

PROSTATE SIZE EVALUTION BY SONOGRAPHY & POST VOID RESIDUAL URINE VOLUME – COMPARATIVE STUDY

Radio-diagnosis

Article Submitted on: 10
October 2019
Article Accepted on: 23
October 2019

Corresponding Author

Dr Arpita Mahapatra
Associate Professor, Department
of Radio Diagnosis,
K.J. Somaiya medical college &
Research Centre, Mumbai

Shadab Mahmud¹, Arpita Mahapatra²

¹ - Ex- Associate Professor, Department of Radiodiagnosis, Nardina Medical College & Research Centre Kanpur

² - Associate Professor, Department of Radio Diagnosis, K.J. Somaiya medical college & Research Centre

Abstract:

Introduction: Confirmatory clinical diagnosis of benign prostatic hyperplasia is made by assessment of prostate size or volume and decreased urinary flow rate. This study was conducted to assess the relationships of post void residual urine with prostate size. However it was also found that there is no significant correlation between post void residual urine volume and age.

Material And Methods: This prospective study was conducted on males aged 55 and above. Prostate size & inner gland volume were measured by transrectal. Ultrasonography and post void residual volume was measured by tranabdominal ultrasonography. 40 males were included in this study and collected Imaging data were analyzed with standard statistical method.

Results: The mean post void urine volume was 50 ml. in persons having normal size prostate. The post void volume increased with increasing prostate. The post void volume increased with increasing prostate size as well as with increased gland mass. No correlation between age and post void residual volume was seen.

Conclusion: These results reveal that in randomly selected persons there is insignificant, little variation in post void residual urine volume with age. However significant correlation was seen between residual urine and prostate volume & inner gland size.

Keywords: Transrectal Ultrasonography, Post void residual urine volume, prostate size, tranabdominal sonography.

Introduction

Most of persons attending urology clinics have lower urinary tract symptoms. Benign prostatic hyperplasia is one of the common causes for this problem. 50% of men aged 55-60 years and 90% men over 80 years have histological evidence of benign prostatic hyperplasia.

Clinically benign prostatic hyperplasia is diagnosed by assessment of prostate

size or volume and decreased urinary flow rate. Characteristic histopathological manifestation of benign prostatic hyperplasia is an increased number of epithelial and stromal cells in periurethral transition zone of prostate.

Benign prostatic hyperplasia is of unknown etiology but androgens, stromal epithelial, interactions, growth factors and neurotransmitters may play a role, either alone or in combination in the initiation of

prostatic growth. Prostatic hyperplasia, Increase resistance to urinary out flow. Compensatory changes in urinary bladder function associated with age related changes in nervous system function. Lead to urinary frequency, urgency and nocturia, the most troublesome benign prostatic hyperplasia related complaints (1).

Measurement of volume of residual urine in bladder after voiding is a common procedure in urological examination of patients presenting with lower urinary tract symptoms and has traditionally been considered to have a significant role in identifying patients those with obstruction. High value of post void residual volume is an indicator for surgery.

Despite controversy of reliability and usefulness of post void residual, urine volume as a diagnostic test, it continues to be used.

Symptom complex referred as prostatism is not specific for benign prostatic hyperplasia. Although non-specific cases of urinary tract pathologies can be excluded in majority of these patients on clinical evaluation including digital rectal examination.

Where the diagnosis is doubtful additional diagnostic tests are required, ultrasonography of prostate is the most common imaging diagnostic modality performed nowadays to diagnose the benign prostatic hyperplasia. 9+ can be performed using the tranabdominal superrapubic approach as well as transrectal approach.

In 1971 Dr. Watrable et al at Tohoku University published their first research work on prostatic ultrasonography in English literature.¹ Since then it is rapidly advancing with global acceptance and importance in diagnosis and management of prostatic diseases. Transrectal method is an accurate means of assessing prostatic volume and is superior in this regard, to abdominal sonography.^{2,3} Among the several methods, the diameter method is the most commonly used for determination of prostate volume. It comprises measurement of height (H), width (W) and length (L) and volume is calculated. Using the formula $(H \times W \times L) \times 0.523(k)^4$

Estimation of accurate intravesical, residual urine is significant importance and serves as an index of adequacy of bladder emptying. The ability to confirm this measurement noninvasively in patients 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. Residual Urine volume in persons above 55 years is used for objective assessment of prostate size. However to decide what is abnormal it is necessary to agree on what can be considered normal. Although residual urine volume measurement is frequently used to evaluate prostate size, only few studies have included sufficient age matched control.

This is a comparative study to compare the influence of inner gland volume, total prostate volume and age on residual urine volume.

This study is conducted to assess the distribution of post void residual urine volume and its relationship with prostate size.

Material And Methods

This prospective study was conducted in multiple centers from May 2014 to April 2019. 40 male patients of 55 year and above were included in this cross sectional prospective study. Patients below 55 years of age, bladder volume >550ml, critically ill patients, patients with UTI or neuropathic patients were excluded from study.

Subjects with full bladder were assessed by transabdominal ultrasound to know prevoid residual volume and after ascertaining that bladder was full, they were instructed to come just after micturition, after micturition patients post void volume was measured with transabdominal ultrasonography using the formula of elliptical volume.

Transrectal ultrasound was done in all men using a 7.5 MHZ biplanar endorectal transducer. Prostate size was measured by planimetric ultrasound with the patient lying in lateral decubitus position. The central and total prostate volume were measured directly from planimetric sections.

Sonographically lucent region in the central part of cross sectional images of the prostate is referred as central zone. To calculate the total prostatic volume and central zone volume 3 measurements were made. The anteroposterior and transverse diameters were, measured at the maximal diamensions, whereas superioinferior diameter was measured as the maximal length from the base to the apex

in the midline saggital plane.

From these baseline images, the hypoechoic central zone volume caliper measured by one operator on static films, which were optimized to measure total prostatic volume. Total prostate volume was manually reread in a similar manner and volumes were calculated with the ellipsoid formula. Data are expressed as the mean and $p < 0.05$ was considered statistically significant data were expressed as correlation coefficient(r).

Observation & Results

This cross sectional study was conducted on 40 patients. Prostate gland volume and inner gland volume were assessed by transrectal and transabdominal ultrasonography. All the patients were aged 55 years and above and the mean age was 64.5 years (range 55 to 85). Correlation between prostate volume and post void residual volume is shown in.

There was increase in mean post void residual volume with increasing prostate size.

There is no correlation between age and post void residual volume ($r=0.040$, $p=0.804$)

Discussion

Most common problem in elderly men confronted by urologist & radiologist is benign prostatic hyperplasia.

Hyperplasia of the prostate gland is a progressive condition with an onset in the early 40s and worsening with age. It has been shown that 50% of men aged 55-60 years and 90% of men above 80 years have histological evidence of benign prostatic hyperplasia. In our study 44% of patients were in 55 to 59 years age group, 31% of patients were in 60-69 years age group and 25% were in >70years age group.

Prostate volume is an important contributing factor to post void residual urine volume. In our study there was a significant – correlation of post void residual urine volume with prostate volume ($r= 0.422$, $p=0.004$).

In a community based study in Rotterdam, Bosch reported. Correlation (0.21) ($p < 0.05$) between post void residual.

Urine volume and prostate size.⁵

However, C.J. Beacok et al found no correlation between post void volume and estimated prostate volume.⁶

We found a significant correlation between inner gland. Volume and post void ($r=0.352$, $p=0.019$). Rotterdam study found modest correlation between post void residual urine volume and age ($r=0.12$, $p < 0.05$).

Kolman et al found no relationship between post void residual urine volume and age.⁷

In our study, post void residual urine volume was not related to age ($r=0.040$, $p=0.804$). There was no shift in the distribution of post void, residual. Urine volume with increasing age decade and the degree of variability was high regardless of age.

Larger the size of prostate gland, greater the post void residual urine volume. It will help the clinicians to determine the severity of symptoms and line of management to be undertaken.

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.

Conclusion

Outcome of our study reveals that significant correlation was observed between post void residual urine volume ($p=0.004$, $r= 0.422$). Similarly significant correlation was also seen between post void residual urine volume and inner gland size ($p=0.019$, $r=0.352$). No significant correlation between post void residual. Urine Volume and age ($r=0.040$, $p=0.804$)

References

1. Watanabe H, Kaiho H, Tanaka M, Tersawa Y. Diagnostic application of ultrasonography to the prostate. Invest Urol 1971; 8: 548-550.
2. Stryles RA, Neal DE, Powell PH. Reproducibility of measurement of prostatic volume by ultrasound: comparison of transrectal and transabdominal

- methods. *Eur Urol* 1988; 14: 266 [DOI: 10.1159/000472957]
3. Hastak SM, Gammelgard J, Holm HH. Transrectal ultrasonic volume determination of the prostate - a preoperative and post operative study. *J. Urol* 1982; 127: 1115-1118. [DOI: 10.1016/S0022-5347(17)54258-5]
 4. Grainger RC, Allison DJ. *Diagnostic Radiology*. 4TM ed. New York: Churchill Livingstone; 2001: 1629.
 5. Bosch JLHR, Kranse R, Van MR. Reasons for the weak correlation between prostate volume and urethral resistance parameters in patients with prostatism. *J. Urol* 1995; 153: 689-693. [DOI: 10.1097/00005392-199503000-00039]
 6. Beacock CJ, Roberts EE, Rees RW. Ultrasound assessment of residual urine. A quantitative method. *Br J. Urol* 1985; 57: 410-413. [DOI: 10.1111/j.1464-410X.1985.tb06299.x]
 7. Kolman C, Girman LJ, Jacobson SJ. Distribution of post void residual urine volume in randomly selected men. *J Urol*. 1999; 161: 122-130. [DOI: 10.1016/S0022-5347(01)62081-0]