

## Original Article

# Prostate calculi can higher urinary retention probability and worsen uncomfortable feeling after prostate biopsy but not predict cancer

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**Abstract:** To investigate whether prostatic calculi might influence the urinary retention (UR) probability, the quality of life (QOL) and the positive rate of cancer after prostate biopsy in middle-aged and old male with PSA higher than normal. This study comprised a retrospective analysis of data from 685 patients (prostatic calculi group 325 VS non-prostatic calculi group 360), those who had undergone transrectal ultrasound-guided prostate needle biopsy (TRUS PNB) from Sept. 2012 to Sept. 2014. To these people, prostate volumes (PV) were recorded by TRUS and prostatic calculi were defined as present or absent. Other variables such as age, International Prostate Symptoms Score (IPSS), the quality of life (QOL), total PSA (prostate specific antigen) rate, and urinary retention cases were also recorded and compared. Among these patients, 154 (prostatic calculi group 73 VS non-prostatic calculi group 81) were diagnosed with prostate cancer through postoperative pathological, there was no significant difference between the two groups. But compared to the non-prostatic calculi group, after the prostate biopsy, the group with prostatic calculi experienced more uncomfortable feelings and enjoyed higher Urinary retention probability. Prostatic calculi could worsen QOL and higher urinary retention probability after transrectal ultrasound-guided prostate needle biopsy, but it is a weak predictor of positive results of prostate cancer in middle-aged and old male with PSA higher than normal.

**Keywords:** Prostatic calculi, prostate-specific antigen, urinary retention, prostate cancer

## Introduction

In recent years, prostate cancer is becoming one of the most common malignancies diagnosed in older males, mainly due to the introduction of PSA and transrectal ultrasound (TRUS) scanning and biopsy [1, 2]. Patients who were suspected to suffer from prostate carcinoma were always checked out had benign prostate hyperplasia with prostate calculi [3]. Prostatic calculi is often asymptomatic and may be present in association with normal prostate glands, benign prostatic hyperplasia, and prostate cancer. As reported their incidence increasing with age, they are often rare in children but common in middle-aged and old male [4-6]. Now, prostatic calculi is almost universally accepted associated with benign prostate hyperplasia (BPH) or chronic prostatitis

and some paper reported that they do not influence the level of PSA in men without clinically detectable prostatitis [7], but whether it will increase the positive rate of prostate cancer and what other influence has prostatic calculi had on prostate biopsy in middle-aged and old male with PSA higher than normal has rarely been reported.

Besides, among all prostate biopsy influences, the occurrence of urinary retention after prostate biopsy is hard to predict, we suspected that prostatic calculi could affect urinary retention probability after prostate biopsy in middle-aged and old male. In this paper we will focus on what impact will prostatic calculi have on prostate biopsy, especially whether they might influence the urinary retention probability and positive rate of cancer in Middle-aged and old male with PSA higher than normal.

## Prostate calculi worsen QOL and higher urinary retention

**Table 1.** General data

	Calculi group (325)	No. Calculi group (360)	<i>p</i> Value
Age	69.51±6.43	69.79±6.39	0.61
TRUS vol (ml)	52.35±16.96	54.42±18.54	0.13
PSA (ng/ml)	7.19±8.95	7.27±7.71	0.91
Cases of cancer	73	81	0.89
Cases of urinary retention	31	17	<0.05
Cases of inflammation	45	32	<0.05

### Materials and methods

#### Patients

Between Sept. 2012 and Sept. 2014, during the two years, 685 consecutive patients (prostatic calculi group 325 VS non-prostatic calculi group 360) without detectable prostatitis, prostatic cancer, prostate surgery or radiation treatment, whose serum PSA higher than 4 ng/ml has undergone transrectal ultrasound-guided 12-core transperineal prostate biopsy by a single surgeon in our department were enrolled in this study and retrospectively analyzed. All blood samples were obtained before prostate local stimulation such as digital rectal examination (DRE), transrectal ultrasonography (TRUS) and without the influence of clinical drugs. Multiple cores of prostate tissue were obtained from both the peripheral zone (PZ) and the transition zone (TZ) of the prostate. All the patients underwent systemic 12-core biopsies under TRUS guidance using an 18 gauge needle fitted on an automatic biopsy gun. The prostate volume and whether calculi exists were recorded when they were undergoing TRUS examinations.

According to the prostate with or without calculi, all patients were divided into two groups, 325 in prostatic calculi group and 360 in non-prostatic calculi group. Before biopsy, data for PSA level, IPSS, QOL and Qmax were tested and compared. One week after biopsy, all the patients who have got their postoperative pathological results were followed up in outpatient department, the results of a new assessment of QOL and Qmax were analyzed correlatively. The mean values of the parameters were compared using the paired Student's *t* test with *P*<0.05 considered significant.

#### Equipment

The BK 2202 sonographer (Denmark) equipped with a 5.0/7.5 MHz transrectal dual-plane

probe was used to perform ultrasonography. The Bard automated biopsy gun (Tempe, Arizona, America) with 22 mm range and 18 G needle was used for biopsy.

#### Biopsy

The 12-core transperineal prostate biopsy was carried out with these patients in the lithotomy position.

According to regular procedure, perineal skin was prepared, disinfected, and locally anesthetized with 20 ml 1% lidocaine. Under the guidance of TRUS, the 18 G biopsy needle was fitted on an automatic biopsy gun and inserted through the perineal skin, the cores were taken as follows: three additional cores from each side more peripheral than a conventional 6 core [8-10]. After biopsy, prostate specimens were preserved in 10% formaldehyde for pathological examination, patients remained in the hospital for observation for 1 day, during this period, patients with urinary retention were catheterized for 3 days. And then patients were followed-up to gather information relating to biopsy-related complications for one week.

#### Statistical analysis

All measurement data were statistically analyzed with a 2-tailed Student's test and presented as mean ± SD. The results were analyzed using descriptive statistics with independent *t*-test and chi-square test to calculate continuous variables and categorical data. Differences were considered statistically significant at *P*<0.05 and odds ratios with 95% confidence intervals were used to estimate the association between independent and dependent variables.

### Results

**Table 1** shows the baseline characteristics and pathology results for all patients. There are about 47.4% (325/685) elder patients in those whose serum PSA higher than 4 ng/ml with prostatic calculi. To observe the affect caused by prostatic calculi, the preoperative data for PSA level, IPSS, QOL and Qmax are compared, there are no significant differences between the 2 groups, 22.5% (154/685) patients were tested positive for prostate cancer by 12-core biopsy, 73 in prostatic calculi group and 81 in non-prostatic calculi group, also no significant differences of positive rate were found between

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**Table 2.** Follow-up data

	Baseline	1 week after biopsy	P Value
<b>QOL</b>			
Calculi group	4.17±0.95	4.45±0.77	<0.05
No. Calculi group	4.03±0.96	4.11±0.86	0.29
P Value	0.64	<0.05	
<b>Qmax</b>			
Calculi group	8.75±3.60	6.63±3.89	<0.05
No. Calculi group	8.43±2.39	8.19±3.98	0.44
P Value	0.44	<0.05	
<b>IPSS</b>			
Calculi group	18.18±3.98	19.76±2.75	<0.05
No. Calculi group	17.83±4.15	18.35±3.99	0.61
	0.36	<0.05	

the 2 groups. After biopsy, 31 cases in prostatic calculi group and 17 cases in non-prostatic calculi group occurred acute urine retention, all of them were catheterized for 3 days and no patients required recatheterization. The preoperative dates and the follow-up results of QOL and Qmax were compared in **Table 2**. Compared with baseline, after biopsy, these indicators were aggravated a lot in both groups, data also indicate that patients in calculi group increased the more degree of LUTS and their life quantity were more seriously affected than patients in non-prostatic calculi group. The different baseline characteristics and pathology results of UR group and non-UR group were showed in **Table 3**. The results of pathological technology demonstrated that 77 people's prostate tissue (prostatic calculi group 45 VS non-prostatic calculi group 32) presented the typical features of chronic inflammatory and hyperplasia. There was a significant difference between the two groups ( $P<0.05$ ). For the 77 people whose prostate tissues were presented the typical features of chronic inflammatory were made further analysis from the perspective of whether chronic inflammatory of the prostate contributes to carcinogenesis. The result of this question (prostate cancer group 30/154 VS BPH group 47/531,  $P<0.05$ ) is consistent with some other analyses [11, 12].

### Discussion

Today, thanks to the development of the PSA test, prostate cancer screening became a medical mantra in middle-aged and old male, it can provide early warning, help detect prostate cancer and for monitoring prostate cancer patients

after treatment [13-15]. Not only prostate cancer, PSA also rises when the prostate is enlarged because of BPH, prostatitis, and sometimes with the aspects which are unknown to us at this time, due to elevated levels of PSA are not cancer specific, so we always use the result of prostate needle biopsy to identify it. Prostate calculi were commonly reported like that they are asymptomatic in most cases, and some papers have been reported these calculi are actually a cluster of bacteria and that they may be the cause of urinary tract infections [16, 17]. But what impact will prostatic calculi have on prostate biopsy have been rarely reported.

To our knowledge this study is the first to evaluate the effect of prostate calculi on the outcome of transperineal prostatic biopsy. In our series, prostatic calculi did not influence the positive rate of prostate cancer in middle-aged and old male with PSA higher than normal and without clinically detectable prostatitis, but can worsen LUTS and higher urinary retention probability after prostate biopsy. The reason for these finding remains unclear but several explanations may be proposed.

Most articles have been reported that the degree of LUTS may be relative to the presence of large prostatic calculi and inflammation [18-20]. Before biopsy the general data are no significant differences between the 2 groups, IPSS, QOL and Qmax were included, it was probably because prostatic calculi are often asymptomatic and pathology results showed that there are no significant differences between the 2 groups in the positive rate of inflammation and cancer. Articles also reported that prostatic calculi do not influence the level of serum PSA in the men who without clinically detectable prostate prostatitis [7], so if prostatic calculi have no significant influence on serum PSA, it would be more difficult to obtain objective conclusion of the relationship between prostatic calculi and prostate cancer. In our experiment, the positive rate of cancer has no significant differences between the 2 groups, so we proposed that prostatic calculi do not influence the positive rate of prostate cancer and the verdict similar to another report that prostatic calculi was not shown to be a risk factor for prostate cancer [3]. On the other hand, When referring to the uncomfortable feelings after biopsy, we have observed that there are significant differences between two

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**Table 3.** Comparison between non-urinary retention (non-UR) and urinary retention (UR) groups

	UR group (48)	non-UR group (637)	P Value
Age	70.23±6.42	69.63±6.41	0.90
TRUS vol (ml)	56.71±17.56	53.20±17.88	0.70
PSA (ng/ml)	7.72±7.25	7.21±6.34	0.41
Cases of cancer	11	143	0.84
IPSS	17.77±4.62	18.11±4.37	0.37
QOL	4.13±0.87	4.08±0.97	0.43
Qmax	7.09±1.69	8.74±3.08	<0.05
Cases of calculi	32	293	<0.05
Cases of inflammation	27	50	<0.05

groups. Compared with non-calculi group, after biopsy the patients in calculi group have suffered more uncomfortable feelings, meanwhile, the bothersome nature of LUTS leads to a more sharply decrease in the quality of life and seriously affected patients mental health. What caused such a big difference? Maybe edema induced by local inflammatory response is responsible.

Quite a number of papers have been reported that a prostatic calculus is actually a cluster of bacteria and that these calculi may be the cause of prolonged bacteriosis in patients with urinary tract infections. After biopsy, the bacteria in calculi may be disseminated by biopsy needle, then caused local inflammatory, further quickly lead to more severe edema. The local inflammatory and more severe edema caused more discomfort. Identification of the risk factor associated with more severe LUTS and cases of urinary retention increased after biopsy would be useful for predicting the uncomfortable feeling before biopsy and who are at special risk for going to have urine catheterization after biopsy could be informed in advance. Our findings should alert clinicians to be aware that after biopsy people with prostate calculi are at higher risk of UR. This is one significant meaning of this study.

An additional observation index of our study showed that the people whose prostate tissues were presented the typical features of chronic inflammatory according to the pathological results were more likely to develop prostate cancer. On this phenomenon, several studies have shown that inflammation of the prostate has a relationship with prostate cancer [21,

22]. The result of this study matches up with other research on the topic.

The large sample size afforded a considerable statistical advantage in detecting real differences between the two groups. Nevertheless, this study suffered from several limitations that should be addressed. The first limitation is that without standardized criteria the diagnoses of prostatic calculi only relied on high-density plot area in images of TRUS and we only included prostatic calculi that were more than 2 mm in diameter on ultrasonography, because when the size was less than 2 mm, it was difficult to discover. This may be less accurate than diagnoses that can be made according to standardized criteria.

Second, some patient information on factors which may have had an effect on the associations detected in this study were not available through the administrative dataset, such as these factors include body mass index (BMI), the application of antithrombotic drugs and how long the calculi lingers in prostate.

Third, as this was a retrospective case-control study, we were unable to comment on causality and only be able to report an association between prostatic calculi and the outcomes of biopsy. Further clinical trials with extended follow-up and larger sample sizes may be needed to better define the possible relationship between prostatic calculi and prostate cancer and feelings after biopsy.

Prostatic calculi can worsen LUTS and higher urinary retention probability after transrectal ultrasound-guided prostate needle biopsy, but doesn't affect the positive rate of prostate cancer in middle-aged and old male with PSA higher than normal. Besides, the UR after prostate biopsy is self-limiting, patient age, IPSS, QOL, prostate volume, PSA and whether cancer or not were not found to be related to UR. This research results would be useful for predicting the uncomfortable feeling before prostate biopsy and the patients who are at special risk for going to have urine catheterization after biopsy could receive an advance notice.

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**Disclosure of conflict of interest**

None.

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