

Greater and Lesser Omenta: Normal Anatomy and Pathologic Processes¹

ONLINE-ONLY CME

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LEARNING OBJECTIVES

After reading this article and taking the test, the reader will be able to:

- Describe the normal anatomy of the omenta as seen on CT scans.
- List the diseases that may manifest as diffuse omental infiltration at CT.
- Discuss the usefulness of multidetector CT with multiplanar reformation in evaluation of omental diseases.

TEACHING POINTS

See last page

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The peritoneum is the largest serous membrane in the body and the one with the most complex structure. The omentum is a double-layered extension of the peritoneum that connects the stomach to adjacent organs. The peritoneal reflections form the greater and lesser omenta, and the natural flow of peritoneal fluid determines the route of spread of intraperitoneal fluid and consequently of disease processes within the abdominal cavity. The omenta serve both as boundaries for disease processes and as conduits for disease spread. The omenta are frequently involved by infectious, inflammatory, neoplastic, vascular, and traumatic processes. Computed tomography (CT) is a primary diagnostic method for evaluation of omental diseases, most of which may manifest with nonspecific clinical features. Multidetector CT with multiplanar reformation allows accurate examination of the complex anatomy of the peritoneal cavity, knowledge of which is the key to understanding the pathologic processes affecting the greater and lesser omenta.

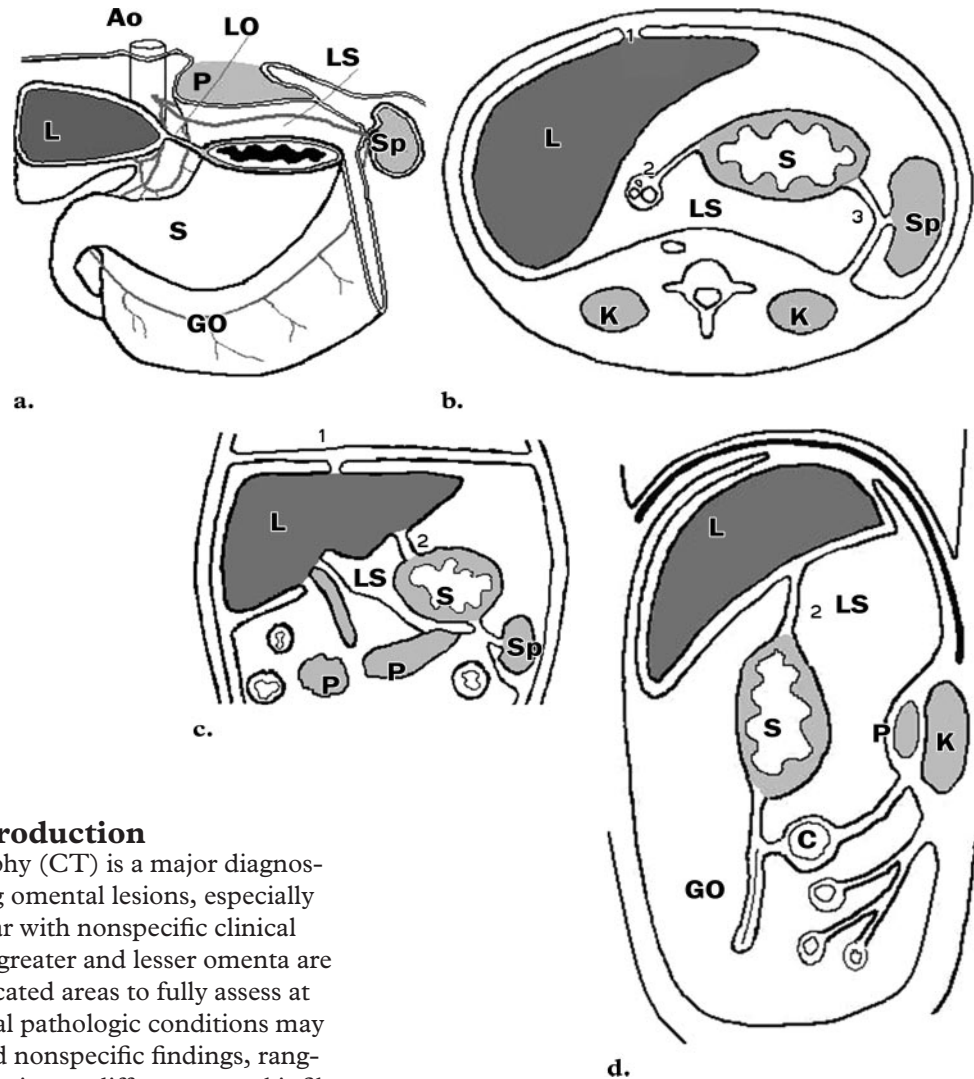
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Figure 1. Drawing of the anatomy of the greater and lesser omenta (a) and axial (b), coronal (c), and sagittal (d) diagrams of the upper abdomen. The greater omentum (GO) is composed of a double layer of peritoneum that extends from the greater curvature of the stomach (S) inferiorly. Its descending and ascending portions usually fuse to form a four-layer vascular fatty apron; the resulting space is contiguous with the lesser sac (LS). The lesser omentum (LO) connects the lesser curvature of the stomach and proximal duodenum with the liver (L) and contains blood vessels, nerves, and lymph nodes. The lesser sac is empty and collapsed so that only parts of its boundaries, such as the posterior gastric wall and pancreatic body, are observed on axial CT scans. Ao = aorta, C = colon, K = kidney, P = pancreas, Sp = spleen, 1 = falciform ligament, 2 = gastrohepatic ligament, 3 = gastro-splenic ligament.



Introduction

Computed tomography (CT) is a major diagnostic tool for evaluating omental lesions, especially those that may appear with nonspecific clinical manifestations. The greater and lesser omenta are anatomically complicated areas to fully assess at CT. As such, omental pathologic conditions may appear as various and nonspecific findings, ranging from a fluid collection to diffuse omental infiltration. The omenta serve not only as boundaries for certain disease processes but also as conduits for disease spread. Thus, the omenta can be affected by a variety of diseases, including infection, inflammation, neoplasms, trauma, and infarction. High-resolution multidetector CT with multipla-

nar reformation improves demonstration of the omental anatomy and detection of omental pathologic conditions. Knowledge of the omental anatomy, the disease spectrum involving the greater and lesser omenta, and the disease-specific CT findings is essential for proper diagnosis and treatment.

In this article, we review the normal omental anatomy, common disease processes of the omenta, and their characteristic CT features. We also discuss the role of multidetector CT with multiplanar reformation in evaluation of omental disease.

CT Protocol and Reformation Technique

Most omental pathologic conditions manifest as nonspecific symptoms and signs. As such, diagnosis is based on CT findings, which are very important in patient treatment. CT is the optimal imaging technique for demonstrating the presence of omental disease and its cause. **Furthermore, coronal and sagittal reformatted CT images help delineate the exact location, origin, or spread pattern of omental disease, as well as clarify the complex anatomy of the omenta.**

CT examinations were performed by using a 16-section CT scanner (Somatom Sensation 16; Siemens Medical Solutions, Erlangen, Germany). Contrast-enhanced CT images with or without nonenhanced images were obtained with the following parameters: 0.5-second rotation time, 0.75-mm collimation, 3-mm section thickness, 35-cm field of view, 3-mm reconstruction thickness, 12-mm feed per rotation, 120 kV, and 140 mA. Two-dimensional axial reconstruction images with 3-mm section thickness are routinely obtained at our institution by using the standard software of the scanner (Somaris/5; Siemens Medical Solutions). On a case-by-case basis, additional sagittal, coronal, or oblique multiplanar reformatted images can be obtained by using personal computer-based software (Advantage workstation; GE Healthcare, Munich, Germany).

Normal Anatomy

The greater omentum is composed of a double layer of peritoneum that hangs down like an apron from the greater curvature of the stomach and the proximal part of the duodenum, covering the small bowel. Its descending and ascending portions fuse to form a four-layer vascular fatty apron (the gastrocolic ligament), with a space contiguous with the lesser sac (Fig 1) (1,2). The greater omentum has considerable mobility and moves around the peritoneal cavity. It functions as a visceral fixation and serves to shield an ab-

normality and limit its spread (1,2). However, it is also a common location for neoplastic intraperitoneal seeding and infectious processes because it is bathed in the peritoneal fluid.

The greater omentum is composed mainly of fatty tissue, with some thin serpentine gastropiploic vessels. **At CT, it appears as a band of fatty tissue with a variable width, just beneath the anterior abdominal wall and anterior to the stomach, transverse colon, and small bowel. Ascites between the greater omentum and the adjacent soft tissues makes the omentum appear as a simple fatty layer, and soft-tissue deposits in the omentum can create an amorphous hazy stranding or a nodular or masslike appearance at CT (3).**

The lesser omentum, which is a combination of the gastrohepatic and hepatoduodenal ligaments, connects the lesser curvature of the stomach and proximal duodenum with the liver and covers the lesser sac anteriorly (Fig 1) (1,4–6). The gastrohepatic ligament contains the left gastric vessels and left gastric lymph nodes. The hepatoduodenal ligament, the thickened edge of the lesser omentum, contains the portal vein, hepatic artery, extrahepatic bile duct, and hepatic nodal group.

As a result of rotation and growth of the stomach during fetal development, the lesser sac is a unique peritoneal space that extends behind the stomach, anterior to the pancreas. The superior recess of the lesser sac surrounds the caudate lobe of the liver, and it communicates with the peritoneal cavity through the epiploic foramen, commonly called the foramen of Winslow (Fig 1) (7,8). As the stomach rotates and the greater omentum elongates, the lesser sac also expands and acquires an inferior recess between the layers of the greater omentum. Later, the inferior recess almost disappears as the layers of the greater omentum fuse (1). The gastrohepatic ligament is identified at CT as a triangular fat-containing area between the stomach and liver. The lesser sac is collapsed at normal times, so only parts of its boundaries, such as the posterior gastric wall and pancreatic body, are observed on CT scans.

Teaching Point

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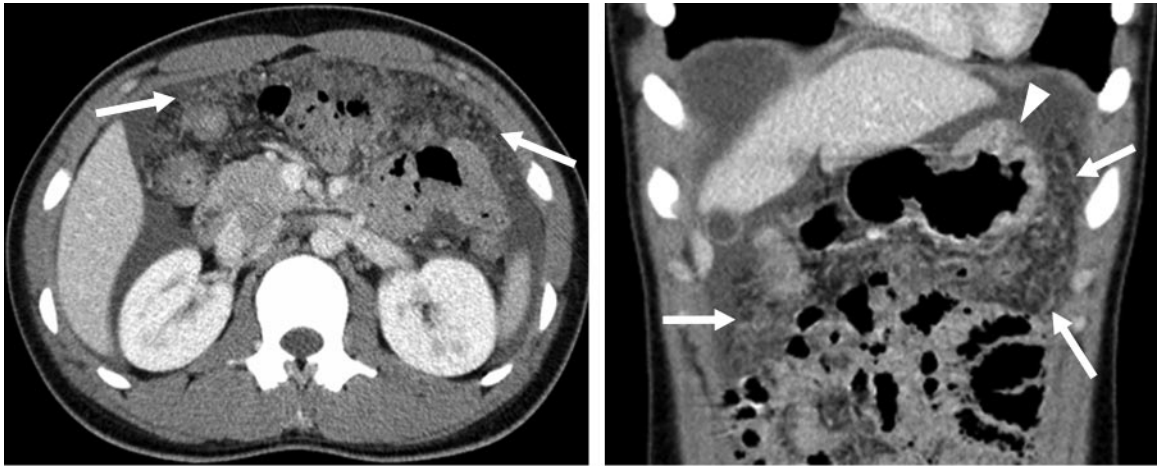


Figure 2. Peritoneal carcinomatosis in a 22-year-old man with epigastric pain. Axial (**a**) and coronal (**b**) CT scans show large amounts of ascites, diffuse nodular omental infiltration (omental cake) (arrows), and abnormal gastric wall thickening (arrowhead in **b**), findings compatible with carcinomatosis from the stomach.

Abnormalities Involving the Greater Omentum

The CT appearances of abnormalities involving the greater omentum are as follows: (*a*) multifocal, ill-defined infiltrative lesions, including peritoneal carcinomatosis, tuberculous peritonitis, malignant peritoneal mesothelioma, pseudomyxoma peritonei, lymphomatosis, and the conditions of cirrhosis and portal hypertension; (*b*) solid or cystic mass-forming lesions including primary and secondary neoplasms and infectious processes; and (*c*) miscellaneous conditions including omental infarction, foreign-body granuloma, hematoma, and hernia.

Multifocal, Ill-defined, Infiltrating Lesions

When there is diffuse infiltration of the peritoneum, omentum, or mesentery at CT, a variety of conditions—including infiltrative edema from liver cirrhosis, diffuse peritoneal tumors, and infectious peritonitis—should be considered. Distinguishing between diffuse peritoneal tumors, such as peritoneal carcinomatosis, malignant mesothelioma, or lymphomatosis, and tuberculous peritonitis is difficult because of nonspecific symptoms and overlapping imaging features. The CT patterns of omental abnormalities, such as fatty stranding, nodular infiltration, large masses, or omental caking, are not significantly different in these diseases (9).

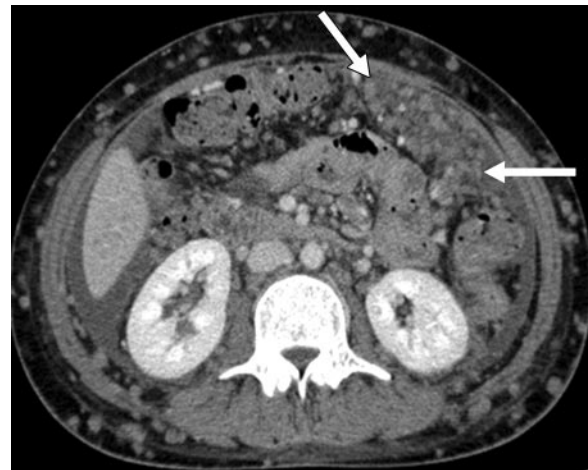


Figure 3. Peritoneal carcinomatosis in a 30-year-old woman with malignant melanoma. CT scan shows hemogenous dissemination of malignant nodules in the peritoneal space including the omentum (arrows), retroperitoneal spaces, and the subcutaneous fat layer of the abdomen.

Liver cirrhosis with portal hypertension is one of the most common causes of diffuse omental infiltrative lesions. Patients with cirrhosis frequently present with mesenteric, omental, or retroperitoneal edema identifiable at CT. The radiologic features of omental edema vary from a mild infiltrative haze to the presence of masslike lesions with discrete margins and are similar to those of other omental pathologic conditions (10).

Metastatic peritoneal tumors most often originate from the ovary, stomach, pancreas, colon, uterus, and bladder. Hematogenous metastases from malignant melanoma, as well as breast and

Teaching Point

Teaching Point



Figure 4. Tuberculous peritonitis in a 38-year-old woman with abdominal distention for 1 week. CT scan shows a large amount of ascites with even peritoneal thickening (arrowhead) and diffuse omental infiltration (arrow) without associated lymphadenopathy. The initial impression was carcinomatosis. When the primary malignancy is unclear, the differential diagnosis should include tuberculous peritonitis, particularly in endemic areas. The final diagnosis was tuberculous peritonitis.

lung carcinoma, are also common. Patients with peritoneal carcinomatosis may demonstrate ascites, peritoneal thickening, seeding nodules, and omental infiltration (Figs 2, 3) (3,11). However, these findings are not specific for peritoneal carcinomatosis and can be seen with other entities that seed the peritoneum, including mesothelioma, tuberculosis, and lymphomatosis. Therefore, the radiologist should make an effort to look for a primary tumor, especially in the gastrointestinal and genitourinary tracts. Although omental caking is commonly seen in patients with peritoneal carcinomatosis, it is not diagnostic for this disease. Irregular thickening of the outer contour of the infiltrated omentum favors the diagnosis of peritoneal carcinomatosis (11).

Tuberculous peritonitis is caused by hematogenous spread of pulmonary tuberculosis or by rupture of a mesenteric node. CT findings favoring a diagnosis of tuberculous peritonitis over other disease processes are as follows: smooth peritoneum with minimal thickening and pronounced enhancement, mesenteric involvement with macronodules (5 mm in diameter), a thin omental line (fibrous wall covering the infiltrated omentum), mesenteric adenopathy with low-attenuation centers (caseous necrosis), and calcifications (Fig 4) (11–13). The fibrotic type of tuberculous peritonitis, although not common, is

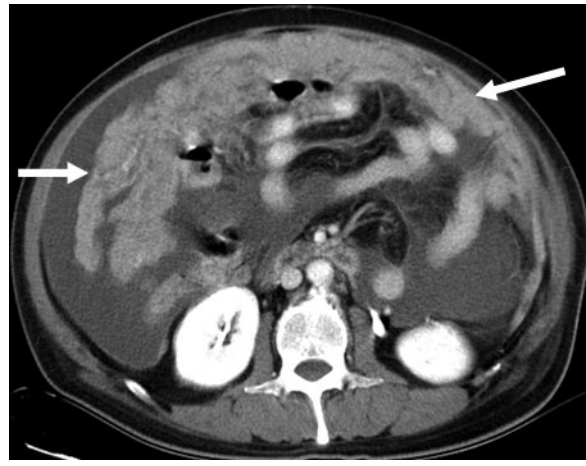


Figure 5. Malignant peritoneal mesothelioma in a 47-year-old man with dyspnea for 1 month. CT scan shows a diffuse, platelike mass in the greater omentum (arrows), massive ascites, and peritoneal thickening. Malignant mesothelioma was confirmed with pleural biopsy and cytologic analysis of peritoneal fluid.

characterized by loculated ascites, large omental masses, and separation or fixation of bowel loops.

Malignant peritoneal mesothelioma is a rare condition and accounts for 12%–33% of all mesotheliomas. Malignant peritoneal mesothelioma may have a variable appearance at CT. It is commonly associated with ascites, irregular or nodular peritoneal thickening, a “stellate” pattern of the mesentery, bowel wall thickening, and omental involvement ranging from finely infiltrated fat with a “smudged” appearance to discrete omental nodules or omental caking (Fig 5) (13). It sometimes manifests as a large quantifiable mass in the upper abdomen with minimal ascites and discrete nodules scattered over the peritoneum.

Pseudomyxoma peritonei is characterized by the gradual accumulation of large volumes of mucinous ascites, which arise from a ruptured benign or malignant mucin-producing tumor of the appendix, ovary, pancreas, stomach, colorectum, or urachus. At CT, pseudomyxoma peritonei appears as a low-attenuation, frequently loculated fluid collection in the peritoneal cavity, omentum, and mesentery. Scalloping of visceral surfaces, especially the liver, is the diagnostic characteristic that distinguishes mucinous from serous ascites at CT (Fig 6) (14). Curvilinear or punctate calcifications in the mucinous materials are frequently identified (15).

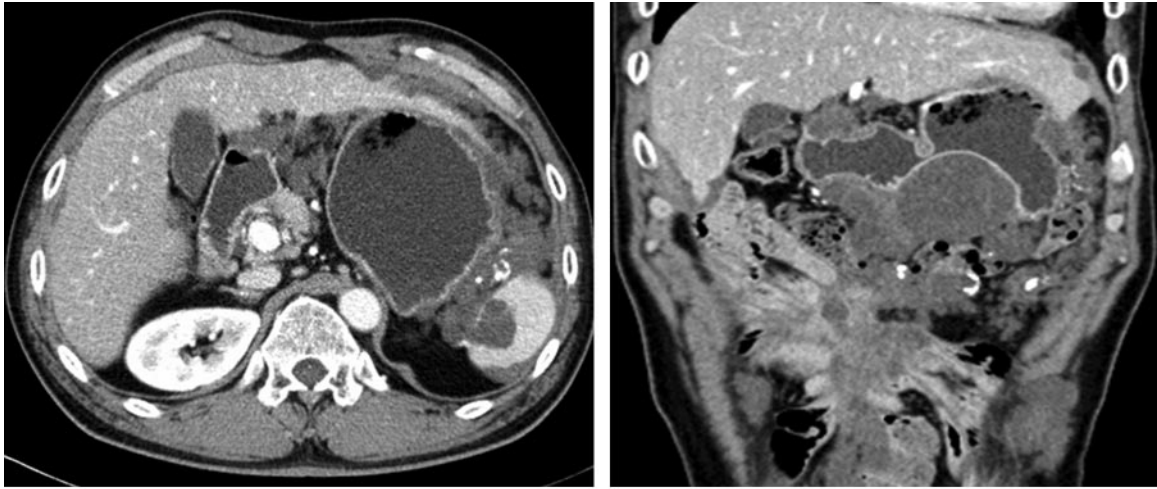


Figure 6. Pseudomyxoma peritonei in a 47-year-old man with abdominal discomfort. Axial (**a**) and coronal (**b**) CT scans show multiple low-attenuation nodules and masses in the omentum and peritoneal cavity. Curvilinear or punctate calcifications of the seeding nodules; scalloping of the liver, spleen, and stomach; and small bowel adhesions from mesenteric infiltration are noted. Pseudomyxoma peritonei was proved with peritoneoscopic biopsy.

Peritoneal lymphomatosis is curable without surgery, unlike other peritoneal malignant diseases. Diagnosis of peritoneal lymphomatosis with CT is difficult because it closely mimics peritoneal carcinomatosis and tuberculous peritonitis. However, ascites without any loculation or septations and a diffuse distribution of enlarged lymph nodes are promising prognosticators (16). Retroperitoneal and mesenteric lymphadenopathy is demonstrable, and the enlarged lymph nodes appear as homogeneous attenuation or central low attenuation with peripheral rim enhancement (Fig 7). CT findings of omental involvement include omental “smudging” and omental caking rather than a discrete nodular pattern.

Solid or Cystic Mass-forming Lesions

Secondary neoplasms involving the greater omentum are far more common than primary tumors. Many neoplasms have been shown to involve the greater omentum by direct spread, peritoneal seeding, or hematologic spread (Fig 8). Metastatic peritoneal tumors most often originate from carcinomas of the ovary, stomach, pancreas, and colon (Fig 9) (9).

Primary neoplasms of the omentum are uncommon and include mesotheliomas, hemangiopericytomas, stromal tumors, leiomyomas, lipomas, neurofibromas, fibromas, leiomyosarcomas, liposarcomas, and fibrosarcomas. Imaging findings of primary omental tumors are nonspecific. Benign tumors are usually well circumscribed and

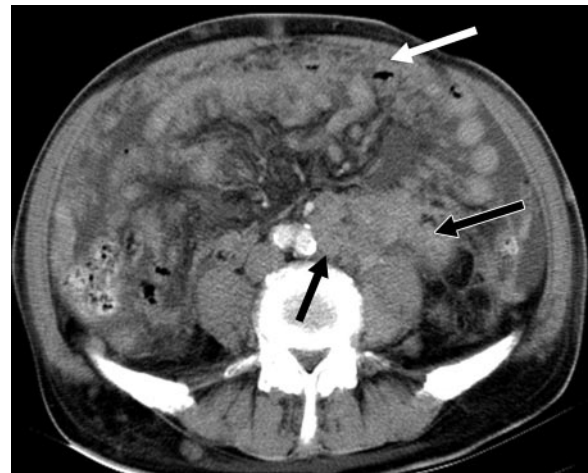


Figure 7. Peritoneal lymphomatosis in a 71-year-old man with abdominal distention for 15 days. CT scan shows ascites in the pelvic cavity and innumerable seeding nodules in the peritoneal cavity and omentum (white arrow). Multiple enlarged lymph nodes with conglomeration (black arrows) are seen in the retroperitoneal spaces. Endoscopic gastric biopsy showed B-cell lymphoma, thus confirming the diagnosis of lymphomatosis.

localized in the omentum. Malignant tumors frequently have indistinct margins and invade into surrounding structures. Both malignant and benign tumors can appear complex, with cystic and solid elements. Some cystic lesions may involve the greater omentum, including cystic lymphangioma, enteric duplication cyst, enteric cyst, mesothelial cyst, and nonpancreatic pseudocyst (17). Abdominal lymphangioma is characterized

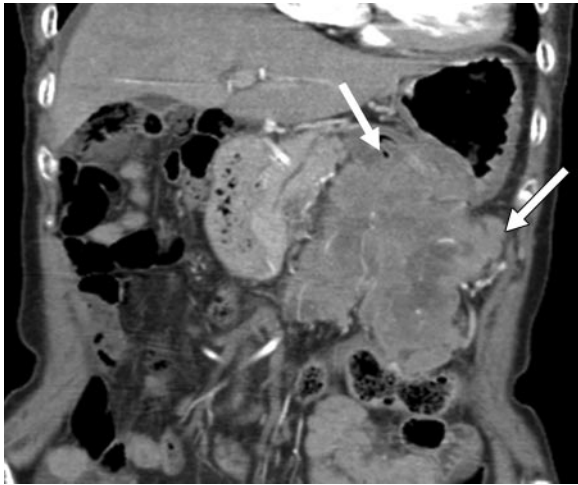


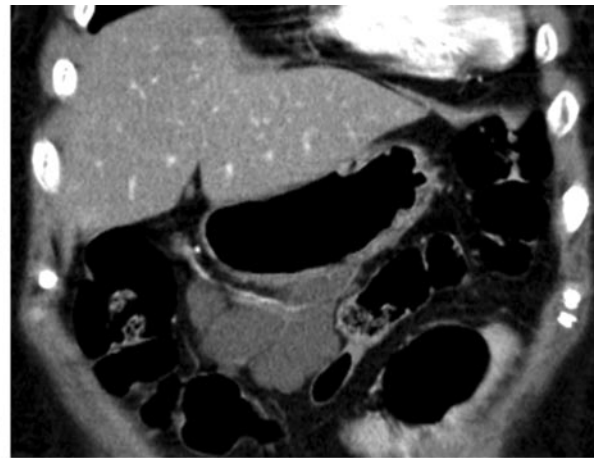
Figure 8. Secondary neoplasm of the greater omentum in an 80-year-old woman with dyspepsia. Coronal CT scan shows a large lobulated mass (arrows) in the left upper quadrant of the abdomen. The mass represents an exophytic tumor from the greater curvature of the stomach, a finding suggestive of an exophytic gastric carcinoma.



Figure 9. Metastatic peritoneal tumor in a 73-year-old woman with a palpable abdominal mass for 2 months. CT scan shows a large, lobulated, heterogeneous mass in the midabdomen, inferolateral to the stomach. Thickened peritoneum (arrow) adjacent to the mass is suggestive of a malignant lesion. Metastatic carcinoma was confirmed at surgical excision. The patient had a history of ovarian carcinoma.



a.



b.

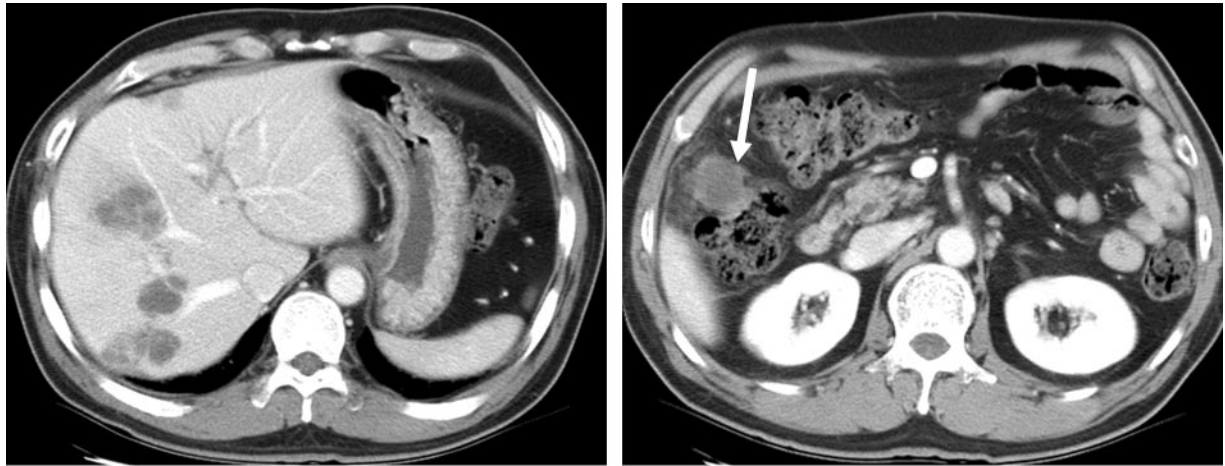
Figure 10. Abdominal lymphangioma in a 38-year-old woman with a gastric ulcer, which was an incidental finding at CT. Axial unenhanced (**a**) and coronal contrast-enhanced (**b**) CT scans show a lobulated cystic mass in the greater omentum inferior to the gastric antrum. The mass is most likely a cystic lymphangioma.

by a uni- or multiloculated fluid-filled mass with a thin wall and occasionally with septa (Fig 10) (17,18).

Unusual infections such as actinomycosis or paragonimiasis may manifest as solid or cystic mass lesions in the greater omentum. Actinomycosis has a worldwide distribution in urban and rural areas and commonly involves the cervicofacial, thoracic, and abdominopelvic regions. It has an infiltrative nature and a tendency to invade normal anatomic barriers. Abdominal actinomycosis manifests as a solid mass with focal areas of decreased attenuation or a mostly cystic mass with irregularly thickened, heterogeneously enhanced walls on CT scans (19,20). Neoplasms

and other inflammatory diseases, especially tuberculosis, manifest in a similar manner and may be confused with actinomycosis.

The primary site of a paragonimiasis infection is the lung, but other organs may be involved. Common CT features of abdominal paragonimiasis include multiple, densely calcified, small nodules scattered in the peritoneal cavity (Fig 11) (20). Omental involvement with paragonimiasis may not be significant clinically, but knowledge of this imaging feature is important in establishing an early diagnosis and avoiding unnecessary surgery.



a.

b.

Figure 11. Abdominal paragonimiasis in a 49-year-old man with hepatic lesions incidentally found during laparoscopic cholecystectomy. **(a)** CT scan shows multilocular cystic lesions in the right lobe of the liver. **(b)** CT scan shows multifocal ill-defined cystic lesions and several nodules (arrow) in the omentum on the right side of the abdomen. These appearances are suggestive of multilobulate parasitic abscesses in the liver with peritoneal seeding of parasitic granulomas. Biopsy of the liver and omentum demonstrated paragonimiasis.



a.

b.

Figure 12. Omental infarction in a 47-year-old man with abdominal pain. Axial **(a)** and sagittal **(b)** CT scans show localized fatty infiltration and congestion with a secondary mass (arrow) in the right lower aspect of the anterior abdomen. This appearance most likely indicates an omental infarction.

Miscellaneous Lesions

Segmental omental infarctions are rare and can cause acute abdomen. Primary torsion has no known cause. Secondary torsion is more common, and the causes include a hernia, a focus of inflammation, previous laparotomy, or a tumor. Preoperative diagnosis is difficult, as right omental involvement is much more common and clinical

signs and symptoms are usually nonspecific; they may thus mimic acute appendicitis or cholecystitis. CT findings range from subtle, focal, hazy soft-tissue infiltration of the omentum to a more extensive, masslike fullness that can resemble pathologic infiltration from more ominous causes. Whirling fatty tissue around a vascular structure may be a specific finding for omental torsion (Fig 12) (21,22). The greater omentum is

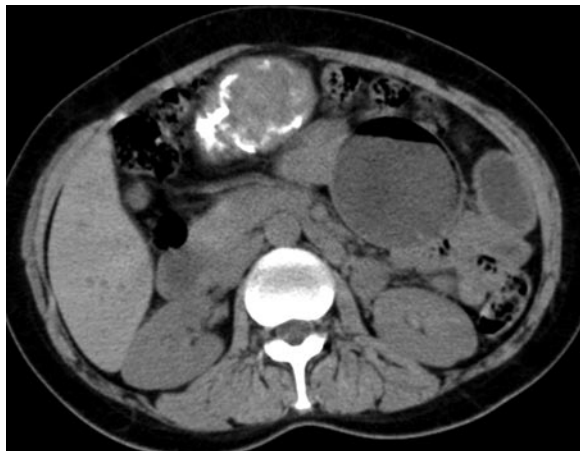


Figure 13. Foreign-body granuloma in a 39-year-old woman with a palpable mass for 10 years and abdominal pain for 1 week. Unenhanced CT scan shows a large, well-circumscribed mass with dense calcification in the anterior midabdomen, an appearance suggestive of a foreign-body granuloma or organizing hematoma. After injection of contrast material, the mass showed no enhancement. A foreign-body granuloma with surgical gauze was found at surgical excision. The patient had a history of cesarean section 10 years earlier.

more frequently traumatized by penetrating injuries than by blunt injury. Injury to the omental vasculature can cause an omental infarct (2).

Foreign-body granuloma from a retained laparotomy sponge may manifest as acute or delayed nonspecific symptoms. It is usually an aseptic process that creates adhesions and a thick capsule around the sponge (Fig 13). If an exudative response occurs, it may lead to the complications of fistula or abscess formation. The typical spongiform pattern with gas bubbles seems to be the most characteristic sign for a retained surgical sponge (23,24).

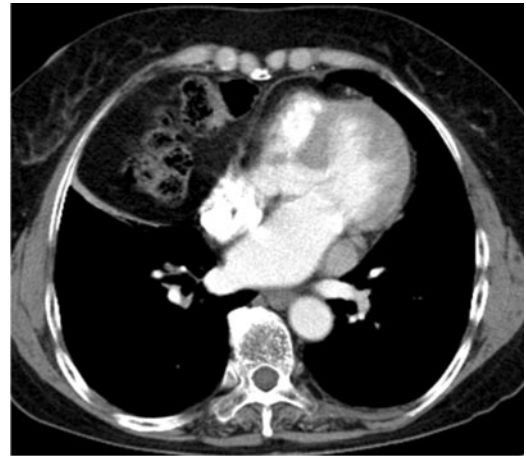
Ventral hernias are subdivided, on the basis of site or cause of herniation, into the following categories: epigastric, umbilical, subumbilical, spigelian, incisional, and parastomal hernias. In general, ventral hernias contain properitoneal fat, omentum, vascular structures, and occasionally bowel (25). A subcutaneous hernia sac may be confused with a lipoma of the abdominal wall. CT scans show the precise anatomic site and content of the hernia sac, as well as the characteristics of the hernia cuff and surrounding wall (Fig 14). CT is essential to confirm the clinical diagnosis and to identify any potential complications.



Figure 14. Ventral hernia in a 66-year-old woman with a palpable mass in the abdomen. Sagittal CT scan shows herniation of omental fat through a defect (arrow) in the anterior abdominal wall. Focal ill-defined lesions with increased attenuation (arrowheads) in the omental fat adjacent to the abdominal wall defect are suggestive of omental fat infarction secondary to vascular compromise.

Bochdalek hernias (posterolateral hernias) are the most common congenital diaphragmatic hernia and frequently occur on the left side (26). Herniated organs may include the omental fat, intestine, stomach, spleen, and left lobe of the liver. Because of pulmonary hypoplasia, these patients are usually symptomatic at birth. A few reported cases have identified patients who were asymptomatic until adulthood. Morgagni hernias (retrosternal hernias) are a rare type of diaphragmatic hernia and usually lie on the right side, slightly posterior to the xiphoid process (Fig 15). Morgagni hernias in children are usually asymptomatic and found incidentally (26). Traumatic diaphragmatic hernias usually result from blunt trauma (traffic accident or fall) as well as from penetrating injuries or iatrogenic causes (26). The left diaphragm is more commonly involved. Iatrogenic diaphragmatic hernias usually develop from thoracoabdominal surgery, such as esophagogastric surgery for esophageal cancer. Hernia orifices, retained organs, and concomitant complications are clearly visualized in most cases, especially at multidetector CT with sagittal and coronal reformation.

Figure 15. Morgagni hernia in a 70-year-old woman with an abnormality at chest radiography. Axial (a), coronal (b), and sagittal (c) CT scans show focal upward displacement of the transverse colon and omental fat (arrows in b and c) in the right anterior cardiophrenic area, an appearance suggestive of a Morgagni hernia.



a.



b.



c.

Abnormalities Involving the Lesser Omentum and Lesser Sac

CT abnormalities involving the lesser omentum and lesser sac include the following: (a) fluid collections of ascitic transudate, inflammatory exudate, bile, or blood; (b) solid or cystic mass lesions including inflammatory processes and primary or secondary neoplasms; and (c) internal hernias.

Fluid Collection in the Lesser Sac

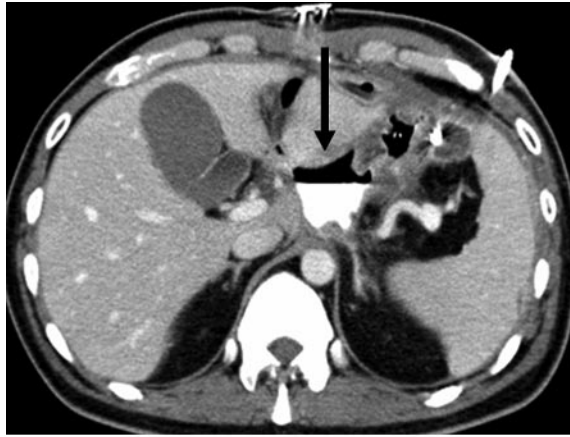
Under normal circumstances, the lesser sac is empty and collapsed. Only certain parts of its boundaries, such as the posterior gastric wall and pancreatic body, are observed at CT. Fluid collections in the lesser sac include ascites, exudate, bile, and blood (4,27).

The most common type of fluid in the lesser sac is ascitic transudate in patients with hepatic failure or renal failure. However, ascites in only the lesser sac is unusual. Large amounts of ascites in the peritoneal cavity flow to the lesser sac through the epiploic foramen rather than via the

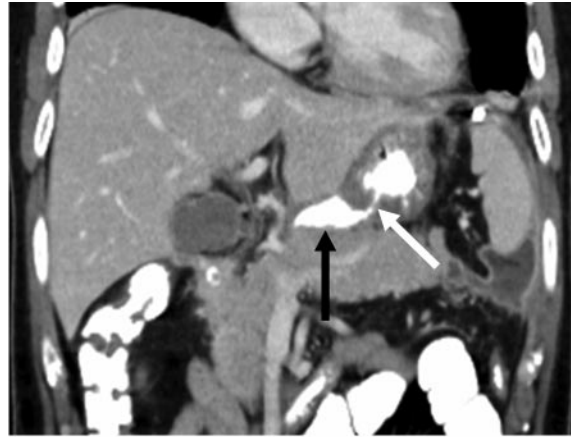
lesser omentum directly. A fluid collection within only the lesser sac should be considered postoperative fluid after gastric or hepatobiliary surgery or an inflammatory exudate from pancreatitis, cholecystitis, or gastric perforation (Fig 16) (8).

Inflammatory infiltrates in the lesser sac are commonly secondary to acute pancreatitis (Fig 17). Because the pancreas does not have a well-defined fibrous capsule, the inflammatory process may spread into the adjacent tissue through a thin layer of the surrounding connective tissue (28). The inflammatory fluid initially accumulates in the lesser sac. A perforated gastric ulcer, a left perinephric abscess, or rarely an ascending pelvic inflammation (eg, appendicitis or diverticulitis) may cause exudate in the lesser sac (7). Bile collection in the lesser sac is caused by bile duct surgery or a penetrating abdominal wound with transection of the common bile duct. Causes of a lesser sac hematoma include traumatic injury of the liver and spleen, hemorrhagic pancreatitis, or bleeding from neoplasms such as a hepatocellular carcinoma (Fig 18).

Teaching Point

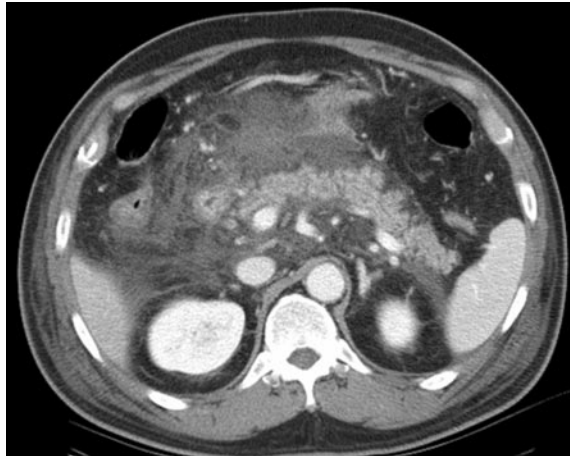


a.

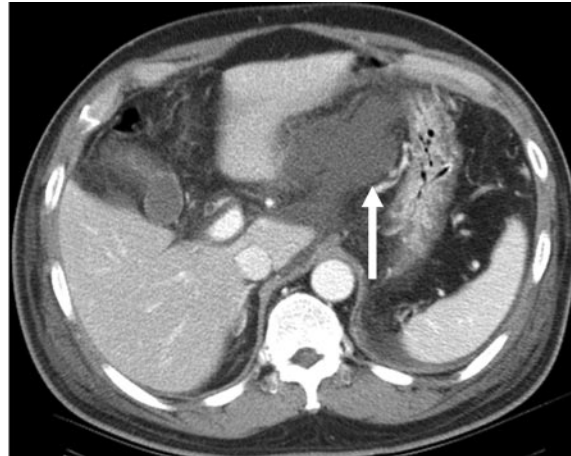


b.

Figure 16. Fluid collection in the lesser sac in a 36-year-old man 2 days after subtotal gastrectomy with gastrojejunostomy for stomach cancer. Axial (a) and coronal (b) CT scans show a collection of meglumine diatrizoate (Gastrografin; Bracco Diagnostics, Princeton, NJ) in the lesser sac (black arrow). This finding was suggestive of leakage (white arrow in b) from the anastomosis of the gastrojejunostomy; such leakage was visualized during an upper gastrointestinal study with meglumine diatrizoate 2 days later.



a.



b.

Figure 17. Inflammatory infiltrate in the lesser sac in a 68-year-old man with a history of heavy alcohol use who had epigastric pain for 2 days. CT scans show infiltration of peripancreatic fat (a) and spread of an inflammatory exudate to the lesser sac (arrow in b) and retroperitoneal space, findings suggestive of acute pancreatitis.

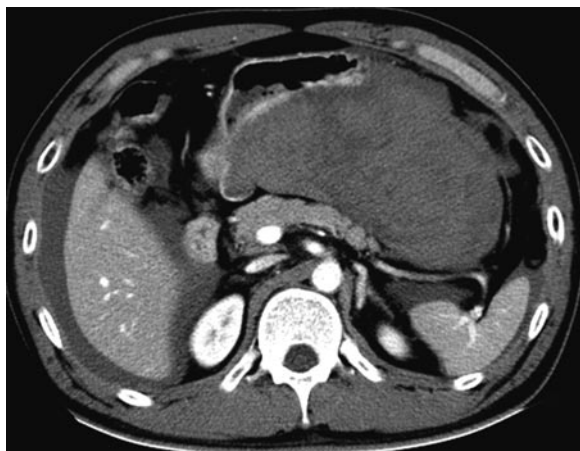
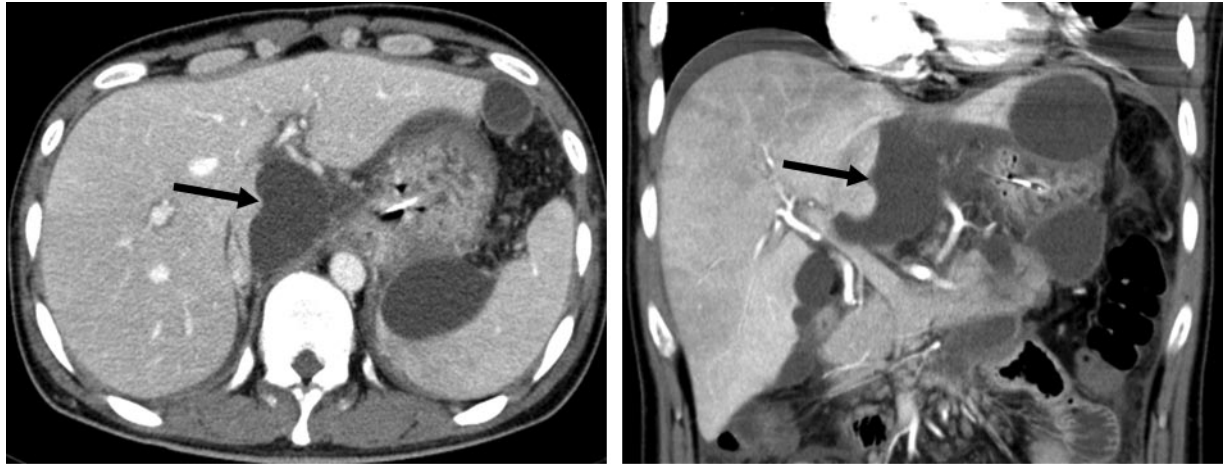


Figure 18. Lesser sac hematoma 1 day after abdominal blunt trauma in a 40-year-old man with acute abdominal pain. Contrast-enhanced CT scan shows a large acute hematoma in the lesser sac between the stomach and pancreas. Emergent laparotomy with hematoma evacuation and “bleeder” ligation was performed.



a. **b.**
Figure 19. Pancreatic pseudocysts in a 31-year-old man who had acute pancreatitis 3 weeks earlier. Axial (**a**) and coronal (**b**) CT scans show multiple cystic lesions in the lesser sac (arrow) and left subphrenic space, an appearance suggestive of pancreatic pseudocysts.



Figure 20. Lymph node metastasis in a 46-year-old woman with an increased tumor marker level. CT scan shows a small nodular lesion (arrow) in the lesser omentum. The radiologic impression was metastatic lymphadenopathy. Early gastric cancer was detected at endoscopy, and a perigastric lymph node metastasis was confirmed at surgery.

Discrete Mass in the Lesser Omentum or Lesser Sac

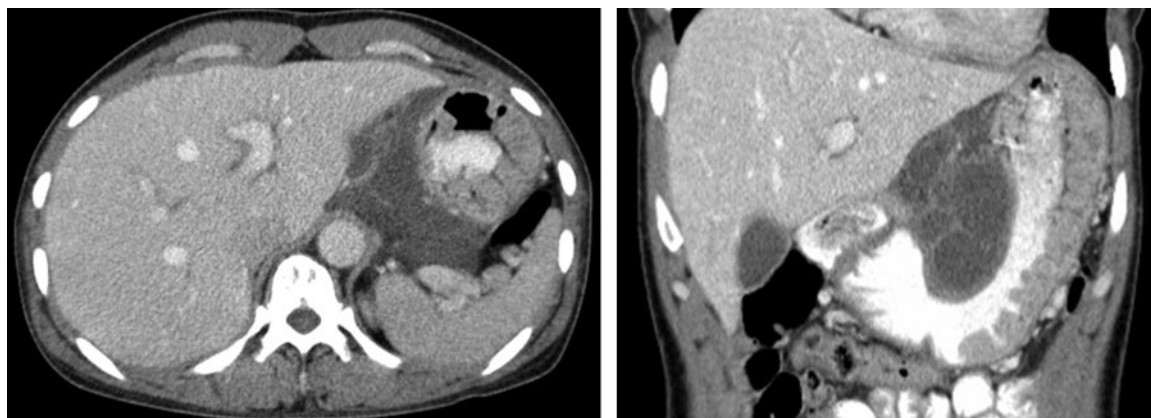
Space-occupying processes in the superior recess of the lesser sac include pancreatic pseudocysts or abscesses, enlarged lymph nodes along the lesser curvature of the stomach, and primary or secondary neoplasms (4,7). Pancreatic pseudocysts are characterized by a unilocular cystic mass with a smooth and thin wall, almost always occurring after pancreatitis (Fig 19). Pathologic lymph node



Figure 21. Gastrointestinal stromal tumor in a 43-year-old woman with abdominal discomfort for 2 months. CT scan shows a well-circumscribed heterogeneous mass between the left lobe of the liver, stomach, and pancreas. The differential diagnosis included an exophytic hepatic neoplasm, a gastric submucosal tumor, and a primary neoplasm of the lesser omentum. At surgery, the patient was found to have a malignant gastrointestinal stromal tumor that originated from the stomach.

enlargement in this region is commonly due to gastric or esophageal cancer or tuberculosis (Fig 20).

Secondary neoplasms are more common than primary neoplasms. Neoplasms invading the lesser omentum usually originate from adjacent structures such as the stomach, liver, or pancreas (Fig 21). Primary neoplasms of the lesser omentum are rare and include benign tumors (lymphangioma, neurogenic tumor, teratoma) and malignant neoplasms (liposarcoma, malignant gastro-



a. **b.**
Figure 22. Cystic lymphangioma in a 48-year-old woman with abdominal discomfort. Axial (**a**) and coronal (**b**) CT scans show a large multiloculated cystic mass in the lesser sac. The attenuation of the lesion was about 16 HU (range, -14 to 40 HU) on unenhanced scans. The diagnosis of cystic lymphangioma was confirmed at surgical excision.

intestinal stromal tumor) (29). Although almost all of these tumors have variable and nonspecific CT features, some manifest with characteristic appearances. For example, lymphangioma appears as a multiloculated low-attenuation mass with a smooth thin wall on CT scans (Fig 22) (18).

Internal Hernia into the Lesser Sac

Lesser sac hernias make up only about 1%–4% of all internal hernias. The herniated organs include the small intestine, cecum, proximal colon, transverse colon, omentum, and gallbladder. The entrance of herniation into the lesser sac is usually through the foramen of Winslow, and less commonly, via the transverse mesocolon or trans-omental (often iatrogenic).

Lesser sac hernias manifest at CT as a cluster of gas-distended or fluid-filled bowel loops located between the liver, stomach, and pancreas. The stomach is usually displaced anteriorly and laterally. Bowel caliber change and radiating vascular markings in the mesentery of protruded bowel loops across the gastroduodenal or gastrocolic ligament is helpful in diagnosing lesser sac hernias (30).

Conclusions

Conditions involving the greater and lesser omenta include infectious, inflammatory, neoplastic, vascular, and traumatic processes. Diagnosis of omental pathologic conditions is difficult because of their nonspecific and overlapping clinical and imaging features. Correlation with the CT

pattern of omental involvement, associated CT findings in the abdomen, and clinical information are essential for proper diagnosis and treatment. Some diseases, such as omental fat infarction, omental herniation, or hemorrhage, can be accurately diagnosed only on the basis of characteristic CT features. Multidetector CT with coronal and sagittal reformation improves the resolution of omental anatomy and the detection of omental pathologic conditions. Knowledge of the omental anatomy, the disease spectrum involving the greater and lesser omenta, and the characteristic CT appearances of each disease is essential for accurate diagnosis and proper treatment.

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Greater and Lesser Omenta: Normal Anatomy and Pathologic Processes

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Page 709

Furthermore, coronal and sagittal reformatted CT images help delineate the exact location, origin, or spread pattern of omental disease, as well as clarify the complex anatomy of the omenta.

Page 709

At CT, it appears as a band of fatty tissue with a variable width, just beneath the anterior abdominal wall and anterior to the stomach, transverse colon, and small bowel. Ascites between the greater omentum and the adjacent soft tissues makes the omentum appear as a simple fatty layer, and soft-tissue deposits in the omentum can create an amorphous hazy stranding or a nodular or masslike appearance at CT (3).

Page 710

The CT appearances of abnormalities involving the greater omentum are as follows: (a) multifocal, ill-defined infiltrative lesions, including peritoneal carcinomatosis, tuberculous peritonitis, malignant peritoneal mesothelioma, pseudomyxoma peritonei, lymphomatosis, and the conditions of cirrhosis and portal hypertension; (b) solid or cystic mass-forming lesions including primary and secondary neoplasms and infectious processes; and (c) miscellaneous conditions including omental infarction, foreign-body granuloma, hematoma, and hernia.

Page 710

When there is diffuse infiltration of the peritoneum, omentum, or mesentery at CT, a variety of condition—including infiltrative edema from liver cirrhosis, diffuse peritoneal tumors, and infectious peritonitis—should be considered. Distinguishing between diffuse peritoneal tumors, such as peritoneal carcinomatosis, malignant mesothelioma, or lymphomatosis, and tuberculous peritonitis is difficult because of nonspecific symptoms and overlapping imaging features..

Page 716

A fluid collection within only the lesser sac should be considered postoperative fluid after gastric or hepatobiliary surgery or an inflammatory exudate from pancreatitis, cholecystitis, or gastric perforation (Fig 16) (8).