

Micturition

Voluntary emptying of the bladder or urination

Objectives

At the end of this lecture student should be able to describe:

- 1. Functions of ureters and bladder**
- 2. Bladder innervation**
- 3. Mechanism of micturition**
- 4. Different component of urinary Cystometrogram**
- 5. Examples of abnormal micturition**
- 6. Symptoms and common causes of acute and chronic renal failure**

Ureters & Urine Transport

- **Urine transport to bladder by two ureters**
- **Ureters has regular peristaltic contraction 1-5/min**
- **Ureters enter bladder wall obliquely (functional sphincter) prevent urine reflux from the bladder**

Urinary bladder

- **Bladder muscle (detrusor) arranges in spiral circular and longitudinal**
- **Form muscle bundle around the urethra (internal sphincter)**
- **External sphincter is made of skeletal muscle**

Micturation

- **its a spinal reflex arc controlled by higher center**
- **Autonomic and somatic innervation**

Autonomic Innervation

- **Parasympathetic**
 - Pelvic nerve S1,2,3
 - innervate the body of bladder
 - afferent → information about wall stretch to spinal center(s2,3)
 - causes bladder contraction.
- **Sympathetic**
 - hypogastric nerve L1,2,3
 - Innervate the body and the neck (internal sphincter IS),
 - Efferent nerves inhibit bladder contraction (β) and activate IS (α)

Somatic Innervation

- **Pudendal nerve S2,3,4**
- **Innervate external sphincter**

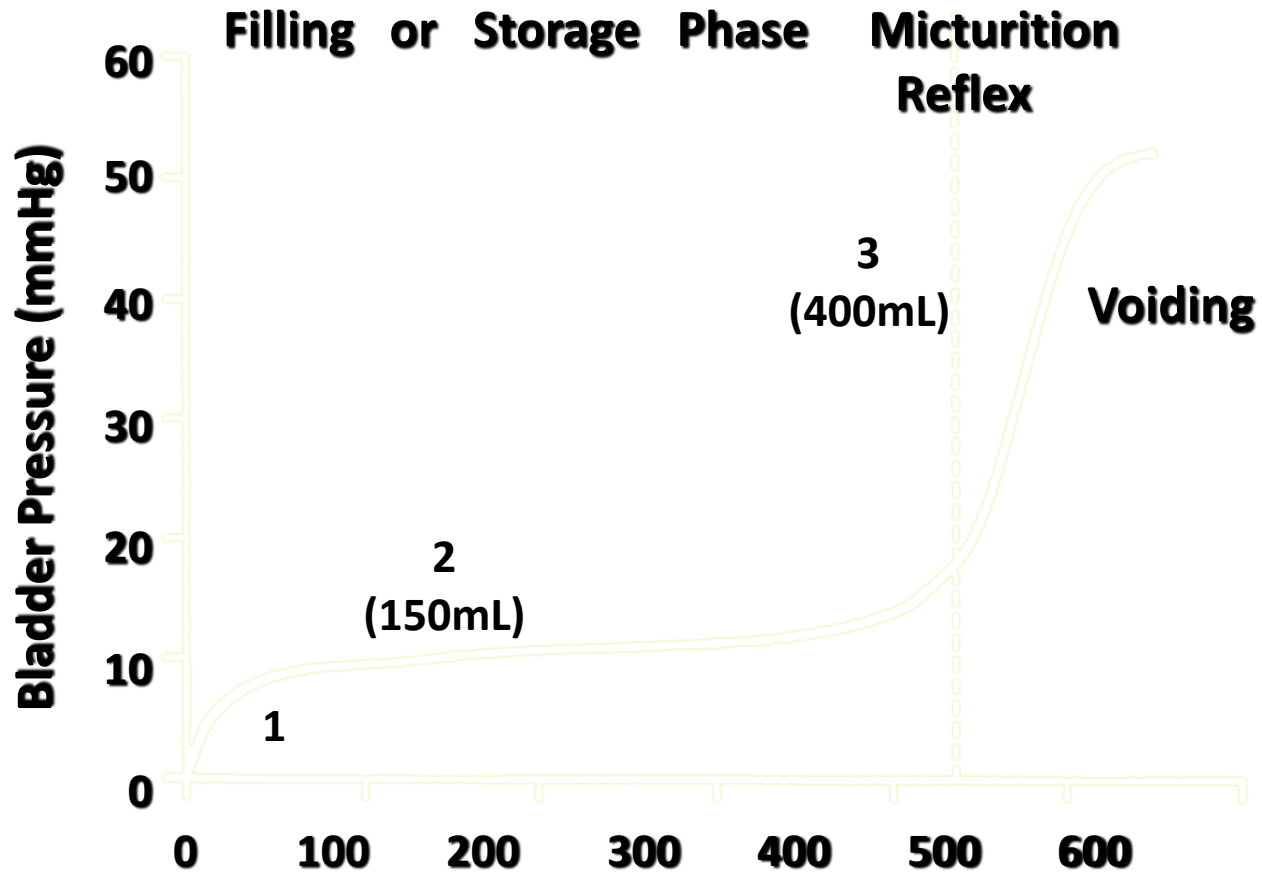
Physiology of Micturation

- **It is a spinal reflex facilitated or inhibited by higher brain centers**
- **Distension of bladder stimulates stretch receptors in the bladder wall**
- **reflex contraction of the bladder and relaxation of internal and external sphincters**

Micturation Reflex

- **During filling phase**
 - Detrusor muscle is relaxed
 - Both sphincters are contracted (sympathetic)
- **This reflex is released by removing inhibitory impulses from the cerebral cortex**

Cystometrogram



Urinary Bladder pressure Versus Volume

- 1. Phase I: Initial slight rise in pressure with increase in urine volume from 0 to 50 ml**
- 2. Phase II: A minimum increase in pressure with increases in urine volume from 50 to 400 ml due to bladder distension. At urine volume of 150-200 ml there is an urge to void urine**
- 3. Phase III: Sudden sharp rise in pressure as the micturition reflex is triggered (sense of fullness at about 400mL)**

Abnormal micturation

- 1. Interruption of afferent nerves or dorsal root (Tabes dorsalis)**
 - Reflex contraction of the bladder lost**
 - Bladder is distended, thin and hypotonic**
 - Some contractions are present due to intrinsic response in the muscle**
- 2. Interruption of both afferent and efferent (tumors)**
 - Bladder is flaccid and distended**

Spinal cord transection

- **During shock the bladder is flaccid**
- **Overflow incontinence**
- **Spinal reflex for emptying will resume in few weeks with no voluntary control**

Acute renal failure

- Kidney stop working suddenly**
- May recover**
- Causes**
 - 1. Prerenal: decrease blood supply to the kidney e.g heart failure, sever hemorrhage**
 - 2. Intrarenal: glomerulonephritis, tubular necrosis (ischemia, toxin, medication)**
 - 3. Postrenal: obstruction by stones (calcium, urate or cystine)**

Chronic renal failure

- **Progressive loss of function**
- **Symptom appear after loss of 70%**
- **Disorders of blood vessel, glomeruli, tubules interstitium and lower tract**
- **Can leads to end stage renal failure**
- **Need dialysis**
- **Common causes:**
 - **diabetes mellitus,**
 - **hypertension**
 - **Atherosclerosis**
 - **Chronic glomerulonephritis**
 - **Interstitial nephritis**

Renal failure

- **Water retention (edema)**
- **Uremia: ↑↑ urea**
- **Azotemia: ↑↑ creatinine, uric acid**
- **Acidosis: ↓↓ pH**
- **Anemia: ↓↓ RBC**
- **Ostomalcia due to ↓↓ active V D**

HEMODIALYSIS

ARTEFICIAL KIDNEY



*Thank You
Dr Sitelbanat*

