

Ultra-Sonographic Assessment of Prostate Size with Post Void Residual Urine Volume: A Retrospective Study

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to compare prostate size with post void residual urine volume, both measured by transabdominal ultrasound.

Material & Methods: A retrospective study was carried out in the Department of Surgery collaboration with Department of Radio-Diagnosis JLN MCH, Bhagalpur, Bihar, India from March 2022 to February 2023 All the male patients above 40 years of age with lower urinary tract symptoms visiting the hospital were included in the study. Present study was performed on 50 patients.

Results: 61-70 years age group was most common (42%), followed by 71-80 years age group (24%) and >80 years age group (18%). Most patients had 100-200 ml pre void urine volume (56%), followed by 50-100 ml (20%) and 201- 300 ml (14%). Post-void urine volume was less than 60 ml in majority of patients (64%). In other patients post-void urine volumes were 61-80 ml (10%), 81-100 ml (6%), 101-120 ml (8%), 120- 400 ml (6%) and more than 400 ml (6%). We assessed relationship of post void residual urine volume with prostate volume. Increase in post void residual volume with was noted with increasing prostate size. A statistically significant correlation was present between post void residual volume and prostate volume.

Conclusion: The present study concluded that trans-abdominal estimation of prostate size and postvoid residual of urine are important in preliminary evaluation of benign prostatic hyperplasia patients. Patients with advanced symptoms may require further evaluation.

Keywords: Benign Prostatic Hyperplasia, Post-Void Residual Urine Volume, Prostate Size, Transabdominal Ultrasound

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Introduction

The prostate is a pyramidal fibromuscular gland which surrounds the prostatic urethra from the bladder base to the membranous urethra. [1] Prostate develops by ninth week of embryonic life from modified wall of proximal portion of male urethra. At the end of 3rd month of intrauterine life epithelium of prostatic urethra begins to proliferate and forms number of outgrowths that penetrate the surrounding mesenchyme. These buds form prostate gland. [2] In men at 20 to 30 years of age weight of the prostate is 20 grams, however mean prostatic weight increases after the age of 50 years. [3]

Lower urinary tract symptoms are one of the commonest presentations in urology clinics. Benign prostatic hyperplasia is one of the common causes for this problem. Benign prostatic enlargement (BPE), bladder outlet obstruction (BOO) and lower urinary tract symptoms (LUTS) is the basic triad for clinical diagnosis of benign prostatic hyperplasia (BPH). [4] It has been known as a cause of urinary

dysfunction and the most common disease affecting the ageing men. Fifty percent of men aged 51-60 years and 90% men over 80 years have histological evidence of benign prostatic hyperplasia. The etiology of benign prostatic hyperplasia is not clear but androgens, estrogens, stromal epithelial interactions, growth factors and neurotransmitters may play a role, either alone or in combination in the initiation of prostatic growth. Prostatic hyperplasia increases the resistance to the flow of urine. Compensatory changes in the urinary bladder function along with age related changes in nervous system function lead to urinary frequency, urgency and nocturia, the most troublesome benign prostatic hyperplasia related complaints. [5] The clinical diagnosis of benign prostatic hyperplasia is made by assessment of prostate size or volume and reduced urinary flow rate. [6] Prostatic hyperplasia increases the resistance to the flow of urine. Compensatory changes in the urinary bladder function along with age related changes in nervous system function lead

to urinary frequency, urgency and nocturia, the most troublesome benign prostatic hyperplasia related complaints. [6] As life expectancy increases, benign prostatic hyperplasia (BPH) is the significant cause of morbidity.

Estimation of accurate intravesical residual urine volume has significant importance and serves as an index of adequacy of bladder emptying. Ultrasonography is useful to confirm this measurement noninvasively in patients and it avoids discomfort, urethral trauma and urinary tract infection. This procedure avoids need for catheterization and permits physiological assessment and allows for repeated examination without fear and anxiety for the patient. [7] Abdominal ultrasonography (USG) is the commonest modality for ascertaining prostate volume. The accurate determination of prostatic volume is important in determining the degree of hyperplastic enlargement, the resultant tendency toward urinary-tract outflow obstruction, and the preferred surgical treatment option. It is also important in determining which prostatic cancer patients are suitable for brachytherapy, as prostates with volumes above 50 mL are usually excluded. [8] In present study we aimed to compare prostate size with post void residual urine volume, both measured by transabdominal ultrasound

Material & Methods

A retrospective study was carried out in the Department of Surgery collaboration with Department of Radio-Diagnosis, JLNMCH, Bhagalpur, Bihar, India from March 2022 to February 2023. All the male patients above 40 years of age with lower urinary tract symptoms visiting the hospital were included in the study. Present study was performed on 50 patients. Age of the patients varied from 40-79 years of age.

Patients referred for estimation of prostate size and postvoid urine volume assessment was considered for present study. Inclusion criteria included symptomatic and asymptomatic male patients of 50 years or above. Exclusion criteria included below 50 years of age, bladder volume > 540 ml, critically ill subjects, patients on anticholinergics, patients with UTI or neuropathic bladder. Informed consent was obtained from all the subjects selected for study. Chief complaints, demographic profile, medical and surgical history of patients was collected in proforma. Complete physical examination was done for every patient. Patients were initially assessed for pre-void residual urine volume with transabdominal ultrasound. During same time prostate size was measured by transabdominal route. Patients were instructed to come immediately after micturition. After micturition, patients post void volume was measured with transabdominal ultrasonography. Statistical analysis was done using descriptive statistics.

Results

Table 1: Distribution of patients according to age group

Age groups in years	N	%
51-60	8	16
61-70	21	42
71-80	12	24
>80	9	18

61-70 years age group was most common (42%), followed by 71-80 years age group (24%) and >80 years age group (18%).

Table 2: Distribution of pre-void urine volume

Pre-void urine volume	N	%
Less than 50	2	4
50-100 ml	10	20
101 – 200 ml	28	56
201- 300 ml	7	14
301- 400 ml	1	2
More than 400 ml	2	4
Total	50	100

Most patients had 100-200 ml prevoid urine volume (56%), followed by 50-100 ml (20%) and 201- 300 ml (14%).

Table 3: Distribution of post-void urine volume

Residual urine volume	N	%
0-20 ml	8	16
21-40 ml	10	20
41- 60 ml	14	28
61-80 ml	5	10
81-100 ml	3	6
101-120 ml	4	8
120- 400 ml	3	6
more than 400 ml	3	6
Total	50	100

Post-void urine volume was less than 60 ml in majority of patients (64%). In other patients post-void urine volumes were 61-80 ml (10%), 81-100 ml (6%), 101-120 ml (8%), 120- 400 ml (6%) and more than 400 ml (6%).

Table 4: Relationship of post void residual urine volume with prostate volume

Post void residual urine volume									
Prostate volume (gms)	0-20	21-40	41-60	61-80	81-100	101-120	121-400	>400	Total
<25	4	7	10	0	0	0	0	0	21
25-34	3	3	3	0	0	0	0	0	9
35-49	1	0	1	4	1	1	0	0	8
50-79	0	0	0	1	2	3	1	0	7
>80	0	0	0	0	0	0	2	3	5
Total	8	10	14	5	3	4	3	3	50

We assessed relationship of post void residual urine volume with prostate volume. Increase in post void residual volume with was noted with increasing prostate size. A statistically significant correlation was present between post void residual volume and prostate volume.

Discussion

Benign prostatic enlargement (BPE), bladder outlet obstruction (BOO) and lower urinary tract symptoms (LUTS) is the basic triad for clinical diagnosis of benign prostatic hyperplasia (BPH). [9] The clinical diagnosis of benign prostatic hyperplasia is made by assessment of prostate size or volume and reduced urinary flow rate. Prostatic hyperplasia increases the resistance to the flow of urine. Compensatory changes in the urinary bladder function along with age related changes in nervous system function lead to urinary frequency, urgency and nocturia, the most troublesome benign prostatic hyperplasia related complaints. As life expectancy increases, benign prostatic hyperplasia will be a significant cause of morbidity. About 50% of men with histologically proven BPH have moderate to severe lower urinary tract symptoms (LUTS) that are symptoms related to storage and voiding of urine. [10]

61-70 years age group was most common (42%), followed by 71-80 years age group (24%) and >80 years age group (18%). Most patients had 100-200 ml prevoid urine volume (56%), followed by 50-100 ml (20%) and 201- 300 ml (14%). Post-void urine volume was less than 60 ml in majority of patients

(64%). In other patients post-void urine volumes were 61-80 ml (10%), 81-100 ml (6%), 101-120 ml (8%), 120- 400 ml (6%) and more than 400 ml (6%). Edmund K et al [11] stated that “our experience over the past 13 years has shown that the prostate can often be adequately visualised and measured with smaller urinary bladder volumes (150 mL or less) than the full bladder (300–400 mL) stated in available instruction manuals”. This fact has been partly confirmed by Bapat et al. [12] They showed that a minimal urinary bladder volume of 100–200 mL is essential for near accurate estimation of prostate volume by TAUS. The study also revealed that with increasing bladder volume, the volume of the prostate increases disproportionately to its actual volume.

We assessed relationship of post void residual urine volume with prostate volume. Increase in post void residual volume with was noted with increasing prostate size. A statistically significant correlation was present between post void residual volume and prostate volume. Higher the inner gland volume and prostate volume, higher is the possibility of benign prostatic hyperplasia being the cause of increased post void residual urine volume. It has been proven that the diagnosis of bladder outlet obstruction cannot be made by symptomatic assessment alone. Size of prostate and postvoid residual of urine are important in evaluation of BPH. Prostatic volume is an important determinant for selecting the treatment, with surgeons preferring open resection for larger prostatic volumes. [13] Studies shown that ultrasound estimated prostate weight or prostate

transition zone volume can also predict obstruction. [14]

Conclusion

The present study concluded that trans-abdominal estimation of prostate size and postvoid residual of urine are important in preliminary evaluation of benign prostatic hyperplasia patients. Patients with advanced symptoms may require further evaluation.

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