

## Lecture- 2

**Objectives:**

1. To understand neurogenic bladder, its causes, diagnosis and treatment.
2. To understand spinal shock and its urological implications.
3. To define urinary retention, its types, causes and management.
4. To define urinary incontinence, its types, causes and management.
5. To define nocturnal enuresis, causes, evaluation and management.

**Neurogenic bladder**

**Is a dysfunction of the urinary bladder results from interference with the normal nerve pathways associated with urination.**

Types of neurogenic bladder are spastic bladder and flaccid bladder. It is also called *neuropathic* bladder.

1. **Spastic neurogenic bladder:** The lesion is above the spinal cord center of (S2-4), therefore it is an upper motor neuron problem. It is characterized by hypertonic bladder; reduction of bladder capacity; with or without presence of residual urine in the bladder.
2. **Flaccid neurogenic bladder:** the lesion involves the spinal cord center of (S2-4) or the peripheral nerves, it is an lower motor neuron problem. It is characterized by hypotonic bladder, the bladder is flaccid with low flow rates and there is a large volume of residual urine.

**Causes**

- Spinal cord diseases and injuries
- Other disorders such as syphilis, diabetes mellitus, stroke, ruptured or herniated intervertebral disk
- Degenerative neurological diseases such as multiple sclerosis and amyotrophic lateral sclerosis
- Congenital spine abnormalities such as spina bifida
- Long-term effects of alcoholism

**Diagnosis**

**History** is essential to record 24-hour urination patterns, including the actual volume of urine voided, how urgent the feeling is to urinate and any factors that aggravate incontinence.

**Physical examination** will likely include a rectal, genital, and abdominal exam to check for enlargement of the bladder or other abnormalities. A complete neurological examination is also essential. Tests to measure urine output are conducted.

**Urodynamic study: Urodynamics (UDS)** is the term used to describe testing and measurements of the function of the lower urinary tract. The lower urinary tract has two essential functions: the storage of urine at low pressure and the voluntary evacuation of urine.

**COMPONENTS OF THE URODYNAMIC STUDY:**

**Postvoiding residual volume (PVR)** is an good assessment of bladder emptying. It can be performed by ultrasound (bladder scan) or catheterization. Elevation of PVR indicates a problem with emptying but does not tell why. An elevated PVR may prompt further testing.

**Cystometrogram (CMG):** Cystometry or, more appropriately, “filling cystometry” is the method by which the pressure/volume relationship of the bladder is measured during bladder filling. The filling phase starts when filling commences and ends when the patient and urodynamicist decide that

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“permission to void” has been given. CMG can be performed by the single measurement of bladder pressure via a bladder catheter (urethral or suprapubic); however, changes in bladder pressure can represent a change in detrusor pressure (Pdet) or a change in abdominal pressure (Pabd). Therefore it is recommended that CMG be performed by measuring both the total vesical pressure (Pves) and Pabd (measured by a catheter placed in the rectum or vagina). To calculate Pdet, the following equation is used: **Pdet = Pves – Pabd**

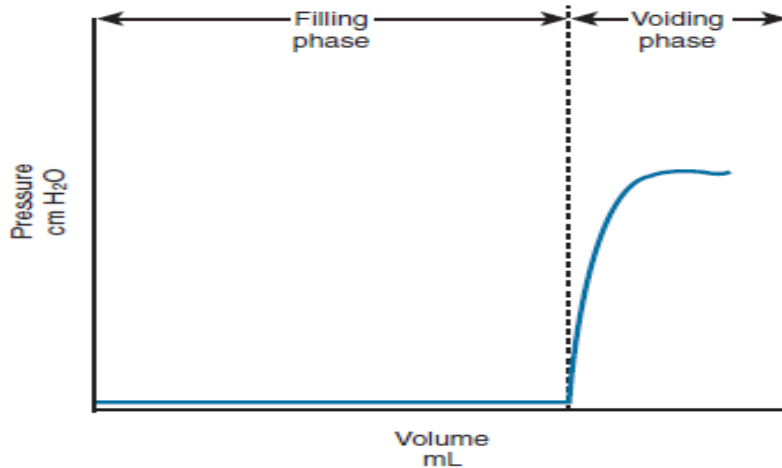


Figure 1 Normal, idealized adult cystometrogram with low pressure storage until the patient is given the command to void and the voiding phase starts. Note that the baseline bladder pressure is near zero (compliant) and there are no involuntary contractions.

**Uroflowmetry** is measurement of the rate of urine flow over time. It is also an assessment of bladder emptying. Normal uroflow is a bell-shaped curve. When the flow rate is reduced or the pattern is altered, this could indicate bladder (underactive) or bladder outlet (obstruction) dysfunction

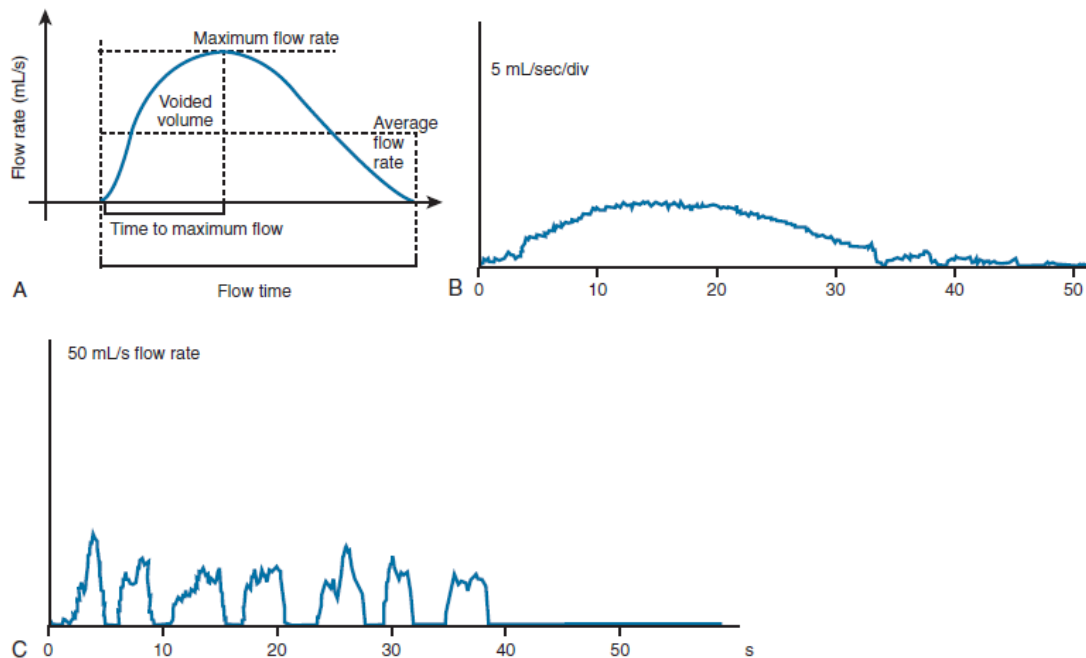


Figure 2 Examples of uroflow curves. A, Normal bell-shaped flow curve of flow rate versus time. B, A flattened pattern is usually indicative of obstruction. C, An interrupted or straining pattern, which can be seen with impaired bladder contractility, obstruction, or voiding with or by abdominal straining.

**Electromyography (EMG)** is the study of the electronic potentials produced by the depolarization of muscle membranes. In the case of UDS, EMG measurement of the striated sphincteric muscles of the perineum is done to evaluate possible abnormalities of perineal muscle function, which are often

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associated with lower urinary tract symptoms and dysfunction. EMG activity is measured during both filling and emptying. Normally the EMG is silent during voiding.

**Urethral pressure profile (UPP)** is a graph indicating the intraluminal pressure along the length of the urethra. Urethral pressure is defined as the fluid pressure needed to just open a closed urethra.

**Pressure-flow study (PFS)** of voiding, are the method by which the relationship between pressure in the bladder and urine flow rate is measured during bladder emptying. Detrusor pressure is measured as explained earlier with the simultaneous measurement of flow rate by a uroflowmeter. This study is used to differentiate between bladder outlet obstruction and detrusor underactivity.

### Spinal shock

Immediately after spinal cord injury, '*spinal shock*' occurs which may last for days or months. The detrusor is not able to contract, the bladder distends and overflow incontinence occurs. Neglected bladder distension will lead to damage to the detrusor, infection and ultimately renal failure.

#### Management is as follows:

The bladder must be emptied by aseptic intermittent catheterization performed two or three times daily or the use of an indwelling urethral catheter on continuous drainage, making sure that the patient has a high urinary output (3 litres per day) to combat infection. Currently, intermittent catheterization is preferred as soon as the patient's spinal injury is stable.

Full urodynamic assessment of bladder function should be undertaken when the injury is stable. This allows an accurate assessment of bladder and sphincter activity and will enable decisions to be made about further management; the prime aim is to prevent upper tract damage by promoting good bladder emptying.

### Urinary retention

#### Is failure of emptying of the bladder totally

**Acute urinary retention:** is the complete and sudden inability to urinate, causing pain and discomfort that relieved when the bladder is catheterized and contain less than 800 ml

**Acute on chronic retention:** is the complete and painful inability to urinate. The pain is relieved when the bladder is catheterized and contain more than 800 ml

**Chronic retention:** is a situation in which the patient unable to empty the bladder completely and after each voiding it consistently contain a postvoiding residual urine volume of more than 300 ml.

#### Causes

##### 1- Outflow obstruction

1. BPH
2. Prostatic cancer
3. Prostatitis
4. Meatal or urethral stenosis
5. Stone or clot at the bladder neck
6. Traumatic urethral disruption
7. Bladder or urethral foreign body

##### 2- Loss of bladder innervations

1. Disc herniation
2. Spinal cord injury
3. Stroke
4. D.M.

5. Postpelvic surgery

### 3- Pharmacological

1. Major tranquilizers
2. Anticholinergics
3. Narcotic
4. Antihypertensive(ganglionic blockers, methyl dopa)

## *Evaluation*

### History and physical examination

- 1- Vital signs
- 2- Palpable &/or percussable bladder in lower abdomen
- 3- Possible purulent or bloody meatal discharge
- 4- DRE (size and consistency of prostate and anal tone)
- 5- Neurological: deep tendon reflexes, anal wink, bulbocavernosus reflex and normal sensation

### Investigation

CBP, BUN, s.creatinine, urinalysis and urine culture, ultrasonography and possibly cystoscopy.

### Management

- 1- Catheterization.
- 2- Definitive treatment will depend on underlying etiology.

## **Incontinence**

**The involuntary leakage of urine, sufficiently sever to cause social or hygiene problem.**

### Continenence is dependent on

- 1- Complaint reservoir
- 2- Sphincteric efficiency( voluntary striated muscle of external sphincter, intact mucosa, intact pelvic floor support)

### Epidemiology

- Affect all ages
- More frequent in elderly, affecting 5-15% of those living in the community & 50% of nursing home residents
- Female:male =2:1

### Classification

- 1- **Stress incontinence:** involuntary loss of urine with sudden increase in intraabdominal pressure e. g. coughing or sneezing.

This is due to weakness of pelvic floor musculature (child bearing, previous abdominal or pelvic surgery)

- 2- **Urge incontinence:** involuntary loss of urine preceded by strong, unexpected urge to void, this is due to local bladder irritation (cystitis, stone, tumour) or due to uninhibited detrusor contraction

- 3- **Overflow incontinence:** Urine loss when intravesical pressure exceed urethral pressure( due to retention & overdistension) e.g. BPH

- 4- **Total incontinence:** Constant or periodic loss of urine without warning e.g bladder extrophy , epispadias, vesicovaginal fistula and ectopic ureteral orifices.

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- 5- **Functional incontinence:** urine loss due to inability to reach toilet in time e.g physical immobility

### Assessment

**Causes of transient incontinence should be ruled out. (DIAPPERS)**

- 1) **Delirium** or hypoxia
- 2) Urinary tract **Infection**
- 3) **Atrophic vaginitis** or urethritis
- 4) **Pharmaceuticals**(Drug side effects)
- 5) **psychological problems**( depression, anxiety, neurosis)
- 6) **Excessive fluid intake** or output(enuresis)
- 7) **Restricted mobility**
- 8) **Recent prostatectomy**
- 9) **Stool impaction**

1- **History and /or voiding diary**

2- **Physical examination( genitourinary, DRE, neurological)**

3- **Lab.: Urinalysis, urine for culture and sensitivity, renal function test**

4- **Others:**

- Ultrasonography,
- Catheterization with postvoid residuals,
- VCUG,
- cystoscopy,
- Urodynamic studies.

### Management

-Goals

- Improvement or cure
- Improvement in quality of life
- Low pressure system with minimal tubes and devices.

-**Stress incontinence:** Pelvic floor exercise (Kegel's exercise),  $\alpha$  agonist, topical estrogen, injectable agent, surgery( suspensions, slings, Sphincter prostheses)

-**Urge incontinence:** antispasmodic (oxybutinin), anticholinergics( propanthaline, tolterodine) and tricyclic antidepressant( imipramine)

-**Overflow incontinence:**

Catheterization and treatment of underlying cause of retention.

-**Total incontinence:** usually surgical correction of underlying etiology or urinray diversion.

-**Other treatment:**

- pads.
- Bladder training(timed voiding pattern)
- Self stimulated voiding
- Condom drainage
- Penile clamp(Cunnunghums)

## Nocturnal Enuresis

**It is an involuntary loss of urine during sleep.**

It occurs normally in children up to 3 years of age but persists in about 15% of children at age 5 and about 1% of children at age 15.

It is more common in boys. At the age of 5 years: 15-20% of males have it and 10-15% of females have it.

All children older than age 6 years with enuresis should undergo a urologic evaluation, although the vast majority will be found to have no significant urologic abnormality.

### Classification

**1- Primary:** Never been dry for more than a 6month period.

**2- Secondary:** The re-emergence of bed wetting after a period of being dry for at least 6 months.

### Etiology

- Familial
- Delay in functional bladder maturation
- Altered ADH secretion, Abnormal decrease in ADH level at night causing increased urine production at night (nocturnal polyuria)
- Altered sleep/arousal mechanism
- Psychological factors
- UTI(1% of cases)

### Evaluation

**1- History:** Frequency of episodes, daytime symptoms, new or recurrent, family history, UTI, bowel problems, and psychological history.

**2- Examination:** exclude organic causes (neurological causes)

**3- Investigation:** Urinalysis(infection, specific gravity is reduced in nocturnal polyuria, glucose, protein)

### Management

#### I- Nonpharmacologic treatment:

**Motivational Therapy:** involves reassuring the parents and the child, removing the guilt associated with bed-wetting and providing emotional support to the child. The child should be instructed about taking responsibility for his or her bed-wetting. In other words, children with nocturnal enuresis should be helped to understand the condition and to realize that while they did not cause the problem, they do have a role in the treatment plan.

Positive reinforcement for desired behavior should be instituted. One way to carry out a program of motivational therapy is to set up a diary and chart, with a reward system for each night the child stays dry.

**Behavioral Conditioning:** is based on the use of a **signal alarm device**. When the child voids in bed, a moisture-sensing device that has been placed near the genitals is activated and triggers an alarm. This evokes a conditioned response of waking and inhibiting urination.

Long-term is 70%

**Another method of behavioral conditioning** involves waking the child two to three hours after he or she has gone to sleep, eliciting a conditioned response of waking when the bladder is full. The success rate of this technique is unknown.

**Bladder-Training Exercises:** in some children with a small bladder capacity, the use of bladder-retention training during the day may help increase bladder capacity at night. This training is accomplished by having the child hold his or her urine for increasing periods of time.

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**II-Pharmacological treatment:**

Is usually reserved for use in children older than seven years of age, includes:

**Tricyclic Antidepressants.** Tricyclic antidepressants, including imipramine (Tofranil),

**Anticholinergic Therapy.** Anticholinergic medications, such as hyoscyamine (Levsin) and oxybutynin (Ditropan), have a direct effect on smooth muscle relaxation and therefore reduce or decrease the bladder's ability to contract.

**Desmopressin Acetate.** Desmopressin acetate (DDAVP), a synthetic analog of arginine vasopressin (antidiuretic hormone). Given nasally or orally but oral route is safer.

**Prognosis:** 15% per year spontaneous resolution.

UROLOGY