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Assessment of Bladder Dysfunction by using Cystometry and Correlation between Cystometry and Ultrasonography Findings in Patients of Prostatism

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Abstract

Introduction: Bladder outlet obstruction (BOO) in men is traditionally linked to the prostate. Urodynamics with pressure flow studies remain the gold standard for diagnosing BOO and other voiding and storage abnormalities. Study had planned to measure various parameters of bladder dysfunction by using Cystometry in patients of Prostatism and to find out correlation between PVR measured by two different techniques i.e. Cystometry and Ultrasonography, if any. *Methods:* This was observational study conducted from 2010 to 2012 in patients visiting Rural Medical College, Loni. Total 75 patients with age> 50 year and IPSS > 19 having symptoms of Prostatism were included in the study. Patient detailed history was taken with recording of USG findings and simple cystometry procedure was performed to measure various parameters like Bladder capacity, postvoid residual volume of urine (PVR) and Urge capacity and repeted 2 weeks after operation/ catheterisation. *Results:* By applying Chi-square test there is a significant association between post void urine in USG and Cystometry (i.e. $p < 0.05$). By applying Student's Paired 't' test there is a highly significant decrease in post void urine before and after 2 weeks operation / Catheterization ($p < 0.01$). And there is a highly significant increase in urge ($p < 0.01$) and only significant increase in Capacity before and after 2 weeks operation / Catheterization ($p<0.05$). *Conclusion:* Simple cystometry can provide useful information for accurate diagnosis, management plan or for prognosis purpose to urosurgeons or urologists. Further studies involving larger number of patients are necessary to determine the optimal role of formal urodynamics in the elderly.

Keywords: Bladder outlet obstruction; Urodynamci study; Cysotmetry; Ultrasonography; Prostatism.

Introduction

Bladder outlet obstruction (BOO) is one of the important pathology in cases of bladder dusfunction. BOO results from various functional or anatomic etiologies. BOO produces compression or resistance upon the bladder outflow channel at any location from the bladder neck to the urethral meatus. This produces lower urinary tract symptoms (LUTS), which may be predominantly obstructive, irritative, or often a combination of both [1].

BOO in men has traditionally been linked to the prostate. Recent terminological changes have led to the use of benign prostatic obstruction/enlargement (BPO/BPE) as nomenclature to replace previously used eponyms such as benign prostatic hyperplasia (BPH) [1]. Also synonymous with BOO in men is LUTS [2]. Other causes of BOO in men include urethral stricture disease, dysfunctional voiding, neurogenic-based detrusor-sphincter dyssynergia (DSD), and primary bladder neck obstruction.

Prostatism is a clinical syndrome, occurring mostly in older men, usually caused by enlargement of the prostate gland and manifested by irritative

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symptoms (nocturia, frequency, sensory urgency, and urgent incontinence) and obstructive (hesitancy, decreased stream, terminal dribbling, double voiding, and urinary retention).

Examination of historical and physical evidence of both onset and magnitude and severity of symptoms is critical in the primary evaluation of patients with Prostatism. Uroflowmetry and postvoid residual urine volume (PVR) are simple tests that can raise or lower the suspicion of bladder outlet obstruction (BOO), but neither can make a definitive diagnosis. Urodynamics with pressure flow studies remain the gold standard for diagnosing BOO and other voiding and storage abnormalities responsible for LUTS and voiding dysfunction [3]. Urodynamic studies are most useful when their results will affect treatment and therefore should be used judiciously. Under these circumstances, the pros of urodynamic studies (generation of well-defined parameters, providing a precise diagnosis leading to specific treatment with improved outcomes, and reproducible findings) outweigh the potential cons (invasiveness, time, consumption, expense, patient discomfort and anxiety, and the fact that symptoms are not always reproduced). In simple bedside cystometry which is one of the urodynamic study, various parameters are measured such as Bladder capacity, postvoid residual volume of urine (PVR) and Urge capacity.

The postvoid residual volume of urine (PVR) is defined as the volume of urine remaining in the bladder immediately after complete voiding [4], and a significant PVR is common in patients with LUTS [5]. The measurement of PVR by ultrasonography (US) could protect patients from the discomfort and risk of urethral injury caused by catheters as done in cystometry studies [6].

Keeping in this mind, study has been planned to measure various parameters of bladder dysfunction by using Cystometry in patients of Prostatism and to find out correlation between PVR measured by two different techniques i.e. Cystometry and Ultrasonography, if any.

Materials and methods

This was observational study conducted for a period of two years from 2010 to 2012 among men attending clinic of urology department for complaints of Prostatism. The study was started after prior approval from Institutional Ethics Committee. Patients included were having age > 50 years, International Prostate Symptom Score > 19, Catheterized patients who have developed retention due to prostatism, Patients with chronic retention, as well with distention overflow due to prostatism and patients willing to participate in the study after written informed consent. Patients with any of the following were excluded: Patients with urethral stricture, Patients with urethral stone, Patients having obstruction because of causes other than prostatism (mechanical or neurological reasons) and Patients not willing for the study. The study included total 75 patients.

After recording patient demographic data & Ultrasonography (USG) findings of patient (Prostate size & PVR), patient was explained the entire simple cystometry procedure and written informed consent was taken. Patient is asked to void before catheterization and post void urine collected after catheterization is noted as PVR. Next, with the patient in supine position, foley' s catheter was inserted perurethrally under all aseptic precautions; sterile water is instilled through a 50 ml syringe so that the top of fluid column in the syringe is 15 cm above the pubic symphysis. The sterile water was then instilled in 25 ml increments. Patient was explained to indicate when he gets urge to micturate and the volume of fluid instilled until then was noted. Meanwhile, any involuntary contraction of the bladder indicated by column of fluid moving upwards and continuing to rise despite requesting the patient to relax and volume of fluid instilled was noted. After that, instillation of water was continued. Patient was told to indicate when he was unable to hold more, has severe discomfort and feels like he has to rush to the toilet. This reading was noted as bladder capacity. Patient was then followed up two weeks later whether operated or catheterized and cystometry was repeated again. All the parameters that were recorded initially were again measured after 2 weeks (post void residual urine, urge to micturate and bladder capacity). Data was analyzed and compared among different variables using percentages and Z-test of difference between two proportions. p value less than 0.05 were considered significant.

Results

Prostate size of all 75 patients was calculated with the use of ultrasonography. 31 (41.33%) cases of prostatism had prostate size in between 50-70 gms, only 5 cases (6.67%) showed prostate size more than 100 gms. Average prostate size reported was 62.32 ± 26.97 (Table 1).

Cystometry findings were compared before and 2 weeks after Operation / Catheterization in all 75 patinets of Prostatism (Fig. 1). By applying Student's Paired 't' test there is a highly significant decrease in post void urine, and AUA score before and after 2 weeks operation /Catheterization ($p<0.01$). And there is a highly significant increase in urge ($p<0.01$) and only significant increase in Capacity before and after 2 weeks operation/Catheterization ($p<0.05$) (Table 2 and Fig. 2).

Table 1: Prostate size (gms) in the cases of Prostatism

Prostate size (gms)	No. of cases	Percentage (%)
< 30	3	4%
30-50	24	32%
50-70	31	41.33%
70-90	10	13.33%
90-100	2	2.67%
More than 100	5	6.67%
Total	75	100%
Mean ± SD	62.32±26.97	

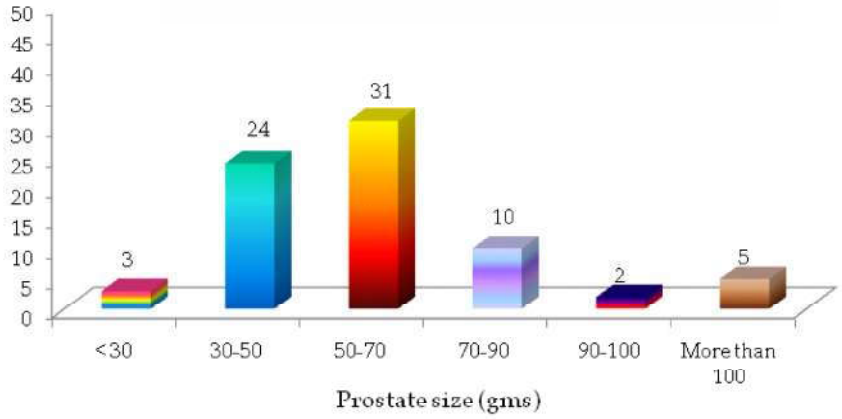

Fig. 1: Prostate size (in gms) on USG in cases of Prostatism

Table 2: Comparison of average values of Post void urine, Urge, and Capacity before and after 2 weeks Operation / Catheterization in cases of prostatism

	Before Operation / Catheterization Mean ± SD	After Operation / Catheterization Mean ± SD	Student's Paired 't' test value	'p' value	Significance
Post void urine(cc)	130.95 ± 68.09	79.2 ± 44.07	7.99	p < 0.01	Highly significant
Urge(cc)	159.87 ± 50.25	196.93 ± 45.56	6.71	p < 0.01	Highly significant
Capacity(cc)	386.13 ± 121.32	398.93 ± 90.82	1.98	p < 0.05	Significant

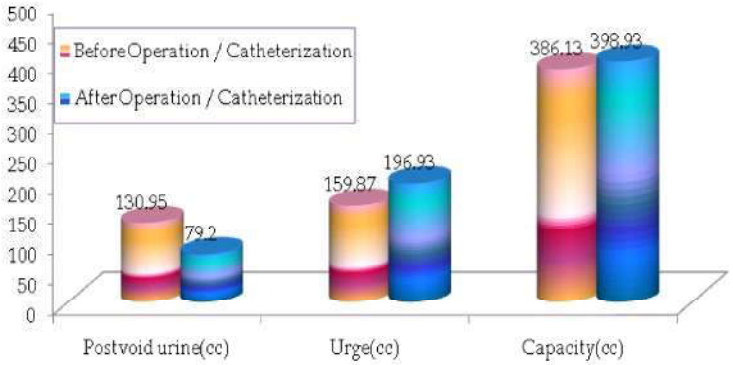

Fig. 2: Comparison of average values of Postvoid urine, AUA score, Urge, and Capacity before and after 2 weeks Operation / Catheterization in cases of prostatism

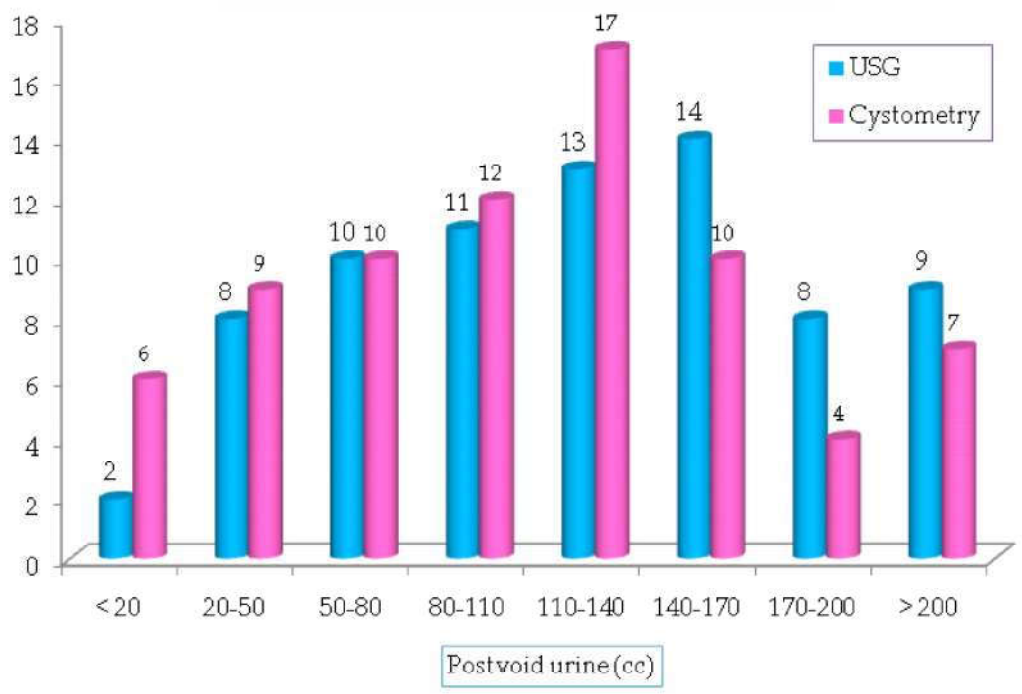

Fig. 3: Comparison of Postvoid Urine in USG and Cystometry in the cases of prostatism

Cystometry finding of PVR was compared with that of USG as given in table 3 & figure 3.

Table 3: Comparison of Post void Urine in USG and Cystometry in the cases of Prostatism

Postvoid Urine (cc)	USG No. of cases (%)	Cystometry No. of cases (%)
< 20	2(2.67%)	6(8%)
20-50	8(10.66)	9(12%)
50-80	10(13.33%)	10(13.33%)
80-110	11(14.67%)	12(16%)
110-140	13(13.33%)	17(22.67%)
140-170	14(18.67%)	10(13.33%)
170-200	8(10.66%)	4(5.33%)
> 200	9(12%)	7 (9.34%)
Total	75	75
Mean ± SD	130.95±68.09	112.40±58.84
Difference between USG and Cystometry	18.55 cc ± 11.12 cc	

Value of $\chi^2 = 4.80$, d. f. =7, significant, $p<0.05$.

By applying Chi-square test there is a significant association between post void urine in USG and Cystometry (i.e. $p<0.05$).

And also by applying Z test of difference between two proportions there is a significant difference between proportions of post void urine in USG and cystometry from 110 cc to more than 200 cc. (i.e. $p<0.05$).

It is also observed that in both USG and cystometry the post void urine in cc the no. of cases are increased 80-110 cc to 140-170 cc and again it is decreased up to >200 cc.

Discussion

Bladder outlet obstruction (BOO) is a common cause of lower urinary tract symptoms (LUTS) in men and women. In men, Prostatism constitutes the most common cause of BOO.

In the last decade there has been increasing awareness among urologists that a policy of prostatectomy in any man with lower urinary tract symptoms is unacceptable. International consultation on benign prostatic hyperplasia guidelines states that baseline measurement should include the International Prostate Symptom Score (I-PSS), maximum urine flow, post-void residual urine and an evaluation of prostate volume by digital rectal examination. For the diagnostic accuracy and management plan of patients, Urodynamic studies like Cystometry can help the urologist to guide the treatment and prognosis by measuring various parameters like Bladder capacity, postvoid residual volume of urine (PVR) and Urge capacity.

In present study, Simple beside cystometry was performed in 75 patients and USG findings of PVR were also compared with Cystometry findings.

In Present study, average prostate size reported was 62.32 ± 26.97 (mean ± SD) while average PVR reported was 130.95 ± 68.09 (mean ± SD) in USG findings. A study done by Jeremy L. et al. [7] had mean post void urine was 61 ml and mean prostate size was 35 gm. In another study conducted by W.P.J Witjes et al. [8]; had a mean prostate size of 41.6 ± 20.8 gm. In the present study mean prostate size and the mean post void urine was more compared to other studies because the mean age i.e. 67.29 years and the sample size i.e. 75 was more as compared to other two studies. Also, in our study maximum i.e. 31 (41.33%) cases of prostatism had prostate size in between 50-70 gms.

E.A. Kiely et al. [9] in 1987 studied 18 cases and measured post void urine by both cystometry and ultrasonography. There was a significant difference in the volume measured by both methods 14.04 ± 12.96. In present study 75 cases were evaluated and there was a significant difference in the pos void urine measured 18.55 ± 11.12. The difference may be more because of larger sample size. By applying the Chi-square test there was a significant association between post void urine in USG and cystometry (i.e. $p < 0.05$).

Conclusions

In our study, there was highly significant decrease in post void urine and highly significant increase in urge ($p < 0.01$) and only significant increase in Capacity before and after 2 weeks operation / Catheterization ($p < 0.05$) in Cystometry findings. There was significant difference between proportions of post void urine (PVR) as measured in USG and cystometry.

So, it can be concluded that simple cystometry can provide useful information for accurate diagnosis, management plan or for prognosis purpose to urosurgeons or urologists. It also helps to identify incontinent patients who should have further urological and urodynamic evaluation. However, simple cystometry has limitations and must be interpreted in conjunction with other clinical data to develop an appropriate treatment plan.

Further studies involving larger number of carefully characterized patients are necessary to determine the most cost effective assessment strategies and the optimal role of formal urodynamics in the elderly. Until such studies are done, we believe that the simple cystometry procedure described can be useful to assess bladder function among incontinent elderly patients in rural setting like ours.

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