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STRUCTURE AND FUNCTIONS OF THE URETHRAL SPHINCTER IN MEN

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Annotation
The urethral sphincter is considered to be composed of two components: the internal sphincter, which represents a direct continuation of the detrusor smooth muscle, and the striated external sphincter. From a clinical standpoint, the bladder neck–proximal urethra normally functions as a sphincter in both sexes. Anatomically there is a unique mixture of smooth and striated muscle, intracellular matrix, and mucosal components contributing to the functional sphincter.

Keywords: component, urethra, prostate, skeletal muscle, mechanisms.

In the male there are two important sphincteric mechanisms:
A proximal “bladder neck mechanism” consisting of the bladder neck, prostate, and prostatic urethra to the level of the verumontanum. This receives a dual innervation from the autonomic nervous system via parasympathetic and sympathetic fibers. The main motor control is likely to be provided by the sympathetic component, although there is some evidence for a contribution from the detrusor muscle where the predominant innervation is parasympathetic. This portion of the continence mechanism is removed during prostatectomy, leaving only the distal urethral sphincter mechanism to prevent urinary leakage.
A distal urethral mechanism at the apex of the prostate. This extends from the verumontanum to the proximal bulb and is composed of a number of structures that help to maintain continence. The male distal sphincter complex is composed of the prostatomembranous urethra, cylindrical rhabdosphincter (external sphincter muscle) surrounding the prostatomembranous urethra, and extrinsic paraurethral musculature and connective tissue structures of the pelvis. The rhabdosphincter is a concentric muscular structure consisting of longitudinal smooth muscle and slow-

twitch (type I) skeletal muscle fibers that can maintain resting tone and preserve continence. Skeletal muscle fibers of the rhabdosphincter have been shown to intermingle with smooth muscle fibers of the proximal urethra, suggesting a dynamic and coordinated interaction. The rhabdosphincter is invested in a fascial framework and supported below by a musculofascial plate that fuses with the midline raphe, which is also a point of origin for the rectourethralis muscle. Superiorly, the fascial investments of the rhabdosphincter fuse with the puboprostatic ligaments. This dorsal and ventral support probably contributes to the competence of the sphincter. The striated fibers of the extrinsic paraurethral muscle (levator ani complex), on the other hand, are of the fast-twitch (type II) variety. During sudden increases in abdominal pressure, these fibers can contract rapidly and forcefully to provide continence. Continence has been shown to be maintained after inducing paralysis of the striated sphincter, indicating that this structure is not solely responsible for continence in men with an intact functioning bladder neck.

The proximal sphincter in the male bladder neck provides a powerful mechanism in both maintaining urinary continence and also prevents retrograde ejaculation of semen during sexual activity. In patients with a damaged distal urethral sphincter (e.g., a pelvic fracture associated urethral disruption), continence can be maintained solely by the proximal bladder neck mechanism. Ultrastructurally, it consists of a powerful inner layer of muscle bundles arranged in a circular orientation.

The distal sphincteric mechanism is also extremely important, as evidenced by its ability to also maintain continence even when the proximal bladder neck mechanism has been rendered totally incompetent by surgical bladder neck incision or a prostatectomy. It is confined to the 3- to 5-mm thickness of the wall of the membranous urethra from the level of the verumontanum down to the distal aspect of the membranous urethra. It is composed mainly of extrinsic striated muscle, which is capable of the sustained contraction necessary for continence and to a lesser degree by intrinsic smooth muscle.

In conclusion, apart from the obvious anatomic differences (the longer urethra and presence of a prostate gland in men), there are important differences in

the configuration of the sphincter mechanisms between males and females. There are two powerful sphincter mechanisms in the male compared with the single weaker intrinsic sphincter mechanism with a weaker bladder neck and also a shorter urethra in the female.

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