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Transrectal Ultrasonography

Submission date: 11-Mar-2022 08:52AM (UTC+0700)

Submission ID: 1781542090

File name: 259-Article_Text-815-1-10-20210127.pdf (240.75k)

Word count: 2758

Character count: 14354

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by Eriawan Agung Nugroho



Relationship between Prostate Volume and *International Prostate Symptom Score (IPSS)* Degree of Tamed Prostate Enlargement on Transabdominal Ultrasonography (TAUS) and Transrectal Ultrasonography (TRUS) Examination

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ARTICLE INFO

Keywords:

Benign Prostate Hyperplasia (BPH)
IPSS
TAUS
TRUS

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All authors have reviewed and approved the final version of the manuscript.

<https://doi.org/10.32539/BJI.v7i1.9>

ABSTRACT

Introduction: IPSS is the gold standard in measuring clinical symptoms of BPH.¹ Prostate volume has been said to have a close relationship with the development of BPH.⁹ The aim of this study was to determine the relationship between prostate volume as measured by transabdominal ultrasonography (TAUS) and transrectal (TRUS) to the degree of IPSS. **Methods:** An analytic observational study with a cross sectional design was carried out on 303 BPH patients at the General Hospital of Kariadi Hospital, Semarang. The data obtained from the TAUS, TRUS and IPSS prostate volume were obtained from medical records for the period 2015 - 2020. The data were then analyzed by using the chi square test. **Results:** Patients with BPH have a TAUS prostate volume in classification I of 0 people 0%, classification II of 16 people (5.3%), classification III of 96 people (31.7%), classification IV of 102 people (33.7%) and classification V of 89 people (29.4%). While TRUS in classification I was 0% (0 people), classification II was 11 people (3.6%), classification III was 92 people (30.4%), classification IV was 110 people (36.3%) and classification V of 90 people (29.7%). IPSS obtained severe IPSS degrees, namely 192 people (63.4%), moderate degrees of 111 people (36.6%), and mild degrees 0% (0 people). The results of the Chi Square test obtained a p-value of 0.000 ($p < 0.05$), indicating that there was a significant relationship between prostate volume, whether examined by transabdominal or transrectal ultrasound, and the degree of IPSS. The correlation coefficient $r = 0.925$ indicates a very strong relationship between prostate volume as measured by both transabdominal and transrectal ultrasound with the degree of IPSS, a positive result shows that the increase in prostate volume, the degree of IPSS will also increase. **Conclusion:** There is a significant relationship between prostate volume as measured by both TAUS and TRUS and the degree of IPSS.

1. Introduction

The *International Prostate Symptom Score (IPSS)* is an IPSS questionnaire containing 8 questions (7 complaint questions + 1 quality of life question). Seven complaint questions (complete blanking, frequency, intermittency, urgency, weak emission, pushing, nocturia) with a total score of 35 showed the most severe symptoms and questions regarding quality of life on a six-point scale.¹ This scoring system has been widely used and researched extensively, especially in

Europe and America², while in Asia it has not been widely reported except in Japan³ and Korea⁴. The IPSS questionnaire is the *gold standard* in measuring most clinical symptoms of BPH including LUTS (*Lower Urinary Tract Symptom*).¹ Lower urinary tract symptoms encourage patients with *Benign prostatic hyperplasia* (BPH) to consult a doctor, however Most of the patients present for the first time with moderate or severe IPSS.⁵ Research results regarding the use of IPSS include research conducted by Agrawal et al.

(2008) said there was no correlation between prostate volume and the IPSS score, but contradicts the study of O'Leary et al. (2007) who said there was a strong correlation between IPSS and the BPH *impact index*.⁶

Several previous studies have also attempted to link IPSS values to prostate volume so that BPH can be detected earlier. In a study by Agrawal et al. (2008),¹² found that there was no correlation between prostate volume and IPSS score. However, in research by O'Leary et al. (2008) found a strong correlation between the IPSS value and the BPH *impact index*.¹³

In this study, researchers will examine the relationship between the degree of IPSS in BPH patients with prostate volume measured using the TAUS and TRUS methods. The results of this study are expected to be used as a reference for early detection of increased prostate volume in BPH patients, especially in conditions where access to TAUS and TRUS is limited, so that complications of BPH can be prevented.

2. Methods

Study design

This study was an observational analytic study with a *cross sectional* approach, which was conducted at Dr. Kariadi, Semarang. The data taken in this study are secondary data from patient medical records. The data recorded were the subject's age, prostate volume based on TAUS and TRUS examinations, and the IPSS value.

Population

Subjects involved in this study were all BPH patients who recorded transabdominal and transrectal ultrasound examination results in medical records at the Kariadi General Hospital Semarang between 2015 and 2020. Subjects will be excluded from the study if there is one of the following criteria, namely only undergoing Either TAUS or TRUS, did not undergo IPSS value measurements, was diagnosed with urinary tract stones, and / or diagnosed with malignancy.

Variables

The prostate volume obtained from TAUS and TRUS examinations was categorized into 5 groups based on

research by Aprilia (2010), classification III if the volume of the prostate is 40.01-60.00 ml, classification IV if the volume of the prostate is 60.01-80.00 ml, and classification V when the volume of the prostate > 80.00 ml.

IPSS contains 8 questions filled out by research subjects and recorded in medical records. IPSS scores are categorized into 3 degrees according to the American Urological Association (AUA). The IPSS score is categorized as mild if the score is 0-7, moderate if the score is 8-19, and the degree of gravity is if the score is 20-35.

Data analysis

Data obtained from the subject's medical records will be analyzed descriptively and correlatively. Subject baseline data, prostate volume, and IPSS scores were reported descriptively. The relationship of prostate volume obtained from TAUS and TRUS examinations with the degree of IPSS was analyzed using the *chi-square* test.

3. Results

This study involved a total of 303 subjects, with the largest age range being 60-69%. The age distribution of the subjects can be seen in Table 1. In this study, it was found that the age of most of the research subjects was 60-69 years, while at a more advanced age (70-79 years) it was found that the number of subjects was the least. This is in accordance with other studies which state that the occurrence of prostate atrophy at a later age will reduce the prevalence of BPH in this population.¹⁴⁻¹⁶ The results of this study are in accordance with the theory which states that as you age, the incidence of benign prostatic enlargement also increases. BPE or Benign Prostatic Enlargement occurs in approximately 70% of men over the age of 60 years.¹¹ The causes of BPE are related to the aging process which results in decreased levels of male hormones, especially testosterone. The testosterone hormone in the prostate gland is converted into dihydrotestosterone.¹²

Based on the TAUS and TRUS examinations, the prostate volume of the most study subjects was in the

IV classification category and none of the study subjects was categorized as classification I. The distribution of the prostate volume of the study subjects can be seen in Table 2. In this study, the method of measuring prostate volume with transabdominal and transrectal ultrasound was used, although there are differences in the measurement of prostate volume based on transabdominal and transrectal ultrasound, but according to research conducted by Yusuf Kidingallo (2011) which compares the correlation of prostate volume based on transabdominal and transrectal ultrasound, statistical analysis based on the Pearson correlation test has a strong correlation and there is no significant difference ($p = 0.000$) with a correlation coefficient of 98.2%.

Based on the IPSS examination, there were 111 subjects (36.6%) in the moderate degree category and 192 subjects (63.4%) in the severe category. As seen in table 3. In this study it was also observed that the IPSS degrees experienced by many subjects were moderate and severe. This result is supported by a study by Fathoni (2006) which found that moderate and severe IPSS scores are the severity levels often found in hospitals, because patients with mild degrees tend not to want to see a doctor. It has been reported that 90% of men aged 50 to 80 have LUTS. It is estimated that 50% of men over the age of 60 years have symptoms of prostate hyperplasia, which can affect the quality of life of patients.²¹ An increased risk for men over 50 years of age is associated with general weakness including weakness in the bladder (detrusor muscle) and loss of function. changes due to the influence of old age reduce the ability of the bladder to maintain urine flow in the adaptation process by obstruction due to prostate enlargement, causing symptoms of urinary disorders or LUTS.²²

Based on the chi-square correlation test, there was

a significant relationship between prostate volume based on TAUS and TRUS and the degree of IPSS ($p = 0.000$). The correlation coefficient value is 0.925, which means that prostate volume based on TAUS and TRUS has a very strong positive correlation with the degree of IPSS. As prostate volume increases, the degree of IPSS will also increase (Table 4 and Table 5).

4. Discussion

Based on theory, patients with BPH will complain of both obstructive and irritating symptoms. Obstructive symptoms include poor streams, having to wait a long time at the onset of micturition (hesitancy), intermittency, straining, dripping at the end of the micturition (terminal dribbling), and feeling uneasy. satisfied after the proxy (incomplete emptying). Irritating symptoms include frequent micturition (frequency), difficult to hold back (urgency), urinating more than once at night (nocturia), and pain during urination (dysuria).¹⁷ This collection of obstructive and irritative symptoms is what became known as LUTS.¹⁸ These symptoms can be measured using the IPSS score.¹⁹ This theory supports the findings of this study, namely that, there was a significant relationship between prostate volume as measured by TAUS and TRUS examinations and the IPSS value. This finding is also in line with research by Overland et al. (2001) who stated that there was a positive correlation between IPSS and prostate volume both as measured by TAUS and TRUS.²⁰

The results of this study, of course, still have to be studied further in other studies that involve a wider variety of subjects, so that they can truly represent conditions in the wider community. Follow-up research may involve a wider variety of health facilities and a more heterogeneous subject.

¹⁵ Table 1. Age distribution of study subjects

Age	n (%)
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40 – 49	29 (9.6)
50 – 59	88 (29.0)
60 – 69	168 (55.4)
70 – 79	18 (5.9)

Table 2. Distribution of prostate volume classification

Category	TAUS n (%)	TRUS n (%)
Classification I	0	0
Classification II	16 (5.3)	11 (3.6)
Classification III	96 (31.7)	92 (30.4)
Classification IV	102 (33.7)	110 (36.3)
Classification V	89 (29.4)	90 (29.7)

Table 3. The frequency distribution of the IPSS degrees

IPSS degrees	Frequency (n)	Percentage (%)
Light	0	0
Moderate	111	36.6
Severe	192	63.4
Total	303	100

Table 4. Chi-square test of prostate volume based on TAUS with the degree of IPSS

Transrectal volume	Degree of IPSS		Total	P value	R
	Moderate	Severe			
Classification II	16 (5.3%)	0 (0%)	16 (5.3%)	0.000	0.925
Classification III	86 (28.4%)	10 (3.3%)	96 (31.7%)		
Classification IV	7 (2.3%)	95 (31.4%)	102 (33.7%)		
Classification V	2 (0.7%)	87 (28.7%)	18 (5.9%)		

Table 5. Chi-square test of prostate volume based on TRUS with the degree of IPSS

Transrectal volume	Degree of IPSS		Total	P value	R
	Moderate	Severe			
Classification II	11 (3.6%)	0 (0%)	11 (3.6%)	0.000	0.925
Classification III	91 (30%)	1 (0.3%)	92 (30.4%)		
Classification IV	7 (2.3%)	103 (34%)	110 (36.3%)		
Classification V	2 (0.7%)	88 (29%)	90 (29.7%)		

5. Conclusion

There was a significant relationship ($p = 0.000$) between prostate volume examined by both transabdominal and transrectal ultrasonography and the degree of IPSS.

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