Intraperitoneal Rupture of a Benign Cystic Ovarian Teratoma: Findings at CT and MR Imaging

Benign cystic ovarian teratomas (dermoids) are the most common ovarian neoplasm, accounting for between 10% and 25% of ovarian tumors. Women of any age may present with these tumors, which are bilateral in 8–15% of the cases. Most patients present with an asymptomatic adnexal mass discovered on a routine pelvic examination or with calcifications in the pelvis revealed on imaging performed for other indications. Cystic teratomas consist of well-differentiated derivatives of all three germ cell layers. Complications of cystic teratomas include torsion (16%), malignant degeneration (2%), rupture (1–2%), and infection (1%) [1]. We present the CT and MR findings of a case in which a cystic teratoma ruptured into the peritoneal cavity.

A 45-year-old nullipara presented with a 3-month history of right pelvic pain and irregular menstrual bleeding. A sonogram revealed a large poorly penetrated central pelvic mass and echogenic ascites. A CT scan was then obtained that showed a large heterogeneous central pelvic mass measuring $16 \times 16 \times 13$ cm, consistent with a large fibroid uterus. Additionally, a $10 \times 7 \times 6$ cm right cul-de-sac mass with a fat-fluid level and calcification was noted, which is consistent with a cystic ovarian teratoma (Fig. 1A). Ascites and omental infiltration (Fig. 1B) were also noted, and fatty implants were observed to be most numerous around the dome of the liver (Fig. 1C). An MR image of the abdomen was obtained to confirm the capsular location of the fatty implants around the dome of the liver on coronal T1-weighted images (Fig. 1D). Despite the radiologic findings, the gynecologist suspected malignancy. The preoperative serum level of CA 125 antigen was not elevated but was not yet available at the time of surgery. The patient underwent total abdominal hysterectomy, bilateral salpingo-oophorectomy, and lysis of adhesions. Biopsy of peritoneal and bowel implants revealed benign histology. The patient had an uneventful recovery.

Spontaneous rupture of cystic ovarian teratomas is a rare occurrence because of the usually thick capsule present. However, in addition to rupture into the peritoneal cavity, perforation into other intraabdominal organs has been reported including rupture into the bladder, small bowel, rectum, sigmoid colon, vagina, and even through the abdominal wall. Two clinical presentations are associated with the intraperitoneal rupture of benign cystic teratomas. The first is acute peritonitis caused by the sudden rupture of tumor contents, which may occur spontaneously or more commonly in association with torsion, trauma,
Infection, or labor. The second presentation is chronic granulomatous peritonitis resulting from a chronically leaking dermoid, which can be characterized by multiple small white peritoneal implants, dense adhesions, and variable ascites that simulate carcinomatosis or tuberculous peritonitis. The latter is the more common presentation [2].

A review of the literature revealed two case reports about the CT findings of intraperitoneal rupture of a teratoma [3, 4]. In one report, a case of a retroperitoneal teratoma that resulted in a fat–fluid level was described, and in the other report, a case in which an ovarian teratoma avulsed from its vascular pedicle, resulting in hemorrhage within the peritoneal cavity was described. Both cases occurred after a motor vehicle accident. In our patient, marked ascites and omental infiltration were seen but no fat–fluid level within the peritoneal cavity was observed, which is likely related to the granulomatous peritonitis that is induced by the chronic leakage of sebaceous material. The visualization of fatty implants within the peritoneal cavity was diagnostic in this case. Preoperative diagnosis of this entity can be important in women of childbearing age who desire to have children. Intraoperatively, the surgeon is confronted with an ovarian neoplasm, widespread peritoneal nodules and masses, and a firm tumorous omentum. The gross appearance is identical to that of metastatic ovarian carcinoma, which would prompt total hysterectomy and bilateral salpingo-oophorectomy. Preoperative knowledge of this entity should prompt frozen-section diagnosis of peritoneal implants intraoperatively so that if benign only unilateral salpingo-oophorectomy would be performed in patients desiring to maintain fertility. No attempt at removal of the peritoneal masses is necessary except for diagnostic purposes.

Fatal Hemoptysis Caused by Ruptured Giant Rasmussen’s Aneurysm

The source of hemoptysis in cavitary pulmonary tuberculosis is usually from bronchial arteries. Pseudoaneurysm of bronchial arteries, although an important source of hemoptysis, is seen infrequently [1]. Pulmonary artery pseudoaneurysms are occasionally encountered in patients with hemoptysis due to pulmonary tuberculosis. Although clinically occult cases do occur, pulmonary pseudoaneurysms are usually symptomatic. Hemoptysis is the chief complaint and is frequently fatal.

A 50-year-old male farmer presented with 400 ml of hemoptysis. Two days earlier, he had a bout of 300 ml of hemoptysis. The patient had a history of partially treated pulmonary tuberculosis. A chest radiograph obtained 2 months before presentation showed multiple bilateral nodular shadows with a large cavity in the right mid zone with an air–fluid level. A chest radiograph obtained at admission showed a large mass in the right lung (Fig. 2A). A bronchial angiogram showed normal findings. CT of the chest revealed a large mass in the right lung overlying multiple small lung nodules (Fig. 2B). A contrast-enhanced CT scan of the chest showed a large partially thrombosed aneurysm involving the right descending pulmonary artery in the wall of the cavity (Fig. 2C). Diagnostic catheter pulmonary angiography confirmed the diagnosis of pseudoaneurysm of the pulmonary artery. The patient had a bout of massive hemoptysis during the angiographic procedure and underwent emergency right pneumonectomy. The resected lung specimen showed a large partially thrombosed Rasmussen’s aneurysm in the wall of the cavity, which was filled with blood. Bilateral diffusely scattered foci of tuberculous lesions were also found. The patient died on the third postoperative day as a result of pulmonary edema.

A destructive lung process, irrespective of its pathogenesis, can destroy adjacent lung, weaken the arterial wall, or erode any vessel in its vicinity [2]. A cavitary lesion in close

References


On the AJR Viewbox

Fig. 2.—50-year-old man with hemoptysis.
A, Anteroposterior radiograph of chest shows large round opacity (arrow) in right lung.
B, CT scan of chest at lung window reveals large mass (arrow) in superior segment of right lower lobe. Multiple small nodules are seen in both lungs.
C, Contrast-enhanced CT scan of chest obtained after administration of IV contrast material shows that large partially thrombosed aneurysm (arrow) that arose from right descending pulmonary artery.
proximity to a central pulmonary artery is a potential source of bleeding [2]. Rasmussen’s aneurysm refers to an aneurysm of the small to medium pulmonary artery branches that develops in the vicinity of a tuberculous cavity. Other causes of mycotic aneurysms are septicemia, bronchiectasis, lung abscess, and other acute or chronic inflammatory conditions. Although syphilitic pulmonary aneurysms are centrally located, Rasmussen’s aneurysms are usually distributed peripherally and beyond the branches of main pulmonary arteries [3]. Aneurysms involving the lobar or segmental branches of the pulmonary arteries occur in Behçet’s and Hughes-Stovin syndromes. Posttraumatic aneurysms, dissecting aneurysms, aneurysms associated with necrotic pulmonary neoplasms, and postembolic and iatrogenic aneurysms represent other less common causes of pulmonary aneurysms [3].

Aneurysmal rupture resulting in massive hemoptysis is potentially fatal, with death caused by aspiration of blood and consequent asphyxiation or, less commonly, by exsanguination [4]. Bleeding associated with acute tuberculosis from the pulmonary vessels is small in volume and caused by necrosis of a small pulmonary artery branch or vein [4, 5]. Massive hemoptysis associated with chronic cavitary tuberculosis usually results from the rupture of Rasmussen’s aneurysm through the wall of the cavity [4], as was seen in our patient.

There is the potential risk of aneurysmal rupture during diagnostic catheter angiography. Endovascular treatment is a successful alternative for the treatment of Rasmussen’s aneurysm. We were unable to occlude the aneurysm because of the extent of hemoptysis present during pulmonary angiography.

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Hypoechoic Renal Peripyramidal Rings in Primary Hyperoxaluria

Primary hyperoxaluria is a rare autosomal recessive genetic disorder characterized by excessive synthesis and urinary excretion of oxalic acid. Nephrocalcinosis, which refers to pathologic deposition of calcium oxalate in renal parenchyma, and increased urinary excretion of oxalic acid result in progressive renal failure and nephrolithiasis, respectively [1].

Sonographic findings in nephrocalcinosis caused by hyperoxaluria include increased parenchymal echogenicity of the normal-size kidneys and loss of corticomedullary distinction. Acoustic shadowing arising from the intensely echogenic renal parenchyma may be detected [2]. Conventional radiographs and unenhanced CT scans are also valuable to visualize dense kidneys.

In a 6-year-old boy with a primary hyperoxaluria who underwent peritoneal dialysis, we observed hypoechogenic rings around the renal pyramids in addition to the sonographic findings mentioned earlier (Fig. 3A). Unenhanced CT scans show these areas as peri- pyramidal hypodense ringlike regions (Fig. 3B).

To our knowledge, there are few reports that include ringlike parenchymal echo changes in renal diseases [3, 4]. Päivänsalo et al. [3] described the hyperechogenic rings in the peripheries of renal medullary pyramids and proved this finding was nonspecific and poorly correlated with the severity of renal disease. However, to our knowledge no reports are available about hypoechogenic peripyramidal rings. We think that these areas, which are distributed along the course of the peripyramidal vascularity (interlobar and arcuate vessels), may reflect the spared regions in a diffusely involved renal parenchyma by calcium oxalate crystals.

Fig. 3.—6-year-old boy with primary hyperoxaluria who underwent peritoneal dialysis.  
A, Sagittal sonogram of right kidney reveals marked increase in echogenicity of renal parenchyma. Note low echogenicity of peripyramidal regions and sinus structures.  
B, Unenhanced CT scan shows hypodense rims at corticomedullary junction and sides of pyramids in hyperdense renal parenchyma.
Further observations are required to clarify diagnostic importance of these areas during the progressive course of the disease.

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Double-Exposure Artifact Mimicking a Cervical Spine Fracture on Computed Radiography

A middle-aged woman presented to the emergency department after being involved in a motor vehicle accident in which she was an unrestrained passenger. On presentation, she complained of mild neck pain. An occipital hematoma was present on physical examination. A cervical spine (C-spine) series was obtained using a computed radiography system (ADC70; Bayer, Tarrytown, NY). The initial lateral C-spine radiograph showed an apparent spondylolisthesis of at least grade 3 C5–C6. Disruption of the anterior cortex of the C5 vertebral body was also apparent (Fig. 4A).

Because of the discrepancy between the findings seen on radiographs and those observed at clinical examination, a second lateral view was obtained. Revisualization of the area of concern showed normal alignment without loss of cortical integrity (Fig. 4B). Discordance between these studies prompted us to perform a CT examination of the C-spine. CT through the entire C-spine revealed normal findings, thus assuring us that the apparent abnormal finding of radiography was the result of an artifact.

Other researchers have explored computed radiography artifacts but none, to our knowledge, have reported a case in which an artifact mimicked a C-spine fracture and precipitated further imaging [1]. In our case, notice that four earrings are visible in the lateral radiograph with apparently abnormal finding (Fig. 4A). Only one earring per ear is seen in subsequent radiographs (Fig. 4B). This reveals the artifact was an inadvertent double exposure, with patient motion between exposures explaining duplicate earrings and the apparent abnormal alignment.

Computed radiography using a photostimulable phosphor plate was developed in 1980 and commercialized in 1983. Its clinical use has increased worldwide. Computerized radiography has been used at our institution since September 1994. Currently, all portable and emergency department X-ray examinations are performed by computed radiography. Examinations of the C-spine are typically obtained using the following parameters: 80 kV and 35–40 mAs; lateral views are obtained at 72 inches (183 cm).

To explain this artifact we must understand computed radiography physics. The linear characteristic curve of computed radiography systems allows capture of a wider range of exposure information in a single image than is possible with a screen-film system. Digital image processing performed in computed radiography systems optimizes image intensity for the dynamic range of the display device and can create a diagnostic-quality image from under- or in this case, overexposed plates. Thus, detecting double exposures with computed radiographs versus radiographs is more difficult. It is unlikely that any interpretation in a double exposure of a radiograph would be possible because of the narrow latitude inherent in the sigmoidal characteristic curve of screen-film. Radiologists need to consider the possibility of an artifactual image with computed radiography and verify this suspicion by repeated imaging.

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Percutaneous Radiofrequency (RF) Ablation Therapy for Hepatocellular Carcinoma: Difficulty in Removing the Expandable RF Needle Electrode

Currently, percutaneous radiofrequency ablation therapy (PRFA) using the expandable radiofrequency (RF) needle electrode with four retractable lateral hooks is widely performed for local treatment of liver tumors. To our knowledge, there have not been any major complications or problems reported during or after PRFA [1]. However, we experienced an unusual technical problem when this electrode was removed. We report an instance of difficulty in removing the expandable RF needle electrode after PRFA for small hepatocellular carcinoma.

A 76-year-old man whose serum was positive for hepatitis C virus antibody was admitted to our hospital for treatment of hepatocellular carcinoma, measuring 1.4 cm in diameter, in the posterolateral of the right hepatic lobe. The patient requested percutaneous local treatment. Therefore, the patient was
treated with PRFA under sonographic guidance. An RF current generator (model 500 generator; RITA Medical System, Mountain View, CA) was used to generate RF energy. To deliver RF energy, we used a 25-cm-long 15-gauge expandable RF needle electrode (model 30, RITA Medical System) (Fig. 5). After local anesthesia was administered, a 15-cm-long 13-gauge guide needle was inserted under sonographic guidance in the vicinity of the tumor. After the inner needle of the guide was removed, the electrode was inserted through the outer sheath of the guide to place the electrode in the tumor area. The hooks were then deployed and the tumor area was ablated. The power needed to maintain a temperature ranging from 90°C to 110°C at the hook tips was delivered for 10 min. The treated area showed an echogenic change measuring 2.0 cm in maximum diameter. After ablation, we tried to retract the hooks into the electrode shaft before removing the electrode. However, the hooks could not be completely retracted into the electrode shaft. We attempted to retract the hooks again after redploying the hooks.

Unfortunately, we failed to redploy the hooks. Therefore, the electrode could not be removed. To resolve this problem, we performed the following technique. First, the outer sheath of the guide was pushed with axial rotation toward the tip of the electrode to stretch the unretracted hooks and receive the electrode into the outer sheath of the guide holding the electrode. Then, we succeeded in pulling the electrode into the outer sheath of the guide. The electrode was then removed leaving the outer sheath of the guide in the liver. To prevent bleeding, microwave irradiation was administered along the puncture line through the outer sheath of the guide as previously described [2]. Once we were able to remove the expandable RF needle electrode, we saw that coagulated tissue had become caught in the space between the hooks and the electrode shaft and that part of the hooks were exposed to the outside of the electrode shaft (Fig. 6). Therefore, we considered that the presence of this coagulated tissue in the space between the hooks and the electrode shaft had prevented retraction of the hooks and redeployment, thus preventing the electrode from being removed because of hooking by the unretracted hooks. A previous report indicated that there were no technical problems related to PRFA and that the electrode was removed smoothly after ablation in all cases [1]. However, every operator should know that the expandable RF needle electrode may be difficult to remove if coagulated tissue becomes caught in the space between the hooks and the electrode shaft, thus preventing hook retraction after ablation, even though this technical problem is rare.

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Localization of Gastrointestinal Bleeding with Contrast-Enhanced Helical CT

There are numerous causes of lower gastrointestinal bleeding such as diverticular bleeding, angiodysplasia, ischemic colitis, neoplasms, ulcerative colitis, Crohn’s disease, and infectious ulceration [1].

Endoscopy or angiography are the major diagnostic tools in the workup of gastrointestinal bleeding. Performing radionuclide studies with tagged RBCs has also been proven to be a valuable technique, but localization is not as accurate with this technique as it is with angiography.

Visualization of venous and arterial bleeding at rates of 0.1 ml/min (6×10⁻⁶ m³/sec) are said to be achieved with nuclear scans. Selective angiography can detect bleeding at a rate of at least 0.5 ml/min (3×10⁻⁵ m³/sec) [2]. Few reports exist on intraarterial helical CT angiography in gastrointestinal bleeding. Catherization of the abdominal aorta and intraarterial injection of contrast medium (intraarterial CT angiography) followed by helical CT have been described for localization of the site of gastrointestinal bleeding [3, 4].

Active arterial extravasation of contrast material related to trauma or anticoagulation on helical CT has also been reported [5]. We present a 74-year-old woman with suspected gastrointestinal bleeding for bloody stools. She required approximately 4 pints of blood over 24 hr, representing a blood loss of approximately 1.6 ml/min (9.6×10⁻⁵ m³/sec), to maintain a stable hematocrit. Eight weeks earlier she had transmediastinal esophageal resection for carcinoma of the proximal esophagus with reconstruction using the stomach via a retrosternal route (Akiyama procedure). A ⁹⁹ᵐTc RBC scan and a 2-hr follow-up scan were obtained on the same day as the CT scan. Two hours after performing scintigraphy, we performed multiphasic helical CT with one precontrast series followed by three postcontrast series. The technical parameters were as follows: 7-mm collimation, 12-mm/sec table speed, and 6-mm reconstruction index; 150 ml of nonionic contrast agent was injected IV at a rate of 5 ml/sec (5×10⁻⁶ m³/sec). The scan delay for the arterial phase was calculated by a test bolus. Scans were obtained 1.5 and 3.5 min later. A precontrast CT scan revealed an area of slight hyperdensity in the right colon that was presumably caused by blood clots (Fig.
During the arterial phase, a marked enhancement in the lumen of the right hepatic flexure was seen (Fig. 7B), showing the site of colonic bleeding. The postcontrast scans, which were obtained 1.5 (Fig. 7C) and 3.5 min (Fig. 7D) after administration of contrast material, showed a decrease of hyperdensity due to dilution of the contrast agent. Colonoscopy was performed after an erosive lesion of the mucosa of the right hepatic flexure was seen on CT, which confirmed the CT findings.

Initial findings from lower and upper gastrointestinal endoscopies were negative. In addition, the $^{99m}$Tc RBC scan did not reveal the site of bleeding.

The patient recovered with conservative treatment. In this case, IV helical CT was able to show accurately the site of gastrointestinal bleeding caused by erosive mucosal changes. These scans were particularly useful because neither endoscopy nor nuclear scanning were able to reveal the site of bleeding and because emergency surgery, which is associated with potential high mortality, was avoided. Further studies are necessary to investigate IV helical CT as a diagnostic tool for detection of intestinal bleeding compared with angiography and scintigraphy.

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