Turkish Continence Society
ICS Recognised Urodynamics Certification Course

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ICS

Classification of urodynamic test and ICS terminology

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ICS

URODYNAMIC OBSERVATIONS

Urodynamic Techniques

✓ There are two principal methods of urodynamic investigation:

- ***Conventional urodynamic studies*** normally take place in the urodynamic laboratory and usually involve artificial bladder filling.

Artificial bladder filling is defined as filling the bladder, via a catheter, with a specified liquid at a specified rate.

- **Ambulatory urodynamic studies** are a functional test of the lower urinary tract for which a transurethral catheter is placed in the bladder (and, in some protocols, another one in the rectum as is typical for a urodynamic study) performed outside the clinical setting, involving natural bladder filling by drinking and continuous recording of the bladder pressure (Pves) for a longer period of time (eg, 12 h).

- Ambulatory urodynamics can reproduce bladder function and urine loss during the individual's normal everyday activities.

Definitions of terms for Urodynamic Tests

- **Urodynamics**

The general term to describe all the measurements that assess the function and dysfunction of the LUT by any appropriate method.

- Urodynamics allows direct assessment of LUT function by the measurement of relevant physiological parameters.

- **Invasive Urodynamics**

Any test that involves insertion of one or more catheters into the bladder and or other body cavities.

- **Non-invasive Urodynamics**

All urodynamics are done without the insertion of catheters: e.g. uroflowmetry, PVR, penile compression-release test, penile cuff, condom catheter.

ICS Standard Urodynamics Protocol

Includes: Clinical history (a valid symptom and bother score and medication list), relevant clinical exam, (3 days-) bladder diary, representative uroflowmetry with post-void residual (PVR) and a complete ICS standard urodynamic test, is referred to as having had the ‘’ICS standard urodynamics protocol (ICS-SUP)’’.

ICS Standard Urodynamic Test

Uroflowmetry and PVR plus transurethral cystometry and pressure-flow study: All performed in the patient’s preferred or most usual position; usually comfortably seated and or standing if physically possible. The patient(s) may be reported as having had an ICS standard urodynamic test (ICS-SUT)’.

ICS Supplementary Urodynamic Test

ICS-SUT may be supplemented with EMG, with imaging, with continuous urethral pressure(s) and or with urethral pressure profile measurement. Cystometry may be done via a suprapubic catheter (specify supplements).

Uroflowmetry

Uroflowmetry: Flow rate of the external urinary stream as volume per unit time in milliliters per second (ml/s).

- ICS uroflowmetry minimally reports, the maximum flow rate and the volume voided and also includes post void residual volume.

- Other characteristics, such as flow pattern (specify) and other parameters may be added.

- Uroflowmetry is a first line screening for most patients with LUTS and provides practice recommendations. ICI consultations and clinical practice guidelines have reconfirmed this.

- It is desirable to allow patients to perform uroflowmetry in their own preferred position and to strive for a minimum physical discomfort and anxiety for the patient as well as for a maximum of dignity.

Measurement of Urine Flow

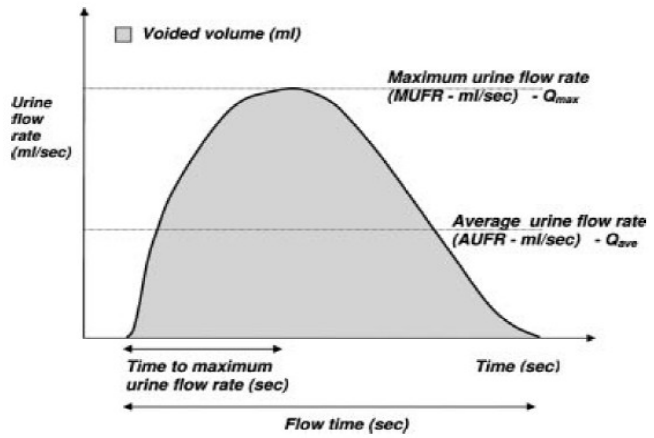
- ***Urine flow*** is defined either as continuous, that is with out interruption, or as intermittent, when an individual states that the flow stops and starts during a single visit to the bathroom in order to void.

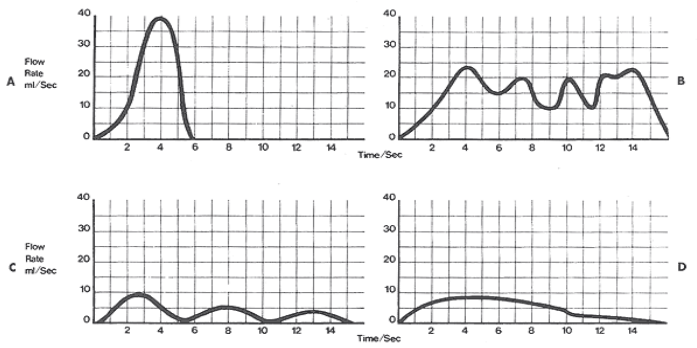
- The continuous flow curve is defined as a smooth arc shaped curve or fluctuating when there are multiple peaks during a period of continuous urine flow.

- ***Flow rate*** is defined as the volüme of fluid expelled via the urethra per unit time. It is expressed in ml/s.

- ***Voided volume*** is the total volume expelled via the urethra.

- ***Maximum flow rate*** is the maximum measured value of the flow rate correction for artefacts.





Graphic representation of various uroflow patterns. **A**, Superflow commonly seen with poor urethral resistance. **B**, Intermittent multiple-peak pattern. **C**, Intermittent interrupted pattern. **D**, Abnormal flow rate characteristic of detrusor outlet obstruction.

Post-Void Residual Volume (PVR)

- The remaining intravesical fluid volume is determined directly after completion of the voiding.

- The technique (eg, ultrasound or catheter) used to measure the volume should be specified.

- ***Voided percentage (Void%):*** The numerical description of the voiding efficacy or efficiency which is the proportion of bladder content emptied.

Calculation: [(volume voided / volume voided + PVR) *100].

- The «Void%» to be used especially in the reporting of cohorts of patients managed to evaluate (management of) voiding as additional to (changes in) voided volume and PVR.

- ***Voiding time*** is total duration of micturition, i.e. includes interruptions. When voiding is completed without interruption, voiding time is equal to flow time.

- ***Flow time*** is the time over which measurable flow actually occurs.

- ***Average flow rate*** is voided volume divided by flow time. The average flow should be interpreted with caution if flow is interrupted or there is a terminal dribble.

- ***Time to maximum flow*** is the elapsed time from onset of flow to maximum flow.

Pelvic Muscle Electromyography (EMG)

- Pelvic muscle kinetics is judged with surface electrodes.

- ICS Standard: Two skin electrodes on the perineal surface with an appropriate reference (= Pelvic muscle EMG).

- Specify: Other types e.g. vaginal probe: ‘vaginal EMG’ ‘anal EMG’ or ‘needle EMG’ etc. and or if not ICS standard: number, position and orientation of electrodes.

Filling Cystometry

- Continuous fluid filling of the bladder via a transurethral (or other route, eg, suprapubic or mitrofanoff) catheter, at least with intravesical and abdominal pressure measurement and display of detrusor pressure, including cough (stress) testing.

- Cystometry ends with "permission to void" or with incontinence of the total bladder content.

- The fluid type and temperature, filling method and rate, catheter sizes, pressure recording technique, and patient position should all be specified.

- **Cysto-Urethrometry**: A cystometry is done with continuous urethral pressure measurement (specify technique).

- *Both filling cystometry and pressure flow studies of voiding require the following measurements:*

- ✓ **Intravesical pressure** is the pressure within the bladder.

- ✓ **Abdominal pressure** is taken to be the pressure surrounding the bladder.

- ✓ In current practice it is estimated from rectal, vaginal or, less commonly from extraperitoneal pressure or a bowel stoma.

- ✓ The simultaneous measurements of abdominal pressure are essential for the interpretation of the intravesical pressure trace.

- ✓ Detrusor pressure is that component of intravesical pressure that is created by forces in the bladder wall (passive and active).

- ✓ It is estimated by subtracting abdominal pressure from intravesical pressure.

✓Filling cystometry is the method by which the pressure-volume relationship of the bladder during bladder filling.

✓It begins with the commencement of filling and ends when a "permission to void" is given by the urodynamicist or with incontinence (involuntary loss) of the bladder content.

The rate at which the bladder is filled is divided into:

✓ ***Physiological filling rate*** is defined as a filling rate less than the predicted maximum-predicted maximum body weight in kg divided by 4, expressed as ml/min.

✓ ***Non-physiological filling rate*** is defined as a filling rate greater than the predicted maximum filling rate predicted maximum body weigth in kg divided by expressed as ml/min.

Bladder Sensation During Filling Cystometry

- ***Normal bladder sensation*** can be judged by three defined points noted during filling cystometry and evaluated in relation to the bladder volume at that moment and in relation to the patient's symptomatic complaints.

- ***The first sensation of bladder filling*** is the feeling when the individual first becomes aware of bladder filling.

- ***The first desire to void*** is defined as the first feeling that the individual may wish to pass urine. The volume at which this occurs should be noted.

- ***Strong desire to void*** this is defined, during filling cystometry, as a persistent desire to void without the fear of leak.

- ***Increased bladder sensation*** is complaint that the desire to void during bladder filling occurs earlier or is more persistent to that previous experienced. This differs from urgency by the fact that micturition an be postponed despite the desire to void.

- ***Reduced bladder sensation*** is complaint that the definite desire to void occurs later to that previously experienced despite an awareness that the bladder is filling

- ***Absent bladder sensation*** means that, the individual reports no sensation of bladder filling or desire to void.

- ***Non-specific bladder sensations*** is the individual reports no specific bladder sensation, but may perceive, for example, abdominal fullness, vegetative symptoms, urethral sensations or spasticity as bladder filling awareness or a sign of bladder fullness

- ***Bladder pain***, during filling cystometry, is a self explanatory term and is an abnormal finding.

- **Urgency,** during filling cystometry, is a sudden, compelling desire to void which is difficult to defer

- ***The vesical/urethral sensory threshold***, is defined as the least current which consistently produces a sensation perceived by the subject during stimulation at the site under investigation.

Detrusor Function During Filling Cystometry

- ***Normal detrusor function:*** allows bladder filling with little or no change in pressure with filling. There are no detrusor contractions, spontaneous or provoked with activities such as postural changes, coughing or hearing the sound of running water

- ***Detrusor overactivity*** is the occurrence of detrusor contraction(s) during filling cystometry. These contractions, which may be spontaneous or provoked, produce a wave form on the cystometrogram, of variable duration and amplitude. The contractions may be phasic or terminal. They may be suppressed by the patient or uncontrollable.

There are certain patterns of detrusor overactivity:

- ***Phasic detrusor overactivity*** is defined by a characteristic wave form, and may or not lead to urinary incontinence.

- ***Terminal detrusor overactivity*** is defined as an involuntary detrusor contraction occurring near or at the maximum cystometric capacity, which cannot be suppressed, and results in incontinence or even reflex bladder emptying (reflex voiding)

- ***Detrusor overactivity incontinence*** is incontinence due to an involuntary detrusor contraction.

Detrusor overactivity may also be qualified, when possible, according to cause; for example:

- ***Neurogenic detrusor overactivity*** when there is a relevant neurological condition.

  This term replaces the term ’’detrusor hyperreflexia''.

- ***Idiopathic detrusor overactivity*** when there are no defined causes.

  This term replaces ’’detrusor instability''

Bladder Compliance During Filling Cystometry

- Bladder compliance describes the relationship between change in bladder volume and change in detrusor pressure.

- Compliance is calculated by dividing the volume change(ΔV) by the change in detrusor pressure (Δpdet) during that change in bladder volume (C=V.Δ pdet).

- It is expressed in ml/cm H20.

Bladder Capacity During Filling Cystometry

- ***Cystometric capacity*** is the bladder volume at the end of the filling cystometrogram, when ‘’permission to void’’ is usually given.
- The end point should be specified, for example, if filling is stopped when the patient has a normal desire to void.
- The cystometric capacity is the volume voided together with any residual urine.

- ***Maximum cystometric capacity***, in patients with normal sensation, is the volume at which the patient feels he/she can no longer delay micturition (has a strong desire to void).

- ***Maximum anesthetic bladder*** capacity is the volume to which the bladder can be filled under deep general or spinal anesthetic and should be qualified according to the type of anesthesia used, the speed of filling, the length of time of filling, and the pressure at which the bladder is filled.

Urethral Function During Filling Cystometry

- ***Normal urethral closure mechanism*** maintains a positive urethral closure pressure during bladder filling even in the presence of increased abdominal pressure, although it may be overcome by detrusor overactivity.

- ***Incompetent urethral closure mechanism*** is defined as one which allows leakage of urine in the absence of a detrusor contraction.

- ***Urethral relaxation incontinence*** is defined as leakage due to urethral relaxation in the absence of raised abdominal pressure or detrusor overactivity.

- ***Urodynamic stress incontinence*** is noted during filling cystometry, and is defined as the involuntary leakage of urine during increased abdominal pressure, in the absence of a detrusor contraction.

Assessment of Urethral Function During Filling Cystometry

Urethral pressure measurement

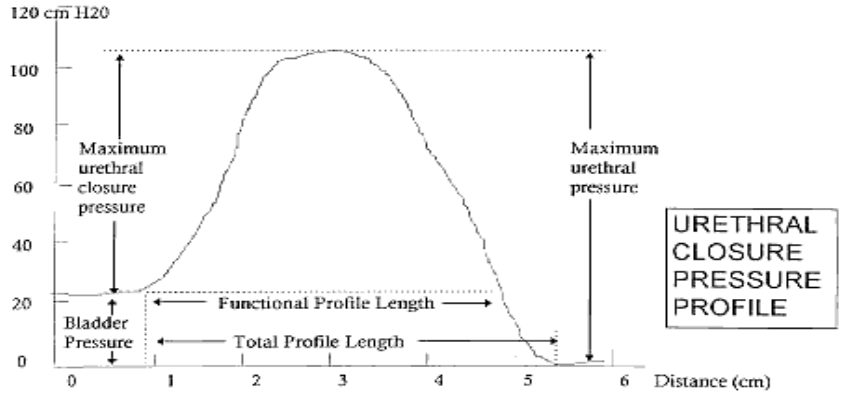
- ***Urethral pressure*** is defined as the fluid pressure needed to just open a closed urethra.

- ***The urethral pressure profile*** is a graph indicating the intraluminal pressure along the length of the urethra.

- ***The urethral closure pressure profile*** is given by the subtraction of intravesical pressure from urethral pressure.

- **Maximum urethral pressure** is the maximum pressure of the measured profile.

- ***Maximum urethral closure pressure (MUCP)*** is the maximum difference between the urethral pressure and the intravesical pressure.

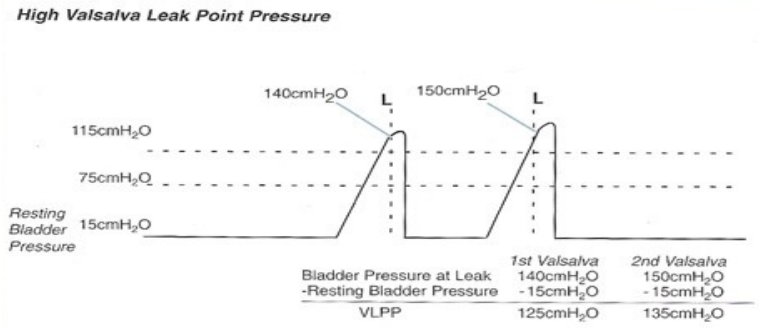


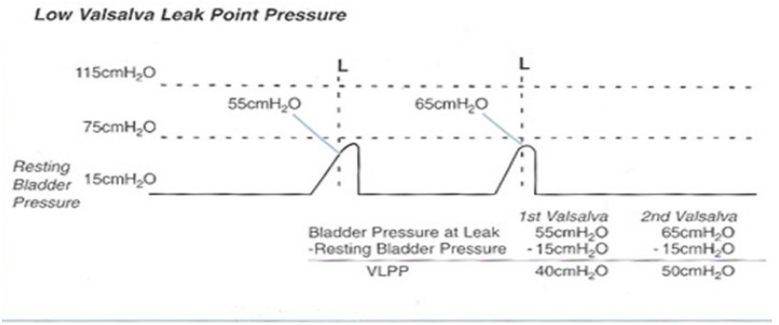
➢**Functional profile length** is the length of the urethra along which the urethral pressure exceeds intravesical pressure in women.

➢ **Pressure ‘’transmission’’ ratio** is the increment in urethral pressure on stress as a percentage of the simultaneously recorded increment in intravesical pressure.

➢**Abdominal leak point pressure** is the intravesical pressure at which urine leakage occurs due to increased abdominal pressure in the absence of a detrusor contraction.

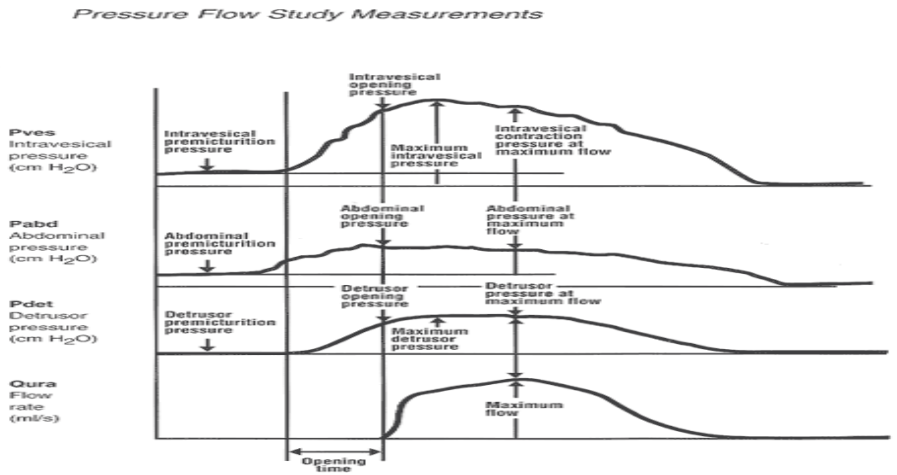
➢ ***Detrusor leak point pressure*** is defined as the lowest detrusor pressure at which urine leakage occurs in the absence of either a detrusor contraction or increased abdominal pressure.

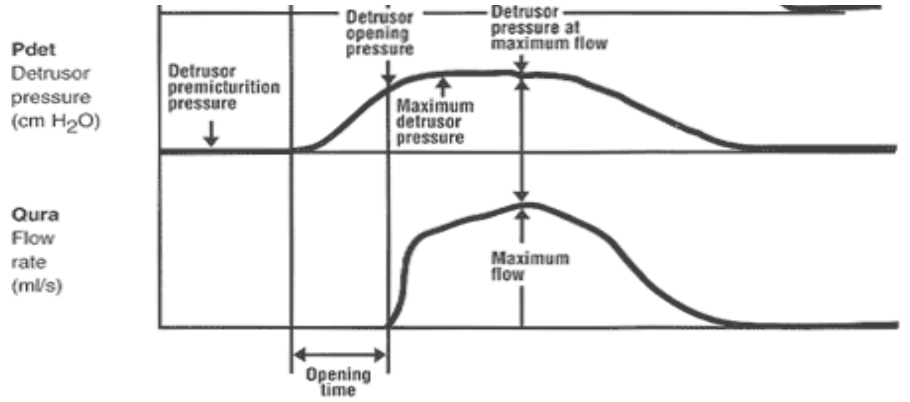




Pressure Flow Studies

✓ ***Pressure flow studies*** of voiding are the method by which the relationship between pressure in the bladder and urine flow rate is measured during bladder emptying.





Pressure Measurements During Pressure Flow Studies (PFS)

- ***Premicturition pressure*** is the pressure recorded immediately before the initial isovolumetric contraction.
- ***Opening pressure*** is the pressure recorded at the onset of urine flow (consider time delay).
- ***Opening time*** is the elapsed time from initial rise in detrusor pressure to onset of flow.
- ***Maximum pressure*** is the maximum value of the measured pressure.
- ***Pressure at maximum flow*** is the lowest pressure recorded at maximum measured flow rate.
- ***Closing pressure*** is the pressure measured at the end of measured flow.
- ***Minimum voiding pressure*** is the minimum pressure during measurable flow. This is not necessarily equal to either the opening or closing pressure.
- ***Flow delay*** is the time delay between a change in bladder pressure and the corresponding change in measured flow rate.

Detrusor Function During Voiding

Normal voiding is achieved by a voluntarily initiated continuous detrusor contraction that leads to complete bladder emptying within a normal time span, and in the absence of obstruction.

Abnormal detrusor activity can be subdivided:

- ***Detrusor underactivity*** is defined as a 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.

- ***Acontractile detrusor*** is one that cannot be observed to contract during urodynamic studies resulting in prolonged bladder emptying and/or a failure to achieve complete bladder emptying within a normal time span

- ***Post void residual (PVR)*** is defined as the volume of urine left in the bladder at the end of micturition.

Urethral Function During Voiding

- ***Normal urethra function*** is defined as urethra that opens, and is continuously relaxed to allow the bladder to be emptied.

- ***Abnormal urethra function*** may be due to either obstruction to urethral overactivity, or a urethra that cannot open due to anatomic abnormalities, such as an enlarged prostate or a urethral stricture.

- ***Bladder outlet obstruction*** is the generic term for obstruction during voiding and is characterised by increased detrusor pressure and reduced urine flow rate. It is usually diagnosed by studing the synchronous values of flow rate and detrusor pressure.

- ***Dysfunctional voiding*** is defined as an intermittent and/or fluctuating flow rate due to inadequate or variable relaxation generally of the sphincters during voiding in neurologically normal men (i.e. no historical, visible or measurable evidence of neurological disease).

- ***Detrusor sphincter dyssynergia*** is defined as a detrusor contraction concurrent with an involuntary contraction of the urethral and/or periurethral striated muscle. Occasionally flow may be prevented altogether.

- ***Non-relaxing urethral sphinter obstruction*** usually occurs in individuals with a neurological lesion and is characterised by a nonrelaxing, obstructing urethra resulting in reduced urine flow.

Video-urodynamic Test

- Urodynamics may be combined with imaging (specify).

- Invasive urodynamics performed with contrast fluid as the filling medium is video urodynamics: X-ray (image amplifier) pictures or cine-loops are made at relevant moments.

- The contrast medium and report patient radiation dose should be specified.

4. CONDITIONS

- ***Acute retention of urine*** is defined as a painful, palpable or percussive bladder, when the patient is unable to pass any urine.

- ***Chronic retention of urine*** is defined as a non-painful bladder, which remains palpable or percussive after the patient has passed urine. Such patients may be incontinent.

- ***Benign prostatic obstruction*** is a form of bladder outlet obstruction; and may be diagnosed when the cause of outlet obstruction is known to be benign prostatic enlargement, due to histologic benign prostatic hyperplasia.

- ***Benign prostatic hyperplasia*** is a term used (and reserved for) the typical histological pattern which defines the disease.

- ***Benign prostatic enlargement*** is defined as prostatic enlargement due to histologic benign prostatic hyperplasia. The term ‘’prostatic enlargement’’ should be used in the absence of prostatic histology.