**Transport of urine from the kidney, ureters into the bladder**

Urine flowing from the collecting ducts into the renal calyces stretches the calyces and increases their inherent pacemaker activity. Which in turn initiates peristaltic contractions that spread to the renal pelvis and then. Down ward along the length of the ureter thereby forcing urine from the renal pelvis toward the bladder.

* The walls of the ureters contain smooth muscle and are innervated by sympathetic and parasympathetic N. as well as by an intramural plexus of neurons and nerve fibers that extends along the ureters.
* Peristaltic contractions in the ureter are enhanced by parasympathetic stimulation and inhibited by sympathetic stimulation.
* The ureters enter the bladder through the detrusor muscle in the trigon region of the bladder. Normally, the ureters course obliquely for several centimeters through the bladder wall.
* The normal tone of the detrusor muscle in the bladder wall tends to compress the ureter, thereby preventing backflow of urine from the bladder when pressure builds up in the bladder during micturition or bladder compression.
* Each peristaltic wave along the ureter increases the pressure within the ureter so that the region passing through the bladder wall opens and allows urine to flow into the bladder.

*In some people, the distance that the ureter courses through the bladder wall is less than normal, so that contraction of the bladder during micturition does not always lead to complete occlusion of the ureter. As a result, some of the urine in the bladder is propelled backward into the ureter, a condition called vesicoureteral reflux. Such reflux can lead to enlargement of the ureters and, if severe, can increase the pressure in the renal calyces and structures of the renal medulla, causing damage to these regions.*

**Micturition**:

It is the process by which the urinary bladder empties when it become filled.

**The principle nerves supply to the bladder are:**

1. **Pelvic nerve:** Which connect with spinal cord through sacral plexus (S2 and S3), which are consist of:
2. **Sensory nerve fibers:** detect the degree of stretch of the bladder walls.
3. **Motor nerve fibers:** transmitted in the pelvic nerves are **parasympathetic** fibers. These terminate on ganglion cells located in the wall of the bladder then short postganglionic nerves innervate the **detrusor muscle**.
4. **Skeletal motor fibers**: Are transmitted to the bladder through pudendal nerve to innervate the skeletal muscle fibers of **external bladder sphincter**.

**3- Sympathetic innervations:** from the sympathetic chain through the hypogastric nerve fibers which connect the spinal cord with L2 segment, which stimulate mainly the blood vessel and have little to do with bladder contraction.Some sensory fibers pass by the waysympathetic N. and important in the sensation of fullness and pain.

**Micturition Reflex:**

As the bladder fill, stretches the bladder wall, stimulating stretch receptor in the bladder neck. (The first urge to void is felt at a bladder volume of about 150 ml, and a marked sense of fullness at about 300-400 ml). Sensory signals are conducted to the sacral segments of the spinal cord through pelvic nerves and then back again to bladder through the parasympathetic fibers in the same nerves initiating micturition contraction of the detrusor muscles. Once a micturition reflex begins the high pressure inside the bladder, forces the bladder neck to open against its tonic contraction. Stretching the bladder neck exacerbates the intensity of the micturition reflex. This reflex passes to sacral portion of spinal cord and then back through pudendal nerve to the external sphincter to inhibit it.

**The micturition reflex can be controlled by high brain centers in the following**

* + - 1. The higher center keep the micturition reflex inhibited all the time except when it is desired to micturate.
      2. The higher centers prevent micturition, even if a micturition reflex occur by continual tonic contraction of the external bladder sphincter until a convenient time presents itself.
      3. When time to urinate arrives the cortical center can facilitate the sacral micturition centers to help initiate a micturition reflex and inhibit the external urinary sphincter so that urination can occur.

**Urine**: On examination of the urine we check the following parameters:

1. **The volume of the urine:** Itvaries widely from day to day depending on type of food and amount of fluid taken or lost.The average amount of the urine is about 1400 ml/day, range 0.5-20 l/day. Low in dehydrated person or as high in a person who has been drinking large amount of water.
2. **The color of the urine:** Normal color of urine is yellow due to the pigment urochrome. The color of urine is varies according to its concentration.
3. **Smell of the urine:** Freshly passed urine has hardly any smell, but when it is allowed to stand, develops an ammonia odor, owing to the bacterial decomposition (urea to ammonia).
4. **The specific gravity of the urin**e: In healthy persons can vary between 1.001- 1.040 according to the concentration of dissolved solids.
5. **Biochemical parameters:** Like (sugar, protein, bile pigment, PH, ketone bodies, RBCs and drugs and other toxins).
6. **Microbial** **parameters**: like (pus cells, bacteria and other immunological factors).