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Practical urodynamics

Male lower urinary tract symptoms: The role of urodynamics☆

CME Credits

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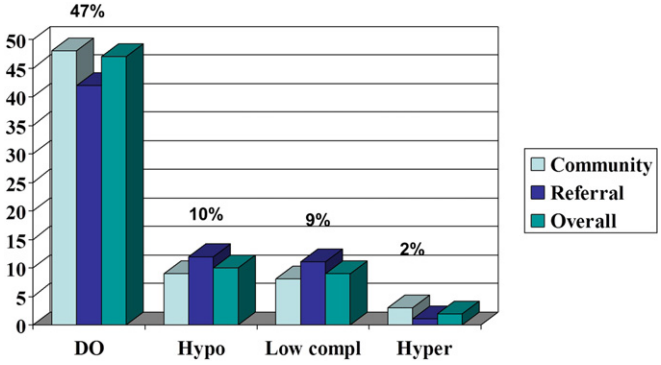
1. Introduction

For nearly the entire 20th century, it was believed that lower urinary tract (LUT) symptoms (LUTS) in men were caused by benign prostatic hyperplasia (BPH) which, in turn, caused benign prostatic obstruction (BPO) and that BPH and BPO were synonymous. It is now known that the pathophysiology of LUTS is multifactorial, and that only about two-thirds of men with LUTS have BPO according to urodynamic criteria.[1–4] LUTS are empirically divided into storage and emptying symptoms. Storage symptoms include urinary frequency, urgency, urge incontinence, nocturia, and bladder/urethral pain. Emptying symptoms are comprised of hesitancy, straining to void, a weak stream, a feeling of incomplete bladder emptying, and urinary retention. Regardless of the symptoms, though, the underlying pathophysiology is limited to five conditions: 1) bladder outlet obstruction (BOO), 2) impaired detrusor contractility (IDC), 3) detrusor overactivity (DO), 4) low bladder compliance (LBC), and 5) sensory urgency (SU).[1–4] Further, several studies demonstrated a lack of correlation between symptoms and urodynamic data.[5–8] Accordingly, the only means of assessing the pathophysiology is by urodynamics. Determining the urodynamic abnormalities responsible for LUTS is important so that treatment can be directed at the underlying pathophysiology.

2. Urodynamic techniques

From a clinical standpoint, the purpose of urodynamic testing is to measure and record various physiologic variables while the patient is experiencing those symptoms which constitute his usual complaints. In this context, urodynamics may be considered to be a provocative test of LUT function. Thus, it is the responsibility of the examiner to ensure that the patient's symptoms are, in fact, reproduced during the study. To this end, it is important that the examiner has all relevant clinical information in his/her consciousness as the urodynamic study progresses. Prior to the

Table 1A
Urodynamic diagnosis during bladder filling in unselected men with lower urinary tract symptoms (LUTS) comparing community to referral practice. DO, detrusor overactivity; Hypo, hyposensitive bladder (capacity > 750 mL); Low compl, low bladder compliance (< 20 mL/cmH_20); Hyper, hypersensitive bladder (bladder capacity < 150 mL) (with permission from Fusco et al. *J Urol* 2001;166:910-3).



Abbreviations: BPH, benign prostatic hyperplasia; BOO, bladder outlet obstruction; BOOI, bladder outlet obstruction index; BPO, benign prostatic obstruction; DO, detrusor overactivity; EMG, electromyogram; FSF, first sensation of filling; IDC, impaired detrusor contractility; IPSS, International Prostate Symptom Score; LBC, low bladder compliance; LUT, lower urinary tract; LUTS, lower urinary tract symptoms; OAB, overactive bladder; pabd, abdominal pressure measured via a rectal catheter; pdet, detrusor pressure – the electronic subtraction of pabd from pves; PdetQmax, detrusor pressure at maximum flow; PFS, pressure-flow study; pves, vesical pressure measured via a transurethral catheter; PVR, post-voided residual volume; Qmax, maximum or peak flow; SU, sensory urgency; TURP, transurethral resection of the prostate; USG, ultrasonography.

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☆ There are 2 CME questions based on this article.

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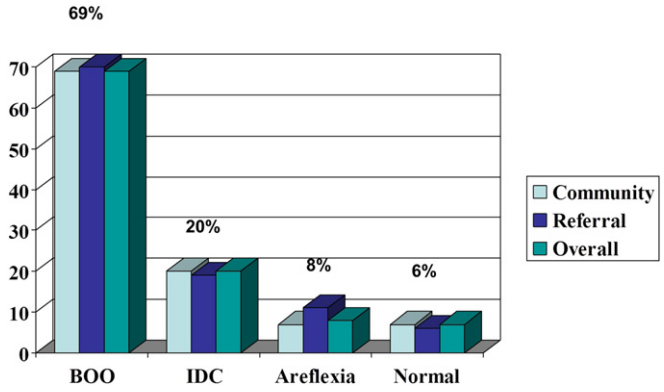
Table 1B
Urodynamic diagnosis during voiding in unselected men with LUTS comparing community to referral practice. BOO, bladder outlet obstruction; IDC, impaired detrusor contractility; Areflexia, acontractile bladder (with permission from Fusco et al. *J Urol* 2001;166:910-3).



study, the patient should have undergone a fairly extensive evaluation including: 1) focused history and physical examination, 2) urinalysis +/- culture, 3) bladder diary, 4) pad test (for patients with incontinence), 5) uroflow, and 6) post-voiding residual (PVR) urine. In order to interpret urodynamic studies properly, the following

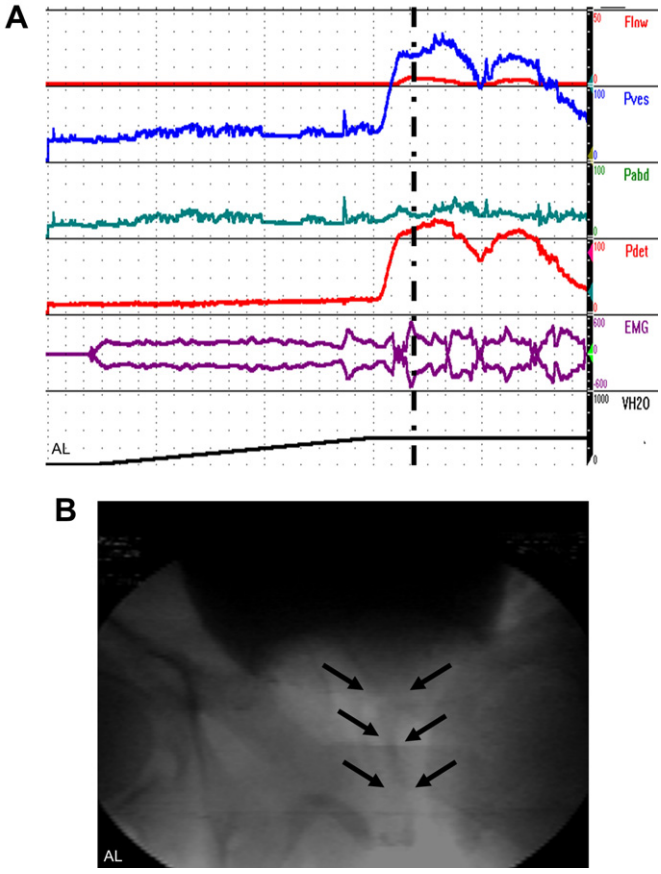


Fig. 1. Schaefer grade 5 prostatic obstruction in a 63-year-old man who developed urinary retention and was treated with an indwelling catheter and tamsulosin for 5 days, at which time this urodynamic study was conducted. A. Urodynamic tracing. At a bladder volume of approximately 400 mL, he had a voluntary detrusor contraction. Qmax = 5 mL/s, Pdet@Qmax = 117 cmH_2O (vertical line), BOOI = 107; voided volume = 215 mL, post-void residual = 174 mL. This corresponds to grade 5 obstruction on the Schafer nomogram. B. X-ray obtained at Qmax (vertical line, Fig. 10A) reveals the prostatic urethra to be elongated and barely visible. He underwent KTP laser ablation of the prostate and his AUA symptom score was 6 one year postoperatively.

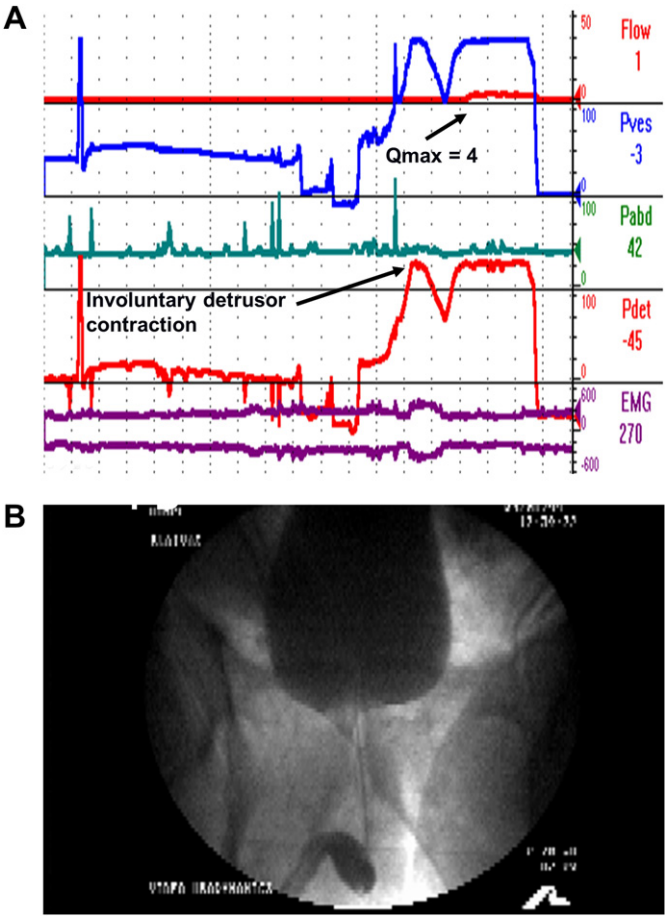


Fig. 2. Schafer grade 6 obstruction and type 3 overactive bladder (OAB) in a 56-year-old man with a 10-year history of severe OAB and obstructive symptoms treated with doxazocin and finasteride. AUASS = 27. A. Urodynamic tracing. He had an involuntary detrusor contraction at a bladder volume of 175 mL and was able to temporarily prevent incontinence by contracting his sphincter, but was unable to abort the detrusor contraction and finally voided involuntarily with a sustained detrusor contraction. Pdet@Qmax = 135 cmH_20; Q max = 4 mL/s. BOOI = 127. The sudden fall in vesical pressure (pves) and a negative detrusor pressure at maximum flow (pdet) were artifacts caused by the catheter moving into the urethra. It was replaced, and the pressure recording was accurate again. B. X-ray obtained at Qmax showing a diffusely narrowed prostatic urethra. He underwent a suprapubic prostatectomy (350 g prostate), and his urinary frequency decreased from 18 to eight voids per day, his urgency subsided, maximum voided volume increased from 120 to 240 mL, Qmax increased from 4 to 17 mL/s, and the post-void residual decreased from 68 to 8 mL.

information should be available to the examiner before the start of the study:

1) What symptoms are you trying to reproduce?;
2) What is the functional bladder capacity (maximum voided volume on the voiding diary)?;
3) What is the PVR urine?;
4) What is the uroflow?; and
5) Is there a neurologic disorder that could be causing the neurogenic bladder?

To evaluate male LUTS (excluding stress incontinence), urodynamics is comprised of the following procedures: cystometry, uroflow, sphincter electromyography (EMG), pressure/flow, and radiographic visualization of the LUT. Each may be performed alone or synchronously with one another. When done synchronously, it is called multichannel urodynamics; when performed with fluoroscopic visualization of the LUT, it is called videourodynamics. As a general rule, uroflow and PVR are usually