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Original Research Article

A prospective study of uroflowmetry in 100 patients with lower urinary tract symptoms

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ABSTRACT

Background: Uroflowmetry is diagnostic procedure of various urinary tract diseases like urethral stricture, benign prostatic hyperplasia, neurogenic bladder, detrusor muscle overactivity by calculating the rate of urine expulsion against the time unit in second. Uroflowmetry is simple and non-invasive diagnostic method.
Methods: This is a prospective study of 100 cases which fulfil inclusion and exclusion criteria. After taking informed written consent of the patients, they have gone under uroflowmetry study by Urocap 3 uroflowmeter, and graphs were obtained and result analysed.
Results: Maximum number of patients has prolonged curve graph were diagnosed as benign prostate hypertrophy (BPH) (53%), dysfunctional voiding curve for detrusor overactivity (20%) intermittent flow curve for neurogenic bladder (7%), Box variety for urethral stricture (7%).
Conclusions: In present study we found that uroflowmetry is helpful in diagnosis of certain urological pathologies. Common lower urinary symptoms were burning micturition, frequency and difficulty in micturition. Age group from 50-70 years was often presented with bladder outflow obstruction. Uroflowmetry overall useful in diagnosis of BPH and urethral stricture which can be supported by ultrasonography of prostate with PVRV and RGU respectively to avoid other invasive and more difficult pressure or flow urodynamic study.

Keywords: Lower urinary tract symptoms, Uroflowmetry, BPH, Urethral stricture

INTRODUCTION

Uroflowmetry test is recommended for patient with lower urinary tract complains. Uroflowmetry is a simple, non-invasive diagnostic procedure. There are three levels of complexity of urodynamics tests: Uroflowmetry, essential urodynamic tests (filling cystometry, pressure or flow studies) and complex urodynamics (urethral pressure profile, video urodynamics, neurophysiologic tests).[1] Uroflometry is the measurement of voided urine (in millilitres) per unit of time (in seconds).[2] By measuring the average and maximum rates of patient's urine flow, the test can estimate the severity of obstruction in urinary tract. It can also help identify other urinary problems, such as a weak bladder or enlarged prostate, urethral stricture.

In 1956 Von Garrelts and Strandell developed an uroflowmeter based on the weight principle that recorded volume and flow rate separately.[3] He showed that the flow rate varies with the volume voided. As early as 1957 he recorded flow rate and intravesical and intrarectal pressures simultaneously. In 1971 Klein et al described an uroflowmeter based on the variation of weight of the urine voided. Uroflowmeter are of three types including rotating disc flow meter, electronic dipstick flow meter and gravimetric flow meter.[4]

This study was planned with the aims and objective of study of common lower urinary tract symptoms in age group between 20-70 years, to study various graph patterns in patient with urinary problems, to study different etiology of lower urinary complain from uroflowmetry, to study the role of uroflowmetry in management of patients with urinary complains, to study improvement in patients after drug therapy or operative procedure by comparing the graphs. By urodynamic study we can differentiate stress urinary incontinence and overactive bladder.[5]

METHODS

This prospective study of uroflowmetry was done in 100 patients of lower urinary tract symptoms was conducted during the period of September 2015- October 2017 at the Sir T. Hospital and Department of Surgery of Government Medical College, Bhavnagar, Gujarat, India.

Inclusion criteria were patients of age group 20 to 70 years of both sexes and patients with lower urinary tract complains. Exclusion criteria were patients not willing to give consent and patient with urinary catheter in situ.

In our study we have used disc uroflowmeter (Urocap 3) which is cheapest uroflowmeter and easy to perform the uroflowmetry, then other two instruments. Urocap 3 (room with toilet) connected with laptop via bluetooth device, and printer which was attached with laptop for graph. Uroflowmetry was performed in patients with full bladder. Adequate privacy was provided and patients were asked to void when they felt a Normal desire to void/urinate. After all set up uroflowmetry was performed when person urinate into a special funnel that is connected to Urocap 3 machine. Patient urinated in a special urinal toilet which was equipped with a machine, which had a measuring device. During uroflowmetry graph plotted which was showing uroflow parameters in terms of maximum flow rate (Qmax), Average flow rate (Qave), voiding time, voided volume, flow time. The test performed in full patient privacy and isolation so patients had normal urination without any discomfort.

The results of uroflowmetry were collected, analysed and interpreted accordingly. Excel software was used for the analysing the data.

Figure 1: Urocap 3 with laptop and printer.

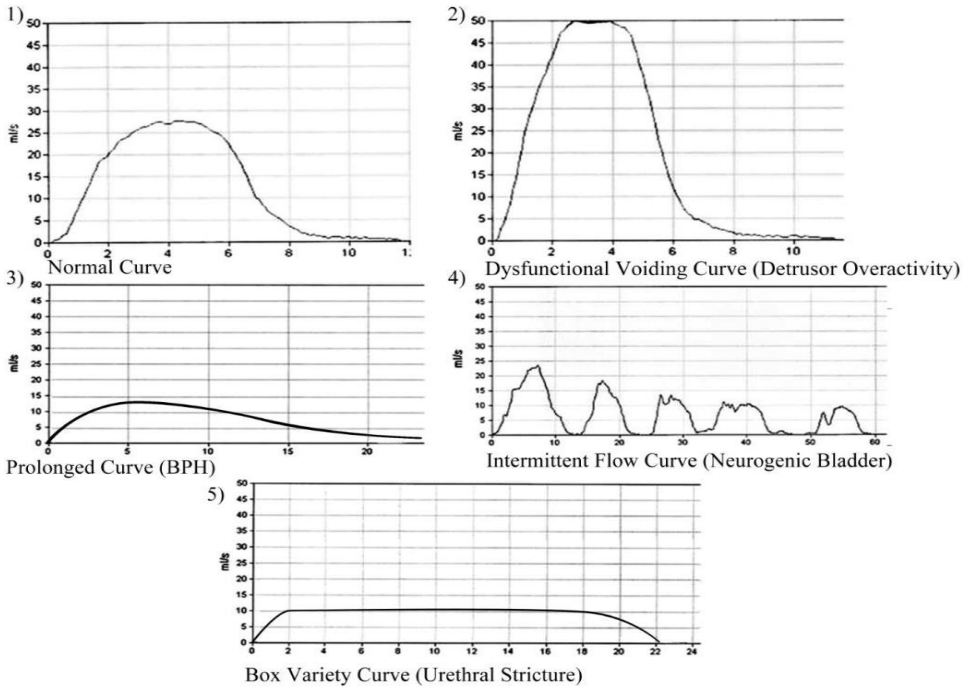

Figure 2: Characteristic of flow pattern.[4]

(1) Normal- there is rapid change before and after the peak flow, (2) dysfunctional voiding curve- an exaggeration of normal associated with high pre-micturition pressure and seen in cases of detrusor overactivity, (3) prolonged curve– associated with outflow obstruction, (4) intermittent flow curve– resulting from abdominal straining to compensate for poor detrusor contractility; a similar picture may be seen with urethral over activity (detrusor sphincter dyssynergia or dysfunctional voiding), (5) Box variety curve- classical pattern of a urethral stricture with a long plateau.

RESULTS

By Urocap 3 uroflowmeter we have done uroflowmetry in 100 patients both male and female with lower urinary tract symptoms**.** Here are the results of the study.

Table 1: Age distribution.

Age group (in years)	No. of patients
20-30	6
30-40	9
40-50	14
50-60	34
60-70	37
Total	100

In this study maximum no. of patients with lower urinary tract symptoms were in age group of 50-60 years (34 patients), in 60-70 years (37 patients).

Table 2: Sex distribution.

Sex	No. of patients
Male	88
Female	12

In this study total male patients are 88 and female patients are 12.

Table 3: Various graph pattern in different lower urinary tract symptoms.

Uroflow pattern	% of patients (n=100)
Normal curve	9
Continuous prolonged curve	53
Box variety curve	7
Intermittent flow curve	7
Dysfunctional voiding curve	20
No curve	4

There are normal curve, Box variety curve, continuous prolonged curve, dysfunctional voiding curve, intermittent flow curve, no flow (curve). Among 100 patients 9% have normal curve, 7% have Box variety curve, 53% have continuous prolonged curve, 7% have intermittent flow curve, 20% have dysfunctional voiding curve and 4% have no flow pattern.

Table 4: Various urinary complaints.

Urinary complains	% of patients (n=100)
Burning micturition	60
Frequency of urination	34
Difficulty in micturition	24
Weakening of urinary steam	26
Acute retention of urine	22
Urgency of urination	17
Urinary incontinence	9
Hesitancy in urination	8

In this study most common complaints were burning micturition and frequency of urination.

From our study we have concluded that patient having normal uroflow curve have mean Qmax-22.61 ml/sec, Qavg-12.2 ml/sec, voiding time 23.28 sec, flow time 21.36 sec, voided volume- 272.22 ml. Patient with Box variety of curve having mean Qmax 7.98 ml/sec, Qavg 4.43 ml/sec, voiding time 65.58 sec, flow time 61.06 sec, voided volume- 269.48 ml, patient having continuous prolonged curve having mean Qmax 10.02 ml/sec, Qavg 6.01 ml/sec, voiding time 39.13 sec, flow time 31.60 sec, voided volume 169.1 ml. Patients with other curves, parameters are described in Table 5.

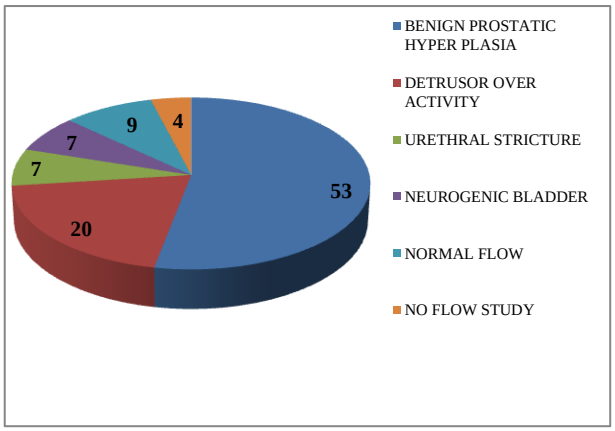

Figure 3: Various urinary tract diseases.

Table 5: Diagnosis from uroflowmetry graphs or curves and various parameters.

Uroflow pattern	Qmax (mean±SD) (ml/sec)	Qavg (mean±SD) (ml/sec)	Voiding time (mean±SD) (sec)	Flow time (mean±SD) (sec)	Voided volume (mean±SD) (ml)
Normal curve	22.61±11.01	12.2±5.88	23.28±9.1	21.36±8.2	272.22±20.59
Box variety curve	7.98±3.72	4.43±2.0	65.58±32.1	61.06±31.01	269.48±169.1
Continuous prolonged curve	10.02±7.3	6.01±5.8	39.13±21.01	31.60±18.48	169.1±157.12
Dysfunctional voiding curve	17.24±17.23	5.18±3.81	44.27±27.86	39.75±28.25	176.57±155.37
Intermittent flow curve	16.12±15.04	5.15±4.01	60.32±57.63	49.15±32.1	249.56±189.58

In this study probable diagnosis made with graph pattern of uroflowmetry, were BPH (53%), detrusor muscle overactivity (20%), neurogenic bladder (7%), urethral stricture (7%), normal study (9%) with no flow study (4%).

DISCUSSION

In this study maximum no. of patients with lower urinary tract symptoms were in age group of 50-60 years (34 patients), in 60-70 years (37 patients). In study of Kumar et al, he found that maximum patients belongs from age group above 50 years (239 patients).[6]

In this study among 100 patients 53% have continuous prolonged curve, 20% have dysfunctional voiding curve, 9% have normal curve, 7% have box variety curve,7% have intermittent flow curve, and 4% have no flow pattern, which is correlate with study Sundaram et al where maximum curve pattern was continuous prolonged curve which was 41%.[7]

In this study probable diagnosis made with graph pattern of uroflowmetry, were benign prostatic hyperplasia (BPH) 53%, Detrusor muscle overactivity 20%, neurogenic bladder 7%, urethral stricture 7%, normal study 9% with no flow study 4% which is correlate with study of Sundaram et al where in maximum 41% patients were diagnosed as BPH by graph pattern of uroflowmeter.[7]

In this study has average Qmax of BOO was 9.09 ml/sec which is correlated with study of Reynard et al as where average Qmax is suggestive of 9.7 ml/sec patients with BOO.[8] In this study mean voided volume was 227ml which correlate with study of Sanjeev et al mean voided volume was 269.6 ml.[9]

Parameter derived from uroflowmetry are considered to be clinically reliable only if voided volume is >150 ml.[10]

Patients which were diagnosed as BPH by Uroflowmetry were 53 out of 100. They were further confirmed by ultrasonography of prostate (size, volume and post voidal residual volume) and digital rectal examination and 7 patients which were diagnose as having urethral stricture confirmed by retrograde ureterogram (RGU). Diagnosis of bladder outlet obstruction by uroflowmetry is consistant with study done by Marin et al.[2]

CONCLUSION

In this study we found that uroflowmetry is helpful to diagnose various lower urinary tract symptoms. Most common patient presented with age group between 50-70 years. Most common pathology of bladder outlet obstruction was BPH. Common lower urinary tract complains were burning micturition, frequency and difficulty in micturition.

Prolonged curve commonly seen in BPH. Box variety curve is suggestive of urethral stricture. Intermittent flow curve is seen in neurogenic bladder and dysfunctional voiding curve in detrusor muscle overactivity.

Uroflowmetry is useful to diagnosed BPH and urethral stricture can be supported by ultrasonography of prostate and RGU. However diagnosis of detrusor muscle overactivity and neurogenic bladder require further more invasive urodynamic study to confirm diagnosis.

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