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Do symptoms of voiding dysfunction predict urinary retention?

Amos O. ADELOWO, MD, MPH^{1,2}, Michele R. HACKER, ScD, MSPH^{2,3}, Anna MERPORT MODEST, MPH³, and Eman A. ELKADRY, MD^{1,2}

¹Department of Obstetrics and Gynecology, Division of Urogynecology, Mount Auburn Hospital, Cambridge, MA

²Department of Obstetrics, Gynecology and Reproductive Biology, Harvard Medical School, Boston, MA

³Department of Obstetrics and Gynecology, Beth Israel Deaconess Medical Center, Boston, MA

Abstract

Objectives—We assessed the relationship between symptoms of voiding dysfunction and elevated post void urinary residual (PVR).

Methods—Cross-sectional study of women presenting for initial evaluation from February through July 2011. Charts were reviewed for demographics, voiding dysfunction symptoms, and examination findings. Urinary retention was defined as PVR ≥ 100cc. Data are presented as median (interquartile range) or proportion; test characteristics are reported with 95% confidence intervals.

Results—Of 641 eligible women, 57 (8.9%) had urinary retention. Of these, 32 (56.1%) had at least one symptom of voiding dysfunction, most commonly sensation of incomplete emptying (30.1%). Sensitivity and positive predictive values of voiding dysfunction symptoms were low. Of 254 women reporting voiding symptoms, most (87.5%) had PVR < 100 and were significantly more likely to have other pelvic floor symptoms and findings.

Conclusions—Patient symptoms do not predict urinary retention. PVR should be measured and other causes of voiding dysfunction symptoms should be considered.

Keywords

Incomplete bladder emptying; Post void residual; Urinary retention; Voiding dysfunction

INTRODUCTION

Urinary retention is the inability to achieve complete bladder emptying by voluntary micturition and can be acute or chronic [1]. It is an infrequently diagnosed urologic condition, especially in women, and is mostly described in small case series or case reports. Prevalence estimates of urinary retention range from 3% to 29%. This wide variation in reported prevalence has been attributed to the lack of standard diagnostic definitions for the evaluation of women with urinary retention [2]. This lack of uniformity translates into a

Corresponding Author: Amos Adelowo MD, MPH, Boston Urogynecology Associates, Mount Auburn Hospital, 725 Concord Avenue, Suite #1200, Cambridge, MA 02138, Tel: 617-354-5452; Fax: 617-354-0458, aadelowo@mah.harvard.edu.

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heterogeneous population of women diagnosed with urinary retention and makes etiology and treatment outcomes harder to assess.

The causes of urinary retention in women can be broadly categorized as infectious, pharmacological, neurological, anatomical, myopathic and functional [3]. Voiding requires a synergistic bladder contraction and outlet relaxation, with sustained detrusor contraction to achieve complete bladder emptying. Therefore, urinary retention may be a consequence of one or more of the following: reduced bladder contractility, poorly sustained detrusor contraction, an anatomically obstructed outlet, impaired outlet relaxation or impaired neurological coordination of the voiding process [1].

Dysfunction in voiding can manifest as symptoms such as poor urinary stream, intermittent flow, terminal and post-micturition dribbling, as well as the need to strain, change voiding position or double void [4]. Acute urinary retention presents as a sudden, painful bladder distension, which requires emergency intervention. Chronic urinary retention, however, may cause indolent, non-painful bladder distension, leading to urinary dribbling, frequent urination or slow, interrupted voiding. In addition to frequency, nocturia can become problematic due to functionally decreased bladder capacity [1]. Aside from the quality of life implications, urinary retention may lead to impaired upper urinary tract function in the presence of chronic excessive bladder pressures. Other risks of incomplete bladder emptying include recurrent urinary tract infections and bladder calculi, which are usually related to urine stagnation.

Clinically, urinary retention can be quantified by a high post void residual volume. While there is no standard for what constitutes a clinically significant post void residual volume, some studies have shown that the majority of people appear to empty the bladder, such that usually less than 50 to 100cc are retained [5]. Some proposed definitions include absolute volumes, proportion of bladder capacity retained or simply the presence of relevant symptoms.

The baseline evaluation of voiding dysfunction in the office setting involves the measurement of post void urine volume with or without urine flow rate (uroflowmetry). While other complex modalities such as pressure flow and video urodynamic studies are available, they are not routinely used for evaluation [6]. Urine post void residual can be measured easily, by catheterization or by bladder scanner, and is a representation of the integrated function of the bladder and urethral sphincter.

Given the symptomatic consequences and potential medical implications of urinary retention, it remains necessary to rule out elevated post void residual in patients who complain of voiding dysfunction symptoms, such as incomplete emptying, straining to void, slow or intermittent/interrupted urine stream, and urine dribbling or double voiding. However, it has been our clinical experience that many women who are objectively found to have urinary retention do not necessarily experience any of these symptoms. Additionally, in our experience, many women who do report symptoms of voiding dysfunction have a normal post void residual volume.

There are very few published studies evaluating whether women with objectively measured urinary retention experience symptoms of dysfunctional voiding. The objectives of this study are to 1) assess the association between patient-reported symptoms of dysfunctional voiding and the objective finding of urinary retention as measured by post void residual volume and 2) investigate whether symptoms of dysfunctional voiding, in the absence of urinary retention, are associated with other clinical symptoms or physical exam findings.

MATERIALS AND METHODS

After IRB approval, we conducted a cross-sectional study of women presenting for initial evaluation at our urogynecology practice from February through July 2011. Women were excluded if they had a cystectomy or needed a catheter, either intermittent self catheterization or an indwelling foley catheter. Women also were excluded if they underwent surgery for urinary incontinence in the previous six months or if they did not have a documented post void residual measurement in their office chart.

As part of our initial evaluation, all patients were asked to complete the pelvic floor distress inventory questionnaire (PFDI-20), pelvic floor impact questionnaire short form (PFIQ-12) and the pelvic organ prolapse/urinary incontinence sexual function questionnaire (PISQ-12). Additional questions in the new patient intake forms include “Do you ever have trouble emptying your bladder? Do you ever push to empty your bladder completely? Is your urine stream continuous or stops and start, strong, weak, or variable? Do you dribble urine after going to the bathroom? Do you feel your pelvic organs falling out? Do you feel anything bulging out of the vagina? Do you feel heaviness or pressure in the vagina? All of these questions had a “Yes”, “No” or “Sometimes” answer choices. The patients also completed a medical and surgical history form. At the beginning of their visit, all patients provided a urine sample, and post void residual was measured within 10 minutes of voiding using a bladder ultrasound scanner (Verathon mobile BVI6400 model, Bothell, WA). Along with the standard physical exam including pelvic organ prolapse quantification, additional assessment of pelvic floor muscles for myofascial tenderness and short, tight pelvic floor was performed by palpation of the levator ani muscles.

The primary exposure of interest was the presence of at least one symptom of voiding dysfunction as reported by patients on the questionnaire completed at the initial evaluation. The symptoms of interest were the sensation of incomplete bladder emptying, slow urine stream, straining to void and urine dribbling or double voiding. Urinary retention was defined as post void residual ≥ 100 cc.

Descriptive statistics are reported as mean with standard deviation, median with interquartile range or proportion and 95% confidence interval (CI) based on data type and distribution. Comparisons were made using a Chi-square or Fisher's exact test for categorical variables and parametric or non-parametric tests for continuous variables, as appropriate. Using post void residual as the gold standard we assessed whether the presence of one or more obstructive voiding symptoms was associated with urinary retention by calculating sensitivity, specificity and predictive values, as well as 95% CIs.

Log-binomial regression was used to calculate the risk ratio (RR) and 95% CI for the association between voiding dysfunction symptoms and urinary retention, as well as to evaluate whether other symptoms and clinical findings were associated with obstructive voiding symptoms among women without urinary retention. Variables that were hypothesized to influence voiding dysfunction symptoms and post void residual were considered potential confounders. Statistical analyses were conducted using Statistical Analysis System (SAS 9.3; SAS Institute, Cary, North Carolina). All tests were two sided and P values <0.05 were considered statistically significant.

RESULTS

There were 653 initial evaluations during the study period. Twelve women did not meet eligibility criteria and were excluded: 1 woman had a history of cystectomy with ileal loop diversion, 3 women were performing intermittent self catheterization, 3 women had an indwelling foley catheter for previously diagnosed urinary retention and 5 women did not

have a documented post void residual. The median age of the remaining 641 women was 55.1 years (42.7–67.3). The majority of women were postmenopausal (57.9%) and sexually active (58.2%) and 43.8% had prior gynecologic surgery. Participant characteristics are shown in Table 1a. Among the study cohort, 254 (39.6%) women reported at least one symptom of urinary voiding dysfunction, the most common of which was incomplete emptying (30.1%). The most common clinical symptoms and physical examination findings were incontinence (65.8%), prolapse (60.5%) and urinary urgency (65.4%). Patient-reported symptoms and examination findings are shown in Table 1b.

The median post void residual was 17.0 cc (0.0–50.0), with a range of 0 – 750cc. Fifty-seven (8.9%, 95% CI: 6.8–11.4) women met our post void residual criteria for urinary retention. Of these women, only 32 (56.1%) reported symptoms of voiding dysfunction. Among them, 84.4% reported incomplete emptying, 71.9% straining to void, 34.4% dribbling or double voiding, and 15.6% a slow urine stream. Women who reported at least one symptom of voiding dysfunction were 2.0 (95% CI: 1.2–3.4) times as likely to have urinary retention compared with women without voiding dysfunction symptoms. Adjusting for age, body mass index, parity and menopausal status as potential confounders did not appreciably alter the risk ratio.

Among the 57 women with urinary retention, only 1 (1.8%) was on an anticholinergic medication, 2 (3.5%) had prior anterior repair, 13 (22.8%) had a previous hysterectomy and 6 (10.5%) had a previous incontinence procedure. Constipation was reported by 20 (35.1%) women, dyspareunia by 9 (15.8%), urinary urgency by 37 (64.9%) and urine incontinence by 38 (66.7%). On exam, twenty (35.1%) women were found to have a short, tight pelvic floor, and 12 (21.1%) had an anterior prolapse of stage 2 or greater.

When compared with post void residual-defined urinary retention, sensitivity and positive predictive values of voiding dysfunction symptoms were low (Table 2). The presence of at least one symptom of voiding dysfunction had a sensitivity of 56.1% (95% CI: 43.3–69.1%), specificity of 62.0% (95% CI: 58.1–65.9%), positive predictive value of 12.6% (95% CI: 8.5–16.7%) and negative predictive value of 93.5% (95% CI: 91.1–96.0%). The sensitivity of each symptom alone was lower, ranging from 8.8% for slow urine stream to 47.4% for sensation of incomplete emptying. In contrast, the specificities of each symptom were higher than that the 62.0% observed for at least one symptom. The positive predictive values were all below 23.0% and each negative predictive value exceeded 91.0%.

Of the 254 women who reported symptoms of voiding dysfunction, the majority (87.4%) did not have retention. However, many of the 222 women without retention had additional clinical symptoms or findings on pelvic examination. Thus, we evaluated whether these other symptoms and findings were associated with symptoms of voiding dysfunction among the 584 women without urinary retention.

Constipation, prolapse, incontinence, presence of a short tight pelvis and urinary urgency, but not dyspareunia or history of prior gynecologic surgery, were independently associated with reporting at least one symptom of voiding dysfunction among women without urinary retention as evidenced by the crude risk ratios and 95% CIs in Table 3. Including the independently associated symptoms and findings in the model simultaneously did not meaningfully alter the risk ratios. The strongest association was observed for urinary urgency; women who reported urgency were nearly twice as likely to report symptoms of voiding dysfunction (adjusted RR: 1.8, 95% CI: 1.4–2.4) than women without urinary urgency. With each increase in prolapse stage, the risk of self-reported voiding dysfunction symptoms increased by 20% (adjusted RR: 1.20, 95% CI: 1.1–1.3). Neither age nor body

mass index had an effect on these associations when evaluated as potential confounders. Both the crude and fully adjusted risk ratios are reported in Table 3.

DISCUSSION

Our results confirm previous reports and clinical observations that patient reported symptoms of voiding dysfunction do not predict urinary retention based on an elevated post void residual. In our patient population almost half of women with urinary retention as defined by an elevated post void residual reported no voiding dysfunction symptoms. Conversely, the majority of women with symptoms of voiding dysfunction had a normal post void residual. There are several potential explanations for these findings. For example, voiding symptoms in the absence of retention may indicate an abnormality related to other pelvic floor dysfunction, while women with true urinary retention may have some neurologic impairment that decreases their ability to feel incomplete emptying or bladder distention that has occurred over a long period of time.

In our study, subjective symptoms of voiding dysfunction were very common; 39.6% of women reported one or more symptoms of voiding dysfunction and an additional 65.8% reported urinary incontinence and 65.4% reported urinary urgency. The fact that women were directly asked about voiding symptoms on a questionnaire may explain the high incidence of reported voiding dysfunction.

Although women who reported at least one symptom of voiding dysfunction were twice as likely to have urinary retention compared with women without such symptoms, only a small fraction (12.6%) of women who reported symptoms had objective evidence of urinary retention. The most common symptom among patients with voiding dysfunction symptoms was the sensation of incomplete bladder emptying. However, the median residual urinary volume in women with this symptom was only 19.0 (IQR 0.0–49.0). In addition, the presence of one or more symptoms of voiding dysfunction showed a general trend towards low sensitivity and positive predictive values in predicting objectively measured retention. Thus, presence of one or more of these symptoms should not be deemed indicative of urinary retention. In patients with symptoms of incomplete bladder emptying, the most common diagnosis was urinary urgency with urinary incontinence and the most common physical exam finding was the presence of short tight pelvic floor on digital palpation.

Our findings are consistent with other published studies. Groutz et al found that 62% of women attending a urogynecology clinic complained of voiding difficulty, including urinary hesitancy, straining to void, weak stream, intermittent stream, double voiding or incomplete emptying, and yet only 21% had urodynamic evidence of voiding difficulty, of which most was related to impaired bladder contractility [7]. Additionally, Al-Shahrani et al found that subjective symptoms of voiding dysfunction were not predictive of objectively measured post void residual urine volume in their cross-sectional study of 134 patients [6].

Although voiding dysfunction symptoms do not predict objectively measured urinary retention, these symptoms are still disruptive of patient quality of life and may indicate another underlying pelvic floor disorder. Therefore, it is important to evaluate for the presence of concurrent clinical symptoms such as constipation, prolapse and urinary incontinence and urgency, as these were shown in our study to be associated with patient-reported symptoms of voiding dysfunction. Concurrent symptoms may be partially attributable to the same underlying pelvic floor dysfunction or potentially contributing to the symptoms of voiding dysfunction. Our data shows that women with voiding dysfunction symptoms in the absence of urinary retention based on post void residual were significantly more likely to have short, tight pelvic floor and pelvic organ prolapse compared with women

without symptoms. It is possible that pelvic muscle dysfunction as well as support defects contribute to many of the symptoms women reported.

Given these findings, our assessment of women with voiding dysfunction should include assessment of their pelvic muscle function and tenderness in addition to measuring support defects. This evaluation may aid in targeted management that will address the pelvic floor, including pelvic floor physical therapy and myofascial release. It is also possible that treatment of concurrent symptoms, such as constipation and prolapse, may alleviate voiding dysfunction symptoms, although the roles of these interventions need to be further investigated.

There are some limitations associated with our study, including its retrospective design and the fact that post void residual was assessed only once. Studies have shown variability in post void residual measurements. Griffiths et al found significant variability in post void residual measurement depending on the time of day with the greatest residual volumes occurring in the morning [8]. Our choice of a cutoff of 100cc for post void residual is consistent with definitions used in other studies as well as in our own clinical practice.

The strength of this study is the number of patients evaluated. In addition, we minimized the potential for bias as patients completed the symptom questionnaire prior to the measurement of their post void residual, and both questionnaires and post void residuals were completed before the encounter with a physician.

Given our findings, post void residual should be routinely performed on initial evaluation as well as in women presenting with new onset of voiding dysfunction symptoms or frequency, urgency or incontinence. Areas of future study include further delineating causes of voiding dysfunction in the absence of retention and identifying potential risk factors for women who may go on to develop true urinary retention. The potential role of pelvic floor and muscular disorders in pelvic symptoms should be explored as this may contribute to a better understanding of optimal treatment strategies.

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Table 1a

Population Demographics

Characteristic	Patients (N = 641)
Age (years) – median (IQR)	55.1 (42.7–67.3)
Body mass index (kg/m²) – median (IQR)	25.9 (23.0–30.2)
Parity – median (IQR)	2 (0–3)
Race/Ethnicity – n(%)	
Caucasian	536 (83.6)
Black/African American	10 (1.6)
Hispanic	13 (2.0)
Other	24 (3.7)
No response	58 (9.1)
Tobacco use – n(%)	
Yes	48 (7.5)
No	593 (92.5)
Sexually active – n(%)	
Yes	373 (58.2)
No	268 (41.8)
Post-menopausal – n(%)	
Yes	371 (57.9)
No	270 (42.1)
Anticholinergic – n(%)	
Yes	44 (6.9)
No	597 (93.1)
Vaginal estrogen – n(%)	
Yes	42 (6.6)
No	599 (93.5)
Prior gynecologic surgery – n(%)	281 (43.8)
Hysterectomy	126 (44.8)
Anterior repair	18 (6.4)
Sling	48 (17.1)

Table 1b

Patient-reported symptoms and physical examination findings

Symptom	Full cohort* n=641
Symptoms of urinary dysfunction – n (%)	254 (39.6%)
Incomplete emptying	193 (30.1)
Straining to void	125 (19.5)
Slow urine stream	22 (3.4)
Dribbling or double voiding	95 (14.8)
Other reported clinical symptoms and examination findings – n (%)	
Incontinence	422 (65.8)
Urinary urgency	419 (65.4)
Dyspareunia	100 (15.6)
Constipation	213 (33.2)
Prolapse on exam	388 (60.5)
Short, tight pelvic floor on exam	271 (42.3)

* Percents do not add up to 100% because women may have had more than one symptom or exam findings.

Table 2

Test characteristics of symptoms for elevated post void residual

	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)
One or more symptoms	56.1% (43.3%–69.1%)	62.0% (58.1%–65.9%)	12.6% (8.5%–16.7%)	93.5% (91.1%–96.0%)
Incomplete emptying	47.4% (34.4%–60.3%)	71.6% (67.9%–75.2%)	14.0% (9.1%–18.9%)	93.3% (91.0%–95.6%)
Straining to void	40.4% (27.6%–53.1%)	82.5% (79.5%–85.6%)	18.4% (11.6%–25.2%)	93.4% (91.3%–95.6%)
Slow urine stream	8.8% (1.4%–16.1%)	97.1% (95.7%–98.5%)	22.7% (5.2%–40.2%)	91.6% (89.4%–93.8%)
Dribbling or double voiding	19.3% (9.1%–29.5%)	85.6% (82.8%–88.5%)	11.6% (5.1%–18.0%)	91.6% (89.3%–93.9%)

Table 3

Relative risk of at least one voiding dysfunction symptom among women without retention as defined by post void residual

Clinical Findings	Crude Relative Risk (95%CI)	Adjusted Relative Risk* (95% CI)
Urgency	2.0 (1.5–2.6)	1.8 (1.4–2.4)
Incontinence	1.5 (1.2–1.9)	1.2 (0.95–1.5)
Constipation	1.5 (1.2–1.9)	1.4 (1.2–1.7)
Short, tight pelvic floor	1.3 (1.1–1.6)	1.3 (1.1–1.6)
Prolapse stage	1.2 (1.1–1.3)	1.2 (1.1–1.3)
Dyspareunia	1.0 (0.76–1.3)	--
History of gynecologic surgery	1.1 (0.86–1.3)	--

* Adjusted for constipation, prolapse stage, incontinence, urgency and short, tight pelvic floor