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by Arif Rananda

Submission date: 20-Jun-2022 12:01PM (UTC+0800)

Submission ID: 1859862867

File name: 07._The_Correlation_of_Prostate_Volume_with_Uroflowmetry_and.pdf (792.55K)

Word count: 2988

Character count: 15811

The Correlation of Prostate Volume with Uroflowmetry and International Prostatic Symptoms Score (IPSS) on Patient with Benign Prostatic Hyperplasia without Urinary Retention

Arif Rananda¹, Reny I'tishom², Wahjoe Djatisoesanto³, Soetojo⁴

¹Researcher, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia, ²Associate Professor, Department of Medical Biology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia, ³Associate Professor, Department of Urology, Faculty of Medicine / Dr. Soetomo General Hospital, Universitas Airlangga, Surabaya, Indonesia, ⁴Professor, Department of Urology, Faculty of Medicine / Dr. Soetomo General Hospital, Universitas Airlangga, Surabaya, Indonesia

Abstract

Objective: To value the correlation of Prostate Volume with Uroflowmetry and IPSS on patients with BPH without urinary retention that would be conducted at Dr. Soetomo 2015-2017. **Method:** This research used retrospective descriptive study using secondary data from medical records to determine the relationship between Prostate Volume (PV) and Uroflowmetry and the International Prostatic Symptom Score (IPSS) of Benign Prostate Hyperplasia (BPH) patients without urinary retention. Uroflowmetry basic parameters is Qmax, V_{void}, and PVR. The sampling technique used the total sampling method that used all existing data in a certain period. **Result:** 86 medical records of BPH patients, the age range 45-64 years: 52 patients (60.46%), and the age range > 65 years: 34 patients (39.54%). PV statistical test with Qmax ($r = 0.012$; $p = 0.913$), the correlation was not significant. PV with V_{void} ($r = 0.112$; $p = 0.305$), the correlation was not significant. PV with PVR ($r = -0.015$; $p = 0.892$), the correlation was not significant. PV with IPSS ($r = 0.048$; $p = 0.660$), the correlation was not significant. **Conclusion:** There is no correlation on Prostate Volume with Uroflowmetry and IPSS on patient with BPH without urinary retention.

Keywords: BPH, Prostate Volume, Uroflowmetry, IPSS, Urinary retention.

Introduction

The prostate is a gland producing alkaline fluid to provide energy and protect sperm during ejaculation. In general, the prostate will enlarge as a man gets older. The prostate gland is located between the urogenital diaphragm and the neck of the bladder, in the anterior rectum. The prostate gland is imaged using TRUS. The normal size of the prostate is about 3x3x5 cm or the volume is about 25mL¹. The prostate is the center of 3 main causes of morbidity, such as Benign Prostatic Hyperplasia, prostate cancer, and prostatitis². Prostate volume (PV) measurement can be performed using

ultrasound. PV is an important figure for choosing what treatment measures to give³.

Histologically, BPH is hyperplasia of the prostate gland and stromal tissue. BPH occurs in about 70% of men over the age of 60. This figure will increase to 90% in men aged over 80 years. The exact incidence of BPH in Indonesia has not been studied yet, but as an illustration of the hospital prevalence at Cipto Mangunkusumo Hospital (RSCM) since 1994-2013, 3,804 cases were found with an average age of the patient was 66.61 years old⁴. Generally, BPH patients will present with LUTS complaints in the form of irritation symptoms such as increased urinary frequency, nocturia, and incontinence, as well as obstruction symptoms, such as weak urine output, incomplete sensation of urination, and intermittent urination^{3,5}.

Corresponding author:

Reny I'tishom

Email:ritishom@fk.unair.ac.id

Uroflowmetry is a simple non-invasive test to evaluate the quality of urine flow from the volume of urine excreted in units of time and is associated with LUTS to determine if there is obstruction in the flow of urine. The parameters used were maximum flow rate (Qmax), voided volume (V_{void}), at the end of uroflowmetry there was post void residual (PVR) urine or the quantity of urine remaining in the bladder after urination was evaluated using suprapubic ultrasonography^{6,7}. Qmax, V_{void} , and PVR urine volume that are the basic parameters of uroflowmetry⁸.

The IPSS can be used to calculate the severity scores of LUTS. IPSS is the most common PROM used to monitor recurrence and has been shown in several studies to be useful on urethral narrowing problems⁸. This research aims to assess the correlation between PV and Qmax, V_{void} , and PVR that is the basic uroflowmetry assessment, and assessing the correlation between PV and IPSS.

Material and Method

Experimental Design

This research used retrospective descriptive design with secondary data of medical record of patient with BPH without urinary retention at RSUD. Dr. Soetomo Surabaya for the period 2015-2017. The medical record data recorded were age, PV, uroflowmetry examination results in the form of Qmax, V_{void} , PVR, and IPSS. The sampling technique used the total sampling method, from 1 December 2015-31 December 2017. The exclusion samples were samples with incomplete medical record data and V_{void} on uroflowmetry <150 ml.

Statistical Analysis

Statistic analysis was conducted using SPSS 22 for windows. All results were analyzed statistically with the Kolmogorov-Smirnov test, followed by the Spearman's rho test to determine the correlation between variables.

Result

General Characteristic

There were 441 medical record data. Yet, 355 incomplete medical records were excluded from the sample group. Data in accordance with the inclusion criteria were 86 medical records. The number of patients aged 45-64 years: 52 people or 60.46%, age range > 65 years: 34 people or 39.54% of the total number of patients. The age range above 45-64 years was the group that most experienced BPH without urinary retention during the 2015-2017 period. PV min: 10.60 cm³ and max value: 99.40 cm³, mean 32.64 ± 14.24 cm³. Qmax, min value: 3.60 mL/s and max value: 43.20 mL/s, mean: 14.04 ± 7.28 mL/s. V_{void} , min value: 150 mL and max value: 802 mL, mean: 284.08 ± 124.36 mL. PVR, min value: 4 mL and max value: 117 mL, mean: 50.12 ± 27.88 mL. IPSS min score: 1 and max score: 35, mean: 17.44 ± 8.27. IPSS scores were classified by LUTS degrees, divided into 3 degrees of severity, such as mild degrees with a score range of 0-7 as many as 14 patients (16.27%), moderate degrees with a score range of 8-19 as many as 42 patients (48.83%), and degrees of severity with the number of 30 patients (34.88%).

Correlation of Prostate Volume with Uroflowmetry and IPSS

Result of statistic test between PV and Qmax was obtained the value of $r = 0.012$ and the value of $p = 0.913$, these value showed that there is no significant correlation. The test results between PV and V_{void} showed that the value of $r = 0.112$ and p value = 0.305. There was no significant correlation. The test results of PV with PVR found that the value of $r = -0.015$ and p value = 0.892, this value indicated a negative and insignificant correlation between PV and PVR. The test results of prostate volume with IPSS found that the value of $r = 0.048$ and p value = 0.660. P value > 0.05 indicated an insignificant result between PV and IPSS.

¹⁷ **Table 1. The correlation between Prostate Volume with Uroflowmetry and IPSS in patients with clinical BPH without urinary retention.**

Variable	Uroflowmetry						IPSS	
	Qmax		Vvoid		PVR		R	Pa
	²⁰ R	Pa	R	Pa	R	Pa		
Prostate Volume	0.012	0.913	0.112	0.305	-0.015	0.892	0.048	0.660

¹⁸ ^aCorrelation using Spearman's Rho Test, significant value at $P < 0.05$.

R: Correlation coefficient.

Discussion

BPH is generally faced by men aged 40 years and over⁹. This study recorded 86 medical records of clinical BPH patients without urinary retention, with an age range of 45-64 years: 52 people and an age range of 65 > 34 people. From these data, patients with an age between of 45-64 years and over were the largest number in this study, and there were no patients in the group age range under 45 years. This was in line with studies in Europe, the US, and Asia which state that old age was a risk factor for the development of BPH¹⁰. BPH cases in Indonesia in 2013 were 9.2 million cases, on average suffered by men aged over 60 years¹¹. This research was conducted based on the high number of BPH cases in Indonesia, BPH associated hyperplasia in PV which may be associated with uroflowmetry and IPSS. The parameters for uroflowmetry consist of Qmax, V_{void}, and PVR. To our knowledge, this is the first study to assess the association between PV and Qmax, V_{void}, PVR, and IPSS in BPH patients without urinary retention, particularly in RSUD. Dr. Soetomo Surabaya.

There was no significant correlation between PV and Qmax. It might because a low Qmax value couldn't be confirmed as a case of obstruction, and conversely, a high Qmax value does not exclude obstruction¹². These results were in line with other studies that correlated prostate gland size with uroflowmetric parameters in patients with LUTS complaints. The research divided the sample into 3 groups, age group 1: 41-50 years, age

group 2: 51-60 years, age group 3: 61-70 years. Based on the correlation test using the Pearson test from groups 1, 2, and 3, there was no correlation between prostate size and Qmax⁹. The statement supported the results of this research that there was no correlation between Qmax PV and Qmax.

The statistical test results in this study, between PV and V_{void} had no significant correlation, in contrast to the results of other studies that stated that there was a significant correlation between PV and V_{void}, with a value of $p = 0.001$ ¹³. However, in this research, it was found that between V_{void} and Qmax, there was a significant correlation with a value of $p = 0.000$. From the discussion above, it was stated that Qmax had no correlation with prostate volume and a high Qmax value did not exclude obstruction. Although there was obstruction in the Qmax value, high results could be found, and this high Qmax value was related to the amount of V_{void}. It means that when the prostate volume enlarged and caused obstruction but the Qmax value was high, the V_{void} would increase according to the Qmax value.

Statistic test result between PV and PVR had no significant correlation. Another research in Korea using 3 years of follow-up data stated that the increase in PVR at the initial evaluation was a significant indicator of BPH along with the increase in PV or IPSS of the Korean population¹⁴. The results of these research indicated a correlation between PV and PVR, in contrast to our

results. Other research in line with ours stated that, the correlation between PV and PVR was not statistically significant for prostate volume and slightly significant but weak for the transition zone volume and transition zone index¹³.

Other studies suggest that PVR can be used to diagnose several diseases such as neurogenic bladder, Cauda equina syndrome, urinary tract obstruction, mechanical obstruction and urinary retention caused by urinary tract infections, medication, or post-surgery¹⁵. Based on Ballstaedt and Woodbury's statement, PVR can be used to diagnose urinary tract obstruction and urinary retention, but in this study using patient data without urinary retention, so the correlation between PV and PVR was not found a correlation, but in this case further research was needed.

PVR is associated with bladder obstruction, lower duct dysfunction, and detrusor failure which may be due to pharmacological effects¹⁶. Other research also stated that uroflowmetry is an electronic record of urine flow rate, duration of the micturition process, abnormal urine flow caused by Bladder Outlet Obstruction (BOO) and the presence of bladder dysfunction which causes a significant increase in PVR⁹. Another research stated that if the bladder tract obstructs, detrusor contractions can remain normal at the beginning of urination, but contractions fail prematurely, so that most of the bladder's capacity contains residual urine. Complete emptying of the bladder can occur in patients with LUTS symptoms but in the absence of obstruction, even when the detrusor contractility is not maximal, but with the appropriate duration of contractions¹⁷. From these statements, PVR is associated with detrusor failure and bladder dysfunction which can cause a significant increase in PVR, and is related to the duration of detrusor contraction. In this case, if the BPH patient had already experienced symptoms of LUTS but without obstruction, even though there was hyperplasia of the prostate or additional PV, the patient could still completely urinate by relying on good contractility of the detrusor and the right duration of contraction, so as not to cause much PVR bladder. However, this needs further research.

There was no significant correlation between PV and IPSS. This might be due to a marked enlargement of the lateral lobe but the symptoms were negligible if they

were not too severe. However, on the other hand, BPH with relatively small PV could find obvious symptoms of obstruction if the obstructing tissue originates directly from the periurethral zone¹⁸. Another research also stated that there was no significant correlation between PV and the symptom score of LUTS severity as measured by IPSS¹⁹. Another research in Africa using The Pearson's test also stated that there was no significant correlation between PV and IPSS ($p > 0.05$)²⁰. This statement was supported by Campbell-Walsh Urology (2015) which stated that there was no correlation between PV and the degree of severity of lower urinary tract symptoms²¹.

Conclusion

There is no significant correlation between PV with Qmax, V_{void}, PVR that were uroflowmetry parameters and IPSS in BPH patients without urinary retention.

Conflict of Interest: The authors declare that there is no conflict of interest.

Ethical Clearance: This research has received a certificate of ethical eligibility from the Hospital Health Research Ethics Committee. Dr. Soetomo Surabaya with ethical number 1603 / KEPK / X / 2019

Source of Funding: Self funding.

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