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MICTURITION

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.

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.

Pathway for Micturition Reflex

Sensory (afferent) impulses from the receptors reach the sacral segments of spinal cord via the sensory fibres of pelvic (parasympathetic) nerve. Motor (efferent) impulses produced in spinal cord, travel through motor fibres of pelvic nerve towards bladder and internal sphincter. Motor impulses cause contraction of detrusor muscle and relaxation of internal sphincter so that, urine enters the urethra from the bladder (Fig. 57.5). Once urine enters urethra, the stretch receptors in the urethra are stimulated and send afferent impulses to spinal cord via pelvic nerve fibres. Now the impulses generated from spinal centres inhibit pudendal nerve. So, the external sphincter relaxes and micturition occurs. Once a micturition reflex begins, it is self-regenerative, i.e. the initial contraction of bladder further activates the receptors to cause still further increase in sensory impulses from the bladder and urethra. These impulses, in turn cause further increase in reflex contraction of bladder. The cycle continues repeatedly until the force of contraction of bladder reaches the maximum and the urine is voided out completely. During micturition, the

flow of urine is facilitated by the increase in the abdominal pressure due to the voluntary contraction of abdominal muscles.

Higher Centres for Micturition

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

Inhibitory centres for micturition.

Centres in midbrain and cerebral cortex inhibit the micturition by suppressing spinal micturition centres.

Facilitatory centres for micturition

Centres in pons facilitate micturition via spinal centres. Some centres in cerebral cortex also facilitate micturition.

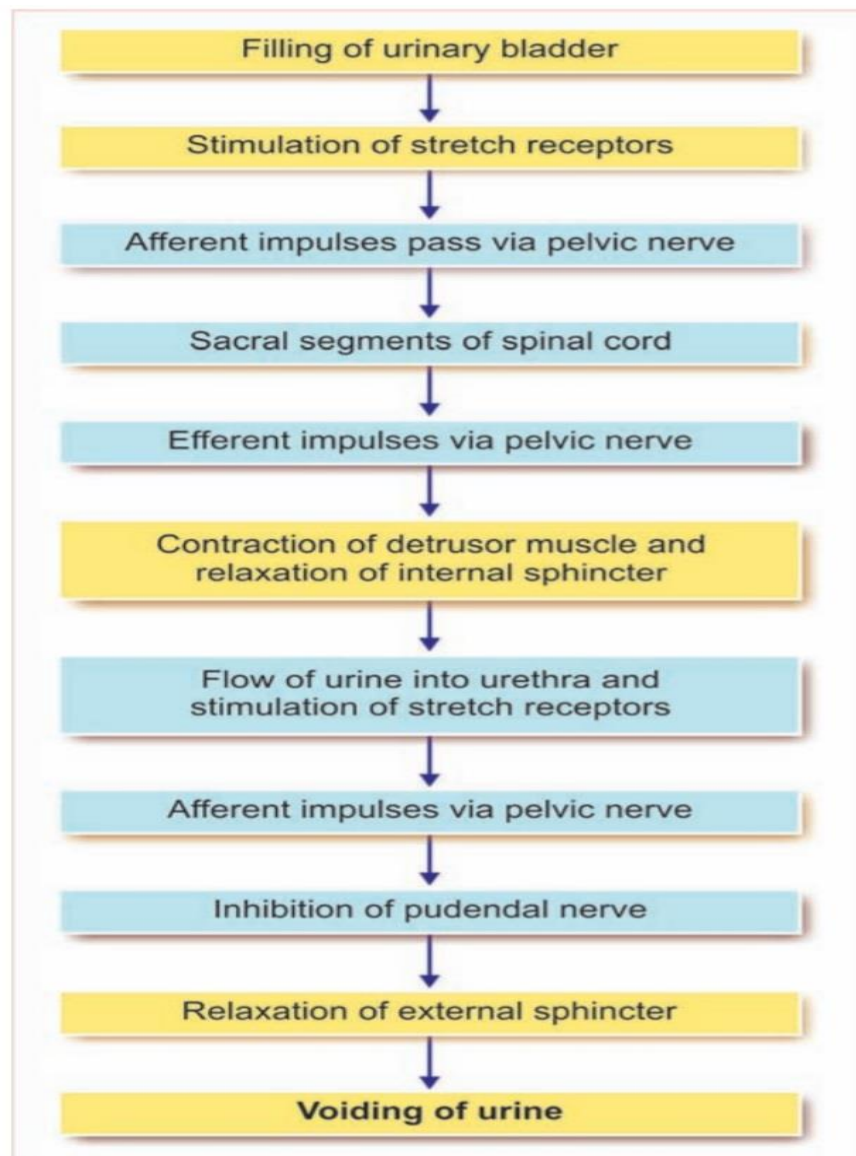


FIGURE 57.5: Micturition reflex

APPLIED PHYSIOLOGY – ABNORMALITIES OF MICTURITION

ATONIC BLADDER – EFFECT OF DESTRUCTION OF SENSORY NERVE FIBERS

Atonic bladder is the urinary bladder with loss of tone in detrusor muscle. It is also called flaccid neurogenic bladder or hypoactive neurogenic bladder. It is caused by destruction of sensory (pelvic) nerve fibres of urinary bladder. Due to the destruction of sensory nerve fibres, the bladder is filled without any stretch signals to spinal cord. Due to the absence of stretch signals, detrusor muscle loses the tone and becomes flaccid. So the bladder is completely filled with urine without any micturition. Now, urine overflows in drops as and when it enters the bladder. It is called overflow incontinence or overflow dribbling.

Conditions of Destruction of Sensory Nerve Fibres

1. Spinal injury: During the first stage (stage of spinal shock) after injury to sacral segments of spinal cord the bladder becomes atonic
2. Syphilis: Syphilis results in the degenerative nervous disorder called tabes dorsalis, which is characterized by the degeneration of dorsal (sensory) nerve roots. Degeneration of sensory nerve roots of sacral region develops atonic bladder. The atonic bladder in tabes dorsalis is called tabetic bladder.

AUTOMATIC BLADDER

Automatic bladder is the urinary bladder characterized by hyperactive micturition reflex with loss of voluntary control. So, even a small amount of urine collected in the bladder elicits the micturition reflex resulting in emptying of bladder. This occurs during the second stage (stage of recovery) after complete transection of spinal cord above the sacral segments. During the first stage (stage of spinal shock) after complete transection of spinal cord above sacral segments, the urinary bladder loses the tone and becomes atonic resulting in overflow incontinence. During the

second stage after shock period, the micturition reflex returns. However, the voluntary control is lacking because of absence of inhibition or facilitation of micturition by higher centres. There is hypertrophy of detrusor muscles so that the capacity of bladder reduces. Some patients develop hyperactive micturition reflex.

UNINHIBITED NEUROGENIC BLADDER

Uninhibited neurogenic bladder is the urinary bladder with frequent and uncontrollable micturition caused by lesion in midbrain. It is also called spastic neurogenic bladder or hyperactive neurogenic bladder. The lesion in midbrain causes continuous excitation of spinal micturition centres resulting in frequent and uncontrollable micturition. Even a small quantity of urine collected in bladder will elicit the micturition reflex.

NOCTURNAL MICTURITION

Nocturnal micturition is the involuntary voiding of urine during night. It is otherwise known as enuresis or bedwetting. It occurs due to the absence of voluntary control of micturition. It is a common and normal process in infants and children below 3 years. It is because of incomplete myelination of motor nerve fibres of the bladder. When myelination is complete, voluntary control of micturition develops and bedwetting stops. If nocturnal micturition occurs after 3 years of age it is considered abnormal. It occurs due to neurological disorders like lumbosacral vertebral defects. It can also occur due to psychological factors. Loss of voluntary control of micturition occurs even during the impairment of motor area of cerebral cortex.