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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-vesicular pressure) is maintained. This is known as the stress-relaxation phenomenon. The ability to voluntarily control micturition develops from 2 years as the CNS 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:

- 20-25ml/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.

At its most basic level, micturition is a simple reflex which is displayed by infants who are not toilet-trained.

When the volume of urine in the bladder reaches about 250ml, stretch receptors in the bladder walls are stimulated and excite sensory parasympathetic fibres which relay information

to the sacral area of the spine. This information is integrated in the spine and relayed to two different sets of neurons. Parasympathetic motor neurons are excited and act to contract the detrusor muscles in the bladder so that bladder pressure increases and the internal sphincter opens. At the same time, somatic motor neurons supplying the external sphincter via the pudendal nerve are inhibited, allowing the external sphincter to open and urine to flow out, assisted by gravity.

### **CONTROL OF MICTURITION**

Children and adults have considerable control over when and where they pass urine. They can also increase or decrease the rate of flow and even stop and start again, so micturition is clearly more than just a simple reflex. This control is learnt in infancy and involves other sensory fibres in the bladder wall. These fibres convey information on the degree of bladder fullness via the spine to the higher centres of the brain, the thalamus and cerebral cortex. This causes us to become aware that we need to pass urine and of the urgency of the situation.

These links between the spine and cerebral cortex are not established until about two years of age and it is suggested that toilet-training is therefore not physiologically possible until that time. The brain is able to override the micturition reflex by inhibiting the parasympathetic motor nerve fibres to the bladder and reinforcing contraction of the external sphincter. The internal sphincter will not open until the external sphincter does.

## **POTENTIAL PROBLEMS ASSOCIATED WITH MICTURITION**

For normal micturition to occur we need:

- Intact nerve pathways to the urinary tract;
- Normal muscle tone in the detrusors, sphincters and pelvic floor muscles;
- Absence of any obstruction to urine flow in any part of the urinary tract;
- Normal bladder capacity;
- Absence of environmental or psychological factors which may inhibit micturition.

Loss of any of these normal functions may result in incontinence or urgency to micturate. Micturition requires the coordinated activity of sympathetic, parasympathetic and somatic nerves. It also requires normal muscle tone and freedom from physical obstruction and psychological inhibition. Control from our higher brain centres allow us to determine the right time and place to allow this important physiological function to occur.