

Correlation between Initial International Prostate Symptom Score (IPSS) and Complications of Benign Prostatic Hyperplasia

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Abstract:

Objective: Benign prostatic hyperplasia (BPH) is a common disease in elderly men, and some of them are suffering from its complications. Early detection and management of complications of BPH will lead to optimal results of treatment. The International Prostate Symptom Score (IPSS) is a disease and symptom-specific scoring system used for initial evaluations of BPH patients. This study aims to determine the correlation between initial IPSS and complications resulting from BPH.

Material and Methods: This hospital-based cross-sectional study enrolled all male patients, aged 60 years and above having complained of lower urinary tract symptoms (LUTS), at the outpatient clinic. Patients' demographic data (age), IPSS, and history of complications from BPH; including urinary tract infection (UTI), hematuria, urinary retention and prostate related surgery were collected.

Results: In total, 301 patients were recruited in this study, with a mean age of 70.1 years old. There was significant correlation between age and IPSS (p-value 0.034), by using correlation coefficients. Sub-group analysis demonstrates a significant correlation of IPSS (both mean and severity group classifications) and complications from BPH (UTI, hematuria, urinary retention, and prostate surgery due to BPH) (p-value<0.001).

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Conclusion: The rate of complications, due to BPH including UTI, hematuria, urinary retention, and BPH-related surgery, correlate with higher initial IPSS.

Keywords: benign prostatic hyperplasia, International Prostate Symptom Score, complication, lower urinary tract symptom

Introduction

Benign prostatic hyperplasia (BPH) is a common disease in elderly men. Many develop only a mild degree of lower urinary tract symptoms (LUTS); however, there are a considerable number of patients suffering from complications of BPH including urinary tract infection (UTI), hematuria, urinary retention, obstructive uropathy, bladder stone, bladder diverticula or have undergone prostate surgery due to BPH. One of the most important BPH evaluations is to identify those at risk of complications. If there is some information that can predict the possibility of complications owing to BPH, early detection and management of complications of BPH will lead to optimal results after treatment¹.

International Prostate Symptom Score (IPSS) is a list of disease-specific quality questions to identify the severity of symptom scores for BPH: adapted from the AUA-7 symptom index by the World Health Organization (WHO)². According to numerous recent standard guidelines, IPSS is widely used as one of the initial evaluations for patients presenting with LUTS suspected of to BPH^{3,4}. In Thai-speaking patients, the Thai version of the International Prostate Symptom Score (IPSS-Th) is used to assess symptoms of BPH as well. The Thai version of the International Prostate Symptom Score (IPSS-Th) is reliable and can be used in the same manner as the English version⁵. There are many studies that demonstrate the correlation between IPSS and factors associated with BPH; for example, quality of life⁶, age^{7,8}, prostate-specific antigen (PSA)⁸, prostate volume^{7,8}, post void volume⁷ and peak flow rate^{7,9}. However, only a limited number of reports emphasize the correlation between IPSS and complications of BPH.

Hence, this study aimed to determine the correlation between initial IPSS and complications resulting from BPH including UTI, hematuria, urinary retention and prostate related surgery due to BPH.

Material and Methods

This hospital-based cross-sectional study was approved by the Ethics Committee of Panyanantaphikkhu Chonprathan Medical Center, Srinakharawit University, Thailand: protocol number EC 013/65. Verbal informed consent were obtained from participants, and all data were retained confidentiality in compliance with the Declaration of Helsinki. This study was conducted in Panyanantaphikkhu Chonprathan Medical Center outpatient clinic; from January 1, 2018 to January 1, 2022. All male patients aged 60 years and above having complained of LUTS, without previous treatment; including both medications and surgery, were recruited into this study. All patients presenting with history of hematuria or urinary tract infection underwent additional investigations; such as cystoscopy or urinary tract imaging, to exclude urinary tract cancer or stone before being enrolled into the study. Participants were excluded if they had urinary tract stones or cancer, a history of radiation in the abdomen or pelvic area, neurological or psychological problems, or incomplete data.

Patient data included: demographic data (age), and history of complications resulting from BPH; including UTI, hematuria (both gross and microscopic hematuria), urinary retention and prostate surgery owing to BPH, were gathered. The definition of UTI in this study is pyuria with bacteriuria on microscopic examination of the urine in both symptomatic and asymptomatic patients. Hematuria is defined as three

or more red blood cells per high power field. Urinary retention in this study is a condition wherein the urine cannot empty from the bladder; the bladder is full and there is a need to use a urethral catheter to drain the urine. IPSS questionnaire was reviewed by urologists at the first visit of patients that complained of LUTS suspected from BPH. The IPSS questionnaire is comprised of seven questions involving incomplete emptying, frequency, intermittency, urgency, weak stream, straining and nocturia. Each question has zero to five points (0 as no symptom to 5 as almost always suffering from symptoms). The summation of IPSS will classify the severity of symptoms into three groups: mild (0–7), moderate (8–19) and severe (20–35). The sample size in this study was determined by the detection of a 5% difference in the prevalence of BPH in Thailand, with 5% α -error, 20% β -error and 80% power of test. By using an average prevalence of BPH among elderly Thai men as 41.3% from a previous study¹⁰, the sample size in this study was determined to be 373.

Statistical analysis was conducted by using SPSS version 16 software. Demographic data and IPSS were present as mean \pm S.D.. Pearson's chi square, chi-square test and binary logistic regression model were used to identify association among each group of IPSS and complications of BPH (UTI, hematuria, urinary retention and prostate surgery due to BPH). One-way ANOVA and independent t-test were used to compare mean \pm S.D. of IPSS, age groups and complications of BPH. Pearson product-moment correlation coefficient was used to find a correlation between age and IPSS. A p-value less than 0.05 was defined as having statistical significance.

Results

From 1st January 2018 to 1st January 2022, 301 patients were enrolled into this study, with demographic data being shown in Table 1. The mean age was 70.1 years old (range 60–95 years old) and categorized into 4

groups: 159 patients (52.3%) aged 60–70, 101 (33.4%) aged 71–80, 38 (12.6%) aged 80–90 and 3 (1%) above aged 90. 66.2% of patients had a history of UTI, 21.9% had a history of hematuria, 21.2% had history of urinary retention and 19.2% used to perform BPH surgery. The mean IPSS was 13.8, with 32.8% in the mild symptom group, 35.1% in the moderate symptom group, and 32.1% in the severe symptom group.

Table 1 Demographic data

Characteristics	Categories	n (%)
Age groups (years)	60–70	159 (52.3)
	71–80	101 (33.4)
	80–90	38 (12.6)
	>90	3 (1.0)
Age	Mean \pm S.D.	70.1 \pm 7.82
UTI	Yes	200 (66.2)
	No	102 (33.8)
Hematuria	Yes	66 (21.9)
	No	236 (78.1)
Urinary retention	Yes	64 (21.2)
	No	238 (78.8)
BPH related surgery	Yes	58 (19.2)
	No	224 (80.9)
IPSS	Level 1 (mild)	99 (32.8)
	Level 2 (moderate)	106 (35.1)
	Level 3 (severe)	97 (32.1)
IPSS	Mean \pm S.D.	13.8 \pm 9.179

UTI=urinary tract infection, BPH=benign prostatic hyperplasia, IPSS=International Prostate Symptom Score

There was no correlation between age and IPSS in the sub-group analysis; as shown in Tables 2 and 3. However, correlation coefficients revealed that there was a significant correlation between age and IPSS (p-value 0.034). Sub-group analysis demonstrates the significant correlations of IPSS (both mean and severity group classifications) and all complications of BPH (UTI, hematuria, urinary retention and prostate surgery due to BPH), with p-value<0.001; as shown in Tables 2 and 3. There was no association between age or age group and complications of BPH in the univariate and multivariate logistic regression model; nonetheless,

there are significant correlations between IPSS (both mean and severity group classifications) and complications of BPH, which are UTI (p-value<0.001), hematuria (p-value<0.001), urinary retention (p-value<0.001) and BPH surgery (p-value<0.001): as shown in Table 4–7, respectively.

Table 2 Sub-group analysis via level of International Prostate Symptom Score (IPSS)

Characteristics	Categories	Level of IPSS			Statistics	p-value
		I (n=99) n (%)	II (n=101) n (%)	III (n=91) n (%)		
Age group (years)	60–70 (n=158)	59 (37.3)	54 (34.2)	45 (28.5)	-0.007b	0.816
	71–80 (n=101)	31 (30.7)	37 (36.6)	33 (32.7)		
	80–90 (n=38)	8 (21.1)	14 (36.8)	16 (42.1)		
	>90 (n=3)	1 (33.3)	0 (0.0)	2 (66.7)		
Age	Mean±S.D.	69.8±7.413	70.7±7.765	72.1±8.180		
UTI	Yes (n=102)	14 (13.7)	34 (33.3)	54 (52.9)	37.988a	<0.001*
	No (n=200)	85 (42.5)	72 (36)	43 (21.5)		
Hematuria	Yes (n=66)	6 (9.1)	21 (31.8)	39 (59.1)	33.848a	<0.001*
	No (n=236)	93 (39.4)	85 (36)	58 (24.6)		
Urinary retention	Yes (n=64)	5 (7.8)	16 (25)	43 (67.2)	48.899a	<0.001*
	No (n=238)	94 (39.5)	90 (37.8)	54 (22.7)		
BPH surgery	Yes (n=58)	2 (3.4)	12 (20.7)	44 (75.9)	65.855a	<0.001*
	No (n=244)	97 (39.8)	94 (38.5)	53 (21.7)		

a=One-way analysis of variance (One-way ANOVA) was used, b=Independent t-test was used, *=significance at 0.05 level
S.D.=standard deviation, UTI=urinary tract infection, BPH=benign prostatic hyperplasia

Table 3 Sub-group analysis via International Prostate Symptom Score (IPSS)

Characteristics	Categories	IPSS Score	Statistics	p-value
		Mean±S.D.		
Age group (years)	60–70	12.9±9.035	1.566a	0.183
	71–80	14.1±9.230		
	80–90	15.9±8.728		
	>90	19±15.524		
UTI	Yes	17.8±8.927	32.512b	<0.001*
	No	11.8±8.633		
Hematuria	Yes	19.5±8.583	35.948b	<0.001*
	No	12.2±8.717		
Urinary retention	Yes	23.1±8.112	61.575b	<0.001*
	No	11.8±8.443		
BPH surgery	Yes	23.3±7.662	102.700b	<0.001*
	No	11.6±7.999		

a=One-way analysis of variance (One-way ANOVA) was used, b=Independent t-test was used, *=significance at 0.05 level
S.D.=standard deviation, UTI=urinary tract infection, BPH=benign prostatic hyperplasia

Table 4 Binary logistic regression model of urinary tract infection (UTI) and no UTI

Characteristics	Categories	Urinary tract infection (UTI)		Univariate analysis p-value	Multivariate analysis		
		No (n=204) n (%)	Yes (n=40) n (%)		Adjusted OR	95% CI	p-value
Age group (years)	60-70	106 (67.1)	52 (32.9)	0.084			
	71-80	69 (68.3)	32 (31.7)				
	80-90	22 (57.9)	16 (42.1)				
	>90	3 (100)	0 (0.0)				
Age	Mean±S.D.	71±0.545	70.8±0.8	0.833			
IPSS	Mild	85 (85.9)	14 (14.1)	<0.001*	Ref.		
	Moderate	72 (67.9)	34 (32.1)		3	1.428 to 5.757	0.003*
	Severe	43 (44.3)	54 (55.7)		7.6	3.813 to 15.245	<0.001*
IPSS	Mean±S.D.	11.8±8.633	17.8±8.927	<0.001*			

OR=odds ratio, CI=confidence interval, S.D.=standard deviation, IPSS=International Prostate Symptom Score, Ref.=reference

Table 5 Binary logistic regression model of hematuria and no hematuria

Characteristics	Categories	Hematuria		Univariate analysis p-value	Multivariate analysis		
		No (n=236) n (%)	Yes (n=66) n (%)		Adjusted OR	95% CI	p-value
Age group (years)	60-70	127 (80.4)	31 (19.6)	0.514			
	71-80	76 (75.2)	25 (24.8)				
	80-90	29 (76.3)	9 (23.7)				
	>90	3 (100)	0 (0.0)				
Age	Mean±S.D.	70.7±7.902	71.5±7.545	0.451			
IPSS	Mild	93 (93.9)	6 (6.1)	<0.001*	Ref.		
	Moderate	85 (80.2)	21 (19.8)		3.9	1.475 to 9.939	0.006*
	Severe	598 (59.8)	39 (40.2)		10.4	4.154 to 26.151	<0.001*
IPSS	Mean±S.D.	12.2±8.717	19.5±8.583	<0.001*			

OR=odds ratio, CI=confidence interval, S.D.=standard deviation, IPSS=International Prostate Symptom Score, Ref.=reference

Table 6 Binary logistic regression model of urinary retention and no urinary retention

Characteristics	Categories	Urinary retention		Univariate analysis p-value	Multivariate analysis		
		No (n=238) n (%)	Yes (n=64) n (%)		Adjusted OR	95% CI	p-value
Age group (years)	60-70	129 (81.6)	29 (18.4)	0.248			
	71-80	80 (79.2)	21 (20.8)				
	80-90	25 (65.8)	13 (34.2)				
	>90	2 (66.7)	1 (33.3)				
Age	Mean±S.D.	70.3±7.569	73±8.415	0.015*	1.03	0.996 to 1.074	0.086
IPSS	Mild	94 (94.9)	5 (5.1)	<0.001*	Ref.		
	Moderate	90 (84.9)	16 (15.1)		3.3	1.142 to 9.288	0.027*
	Severe	54 (55.7)	43 (44.3)		14.2	5.289 to 38.154	<0.001*
IPSS	Mean±S.D.	12.8±8.443	21.1±8.112	<0.001*			

OR=odds ratio, CI=confidence interval, S.D.=standard deviation, IPSS=International Prostate Symptom Score, Ref.=reference

Table 7 Binary logistic regression model of BPH related surgery and no BPH related surgery

Characteristics	Categories	BPH related surgery		Univariate analysis	Multivariate analysis		
		No (n=224) n (%)	Yes (n=58) n (%)	p-value	Adjusted OR	95% CI	p-value
Age group (years)	60–70	133 (84.2)	25 (15.8)	0.318			
	71–80	78 (77.2)	23 (22.8)				
	80–90	29 (76.3)	9 (23.7)				
	>90	3 (100)	0 (0.0)				
Age	Mean±S.D.	70.7±8.007	71.7±6.98	0.387			
IPSS	Mild	97 (98.0)	2 (2.0)	<0.001*	Ref.		
	Moderate	94 (88.7)	12 (11.3)		6.1	1.349 to 28.411	0.019*
	Sever)	53 (54.6)	44 (45.5)		40.3	9.388 to 172.694	<0.001*
IPSS	Mean±S.D.	11.6±7.999	23.3±7.662	<0.001*			

BPH=benign prostatic hyperplasia, OR=odds ratio, CI=confidence interval, S.D.=standard deviation, IPSS=International Prostate Symptom Score, Ref.=reference

Discussion

In recent years, many researches have shown the correlation between IPSS and different factors associated with BPH; such as age, prostate volume, peak flow rate, post-void residual urine and clinical bladder outlet obstruction⁷⁻⁹. All of the studies cited above have shown that higher IPSS correlated with many factors, which indicated more severity of BPH symptoms. Moreover, there are many reports of an association between factors relating to BPH severity; such as intravesical prostatic protrusion¹¹, post-void residual urine², prostate volume¹², the elevation of PSA level¹² and complications of BPH. From the studies above, IPSS may be expected to predict severity the and complications of BPH. Similar results were found in this study in that older age, hematuria, urinary retention, UTI, and BPH-related surgery are associated with higher IPSS. The overall incidence of complications from BPH and BPH related surgery is varied (range 0.3–30%)¹³⁻¹⁵. In this study, some complication rates were comparable with others (hematuria 21.9%, urinary retention 21.2% and BPH-related surgery 19.2%). However, the incidence of UTI was higher than average (66.2%), which may be explained due to the

fact that our inclusion criteria for participant recruitment were based mainly on LUTS. This criterion should give a higher rate of patients with UTI enrolled in this study.

Most factors, which can predict BPH complications, were used for further or advanced investigations to predict the complications. On the other hand in this study, it tried to figure out the indicators of the complications resulting from BPH, by using IPSS; one of the initial, basic BPH evaluations. The results showed that there were strong associations between IPSS and BPH complications; like other evaluations mentioned above.

There were some limitations in this study. Firstly, it could not collect and interpret all the data on BPH complications. For instance, the documents for the bladder stone or renal deterioration were difficult to analyze, since there are numerous confounding factors causing these conditions. Secondly, this study was a hospital-based report, which means that it might not represent the entire population. Lastly, this study may include bias, due to its retrospective study protocols and incomplete data. As a result, further studies are required to determine factors associated with other complications from BPH.

Conclusion

The increased incidence of complications resulting from BPH; including UTI, hematuria, urinary retention and BPH-related surgery, are statistically significantly correlated with higher initial IPSS. Thus, the results may assist in deciding and selecting appropriate individualized treatment options for BPH patients.

Conflict of interest

The authors declare no financial or other conflicts of interest involved in this project.

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