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

- **Parasympthatic**
  - 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 syphincter IS),
  - Efferent nerves inhibit bladder contraction (β) and activate IS (α)

Somatic Innervation

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

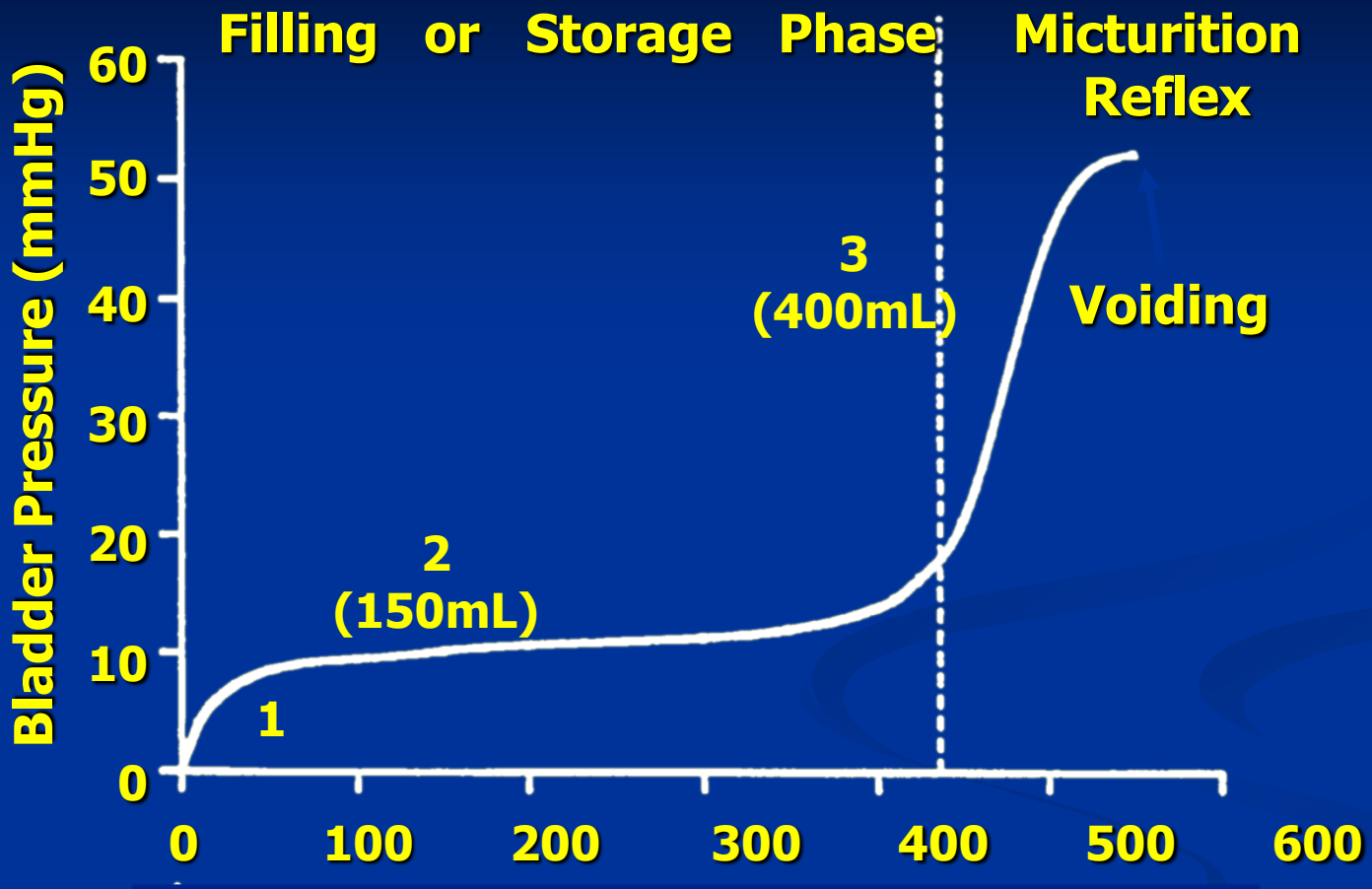
Physiology of Micturation

- 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 hemorrahge
  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 retension (edema)
- Uremia: ⇑urea
- Azotemia: ⇑ creatinine, uric acid
- Acidosis: ⇓ pH
- Anemia: ⇓ RBC
- Ostomalcia due to ⇓ active V D

HEMODIALYSIS
ARTEFICIAL KIDNEY


Dialysis
King Khalid University Hospital


Thank You
Dr Sitelbanat