The value of uroflow in evaluating LUTS (Lower Urinary Tract Symptoms) in men; ten years of experience

A. Manu-Marin, R. Neamţu, N. Calomfirescu, M. Neamţu, L. Vesa, C. Belinski, C.Neicuţescu
Secţia Urologie, Spitalul Prof. D. GEROTA, Bucureşti

Abstract

Introduction & Objectives: The scope of this article is to review the technique of uroflow, the definitions of the ICS (International Continence Society), the data that are a must in results presentation, and the artifacts that can influence the results. Uroflowmetry is a noninvasive test to study the dynamics of urine flow. The parameters that characterize the curve are the maximum flow, the average flow, the voided volume, the time of micturition, and the pattern of the curve that can be continuous or interrupted.
Material & Method: Between 1997 and 2007 we have performed 7786 uroflow measurements. From these, 5489 measurements where done in male patients with lower urinary tract symptoms (LUTS).
Results: BOO suggestive of BPH (compressive obstruction) was seen in 27% of patients and BOO suggestive of urethral stricture (constrictive obstruction) was seen in 6% of patients. For the patients with an interrupted or an irregular curve (9% of the patients), pressure/flow studies where done to study detrusor contractility.
Discussions and Conclusions: Uroflows curves are not clearly and without doubt linked to certain pathologies but, from our experience, the plateau shape curve, with low Qmax, are strongly suggestive for urethral stricture, and those with large variations in amplitude are reasonable suggestive of altered detrusor contractility. Especially the interrupted curves are a real indication for pressure/flow studies.

Key words: uroflow, bladder outlet obstruction.

Correspondence: A. Manu-Marin
Secţia Urologie, Spitalul „Prof. Dr. Dimitrie Gerota”, Bucureşti
E-mail: andri_66@yahoo.com

Introduction

The standardization of the techniques for urodynamic testing was started by the ICS in 1973.

There are three levels of complexity of urodynamics tests: uroflowmetry, essential urodynamic tests (filling cystometry, pressure/flow studies) and complex urodynamics (urethral pressure profile, videourodynamics, neurophysiologic tests) (1, 2).

The scope of this article is to review the technique of uroflow, the definitions of the ICS (International Continence Society), the data that are a must in results presentation, and the artifacts that can influence the results. The other objective was to retrospectively analyze our 10 years database and to draw conclusions on the practical value of uroflow in the day to day urology clinic.

Material and Method

Between 1997 and 2007 we have performed 7786 uroflow measurements. A number of 5489 of these measurements where done in male patients with lower urinary tract symptoms (LUTS).

For the first two years we have used an uroflow machine with a rotating disc and after that a weight measuring uroflow machine.

The screening of patients with LUTS in our department comprises the measure of the uroflow and of the post void residual by ultrasound.

To obtain an uroflow measurement that can be of clinical use the voided volume should be greater than 150 ml. Smaller volumes can impair by themselves the flow, especially the Q_{max}, and frequently, also, the shape of the curve. This is a real problem in patients with overactive bladder syndrome (OAB) who usually voids volumes less than 100ml; when the Qmax is good the measurement can be used to exclude BOO but when Qmax is smaller than 15 ml/s pressure/flow studies should be performed to exclude BOO.

Results

BOO suggestive of BPH (compressive obstruction) was seen in 27% of patients and BOO suggestive of urethral stricture (constrictive obstruction) was seen in 6% of patients.

For the patients with an interrupted or an irregular curve (9% of the patients), pressure/flow studies where done to study detrusor contractility.

A total of 58% of patients had unobstructed flow pattern.

Combining micturition diary data with symptoms and uroflow helped diagnose OAB syndrome in 36% of the patients.

Discussions

Uroflowmetry is a noninvasive test to study the dynamics of urine flow. The parameters that characterize the curve are the maximum flow, the average flow, the voided volume, the time of micturition, and the pattern of the curve that can be continuous or interrupted (1, 2) (Fig 1).

- Maximum Flow (Q_{max}) is the highest value of the flow,
- Voided Volume is the total amount urine expelled
- Flow Time
- Average Flow Rate (Qave)
- The Time to maximum flow

When the curve is interrupted the same parameters for describing it are used with the exception of the micturition time which will not take into account the time of the interruptions.

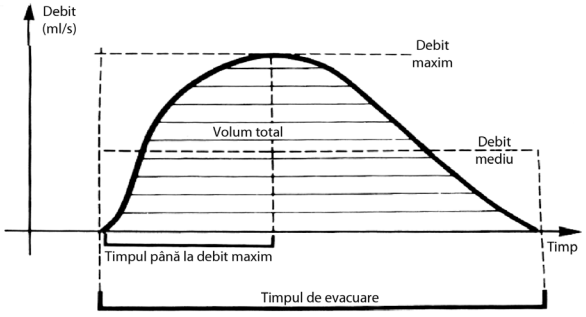


Fig 1. Parameters of the uroflow curve

When presenting the results of the uroflow it is considered necessary to mention the external conditions at the time when the flow was obtained: intimacy, relaxed patient, standing or sitting, the way the bladder was filled up (natural, by catheter, with diuretics).

A standard uroflow measurement imposes (3):

- The patient should drink around one liter of water in the morning (a tablet of furosemid can be used if necessary)
- The patient must have a natural sensation to void,
- The patient should be at ease in an relaxing environment when passing urine

➢ Two measurements followed by the measurement of post void residual should be performed.

The shape of the curve must be examined taking into account sex, age and the voided volume (4).

A considerable number of authors, von Garrelts (1958), Backman (1965), Siroky (1979), Kadow (1985), Hayden (1990), have constructed nomograms to help the interpretation of the curves (5).

The uroflow curve can be clasified as continuous or interupted. When analyzing a uroflow curve it should be remmembered that the dynamics of the flow are the result of the detrusor/abdomen contraction and the urethral resistance (6).

Continuous curves

Normal shape:

➢ The normal shape is a bell shape

➢ Qmax is reached in the first 30% of the curve (five seconds from the start)

➢ The shape of the curve can vary, for the same patient, depending on the volume voided, but the first and the last leg of the curve will have similar shapes. (Fig. 2)

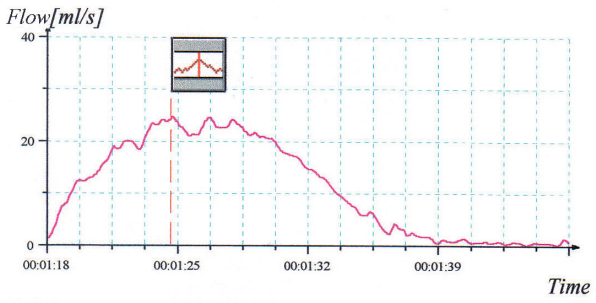


Fig. 2 Normal, bell shape, uroflow.

Overactive detrusor

➢ It is a pathology of the filling phase of the bladder

➢ All parameters of the curve are raised; because of the premature detrusor contraction the Qmax is reached faster.

➢ Filling cystometry is the test that establishes the diagnostic.

Bladder outlet obstruction (BOO) (7, 8)

➢ Qmax and Qave are smaller (Qave > Qmax/2)

➢ Qmax is reached relatively fast and is followed by a long descending slope that ends in terminal dribbling

➢ Two patterns can be recognized and differentiated: compressive (BPH) (Fig. 3) like the one described above and constrictive (urethral stricture) (Fig. 4) when the shape is of a plateau with little difference between Qmax and Qave.

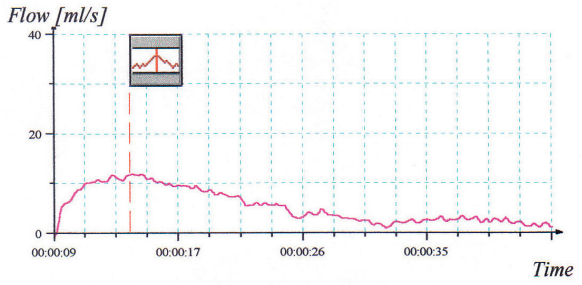


Fig. 3 Uroflow curve with pattern suggesting compressive BOO

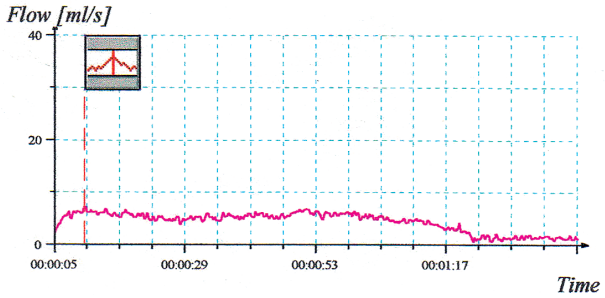


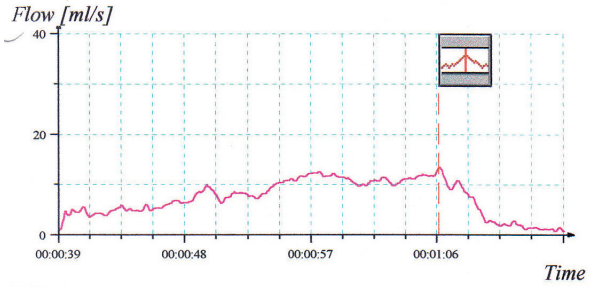
Fig 4 Uroflow curve with plateau shape suggesting constricting BOO

Detrusor hypo contractility

➢ Qmax is low and is reached late in the second part of the curve (Fig. 5)

➢ Pressure/flow study only can establish a diagnosis.

Fig. 5 Uroflow curve suggesting detrusor hypo contractility



Interrupted curves

Discontinuous curve because of abdominal straining

It is the characteristic of the patients who strain during voiding as a habit or because they feel the bladder is not emptying as they want. The curve is usually continuous but with high variations in amplitude (Fig. 6). Pressure/flow studies are needed to establish the cause.

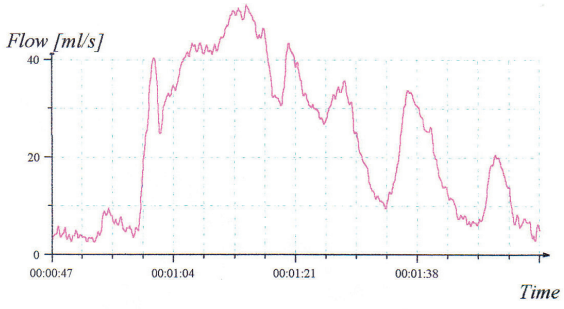


Fig 6 Oscillations determined by abdominal straining

Discontinuous curve secondary to urethral hyperactivity

It is frequently present in neurological patients. The involuntary contractions of the external, striated sphincter are completely stopping the flow from time to time. It can also appear in non neurological patients when it is called dysfunctional voiding. The shape of the curve obtained is usually interrupted with high amplitude flow between interruptions.

Discontinuous curve because of detrusor hypo contractility

It is present in patients with altered detrusor contractility because of miogenic or neurogenic causes. The detrusor contraction is not a continuous but has constant fluctuations and even interruptions. Interrupted curve is the rule (Fig. 7).

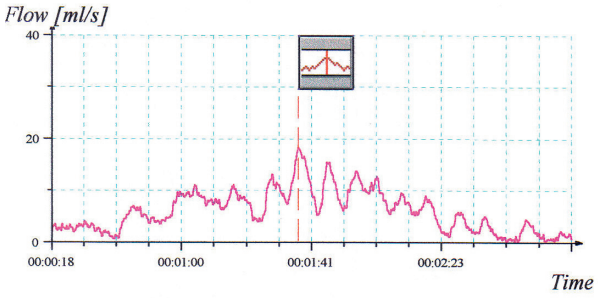


Fig 7 Oscillations and low Qmax suggesting detrusor hypo contractility

Artifacts of uroflowmetry (3, 9)

Artifacts can appear from poor technique or poor interpretation of the curves obtained.

The habit of some men to balance the stream during voiding can create false higher Qmax. Voiding with an over full bladder can result in smaller than usual Qmax.

Misinterpretation of the data could be from taking into account the Qmax only and not also the shape of the curve or from not taking into account the voided volume.

Uroflowmeters (10)

Actual uroflow machines are using three different techniques to weight the urine and concomitantly measure the time:

1. Measuring urine weight in real time; the machine is measuring the urine weight, transforming it into volume and presenting it in real time.
2. The machines with a rotation disc are measuring the necessary power needed to maintain the constant rotation of a disc against the urine flow.
3. The machines with a dipstick situated vertically in the recipient who is collecting the urine; the electrical capacity of a conductor is decreasing during filling and this is measured by the machine and transformed in a flow curve.

Type 1 has a high accuracy but it is very sensitive to vibrations, the type 2 has also a good accuracy, it is not sensitive to vibrations but it is sensitive to a correct impact of the urine stream. Type 3 is the cheapest but with lower accuracy.

The curves obtained are usually printed on paper by all types of machines.

A reliable uroflow machine is considered to have an error margin les than 5% and a capacity to measure flows between 0 and 50 ml/s. the optimal paper speed is 0, 25 cm/s.

Conclusions

The suspicion of BOO is the most frequent reason to perform uroflow measurements in men (11, 12). The uroflow does not have the capacity to study the obstructed voiding, it can only suggest BOO. Still, it is well accepted, from clinical studies and statistical analyses that for a Qmax fewer than 10 ml /s there are 90% chances that BOO exist (4, 13, 14). For a Qmax between 10 and 15 ml/s the chance of BOO drops to 71%.

Uroflows curves are not clearly and without doubt linked to certain pathologies but, from our experience, the plateau shape curve, with low Qmax, are strongly suggestive for urethral stricture, and those with large variations in amplitude are reasonable suggestive of altered detrusor contractility. Especially the interrupted curves are a real indication for pressure/flow studies.

Bibliografie

1. Abrams P, Griffiths DJ: *The assessment of prostatic obstruction from urodynamic measurements and from residual urine*. Br J Urol 1979;51:129.
2. Manu-Marin AV, Calomfirescu N, Neamtu M: *Investigarea tulburarilor mictionale. Rolul examenului urodinamic. Tendinte actuale de diagnostic si tratament in practica medicala*. Editura Ministerului de Interne 2002;405.
3. Calomfirescu N, Manu Marin AV: *Urodinamică şi Neurourologie*. Ed. Academiei, 2004.
4. Drach GW, Layton TN, Binard WJ: *Male peak urinary flow rate: relationships to volume voided and age*. J Urol 1979; 122:210.
5. Siroky MB, Olsson CA, Krane RJ: *The flow rate nomograms: II. Clinical correlation*. J Urol 1980;123:208.
6. Madersbacher S; Pycha A; Klingler CH; Mian C; Djavan B; Stulnig T; Marberger M. *Interrelationships of bladder compliance with age, detrusor instability, and obstruction in elderly men with lower urinary tract symptoms*. Neurourol Urodyn. 1999; 18(1):3-15
7. Reynard JM; Yang Q; Donovan JL; Peters TJ; Schafer W; de la Rosette JJ; Dabhoiwala NF; Osawa D; Lim AT; Abrams P. *The ICS-BPH Study: uroflowmetry, lower urinary tract symptoms and bladder outlet obstruction*. Br J Urol. 1998; 82(5):619-23
8. Calomfirescu N, Voinescu V: *Uroflowmetria in tratamentul endoscopic al stricturilor uretrale masculine*. Editura Academiei 2001;45.
9. O´Donnell PD: *Pitfalls of urodynamic testing*. Urol Clin North Am 1991;18:257.
10. Barnes DG, Lewis RCA, Shaw PJR, Worth PHL: *A consumer´s guide to commercially available urodynamic equipment*. Br J Urol 1991;68:138.
11. Abrams P, Blaivas JG, Stanton SL, Andersen JT: *The standardisation of terminology of lower urinary tract function*. Neurourol Urodynamic 1988;7:403.
12. Jepsen JV;Bruskewitz RC. *Comprehensive patient evaluation for benign prostatic hyperplasia*. Urology. 1998; 51 (4A Suppl):13-8
13. Grino PB, Bruskewitz R, Blaivas JG, Siroky MB, Andersen JT, Cook T, Stroner E: *Maximum urinary flow rate by uroflowmetry: automatic or visual interpretation*. J Urol 1993;149:339.
14. Kuo HC. *Clinical prostate score for diagnosis of bladder outlet obstruction by prostate measurements and uroflowmetry*. Urology. 1999; 54(1):90-6