prostate biopsy. Urine and blood cultures should be taken for all patients before and after biopsies, for greater accuracy. Nevertheless, asymptomatic bacteriuria required no further treatment in most patients.<sup>(12)</sup> Thus, we only performed urine and blood cultures for patients who had symptomatic infection.

The hospitalization rates in the reviewed literature vary from 0.7% to 9.5%.<sup>(13-15)</sup> In our series, a high infection and hospitalization rate (9.23%) was noted in patients who had two prophylactic doses of fluoroquinolone and phosphate enema bowel preparation. We do not know why the infection rate in Group I was a little higher. Inaccurate bowel preparation may be the reason in these little educated agricultural aged people. As a result, the biopsy procedure may inoculate bacteria into the prostate and induce infection.

Jeffrey et al. advocated that the use of a cleansing enema before biopsy increases cost and patient discomfort without providing a clinically significant improvement in outcome.<sup>(16)</sup> However, Lindert et al. strongly proposed that bacteremia may be significantly minimized by a pre-biopsy phosphate enema independent of antibiotics prescribed.<sup>(7)</sup> In clinical practice, almost all patients receive bowel preparation before prostate biopsies. In the United States, 79% to 81% of patients received an enema prepara-

**Table 2.** Clinical Symptomatic Infection after Transrectal Ultrasound Guided Prostate Biopsy in Six Patients in Group I

Patient	BT (°C)	WBC (1000/uL)	Segment (%)	Leukocyte	RBC (HPF)	WBC (HPF)	Nitrite	Bacteria (HPF)	Urine Culture	Blood Culture
1	38.4	9.6	90.3	2+	Num	>100	+	-	-	-
2	39.0	11.1	84.0	-	-	-	-	1+	-	Klebsiella E. Coli
3	38.6	2.7	77.0	2+	Num	Num	+	1+	E. Coli	E. Coli
4	38.0	9.6	58.3	Trace	31-35	2-4	-	1+	-	-
5	40.0	25.1	93.0	2+	18-20	Num	+	2-4	-	E. Coli
6	37.5	13.0	92.0	Trace	> 100	25-28	+	2+	-	Klebsiella

**Abbreviations:** BT: maximum body temperature; WBC: white blood cell; RBC: red blood cell; HPF: high power field; Num: numerous.

tion before biopsy.<sup>(2,17)</sup> Bacteria are apparently introduced into the urine or blood from the rectum via the biopsy needle. In fact, 38% to 76% of patients who did not receive an enema before prostate biopsies developed bacteremia. However, only 17% to 19% of patients developed bacteremia when a povidone-iodine enema was administered.<sup>(18,19)</sup> Our results revealed that phosphate enema with povidone-iodine could further decrease the infection rate from 9.23% to 0%. The only difference between Group I and II was the method and combination of bowel preparation. Therefore, we can say that the different bowel preparations had a statistically significant impact on the infection rate after prostate biopsy. We believe that the most meaningful effect was brought about by the povidone-iodine and the method of bowel preparation. This could provide more accurate and complete sterilization of the rectum and avoid bacteria dissemination after biopsy. However, the modified procedure is time consuming and extra paramedical personnel are necessary to perform the procedure. We also expect that if a patient can follow this method of rectal preparation and formula of enema, the infection rate may be improved.

The rate of bacteriuria after biopsy ranges from 20% to 44% but these conditions are usually asymptomatic.<sup>(7,18)</sup> Our symptomatic infection rate was 9.23% before the use of the modified bowel preparation. In addition to the sterilization effect of a povidone-iodine enema, another important factor was the procedure of bowel preparation and technical compliance of patients. The infection rate decreased significantly after this modified bowel preparation was performed by a doctor at the hospital. We found that it is difficult to explain the procedure of bowel preparation to patients who are little educated and aged. Therefore, a phosphate enema combined with povidone-iodine administered by a doctor at the hospital provides assurance of accurate enema procedures.

Symptomatic infections are most commonly caused by *Escherichia coli*, followed by *Enterococcus*, *Klebsiella*, *Bacteroides fragilis* and *Clostridium*.<sup>(7,12)</sup> In this study, *Escherichia coli* and *Klebsiella* species were isolated from urine or blood in four of six patients with symptomatic infection. Our observation is similar to previous reports.

A total of 11 different antibiotics have been reported with 20 different dosages. There have been

23 different kinds of regimens reported, with duration of prophylactic treatment ranging from one dose to 17 days.<sup>(2)</sup> There are different and variable opinions about dosage, duration and types of antibiotics. In the United States, oral antibiotics were given by 93.3% of urologists, intramuscular antibiotics by 3.5%, and combined oral and intramuscular antibiotics by 3.3%.<sup>(2)</sup> Long-acting oral fluoroquinolone before and after the procedure has been recommended as a satisfactory coverage of antibiotics for patients without complications.<sup>(5,11,15,20)</sup> However, fluoroquinolone has a relative high cost and does not necessarily decrease the infection rate. In our series, trimethoprim-sulfamethoxazole was given twice daily for three days only after prostate biopsy and there was no symptomatic infection found in the Group II patients. This strategy may reduce some cost in the period of limited third party reimbursement. If bowel preparation of phosphate enema with povidone-iodine is performed accurately, trimethoprim-sulfamethoxazole may also be regarded as a safe and effective post prostate biopsy prophylactic antibiotic.

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## 減少前列腺切片手術感染之改良式腸道準備方法

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**背景：** 在超音波導引下做前切腺切片手術，術後併發感染是大家所在意的議題。然而，我們發現用傳統腸道準備方法——磷酸灌腸法 (phosphate enema)——有比較高的感染機會。因此，我們嘗試改變術前腸道的準備方法。並把這種新的方法用在鄉村且對腸道準備方法順應性不好的年老病人身上。

**方法：** 我們把它分成兩個族群。第一個族群：從 2002 年 4 月到 2003 年 5 月，凡是在家自行實施磷酸灌腸法並來醫院接受前切腺切片手術的病患。第二個族群：從 2003 年 6 月到 2005 年 5 月，凡是在醫院接受磷酸加上優碘 (povidone-iodine) 灌腸法並實施前切腺切片手術的病患。事先排除已插尿管，尿道感染及有前列腺炎的病患。術前全部給予口服 Fluoroquinolone 一天，術後也全部給予口服 Baktar 三天。術後感染定義為發燒超過 37.7°C，或者有怯寒並有肛門指診疼痛的情形。

**結果：** 第一個族群有 65 個病人，第二個族群有 157 個病人。其中第一個族群中有 6 個病人感染，感染的機會 9.23%。第二個族群中並沒有病人感染。其中主要的差別在於腸道的準備方法及地點。感染的菌類以 *Escherichia coli* 或 *Klebsiella species* 為主。

**結論：** 雖然前列腺切片手術術前之腸道準備方法在泌尿科醫師之間並無一定的標準。但是我們認為以磷酸加上優碘灌腸法，對於年老或自行腸道準備不良的病人，是一個不錯的方法。

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**關鍵字：** 前列腺切片，灌腸，超音波，感染。