Adult Urodynamics

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1. Introduction

Urodynamics (UDS), is an interactive diagnostic study of the lower urinary tract composed of a number of tests that can be used to obtain functional information about urine storage and emptying .[1] It can be considered either a study of human functional physiology and/or the search for the source of lower urinary bother brought to the clinic by the patient.[1,2] It is the clinician's responsibility to assess the degree to which these two elements must each be assessed in the interest of the patient's well-being. This section provides an overview of urodynamic testing in its capacity to help clinicians obtain diagnostic information and provide management recommendations to minimize patient morbidity/mortality and provide effective relief of LUT bother.

The physiology of "normal bladder control" includes the following elements:

- As renal output fills the bladder, the continent human is able to store urine in the bladder under low pressure and without symptoms,
- Progressive recognition of increasing bladder volume,
- Socially appropriate decision-making on the timing and circumstances of bladder emptying.
- Voluntarily transition from urine storage to voiding.
- Ability of the urinary sphincter to relax and the bladder to generate sufficient intravesical pressure to void to near-completion without bother,
- Resumption of asymptomatic urine storage.

This idealized cycle does not always represent the lower urinary tract (LUT) function in daily life. For example, older adults often have asymptomatic postvoid residual volumes (PVRs) that could be considered pathologic under other circumstances (youth, presence of symptoms). The sensation of urgency to void can often be influenced by situational factors (the sound of running water, proximity to the toilet). Adults may seek medical evaluation and treatment when their perceived function differs from their expectation of "normal," or when deviations from expected LUT function cross a threshold of bother. Recognition of the subtle differences between "textbook" function and the experience of the patient who presents for evaluation of lower urinary tract bother is the first step in providing safe, effective, and efficient care.

The objective of any *invasive urodynamic evaluation* is to augment information obtained by clinical history and office examination, with the goal of a more complete understanding of the origins of the individual patient's symptoms and/or dysfunction. Yet, a variety of factors can preclude an unbiased assessment of the patient's physiology and experience. The typical urodynamic examination provides volume, pressure, and perception data about a limited number of filling/voiding cycles obtained under artificial conditions in the awake and sentient patient of diverse backgrounds. Thus, *at best,* correctly conducted urodynamic evaluations can only provide **quasi-objective data** which must be **interpreted** by the skilled urodynamicist in order to provide clinical utility within the context of that patient's complaints.

2. Keywords

Urodynamic study, lower urinary tract, diagnostic evaluation

3. Definitions

Urodynamics encompasses a number of individual tests and components.[1] Common UDS components and their descriptions are presented in **Table 1.**

Table 1. Common UDS Components and Descriptions

UDS Component/test	Description
Post-void residual (PVR)	The volume of urine left in the bladder at the completion of micturition. This can be measured by ultrasound or catheterization.
Uroflowmetry	The measurement of the rate of urine flow over time.
Cystometry	The method by which the pressure/volume relationship of the bladder is measured during bladder filling. Measurements obtained during cystometry include bladder sensations, compliance, bladder capacity and the presence or absence of detrusor overactivity (DO).
Electromyography (EMG)	The study of the electronic potentials produced by the depolarization of muscle membranes. In most UDS tests, EMG measurement of the striated sphincteric muscles of the perineum is done to evaluate possible abnormalities of perineal muscle function that are often associated with lower urinary tract symptoms and dysfunction.
Pressure flow studies (PFS)	Allows measurement of the relationship between pressure in the bladder and urine flow rate during bladder emptying.
Videourodynamic studies (VUDS)	The addition of simultaneous imaging (usually fluoroscopy) during cystometry and/or PFS.
Abdominal leak point pressure (ALPP) or Valsalva leak point pressure (VLPP)	A measurement of urethral function or outlet competence and is the intravesical pressure at which urine leakage occurs due to increased abdominal pressure in the absence of a detrusor contraction.

Urethral pressure profile	A continuous pressure measurement of the urethra from the bladder neck to the urethral meatus.
Maximum urethral closure pressure (MUCP)	The maximum difference between the urethral pressure and the intravesical pressure.

4. Indications for Performing UDS

The AUA and SUFU published evidence-based guidelines for the use of UDS in adults[1] and further guidance is provided by the International Consultation on Incontinence.[2,3] According to these organizations, urodynamic studies can be of benefit to **those in whom information beyond that obtained by a history, physical examination and basic tests is necessary in order to make an accurate diagnosis and direct therapeutic decisions, those whose LUT condition may have the potential to cause deleterious and irreversible effects on the upper urinary tracts, or to confirm and/or understand the effects of interventional techniques or investigate the reason for failure of a treatment.**

It is important to note that significant functional and anatomic abnormalities may be present even in the absence of bothersome symptoms, particularly in patients with neurologic disease.

In clinical practice, the utilization of UDS is highly provider-dependent. In most circumstances, the experienced urologist can offer conservative or empiric, non-invasive treatments without the need for urodynamic testing. Many types of urodynamic testing require urethral catheterization and include cystometry and pressure flow studies (PFS) with or without urethral pressure profile (UPP) and video/fluoroscopy (ie videourodynamics, VUDS). Such testing subjects patients to the risks of urethral instrumentation including infection, urethral trauma, anxiety, pain, and in the case of VUDS, exposure to radiation. Thus, the clinician must determine whether urodynamic tests offer additional diagnostic benefit beyond symptom assessment, physical examination and other less invasive diagnostic testing. Uroflowmetry and ultrasound post-void residual (PVR) may be appropriate non-invasive tests given the clinical scenario and the options for treatment. UDS is not recommended for the initial workup and management of the uncomplicated patient with bothersome LUTS. Whether such testing can improve outcomes with any intervention, including specific surgical procedures, or may improve overall surgical outcomes in uncomplicated patients is not clear.[4,5] In more complex individuals with LUTS, there may be a role for various types of UDS testing in order to exclude complicating factors and potentially guide therapy.

5. Pre-Test Considerations

5.1 Clinical indication

It is essential that, prior to proceeding with an invasive UDS study, the clinician has a clear question and indication for performing the test as well as an intention to utilize information obtained to guide therapy.[1] In order to do this, the clinician should obtain a detailed urologic history, perform an appropriate physical examination, and consider obtaining frequency/volume charts, and any other information to identify clinical relevant findings during the UDS study.[6] Conducting a comprehensive evaluation prior to UDS testing can allow the clinician to enhance the relevance and reliability of the study findings. For example, a patient's bladder diary capacity can be correlated to the cystometric capacity obtained during the study. These capacities should be plausibly similar to appropriately reproduce the patient's symptoms.[7]

5.2 Type of Study

The UDS study and equipment used should be tailored to answer the clinical question and should be interpreted in the context of the patient's history and presentation.[1] For example, in the patient with vaginal prolapse, if the reported symptoms of SUI are not recreated during the study, it may need to be repeated with a pessary in place.

In deciding when to perform a VUDS over a UDS study, the clinician should consider whether obtaining simultaneous fluoroscopic images would improve the ability to detect and understand the underlying pathologic abnormalities, such as specific sites of obstruction, presence and grade of VUR, and anatomic abnormalities of the bladder.[7]

Certain urodynamic measurements such as EMG and urethral pressure profile studies may not be necessary for every study and should be measured only if they provide valuable and so far unavailable information in the evaluation of that patient's condition.

5.3 Safety

In general, multichannel or complex UDS is a safe procedure, although invasive by nature because of the urethral/bladder catheterization required. AUA guidelines do not recommend antimicrobial prophylaxis prior to UDS in healthy adults in the absence of infectious signs or symptoms.[8] Antibiotic prophylaxis (single dose of trimethoprim-sulfamethoxazole is preferred) is recommended for UDS according to the AUA/SUFU Best practice policy for certain *non-index* patients, particularly those who have been determined to be at greater risk of symptomatic infection or greater risk from consequences of symptomatic infection.[9] The Best practice policy further recommends that all patients undergo screening for a UTI prior to UDS with a discussion of symptoms and a dipstick urine analysis. If UTI is suspected, the UDS should be postponed until treatment has been completed. Specific patients who are recommended to receive peri-procedure antibiotics include those with neurogenic lower urinary tract dysfunction, elevated PVR, asymptomatic bacteriuria, immunosuppression, age over 70, an indwelling catheter, external urinary collection device, or on clean intermittent catheterization (CIC) as well as those who have undergone recent joint replacement or have a history of joint infection.[9]

Several other safety considerations must be addressed. Latex allergy must also be assessed, and it is likely best practice to avoid use of latex gloves and/or study catheters. Attention to proper patient positioning is important, as many patients may have physical limitations impacting mobilization and balance. Vasovagal response or syncope may occur in some patients; recognition and implementing corrective measures (i.e. lying the patient down to improve cerebral blood flow) can often treat the symptoms. In select patients with cervical or thoracic level spinal cord injuries (i.e. at or above T6), autonomic dysreflexia (AD) can be a life-threatening syndrome of imbalanced reflex sympathetic discharge.[10] AD is provoked by bladder and bowel distension and even catheterization. When AD is identified a quick response is required. An highly practical overview of the pathophysiology, prevention, and management can be found in the **Neurogenic Lower Urinary Tract Dysfunction Core Curriculum**. Finally, when fluoroscopy is used during UDS (i.e. videourodynamics), appropriate radiation protection and shielding are necessary.[11]

6. Performing the Study

Proper set-up for the UDS study is critical for quality assurance and for meaningful study results. The urodynamicist must be able to troubleshoot when difficulties arise. Scarpero[10] and Schafer[12] provide excellent overviews of set-up and study protocols to ensure high quality urodynamic studies.

6.1 Equipment

The International Continence Society (ICS) has outlined recommended minimum requirements for the equipment for UDS.[12,13] In general, multichannel UDS requires: multiple measurement channels (two for pressure and one for flow); a continuous display of measurements and signals over time; and a method of storage for the measurement values. Infused and voided volumes should also be recorded. A method for noting and recording events during the study should also be available. Currently, most UDS studies are performed with the use of a dedicated machine that includes a computer terminal and monitor to capture and record measurements and values.

6.1.1 Videourodynamics/Fluoroscopy

VUDS involves the use of a radiographic contrast solution for bladder instillation and fluoroscopic equipment to take static and video images during the study.[11] To minimize fluoroscopy time and radiation exposure, selected images are obtained only during points of interest, such as: scout imaging, early fill, during Valsalva/cough testing, during detrusor overactivity, during voiding, and after voiding. Total time should ideally be well less than one minute. Features of modern C-arm equipment permit high-quality single shot images captured in just a fraction of a second of fluoroscopy time, allowing more points of assessment throughout the study with a considerable decrease in radiation exposure.

6.1.2 Catheter Types

A number of different catheter types are available for performing urodynamic studies and can vary by the type of infused agent (i.e. fluid, air), the location of pressure transducer (i.e. micro-tip transducer catheters vs. external transducer), shape of the catheter (i.e. straight or coude-tip) and size and number of lumens (e.g. multiple, single lumen vs. double lumen catheters). Historically, external transducers connected to fluid-filled tubing and catheters have been most commonly used and represent the basis for urodynamics standards and measurements.[10,12,14] However, newly purchased systems typically default to air-charged systems, which may improve ease of set up but may be subject to variations from historic standards.[15,16] A double lumen urethral catheter is preferred.

7. Interpretation of UDS tests and key parameters

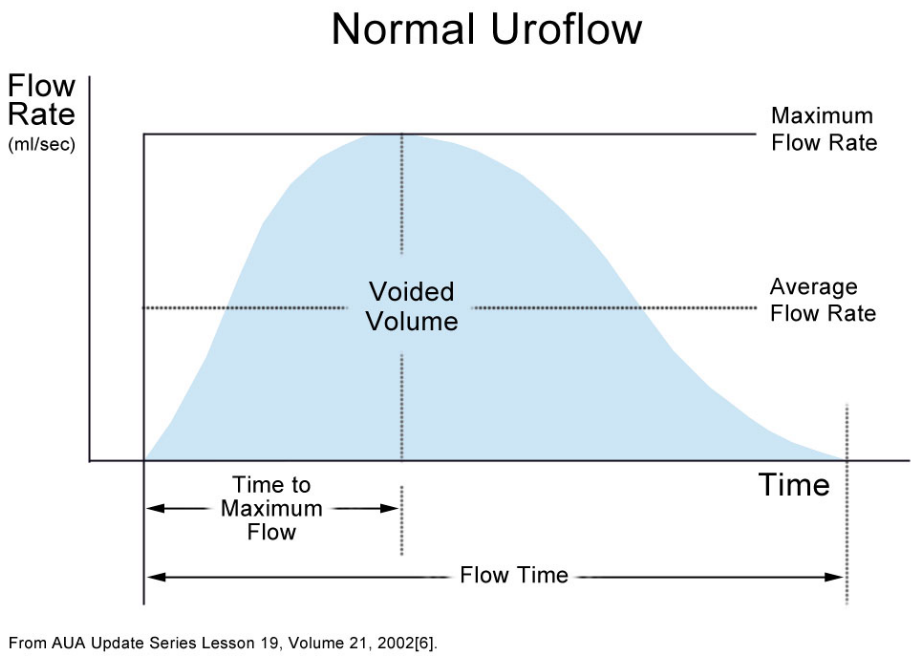


Figure 1: Graph of Normal Uroflow from AUA Update Series Lesson 19, Volume 21, 2002

The interpretation of urodynamic studies is nuanced and requires expertise. It has been shown that when contextual presence is removed, many urologists have difficulty consistently interpreting readings from other centers or even their own units.[17] Pathologic findings, normal physiologic reactions and test artifacts can become confused.[18]

It is important to recognize that under the artificial setting of urodynamics testing, certain findings such as DO or SUI may not be elicited even in the symptomatic patient. Thus, the findings should be interpreted in the overall context of that patient's workup, including history, physical exam, pad weight testing, diaries, etc.

7.1 Uroflowmetry

Uroflowmetry or uroflow is performed with the patient voiding spontaneously into a calibrated recording device. Important parameters to assess with uroflow include maximum flow rate (Qmax) measured in milliliters per second; voided volume; the flow curve or pattern (tracing); and the post-void residual volume. A minimum volume of 150 ml is generally accepted as the cut-off for interpretability, as volumes less than this are associated with measuring imprecision.[19] The flow curve tracing should be evaluated for continuity or intermittency and overall shape. A normal flow curve is a continuous, bell-shaped smooth curve with rapidly increasing flow rate and a similarly rapid flow diminishment (**Figure 1**). An important limitation of uroflowmetry is that one cannot distinguish between urinary obstruction (e.g. bladder outlet obstruction) and bladder dysfunction (e.g. detrusor hypocontractility) based on uroflow parameters alone. Pressure-flow studies (**discussed below**) are needed differentiate these conditions.

7.2 Filling Cystometry

UDS is generally divided into 2 phases: bladder filling, which assesses the storage phase of the micturition cycle, and bladder emptying, which assesses the voiding phase of the micturition cycle. Cystometry generally implies measurement of the filling phase; pressure-flow studies (PFS) record the voiding phase. During cystometry, intravesical pressure (i.e. Pves) and abdominal pressure (i.e. Pabd) are simultaneously recorded with bladder and intrarectal or intravaginal transducers, respectively; detrusor pressure (i.e. Pdet) is the difference between intravesical and abdominal pressures.

Key parameters to measure during cystometry include:

- *bladder sensation* (recorded as the bladder volume at which the patient reports first desire to void, normal desire to void, strong desire to void, urgency, and pain, if applicable)
- *bladder capacity* (maximum cystometric capacity)
- *bladder compliance* (measured as the change in volume over change in pressure)
- *detrusor overactivity* (i.e. the presence of uninhibited detrusor contractions with or without leak)
- *stress urinary incontinence*

Continence is often assessed during the filling phase with provocative maneuvers, such as vigorous coughing and straining, to determine leak point pressures (**discussed below**). *Detrusor leak point pressure* is a specific value that represents the lowest value of the detrusor pressure at which leakage is observed *in the absence of increased abdominal pressure or a detrusor contraction*.[20] It is invariably associated with neurogenic bladder conditions and, when elevated above 40 cm of water, is predictive of renal deterioration.[21,22]

7.3 Studies of Urethral Function

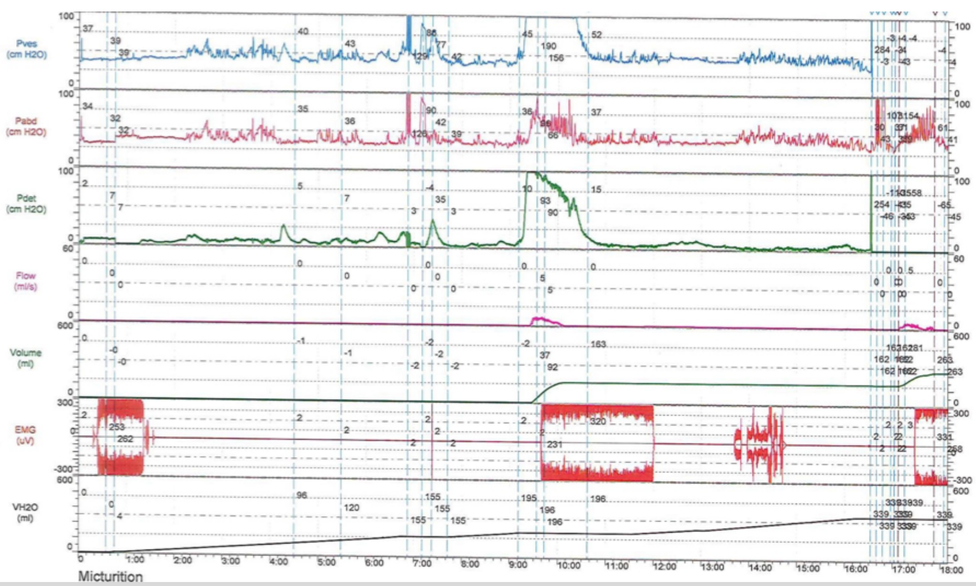


Figure 2: Bladder Outlet Obstruction – note high pressure, low-flow voiding (mid figure). The Pves catheter was removed at the end of the study (far right, Pves to 0 cmH2O) in an effort to capture uninstrumented voiding in the context of incomplete

emptying.

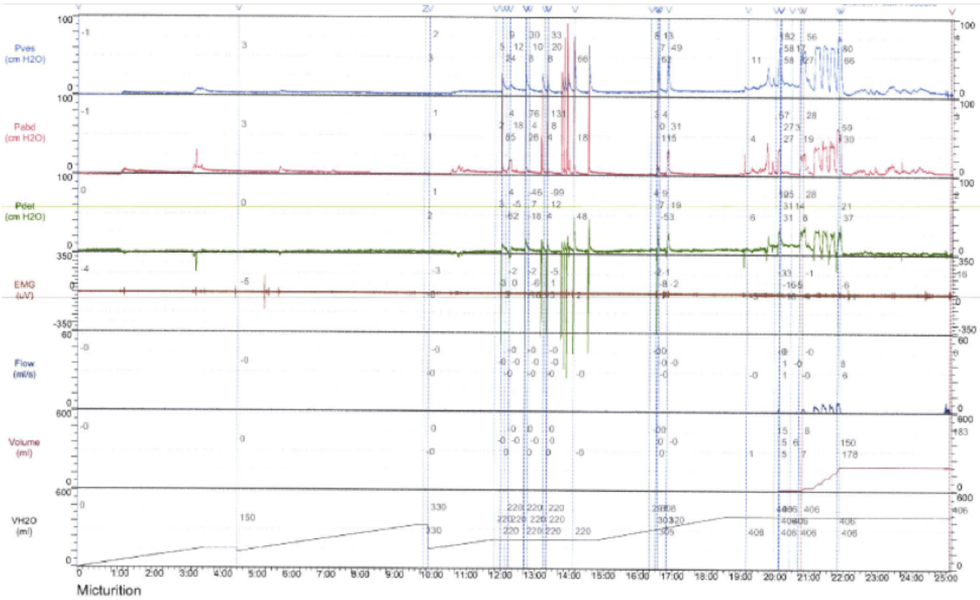


Figure 3: Detrusor Underactivity – note Valsalva voiding, limited appreciable detrusor contraction, and intermittent, low flow

Urethral function is assessed urodynamically by measuring bladder pressures during provocative maneuvers testing for urinary incontinence (i.e. coughing and straining) and/or through separate studies of urethral profilometry, usually during filling cystometry. Valsalva or abdominal leak point pressure (ALPP) represents the lowest value of the intentionally increased intravesical pressure (rise above baseline Pves) that provokes urinary leakage in the absence of a detrusor contraction. [20] Low ALPP implies poor urethral function, while an elevated ALPP implies the persistence of some urethral function. Distinction of low and high ALPP may have a role in determining the type of anti-incontinence treatment offered.[21] An ALPP of less than 60 cm of water classically defines the presence of intrinsic sphincter deficiency (ISD), although the clinical utility of this definition is uncertain (**discussed below**).

Urethral profilometry involves the use of a specialized urethral catheter to record pressure measurements along the course of the urethra.[12,23] While a number of parameters can be recorded, the maximum urethral closure pressure (MUCP), i.e. the maximum difference between the urethral and intravesical pressures,[20] is the most widely used.

7.4 Pressure-flow Studies

Bladder emptying is assessed during the voiding phase with pressure-flow studies. During PFS, simultaneous measurements of uroflowmetry and bladder pressures are recorded, allowing the assessment of the interaction of the bladder, bladder outlet, pelvic floor and urethra during voiding. Relevant measurements during PFS include those from uroflowmetry (i.e. Qmax, voided volume, and PVR) in addition to those related to bladder contractility: detrusor pressure at maximum flow (Pdet at Qmax) and maximum detrusor pressure (max Pdet).

Onset of voiding may be rapid or delayed, and several patterns of voiding may emerge, including detrusor contraction, detrusor contraction plus Valsalva, Valsalva-only, or “pelvic relaxation”, typically represented by flow in the absence of appreciable detrusor contraction or Valsalva effort.[24] Detrusor function during voiding may be described as normal, diminished (detrusor underactivity), or absent (acontractile) but should be interpreted in the context of flow (supra-normal, normal, or low), clinical symptoms, and whether the study effectively reproduced clinical symptoms.[20]

A convenient nomenclature for important parameters determined during multi-channel UDS is the 8 “Cs**” (Table 2**).[21]

Urodynamically, urinary obstruction is defined by the relationship between uroflow and bladder contractility:[21,25] elevated voiding pressures and diminished uroflow are the hallmark of bladder outflow obstruction (**Figure 2**). Diminished pressures and low flow imply detrusor underactivity, although obstruction cannot be fully ruled-out (**Figure 3**). Normal detrusor pressures during voiding are between 40 and 60cm of water for men and between 10 and 30cm of water for women, however these pressures have been shown to decrease with age.[26] Based on normative values, several nomograms have been proposed to define bladder outlet obstruction, although most of these are validated only in men.[25]

Compliance is defined as change in volume divided by change in pressure, and has important implications in assessing the risk of retention or obstruction to the upper tracts. It can be challenging to properly calculate true bladder compliance in the patient with severe DO and thus low volumes or severe ISD.

Table 2: “Eight Cs”: a convenient mnemonic for important parameters to assess during multichannel urodynamics.

Filling cystometry
Contractions (involuntary bladder)
Compliance
Continence
Capacity
Conscious sensation
Pressure-flow studies
Contractility
Complete Emptying
Clinical Obstruction
* *From AUA Update Series Lesson 20, Volume 21, 2002*[21]

7.5 Electromyography (EMG)

Electromyography (EMG) is used to assess the coordination of the external urethral sphincter and detrusor function. Either with surface patch electrodes placed on the perineum overlying the external striated sphincter or with needle electrodes inserted directly into the sphincter, EMG records the electrical activity of the external striated sphincter. EMG activity is expected to progressively increase during the filling phase, as part of the normal guarding reflex. Immediately prior to initiation of voiding, EMG activity generally diminishes abruptly as the patient relaxes the sphincter. Lack of coordination of the sphincter activity immediately prior to and during voiding, manifested by increased EMG activity, implies a functional abnormality in coordination, either pathological or behavioral. *Detrusor external sphincter dyssynergia* (DESD) is diagnosed in the setting of neurologic conditions. If discoordinated sphincter activity is present in the absence of a relevant neurologic condition, it is typically referred to as “dysfunctional voiding” or “sphincteric pseudodyssynergia” and may benefit from behavioral modifications.

EMG testing is not always necessary and should be employed selectively to the patient who is likely to benefit from the additional information. It is technically challenging and non-specific and commonly contains artifacts. Thus, interpretation of the EMG requires close communication between the patient and the clinician. [1]

7.6 Fluoroscopy

Fluoroscopy adds anatomic information to the UDS evaluation.[11] During VUDS, many anatomic aspects should be assessed both during filling and voiding phases, depending on the clinical scenario, and include: contour of the bladder, especially noting any diverticula, stones, fistula or trabeculations (**Figure 4**); presence of vesicoureteral reflux and associated hydronephrosis (**Figure 5**); anatomy and function of the bladder neck and proximal urethra, which would be expected to be closed at rest and open during voiding; and urethral anatomy, noting any diverticuli, fistulae or areas of obstruction during voiding (**Figure 6** and **Figure 7**).[27]

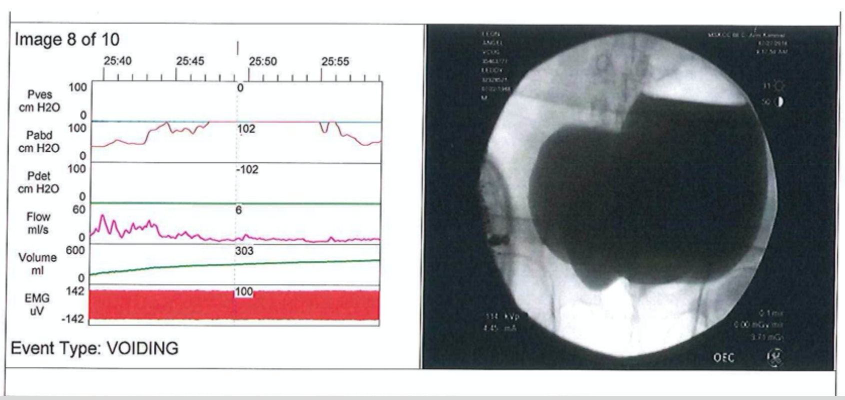


Figure 4: Bladder Diverticulum: Arrow indicates large right bladder wall diverticulum

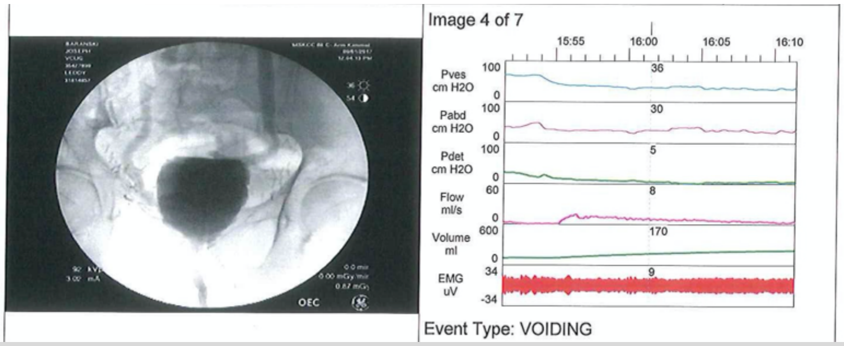
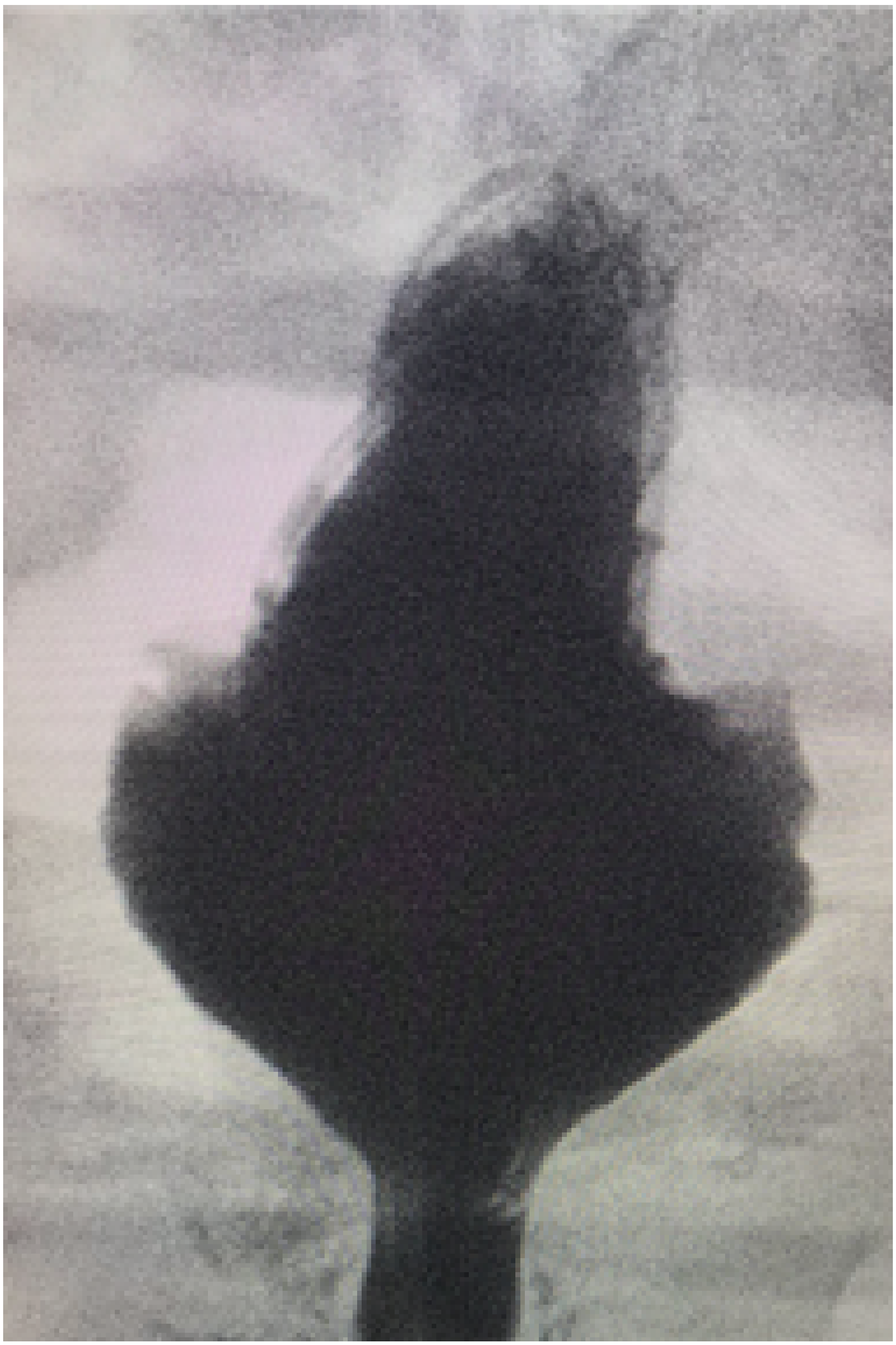


Figure 5: Bilateral ureteral reflux in bilateral re-implanted ureters



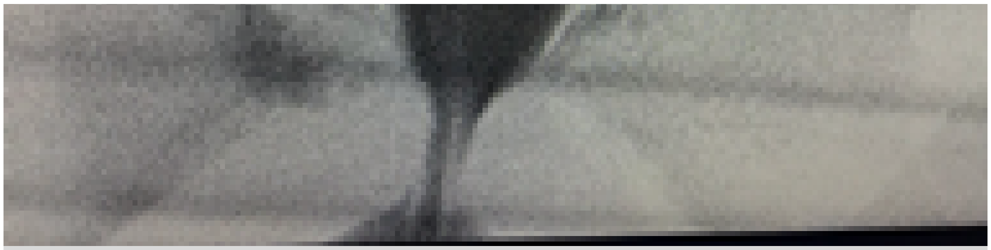


Figure 6: VUDS image demonstrating an elongated, trabeculated bladder, synergic bladder neck, dilated proximal urethra, and a dense membranous urethral stricture

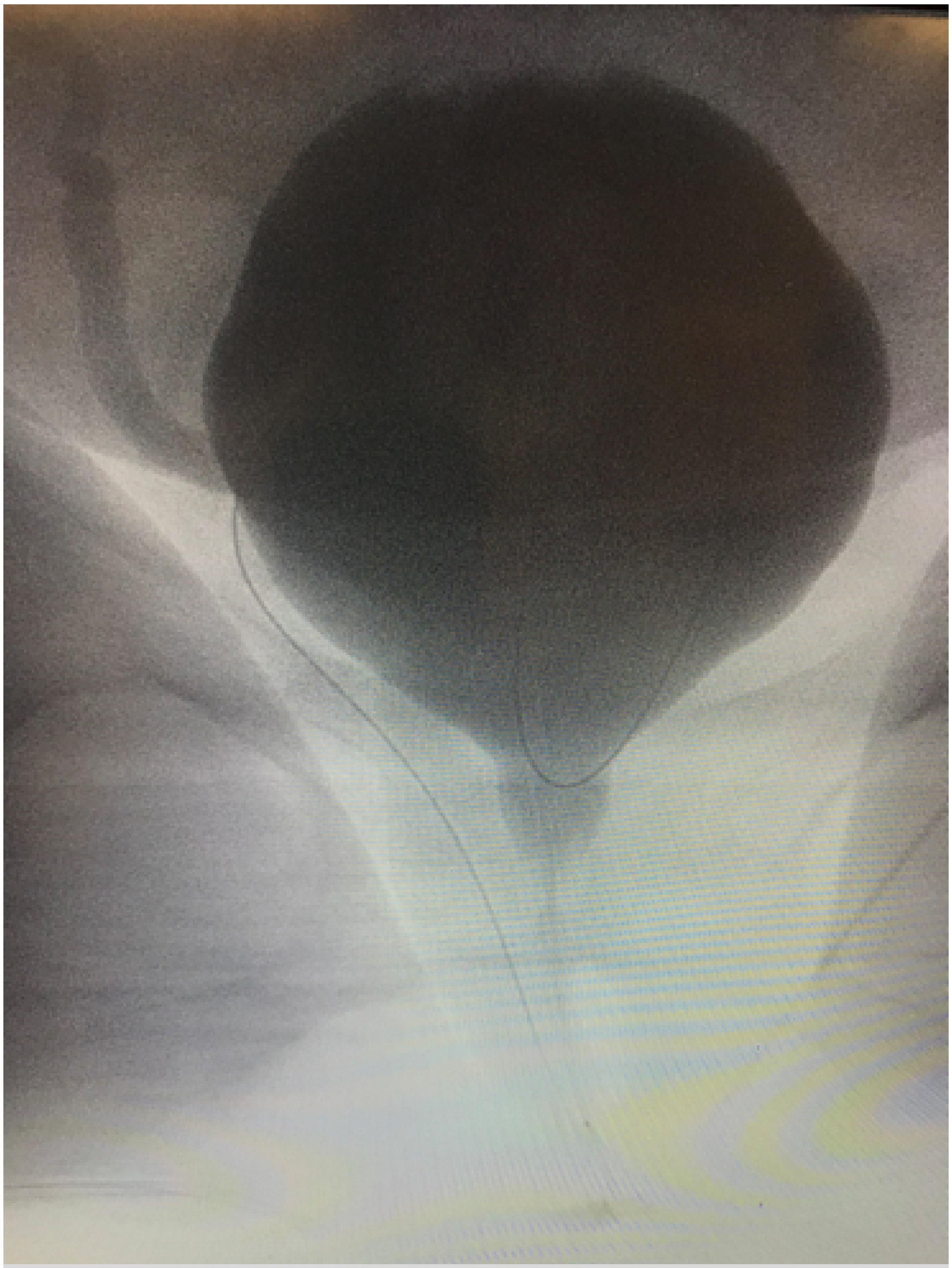


Figure 7: Image demonstrates detrusor external sphincter dyssynergia with dilated proximal urethra and bladder neck and right sided vesicoureteral reflux.

8. Clinical Utility for Specific Conditions

8.1 Female Stress Urinary Incontinence and Pelvic Organ Prolapse

See Core Curriculum **Surgery for Female SUI** and **Pelvic Organ Pelvic Organ Prolapse Evaluation and Treatment**

Current **AUA/SUFU Guidelines on SUI** suggest that urodynamics may be omitted for the evaluation of an “index patient” when SUI is clearly demonstrated. Results from recent clinical trials suggest that routine UDS in uncomplicated SUI does not improve outcomes. The VALUE trial randomized 630 women with demonstrable SUI to either UDS or office evaluation alone prior to anti-incontinence surgery and reported that 12 months outcomes were not inferior when UDS was omitted. [28] Similar results were reported in trials in Europe.[29,30] Furthermore, according to secondary analyses of RCTs evaluating SUI interventions, baseline urodynamic findings are not predictive of negative outcomes.[31,32] In non-index patients, UDS may be considered as an adjunct to the evaluation of incontinence or obstruction. (**Figure 8**).[33]

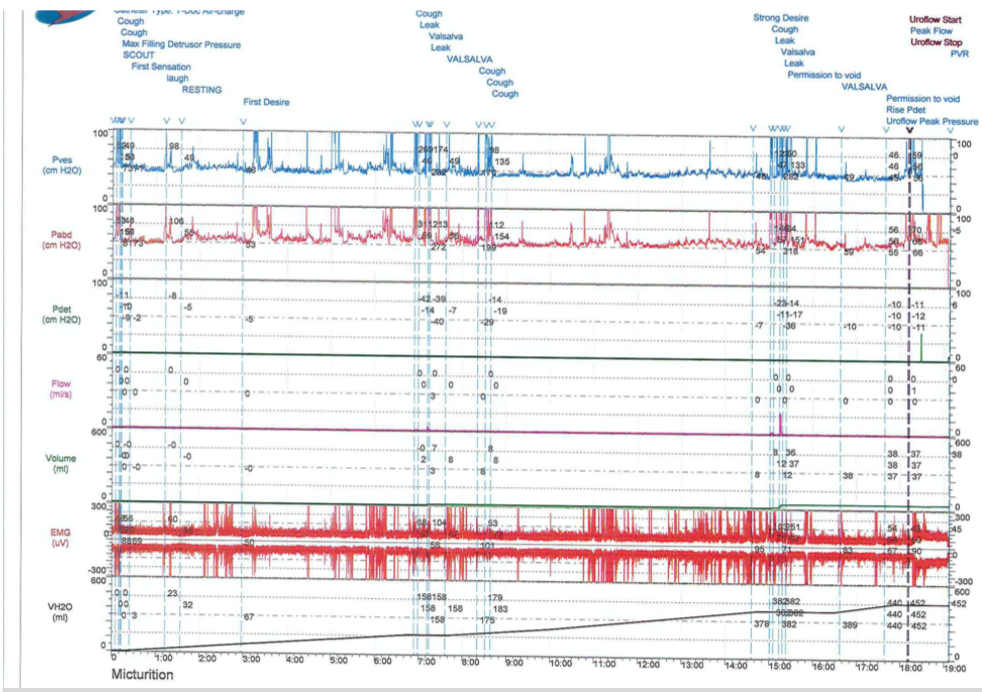


Figure 8: Stress Urinary Incontinence: Leak with valsalva at 158cc and 382cc

8.2 Intrinsic Sphincter Deficiency

Classic UDS teaching emphasized the determination of abdominal leak point pressures in order to differentiate sub-types of SUI based on minimum LPP values. SUI in the setting of low LPP is considered ISD, with proposed cut-off values of 60 cm H_2O or less.[21] The clinical utility of differentiating ISD from SUI associated with urethrovesical hypermobility has not been established.[2]

AUA guidelines for **UDS**[1] and **SUI**[34] do recommend performing a PVR assessment prior to invasive therapy for SUI, even in uncomplicated patients. Multichannel UDS remains an option prior to invasive therapies, particularly if the diagnosis is in question or the patient has other complicating features, such as prior incontinence procedures, pelvic organ prolapse, known or suggested neurogenic bladder, concomitant OAB symptoms, or any evidence of dysfunctional voiding.[34] If invasive UDS is being performed, the AUA guidelines do recommend a test of urethral function, either with valsalva or abdominal leak point pressure (VLPP/ALPP) or maximum urethral closure pressure (MUCP).[1] If SUI is not seen on UDS, removing the urethral catheter and repeating stress testing is recommended. Finally, in the setting of advance POP, reducing the POP at the time of UDS to define occult stress incontinence and detrusor dysfunction remains an option[1] and may help direct treatment.[35]

8.3 Overactive Bladder/Urge Urinary Incontinence

See Core Curriculum **Overactive Bladder: Evaluation and Treatment**

Routine use of UDS is not recommended for the initial workup and treatment of an uncomplicated patient with OAB/UUI, although for patients who fail initial first- and second-line therapies, particularly where concern for SUI, detrusor underactivity, and/or outlet obstruction (e.g. prostatic obstruction, dysfunctional voiding) exists, UDS may be considered (**Figure 9**).[36] Additionally, clinicians may perform multi-channel filling cystometry when it is important to determine if altered compliance (**Figure 10**), DO or other urodynamic abnormalities are present (or not) in patients with urgency incontinence in whom invasive, potentially morbid or irreversible treatments are considered.[1,37] Importantly, **the absence of DO on UDS in patients with UUI and mixed incontinence does not exclude it as a causative agent for their symptoms**,[1] as up to 40% of patients with UUI do not have DO on UDS.[10] 3 In patients with UUI after bladder outlet procedures, PFS may be helpful to evaluate for persistent bladder outlet obstruction versus persistent DO or SUI.[1,38]

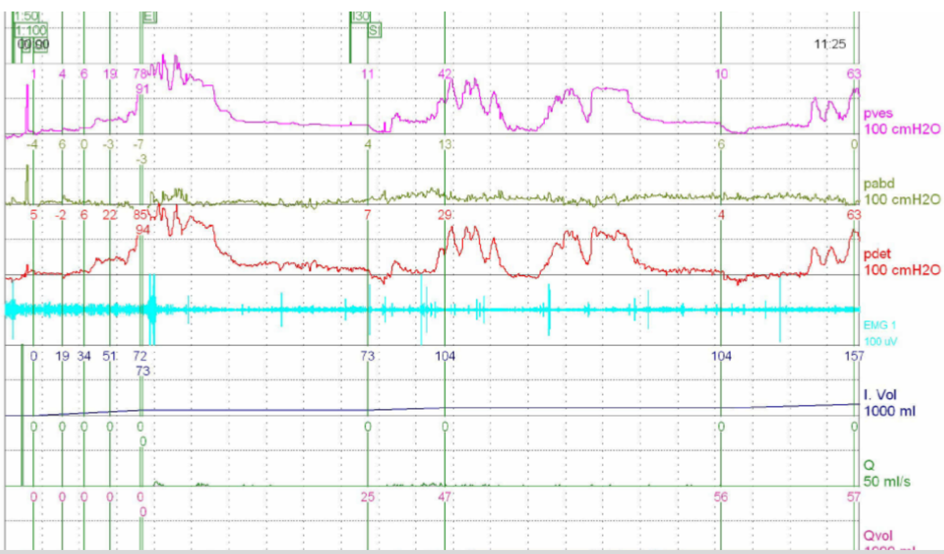


Figure 9: Detrusor overactivity with Urgency Urinary Incontinence

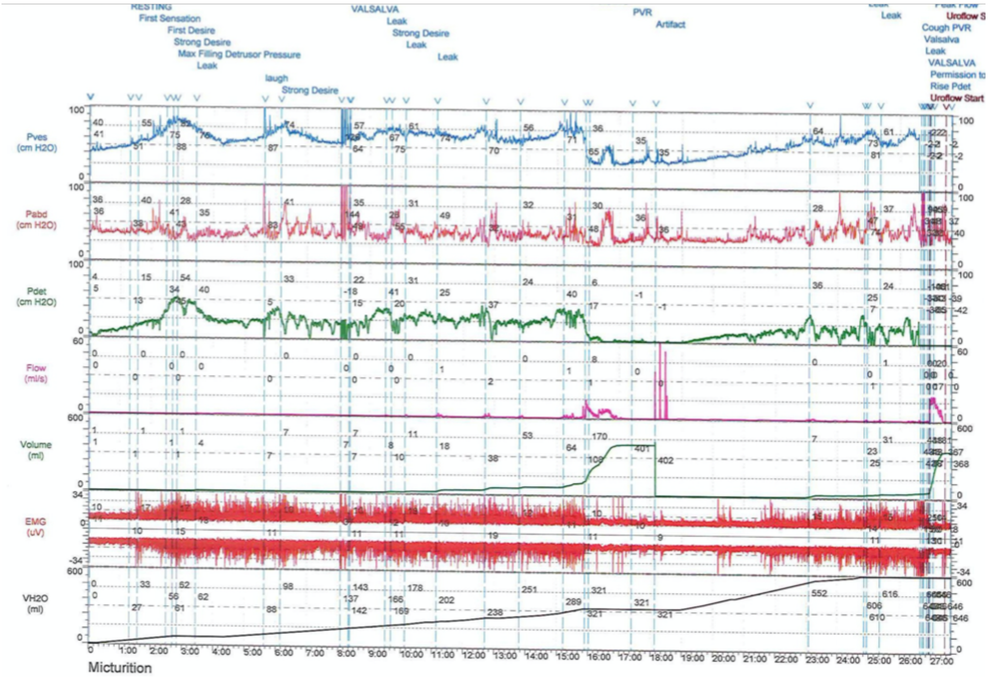


Figure 10: Altered Bladder Compliance: Sustained elevated detrusor pressure (Pdet) throughout fill

8.4 Neurogenic Bladder

See Core Curriculum **Neurogenic Lower Urinary Tract Dysfunction**

The clinical utility of UDS in the evaluation and treatment of NGB is better established than for other conditions. Indeed, in the evaluation of patients suspected of having NGB or those with relevant neurologic conditions, UDS are recommended at baseline and as part of ongoing follow-up.[1] Because there is generally poor correlation between LUTS and objective findings on UDS, patients with a symptomatically stable bladder may display pathology on urodynamic examination.[10] Failure to detect pathology may have significant ramifications, including loss of renal function. Elevated bladder pressures during urine storage, represented by detrusor pressure greater than 40 cm of H_2O, are associated with increased risk of upper urinary tract dysfunction and renal injury.[21,39]

AUA/SUFU guidelines recommend the use of PVR, complex CMG, PFS, and EMG during initial urological evaluation of patients with relevant neurological conditions (e.g., spinal cord injury and myelomeningocele) with or without symptoms and as part of ongoing follow-up when appropriate.[1] For patients with other neurologic conditions, these tests can be performed in the evaluation of LUTS. The addition of fluoroscopy (videourodynamics) is a recommended option in the evaluation of patients with known or suspected NGB as the presence of VUR and bladder trabeculations predict a higher risk of renal deterioration.

8.5 Lower Urinary Tract Symptoms

For the evaluation of LUTS in women and men, in particular, simple, non-invasive tests, such as PVR and uroflow, should be considered. The AUA guidelines suggest that PVR be used in patients with

LUTS as a safety measure to rule out significant urinary retention both initially and during follow up and uroflow in the initial and ongoing evaluation of male patients with LUTS when an abnormality of voiding/emptying is suggested. [1] Multi-channel UDS should be considered when it is important to determine if DO or other abnormalities of bladder filling/urine storage are present or if obstruction is present in patients with LUTS, particularly when invasive, potentially morbid or irreversible treatments are considered. [1]

8.6 Detrusor underactivity (Underactive Bladder)

Detrusor underactivity (urodynamic definition) is defined by the ICS as a detrusor contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or a failure to achieve complete bladder emptying within a normal time span. [20] Urodynamics may be helpful in the evaluation of patients suspected as having clinical symptoms of underactive bladder (clinical definition), as the symptoms may be very similar to those seen with bladder outlet obstruction. [40] Presently, there is no consensus on specific UDS parameters that constitute detrusor underactivity. Underactive bladder syndrome has been proposed as clinical definition to encompass signs and symptoms associated with detrusor underactivity (**Figure 4**).[41]

9. Treatment Complications

If appropriate safety considerations are followed, complications related to the urodynamics procedure are generally mild and may include discomfort during the procedure due to catheterization and bladder filling, post-procedure hematuria that is self-limited and urinary tract infection (UTI). A study of over 800 consecutive women undergoing UDS found a prevalence of UTI of 8.4% after UDS, although all patients were prescreened and pretreated as required prior to the procedure. They found that the risk of UTI increased with age ≥70, prior continence surgery and a recent diagnosis of UTI. [42]

Presentations

URODYNAMICS Presentation 1

References

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