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Nonovarian Cystic Lesions of the Pelvis†

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Cystic disease in the female pelvis is common. The majority of cystic pelvic masses originate in the ovary, and they can range from simple, functional cysts to malignant ovarian tumors. Mimics of ovarian cystic masses include peritoneal inclusion cyst, paraovarian cyst, mucocele of the appendix, obstructed fallopian tube (eg, hydrosalpinx, pyosalpinx, and hematosalpinx), uterine leiomyoma, adenomyosis, spinal meningeal cyst, unicornuate uterus, lymphoceles, cystic degeneration of lymph nodes, lymphangioleiomyomatosis, hematoma, and abscess. A cystic pelvic mass is nonovarian if it is separate from the normal ovaries. However, the different types of cystic pelvic masses may have similar imaging appearances, and radiologic evaluation may be of limited diagnostic use. It is important to understand the relationship of a mass with its anatomic location, identify normal ovaries at imaging, and relate imaging findings to the patient’s clinical history to avoid misdiagnosis.

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Abbreviation: LAM = lymphangioleiomyomatosis

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Introduction
Cystic disease in the female pelvis is common. In most cases, it originates in the ovary, and it can range from simple, functional cysts to malignant ovarian tumors. When evaluating a cystic adnexal mass, it is important to consider nonovarian disease processes that may mimic those of the ovaries, because a misdiagnosis can profoundly affect patient management. Because the different types of cystic pelvic masses can have similar imaging features, radiology may be of limited diagnostic use. It is important to understand the relationship of a mass with its anatomic location, identify normal ovaries at imaging, and relate imaging findings to the patient's clinical history to avoid misdiagnosis. To our knowledge, no other review article has encompassed imaging findings of nonovarian cystic pelvic masses. In this article, we review the normal anatomy of the female pelvis, and we discuss ultrasonographic (US), computed tomographic (CT), and magnetic resonance (MR) imaging features of intra- and extraperitoneal nonovarian cystic lesions, which are classified according to their location (Table).

Normal Pelvic Anatomy
The female pelvis contains a number of anatomic compartments, and it is important to be familiar with these intra- and extraperitoneal spaces. The peritoneum is a thin serosal membrane that either partially or completely covers the visceral organs of the abdomen and pelvis, and it plays an important role in fluid and lymph reabsorption; failure of this process can cause fluid to accumulate in the peritoneal cavity (1). The peritoneum and its reflections divide the pelvis into the intra- and extraperitoneal spaces (Fig 1). The intraperitoneal space contains the ovaries, small intestine, transverse colon, and upper two-thirds of the rectum. The extraperitoneal space is inferior and posterior to the peritoneum and contains the uterus, bladder, pelvic ureters, ascending and descending colon, lower one-third of the rectum, iliac vessels, and lymphatics. It also includes the presacral space. Organ displacement is a clue to the origin of a pelvic lesion. For instance, if a ureter is displaced anteriorly or the iliac vessels are displaced medially by a pelvic mass, it likely is extraperitoneal. If a mass displaces the iliac vessels, uterus, or bowel laterally, it likely is intraperitoneal. Compression and anterior displacement of the lower rectum are indicative of a presacral, and thus extraperitoneal, origin.

The broad ligament is the main suspensory ligament of the ovaries and fallopian tubes and is an important landmark at cross-sectional imaging (Fig 2). In postpartum women with a lax broad ligament and in women with a large pelvic mass, the ovaries may be displaced superiorly and should be assessed carefully. A cystic pelvic mass is nonovarian if it is separate from the normal ovaries.

Cystic Lesions of Intraperitoneal Origin
Peritoneal Inclusion Cyst
A peritoneal inclusion cyst, also known as a multilocular inclusion cyst and an entrapped ovarian cyst, is a nonmalignant, reactive, mesothelial proliferation of peritoneal cells that results from insult to the peritoneum. The most common peritoneal insults are endometriosis, pelvic inflammatory

<table>
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<td>Intraperitoneal</td>
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<td>Vascular and lymphatic</td>
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disease, previous abdominal or pelvic surgery, and trauma. Peritoneal inclusion cysts occur almost exclusively in premenopausal women with active ovaries, pelvic adhesions, and impaired absorption of peritoneal fluid, which leads to formation of fluid-filled cysts that conform to the shape of the peritoneal cavity, and they may recur (1). At imaging, the ovaries are entrapped by, but clearly separate from, the cystic locules (Figs 3, 4) (1).

Although peritoneal inclusion cysts may cause pelvic pain or swelling, they often are incidentally found at imaging and are probably underdiagnosed in the general population.
Paraovarian Cyst

Paraovarian cysts account for 10%–20% of all adnexal masses. They arise from the mesosalpinx—the superior, free border of the broad ligament—which invests the fallopian tube. Paraovarian cysts occur over a wide age range, but they are most common in women in the 3rd and 4th decades of life (2,3). Because they arise from the broad ligament or fallopian tube, the ipsilateral ovary is not affected and maintains its normal configuration. Paraovarian cysts can be very small to large enough to fill the pelvis; however, the average size at diagnosis is 8 cm (3). Bilateral cysts and multiple unilateral cysts have been documented (3).

Imaging findings of paraovarian cysts usually are specific. US typically depicts a simple unilocular round or oval hypoechoic cyst separate from the ipsilateral ovary. Rarely, it may be complicated by torsion or hemorrhage, in which the portion of the wall in contact with the fallopian tube or mesosalpinx becomes thickened. Echogenic debris and internal echoes also may be seen. The presence of soft tissue within the cyst may indicate a benign or malignant neoplasm (cystadenoma or cystadenocarcinoma), a rare complication (3).

At CT, a round or oval cystic structure is seen in close proximity to, but separate from, the ovary (Fig 5). MR imaging also clearly depicts the independent relationship of the ovary to an adjacent paraovarian cyst, which usually appears as a well-defined homogeneous structure, with high signal intensity on T2-weighted images and low signal intensity on T1-weighted images. If the cyst is complicated by torsion or hemorrhage, it may demonstrate high signal intensity on T1-weighted images and have thick walls. The presence of soft-tissue components is indicative of a neoplasm (2).

US is the modality used most often for detection of peritoneal inclusion cysts, and it is useful for imaging-guided aspiration. At US, peritoneal inclusion cyst appears as an anechoic cystic mass, with an area of through-transmission that abuts the ovary. At color Doppler US, low-resistance flow may be seen within the septations, a result of vessels running in mesothelial tissue. CT and MR imaging depict unilateral or bilateral cystic masses with attenuation or signal intensity of fluid and without enhancing solid components or entrapped ovaries. Hemorrhage occasionally may be seen within a cyst. When this occurs, the cyst demonstrates attenuation higher than that of simple fluid at CT, high signal intensity at T1-weighted MR imaging, and low signal intensity at T2-weighted MR imaging (1).
Figure 7. Appendiceal mucocele in a 79-year-old woman with a painful right iliac fossa mass. (a) Axial T2-weighted MR image shows a tubular structure (white arrows) arising from the cecum (black arrow). (b) Axial T2-weighted MR image shows the tubular structure (white arrows), which has thin walls and is distended, with areas of high signal intensity, findings indicative of mucin. At laparotomy, the presence of an appendiceal mucocele was confirmed. Black arrow = cecum.

The differential diagnosis includes a simple ovarian cyst, peritoneal inclusion cyst, and hydro-salpinx; a round or oval cystic structure in close proximity to but separate from the ovary is the key imaging feature of a paraovarian cyst.

Mucocele of the Appendix

An obstructed, dilated appendix filled with mucin is called a mucocele. Mucocele of the appendix is a rare condition, with a reported prevalence of 0.2%–0.3% among patients who undergo appendectomy. It is more common in middle-aged women (female-to-male ratio, 4:1; average age, >50 years) (4,5). There are four histologic subtypes of appendiceal mucocele: retention cyst, mucosal hyperplasia, cystadenoma, and cystadenocarcinoma. Cystadenoma and cystadenocarcinoma are mucin-secreting tumors. It is important to identify a mucocele preoperatively to avoid rupture at surgery, which may lead to pseudomyxoma peritonei. It is also important to determine the likelihood of malignant transformation. A mucocele may be mistaken for a right complex adnexal mass if the appendix is abnormally located in the pelvis and the distended portion involves only the tip and middle of the appendix, giving it a pear or drumstick-like appearance. At biochemical analysis, mucoceles may have elevated carcinoembryonic antigen level and CA 19-9 and CA 125 tumor markers (6,7).

Care must be taken to trace the tubular structure back to the cecal pole at all imaging modalities, especially US. At US, cystadenoma and cystadenocarcinoma appear as a cystic mass with a wall of variable thickness, which may be calcified. Heterogeneous low-level echoes and through-transmission may be seen, findings that may help identify the jellylike contents of a mucocele (Fig 6). CT features of a mucocele include a cystic mass with calcified walls (porcelain appendix), with a cecal origin, and that is separate from the ovary (Fig 7) (8). The presence...
Figure 8. Ruptured appendiceal mucocele in a 55-year-old woman with right iliac fossa pain. Contrast-enhanced CT image shows an intermediate-attenuation cystic mass with solid septa that originates from the cecum and represents a ruptured mucinous appendiceal tumor. The mucinous content has spilled out, concealing the tumor, but its intermediate attenuation and anatomic position are indicative of the diagnosis. The right ovary (arrow) is clearly separate from the ruptured mucocele, a finding indicative of its nonovarian origin.

Figure 9. Hydrosalpinx in a 47-year-old woman with menorrhagia. (a) Longitudinal and transverse transabdominal US images show a hypoechoic serpiginous, fluid-filled structure in the left adnexa, a finding suggestive of hydrosalpinx. (b) Contrast-enhanced CT image shows the low-attenuation hydrosalpinx (white arrow) posterior to the uterus, with incomplete septa and enhancing thin walls. The right broad ligament (black arrows) stretches laterally around the hydrosalpinx, a finding that helps confirm its origin from the fallopian tube.

of a cyst wall of variable thickness does not seem to correlate with malignancy; however, at contrast material–enhanced CT, focal enhancing nodules on the walls of a dilated appendix are suggestive of cystadenocarcinoma (9). Mucoceles usually are found incidentally, but they may manifest with nonspecific pain or acute local peritonitis if rupture occurs (Fig 8).

Fallopian Tube Cyst

Hydrosalpinx.—The terms hydrosalpinx, pyosalpinx, and hematosalpinx are used to describe a dilated fallopian tube filled with fluid, pus, or blood, respectively. Blockage usually occurs at the fimbriated end of the fallopian tubes and is caused by adhesions from infectious or inflammatory processes. The most common causes of hydrosalpinx are pelvic inflammatory disease and endometriosis; among women with these conditions, 8% develop hydrosalpinx (4).

At US, hydrosalpinx appears as a thin-walled tubular or corkscrew-shaped structure centered in the fallopian tube. It usually is separate from the ovaries, although it may be attached by adhesions (Fig 9). There are many other US findings of hydrosalpinx, such as short linear or small round projections in the mucosal or submucosal folds of the walls that appear similar to the spokes of a cogwheel on transverse images, a finding known as the “cogwheel” sign (10). Diametrically opposed indentations in the walls of a hydrosal-
Figure 10. Hydrosalpinx in a 54-year-old woman with left iliac fossa pain. Consecutive coronal T2-weighted MR images show a high-signal-intensity, thin-walled, tubular, serpiginous structure in the left adnexa, a finding suggestive of a left hydrosalpinx (arrow).

Figure 11. Pyosalpinges in a 27-year-old woman with sepsis, hypotension, and pelvic pain. (a) Contrast-enhanced CT image shows bilateral thick-walled serpiginous fluid-filled structures (white arrow). Inflammatory fat stranding is seen throughout the pelvis, especially in the presacral fat (black arrow), a finding indicative of bilateral pyosalpinges. (b) Contrast-enhanced CT image shows the uterus in the midline (black arrow). The ovaries are not separate from the pyosalpinges, a finding suggestive of tubo-ovarian abscess formation (white arrow).

Hydrosalpinx are referred to as the “waist” sign, and in patients with chronic hydrosalpinx, submucosal folds are flat and nodular, an appearance known as the “beads-on-a-string” sign. The most helpful and specific findings of hydrosalpinx are a tubular shape with small round projections and the waist sign (10). When US findings are equivocal, MR imaging is performed because its imaging features are identical to those seen at US (Fig 10). At CT, care should be taken with patients who have not ingested oral contrast material, because the small bowel may mask or mimic dilated fallopian tubes.

Pyosalpinx.—The imaging features of pyosalpinx are similar to those of hydrosalpinx; however, pyosalpinx is more likely to be bilateral, with fallopian tube wall thickening, thickened uterosacral ligaments, edema of the presacral fat, and small-bowel ileus (Fig 11) (11). Pelvic inflammatory disease is one of the most common causes of acute pelvic pain; it is important to differentiate pelvic inflammatory disease from ovarian malignancy, adnexal torsion, and acute appendicitis (12).
Because the US features of pyosalpinx are similar to those of simple hydrosalpinx, it is important to be familiar with the patient’s clinical history and to recognize the clinical features of sepsis that are indicative of pyosalpinx. Systemic features such as fever, leukocytosis, and cervical motion tenderness also are indicative of pyosalpinx.  

**Hematosalpinx**—Hematosalpinx results from obstruction and dilatation of the fallopian tubes by blood products. It most commonly occurs in the context of endometriosis, although a tubal ectopic pregnancy, pelvic inflammatory disease, adnexal torsion, malignancy, and trauma also may cause tubal bleeding (13).

Altered blood products within a hematosalpinx demonstrate homogeneous low-level echoes at US, high attenuation at CT, and high signal intensity at T1-weighted fat-suppressed MR imaging (Fig 12). These blood products may cause adhesions to fold or pull the ovaries and fallopian tubes toward the midline, a finding known as the “kissing ovary” sign, or to encase the ovary, resulting in an appearance similar to that of a complex cystic solid mass (14–16). Because pyosalpinx and hematosalpinx have similar imaging characteristics, such as adhesions and the kissing ovary sign, it may be difficult to differentiate between them at US and CT. MR imaging findings are more specific and allow better characterization of blood products.

**Uterine Leiomyoma**

It rarely is difficult to distinguish a uterine lesion from a cystic adnexal mass; however, three conditions may present diagnostic difficulty: a pedunculated or parasitized leiomyoma with cystic degeneration, cystic adenomyosis, and a unicor- nuate uterus with a rudimentary obstructed horn.

Uterine leiomyoma is a benign, smooth muscle tumor. It is the most common gynecologic tumor, affecting 40% of women over the age of 35, with an increased prevalence among those of African-Caribbean descent (17). A subserosal leiomyoma may be exophytic or pedunculated. It may mimic an adnexal mass if it is attached to the myome-
Figure 13. Cystic degeneration of a pedunculated leiomyoma in a 29-year-old pregnant woman who, at 21 weeks gestation, underwent routine US, where a 2.7-cm cystic mass was seen in the lower abdomen; the right ovary was not visualized. (a, b) Coronal T2-weighted (a) and axial T2-weighted fat-saturated (b) MR images show a well-defined, thick-walled, high-signal-intensity mass (arrow) to the right of and posterior to the gravid uterus. (c) Axial T2-weighted fat-saturated MR image shows the right ovary (arrow). (d) Coronal T2-weighted MR image shows both ovaries (arrows), which are displaced laterally by the gravid uterus. Although no definite pedicle was seen attached to the uterus, degenerating pedunculated leiomyoma was presumed, a diagnosis confirmed at caesarean section.

Adenomyosis
Adenomyosis is a common, nonneoplastic condition that affects menstruating women, particularly those who are multiparous. It is characterized by the presence of heterotopic endometrial glands and stroma within the myometrium, with adjacent smooth muscle hyperplasia. A rare variation of adenomyosis is cystic adenomyosis, which is caused by extensive menstrual bleeding into the ectopic endometrium. In cystic adenomyosis, lesion size varies, and lesions may occur anywhere within the myometrium. If a lesion is pedunculated, it may mimic an extraterine ovarian cystic lesion. Similar to a pedunculated leiomyoma, the presence of a pedicle or bridging vessel is indicative of a uterine origin.
Both degenerating pedunculated fibroids and cystic adenomyosis may manifest with abdominal pain and elevated CA-125 levels, clinical findings that may resemble those of conditions such as endometriosis and malignancy. The imaging findings of cystic adenomyosis—especially at transvaginal US—also may resemble those of a cystic adnexal mass, particularly if the ovary is not well visualized. At US, a thick-walled hypoechoic cystic mass may be seen, although this appearance may vary depending on the amount of hemorrhage present. Because of the presence of blood products, the fluid contents of the mass demonstrate high signal intensity on T1-weighted fat-suppressed MR images and intermediate to high signal intensity on T2-weighted MR images. The wall of the mass demonstrates low signal intensity on T2-weighted MR images, a finding due to hemosiderin deposition. It is important to evaluate the ovaries to determine whether subserosal cystic adenomyosis is present (19,20).

Unicornuate Uterus
Failure of one of the Müllerian ducts to elongate results in an asymmetric uterus, with or without a small rudimentary horn, a condition known as unicornuate uterus. If the uterine horn becomes obstructed, it may become dilated and filled with fluid or blood products and thus mimic a cystic pelvic mass. Misdiagnosis occurs when the uterus has not been identified as unicornuate with a rudimentary horn, and the presence of a thick-walled cystic structure adjacent to the uterus may be mistaken for an adnexal mass (Fig 14). To recognize this condition, it is important to identify the normal ipsilateral ovary. An obstructed uterine horn may mimic ovarian endometrioma that is stuck to the uterus (19,20).

Cystic Lesions of Extraperitoneal Origin

Spinal Meningeal Cyst
A presacral lesion may be confused with a cystic adnexal mass if it is large and cystic (21). One such presacral lesion that may be mistaken for a cystic adnexal mass is a spinal meningeal cyst, also known as a perineural or arachnoid cyst. It is caused by a diverticulum of the spinal meningeal sac, nerve root sheath, or arachnoid. A spinal meningeal cyst may be unilocular or multilocular, and it may be difficult to determine the exact location and extension of the mass at US, especially at transvaginal US. Continuity of the lesion...
with the sacral area is a key imaging finding and is suggestive of a sacral, and thus extraperitoneal, origin, and it excludes a cystic ovarian lesion (21). Spinal meningeal cysts are best appreciated at MR imaging, which demonstrates the connection of the mass to the thecal sac or nerve roots (Figs 15, 16) (22). The differential diagnosis of a spinal meningeal cyst includes cystic sacrococcygeal teratoma, anal duct cyst, and degenerative neurogenic tumor; the latter has cystic and solid elements that enhance after the administration of gadolinium-based contrast material, a finding that helps distinguish it from a spinal meningeal cyst (23).
Retrorectal Developmental Cyst

A retrorectal developmental cyst is a rare congenital cystic lesion that originates from the vestiges of embryonic tissue (24,25). It may manifest as a presacral mass, and it encompasses dermoid, epidermoid, and enteric (eg, tailgut and duplication) cysts (Fig 17). Retrorectal cysts may be multicystic, and it can be difficult to differentiate between a retrorectal cyst and an adnexal mass at US. MR imaging is best to determine the relationship of the mass to the rectum, ovaries, and spine. Because these lesions are located in the retroperitoneal space, anterior displacement of the ureter, uterus, and rectum may occur, a finding indicative of a presacral location. However, unlike spinal meningeal cysts, they are not connected to the dura. Malignant transformation has been reported in a small number of cases (26).

Figure 17. Tailgut (hindgut) cyst in a 30-year-old woman with a complex cystic pelvic mass. Sagittal T2-weighted MR image shows a multilocular cystic lesion in the presacral area with a nodular solid component (arrows). The cyst is not continuous with the thecal sac, and it is separate from the right ovary (arrowhead). Surgery revealed a tailgut cyst associated with a carcinoid tumor.

Figure 18. Lymphocele in a 41-year-old woman with stage 1B1 cervical cancer who underwent lymphadenectomy and pelvic lymph node dissection. (a) Coronal T2-weighted MR image shows a thin-walled, fluid-filled cystic structure at the lymphadenectomy site, a typical location of right external iliac lymph node dissection. The right common iliac vessels (black arrow) are displaced medially and superiorly, the right iliopsoas muscle is immediately lateral to the lymphocele, and the right ovary (white arrow) is separate from and medial to the lymphocele. (b) Axial T2-weighted MR image shows deviation of the right external iliac vessels medially (double black arrows), around the lymphocele (black arrow), and the right ovary (white arrow) medial to the lymphocele.
Figure 19. Cystic degeneration of lymph nodes in a 52-year-old woman with a history of total abdominal hysterectomy and bilateral oophorectomy for stage 2A cervical carcinoma who presented with a right pelvic recurrence and underwent three additional cycles of chemotherapy. (a) Axial T2-weighted MR image shows two high-signal-intensity cystic masses: The larger mass (arrow) is adjacent and medial to the right external iliac vessels, and the other, smaller mass (arrowhead) is in the right acetabulum. The once-solid nodal tissue is now entirely cystic. (b) Coronal gadolinium contrast material–enhanced T1-weighted MR image shows the larger cystic mass, which demonstrates avid rimlike enhancement (arrows).

Lymphocele
Lymphocele is a common complication of lymphadenectomy, which often is performed to assess lymph node status in patients with gynecologic malignancy (27). A lymphocele is a fluid-filled cyst with no epithelial lining. It occurs in 12%–24% of patients who undergo radical lymphadenectomy, and it usually is detectable 3–8 weeks after surgery (23). The symptoms of a lymphocele depend on its size and location and whether a superinfection is present (28). It is important to differentiate between lymphocele and other postoperative complications such as hematoma, seroma, abscess, and cystic tumor recurrence, because the clinical management of each condition is different. It may be difficult to differentiate between these conditions at imaging alone. Aspiration or drainage of the fluid collection and biochemical analysis often help the diagnostic process (28).

Lymphoceles typically appear as unilocular thin-walled, fluid-filled structures at imaging, unless they are complicated by infection or hemorrhage. Enhancing soft tissue is indicative of tumor recurrence (29). Lymphoceles occur at the lymph node dissection site, and at imaging they follow the course of pelvic lymph node chains. Recognizing a lymphocele may be straightforward if it is small, but if the lymphocele is large, adjacent structures such as the iliac vessels, bladder, and rectosigmoid colon may be compressed and distorted (Fig 18). Lymphoceles always retain their lateral relationship to adjacent pelvic vessels after pelvic surgery.

Cystic Degeneration of Lymph Nodes
Squamous cell carcinoma that originates from the uterine cervix, vagina, vulva, or urinary bladder is associated with cystic lymph node metastases (30). These thin-walled cystic lymph nodes lie along the line of the lymph node chains, adjacent and posterolateral to their corresponding vessels (Fig 19). They are best appreciated at CT and MR imaging, and their extraperitoneal location helps distinguish them from ovarian masses. Comparison with previous images is always helpful in assessing the progress of recurrent disease.

Lymphangioleiomyomatosis
Lymphangioleiomyomatosis (LAM) is a rare condition characterized by the proliferation of abnormal smooth muscle cells. It occurs almost exclusively in premenopausal women (31–33). In the lung parenchyma, thin-walled cysts are a well-recognized finding of LAM, as are chylous
Retroperitoneal lymphangiomas account for approximately 1% of all lymphangiomas (37,38). Imaging findings usually are nonspecific and resemble those of other retroperitoneal cystic masses. US depicts multiple hypoechoic thin-walled cysts that may contain septa and calcification. CT and MR imaging depict nonenhancing cystic masses in the retroperitoneum. The masses have high signal intensity on T2-weighted MR images, and calcification may be seen within the cyst walls, a finding better appreciated at CT (37). The cysts vary in size, ranging from 5 cm to large enough to fill the pelvis (39). The rate of malignant transformation is low; however, excision is recommended to prevent infection, rupture, and bleeding (37).

Cystic Lymphangioma
Cystic lymphangioma is a benign neoplasm that results from malformation of the lymphatic anatomy. It is common among children and usually manifests in the neck or axilla. It rarely occurs in adults, and it has an equal sex distribution.

Figure 20. LAM with abdominal involvement in a 27-year-old woman with chylothorax and pneumothorax. (a, b) Axial (a) and coronal (b) T2-weighted MR images show cystic lesions (arrow) in the left pelvic sidewall. Retroperitoneal lymph vessels are dilated and displace adjacent vascular structures, a finding suggestive of a lymphovascular origin. (c) Coronal T2-weighted MR image shows the normal ovaries (arrows).

CT demonstrates low- or negative-attenuation retroperitoneal cystic masses, with either thin or thick walls, along the line of the lymph node chains. Fat-fluid levels may be seen within the masses, and abdominal lymph nodes may be enlarged with low attenuation (35,36). At MR imaging, retroperitoneal masses similar to those noted at CT are seen, with high signal intensity on T2-weighted images and either high or low signal intensity on T1-weighted images, depending on the lipid content of the cysts. Fat-fluid levels and chylous ascites also may be seen. US findings of LAM are nonspecific.

Hemangioma
Hemangioma is a neoplasm that results from a proliferation of blood vessels and that closely
Figure 21. Hemangioma in a 29-year-old woman with Klippel-Trenaunay-Weber syndrome. Coronal T2-weighted MR image shows multiple cystlike hemangiomas (arrows) that follow the course of the pelvic vasculature.

Figure 22. Iliopsoas abscess in a 67-year-old woman with fever, malaise, and right iliac fossa pain. Contrast-enhanced CT image shows a well-defined, low-attenuation cystic mass with thick enhancing walls and internal septa. The mass is adherent to the medial aspect of the left iliac wing and does not appear to be separate from the iliopsoas muscle. The internal and external iliac vessels deviate medially (black arrows), and inflammatory stranding is seen in the adjacent fat (white arrow). These findings are indicative of a left iliopsoas abscess secondary to Gram-negative septicemia.

Cystic Lesions of Either Intra- or Extraperitoneal Origin

Pelvic Abscess
A variety of disorders can cause pelvic abscess, including appendicitis, diverticulitis, inflammatory bowel disease, postoperative anastomotic leak, infected hematoma, lymphocele, seroma, and urinoma (42). Pelvic abscesses may be intra- or extraperitoneal, depending on the location of the focus, and patient presentation ranges from practically asymptomatic to moribund, depending on the amount of sepsis present. Pelvic abscess should always be considered in patients with elevated inflammatory markers and pyrexia.

Imaging features of pelvic abscess vary, with thick or thin walls, simple or complex fluid collections, adjacent inflammatory fat stranding, free fluid, and inflammation of surrounding organs seen at all modalities (Figs 22, 23). Air from gas-forming organisms or fistulization with adjacent bowel may be seen. It may be difficult to
ascertain where the initial infection began if the abscess is large or if diffuse, extensive inflammatory change is present. However, careful examination of surrounding structures and a detailed clinical history help determine the correct diagnosis and the origin of the abscess.

Hematoma
Pelvic hematoma results from trauma, surgery, and coagulopathy and may be intra- or extraperitoneal, depending on the location of the surgical site. The imaging appearance of blood products varies according to the age of the hematoma. For this reason, awareness of the date of surgery or the onset of bleeding is important.

At US, acute hematoma appears as an echogenic area that becomes hypoechoic over time. Septa and thick walls may or may not be present, depending on the liquefaction and reabsorption of blood products. At CT, acute hematoma appears as a high-attenuation area (50–80 HU), a finding due to the presence of aggregated fibrin (43). After 2–3 weeks it becomes hypoattenuating and begins to liquefy, and CT findings resemble those of a simple cyst, with attenuation of water. Rim calcification of the wall of a hematoma may occur in chronic cases.

At MR imaging, acute and subacute hematoma demonstrate high signal intensity on T1-weighted fat-suppressed images. Over time, a thick, dark peripheral rim may be seen on both T1- and T2-weighted images, with a bright inner ring on T1-weighted images, a finding known as the concentric ring sign (Fig 24) (44). Although subacute hematoma may have an imaging appearance similar to that of recurrent tumor, hematoma does not enhance with the administration of contrast material, and, unlike a tumor, it decreases in size over time.

Bladder Diverticulum
Bladder diverticulum occurs when the bladder mucosa herniates through the muscle wall but maintains its continuity with the bladder, often by a narrow neck. It most commonly occurs at sites of congenital muscular wall weakness, such as the urethral meatus or the posterior lateral wall. Bladder diverticulum may be primary (idiopathic), associated with vesicoureteral reflux; secondary, associated with bladder outlet obstruction; or congenital, associated with a condition such as prune belly syndrome or kinky-hair disease.

A large bladder diverticulum with a narrow connecting neck may mimic a thin-walled pelvic cyst. It is important to carefully examine the bladder walls for a connection with the diverticulum. Bladder diverticulum may contain calculi and malignant tumors secondary to chronic inflammation, and it may appear complex at imaging, with thickened walls, debris, or soft-tissue components (45). At US, a hypoechoic fluid-filled,
blind-ending structure is seen continuous with the bladder wall. CT or MR urography may help define the bladder and diverticulum if US fails to clearly depict a connection between them (46).

Summary
Not all cystic lesions in the female pelvis are ovarian. It is important to consider disease processes that may mimic those of the ovaries because they affect patient management. It also is important to be familiar with the imaging characteristics of the various pelvic cysts, their anatomic locations, and the patient’s clinical history to make an accurate diagnosis.

References


Nonovarian Cystic Lesions of the Pelvis

Penelope L. Moyle, MBChB • Masako Y. Kataoka, MD, PhD • Asako Nakai, MD, PhD • Akiko Takahata, MD, PhD • Caroline Reinhold, MD • Evis Sala, MD, PhD

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Organ displacement is a clue to the origin of a pelvic lesion.

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Peritoneal inclusion cysts occur almost exclusively in premenopausal women with active ovaries, pelvic adhesions, and impaired absorption of peritoneal fluid, which leads to formation of fluid-filled cysts that conform to the shape of the peritoneal cavity, and they may recur (1). At imaging, the ovaries are entrapped by, but clearly separate from, the cystic locules (Figs 3, 4) (1).

Figure 3. Peritoneal inclusion cyst in an 18-year-old woman with left iliac fossa pain. (a) Transabdominal US image shows a hypoechoic cystic locule conforming to the peritoneum. The left ovary (arrowhead) and broad ligament (arrows) are separate from, but entrapped within, the cyst. (b) Sagittal T2-weighted MR image shows the high-signal-intensity fluid-filled peritoneal inclusion cyst conforming to the peritoneum. The right ovary is entrapped within the cystic locule (arrow). (c) Coronal T2-weighted MR image shows that both ovaries are entrapped within the peritoneal inclusion cyst (arrows).

Figure 4. Peritoneal inclusion cyst in a 47-year-old woman with Crohn disease, a history of multiple bowel resections, and suspected perianal fistula. Axial (a) and coronal (b) T2-weighted fat-saturated MR images show multiple thin-walled, fluid-filled high-signal-intensity locules conforming to the peritoneum. The ovaries (arrow) are separate from the cysts, a finding indicative of peritoneal inclusion cyst, which was incidentally discovered.
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The differential diagnosis includes a simple ovarian cyst, peritoneal inclusion cyst, and hydrosalpinx; a round or oval cystic structure in close proximity to but separate from the ovary is the key imaging feature of a paraovarian cyst.

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Lymphocele is a common complication of lymphadenectomy, which often is performed to assess lymph node status in patients with gynecologic malignancy (27). A lymphocele is a fluid-filled cyst with no epithelial lining.

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The imaging appearance of blood products varies according to the age of the hematoma. For this reason, awareness of the date of surgery or the onset of bleeding is important.