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### **QUESTION**

Write a short note on Micturition

### **ANSWERS**

Micturition is a process by which urine is voided from the urinary bladder. It is a reflex process. However, in grown up children and adults, it can be controlled voluntarily to some extent. The functional anatomy and nerve supply of urinary bladder are essential for the process of micturition.

### **FUNCTIONAL ANATOMY OF URINARY BLADDER AND URETHRA**

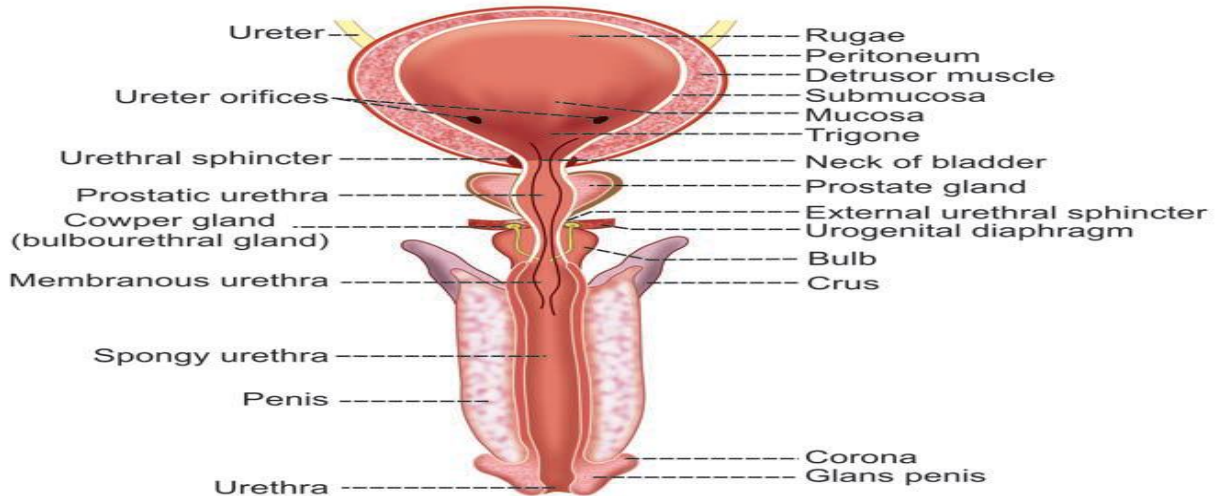
- **URINARY BLADDER**

Urinary bladder is a triangular hollow organ located in lower abdomen. It consists of a body and neck. Wall of the bladder is formed by smooth muscle. It consists of three ill-defined layers of muscle fibers called detrusor muscle, viz. the inner longitudinal layer, middle circular layer and outer longitudinal layer. Inner surface of urinary bladder is lined by mucus membrane. In empty bladder, the mucosa falls into many folds called rugae.

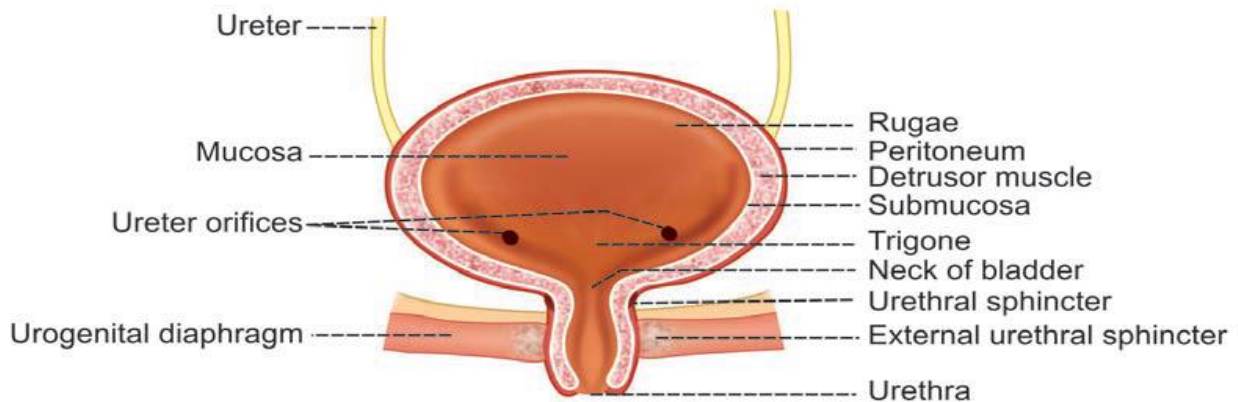
At the posterior surface of the bladder wall, there is a triangular area called trigone. At the upper angles of this trigone, two ureters enter the bladder. Lower part of the bladder is narrow and forms the neck. It opens into urethra via internal urethral sphincter.

- **URETHRA**

Male urethra has both urinary function and reproductive function. It carries urine and semen. Female urethra has only urinary function and it carries only urine. So, male urethra is structurally different from female urethra.



**THE MALE URINARY BLADDER AND URETHRA**



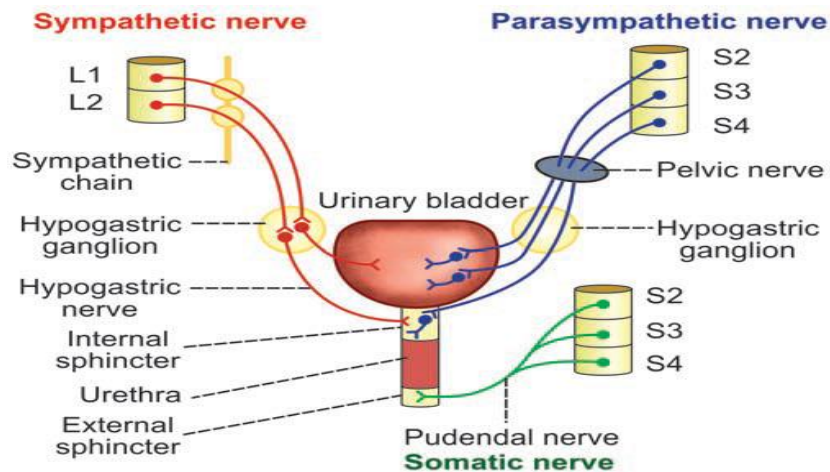
**THE FEMALE URINARY BLADDER AND URETHRA**

**NERVE SUPPLY TO URINARY BLADDER AND SPHINCTERS**

Urinary bladder and the internal sphincter are supplied by sympathetic and parasympathetic divisions of autonomic nervous system whereas, the external sphincter is supplied by the somatic nerve fibers.

Nerve	On detrusor muscle	On internal muscle	On external sphincter	Function
Sympathetic nerve	Relaxation	Constriction	Not supplied	Filling of urinary bladder
Parasympathetic nerve	Contraction	Relaxation	Not supplied	Emptying of urinary bladder
Somatic nerve	Not supplied	Not supplied	Not supplied	Voluntary control of micturition

**TABLE1.1- SUMMARY OF FUNCTIONS OF NERVES SUPPLYING URINARY BLADDER AND SPHINCTERS**



**NERVE SUPPLY TO URINARY BLADDER AND URETHRA**

### FILLING OF URINARY BLADDER

#### PROCESS OF FILLING

Urine is continuously formed by nephrons and it flows into urinary bladder drop by drop through ureters. When urine collects in the pelvis of ureter, the contraction sets up in pelvis. This contraction is transmitted through rest of the ureter in the form of peristaltic wave up to trigone of the urinary bladder. Peristaltic wave usually travels at a velocity of 3 cm/second. It develops at a frequency of 1 to 5 per minute. The peristaltic wave moves the urine into the bladder.

After leaving the kidney, the direction of the ureter is initially downward and outward. Then, it turns horizontally before entering the bladder. At the entrance of ureters into urinary bladder, a valvular arrangement is present. When peristaltic wave pushes the urine towards bladder, this valve opens towards the bladder. The position of ureter and the valvular arrangement at the end of ureter prevent the back flow of urine from bladder into the ureter when the detrusor muscle contracts. Thus, urine is collected in bladder drop by drop.

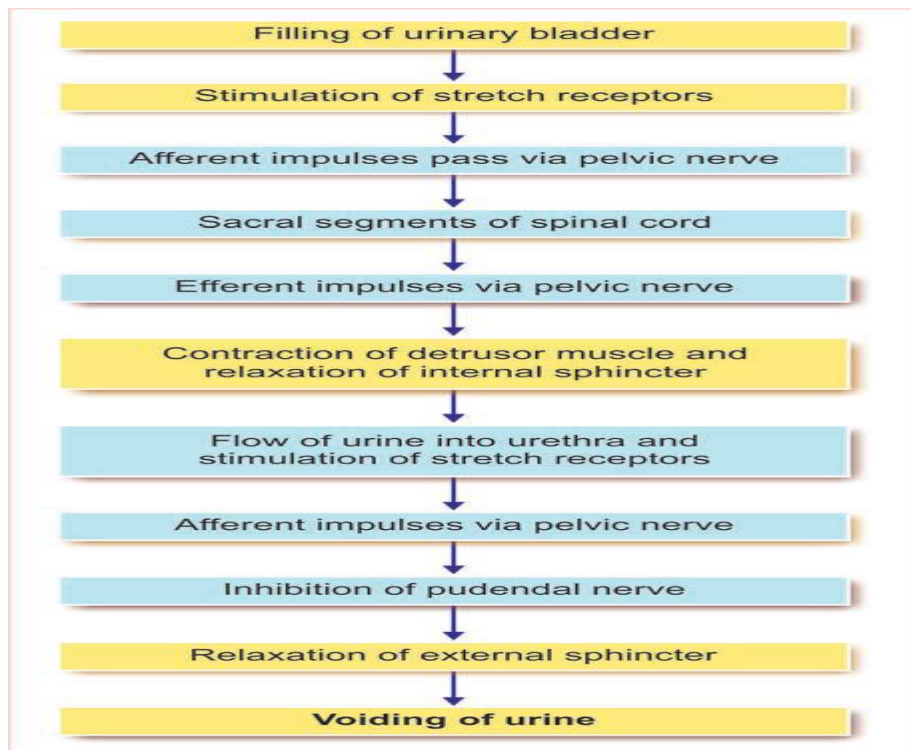
A reasonable volume of urine can be stored in urinary bladder without any discomfort and without much increase in pressure inside the bladder (intravesical pressure). It is due to the adaptation of detrusor muscle. This can be explained by cystometrogram.

#### CYSTOMETROGRAM

Cystometry is the technique used to study the relationship between intravesical pressure and volume of urine in the bladder. Cystometrogram is the graphical registration (recording) of pressure changes in urinary bladder in relation to volume of urine collected in it.

### MICTURITION REFLEX

Micturition reflex is the reflex by which micturition occurs. This reflex is elicited by the stimulation of stretch receptors situated on the wall of urinary bladder and urethra. When about 300 to 400 mL of urine is collected in the bladder, intravesical pressure increases. This stretches the wall of bladder resulting in stimulation of stretch receptors and generation of sensory impulses.



**SUMMARY OF THE PATHWAY OF MICTURITION REFLEX**

#### HIGHER CENTERS FOR MICTURITION

Spinal centers for micturition are present in sacral and lumbar segments. But, these spinal centers are regulated by higher centers. The higher centers, which control micturition are of two types, inhibitory centers and facilitatory centers.

Inhibitory centers for micturition

Centers in midbrain and cerebral cortex inhibit the micturition by suppressing spinal micturition centers.

Facilitatory centers for micturition

Centers in pons facilitate micturition via spinal centers. Some centers in cerebral cortex also facilitate micturition.

#### APPLIED PHYSIOLOGY –

##### *ABNORMALITIES OF MICTURITION*

- i. Atonic bladder – effect of
- ii. Destruction of sensory nerve fibers
- iii. Automatic bladder
- iv. Uninhibited Neurogenic bladder
- v. Nocturnal micturition