Ectopic Lesions in the Abdomen: Imaging and Pathology

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Learning objectives

1. To discuss and illustrate the imaging features of various ectopic lesions in the abdomen

2. To correlate the imaging findings and pathology
Background

"Ectopic" means "in an abnormal position". There are various type of ectopic lesions in the abdomen. Imaging diagnosis of unusual "ectopic" lesions in the abdomen has always been a challenge for the radiologist.

I. Ectopic organ and its pathology

Ectopic liver (HCC), Ectopic pancreas, Intrapancreatic accessory spleen, Meckel's diverticulum with ectopic gastric mucosa

II. Spillage of pathology from original organ

Gallstone ileus, Dropped appendicolith, Splenosis

III. Others

Ectopic abdominal pregnancy, Malignant tumor arising from undescended testis
Findings and procedure details

I. Ectopic Organ and Its Pathology

**HCC in Ectopic Liver**

Ectopic liver (Fig.1) is defined as liver tissue distinctly outside the liver without any communication with the liver; the accessory lobe (Fig.2) is described as liver tissue connected to the liver often by a stalk. The incidence of developing an ectopic liver was 0.47%, and accessory lobe was 0.09%, by laparoscopic series. Ectopic HCC can be defined as an HCC arising from hepatic parenchyma located in an extrahepatic organ or tissue. A review of the literature disclosed 23 cases of HCC arising outside the liver, mostly from Japan. In all these reports except one case, the mother liver did not have HCC at the initial presentation of ectopic HCC. Because an ectopic liver does not have a complete vascular and ductal system as a normal liver, it is perhaps functionally handicapped and more prone to hepatocarcinogenesis.

**Ectopic Pancreas**

Ectopic or heterotopic pancreas is defined as pancreatic tissue that lacks anatomic and vascular continuity with the main body of the pancreas. Common CT findings were well-defined oval or round masses (Fig.3, Fig.4) with smooth or serrated margins in the gastric antral wall. On rare occasions, complications, including pancreatitis, pseudocyst, cyst formation (Fig.5), insulinoma, adenoma and malignant transformation have been reported.

**Intrapancreatic Accessory Spleen (IPAS)**

As the imaging techniques have recently advanced, IPAS will be more frequently detected as an incidental pancreatic nodule (Fig.6) on CT or MRI. Because accessory spleens usually pose no clinical problems, it is important to characterize accessory spleens as noninvasively as possible. An IPAS has similar characteristics to those of the spleen on the precontrast and contrast-enhanced images of all the imaging modalities.

Superparamagnetic iron oxide (SPIO)-enhanced MRI and Levovist-enhanced US, and the mechanisms of which are theoretically similar to that of Tc-99m scintigraphy, can be used as alternative tools to confirm the diagnosis of IPAS. An IPAS shows a significant
signal drop similar to the spleen on the SPIO-enhanced T2 or T2*-weighted imaging and prolonged enhancement on the delayed hepatosplenic phase of contrast-enhanced US.

Epidermoid cyst in an intrapancreatic accessory spleen (ECIPAS) is extremely rare. All ECIPAS cases were located in the pancreatic tail. Nevertheless, inclusion of this condition in the differential diagnosis of pancreatic tail cystic lesions is warranted. Enhancing the cystic wall of ECIPAS similar to the spleen (Fig.7) was a helpful feature and should be considered in the differential diagnosis of pancreatic tail cystic lesions.

**Meckel's Diverticulum with Ectopic Gastric Mucosa**

Meckel's diverticulum is the most common congenital anomaly of the gastrointestinal tract, occurring in 2%-3% of the population. It results from improper closure and absorption of the omphalomesenteric duct. It is a true diverticulum that is composed of all layers of the ileal wall. Normal small intestinal epithelium lines the diverticulum. Heterotopic gastric and pancreatic mucosa are frequently found histologically within the diverticula of symptomatic patients. Gastric heterotopia (Fig.8) is most common, reported in 23%-50% of cases. The gastric mucosa may be fundic, body, antral, or pyloric in type. Fundic and body mucosa contain oxyntic glands with parietal, chief, and mucous neck cells. The common complications are hemorrhage from peptic ulceration, small intestinal obstruction, and diverticulitis.

**II. Spillage of Pathology from Original Organ**

**Gallstone Ileus**

It is mechanical intestinal obstruction caused by impaction of one or more gallstones in intestine. Best diagnostic clue is "Rigler triad" (Fig.9, small bowel obstruction + gas in biliary tree + ectopic gallstone).

Acute cholecystitis, followed by pericholecystic inflammation can cause adherence of the biliary and enteric systems. Pressure by the gallstone against the biliary wall can eventually cause cholecysto-duodenal fistula. The mortality of gallstone ileus is high (15-20%), because of late diagnosis and surgical treatment and also because of the severe health problems that the elderly patients may have. Usually, gallstones greater than 2.5cm in diameter increase the incidence of impaction and obstruction. The most common site for stone impaction is the ileum, because it is notably the narrowest point in the small and large bowel.
**Dropped Appendicolith**

As with cholecystectomy in which a gallstone is inadvertently retained, appendicoliths can be left behind after appendectomy for acute appendicitis. These appendicoliths are retained because of extrusion from a perforated appendix before surgery or owing to failure to recognize and extract an appendicolith during surgery.

The typical imaging description of symptomatic dropped appendicolith (Fig.10) is an abscess containing one or more high-attenuation foci, most commonly in the pelvis or Morison's pouch. Dropped appendicoliths after laparoscopic appendectomy are rare, but awareness of the CT findings on the part of the radiologist can be helpful for prompt diagnosis and management of this potential source of intraperitoneal infection.

**Splenosis**

Splenosis refers to heterotopic autotransplantation and implantation of splenic tissue after either splenic trauma or surgery. The differential diagnosis includes endometriosis, peritoneal mesothelioma, and peritoneal metastatic implants.

The clinical history of previous splenic injury or prior splenectomy, intense contrast medium enhancement of the lesion similar to spleen on CT (Fig.11), and intense uptake of tracer by splenules permit differentiation from these other disorders.

**III. Other Ectopic Lesions**

**Omental Pregnancy**

Abdominal pregnancy occurs in 1.4% of all ectopic pregnancy cases, and omental pregnancy (Fig.12) is the least common form of abdominal pregnancies. The mortality rate for abdominal pregnancy is seven times higher than non-abdominal cases.

Although there has been no consensus for the diagnosis of primary omental pregnancy, there are Studdiford's criteria: (i) normal bilateral Fallopian tubes and ovaries with no recent or remote injury; (ii) absence of any uteroperitoneal fistula; (iii) presence of a pregnancy related exclusively to the peritoneal surface and early enough to eliminate the possibility of implantation following a primary nidation in the tube.
Recent contraceptive usage such as progesterone-only pills and intrauterine devices can be accepted as a risk factor. Mortality due to omental pregnancy is mostly related to hemorrhagic shock.

**Malignancy Arising From Undescended Testis**

There are five well-established positive associations with testicular carcinoma: prior testicular tumor, positive family history, cryptorchidism, infertility, and intersex syndromes.

Cryptorchidism (incomplete descent of the testicles from the retroperitoneum into the scrotum) has a strong association with testicular carcinoma. The prevalence of undescended testes is approximately 6% for term infants. Associated abnormalities are renal agenesis/ectopia (Fig.13), epispadias, Wolffian duct anomalies, and seminal vesicle cyst.
Fig. 1: A 43-year-old woman with a HCC in an ectopic liver. A Contrast-enhanced helical CT scan at portal venous phase shows a large, lobulating, contoured heterogeneous mass (arrow) in the upper spleen. B Gross specimen consists of a well-demarcated, solid firm mass (H) with hemorrhagic and necrotic foci, spleen (S), and partially resected diaphragm (arrow). The tumor invaded the diaphragm. C Cytokeratin 7 immunostaining shows positive stained bile ducts (arrow) within the tumor, which were consistent with hepatocellular carcinoma in an ectopic liver (Avidin-Biotin-Complex, x200). D CT scan obtained 15 months postoperatively shows the increased size of the mass in the liver dome with poor uptake of iodized oil (arrow), suggesting a viable tumor. Other small masses with dense iodized oil uptakes (short arrows) are shown.

Fig. 2: A 59-year-old man with HCC in accessory hepatic lobe. A CT scan shows hemoperitoneum and a high density lesion (arrow) mimicking hematoma in LUQ abdomen. B FU CT 4 months later shows a lobulating mass (arrow) with interval increased size. Note a thin linear stalk from the mass (short arrows). C Coronal reconstruction image shows a mass (arrow) just beneath left hemidiaphragm. D Gross specimen shows a well-demarcated, solid firm mass with hemorrhagic and necrotic foci. E Photomicrograph (H&E, x400) shows well-differentiated HCC.

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Fig. 3: A 46-year-old woman with ectopic pancreas. A, B CT scan shows a small oval submucosal lesions (arrow) with moderate enhancement in the wall of gastric body on the posterior wall. C Endoscopy shows a polypoid lesion (arrow) with normal gastric mucosa. D Photomicrograph (H & E, x400) shows ectopic pancreatic tissue island (asterisk) in the muscular layer of the stomach.

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Fig. 4: A 57-year-old man with ectopic pancreas. A, B CT scans show a few small cystic lesions (arrows) in the gastric antrum. C Endoscopy demonstrates small polypoid lesions (arrows) with normal gastric mucosa in the antrum of the stomach. D Cut surface of the subtotal gastrectomy specimen shows small cystic changes (arrows) in the muscular layer of the stomach.

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Fig. 5: A 29-year-old man with gastric duplication cyst in ectopic pancreas. A Upper GI series shows oval filling defect (arrows) with smooth border in the gastric antrum. B CT scans demonstrate about 3 cm oval cystic lesion with even enhancing wall (arrows) in the posterior wall of gastric antrum. C Endoscopy shows polypoid lesion (asterisk) with overlying normal gastric mucosa in the stomach. D Endoscopic ultrasound reveals anechoic mass (asterisk) in the submucosal layer of gastric antrum. E Cut surface of the gross specimen shows a cystic mass (asterisk) with thin wall and translucent fluid. F Photomicrograph (H & E, x100) shows ectopic pancreatic tissue island (asterisk) in the submucosal layer.

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Fig. 6: A 45-year-old man with IPAS. A On arterial phase CT scan, lesion (arrow) enhanced more strongly than did spleen (S). B Portal phase CT scan reveals slightly higher attenuation of lesion (arrow) compared to that of pancreas. C, D On precontrast T1- (C) and T2-weighted (D) MR images, IPAS (arrows) is hypointense and hyperintense to the pancreatic parenchyma and isointense to the adjacent spleen (S) on both images. E On an SPIO-enhanced, T2-weighted image obtained 10 min after SPIO administration, a signal drop to a similar degree as that in the lesion (arrows) and spleen (S), is noted. F Transverse Tc-99m SPECT image of upper abdomen shows hot uptake foci (arrow) near splenic hilum. S = spleen, L = liver G The resected specimen from the distal pancreatectomy, showed a brownish nodule (arrows) surrounded by pancreatic tissue. H Photomicrograph (H & E, x100) reveals dense lymphoid follicles and splenic pulps that are typical of an ectopic spleen in the IPAS.
Fig. 8: A 13-year-old boy with perforated Meckel's diverticulum with ectopic gastric mucosa. A Enhanced pelvis CT scan show normal appendix (arrows). We can exclude acute appendicitis. B, C CT scan shows a rim-enhancing tubular structure (arrows). There are surrounding inflammatory changes and thickening of subjacent small intestine. D CT scan shows abnormal air density (arrow) within inflamed adjacent mesenteric fat, which suggests perforation of diverticulum. E Photomicrograph (H & E, x16) shows the diverticulum composed of all layers of the intestinal wall. F Photomicrographs (H & E, x40) show gastric fundic mucosa surfaced by foveolar cells (arrow).
Fig. 9: A 80-year-old man with gallstone ileus. A Plain abdominal radiograph shows small bowel obstruction and an ectopic gallstone (arrow). B CT scan shows pneumobilia (short arrows) due to cholecysto-enteric fistula. C, D Coronal and axial CT scan show large gallstone (arrows) within dilated ileum. E Photograph shows a brownish gallstone, which is expelled from ileum.

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Fig. 10: A 20-year-old man with abscess after dropped appendicolith during laparoscopic appendectomy. A, B US show nonspecific mass with calcification (arrows) in subhepatic space. C, D CT scan show collection with wall enhancement (arrows) consistent with abscess and containing calcification representing "dropped" appendicolith (short arrow) in more posterior collection. E Resected specimen shows subhepatic abscess by retained appendicolith (arrow).

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Fig. 11: A 43-year-old man with splenosis on hepatic surface mistaken for HCC before surgery. A Arterial phase helical CT shows a well-circumscribed subcapsular mass (arrow) seemingly in the right hepatic lobe with homogeneous high density, compared with hepatic parenchyma. B Equilibrium phase helical CT shows isodense mass (arrow) with hepatic parenchyma. C Inferior phrenic arteriogram shows hypervascular stain (arrow). D, E Both CTHA and CTAP show a perfusion defect in right hepatic lobe (arrows). F Lipiodol CT shows partial iodized-oil retention in the mass (arrow). G Photograph of gross specimen shows a well-defined smooth bordered dark-red mass (S) with a thin capsule (arrows). The remaining hepatic parenchyma (L) shows macronodular liver cirrhosis. H Microscopic examination shows splenic tissue with white and red pulp (H & E, x200).
Fig. 12: A 28-year-old woman with omental pregnancy. A, B, C T1-axial (A), T2-axial (B) and coronal (C) MR images show a well-defined cystic lesion with peripheral wall (arrows) at lateral aspect of ascending colon, suggested to be the focus of ectopic pregnancy. The patient was approached laparoscopically and consequently underwent partial omentectomy. D Gross specimen shows a 4- × 2.5- × 1.5-cm omental tissue containing ectopic mass. E Photomicrograph (H & E, x40) shows chorionic villi located in the adipose tissue.
**Fig. 13:** A 29-year-old man with mixed germ cell tumor of undescended left testis and multicystic dysplasia of ectopic kidney. A, B Coronal and C, D axial CT scan show a mass with enhancing solid portion in left pelvic cavity (arrows) and another cystic mass (short arrows) with focal soft tissue density in LLQ area. Note compensatory enlarged right kidney. E Gross specimen of solid mass shows hemorrhagic tumor. F Photomicrograph (H&E, x16) shows mixed germ cell tumors and hemorrhage (arrows). G Photomicrograph (H&E, x40) of cystic lesion shows kidney tissue including glomerulus (arrows).

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**Fig. 7:** A A 37-year-old man with ECIPAS. A Unenhanced CT show the unilocular lesion in the pancreas tail with smooth cystic wall (arrow). B Portal and C delayed phase CT scan show the solid component (arrows) surrounding the cyst with the same density as the spleen. D, E Dynamic enhanced MRI show unilocular cystic lesion with enhancing wall (arrows) similar to the spleen. F Distal pancreatectomy specimen shows splenic parenchymal tissue (arrows) around the cyst.

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Conclusion

Imaging diagnosis of unusual "ectopic" lesions in the abdomen has always been a challenge for the radiologists. There are various type of ectopic lesions in the abdomen: Ectopic organ and its pathology, Spillage of pathology from original organ, and abdominal pregnancy. Familiarity with the radiologic features of these ectopic lesions in the abdomen can help ensure correct diagnosis and proper management.
References


