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MICTURITION

Micturition (urination) is the process of urine excretion from the urinary bladder. Most of the time, the bladder (detrusor muscle) is used to store urine. As it fills, the rugae distend and a constant pressure in the bladder (intra-vascular pressure) is maintained. This is known as the stress-relaxation phenomenon. The ability to voluntarily control micturition develops from 2 years as the central nervous system develops. Micturition is also known as the voiding phase of bladder control and it is typically a short lasting event. Urinary flow rate in a full bladder is:

* 20—50ml/s in men
* 25—30ml/s in women

Whilst the capacity of the bladder varies from roughly 300—550ml, afferent nerves in the bladder wall signal the need to void the bladder at around 400ml of filling.

STAGES OF MICTURITION

The urinary bladder has two distinct stages or phases:

* Resting or filling stage
* Voiding stage

Resting or Filling Stage

It is in this phase of the bladder that the urine is transported from the kidneys via the ureters into the bladder. The ureters are thin muscular tubes that arise from each of the kidneys and extend downwards where they enter the bladder obliquely. The oblique placement of the ureters in the bladder wall serves a very important function. The opening of the ureter into the urinary bladder is not guarded by any sphincter or muscle. Therefore, this oblique nature of opening prevents the urine from re-entering the allowing the bladder to distend and accommodate more urine.

Voiding Stage

During this stage, both the urinary bladder and the urethra come into play together. The detrusor muscle of the urinary bladder which was relaxing so far starts to contract once the bladder’s storage capacity is reached. The urethra is controlled by two sets of muscles: The Internal and External Urethral Sphincters. The internal sphincter is a smooth muscle whereas the external sphincter is skeletal. Both these sphincters are in a contracted state during the filling stage.

REGULATION OF MICTURITION

Passing of urine is under parasympathetic control. Bladder afferent signals ascend through the spinal cord and then project to the pontine micturition centre and cerebrum. Upon the voluntary decision to urinate, neurons of the pontine micturition centre fire to excite the sacral preganglionic neurons. The micturition reflex is one of the autonomic reflexes, but release of urine is regulated by voluntary neural mechanisms that involve centers in the brain and spinal cord. The micturition reflex is a bladder-to-bladder contraction reflex for which the reflex centre is located in pontine micturition centre. The efferent pathway from the pontine micturition centre also runs through the lateral funiculus of the spinal cord to inhibit the thoracolumbar sympathetic nucleus and the sacral pudenal nerve nucleus, while promoting the activity of the sacral parasympathetic nucleus. Inhibition of the sympathetic nucleus and pudenal nerve nucleus induces relaxation of the bladder neck and the external urethral sphincter, respectively. The activity of these neurons is affected by the pontine activity. There are various excitatory and inhibitory areas co-existing in the brain, but the brain has an overall inhibitory effect on micturition, and thus maintains continence. For micturition to occur, the cerebrum must abate its inhibitory influence on the pontine micturition centre.