Endoanal Imaging of Anorectal Cysts and Masses

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Learning Objective

The reader will become familiarized with the role of endoanal ultrasonography in evaluation and treatment of anorectal cysts and masses

Endometriosis

Deep Endometriosis

Endometriosis is defined by the presence of endometrial glands and stroma outside the endometrial cavity and the myometrium. The most common locations of the ectopic endometriotic implants are found in the pelvis (ovaries and pelvic peritoneum), followed by deep infiltration sites (uterosacral ligaments, rectosigmoid colon, vagina, and bladder). Imaging examinations have been recommended for the diagnosis and identification of the lesion location [1, 2]. Several reports have demonstrated the accuracy of ultrasonography and its different modalities, including abdominal, transvaginal, transperineal, transrectal endoscopic, or three-dimensional (3D) mode, for the diagnosis of deep infiltrating endometriosis in the rectal layers [3–7].

Anorectal ultrasound scanning using a 360° transducer provides the most detailed view of endometriosis infiltration in the rectal wall. Three-dimensional ultrasound (3D-US) with automatic scanning and multifrequencies makes it possible to determine the exact circumferential and longitudinal extension of the infiltration into the rectal layers, mesorectal fat, or adjacent tissues, and the relation between the lesion and the anal sphincter muscles. The examination includes the measurement of infiltration length and the distance between the distal infiltration edge and the proximal edge of the sphincter muscles [8], thus providing crucial information for the choice of therapeutic approach. Lesions appear as heterogeneous hypoechoic images mostly located in the perirectal fat and serosa or infiltrating the muscularis propria or submucosa rectal layers (Figs. 14.1, 14.2, and 14.3).

Ovarian endometrioma may be found in association with endometriosis infiltration in the rectal wall in variable percentages, and 3D-US can be useful in the identification of details [9] (Fig. 14.4). Studies using 3D-US with different modalities have reported several advantages: reconstruction of a volumetric image that can be saved, rotated, and evaluated in different planes in real time and that can be assessed and compared by the same or different examiners over time [10–12].

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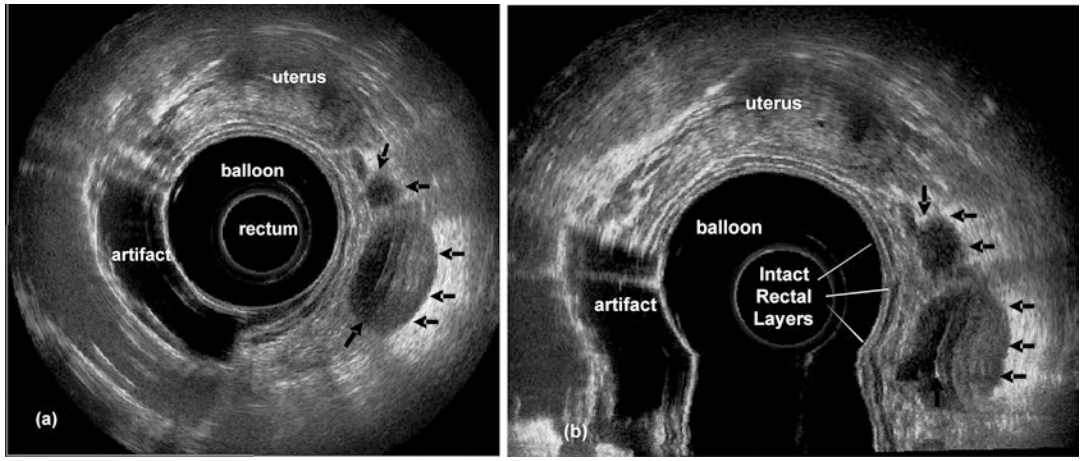

Fig. 14.1 Endometriosis lesion infiltrating the perirectal fat. The rectal layers are intact. (**a**) Axial plane. (**b**) Coronal with axial plane. Two heterogeneous hypoechoic images in the left lateral quadrant compromising the perirectal fat (*arrows*). Mucus in the rectal lumen, outside the lesion site (*artifacts*)

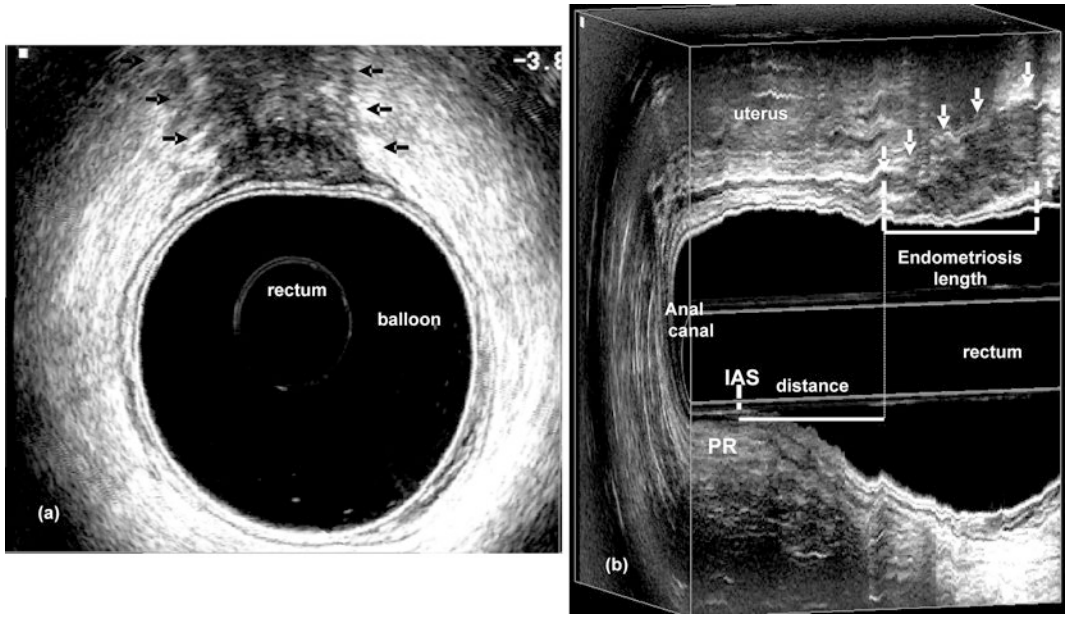

Fig. 14.2 Endometriosis lesion in the anterior quadrant infiltrating the rectal wall as far as the muscular propria (*arrows*). (**a**) Axial plane. Heterogeneous hypoechoic image compromising 20% of rectal circumference (*arrows*). (**b**) Sagittal. The length of the endometriosis lesion and the distance between the distal infiltration edge and the proximal edge of the sphincter muscles (posterior quadrant) (*arrows*). Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

Perianal Endometriosis

Perineal endometriosis is rare and is characterized by the presence of endometrial tissues in the perineal sites with or without involvement of sphincter muscles [7]. The majority of patients are at reproductive age and have a history of vaginal delivery. Lesions may frequently be found in the episiotomy scar or laceration site after vaginal delivery.

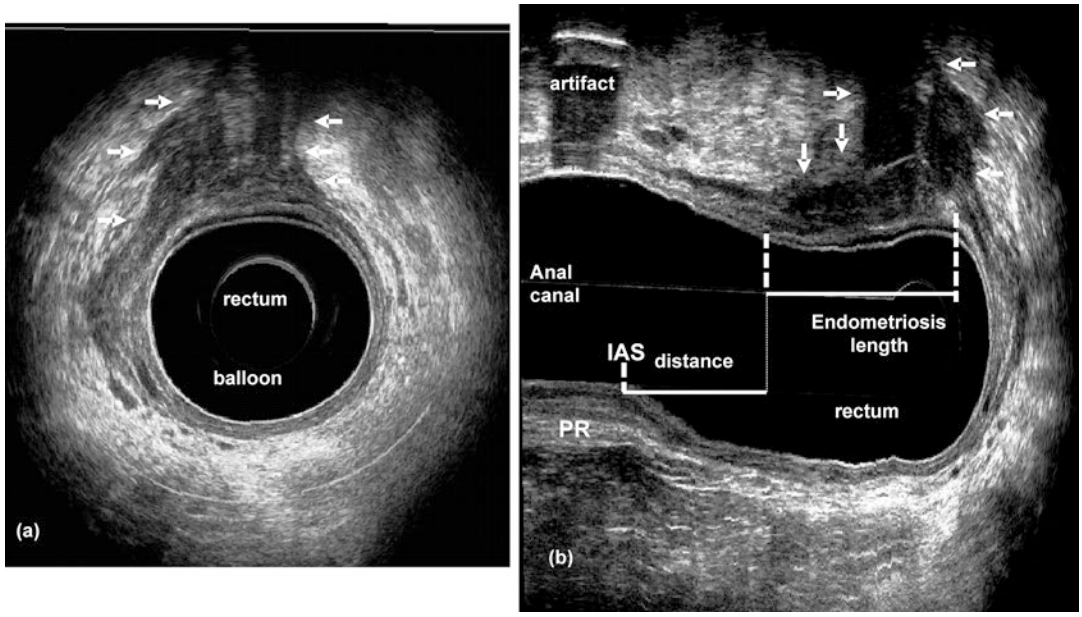

Fig. 14.3 Endometriosis lesion in the right anterior quadrant infiltrating the rectal wall as far as the muscular propria. (**a**) Axial plane. Heterogeneous hypoechoic image compromising 30% of rectal circumference (*arrows*). (**b**) Sagittal. The length of the endometriosis lesion and the distance between the distal infiltration edge and the proximal edge of the sphincter muscles (posterior quadrant) (*arrows*). Mucus in the rectal lumen, outside the lesion site (*artifacts*). Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

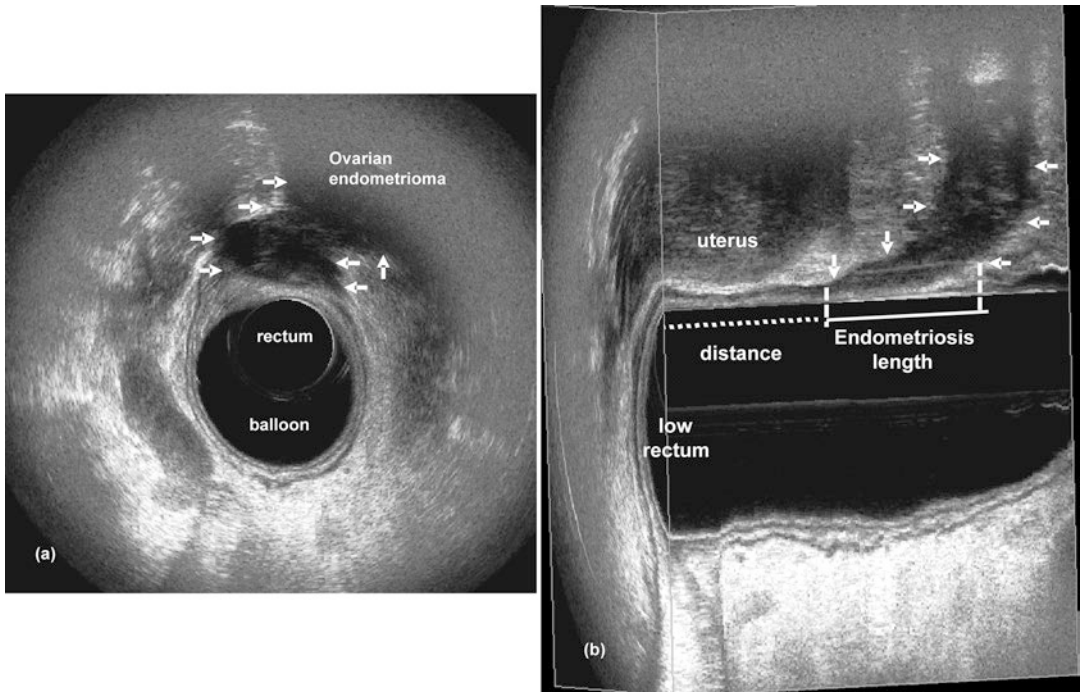

Fig. 14.4 Ovarian endometrioma lesion infiltrating the upper rectal wall (left anterior quadrant) as far as the muscular propria layer. (**a**) Axial plane-ovary with a heterogeneous hypoechoic image compromising 20–30% of the rectal circumference (*arrows*). (**b**) Sagittal. The length of the endometriosis lesion and the distance between the distal infiltrated edge and the lower rectum (*arrows*)

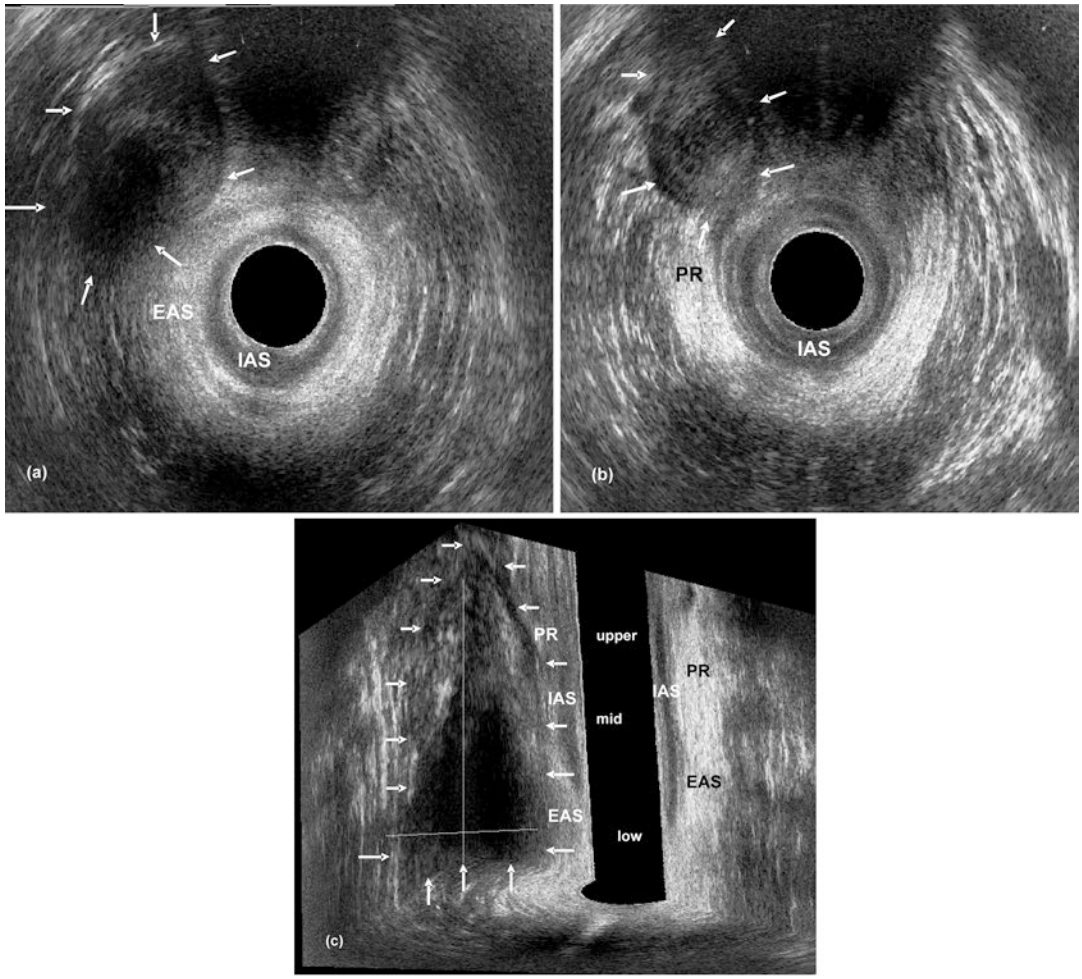

Fig. 14.5 Endometriosis lesion (heterogeneous image) in the perianal fat infiltrating the external anal sphincter (*EAS*) and puborectalis (*PR*) muscles in the entire length of the anal canal. (**a**) Mid anal canal. Endometriosis lesion infiltrating the lateral fibers of the EAS (*arrows*). (**b**) Upper anal canal. Endometriosis lesion infiltrating the right side of the PR (*arrows*). The vagina wall is infiltrated as well. (**c**) Coronal with axial planes. Length and depth (*arrows*) of the lesion infiltration. Internal anal sphincter (*IAS*)

The complete physical examination, including gynecologic and digital rectal examination, combined with 3D-US, should confirm whether or not the anal sphincter is involved and determine the exact circumferential and longitudinal extension of the infiltration. This provides the best approach in planning a local resection or sphincter-saving surgery in order to avoid fecal incontinence [13, 14] (Fig. 14.5).

Pre-sacral Neoplasia

Perirectal neoplasia is most often located in the retrorectal space and may be of varied etiology. Half the cases are congenital and two-thirds are cystic in nature [15, 16]. It commonly develops in young females or in adults, and it is rare in infants. Teratoma is the most frequently observed form in pediatric patients and contains fat or

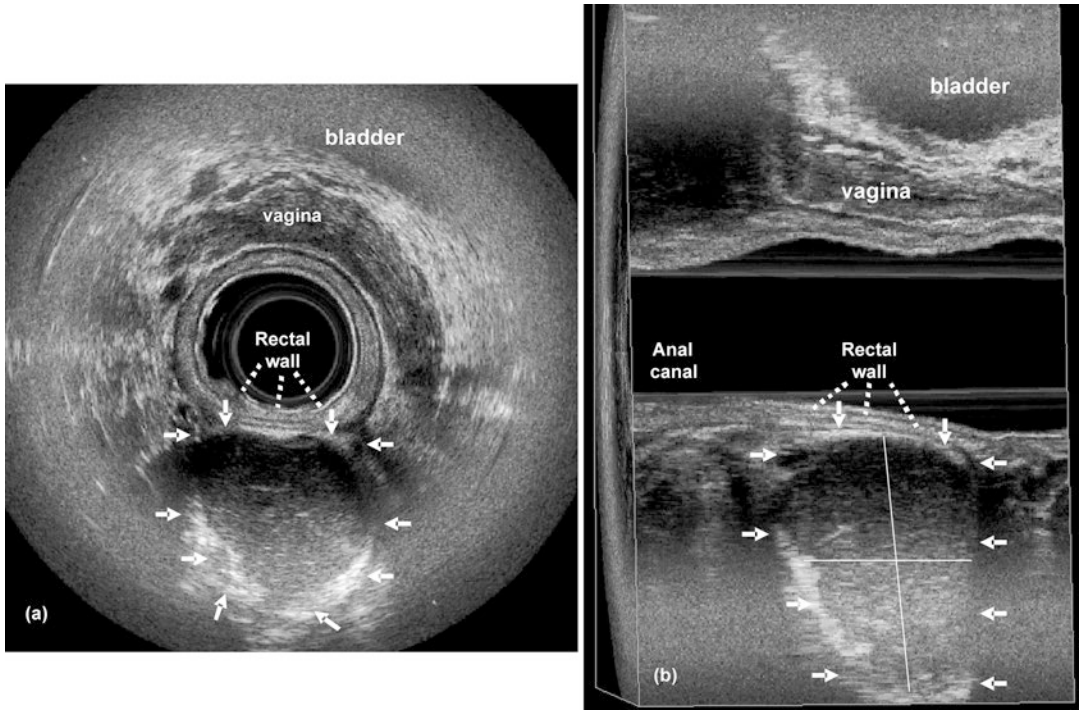

Fig. 14.6 (Female) Pre-sacral cystic lesion located at the level of low rectum with regular outline and without adherence to the rectal wall (*arrows*). The rectal wall is intact. (**a**) Axial plane. Heterogeneous image located at the level of the low rectum (*arrows*). (**b**) Sagittal with diagonal planes. A well-circumscribed (hyperechogenic line that surrounds the lesion) and unilocular cystic lesion. Lesion size (longitudinal length and the depth)

calcifications in 50% of cases [16, 17]. A wide variety of cystic lesions occur in the retrorectal space, and most are congenital. They are classified as epidermoid cysts, dermoid cysts, enteric cysts (tailgut cysts and cystic rectal duplication), and neurenteric cysts, according to their origin and histopathologic features [18].

Imaging may show specific signs and characteristics of the lesion, but the diagnosis remains histopathologic. Anorectal ultrasound scanning is useful in the evaluation of size, type of lesion (mixed cystic and solid components), and relation with the rectal wall and the sphincter muscles. Perirectal neoplasia has different characteristics: unilocular or multilocular retrorectal lesion; hypoechoic lesion (cystic); and mixed echogenicity/heterogeneous lesions, due to mucoid material, inflammatory debris, or solid component, usually with regular outline and not adhering to the rectal wall. In large lesions, displacement or stenosis of the rectal wall due to extrinsic compression may be visualized. It is important to define a rectal wall invasion or a communication between the cyst and the anorectal lumen (Figs. 14.6, 14.7, and 14.8).

Rare Tumors

Rectal Leiomyoma

Leiomyoma is a benign mesenchymal neoplasm that usually develops where smooth muscle is present. This lesion is rare, except in the esophagus and rectum. Only 3% of these smooth muscle tumors arising from the colon are gastrointestinal leiomyomas and represent about 0.1% of rectal neoplasias [19, 20]. In the rectum, most leiomyomas present as small intraluminal polyps and are limited to the muscularis mucosa, although there are reports of anorectal leiomyomas [21].

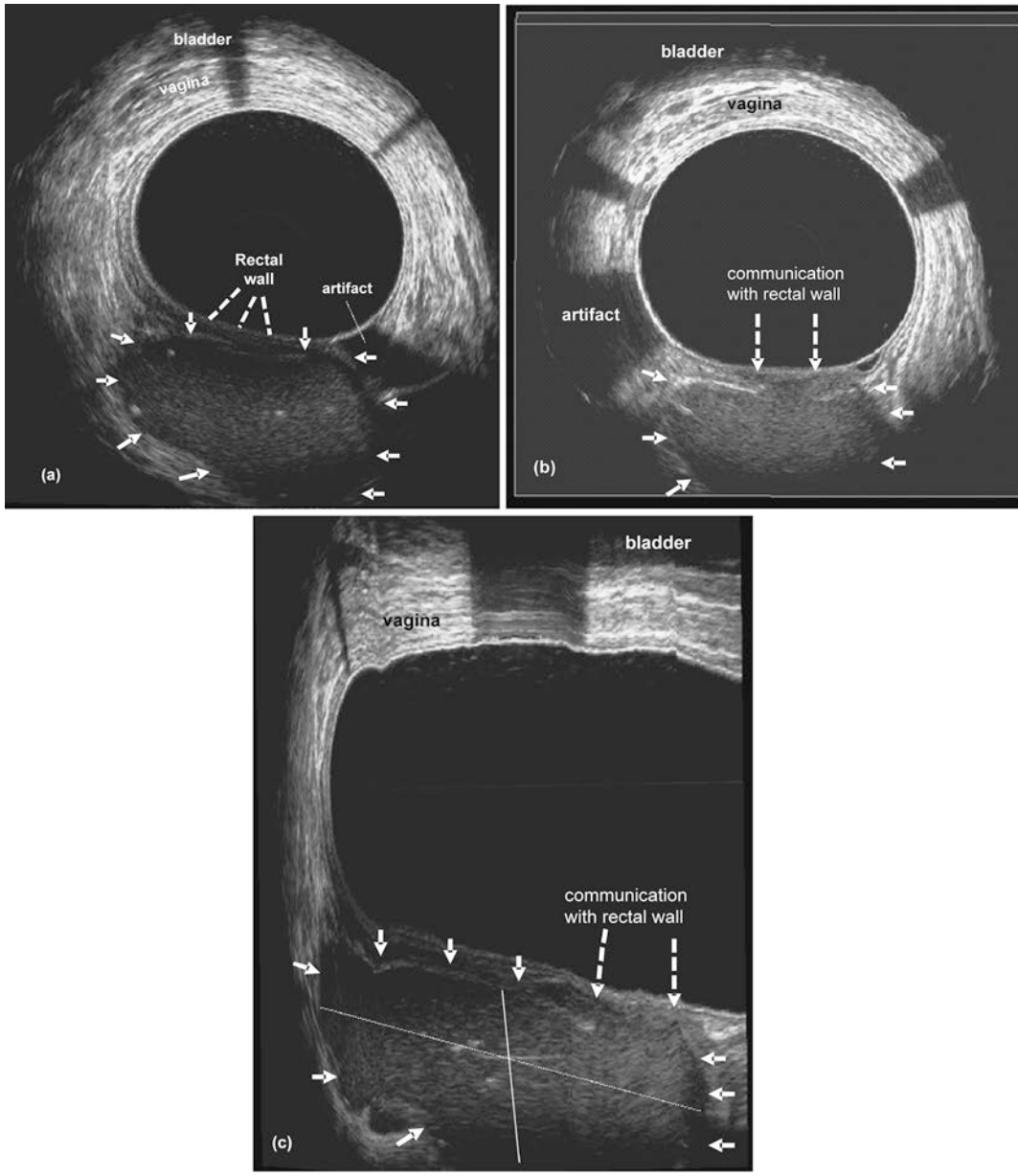

Fig. 14.7 (Female) Cystic lesion (mixed echogenicity) in the pre-sacral space at the level of low rectum. There is a contiguous (communication) area with rectal wall. (**a**) Axial plane. In this position, the lesion appears with regular outline and without adherence to the rectal wall (*arrows*). The rectal wall is intact. (**b**) Axial plane. The image shows the area of the cystic lesion, which communicates with the rectal wall (*interrupted arrows*). (**c**) Sagittal plane. The hyperechogenic line that surrounds the lesion (*arrows*) is interrupted (*small area*) and there is a communication with rectal wall (*interrupted arrows*). Lesion size (longitudinal length and the depth). External anal sphincter (*EAS*), Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

Definitive diagnosis requires anatomical and pathological examination (immunohistochemical staining). Leiomyomas are positive for actin and desmin and negative for CD34 and CD117 [20, 22]. Anorectal 3D ultrasound scanning shows the exact extent of the lesion and relationship with the anatomical structures (Fig. 14.9).

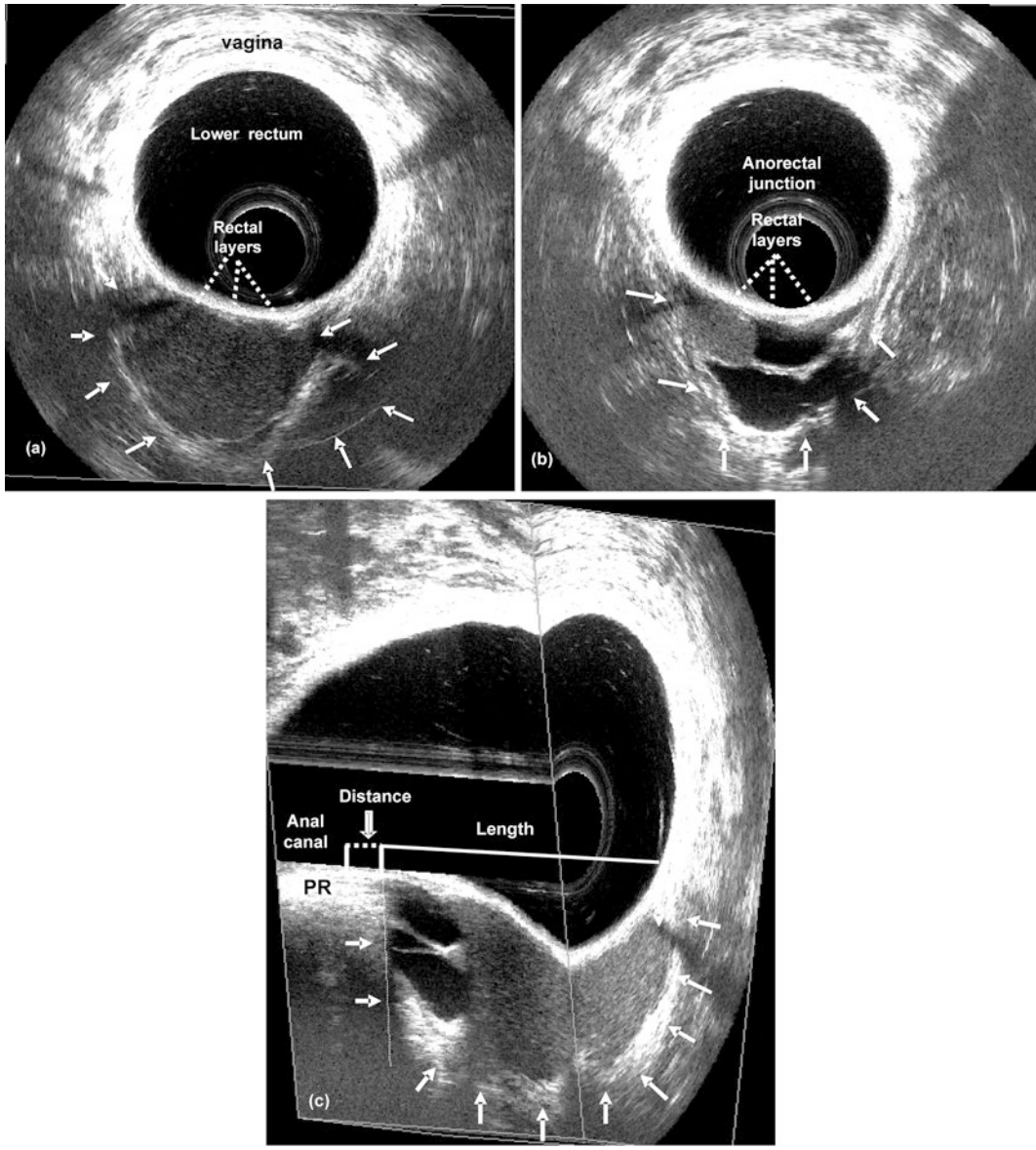

Fig. 14.8 (Female) Multilobulated heterogeneous (cystic and solid) lesion in the pre-sacral space, at the level of the low rectum and anorectal junction with regular outline and without rectal wall involvement. (**a**) Heterogeneous images in the low rectum (*arrows*). (**b**) Heterogeneous images in the anorectal junction (*arrows*). (**c**) Sagittal with diagonal planes. The lesion length and the distance between the distal and the proximal edges of the sphincter muscles (posterior quadrant) (*arrows*). Puborectalis muscle (*PR*)

Gastrointestinal Stromal Tumors (GIST)

Gastrointestinal stromal tumors (GIST) are the most common mesenchymal tumors of the GI tract; however, they represent less than 1% of all gastrointestinal tumors [23]. GIST can occur everywhere along the GI tract, but most often are found in the stomach (60%) or small intestine (30%), followed by the rectum (3%), colon (1–2%), esophagus (<1%), and omentum/mesentery (rare) [24].

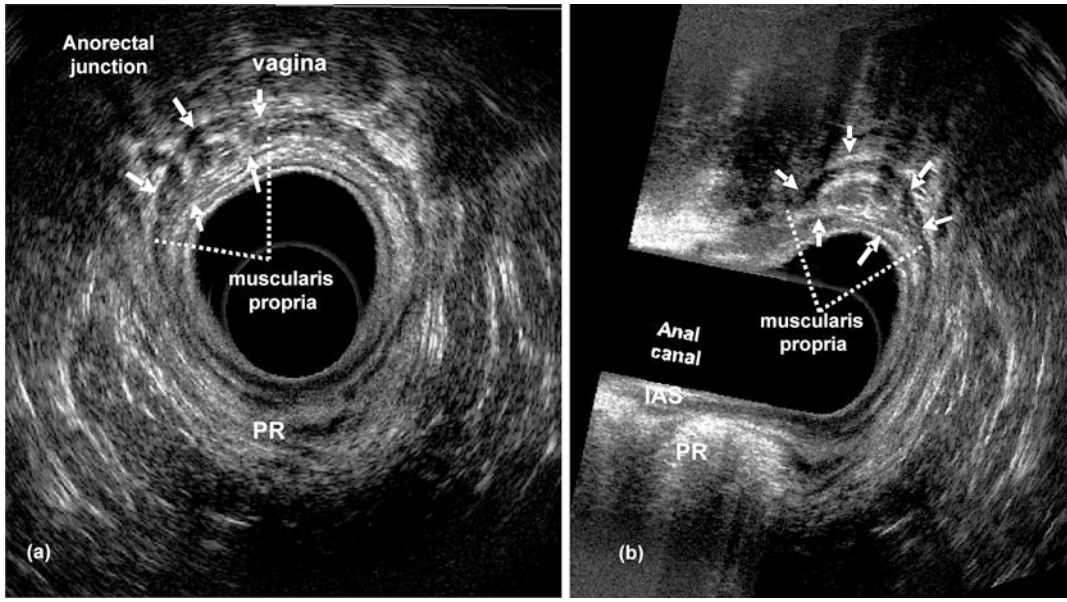

Fig. 14.9 Small lesion located at the level of the anorectal junction in the right anterior quadrant. Heterogeneous lesion expands the outer hypoechoic layer that corresponds the muscularis propria. Rectal leiomyoma (*arrows*). (**a**) Axial plane. (**b**) Multiplane—sagittal with diagonal plane and axial. Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

The clinical presentation and diagnosis of patients with GIST depend on the anatomic location of the lesions and their size and aggressiveness. Small GIST may form solid subserosal, intramural, or—less frequently—intraluminal mass. Large tumors tend to form external masses attached to the outer aspect of the gut, involving the muscular layers [25]. Evaluation includes imaging and/or endoscopy, but pathology and molecular genetics studies are required. Approximately 95% of GISTs are positive for the CD117 antigen [25].

Anorectal ultrasound scanning provides the most detailed view of the lesion and the relationship with other anatomical structures. 3D anorectal ultrasound makes it possible to determine the circumferential and longitudinal extension of the tumors and the relationship of the lesion with the sphincter muscles, the rectal layers, the perianal tissues, and the adjacent organs, crucial in planning a surgical resection (Figs. 14.10 and 14.11).

Cystic Vaginal Lesion

Vaginal cysts are benign lesions [26, 27]. The most frequent types are vaginal inclusion cysts and may result from injury to the vaginal walls during delivery or after surgery. Other lesions are Gartner duct cysts. They develop on the lateral walls of the vagina and are remnants of mesonephric ducts. This duct is present while the fetus is developing in the womb and most often disappears after birth. If parts of the duct remain, they may collect fluid and develop into a vaginal wall cyst later in life. A Bartholin cyst or abscess is the buildup of fluid into pus that forms a lump in one of the glands found on each side of the vaginal opening. It is located on the labia.

The clinical presentation depends on the cyst size. Diagnosis needs imaging techniques (ultrasound, magnetic resonance, or computed tomography). Ultrasound is recommended as the first-line imaging modality by the American College of Radiology Appropriateness Criteria [28]. Routine ultrasound protocol includes transabdominal and transvaginal ultrasound. Translabial imaging is not part of a routine examination and is limited to cases in which transvaginal ultrasound cannot be performed due to obstruction or pain, or there is a specific request for directed vaginal imaging. Pelvic magnetic resonance imaging is recommended by the American College of Radiology Appropriateness Criteria when ultrasound is inconclusive or not diagnostic.

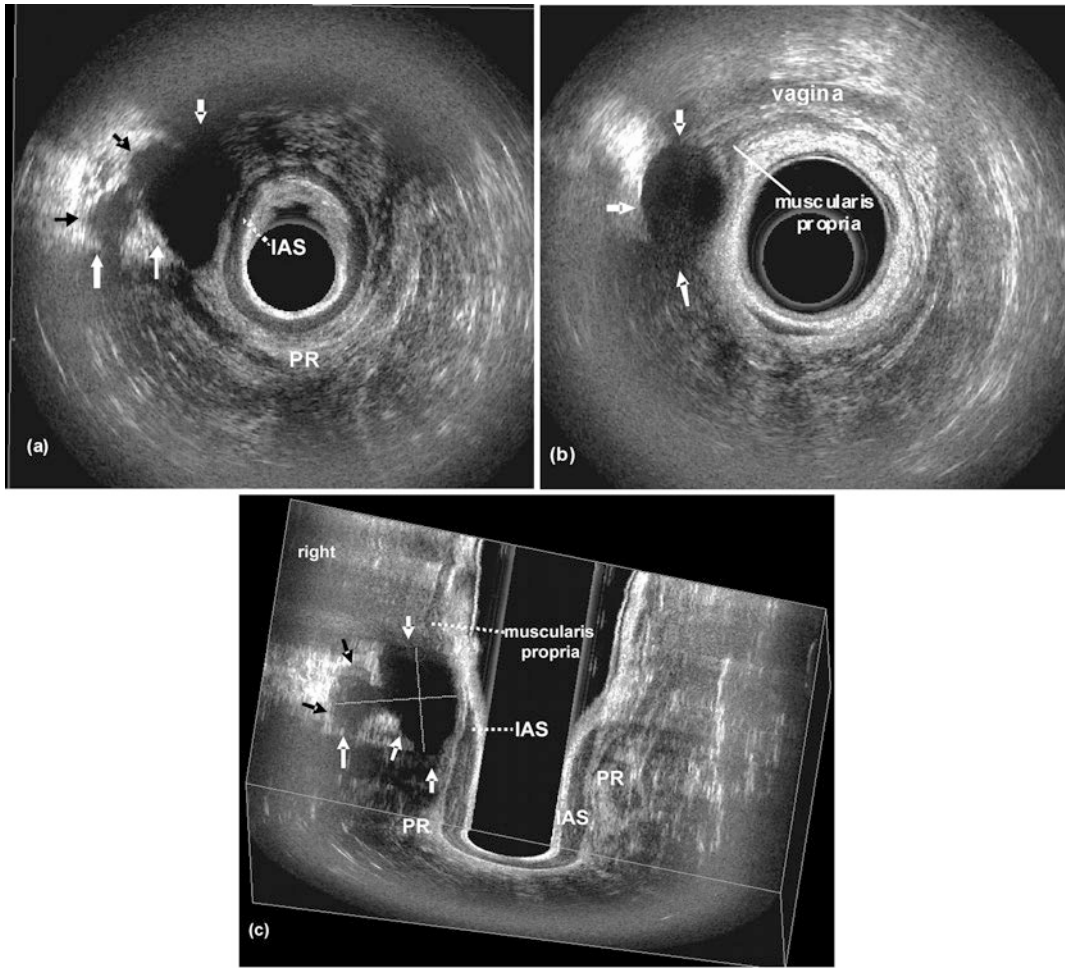

Fig. 14.10 (Female) Gastrointestinal stromal tumors. Heterogeneous lesion located at the level of low rectum, anorectal junction, and upper anal canal in the right anterior quadrant. The lesion compromises the puborectalis muscle and rectal wall. (**a**) Axial plane. Lesion located in the perianal fat and compromised the Puborectalis muscles (right anterior quadrant) (*arrows*). The internal anal sphincter (IAS) is intact. (**b**) Axial plane. The lesion located in the perirectal fat and compromised the rectal wall as far as the muscular propria (*arrows*). (**c**) Coronal plane. Lesion size (longitudinal length and the depth) (*arrows*). Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

Computed tomography is not considered the modality of choice for the evaluation of the female pelvis. 3D anorectal and endovaginal ultrasound with 360° modality and high frequency provides specific information concerning the relation between the lesion and the sphincter muscles, the rectal layers, and the adjacent organs (i.e., the bladder), and it has the advantage of allowing multiplanar assessment, measurements of the lesion's length and depth, and endorectal circumferential involvement (Fig. 14.12).

Cystic lesions appear as an hypoechoic and well-delimited area due to the fluid inside. When infected, they are visualized as heterogeneous lesions due to proteinaceous contents.

Benign Urethral Lesion

Benign solid lesions are rare; leiomyomas, hemangiomas, and fibroepithelial polyps are the most frequent diagnosis. Urethral leiomyomas

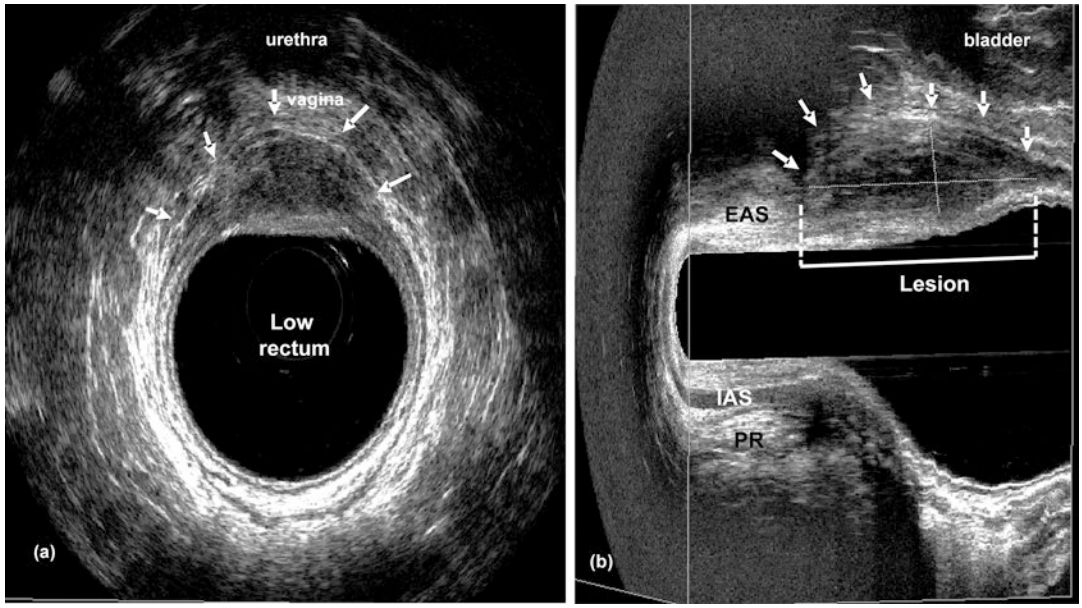

Fig. 14.11 (Female) Gastrointestinal stromal tumors. Heterogeneous lesion located at the level of the low rectum and anorectal junction without sphincter invasion. (**a**) Axial plane. The lesion is located in the perirectal fat, compromising the whole thickness of the rectal wall (*arrows*). (**b**) Coronal plane. Lesion size (length and depth) (*arrows*). Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

originate from smooth muscle fibers of the urethra [29, 30]. Hemangiomas of the urethra develop from embryonic remnants of angioblastic cells that failed to develop into normal blood vessels [31]. Fibroepithelial polyps of the urethra more commonly occur in children [32]; however, they may be present in adulthood and most often the clinical presentation is that of an obstructing mass at the bladder neck and prostatic urethra.

Imaging is useful in distinguishing between urethral lesion or disorders of adjacent organs. Magnetic resonance imaging is an important technique in the evaluation of solid urethral and peri-urethral lesions. Another option is high-resolution transvaginal, transperineal, and transurethral ultrasound to assess cystic urethral and peri-urethral lesions. 3D-US adds important information due to high resolution multiplanar imaging of the pelvic floor. It helps to identify the consistency, extension, and relationship of the lesion with the adjacent anatomic structures (Fig. 14.13).

Lymphocele

Lymphoceles are due to the collection of lymphatic fluid in anatomic compartments, such as pelvic or retroperitoneal spaces, that result from transected afferent vessels during radical lymphadenectomy for prostatic or gynecologic cancers or during renal transplantation [33, 34].

Symptoms are related to the size of the lesion and the presence of infection. When a lymphocele is small and sterile, it usually re-absorbs spontaneously. When it is large, however, the lymphocele may compress adjacent structures

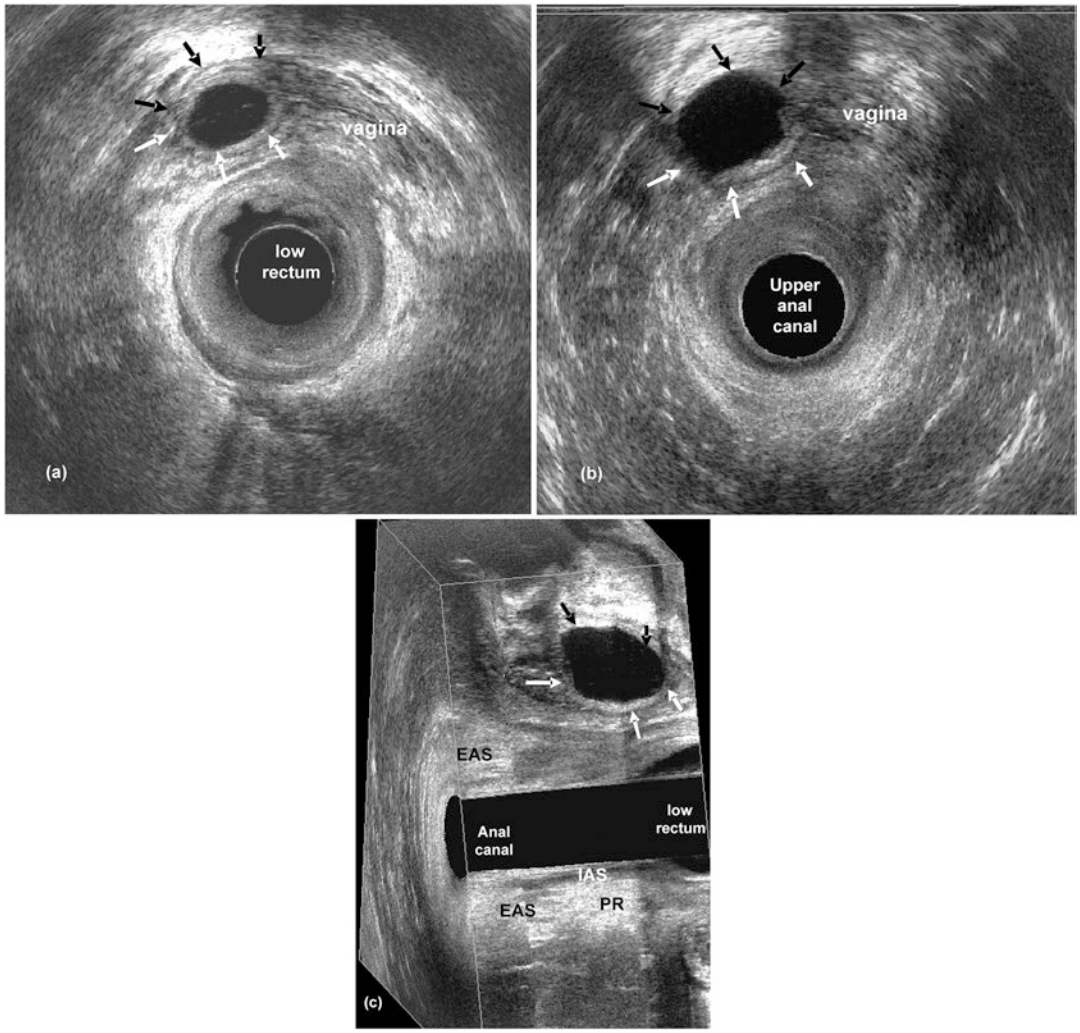

Fig. 14.12 Cystic vaginal lesion. Hypoechoic well-circumscribed lesions resulting after surgery. (**a**) Axial plane. The lesion located in the anterior vaginal wall at the level of low rectal. (**b**) The lesion at the level of upper anal canal. (**c**) Sagittal plane. Longitudinal length of the cystic lesion (*arrows*). Internal anal sphincter (*IAS*), Puborectalis muscle (*PR*)

such as the iliac vessels, bladder, ureter, or rectosigmoid.

Abdominal ultrasound is performed to determine the relationship between the lymphocele and adjacent abdominal organs. However, for lesions deep in the pelvis, 3D anorectal ultrasound is useful to identify the position, length, and depth of the lesion, the consistency of the fluid, and to characterize the presence of infection. Moreover, it provides further information for planning the treatment approach such as the relation with adjacent anatomic structures, or the distance between the distal margin of the lymphocele and the proximal margin of sphincter muscles (Fig. 14.14).

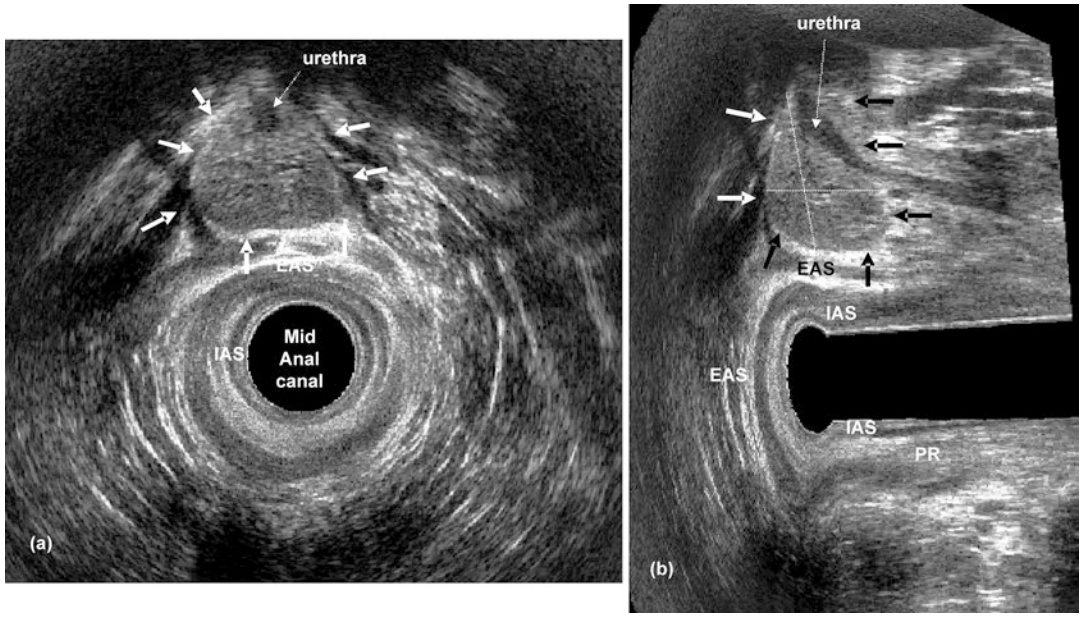

Fig. 14.13 Urethral leiomyoma. Heterogeneous well-demarcated image. (**a**) Axial plane. Mid-anal canal. The lesion involves the urethra (in the total circumference) and without sphincter muscles involvement. (**b**) Sagittal plane. The length and depth of the lesion (*arrows*) in the distal part of the urethra

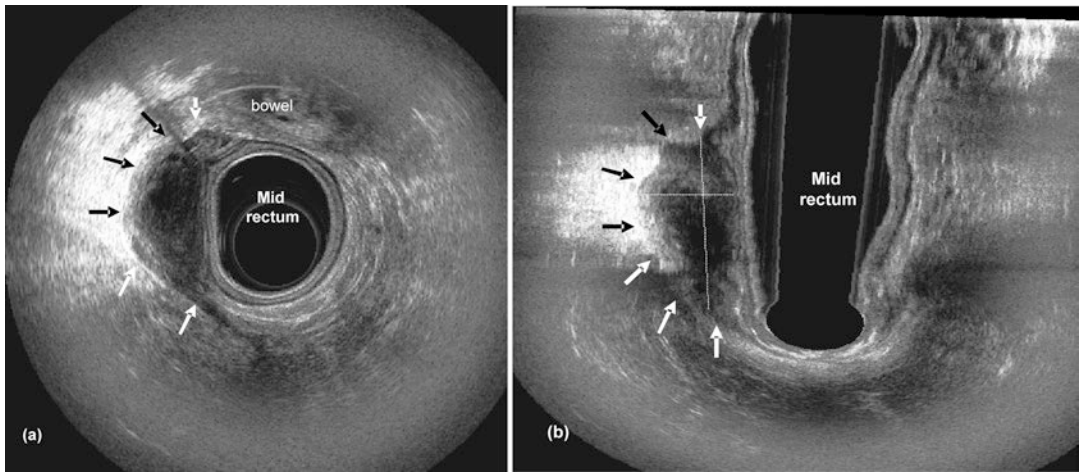

Fig. 14.14 Lymphocele after an extended pelvic surgery. Heterogeneous images adjacent of the rectal layers in the right side. (**a**) Axial plane. Lymphocele outside the rectal layers and involving around 50% of the circumference. (**b**) Coronal plane. Length and depth of the lymphocele

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