The urethra is a tubular structure through which urine is expelled after accumulating in the physiological reservoir called the bladder. In men, this canal is also used by the seminal ducts and carries the sperm from the veru montanum all the way to the external urethral orifice.

Traditional radiological exams such as retrograde urethrography and micturition cystourethrography are considered the standard imaging techniques for the morphological and functional study of the urethra. They do however present certain limitations and only provide images of the urethral lumen similar to those obtained by urethroscopy (Merchant et al. 1997). With a view to reducing doses and exposure to the gonads, ultrasonography imaging is increasingly used even though its diagnostic role has not been fully tested.

Male urethral imaging and pathology are not widely covered in the radiological literature since this part of the urinary tract is easily studied by urologists with clinical or endoscopic examinations. Ultrasonography is used in association with voiding cystourethrography and retrograde urethrography.

Voiding cystourethrography is used to study the posterior urethra allowing the detection of bladder neck pathologies, post-surgical stenosis and neoplasms. The functional aspects of micturition can be monitored in patients with neuromuscular dysfunction of the bladder using digital radiographic imaging.

Retrograde urethrography is commonly used to explore the anterior urethral anatomy and pathologies, but recently sonourethrography has been increasingly proposed. The latter is able to study the urethral mucosa and the periurethral tissues possibly involved in urethral pathologies such as strictures, diverticula, trauma and tumors, which cannot be detected radiographically or at urethroscopy.
the bladder neck to the lower edge of the urogenital diaphragm, includes the prostatic and the membranous portions. The anterior urethra is 14–15 cm long and is divided into the bulbar and into the penile or pendulous portions.

On account of its complex embryological origin, the urethral epithelial lining differs depending on the tract under consideration. In particular, transitional epithelium is found from the bladder neck to the veru montanum, the cylindrical epithelium as far as the fossa navicularis and squamous epithelium up to the external meatus.

19.2.1 Posterior Urethra

The prostatic urethra is about 3–4 cm long in the young male, but reaches 8–10 cm in cases of benign prostatic hyperplasia. It begins at the vesical neck, passes through the prostate gland assuming an arcuate course up to the prostate apex. Two parts can be identified: the supramontanal tract from which the periurethral gland ducts emerge and the submontanal tract where the excretory ducts of the peripheral gland are located. The submontanal urethra is surrounded by the striated sphincter.

The membranous urethra, about 1–2 cm long, passes through the urogenital diaphragm, which contains the Cowper glands. In this tract the urethra is surrounded by the striate sphincter and the perineal muscles.

19.2.2 Anterior Urethra

The bulbar urethra is surrounded by the bulb of the corpus spongiosum; it is larger than the other portions (1.5–2 cm), does not have stiff fascia and extends from the perineal area to the suspensor ligament of the penis.

The penile or pendulous urethra is of relatively uniform diameter, about 1 cm, stretching from the penile ligament to the external urethral meatus. Before its emergence at the meatus, there is an ampullar dilatation called the fossa navicularis.

Many small glands (of Littré) are to be found at the lumen of the anterior urethra, which are more numerous in the bulbar portion and near the fossa navicularis.

19.3 Ultrasound Anatomy and Technique

Because of its complex morphology and course, the male urethra can be accurately studied using different approaches and probes (Desser et al. 1999).

The posterior urethra can be investigated using high frequency endorectal probes at rest, which can depict the normal anatomy of the collapsed posterior urethra identifying the mucosa and the posterior urethral musculature (Fig. 19.1). The voiding phase is well studied with linear endorectal probes (Fig. 19.2), which are commonly employed in the study of the prostate and the anal canal (Merkle and Wagner 1988; Morey and McAninch 1997). The technique is not different from voiding cystourethrography, even though it does offer a smaller field of view. The bladder is distended physiologically and does not require the application of a catheter or the use of contrast medium. Some problems may be observed in patients suffering from incontinence or renal failure with reduced urine output, but the main drawback is the difficulty patients have voiding in the lateral position with the probe in the rectum (McAninch et al. 1988). The problem can be sometimes resolved by placing the patient in an upright position or by using a special stool with a hole at the centre through which the probe can be inserted into the rectum (simil-urodynamic stool). The images are recorded continuously on videotapes or electronically on CD and can be reviewed later with the urologist or neurologist.

Fig. 19.1. Normal posterior urethra during rest in a young male. Endorectal end-fire probe in sagittal scan. The collapsed urethra is hypoechoic (arrowheads) with respect to the surrounding prostatic tissue, and a linear hyperechoic structure corresponds to the mucosa; the hypoechoic outer line is due to the muscular layers.