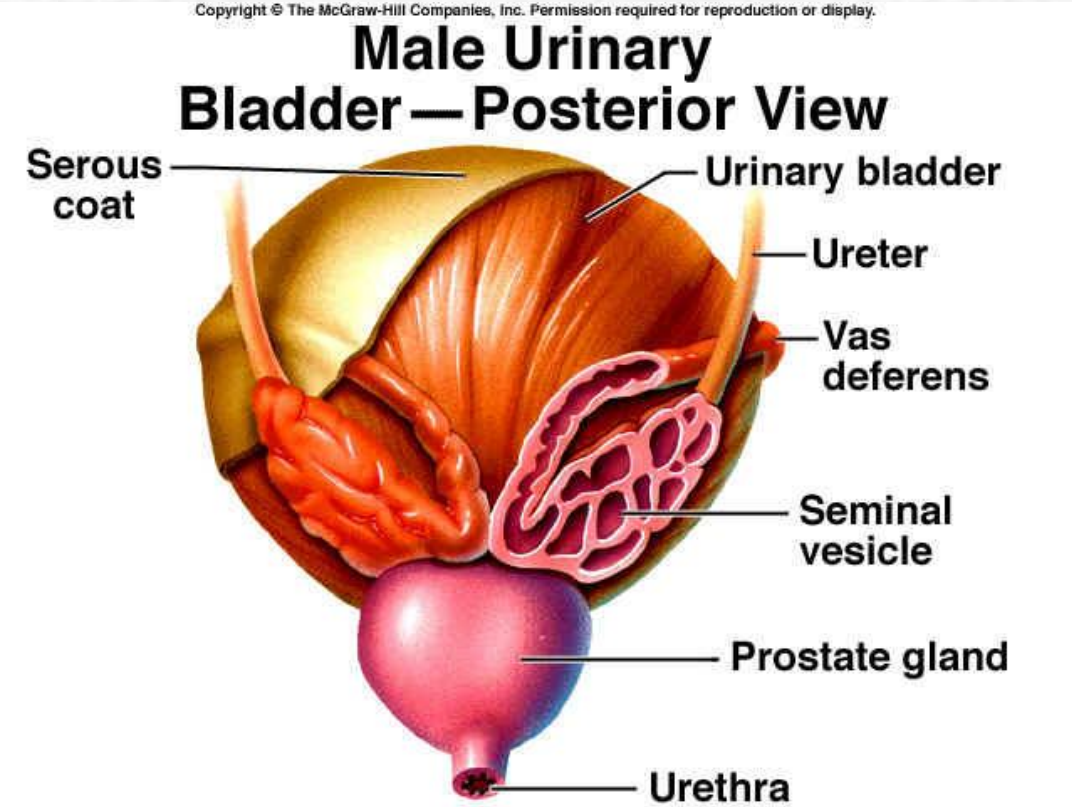
MICTURATION REFLEX

Micturation is the process by which urine is voided from the urinary bladder.

It is a reflex process.

In grown up children and adults, it can be controlled voluntarily to some extend



ANATOMY OF THE URINARY BLADDER

- Urinary bladder consist of the body,neck and internal urethral spincter.
- Smooth muscle forming the body of bladder is called detrusor muscle,which is formed by three ill defined layers of muscle fibers, the inner longitudinal layer, middle circular layer and outer longitudinal layer.
- 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.

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URINARY BLADDER CONTINUED

- The lower part of the bladder is narrow and forms the neck.
- The Distal end of this is guarded by internal urethral sphincter. This sphincter is made up of detrusor muscle. It opens towards urethra.
- At the other end of urethra, there is external urethral sphincter. It is made up of skeletal muscle.(responsible for voluntary control of micturation.)

PROCESS OF FILLING OF URINARY BLADDER

.When urine is collected in the pelvis of ureter, the contraction is set up in the pelvis.

- The contraction is transmitted through the rest of the ureter as peristaltic wave up to trigone of the urinary bladder.
- Peristaltic wave usually travels at the velocity of 3cm/second. It develops at a frequency of 1 to 6 /minute.
- The direction of the ureter is initially downward and outward.This , and the valvular arrangement at the opening of the ureter prevents the back flow of urine from bladder into the ureter when the detrusor muscle contracts.

CYSTOMETROGRAM

- First, the bladder is emptied completely.Then, a small and known quantity of fluid is introduced into the bladder at regular interval and, the pressure developed is recorded continuously.A graph is obtained by plotting all the values of volume and the pressure.
- When about 100ml of urine is collected, the pressure rises to about 10cm water and now, the desire for micturation occures.
- An additional volume of about 200 to 300ml of urine can be collected in bladder without much increase in pressure(This is because of adaptation of urinary bladder by relaxation

CYSTOMETROGRAM

- When total urine volume rises beyond 400ml,the pressure rises sharply and the urge for micturation starts.
- Beyond 600-700ml of urine, voluntary control starts failing.

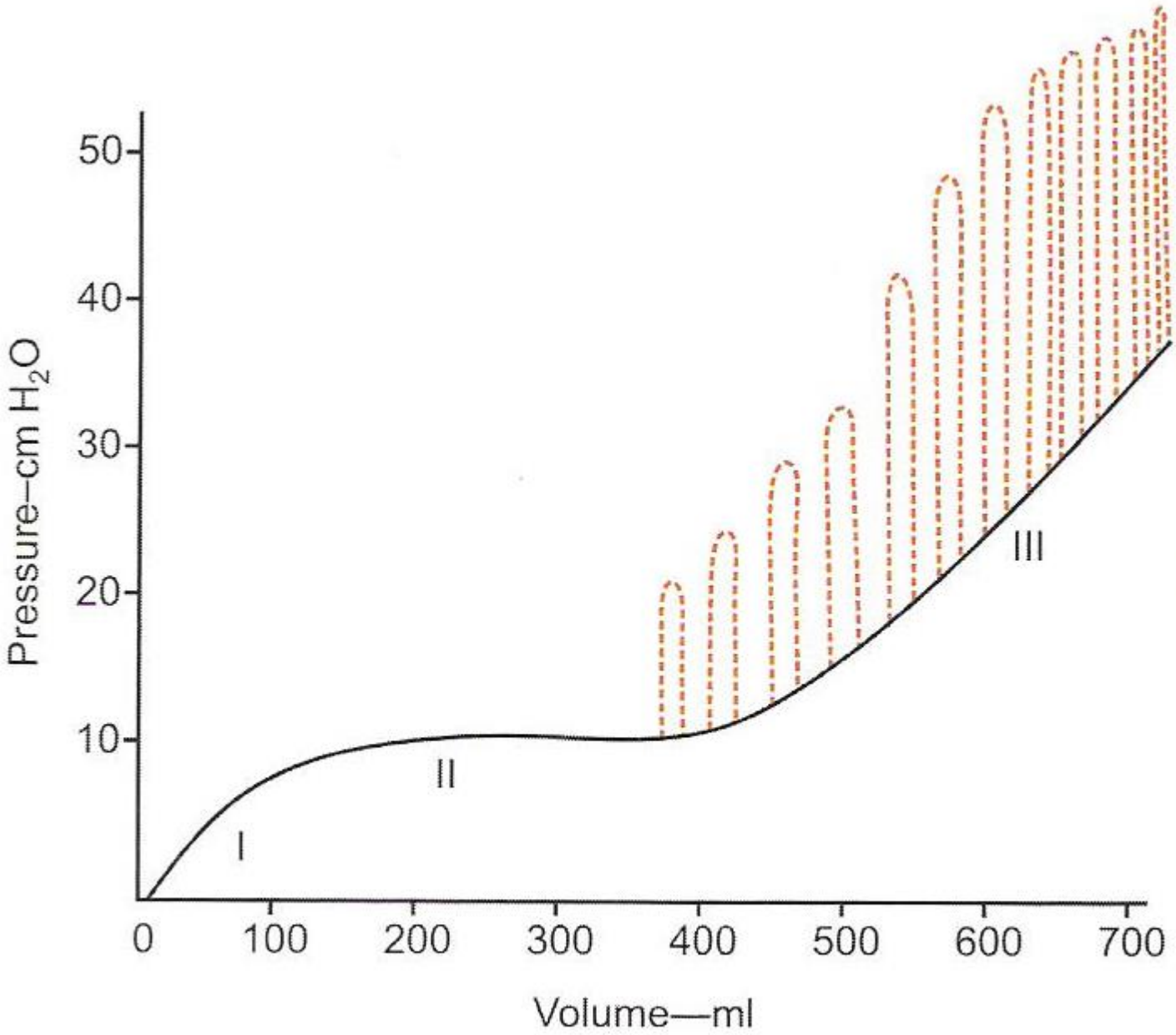

FIGURE 57-2: Cystometrogram. Dotted lines indicate the contraction of detrusor muscle

STEPS OF MICTURATION REFLEX

1. Filling of urinary bladder.
2. Stimulation of stretch receptors.
3. Sensory(afferent)impulses form the receptors reach the sacral segments of spinal cord via the sensory fibers of pelvic(parasympathetic) nerve.
4. The motor (efferent) impulses produced in spinal cord ,travel through motor fibers of pelvic nerve towards bladder and internal sphincter.

STEPS OF MICTURATION REFLEX(CONTINUED)

5.The motor impulses causes contraction of detrusor muscle and relaxation of internal sphincter.

6.Flow of urine into urethra and stimulation of stretch receptors.

7.Afferent impulses vis pelvic nerve.

8.Inhibition of pudendal nerve.

9.Relaxation of external sphincter.

10.Voiding of urine.

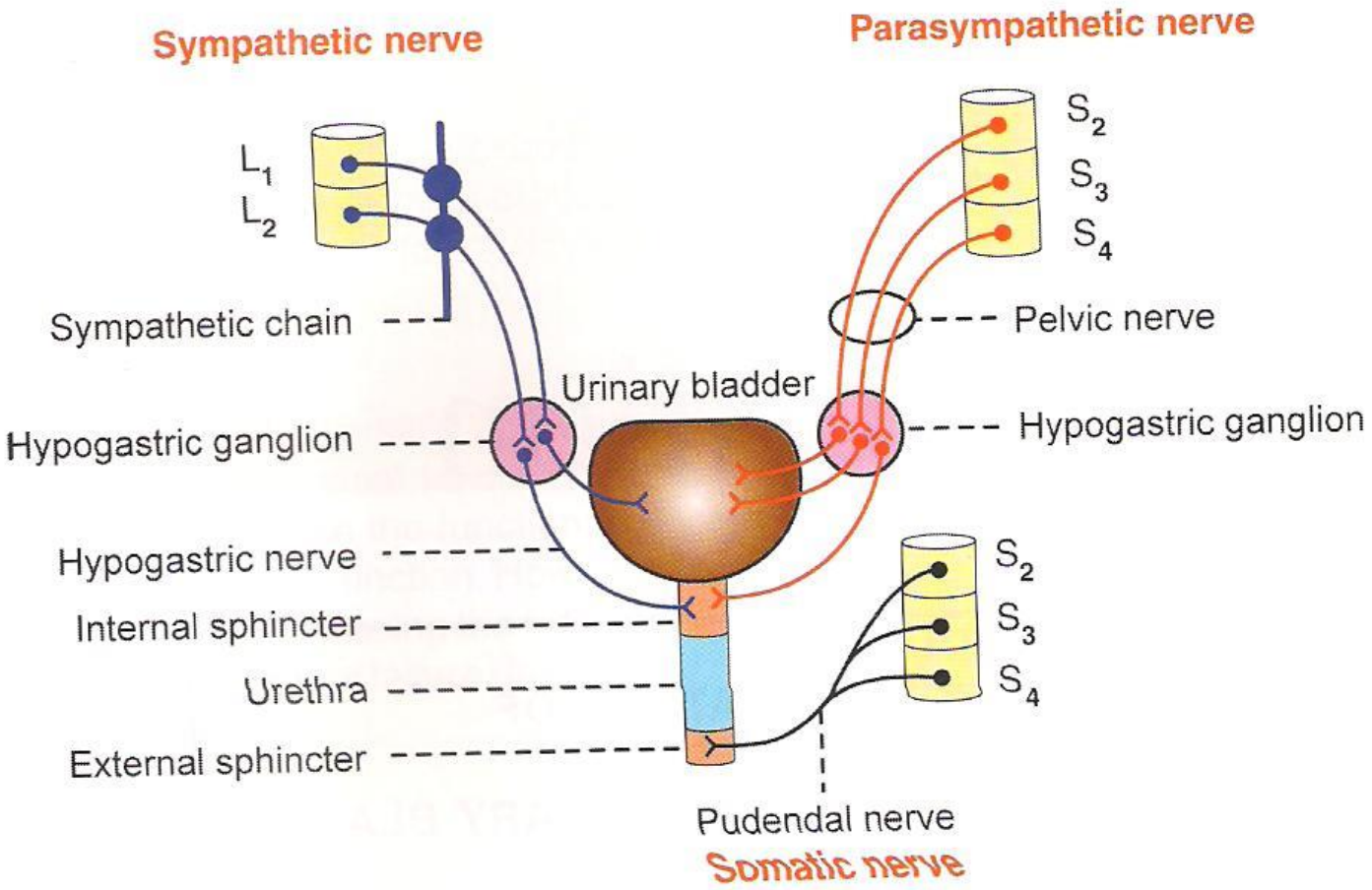

FIGURE 57-1: Nerve supply to urinary bladder and urethra

NERVE OF FILLING

- The stimulation of sympathetic nerve causes relaxation of detrusor muscle and constriction of the internal sphincter.Therfore, it results in filling of urinary bladder and, the sympathetic nerve is called nerve of filling.

NERVE OF EMPTYING

- The stimulation of pelvic (parasympathetic) nerve causes contraction of detrusor muscle and relaxation of the internal sphincter leading to emptying of urinary bladder. So, the parasympathetic nerve is called the nerve of emptying or nerve of micturation.
- The pelvic nerve has sensory fibers also. The sensory fibers carry impulses from stretch receptors present on the wall of the urinary bladder and urethra to the central nervous system.

FUNCTION OF PUDENDAL NERVE

- It maintain the tonic contraction of the skeletal muscle fibers of the external sphincter so that ,the external sphincter is contracted always.
- During micturation,the nerve is inhibited.
- This causes relaxation of external sphincter and voiding of urine.
- **Thus, the pudendal nerve is responsible for voluntary control of micturation**.

RESIDUAL URINE

- Is the amount of urine left in the bladder after the end of micturation amount is 10ml.