MRI of the Male Pelvic Floor

Janesh Lakhoo, MD, MS
Gaurav Khatri, MD
Rania F. Elsayed, MD, PhD
Victoria Chernyak, MD
Jeffrey Olpin, MD
Ari Steiner, MD
Varaha S. Tammisetti, MD
Karthik M. Sundaram, MD, PhD
Sandeep S. Arora, MBBS

The pelvic floor is a complex structure that supports the pelvic organs and provides resting tone and voluntary control of the urethral and anal sphincters. Dysfunction of or injury to the pelvic floor can lead to gastrointestinal, urinary, and sexual dysfunction. The prevalence of pelvic floor disorders is much lower in men than in women, and because of this, the majority of the published literature pertaining to MRI of the pelvic floor is oriented toward evaluation of the female pelvic floor. The male pelvic floor has sex-specific differences in anatomy and pathophysiologic disorders. Despite these differences, static and dynamic MRI features of these disorders, specifically gastrointestinal disorders, are similar in both sexes. MRI and MR defecography can be used to evaluate anorectal disorders related to the pelvic floor. MRI can also be used after prostatectomy to help predict the risk of postsurgical incontinence, to evaluate postsurgical function by using dynamic voiding MR cystourethrography, and subsequently, to assess causes of incontinence treatment failure. Increased tone of the pelvic musculature in men secondary to chronic pain can lead to sexual dysfunction. This article reviews normal male pelvic floor anatomy and how it differs from the female pelvis; MRI techniques for imaging the male pelvis; and urinary, gastrointestinal, and sexual conditions related to abnormalities of pelvic floor structures in men.

Online supplemental material is available for this article.

Abbreviations: AUS = artificial urethral sphincter, CPPS = chronic pelvic pain syndrome, PCL = pubococcygeal line, SUI = stress urinary incontinence

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From the Department of Radiology and Radiological Sciences, Vanderbilt University Medical Center, Medical Center North, 1161 21st Ave South, CCC1121, Nashville, TN 37232 (J.L., K.M.S., S.S.A.); Department of Radiology, University of Texas Southwestern Medical Center, Dallas, Tex (G.K.); Department of Radiology, Faculty of Medicine, Cairo University Hospitals, Cairo, Egypt (R.F.E.); Department of Radiology, Montefiore Medical Center, Bronx, NY (V.C.); Department of Radiology, University of Utah School of Medicine, Salt Lake City, Utah (J.O.); Department of Radiology, South Nassau Communities Hospital, Oceanside, NY (A.S.); and Department of Diagnostic and Interventional Radiology, University of Texas Health Science Center at Houston, Houston, Tex (V.S.T.). Presented as an education exhibit at the 2018 RSNA Annual Meeting. Received March 15, 2019; revision requested May 17 and received June 18; accepted July 3. For this journal-based SA-CME activity, the author S.S.A. has provided disclosures (see end of article); all other authors, the editor, and the reviewers have disclosed no relevant relationships. **Address correspondence to** S.S.A. (e-mail: *sandeep.s.arora@vumc.org*).

SA-CME LEARNING OBJECTIVES

After completing this journal-based SA-CME activity, participants will be able to:

- Identify changes in male pelvic floor structures during micturition and defecation.
- Describe the mechanism of action of male urethral slings.
- Discuss the pathophysiologic causes of pain in chronic pelvic pain syndrome.

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Introduction

The pelvic floor is a complex structure that supports the pelvic organs and provides resting tone and voluntary control of the urethral and anal sphincters. Dysfunction or injury to the pelvic floor may result in debilitating disorders including pelvic organ prolapse, defecatory dysfunction, urinary incontinence, and sexual dysfunction. Although the most important risk factor for pelvic floor dysfunction in women is pregnancy, those for men include aging, muscle atrophy, injury, obesity, surgery (primarily prostatectomy), radiation exposure, smoking, trauma, and conditions resulting in increased intra-abdominal pressure including chronic constipation (1). In our anecdotal experience, male patients with sexually transmitted diseases such as human immunodeficiency virus (HIV) infection can present with pelvic floor dysfunction, although the degree of the association is not known.

The prevalence of pelvic floor dysfunction in men remains small relative to that in women (2), and the majority of the literature pertaining to MRI of the pelvic floor is thus oriented toward evaluation of the pelvic floor in women. However, anecdotal reports have suggested a recent increase in interest for imaging evaluation of pelvic floor dysfunction in men.

TEACHING POINTS

- The male urogenital diaphragm is traversed by the membranous urethra and the deep dorsal vein of the penis through two separate openings, while the female urogenital diaphragm is traversed by the vagina and urethra through a single opening. The anal aperture (rectal hiatus) is the only opening present in the pelvic diaphragm of both sexes.
- The typical landmarks and measurements used during MR defecography, including the pubococcygeal line (PCL), the H line (the length of the hiatus), the M line (the descent of the lavator plate), and the anorectal angle, have not been validated in men, and the values obtained should be interpreted carefully and in congruence with evaluation of clinical symptoms.
- Imaging evaluation of the full extent of rectal intussusception or rectal prolapse requires complete rectal emptying. Incomplete emptying may allow underestimation of this entity. This is why supine MR defecography may be less sensitive for rectal intussusception than an upright examination, particularly in patients who are not able to defecate completely.
- The mechanism of action of the noncompressive sling, which is similar to that of the transobturator sling, is thought to be related primarily to elevation of the bulbar urethra by 2–3 cm into the higher-pressure pelvic outlet. Noncompressive slings are preferred in patients with detrusor underactivity.
- Pain associated with CPPS is thought to be due to abnormally increased pelvic floor muscle tone. Spasms of the pelvic floor muscles can lead to extrinsic compression that restricts the lumen of the internal pudendal artery, limiting cavernosal inflow. It is also hypothesized that increased tone of the pelvic muscles secondary to pain prevents corporal smooth muscle relaxation needed for restriction of venous outflow and development of a closed compartment, thus contributing to sexual dysfunction.

The patient history, physical examination, and functional studies (eg, urodynamics, voiding cystourethrography, and anorectal pressures evaluation) are the mainstays of evaluation and are used as initial steps in assessment of most patients with pelvic floor dysfunction. Transperineal, transrectal, transvaginal, and, on rare occasions, transurethral US is used in evaluation of pelvic floor dysfunction. MRI has been shown to have utility in identifying the causes of pelvic floor dysfunction in female patients. However, no validated guidelines exist for MRI of the pelvic floor in male patients. MRI is important in the evaluation of the male pelvis because it provides both anatomic and functional information. Dedicated high-spatial-resolution images of the pelvis allow evaluation of the pelvic floor anatomy, and time-resolved imaging such as MR defecography sequences, which involve real-time imaging during active rectal evacuation, provide functional information (3).

This article provides a comprehensive review of MRI of the pelvic floor in men. We discuss normal male pelvic floor anatomy and how it differs from the female pelvis at imaging; techniques and protocols for MRI of the male pelvis; and various conditions including gastrointestinal, urinary, and sexual dysfunction related to anatomic and functional abnormalities of pelvic floor structures in men. We discuss conditions pertinent to the differential diagnosis of pelvic floor dysfunction in men, as well as postsurgical imaging of the male pelvic floor.

Male Pelvic Floor Anatomy

An understanding of pelvic floor anatomy is essential for interpreting imaging examinations of the pelvic floor, particularly in male patients, given the less common incidence of these examinations at most centers. The boundaries of the pelvic floor include the pubic bone anteriorly, the sacrum and coccyx posteriorly, and the ischial tuberosities laterally. Multiple muscles and associated fasciae support the pelvic floor and can be divided into three layers from superficial (caudal) to deep (cranial) in men: the superficial perineal pouch, the urogenital diaphragm, and the pelvic diaphragm (4,5). The pelvic floor anatomic structures are illustrated in Figures 1–3 and depicted on MR images in Figure 4.

Superficial Perineal Pouch

The superficial perineal pouch consists of the bulbospongiosus, ischiocavernosus, and superficial transverse perinei muscles (Fig 1). These muscles help to maintain urinary continence and are important for penile rigidity during erection and ejaculation. Superficial transverse perineal muscles provide support to pelvic and perineal structures, because simultaneous contraction of these paired muscles serves to stabilize the perineal body and fix the central tendinous portion of the perineum.

These muscles are vulnerable to traumatic injury related to pelvic fractures and iatrogenic trauma due to surgery. Figure 5a shows the thickened appearance of the superficial transverse perineal muscle on the right and atrophy on the left. The normal appearance of the superficial transverse perineal muscle is also depicted (Fig 5b).

Urogenital Diaphragm

The urogenital diaphragm, sometimes referred to as the perineal membrane, consists of the deep transverse perinei, the sphincter urethrae, and the compressor urethrae muscles as well as a muscular membrane (Figs 2, 4) that separates the superficial perineal pouch from the upper pelvis. It assists with urethral closure when there is increased intra-abdominal pressure and has fascial connections to the deep abdominal musculature, which help to stabilize the pelvis (including the external genitalia) during movement. The perineal body is

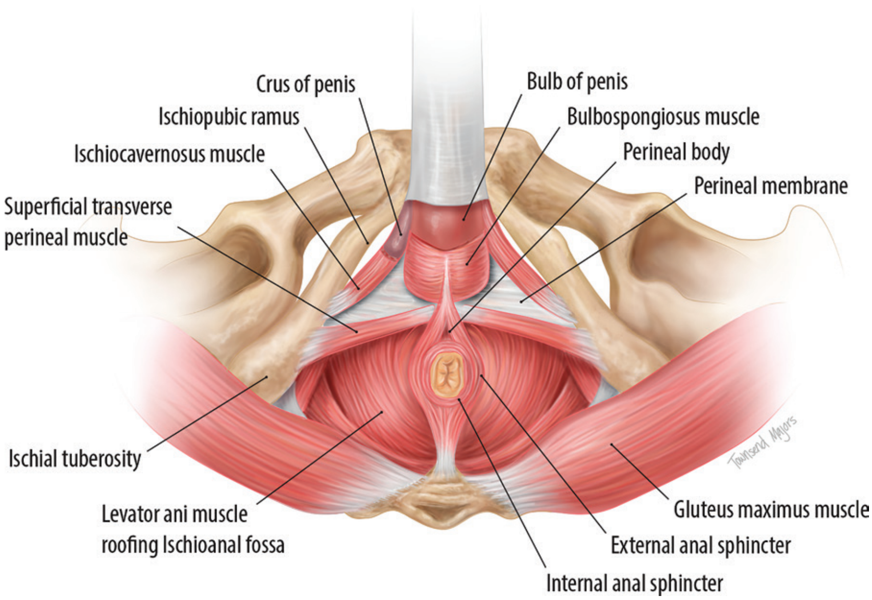


Figure 1. Illustration shows the inferior view of the male pelvic floor and the muscles and fascia that form the superficial perineal pouch and the urogenital diaphragm.

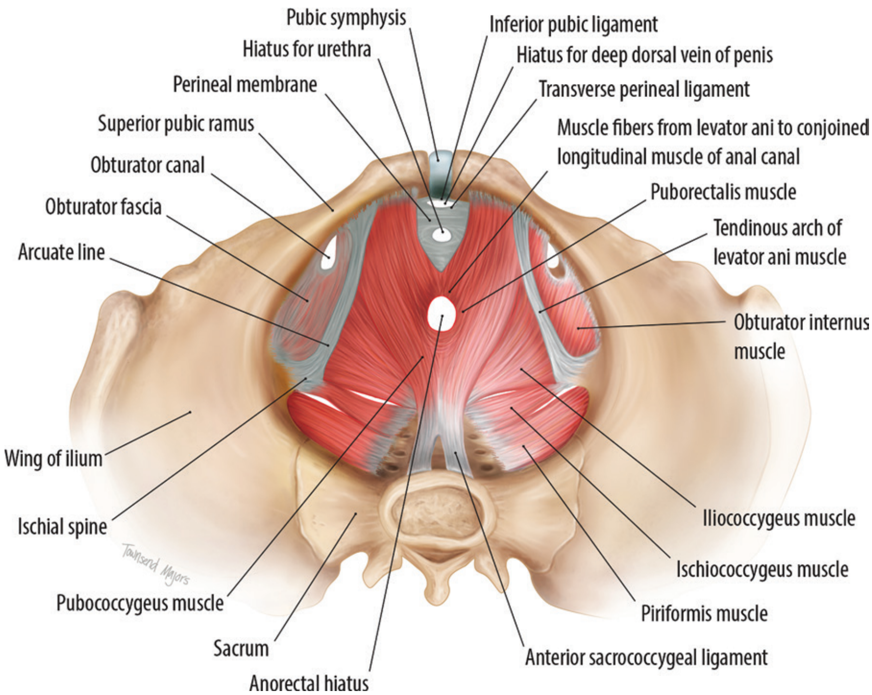


Figure 2. Illustration shows the superior view of the male pelvic floor and the muscles and fascia that form the pelvic diaphragm.

an ill-defined structure of connective tissue located in the midline along the posterior border of the urogenital diaphragm and serves as an anchor point where multiple muscles of the pelvic floor and the perineum attach (Fig 1), including fibers from the external anal sphincter, the external urethral sphincter, the superficial and deep transverse perineal muscles, the bulbospongiosus, and the anterior fibers of the levator ani. In men, the membranous urethra and deep dorsal vein of the penis traverse the urogenital diaphragm by means of two separate apertures (Figs 2, 6). Abnormalities of the deep dorsal vein of the penis are rare; however, superficial dorsal vein thrombosis or thrombophlebitis (also known as penile Mondor disease) can be seen in patients who also have cancer, trauma, sexually transmitted diseases, iatrogenic injury, or intracavernous injections (Fig 6).

Pelvic Diaphragm

The pelvic diaphragm extends from the dorsal aspect of the pubic symphysis to the coccyx and from the interior surface of one ilium to the other and is formed mainly by the pubococcygeus-puborectalis complex and iliococcygeus muscles (Figs 2, 4c). The anorectal hiatus is the only opening in the pelvic diaphragm. The iliococcygeus muscle arises from the external anal

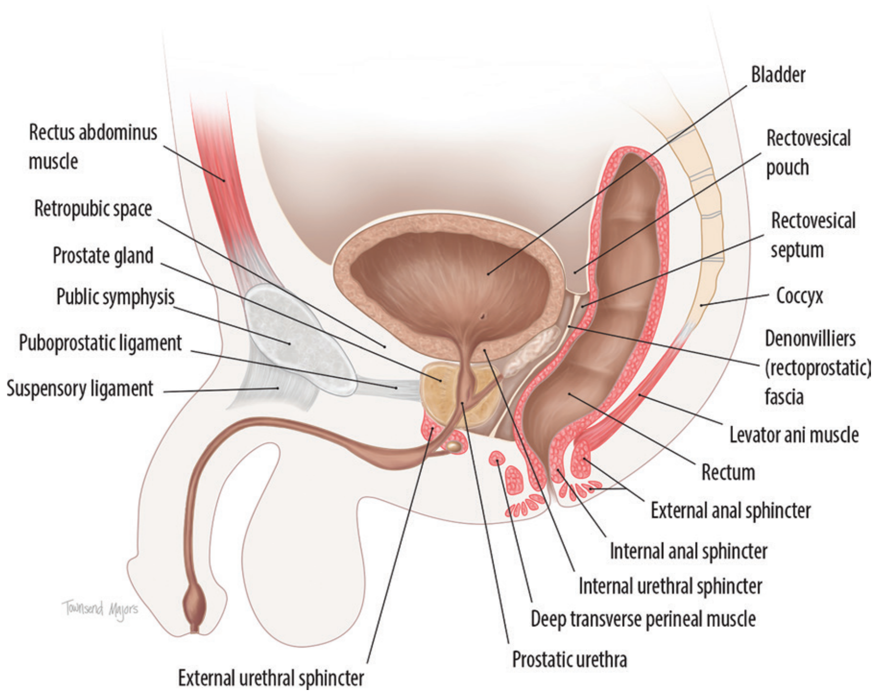


Figure 3. Illustration shows a sagittal view of the male pelvis and the relationship of the pelvic organs, musculature, and some of the fasciae that form the male pelvic floor.

sphincter and fans out laterally to insert onto the pelvic sidewall at the tendinous arch. The pubococcygeus arises from the pubic bone and fans out laterally to insert at the pelvic sidewall on the tendinous arch (6). The posterior condensation of the iliococcygeus and pubococcygeus muscles forms a firm midline raphe known as the levator plate (7). The puborectalis forms a U-shaped sling around the rectum. It inserts anteriorly on the pubic symphysis on either side of midline, passing laterally to the anorectum and urethra. The puborectalis is instrumental in maintaining urinary continence, which is achieved by elevating the bladder neck and compressing it against the pubic symphysis. The puborectalis is also responsible for controlling the anorectal angle, thereby maintaining anal continence when it is contracted and allowing for bowel evacuation when relaxed. Paradoxical contraction or deficient relaxation of the puborectalis is seen in patients with pelvic floor dyssynergia. The anorectal junction is the point where the distal rectum tapers to meet the anal canal and is demarcated by the posterior impression of the puborectalis muscle. Together, the iliococcygeus, pubococcygeus, and puborectalis are known as the levator ani and serve to elevate the anal sphincter during contraction. Normal and abnormal appearances of the iliococcygeus muscles are depicted in Figure 7. The obturator internus, while not officially part of the pelvic floor musculature, contributes to the support of the pelvic organs. Contraction of the obturator internus shortens and elevates the pelvic floor, because it originates from the arcus tendinous levator ani, which is a fascial component of the pelvic floor.

Pelvic Floor Fascia

The pelvic floor fascia in men lines the walls and floor of the pelvis (8). It is made of the endopelvic fascia (ie, extension of the transversalis fascia that covers the pelvic musculature), visceral pelvic fascia, and the *Denonvillier fascia*, which is otherwise known as the *rectovesical septum* (the layer of fascia between the prostate and the rectum that adheres to the prostate posteriorly).

The primary function of the Denonvillier fascia is to form an important barrier to the spread of malignant and nonmalignant diseases between the perirectal and periprostatic spaces. Transperineal injection of a spacer between the rectum and the prostate gland is contained by the Denonvillier fascia and can be used to separate the rectal wall from the prostate gland to minimize rectal toxicity during prostate radiation therapy (Fig 8a). If the injection needle traverses the Denonvillier fascia, it can lead to inadvertent spacer injection in the rectal wall or into the periprostatic vessels (Fig 8b). In addition to being an anatomic distinction between the prostatic compartment and the perirectal space, the Denonvillier fascia provides some structural support to the male pelvic floor (9). As a result, deficiency of the rectogenital or Denonvillier fascia can lead to posterior drooping of the bladder wall (the “saddle bag” sign) (Fig 9). Rectoceles also are associated frequently with prostatectomy and are possibly related to postoperative deficiency of the Denonvillier fascia (10).

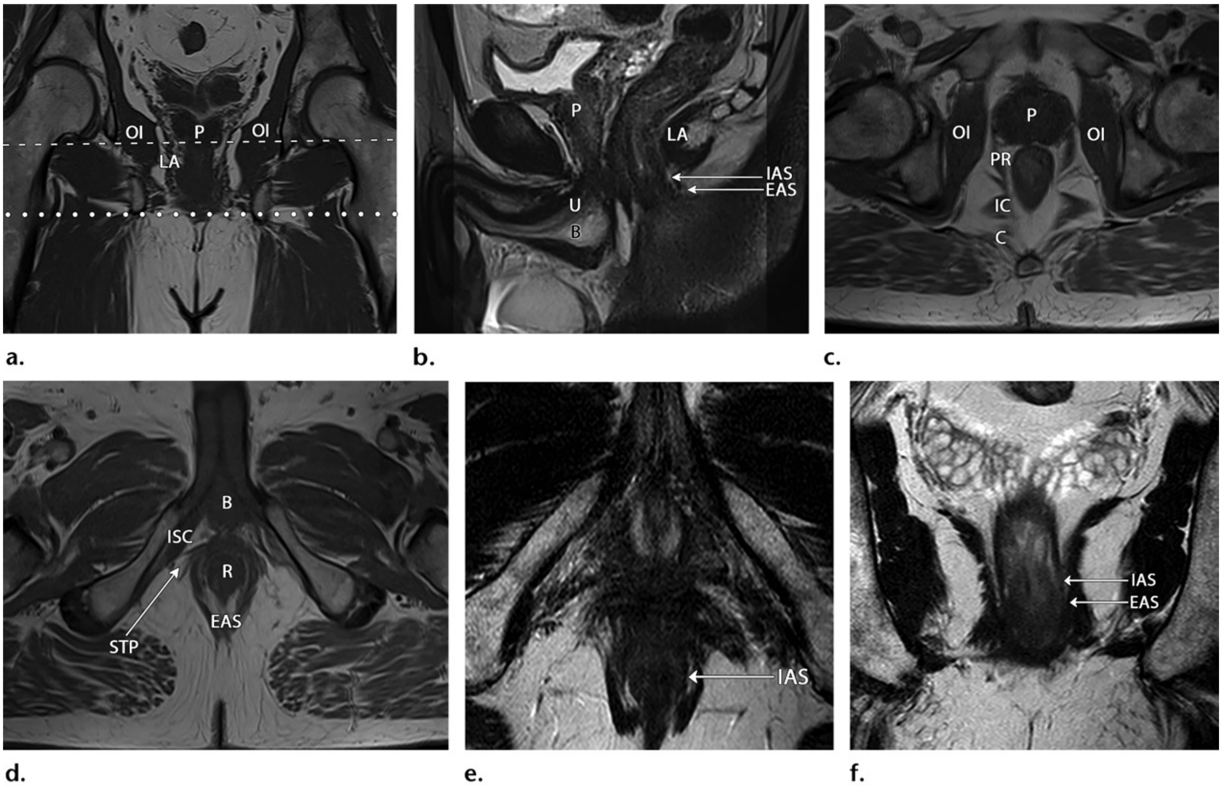


Figure 4. MRI anatomy of the male pelvis and pelvic floor in multiple patients aged 50 years or older. **(a–d)** Representative T1-weighted coronal **(a)**, T2-weighted sagittal **(b)**, and T1-weighted axial **(c, d)** MR images at the level of the lower prostate (**c**; dashed line in **a**) and the base of the penis (**d**; dotted line in **a**) show the anatomy of the male pelvis and pelvic floor. The levator ani *(LA)*, which is made up of the puborectalis *(PR)*, pubococcygeus *(PC)*, and iliococcygeus *(IC)*; coccygeus *(C)*, prostate *(P)*, obturator internus *(OI)*, superficial transverse perineal *(STP)*, bulbospongiosus *(B)*, ischiocavernosus *(ISC)*, external anal sphincter *(EAS)*, internal anal sphincter *(IAS)*, and rectum *(R)* are identified. **(e, f)** Axial (**e**) and coronal (**f**) T2-weighted MR images show the external anal sphincter (*EAS*) and internal anal sphincter (*IAS*). **(g)** Coronal T2-weighted image shows the sphincter urethrae *(SU)*, also known as the external sphincter muscle of the urethra *(U)*, which surrounds the whole length of the membranous urethra. This is enclosed in the fascia of the urogenital diaphragm. Note the extension of the proximal external sphincter and the proximal membranous urethra into the prostatic apex.

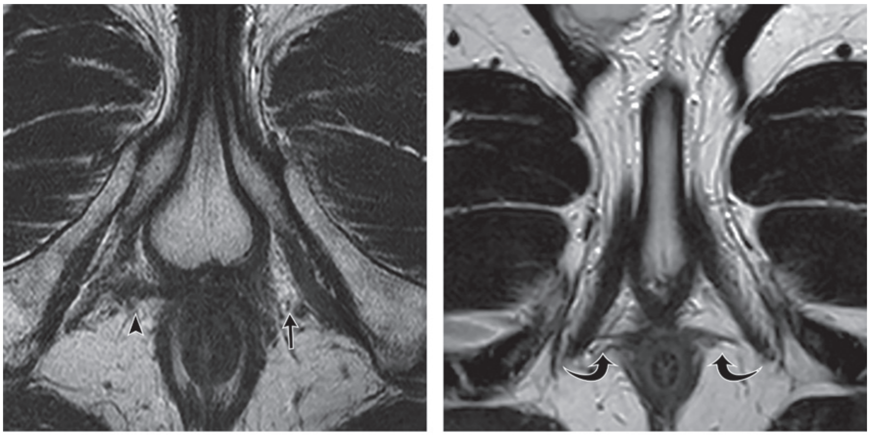
The levator ani fascia, a part of the endopelvic fascia, is located between the levator ani muscles and the external urethral sphincter. It contains neurovascular structures, and preservation of the this fascia during radical prostatectomy protects the innervation of the levator ani muscle and the external urinary sphincter (11).

Ligaments

The male urethral suspensory mechanism is composed of three continuous structures: the anterior pubourethral ligament, the intermediate pubourethral ligament, and the posterior pubo-urethral or puboprostatic ligament. The urethral suspensory mechanism inserts bilaterally along the lateral border of the urethra to form a sling of support from the pubic arch (12). The puboprostatic ligament supports the prostate gland and may be deficient or injured in men with substantial prostate descent on straining; however, the importance of excessive prostate descent in men is unknown. The suspensory ligament of the penis, which contributes to the anterior pubo-urethral ligament, is technically not a part of the pelvic floor but is an important structure that can be injured and cause penile torsion or instability. It also can be divided surgically for cosmetic penile lengthening procedures.

Differences between the Male and Female Pelvic Floor

The female pelvis is typically wider than the male pelvis to accommodate the uterus and facilitate



a. b.

Figure 5. **(a)** Axial T2-weighted non–fat-saturated MR image in a 70-year-old man shows scarring and thickening of the right transverse perineal muscle (arrowhead) relative to atrophy on the left (arrow). These findings are likely due to surgical and radiation changes after prostatectomy for prostate cancer. **(b)** Axial T2-weighted non–fat-saturated MR image in a 40-year-old asymptomatic man with normal anatomy (curved arrows).

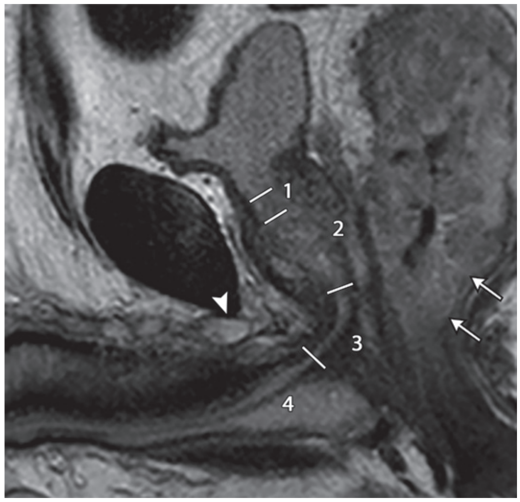


Figure 6. Thrombus in the dorsal vein of the penis in a 65-year-old man with rectal cancer. Sagittal T2-weighted non–fat-saturated MR image shows an incidental thrombus causing loss of normal flow void in and proximal irregular dilatation of the dorsal vein of the penis (arrowhead) that subsequently resolved without anticoagulative therapy and was not seen at MRI performed 5 months later (not shown). Arrows = rectal cancer. Also note the urethra on the sagittal image, which is composed of four parts: the preprostatic *(1)*, prostatic *(2)*, membranous *(3)*, and spongy or penile *(4)* urethra. The length of the membranous urethra has been shown to be correlated with continence after prostatectomy. Patients with a longer membranous urethra have a higher chance of achieving continence in the 1st year after intervention.

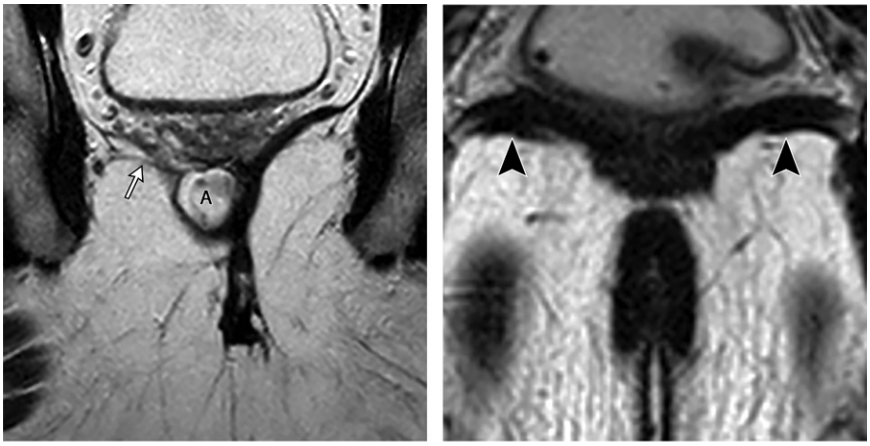
childbirth. The female pelvis is divided into the anterior, middle, and posterior compartments (7). The anterior compartment contains the bladder and urethra; the middle compartment contains the uterus, vagina, and cervix; and the posterior compartment contains the sigmoid, rectum, anal canal, and anus (6). In comparison, there are two functional compartments in the male pelvic floor: the anterior (genitourinary) and posterior (anorectal) compartments. In men, the prostate gland is located below the bladder and surrounds the urethra. The male urogenital diaphragm is traversed by the membranous urethra and the deep dorsal vein of the penis through two separate openings, while the female urogenital diaphragm is traversed by the vagina and urethra through a single opening. The anal aperture (rectal hiatus) is the only opening present in the pelvic diaphragm of both sexes.

The urethra is substantially longer in men, measuring approximately 20 cm (compared to 4 cm in women) and passes through the prostate before passing through the pelvic floor and into the penis. It is divided into the preprostatic, prostatic, membranous, and spongy urethra (Fig 6). The spongy urethra can be further divided into bulbar and penile portions.

The three main layers in the female pelvic floor are the endopelvic fascia, urogenital diaphragm, and pelvic diaphragm (7). In men, the pelvic floor is divided into the urogenital diaphragm, the pelvic diaphragm, and the superficial perineal pouch (4,13). The male endopelvic fascia contains smooth muscles, in contradistinction to the monolayered female endopelvic fascia that contains predominantly elastic fibers with little or no smooth muscles (14).

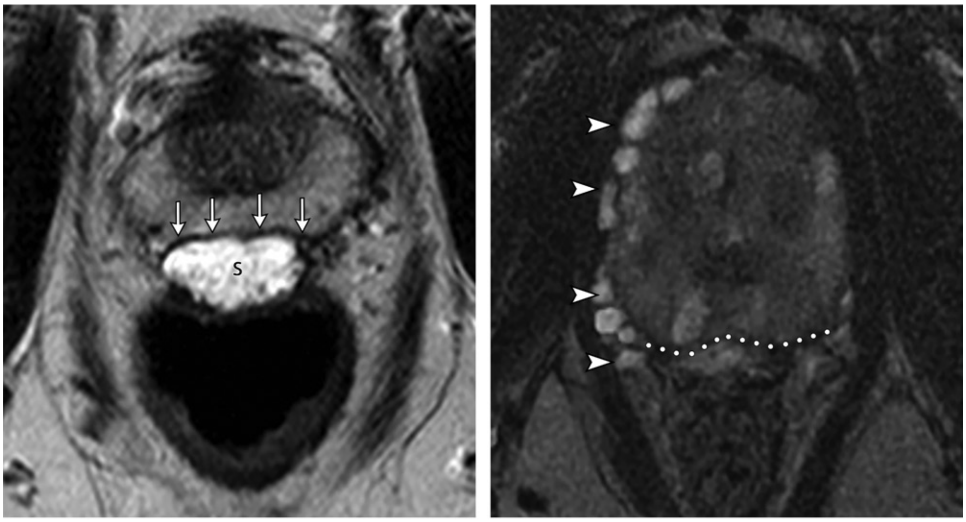
MRI Technique

The principles of MRI in the male patient for assessment of pelvic floor dysfunction are similar to those used for imaging in female patients and must include MR defecography with real-time image acquisition during rectal evacuation. Rectal filling with gel or other contrast media is required to elicit a defecatory effort. Sonographic gel usually is used because of its favorable MRI signal intensity characteristics, including high signal intensity on T2-weighted images. Approximately 100–150 mL of gel is introduced into the rectum by means of a short



a. b.

Figure 7. Different appearances of the iliococcygeus muscles in two men. **(a)** Coronal T2-weighted non–fat-saturated MR image in a 56-year-old man who was previously treated with abdominoperineal resection and who had a normal left iliococcygeus muscle shows atrophy of the right iliococcygeus muscle (arrow), which most likely is secondary to invasion from recurrent rectal adenocarcinoma *(A)*. **(b)** Coronal T2-weighted non–fat-saturated MR image in a 22-year-old man with pelvic floor pain and difficulty in defecation shows bilateral thickening of the iliococcygeus muscles (arrowheads).



a. b.

Figure 8. Successful and unsuccessful spacer injection between the Denonvillier fascia and the posterior rectal wall in two men. **(a)** Axial T2-weighted MR image in a 61-year-old man shows successful spacer injection between the rectal wall and Denonvillier fascia (arrows) to separate the rectal wall (posterior) from the prostate gland (anterior) in an attempt to minimize toxicity during prostate radiation therapy. The Denonvillier fascia can be seen as a dark line just anterior to the high-signal-intensity injected spacer *(S)*. **(b)** Axial T2-weighted MR image in a 62-year-old man shows the spacer injected into the periprostatic vessels (arrowheads), which is a potential complication that occurs when the spacer is injected anterior to the Denonvillier fascia (dotted line).

flexible tube or a catheter tip syringe, with the patient lying in the lateral decubitus position on the imaging table. An incontinence pad, diaper, or enema ring is used to contain the evacuated material. No oral or intravenous contrast agents are administered. Although upright imaging can be performed, this requires open magnets and MRI-compatible commodes, which are not available at most centers in the United States. At most centers, patients are imaged in a supine position, with knees slightly flexed and a pillow or other cushioning for support and legs slightly parted. The MRI protocol includes static T2-weighted fast spin-echo imaging in all three planes (axial, coronal, and sagittal) followed by dynamic MR defecography in a single midline sagittal plane with the use of steady-state balanced gradient-echo sequences such as fast imaging employing steady-state acquisition (FIESTA), true fast imaging with steady-state precession (TrueFISP), or balanced fast field echo (BFFE) through a single midsagittal plane during squeezing, defecation, and evacuation (Table 1). As in female patients, performance of the MR defecography sequences during multiple defecatory efforts (at least three) to elicit maximal prolapse or other dysfunction in real time is recommended. In some centers, MR defecography sequences are performed during straining. Although, to our knowledge, there are no dedicated studies

Figure 9. The saddle bag sign in a 53-year-old man. Axial contrast-enhanced CT image of the pelvis shows drooping of the right bladder wall posteriorly (arrowheads), which may be secondary to deficiency of the Denonvillier fascia.

Table 1: 1.5-T MR Defecography Protocol

Sequence	Plane of Imaging	Acquisition Maneuver	Field of View (cm)	Section Thickness (mm)	TR (msec)	TE (msec)	Flip Angle (degrees)	Matrix
T2-weighted fast spin echo	Axial	Rest	26	5	3920	91	150	320 × 256
T2-weighted fast spin echo	Sagittal	Rest	26	5	4070	91	150	320 × 256
T2-weighted fast spin echo	Coronal	Rest	26	5	5120	91	150	320 × 256
T1-weighted GRE OP and IP	Axial	Rest	26	5	140	2.3/4.6	55	256 × 208
Cine TrueFISP, FIESTA, and BFFE	Sagittal	Kegel	34	8	734.4	1.8	80	256 × 256
Cine TrueFISP, FIESTA and BFFE × 3	Sagittal	Defecation	34	8	734.4	1.8	80	256 × 256
Cine TrueFISP, FIESTA, and BFFE	Sagittal	Postdefecation strain	34	8	734.4	1.8	80	256 × 256

Note.—BFFE = balanced fast field echo, FIESTA = fast imaging employing steady-state acquisition, GRE = gradient echo, IP = in phase, OP = out of phase, TE = echo time, TR = repetition time, True FISP = true fast imaging with steady-state precession.

in males, imaging during defecation has been shown to be more sensitive than straining for depiction of prolapse in female patients (15–17). On occasion, imaging the patient during straining with an empty rectum may be helpful to demonstrate cul-de-sac hernias, especially if patients are not able to evacuate the rectal gel completely despite multiple attempts. Voiding MR cystourethrography, which has been used previously to detect vesicoureteral reflux in children, also may be used in conjunction with MR defecography (with a full bladder), particularly in men with predominant urinary dysfunction or if there is a need to evaluate urethral slings.

As for female patients, patient communication and coaching is of utmost importance in performing successful MR defecography. Given the unusual nature of the examination, in which patients are expected to defecate in the supine position on an MRI table, patients must be aware of these expectations before the examination. Furthermore, technologists should explain the terms they intend to use as instructions during the examination, such as Kegel or squeeze, Valsalva or strain or bear down, and defecate or evacuate, to maximize patient adherence. Finally, technologists should continue imaging until patients have completed the maneuver (eg,

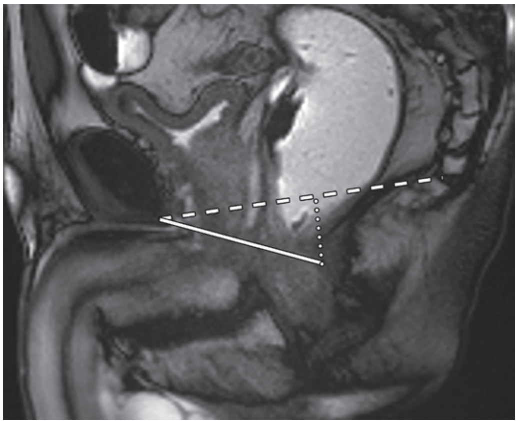


Figure 10. Pelvic floor landmarks adopted from the literature on the female pelvis, including the PCL (dashed line), the H line (solid line), and the M line (dotted line). The PCL is a line extending from the inferior edge of the pubic symphysis to the last coccygeal joint. The H line extends from the inferior border of the pubic symphysis to the posterior wall of the rectum at the anorectal junction and represents the anteroposterior width of the levator hiatus. The M line is a perpendicular line from the PCL to the H line that represents the distance of the levator hiatus descent.

Table 2: Sex Differences in Normal Values of Pelvic Floor Landmarks

Landmark	Men*	Women
H line (cm)	Not validated	<5
M line (cm)	1.2	<2
Anorectal angle (degrees)	101	108–127
Puboprostatic angle (degrees)	33.9	NA†

Sources.—References 7, 22, and 23.
*Please note that values in men are based on a small series.
†NA = not applicable.

squeeze, defecation) and have returned to a resting position.

Male Pelvic Floor Landmarks

A large volume of literature describing landmarks used in evaluation of the female pelvis is available (6,7). Although the literature on the male pelvis, to our knowledge, is sparse, some studies have been performed with the use of MR defecography (17), and a few conventional defecography studies have been performed to evaluate differences in pelvic floor laxity (18–21). However, we know that the male pelvis is inherently narrower and deeper than the female pelvis (22). The typical landmarks and measurements used during MR defecography, including the pubococcygeal line (PCL), the H line (the length of the hiatus), the M line (the descent of the lavator plate), and the anorectal angle, have not been validated in men, and the values obtained should be interpreted carefully and in congruence with evaluation of clinical symptoms (Fig 10). Table 2 shows a comparison of normal values of important pelvic floor measurements in men and women (7, 22,23).

The PCL is a line extending from the inferior edge of the pubic symphysis to the last coccygeal joint and marks the inferior extent of the pelvic floor. The H line extends from the inferior border of the pubic symphysis to the posterior wall of the rectum at the anorectal junction and represents the anteroposterior length of the levator hiatus. The urethra and rectum pass through the pelvic floor hiatus in men, while the urethra, vagina, and rectum pass through the pelvic floor hiatus in women. The normal length of the H line in women is less than 5 cm (7).

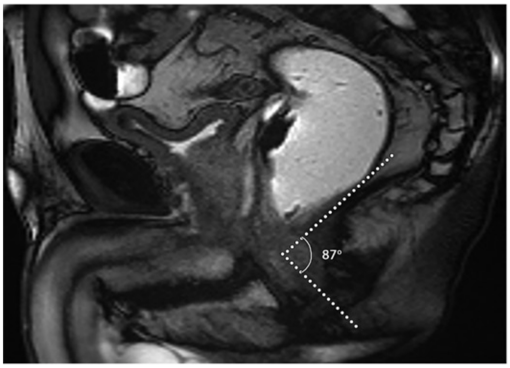
The M line is a perpendicular line from the PCL to the posterior tip of the H line that represents the distance of the levator hiatus descent. Goh et al (23) found descent of the anorectal junction of approximately 1.2 cm in asymptomatic males during maximum strain in a study of 25 men but did not observe any statistically significance difference between men and women. Normal and abnormal values of H and M lines in women are listed in Table 3.

The anorectal angle is the angle between the central axis of the anal canal and the posterior wall of the distal rectum (Fig 11). The anorectal junction, described earlier, represents the apex of the anorectal angle. In a study evaluating the normal anatomy in 25 male patients, Goh el al (23) found the normal resting anorectal angle to be approximately 101°. A normal value in women is 108°–127° (6). Although this may suggest a slightly narrower resting anorectal angle in men, the clinical significance of this difference remains unknown. As in women, this angle becomes more acute in men during squeezing or Kegel muscle contraction

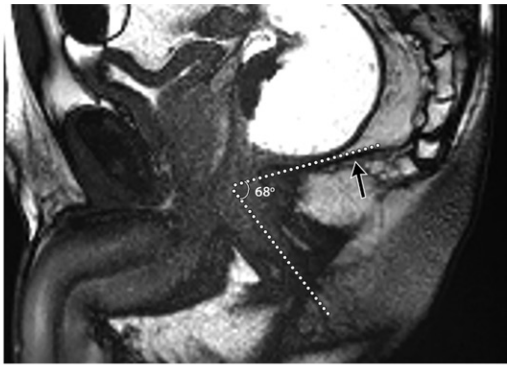
Table 3: Grading of Pelvic Floor Laxity in Women with H and M Lines

Grade	Hiatal Enlargement (H Line) (cm)	Anorectal Junction Descent (M Line) (cm)
Normal	<6	<2
Mild	6–8	2–4
Moderate	8–10	4–6
Severe	>10	>6

Source.—Reference 7.
Note.—Values have not been validated in men.



a.



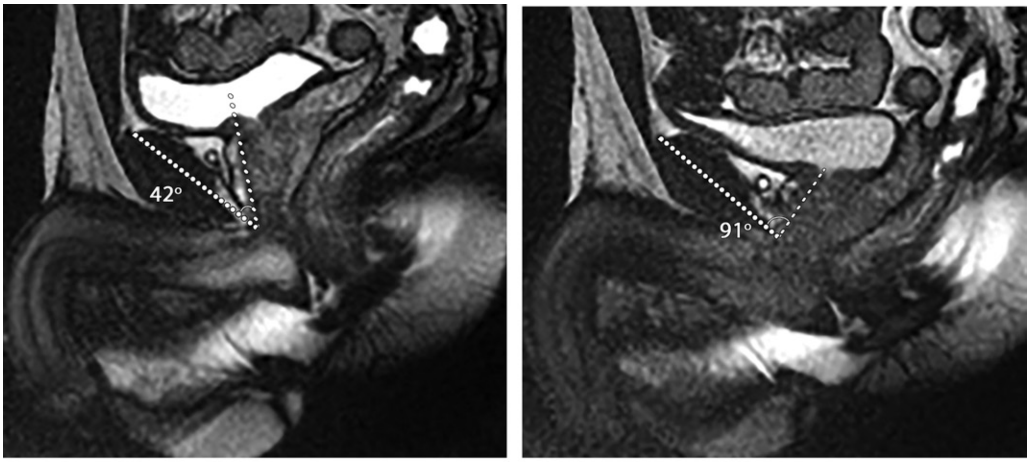
b.

c.

Figure 11. The anorectal angle in a 63-year old man. **(a)** Sagittal T2-weighted MR image shows the anorectal angle, the angle between the central axis of the anal canal and the posterior wall of the distal rectum, to be 87° (dotted lines). The normal angle has been found to be approximately 101° at rest in males (not shown). **(b)** Sagittal T2-weighted MR image shows the normal elevation of the levator plate (arrow) during squeezing, with the resultant decrease in the anorectal angle to 68°, which is partly due to contraction and shortening of the puborectalis muscle (not shown), which moves the anorectal junction cranially and anteriorly. **(c)** Sagittal T2-weighted MR image shows the expected increase in the anorectal angle to 97° during straining and defecation.

secondary to shortening of the puborectalis muscle and elevation of the anorectal junction. During defecation, the puborectalis muscles and levator plate typically relax, resulting in expected widening of the anorectal angle. The absence of puborectalis relaxation and anorectal widening during defecation can be a cause of defecatory dysfunction. In women, the anorectal angle decreases during contraction and increases during defecation by approximately 15°–20° (24).

One angle that is specific to the male pelvic floor is the puboprostatic angle (Fig 12). This is the angle between the pubic symphysis and the axis of the bladder neck. Under normal circumstances, normal micturition in men comprises five stages: relaxation of the pelvic floor, descent of the bladder neck, widening of the puboprostatic angle, contraction of the prostate gland, and micturition. Rotation of the prostate gland around the pubic symphysis as measured by the increase in the puboprostatic angle along with prostate contraction is thought to be essential for micturition. Contraction of the prostate gland or an increase in the puboprostatic angle is not normally expected during the Valsalva maneuver or defecation. In a study of 15 men with normal function who underwent MRI voiding cystourethrography, the mean puboprostatic angle before voiding was 33.9°, and the angle increased at the end of voiding to 56.8°. The size of the prostate affects the puboprostatic angle (25,26). Figure 12 shows a technique to measure the puboprostatic angle at rest and during strain. Another measurement is the prostatic-urethral angle, which is the acute angle between the proximal and distal prostatic urethra. An increased prostatic-urethral angle at rest (greater than 34°) in patients with benign prostatic



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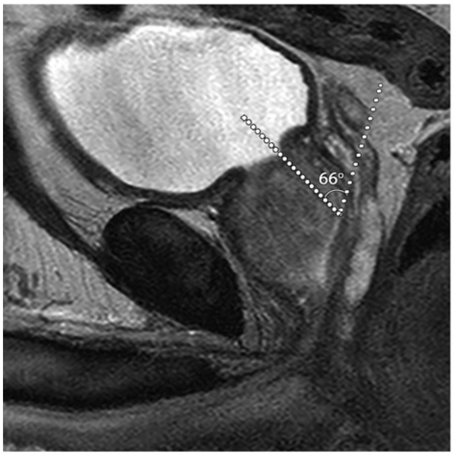

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Figure 12. Puboprostatic and prostatic-urethral angles. **(a, b)** Sagittal midline true fast imaging with steady-state precession (TrueFISP) MR images in a 39-year-old man with benign prostatic hyperplasia show a normal increase in the puboprostatic angle from 42° at rest **(a)** to 91° during strain **(b)**. **(c)** Sagittal T2-weighted MR image in a 67-year-old man shows a prostatic-urethral angle measurement of 66°.

hyperplasia has been shown to correlate with bladder outlet obstruction and increased urinary retention (Fig 12) (27).

During the volitional contraction of the pelvic floor (eg, when attempting to stop the urinary flow during voiding), the urethrovesical junction and the anorectal junction move upward and forward, the bulb of the penis moves ventrally, and there is a small displacement of the ventral urethral margin dorsally at the level of the external urethral sphincter, as demonstrated with perineal US (28,29). To our knowledge, this mechanism has not been investigated with MRI.

Male Pelvic Floor Dysfunction

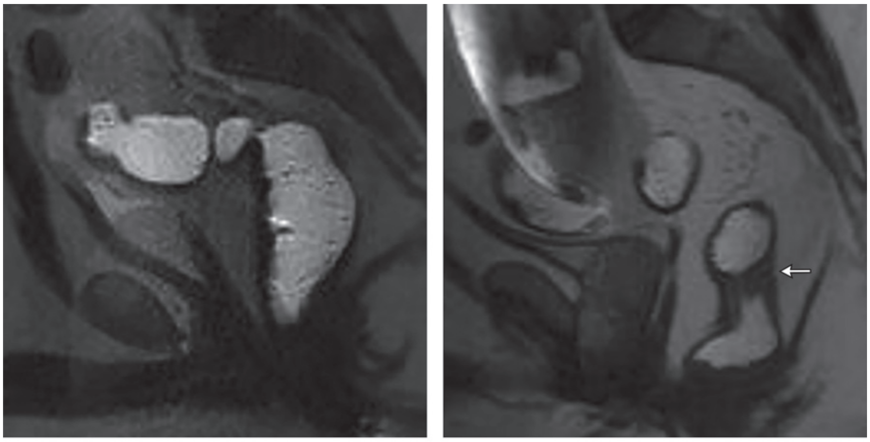
Three broad categories of male pelvic floor dysfunction are gastrointestinal dysfunction, urinary dysfunction, and sexual dysfunction.

Gastrointestinal Dysfunction

Patients who have gastrointestinal manifestations of pelvic floor dysfunction may present with defecatory dysfunction and constipation or fecal incontinence. Imaging findings of these conditions in men are similar to those in women.

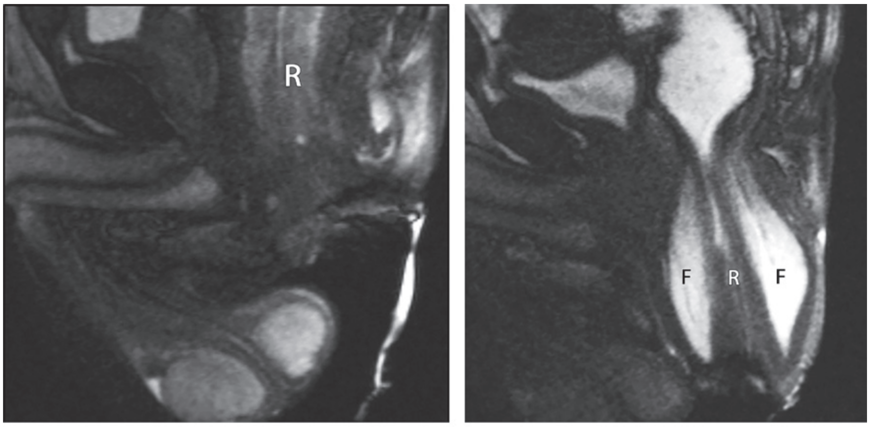
Intussusception and Rectal Prolapse.—*Intussusception* is defined as the invagination of the rectal wall into the rectal lumen. The prevalence of intussusecption is 0.25%–0.42% of the adult male population (30). Partial-thickness rectal intussusception occurs when only the mucosal layer prolapses into the lumen. Full-thickness rectal intussusception occurs when all the layers of the wall are involved. There are varying levels of intussusception based on the location of the intussusceptum: *(a)* intrarectal intussusception (ie, an intussusceptum that remains within the rectum) (Movie E1), *(b)* intra-anal intussusception (ie, an intussusceptum that extends into the anal canal), and *(c)* extra-anal intussusception (ie, complete rectal prolapse or protrusion of the intussusceptum outside the anal verge) (Movie E2). Symptoms include pain, fecal incontinence, diarrhea, constipation, mucous discharge, and bleeding. Risk factors include congenital laxity of the pelvic floor, anal intercourse, and chronically increased abdominal pressure (31).

Rectal intussusception shows a "bowel-within-bowel" appearance at sagittal midline MRI during the straining and evacuation phases (Fig 13). MRI has shown that the inversion point of the intussusception usually begins at the site of the detachment of the rectal wall from the Denonvillier fascia, which further suggests some support function of the Denonvillier fascia (18). Although partial-thickness intrarectal intussusception may be subtle, more extreme cases of rectal prolapse are readily identifiable on sagittal MR defecograms (Fig 14). Imaging evaluation of the full



a. b.

Figure 13. Intrarectal intussusception in a 22-year-old man with a history of a solitary rectal ulcer (not shown) and constipation. **(a)** Sagittal steady-state MR image shows the patient during rest. **(b)** Sagittal steady-state MR image shows intrarectal intussusception (arrow) with straining after maximal evacuation (Movie E1).



a. b.

Figure 14. Rectal prolapse in a long-term incarcerated 36-year-old man with a history of repetitive traumatic anorectal sexual assault. Sagittal steady-state defecograms shows severe full-thickness prolapse of the rectum *(R)* and surrounding peritoneal fat *(F)* in the patient at rest **(a)** and during the Valsalva maneuver **(b)**. He was treated with sigmoid colectomy and rectopexy (Movie E2).

extent of rectal intussusception or rectal prolapse requires complete rectal emptying. Incomplete emptying may allow underestimation of this entity. This is why supine MR defecography may be less sensitive for rectal intussusception than an upright examination, particularly in patients who are not able to defecate completely. Treatment options include rectopexy (Fig 15), perineal rectosigmoidectomy, and resection of prolapsing mucosa (ie, the Delorme procedure).

Anorectal Junction Descent and Rectocele.—In women, prolapse in the anterior and middle compartments pertains to varying descent of the bladder and uterus. In the posterior compartment, *prolapse* is used only to describe the most severe grade of rectal intussusception, and the term *anorectal junction descent* is used to describe bowel descent without eversion due to pelvic floor laxity. This distinction also should be made in men. The descent of the anorectal junction below the PCL (M line) is considered mild at 2–4 cm, moderate at 4–6 cm, and severe at greater than 6 cm in women (7). These measurements have not been validated in men. Anorectal

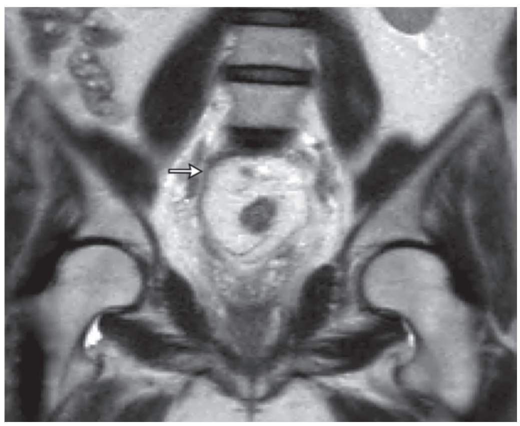
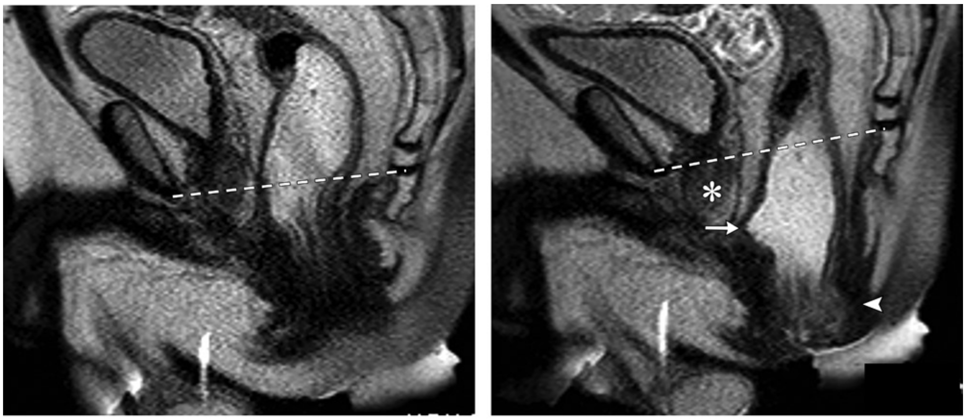


Figure 15. Rectopexy in a 50-year-old man. Coronal T2-weighted MR image shows postoperative changes related to rectopexy (arrow).

junction descent may be associated with rectoceles. A rectocele occurs when the rectal wall protrudes or bulges beyond the expected margin of the rectal wall (Fig 16, Movie E3). The prevalence of rectoceles is 4.4%–17% in men who undergo defecography and is highly associated with prostatectomy (32). Anterior rectoceles are the most common type in both men and women



a. b.

Figure 16. Anorectal descent and rectocele in a 50-year-old man with AIDS who was treated with rectopexy 6 months earlier and returned for evaluation after hearing a "pop." Sagittal T2-weighted MR images acquired with the patient at rest **(a)** and while straining **(b)** show anorectal descent (arrowhead in **b**) and a small anterior rectocele (arrow in **b**) measuring approximately 1.1 cm. Note the descent of the prostate (* in **b**) below the pubococcygeal line (dashed line in **a** and **b**) (Movie E3).

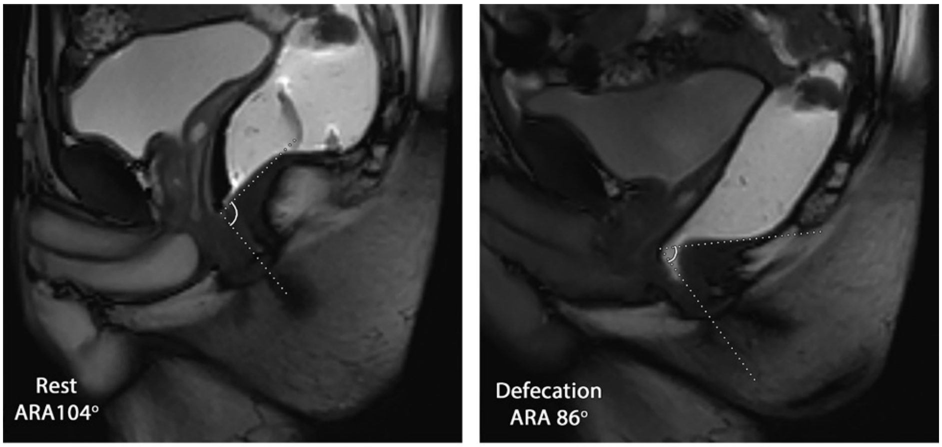
(10). In women, rectoceles manifest as posterior vaginal wall bulging, but they may be occult in men, given the absence of a clinically apparent bulge (10). Lateral and posterior rectoceles result from defects in the prerectal and pararectal fasciae and are commonly seen in patients with dyssynergia (18). Rectoceles in women can be graded as small (less than 2 cm), moderate (2–4 cm), or large (greater than 4 cm) (7). The same grading scale may be used in men, although normal values have not necessarily been established in men. Small rectoceles can be asymptomatic. Larger rectoceles can result in symptoms of incomplete evacuation.

Enteroceles.—An *enterocele* usually refers to herniation of the peritoneum-covered small bowel between the vagina and rectum in women. Enterocele occurrence in men is very rare, probably because of the absence of the posterior cul-de-sac. Nevertheless, they have been reported in the literature (33), and careful evaluation for enteroceles should be performed.

Dyssynergia.—*Dyssynergia* is a condition that results from the inability to coordinate the function of the abdominal and pelvic floor muscles to evacuate stool. Under normal circumstances in men and women, the external anal sphincter and puborectalis muscles relax, resulting in widening of the anorectal angle when patients increase intra-abdominal pressure to initiate defecation. The hallmark of pelvic floor dyssynergia is the contraction of the puborectalis muscle and elevation of the levator plate, resulting in paradoxical narrowing of the anorectal angle during attempts at defecation (Fig 17, Movie E4) (18). It is important to differentiate this finding at imaging from voluntary Kegel contractions or squeezing of the pelvic floor. Proper explanation and coaching of the patient regarding the difference between these maneuvers is imperative to avoid a false diagnosis of dyssynergia. Clues that patients are in fact attempting to defecate rather than squeezing include anterior bulging of the anterior abdominal wall and the descent of the anorectal junction (ie, an increase in the length of the M line) due to increased intra-abdominal pressure. Anatomic evaluation may reveal hypertrophied puborectalis and external anal sphincter muscles in patients with dyssynergia.

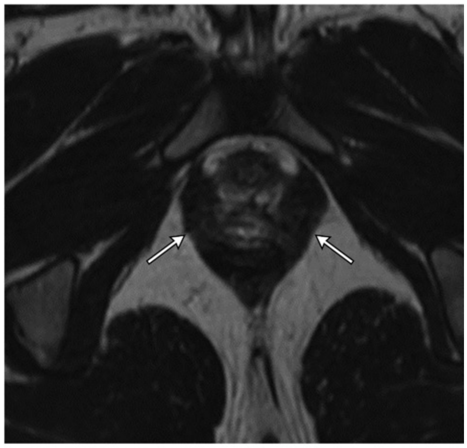
The exact cause of pelvic floor dyssynergia is unknown, but it may be due to traumatic injury to the pelvic floor neuromuscular structures. Case reports have also documented dyssynergia in patients after ileal pouch–anal anastomosis (34). Imaging can be performed to evaluate for pelvic floor dyssynergia, because this condition is managed with biofeedback therapy rather than surgical intervention; however, imaging is not the first test used for diagnosis. Dyssynergia is usually diagnosed with anorectal manometry, and MRI is used for problem solving and evaluating secondary causes. During anorectal manometry, there is normally an increase in rectal pressure during bearing down, with associated relaxation of the external anal sphincter. This process is under voluntary control, and an inability to perform this coordinated movement is one of the key findings in patients with dyssynergia (36).

MRI Evaluation of Ileal Pouch–Anal Anastomosis.—*Fluoroscopic defecating pouchography* (an examination of the ileal pouch) has been used in the assessment of patients with inadequate evacuation after ileal pouch–anal anastomosis and may reveal pouch intussusception, anterior



a. b.

Figure 17. Anorectal angle *(ARA)* in a 28-year-old patient with dyssynergia. **(a, b)** Sagittal steady-state MR images show that the anorectal angle decreases from 104° **(a)** to 86° **(b)** during defecation because of paradoxical contraction of the puborectalis muscle. **(c)** Axial T2-weighted MR image shows bilaterally thickened puborectalis muscles (arrows) (Movie E4).



c.

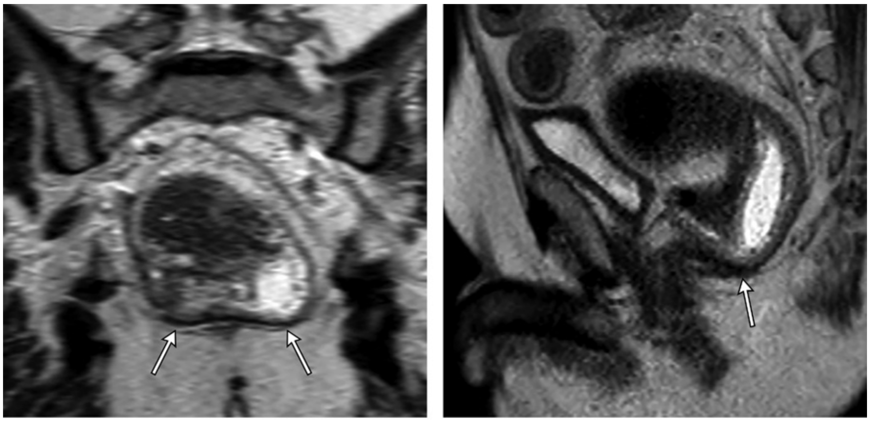
pouchocele, pouch prolapse, or dyssynergic defecation. Findings at defecating pouchography have been shown to correlate with clinical symptoms of straining, anal pain, incontinence, and fecal urgency (36). MRI evaluation of ileal pouch–anal anastomosis may provide functional information similar to that of a fluoroscopic defecating pouchogram (37) but can also allow a more complete assessment of the pouch and pelvic anatomy (Fig 18). MRI also can be used to evaluate other pouch complications including but not limited to pouchitis, stricturing, and fistulization (37).

Anal Incontinence.—The internal and external anal sphincters and the puborectalis muscle maintain fecal continence. Causes of anal incontinence include but are not limited to traumatic and iatrogenic damage to the sphincter complex and neurologic disorders such as pudendal nerve damage. MRI signs of anal incontinence include the inability to retain the instilled rectal contrast material and pelvic floor descent. Intussusception and/or rectocele can accompany anal incontinence (6). As in women, MRI also can be used to identify sphincter tears or anal sphincter atrophy (38) in men with anal incontinence.

Transperineal Hernia.—Transperineal hernias also have been reported in men with perineal injuries, constipation, or other conditions that result in increased intra-abdominal pressure. They also have been reported in patients after abdominoperineal resection and pelvic exenteration (39). Palumbo et al (40) reported a rare case of an anterior perineal hernia in a young male saxophone player, which presumably was caused by chronically increased intra-abdominal pressure and was detected with dynamic transperineal US. Transperineal hernias may appear as defects in the pelvic diaphragm that are best seen when the patient is bearing down and may contain intrapelvic fat or other pelvic contents (Fig 19).

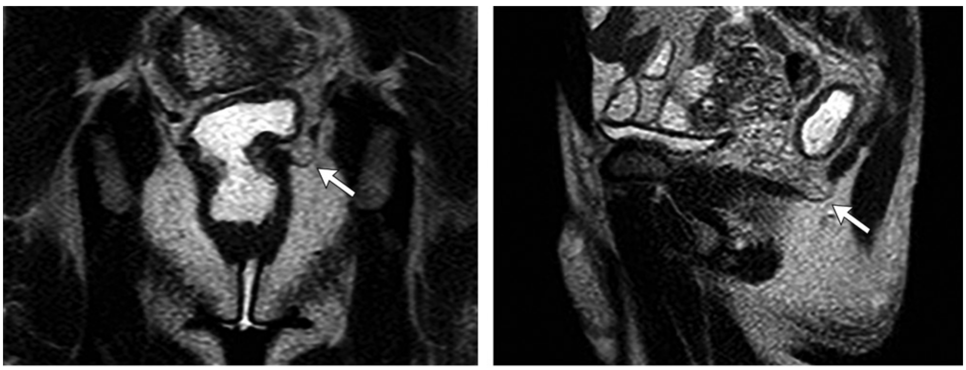
Urinary Dysfunction

The symptoms of male urinary dysfunction can be categorized as lower urinary tract symptoms, functional urinary incontinence, and stress urinary incontinence (SUI). Lower urinary tract symptoms are secondary to poor coordination between the bladder muscles and the urethra and can lead to irritative voiding symptoms such as urge incontinence (due to infection or neurogenic bladder overactivity) and/or obstructive symptoms such as overflow incontinence (ie, "dribbling") that are secondary to bladder outlet obstruction or a neurogenic bladder. Pelvic floor hyperactivity or spasms can lead to lower urinary tract symptoms. A full discussion of lower urinary tract symptoms is beyond the scope of this article.



a. b.

Figure 18. Ileoanal pouch anastomosis in an 81-year-old man with a history of ulcerative colitis after total colectomy and ileoanal pouch anastomosis who presented with an inability to defecate despite the urge to do so and intense pressure, presumably due to gas buildup and rectal spasms. Coronal **(a)** and sagittal **(b)** left paramedian T2-weighted MR images acquired while the patient was straining show marked bowing of the ileococcygeus muscles bilaterally (arrows in **a**) that is even more pronounced in **b** (arrow). There is decreased angulation between the ileal pouch and the anus **(b)** on straining, thereby hindering evacuation. The ileoanal junction (off plane) never passes below the PCL, but the distal ileum balloons below the PCL bilaterally (not shown).



a. b.

Figure 19. Transperineal hernia in a 22-year-old man (same patient as in Figure 7b, who had bilateral iliococcygeus thickening). Coronal **(a)** and sagittal **(b)** T2-weighted MR images show a defect in the ileococcygeus muscle on the left during straining, with herniation of fat through the defect (arrow).

MRI may be used in the planning and outcome evaluation of prostatic artery embolization (41), in classification of benign prostatic hypertrophy, and as a problem-solving tool in patients with persistent symptoms after treatment. Functional incontinence is secondary to limited motility in elderly or disabled patients. Functional incontinence is urinary incontinence that results from physical or mental impairment that may limit the ability of an individual to go to the bathroom to urinate. Imaging in these patients is primarily for evaluation of associated complications and to rule out other causes of incontinence.

SUI is defined as urinary leakage with exertion. It is common in patients who have undergone prostatectomy, almost all of whom experience some degree of SUI in the immediate postoperative phase (42), with up to 89% achieving continence within 1 year (43). SUI also can occur after prostate radiation therapy. The length of the membranous urethra has been shown to be directly related to the incidence of SUI and the time required for these patients to achieve continence (44). Those with a longer membranous urethra were found to achieve continence more frequently and in a shorter time frame after prostatectomy. Coakley et al (43) found that 89% of patients with a membranous urethra less than 12 mm in length before intervention developed persistent SUI after prostatectomy, compared with 77% of patients in whom the urethral length was 12 mm or greater. These findings were confirmed by Tienza et al (42), who found that patients with a membranous urethra shorter than 14.3 mm are at an increased risk for development of SUI after prostatectomy. They also found that patients with a prostate volume greater than 50 mL were also at a greater risk of postprostatectomy incontinence. Preservation of both the external urethral sphincter and the intraprostatic portion of the membranous urethra has been shown to be important, because 10%–40% of the functional membranous urethra is actually covered by the prostatic apex (45). MRI can be used to evaluate these variables and help determine the probability of incontinence to allow adequate preoperative counseling. The length of the membranous urethra is measured on coronal MR images as the distance from the external sphincter and/or prostatic apex to the entry of the urethra into the penile bulb (Fig 20) (43).

Figure 20. Membranous urethra length *(MUL)* in a 63-year-old man. Coronal T2-weighted image shows the measurement of the membranous urethra. Note that the proximal part of the membranous urethra is covered by the prostatic apex.

Postoperative MRI of the Urinary Tract.—In addition to preservation of the membranous urethral and external urethral sphincter during prostatectomy, various musculofascial reconstruction techniques during surgery have been used to reinforce urethral support and improve postoperative time to continence. The urethral support usually is provided by suturing the vesicourethral junction anteriorly to the pubic bone periosteum. It is important to have a stable anastomosis after reinforcement (46). An unstable anastomosis may lead to enhanced scar formation with resultant anastomotic stricture as a consequence. MRI can be used to evaluate the periurethral postsurgical anastomosis. At postprostatectomy MRI, incontinent patients show a substantially wider angle of the membranous urethra (ie, the angle between a centerline through the bladder neck and the perpendicular line to the PCL during voiding) and more pronounced lowering of the bladder neck and the external urethral sphincter (47).

In patients who recover urinary continence after radical prostatectomy, an increase in the thickness of the puborectalis muscle and movement of the bladder neck upward and forward have been observed at postprostatectomy MRI (48).

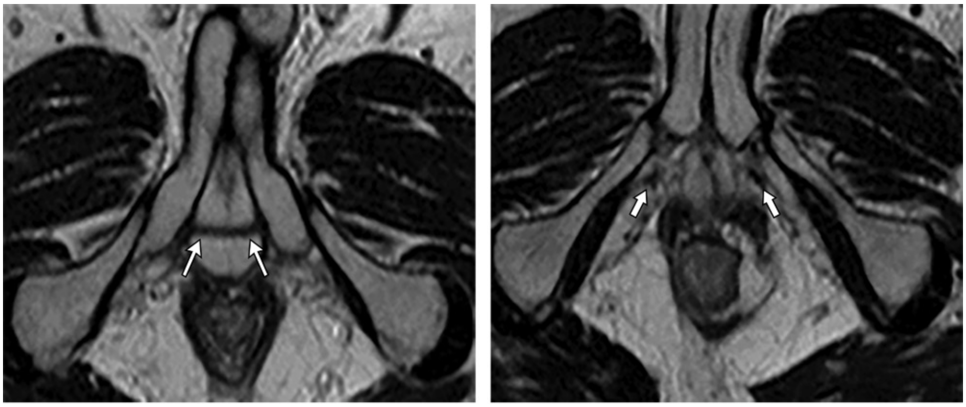
Dynamic voiding MRI also has been used to evaluate function in patients with a neobladder. A neobladder exhibits more dynamic movement during micturition than does a normal bladder (48).

Men with persistent SUI despite conservative therapy may be treated with placement of a urethral sling or an adjustable urinary sphincter (AUS). Bulking agents, synthetic materials injected around the urethra near the bladder neck, are used less commonly in men because of the high failure rate of these materials. Bulking agents vary in appearance; however, the more commonly used agents have signal intensity characteristics that are comparable to those of the adjacent muscle at T1-weighted MRI and are hyperintense relative to muscle at T2-weighted MRI (49). MRI of the pelvic floor can be used to evaluate urethral slings and AUS after placement.

Urethral Sling.—Urethral slings are strips of synthetic polypropylene mesh material that are placed around the posterior aspect of the urethra and treat incontinence by supporting the urethral bulb and distal membranous urethra. Slings usually are used in patients with mild to moderate postprostatectomy incontinence, which is defined as less than 200 g of urine leakage over a 24-hour period (50). Continence rates after placement of a sling are 54%–80% (50). Slings can be noncompressive or compressive.

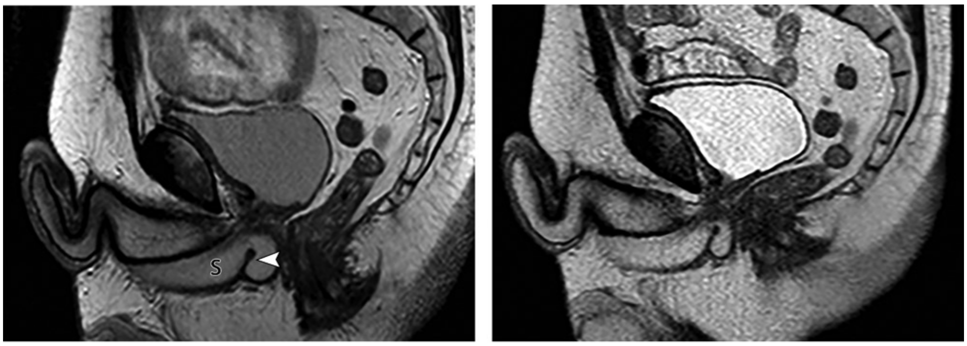
The mechanism of action of the noncompressive sling, which is similar to that of the transobturator sling, is thought to be related primarily to elevation of the bulbar urethra by 2–3 cm into the higher-pressure pelvic outlet. Noncompressive slings are preferred in patients with detrusor underactivity. The central portion of the transobturator sling typically is fixed to the corpus spongiosum and the arms are pulled through the obturator foramen, exiting lateral to the pubic symphysis bilaterally (Figs 21, 22). The sling results in indentation of the proximal corpus spongiosum distal and dorsal to the sphincteric urethra and prevents the urethrovesical junction from descending below the PCL during straining, coughing, and micturition (50). Compressive slings (eg, a quadratic sling or an adjustable sling) are offered only to those with preserved detrusor activity, which is necessary to overcome the fixed resistance of the device (51). A comprehensive review of different types of slings is beyond the scope of this article.

RadioGraphics



a. b.

Figure 21. Urethral sling in a 70-year-old man. Axial T2-weighted MR images show the appropriate position for the urethral sling (arrows). A normal urethral sling is thin and hypointense on T2-weighted MR images and extends laterally into the obturator foramina.



a. b.

Figure 22. Urethral sling in a 70-year-old man (same patient as in Fig 21). **(a)** Sagittal T2-weighted image with the patient at rest shows the positioning of the sling *(S)* below the urethral bulb, with a slight indentation (arrowhead). When it is tensioned appropriately, the sling elevates the urethral bulb 2–4 cm into the pelvis and provides support to the distal membranous urethra. **(b)** Sagittal T2-weighted image shows the patient during increased abdominal pressure, which facilitates continence during stress. Note the cushion of healthy spongeous tissue between the sling and the distal sphincteric urethra. In cases of sling failure or sling-related injury, one can see atrophy or focal thinning of this tissue (not shown).

MRI can help in evaluation of the function and complications of the sling after it is placed. There should be enough length of the bulb posterior to the sling (>10 mm) (52). The sling should provide passive urethral support during rest and stress but should not cause urethral compression, which would be an impediment to flow during active micturition (25). Substantial elevation of the bladder neck, the posterior bladder wall, and the external urinary sphincter and lengthening of the membranous urethra have been observed after placement of urethral slings in men (53); however, these measurements are not predictive of continence success. The severity of pre- and postoperative periurethral fibrosis, as seen at MRI, has been associated with the frequency of retrourethral transobturator sling failure (53). Potential complications of urethral slings include erosion, infection, urinary retention, and mechanical complications (54).

Artificial Urethral Sphincter.—An AUS can be used in patients with any level of incontinence and in patients with prior sling placement. The AUS consists of a pump, a pressurized reservoir, and a sphincter cuff (Fig 23). The circumference of the cuff is 3.5–14 cm and the reservoir is available with five preset pressure settings. The AUS is placed around the bulbous urethra so that during inflation, the urethra lumen is occluded. To allow urination, the cuff is deflated manually by squeezing the intrascrotal control pump, which directs fluid from the inflated cuff into the reservoir. After a short delay, the cuff automatically reinflates owing to an existing pressure gradient between the reservoir and the cuff. Continence rates after placement of an AUS are 76%–89% (54). Some causes of early sphincter failure include a large cuff size, insufficient reservoir pressure, system leakage, detrusor overactivity, infection, and overflow incontinence. Causes of late sphincter failure

Figure 23. Artificial urinary sphincter in an 82-year-old man. T2-weighted sagittal right lateral **(a)** and axial **(b, c)** MR images through the pelvis show appropriate positioning of an artificial urinary sphincter in a patient with severe urinary incontinence that was refractory to medical management. The artificial urinary sphincter consists of a pressurized reservoir (arrow in **a**) in the abdomen, a sphincter cuff that goes around the bulbous urethra (arrowhead in **b**), and a pump placed in the scrotum (*). The pump in the right scrotum is partially obscured by susceptibility artifact.

include device malfunction (8%–45%) and urethral atrophy, infection, or erosion (7%–17%) (50). Sphincter failure usually leads to revision surgery.

Imaging allows detection of device malfunction including but not limited to system discontinuity, migration, infection, and loss of reservoir fluid. If there is insufficient coaptation of the cuff and urethra without other abnormalities, the cuff may be downsized or a tandem cuff may be placed. Cystoscopy is the mainstay in evaluation of AUS dysfunction, and cross-sectional imaging is sometimes used to detect system leaks and device infection or failure (51). In balloon reservoirs filled with radiopaque iodine contrast material at the time of placement, plain film radiography of the pelvis may be all that is needed to detect the reservoir status.

Sexual Dysfunction

Male sexual dysfunction is generally related to hormonal, neurologic, and vascular causes; however, nonrelaxing pelvic floor muscles are thought to contribute to male sexual dysfunction in certain patients, particularly in those with chronic pelvic pain syndrome (CPPS). CPPS can be classified into four categories on the basis of the presence of acute (acute pain and/or fever) or chronic (recurrent or chronic pain) symptoms and the presence or absence of inflammatory cells and pathogens in the urine and prostate secretions.

CPPS I, formerly known as acute bacterial prostatitis, consists of sudden pain, fever, and bacteria identified at urinalysis and/or in prostate secretions. Imaging typically is not indicated for symptoms of uncomplicated forms of prostatitis. CPPS II, formerly known as chronic bacterial prostatitis, consists of recurrent or chronic pain associated with bacteria identified at urinalysis and/or in prostate secretions, without fever or other signs of infection. CPPS III, also known as noninfectious prostatitis or prostatodynia, consists of recurrent or chronic pelvic pain without pathogens but with the possible presence of inflammatory cells in the urine or prostate secretions. CPPS IV is the presence of inflammatory cells in urine or prostate secretions, without symptoms.

Pain associated with CPPS is thought to be due to abnormally increased pelvic floor muscle tone.

Spasms of the pelvic floor muscles can lead to extrinsic compression that restricts the lumen of the internal pudendal artery, limiting cavernosal inflow. It is also hypothesized that increased tone of the pelvic muscles secondary to pain prevents corporal smooth muscle relaxation needed for restriction of venous outflow and development of a closed compartment, thus contributing to sexual dysfunction. Pelvic floor physiotherapy can help men with sexual dysfunction secondary to CPPS, veno-occlusive disease, and premature ejaculation. Transperineal US has been used to evaluate the function of pelvic floor muscles in men with chronic pelvic pain syndrome (55–57). Videourodynamic findings of spastic dysfunction of the bladder neck and the prostatic urethra with dysfunctional voiding and intraprostatic reflux may be associated with CPPS type III (58,59). US guidance also can be used for botulinum toxin-A injection into pelvic floor muscles for treatment of chronic pelvic pain (60). High-spatial-resolution static MRI can help in the evaluation of the anatomy of pelvic floor muscles, and dynamic images could help in determining the changes in function of these muscles. However, the role of MRI evaluation of the pelvic floor with regard to sexual dysfunction has not been evaluated or validated, and dynamic perineal US remains the standard of care.

Conclusion

To our knowledge, there is a paucity of literature related to imaging evaluation of male pelvic floor dysfunction. As with evaluation of the female pelvic floor, MRI provides both anatomic and functional information that allows for evaluation of gastrointestinal and urinary dysfunction related to the male pelvic floor. MRI also can help in evaluation of postsurgical complications related to prostatectomy, urethral slings, and AUS. Radiologists should note that standard measurements for the male pelvic floor during functional MRI have not yet been validated, and interpretation of these findings should be done in the context of clinical information provided by the patient and referring provider. A sample report has been provided to assist radiologists in interpretation of male pelvic floor MRI (Fig E1).

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