

The role of urodynamic investigations in diagnosis of women's urinary retention

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Abstract

Introduction and Objectives. Urinary retention in women has often been considered to be caused due to neurologic or psychogenic disorders. In spite of extensive investigations sometimes the causes of urinary retention may remain unknown. The aim of this paper is to highlight the place of post-void residual urine (PVR) evaluation and the urodynamic diagnosis of voiding dysfunctions in women.

Materials and Methods. We performed a retrospective study over a period of 3 years in Mures County Hospital, Clinic of Urology. In this study we included 47 women which presented the selection criteria (voiding symptoms, PVR confirmed by abdominal ultrasound, over 50 ml and the results of urodynamic investigations: uroflowmetry and pressure-flow study).

Results. The mean age of the patients was $51,97 \pm 16,07$ SD (standard deviation) years old with wider extremities between 20 to 78 years old. The mean value of PVR was 140 ml (50-260 ml). The mean value of Peak flow rate (Q max) was $11,70 \text{ ml/s} \pm 6,82$ SD. The mean value of detrusor pressure (Pdet) at peak flow was $70,07 \pm 32,66$ SD cm H₂O in detrusor sphincter dyssynergia, $64,66 \pm 33,32$ SD cmH₂O, in obstructed cases and $11,29 \pm 5,63$ SD cm H₂O in cases with impaired detrusor contractility. The urodynamic diagnosis (pressure flow study) revealed detrusor sphincter dyssynergia in 14 cases, 11 with underactive detrusor, 14 with acontractile detrusor, 2 with obstruction due to genital prolapse gr III and IV, 2 with urinary retention post TOT and 4 with urethral stenosis. Statistical analysis demonstrated a correlation between the quantity of post void residual urine and value of Qmax ($r = -0,32$ and $p = 0,02$) and also the existence of PVR and diagnosis of impaired detrusor contractility, $p = 0,02$.

Conclusions. Urinary retention in women is a condition that needs an adequate attention and a proper diagnosis protocol, in order to take into account the study of detrusor contractility. A significant post-void residual urine can be associated with an impaired detrusor contraction.

Key-words: urinary retention, post-void residual urine, uroflowmetry, pressure-flow study

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Introduction And Objectives

Incomplete or complete (acute or chronic) urinary retention, is an encountered disorder that can affect women. In everyday practice it is very important to think about this condition, in spite of difficulties in the diagnosis, because unidentified and/or untreated, can lead to urinary tract damage, compromising the patient's life.

Previously urinary retention in women has often been considered to be due to neurologic or psychogenic disorder⁽¹⁾. In spite of extensive investigations sometimes the causes of urinary retention may remain unknown⁽²⁾.

Female's urinary retention can be idiopathic or induced by multiple causes classified in bladder dysfunctions or outlet obstructions followed by LUTS, predominant voiding ones⁽¹⁾.

Bladder dysfunctions like striated sphincter dyssynergia, acontractile or underactive detrusor, overactive detrusor, can be caused by neuro-urological disorders like spinal cord injury, lesions and diseases of the peripheral and/or central nervous system.^(3,4)

Outlet obstruction can be caused by pelvic organ prolapse, malignancy, iatrogenic (post-stress urinary incontinence surgery), bladder neck obstruction, urethral stenosis, urethral diverticulum, caruncle, foreign body, periurethral abscess and others.⁽⁴⁾

In most of these cases the symptomatology develops gradually or can be unnoticed by the patient.

Urodynamic investigation are very important tools in the management of urinary retention, objectifying the (dys-) function of lower urinary tract.⁽³⁾

The aim of this paper is to highlight the place of post-void residual urine (PVR) assessment in women and identify the correlation with different urodynamical parameters in diagnosis of urinary retention.

Materials And Methods

We performed a retrospective study over a period of 3 years (January 2012-January 2015) in Mures County Hospital, Clinic of Urology. The criteria used for the selection of the cases were: the existence of lower urinary tract symptoms (voiding symptoms), post-void residual urine confirmed by abdominal ultrasound (over 50 ml) and the existence of urodynamic investigations (uroflowmetry and pressure-flow study). In this study we included 47 women with the above inclusion criteria.

The investigation protocol used in these cases consisted of:

- history (familial risk factors, presence of neurologic pathology, bowel habits, surgery, medication, associated pathology for urinary retention);
- physical examination
- micturition diary
- abdominal ultrasound included post-void residual urine evaluation
- urine analysis and bacteriological examination;
- gynecological and/or neurological examination;
- urodynamic investigations (uroflowmetry and pressure-flow study);

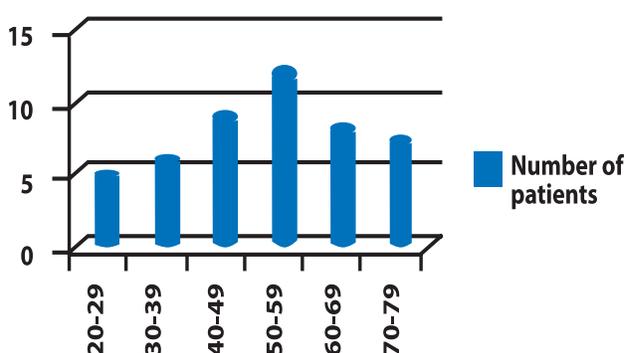
Statistical analysis was performed using the MedCalc Software, Version 12.5.0.0. Data were considered as nominal or quantitative variables. Nominal variables were characterized using frequencies. A chi-square test was used in order to compare the frequencies of nominal variables. Quantitative variables were compared using Mann-Whitney test. The correlation between quantitative variables was assessed using Spearman's rho, when appropriate. We used as dependent variable the neurogenic bladder. We included as independent variables the data for post-void residual urine, Qmax, bladder capacity. The level of statistical significance was set at $p < 0.05$.

Results

In this study we analyzed the data of 47 women with voiding urinary tract dysfunction who accomplished the inclusion criteria.

Regarding the distribution of the patients depending on age group we observed that urinary retention was predominant in the 50-59 years age group (12 cases) followed by 40-49 years (9 cases) and 60-69 years (8 cases). Young women in the 20-39 years age group totalized 19 cases. The mean age was $51,97 \pm 16,07$ (standard deviation) years old with wider extremities (20 to 78 years old). (Figure 1.)

Figure 1. Distribution of patients on age groups



Concerning the symptomatology, some of the women had no or atypically symptoms, post-void residual urine was detected after the ultrasound examination. In most of the cases patients complained about weak stream, disuria, pollakiuria, hesitancy, intermittent stream.

The mean value of post-void residual urine was 140 ml with extremities between 50 and 260 ml identified by abdominal ultrasound examination. In majority of the cases the quantity of post-void residual urine (PVR) was between 50-100 ml, in 31 cases, followed by 100-200 ml in 9 cases and PVR more than 200 ml in 7 cases (Table 1).

Table 1. Post-void residual urine after ultrasound examination

Post void residual urine (PVR)	Number of cases
< 100 ml	31
100-200	9
> 200 ml	7

In the studied group of patients we observed a normal bladder capacity in 20 cases and a high bladder capacity (more than 400 ml) in 27 cases. Concerning the relation between the existence of post void residual urine and bladder capacity we applied the Mann Whitney test which revealed a statistical significant relation $p = 0,0006$. Post void residual urine is higher in patients with high bladder capacity (more than 400 ml) comparative with patients with normal bladder capacity.

We performed uroflowmetry in all of the cases included in the study. We analyzed the curve's shape and different parameters and we found the following results. (Table 2)

Table 2: The aspect of the curves

The shape of the curve	Number of patients
Continuous symmetrical trace with extended flow time	21
Irregular trace with normal Qmax	5
Irregular trace with low Qmax	12
Intermittent trace due to straining	9

We observed a continuous and prolonged uroflowmetry curve and extended flow time, especially in obstructed cases of urethral stenosis, genital prolapse or post stress urinary incontinence surgery (TOT). In cases with irregular trace or intermittent ones due to straining we took into account a possible case of detrusor contractility dysfunction that was confirmed by pressure-flow study.

Concerning the uroflowmetry result we observed a low Maximum flow rate (Qmax) value in most of the cases (42 cases) and normal Qmax in 5 cases (the values were considered according Abrams). The normal value of time of peak flow was between 3-10 seconds in 32 cases and a delay time of peak flow (more than 10 sec.) in 15 cases. Peak flow rate (Qmax) had a low value in most of the cases (mean value of Q max was 11,70 ml/s, SD).

Following the statistical analysis we proposed to demonstrate if there is a correlation between post void residual urine and Qmax. We calculated the correlation coefficient, $r = -0,32$ and $p = 0,02$ that had a statistical significant value, so that we could conclude that a low value of Qmax can determine a higher volume of post void residual urine. (Fig.2)

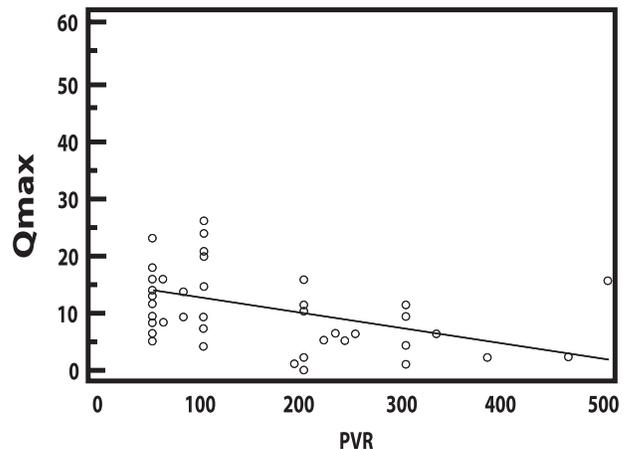


Figure 2: Correlation between RVR and Qmax

We performed pressure-flow study (PFS) in all the 47 cases of urinary retention in women, some of them with history of neurological diseases, diabetes, obstetric history, urinary incontinence surgeries, patients with genital prolapse who had indication of surgical treatment, advanced age or in cases when clinical examination and uroflowmetry were not enough to reveal a proper diagnosis. During the filling phase we didn't detect any involuntary detrusor contractions and the loss of urine was insignificant. Concerning the voiding phase of the pressure-flow study, the detrusor

pressure (Pdet) at peak flow reached a very high value in detrusor sphincter dyssynergia (the mean value of Pdet was $70,07 \pm 32,66$ SD cm H₂O), in obstructed cases, the mean value of Pdet was $64,66 \pm 33,32$ SD cm H₂O and in cases with impaired detrusor contractility the mean value was lower, (Pdet = $11,29 \pm 5,63$ SD cm H₂O).

Regarding the PFS results, 14 patients were diagnosed with detrusor sphincter dyssynergia, 25 with impaired detrusor contractility (11 with underactive and 14 with acontractile detrusor), 2 with obstruction due to genital prolapse gr III and IV, 2 with urinary retention post TOT and 4 with urethral meatus stenosis. We performed pressure-flow study in the cases with genital prolapse, urinary retention after TOT surgery or urethral stenosis to verify the detrusor pressure preoperative and exclude a detrusor contractility dysfunction.

In majority of the cases, the urodynamical result revealed that the cause of urinary retention was due to a detrusor contractility dysfunction. In young women the most frequent cause was detrusor sphincter dyssynergia. Chi-square test revealed a statistical significant relation between young women aged under 40 years old and the existence of detrusor sphincter dyssynergia (P value = 0,01) and a significant relation between the group of women over 40 years old and the diagnosis of impaired detrusor contractility (p value = 0,02).

Postvoid residual urine volume was statistical significant correlated with diagnosis of neurogenic bladder (cases with impaired detrusor contraction), $p = 0,02$ (Mann Whitney) and also in those cases, the volume of post void residual urine was significantly higher comparative with the obstructed cases. (Figure 3)

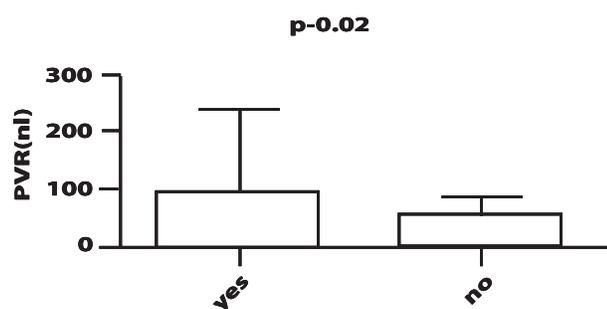


Figure 3: The relation between the diagnosis of neurogenic bladder and PVR

Also we evaluated the relation between Qmax and diagnosis of impaired detrusor contraction (according to Mann Whitney test) and the result was statistical insignificant for our cases, $p = 0,95$ ($p > 0,05$).

The treatment was established according to the

cause of urinary retention. We performed urethral dilatation (Benique) to the patients with urethral stenosis in 4 cases, we recommended self intermittent catheterization to the patients with impaired detrusor contractility in 25 cases, alpha blockers and self intermittent catheterization to the patients with detrusor sphincter dyssynergia (14 cases). In 2 cases with genital prolapse gr. III/IV a surgical treatment was recommended and in 2 cases with urinary retention caused by post-stress incontinence surgery (TOT) we performed the extraction of the tape.

Discussions

Urinary retention in women is not a common medical problem so that the management of this condition depends on the etiology.⁽⁵⁾ A proper diagnosis was established following the diagnosis protocol of the EAU Guidelines.⁽³⁾

In our study, urinary retention was predominant in the 6th decade of age.

Regarding the symptomatology in some of the cases, women related the presence of weak or intermittent stream, dysuria, hesitancy, but in some of them, they didn't relate typical symptoms and a volume of post void residual urine was detected during a transabdominal ultrasound.

PVR can be a consequence of bladder outlet obstruction and/or impaired detrusor function.^(3,6,7) Concerning the quantity of PVR between 50-100 ml, we found it predominant in the obstructed cases (urethral stenosis, genital prolapse or after incontinence surgery). High quantity of PVR, over 200 ml, was found most in cases with detrusor sphincter dyssynergia or impaired detrusor contraction (17 cases).

Clinical examination, micturition diary, abdominal ultrasound with the full bladder have an important character in evaluating the bladder capacity and decide the next steps of the investigational protocol.^(3,7)

Uroflowmetry was performed to all of the patients included in the study. In most of the cases Qmax had a low value. Uroflowmetry curve in patients with outlet obstruction was in most of the cases prolonged with extended flow time or had an irregular shape with normal or low Qmax. In neurological dysfunctions the curve was often intermittent and asymmetric frequently due to the abdominal straining or irregular with normal or low Qmax. We considered that the type of the curve has an important value in the decision of performing pressure flow-study. In some of the cases the value of Qmax was normal due to the abdominal

pressure used by the patient during the micturition. In most of the cases, the value of Qmax was not enough to establish a proper diagnosis, so that the analysis of voiding phase during pressure-flow study was mandatory in those situations.

Pressure-flow study was performed in all the cases selected for this study. Degeneration of muscle cells and axons can be a cause of impaired detrusor contractility in the aging detrusor⁽⁸⁾. However, Smith (2010) concluded that an age-related degradation in detrusor contractility as a primary contributor to impaired bladder emptying remain to be elucidated⁽⁹⁾. In this group of patients, the mean age was $51,97 \pm 16,07$ (standard deviation) years old with extremities between 20 and 78. In our study, we observed that the urinary retention due to the decrease of detrusor contractility is related with the increasing age compared with young women, where the detrusor sphincter dyssynergia was the predominant cause.

Concerning the relation between PVR and urodynamic parameters we observed that PVR is higher in patients with high bladder capacity comparative with the cases with normal one, also there is a correlation between low Qmax value and the quantity of PVR (a decreased Qmax was correlated with an increased PVR). Also the existence of PVR was significant related with the neurogenic bladder diagnosis ($p = 0,02$)

Even if a low value of Qmax doesn't translate a neurogenic bladder diagnosis ($p = 0,95$), the existence of PVR can be associated with this condition ($p = 0,02$).

Conclusions

Urinary retention in women is a condition that needs an adequate attention and a proper diagnosis protocol, in order to study the detrusor contractility dysfunction. A significant PVR can be associated with this condition.

In some of the cases a low value of Qmax can be insufficient to differentiate a diagnosis of obstruction by a detrusor contractility dysfunction so that, for a proper diagnosis the pressure-flow study is a valuable investigation.

The treatment was initiated according to the cause of urinary retention.

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