**Introduction**

The ampulla of Vater is located in the major duodenal papilla and represents the junction of the common bile duct (CBD) and main pancreatic duct of Wirsung (Fig 1). The term *ampulla* is defined as a dilated common channel that is formed where the two ducts combine. However, the use of this terminology is controversial because the presence of a common channel is inconstant, and actual dilatation of the common channel is unusual.

The joining of the CBD and main pancreatic duct may occur in three ways. Most commonly (60%), the CBD and main pancreatic duct join to form a common channel that is 1–8 mm in length. Less often (38%), a common channel is not present, and instead there is a single orifice in the papilla that contains a separate opening for each duct (double-barrel configuration). Rarely (2%), there are two separate orifices in the papilla that drain the CBD and main pancreatic duct separately (1).

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**Imaging Features of Benign and Malignant Ampullary and Periampullary Lesions**

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*Abbreviations: CBD = common bile duct, ERCP = endoscopic retrograde cholangiopancreatography, GIST = gastrointestinal stromal tumor, GRE = gradient echo, HASTE = half-Fourier acquisition single-shot turbo spin-echo, IPMN = intraductal papillary mucinous neoplasm, MRCP = MR cholangiopancreatography, PNET = pancreatic neuroendocrine tumor, CBD = common bile duct, GIST = gastrointestinal stromal tumor, MRI = magnetic resonance imaging, MRCP = magnetic resonance (MR) cholangiopancreatography, PNET = pancreatic neuroendocrine tumor.*

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**SA-CME LEARNING OBJECTIVES**

After completing this journal-based SA-CME activity, participants will be able to:

- Describe the anatomy of the ampulla and periampullary region.
- Discuss the primary imaging modalities used for evaluation of the ampulla and periampullary region.
- Describe the imaging features of various ampullary and periampullary lesions.

See www.rsna.org/education/search/RG.
The ampulla of Vater is surrounded by the sphincter of Oddi, a 1-cm structure composed of smooth muscle that regulates the flow of bile and pancreatic juices into the duodenum. The sphincter of Oddi surrounds a portion of the distal CBD, the distal main pancreatic duct, and the common channel (or, depending on the anatomy, the distal parallel channels). The smooth muscle is interspersed with glandular tissue that drains into the ampulla of Vater (1).

The major duodenal papilla is located along the second or third portion of the duodenum (2). At cross-sectional imaging, the major duodenal papilla normally is 1 cm or less in diameter. On contrast material–enhanced images, its enhancement is similar to that of the adjacent duodenal mucosa (2, 3).

Given the importance of these anatomic structures, it is essential for radiologists to understand the variety of lesions that can occur in the ampulla and periampullary region (Table).

### Ampullary and Periampullary Neoplasms

#### Ampullary Cancer

Ampullary cancer (adenocarcinoma) is a rare malignancy that arises from the distal biliary epithelium of the ampulla of Vater. Because of the central location of the lesion, patients often present with obstructive symptoms early in the disease process. Therefore, tumors may be discovered while they are still small and may be surgically resectable. Ampullary cancer is a rare malignancy, with an age-adjusted incidence of 0.70 per 100,000 men and 0.45 per 100,000 women (4).

Approximately 62% of lesions manifest at imaging as a discrete nodular mass that produces an irregular filling defect at the distal margin of the pancreaticobiliary junction (2). However, in some cases, a discrete tumor in the ampullary area may not be visible at imaging (5). At non–contrast-enhanced CT, the tumor typically appears as a hypoattenuating mass with an attenuation of approximately 40 HU. The tumor usually demonstrates enhancement on arterial and portal venous phase images (6). Its borders may be lobulated or infiltrating (Fig 2). At MR imaging, a visible ampullary tumor will enhance after gadolinium-based contrast agent administration (7). The addition of diffusion-weighted imaging sequences to conventional MR imaging has more recently been shown to improve detection of ampullary carcinoma (5). At MRCP, ampullary tumors typically manifest as a filling defect or focal stricture at the distal end of a dilated CBD (7). Dilatation of both the biliary and pancreatic ducts is seen in approximately 52% of cases (2). If the mass does not fully obstruct the biliary and pancreatic ducts after their junction, or when there are separate duodenal openings for the biliary and pancreatic ducts, the double-duct sign may be absent (2). In cases where duct dilatation is seen at imaging without a visible mass, the tumor may not be evident even at endoscopy, and diagnosis may require papillotomy and deep biopsy.

#### Ampullary Adenoma

Ampullary adenomas are uncommon premalignant lesions that may undergo malignant transformation into adenocarcinoma. They may occur spontaneously or in the context of familial...
# Symptoms, Imaging Findings, and Diagnosis of Ampullary and Periampullary Lesions

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<td><strong>Ampullary cancer</strong></td>
<td>Painless jaundice, pruritus, abdominal pain, weight loss, fever</td>
<td>Irregular nodular mass at the distal margin of the pancreaticobiliary junction; less commonly, the tumor is visible only at endoscopy</td>
<td>CT, MR imaging, endoscopy, histopathology</td>
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<td><strong>Ampullary adenoma</strong></td>
<td>Painless jaundice, pruritus, abdominal pain, weight loss, fever</td>
<td>Ampullary soft-tissue mass (&gt;1 cm), irregular ampullary margin, extrahepatic biliary dilatation, pancreatic duct dilatation</td>
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<td><strong>Distal CBD (extrahepatic) cholangiocarcinoma</strong></td>
<td>Painless jaundice, pruritus, abdominal pain, weight loss, fever</td>
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<td>CT, MR imaging, endoscopy, histopathology</td>
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<td><strong>Duodenal adenocarcinoma</strong></td>
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<td>CT, MR imaging, endoscopy, histopathology</td>
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<td>CT, MR imaging, endoscopy, histopathology</td>
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<td>Variable</td>
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<td>MRCP, ERCP</td>
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Note.—CT = computed tomography, ERCP = endoscopic retrograde cholangiopancreatography, GIST = gastrointestinal stromal tumor, IPMN = intraductal papillary mucinous neoplasm, MR = magnetic resonance, MRCP = MR cholangiopancreatography, PNET = pancreatic neuroendocrine tumor, US = ultrasonography.

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<td>CT, MR imaging</td>
</tr>
<tr>
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<td>Abdominal pain, but physical examination may not be impressive because of retroperitoneal location</td>
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<td>CT, fluoroscopy, exploratory laparotomy</td>
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polyposis syndrome (8). The prevalence of ampullary adenomas has been estimated as 0.04%–0.12% in autopsy series (9). Cross-sectional imaging findings of ampullary adenomas (Fig 3) have not been described extensively. In one study, common CT findings of an ampullary adenoma included an ampullary soft-tissue mass greater than 1 cm, an irregular margin of the ampulla, extrahepatic biliary duct dilatation, and pancreatic duct dilatation (10). At imaging, the tumors are more readily visualized when the duodenum is well distended.

Distal CBD (Extrahepatic) Cholangiocarcinoma
A cholangiocarcinoma is an adenocarcinoma that arises from the epithelial cells of the biliary duct. The reported age-adjusted incidence of extrahepatic cholangiocarcinoma is 1.2 per 100,000 men and 0.8 per 100,000 women (11). There are two gross subtypes of extrahepatic cholangiocarcinoma: infiltrating and polypoid. A common imaging feature of both subtypes is biliary duct dilatation, which terminates abruptly at the level of the mass (12). At cross-sectional

Figure 2. Ampullary adenocarcinoma in a 71-year-old man. (a) Coronal T2-weighted half-Fourier acquisition single-shot turbo spin-echo (HASTE) (Siemens Healthcare, Erlangen, Germany) MR image shows a mildly hyperintense lobulated mass (arrows) arising from the ampulla, with associated dilatation of the CBD. (b) Axial contrast-enhanced fat-saturated T1-weighted gradient-echo (GRE) MR image shows the infiltrative nature of the heterogeneously enhancing ampullary mass (arrows).

Figure 3. Ampullary adenoma in a 65-year-old man. (a) Coronal T2-weighted HASTE MR image shows a lobulated mass in the region of the ampulla (arrow), with mild dilatation of the CBD and pancreatic duct. (b) Image from endoscopic US shows a filling defect (arrow) caused by the echogenic lobulated mass, which arises from the region of the ampulla and fills the distal CBD.
imaging, an infiltrating cholangiocarcinoma is typically characterized by ductal wall thickening and sudden luminal obliteration (2). A polypoid lesion may manifest at imaging as an intraductal polypoid mass that typically does not cause complete obstruction (Fig 4) (2). A cholangiocarcinoma typically is hypointense relative to the liver parenchyma on T1-weighted MR images and hyperintense on T2-weighted MR images (13). It may also demonstrate homogeneous slow enhancement and typically is more conspicuous on fat-suppressed MR images (13).

**Duodenal Adenocarcinoma**

A periampullary duodenal adenocarcinoma is a rare tumor that typically abuts but spares or only partially involves the major duodenal papilla (7). At imaging, the tumor manifests as either a polypoid or intraluminal mass, with eccentric duodenal wall thickening (14,15). Between 1985 and 2005, 67,843 patients in the United States were diagnosed with small-bowel malignancies, with adenocarcinoma accounting for 37% of these cases (16). However, the true incidence of periampullary duodenal adenocarcinoma is not known. Duodenal adenocarcinoma more commonly involves a relatively short segment of the bowel and results in gradual luminal narrowing (17). If there is ampullary involvement, biliary dilatation may be seen at imaging. Larger lesions may cause luminal obstruction and gastric distention. At multiphasic CT studies, periampullary duodenal adenocarcinoma is typically hypovascular (Fig 5) (17). At MR imaging, the lesions manifest as polypoid fungating masses or areas of eccentric wall thickening (2).
Gastrointestinal Stromal Tumor
GISTs are tumors of mesenchymal origin. The age-adjusted yearly incidence of GIST is 0.68 per 100,000 persons (18). Periampullary stromal tumors account for approximately 3%–5% of all GISTs (19). The small intestine is the second most common site of involvement, after the stomach (18). The masses may be intramural or intraluminal (20). The imaging appearance of GISTs can vary from small homogeneous masses to large necrotic masses (21). Tumors may be endophytic or exophytic to the bowel (21). Smaller tumors typically manifest at imaging as sharply demarcated, smooth-walled, homogeneous soft-tissue masses with at least moderate contrast enhancement (Fig 6). They typically show low signal intensity on T1-weighted MR images and intermediate to high signal intensity on T2-weighted MR images (20). Larger tumors tend to undergo central necrosis and cavitation and demonstrate heterogeneous enhancement at imaging.

Periampullary Lipoma
A periampullary duodenal lipoma is a benign lesion that is frequently asymptomatic and typically occurs in men aged 70–80 years (14). Small-bowel lipomas are relatively rare, with few cases described in the literature (22). The prevalence of
Figure 7. Periampullary duodenal lipoma in a 70-year-old man. (a) Spot image from a biphasic upper gastrointestinal study shows a smoothly marginated filling defect that extends from the second to third portion of the duodenum. This finding was slightly mobile at fluoroscopy. (b) Axial nonenhanced CT image shows an intraluminal mass with attenuation of fat in the second portion of the duodenum (arrow), a finding consistent with a lipoma.

Figure 8. Pancreatic adenocarcinoma in a 68-year-old man who presented with painless jaundice. (a) Coronal contrast-enhanced reformatted CT image obtained in the portal venous phase demonstrates a hypoattenuating mass in the pancreatic head that involves the ampullary region (arrows). There is abrupt termination of the dilated CBD because of the mass. (b) Axial contrast-enhanced CT image obtained in the pancreatic phase demonstrates tumor extension through the ampulla and papilla into the duodenal lumen (arrow).

periampullary lipomas is unknown. At imaging, they appear as smooth well-marginated masses. At CT, they demonstrate fat attenuation (<−20 HU) (Fig 7) (22). At MR imaging, they show fat signal intensity with all sequences.

Pancreatic Adenocarcinoma
Pancreatic adenocarcinoma may occur near the ampulla of Vater and manifests as an ampullary or more likely periampullary mass. Depending on the location of the tumor and its relationship to the pancreaticobiliary tree, patients may present with obstructive symptoms. Approximately 43,920 patients are diagnosed with pancreatic cancer in the United States each year (23). Most of these cancers (85%) are ductal adenocarcinomas. At contrast-enhanced CT and MR imaging, a pancreatic adenocarcinoma typically manifests as a heterogeneously enhancing lesion that is hypovascular relative to the normal pancreatic parenchyma (Fig 8) (17). A pancreatic adenocarcinoma is hypointense relative to the normal pancreas on fat-suppressed T1-weighted MR images, shows decreased enhancement relative to the pancreas on arterial phase MR images, and progressively enhances on more
delayed phase MR images (24). On T2-weighted MR images, the tumor usually is minimally hypointense relative to the pancreas and therefore difficult to visualize (25).

**Pancreatic Neuroendocrine Tumor**

PNETs constitute a rare subtype of tumors that arise from the endocrine cells in or near the pancreas (26). A conservative estimate of the incidence of PNETs in the United States is approximately 25–30 per 100,000 individuals (27). The most common location for these tumors is the gastrinoma triangle, which is defined by the junction of the cystic and common hepatic ducts, the junction of the second and third portions of the duodenum, and the border of the body and tail of the pancreas (26). PNETs are unlikely to cause ampullary or ductal obstruction. They are hypointense on nonenhanced CT images (28). At MR imaging, they typically are hypointense on fat-suppressed T1-weighted images and hyperintense on T2-weighted images (12,29). At contrast-enhanced CT or MR imaging, PNETs demonstrate homogeneous hyperenhancement relative to the normal pancreatic parenchyma during the arterial and capillary phases (Fig 9) (12,30).

In a recent series of 78 cases of PNET, it was reported that 18% of PNETs are partially or completely cystic. More typically, cystic PNETs demonstrate peripheral contrast enhancement; however, some can appear entirely cystic at imaging. Although cystic PNETs have traditionally been believed to represent larger tumors with cystic degeneration, a more recent series showed that the incidence of small and larger cystic PNETs is similar (31).

**Intraductal Papillary Mucinous Neoplasm (Main Duct Type)**

IPMNs are a group of neoplasms in the biliary duct or pancreatic duct that cause cystic dilatation from excessive mucin production and accumulation. The true incidence of IPMNs is unknown because many are small and asymptomatic. However, in a series of 2832 consecutive CT scans of adults with no history of pancreatic lesions, 73 cases of pancreatic cysts (2.6%) were identified (32). Many of these cases likely were IPMNs, given that IPMNs account for 20%–50% of cystic pancreatic neoplasms. There are three main types of pancreatic IPMNs: main duct, branch duct, and combined. A main duct IPMN commonly causes dilatation of the papilla, with bulging of the papilla into the duodenal lumen (33). Filling defects caused by mural nodules or mucin may be seen at MRCP or ERCP. At CT and MR imaging, filling defects caused by mural nodules enhance, while filling defects caused by mucin do not enhance (33).

**Other Cystic Pancreatic Neoplasms**

In addition to IPMNs, the most common cystic pancreatic lesions are pancreatic pseudocysts, serous cystic neoplasms, solid pseudopapillary neoplasms, and mucinous cystic neoplasms. A combination of factors that include patient age, clinical history, and imaging and laboratory findings is often required for diagnosis. With the exception of serous cystic neoplasms, cystic pancreatic lesions that occur in the periampullary region could cause ductal obstruction.
Non-neoplastic Lesions

Intrinsic Bile Duct Processes

Papillary Stenosis.—Papillary stenosis is the blockage of bile or pancreatic fluid flow at the sphincter of Oddi in the absence of a mass or inflammatory lesion at the ampulla. It may manifest with pancreatitis, jaundice, or pain. The most common cause of papillary stenosis is sphincter of Oddi dysfunction, which can be either structural or functional. In the general population, the prevalence of sphincter of Oddi dysfunction is 1.5% (34). At imaging, benign and malignant causes of papillary stenosis are difficult to differentiate. In a recent CT study, a papillary size of less than 12.3 mm was found to be the only independently reliable variable for differentiating benign from malignant causes of papillary stenosis (6). At MR imaging and MRCP, papillary stenosis appears as dilatation of the bile duct or pancreatic duct, with no definite mass lesion seen (7). ERCP, endoscopic US, or serial follow-up studies may be helpful to determine the cause of papillary stenosis in these patients (Fig 10) (35).

Choledocholithiasis.—Gallstone disease is very common and affects 15% of the population. Of these cases, 10%–15% develop choledocholithiasis (36). CT is not as sensitive as MRCP or ERCP for detection of biliary stones, with a sensitivity of 72%–78% reported in the literature (37). If a ductal stone is visible at CT, it classically appears as a hyperattenuating lesion surrounded by hypoattenuating bile and ampullary soft tissue (17,38). With the exception of stones less than 3 mm in size, MRCP is highly sensitive for choledocholithiasis, with an overall pooled sensitivity of 95% reported in one meta-analysis of patients with suspected biliary disease (Fig 11)
Pancreas divisum and santorinicele.

Pancreatic Divisum.—Pancreatic divisum is a congenital anomaly of the pancreas due to failure of fusion of the dorsal and ventral pancreatic ducts (15). Pancreatic divisum may be visualized at both CT and MR imaging, where the noncommunicating dorsal duct is seen to drain into the minor papilla independent of the CBD (Fig 12) (40,41). Another well-described imaging finding is the dominant dorsal duct sign, in which a larger dorsal duct is seen relative to a smaller ventral duct (40). Pancreas divisum may be associated with stenosis of the main duct at the minor papilla (40). A relative obstruction to pancreatic exocrine secretory flow through the minor duct and minor papilla may result in pancreatitis in a small number of patients with pancreas divisum (42). In a series of 1825 successful consecutive ERCP procedures, the incidence of pancreas divisum was 7.5% (43).

Santorinicele.—A santorinicele is a cystic dilatation of the accessory pancreatic duct, usually in the setting of pancreatic divisum; however, two case reports have described findings of a santorinicele without pancreatic divisum (44,45). A santorinicele is a rare entity that has primarily been reported in case reports and case series, and the true incidence is unknown. It is most easily diagnosed at MRCP, where it appears as a cystic dilatation with sparing of the minor papilla (Fig 12) (15). Diagnosis at MRCP is aided with administration of intravenous secretin, which improves visualization of the pancreatic ducts (15). Secretin is a hormone secreted by the duodenum in response to increased acid. It causes transient constriction of the sphincter of Oddi and increased production of pancreatic secretions. The effects of intravenous secretin stimulation are greatest 4–10 minutes after injection (46).

In cases of suspected ampullary stenosis, secretin administration will cause persistent...
dilatation of the pancreatic duct (46). Increased pancreatic secretions caused by secretin administration will also distend the adjacent duodenum with fluid. On T2-weighted MR images, pancreatic secretions provide a natural contrast with the adjacent ampulla and can improve visualization of ampullary masses (46,47).

**Choledochocoele.—**A choledochocoele (type III choledochal cyst) is a cystic dilatation of the intramural portion of the CBD that results in enlargement of the papilla (7,15). Choledochocoeal cysts are rare in Western countries, with an overall incidence of one per 100,000–150,000 (48). Type III choledochal cysts are the rarest type, accounting for 1%–4% of all cases (48). Their pathogenesis is controversial (7,15). At MRCP, a choledochocoele will appear as a cystic mass that is contiguous with the distal bile duct (Fig 13) (49). Diagnosis is important because a choledochocoele may cause recurrent bouts of pancreatitis (50).

**Periampullary Processes Related to the Pancreas and Duodenum**

**Groove Pancreatitis.—**Groove pancreatitis, a distinct form of chronic pancreatitis, is characterized by inflammation and fibrous tissue formation that affect the pancreaticoduodenal groove between the head of the pancreas, the duodenum, and the CBD. The true prevalence of groove pancreatitis is unknown because only case reports and case series have been published (51). At CT or MR imaging, a sheetlike low-signal-intensity mass with delayed enhancement is seen in the pancreaticoduodenal groove area near the minor papilla (52). Thickening of the duodenal wall and cystic changes along the duodenal wall can also be seen at imaging (Fig 14) (52). A long, smooth, segmental stenosis in the distal or intrapancreatic CBD or a medial shift of the duct may be seen at MRCP. A widening of the space between the distal pancreatic duct and CBD and the duodenal lumen is another characteristic imaging sign (53).
Autoimmune Pancreatitis and IgG4-related Sclerosing Cholangitis.—Autoimmune pancreatitis is a benign, IgG4-related, fibroinflammatory form of chronic pancreatitis. Autoimmune pancreatitis is a relatively recently described entity that was first recognized in 1995. Although the true prevalence of this disease is unknown, a recent study that involved 23 institutions in 10 countries registered 1064 patients who met the diagnostic criteria for autoimmune pancreatitis (54). Laboratory studies typically demonstrate elevated serum IgG4 levels, and imaging studies show a focally or diffusely enlarged sausage-shaped pancreas with a capsule-like rim and an irregularly narrowed pancreatic duct (55). The bile ducts, salivary glands, kidneys, and lymph nodes can be involved either synchronously or metachronously (56). At imaging, IgG4 cholangiopathy manifests as sclerosing cholangitis or pseudotumorous lesions (Fig 15) (57). Patients typically respond to steroid therapy.

Pancreaticoduodenal Artery Pseudoaneurysm.—A pancreaticoduodenal artery pseudoaneurysm is a complication associated with acute or chronic pancreatitis and results...
from leakage of pancreatic enzymes and erosion of the arterial wall (15). The prevalence of pancreaticoduodenal artery pseudoaneurysms is unknown because only a few case reports have been published (58). At imaging, a round mass that follows the enhancement pattern of blood pool is identified in the pancreaticoduodenal groove. Thin-walled calcifications may be seen at CT, as well as an internal mural thrombus (Fig 16) (15). Although the enhancement pattern follows that of blood pool, the exact imaging features may depend on the degree of patency of the lumen of the pseudoaneurysm. A pseudoaneurysm may rupture into the peritoneum, retroperitoneum, or intestinal lumen (15).

**Brunner’s Gland Hyperplasia and Hamartoma.**—Brunner’s glands are submucosal glands located in the proximal two-thirds of the duodenum that produce alkaline secretions to buffer gastric acid (59). Brunner’s gland hyperplasia and hamartomas are uncommon benign tumors of the duodenum, with fewer than 200 cases reported (60). There have been reports of Brunner’s gland hyperplasia that manifests as acute pancreatitis (60). At imaging, Brunner’s gland hyperplasia manifests with solitary or multiple small (<5-mm) nodular filling defects in the proximal duodenum (Fig 17) (61).

The pathogenesis of Brunner’s gland hamartoma is unknown. It most commonly occurs along the posterior wall of the first and second portions of the duodenum (61). It is a benign mass that manifests at imaging as a solitary filling defect (59). Patients commonly are asymptomatic but may present with symptoms of duodenal obstruction, intussusception, or CBD or pancreatic duct obstruction (61). On nonenhanced CT images, an isoattenuating mass relative to the adjacent duodenal wall is seen (Fig 18). Peripheral rimlike enhancement or small internal cystic portions may be seen on contrast-enhanced CT images (62).

**Duodenitis.**—Duodenitis is inflammation of the duodenum in the absence of ulcer formation (14,59). Duodenitis is associated with *Helicobacter pylori* infection, use of nonsteroidal anti-inflammatory drugs, use of ethanol, and gastric acid secretion. Furthermore, inflammation of the duodenal papilla may occur in patients with acquired...
immunodeficiency syndrome or those undergoing radiation therapy (14). The true incidence of duodenitis is unknown, given the difficulty of making a diagnosis without the use of endoscopy or imaging. Duodenitis manifests on cross-sectional images as thickening of the duodenal wall (Fig 19) (14,59). MR imaging shows duodenal wall thickening, with wide variability in the degree of enhancement on fat-saturated images (63).

**Duodenal Crohn Disease.**—Crohn disease may affect the duodenum, typically the first and second portions, and is associated with contiguous involvement of the stomach (59). The incidence of Crohn disease is 201 per 100,000, with the duodenum affected in 1%–2% of patients (64). Duodenal Crohn disease has imaging characteristics similar to those of Crohn disease located elsewhere in the small bowel, including thickened folds, ulcers, strictures, and fistula formation (Fig 20) (14,59,65). Rarely, duodenal Crohn disease may cause ampullary stenosis and biliary obstruction, with a prominent papilla seen at MRCP (66).

**Duodenal Diverticula.**—Duodenal diverticula commonly occur in the periampullary region because they are frequently found on the medial aspect of the descending portion of the duodenum (59). The incidence of juxtapapillary duodenal diverticula ranges from 0.16% to 23%, depending on the method of identification (radiography vs endoscopy) (67). At CT, the diverticula may be fluid filled, mimicking a pancreatic pseudocyst, or may contain foci of air, mimicking a pancreatic abscess (59). They may
Figure 21. Duodenal hematoma in a 37-year-old woman who was involved in an automobile collision. (a) Axial nonenhanced CT image shows a hyperattenuating hematoma (arrowhead) compressing the second portion of the duodenum (arrow). (b) Coronal T2-weighted HASTE MR image obtained 1 day after (a) because of elevated bilirubin levels shows mild dilatation of the CBD and intrahepatic duct due to extrinsic compression by the duodenal hematoma (arrows).

Duodenal injuries result from compression trauma against the spinal column caused by deceleration injuries and seatbelt, handlebar, and sports injuries (69). They typically are subserosal and may be associated with duodenal narrowing. At CT, the most reliable sign of a duodenal hematoma is mixed attenuation, including areas of high attenuation from hemorrhage (69) (Fig 21). A duodenal hematoma must be differentiated from duodenal transection because transection is a surgical emergency and a hematoma is not.

Conclusion

The ampulla and periampullary region are difficult to assess radiologically, and the imaging characteristics of benign and malignant conditions in these areas overlap. Moreover, although some entities can be well evaluated with the high spatial resolution provided by CT, others are better assessed with the superior contrast resolution of MR imaging or MRCP. Knowledge of this region and its associated pathologic conditions is important to differentiate diseases that should be managed medically from those that require intervention.

References


Imaging Features of Benign and Malignant Ampullary and Periampullary Lesions

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The term *ampulla* is defined as a dilated common channel that is formed where the two ducts combine. However, the use of this terminology is controversial because the presence of a common channel is inconsistent, and actual dilatation of the common channel is unusual.

Page 625
The ampulla of Vater is surrounded by the sphincter of Oddi, a 1-cm structure composed of smooth muscle that regulates the flow of bile and pancreatic juices into the duodenum. The sphincter of Oddi surrounds a portion of the distal CBD, the distal main pancreatic duct, and the common channel (or, depending on the anatomy, the distal parallel channels).

Page 625
Ampullary cancer (adenocarcinoma) is a rare malignancy that arises from the distal biliary epithelium of the ampulla of Vater. Because of the central location of the lesion, patients often present with obstructive symptoms early in the disease process. Therefore, tumors may be discovered while they are still small and may be surgically resectable.

Page 633
Papillary stenosis is the blockage of bile or pancreatic fluid flow at the sphincter of Oddi in the absence of a mass or inflammatory lesion at the ampulla. It may manifest with pancreatitis, jaundice, or pain. The most common cause of papillary stenosis is sphincter of Oddi dysfunction, which can be either structural or functional.

Pages 634–635
In cases of suspected ampullary stenosis, secretin administration will cause persistent dilatation of the pancreatic duct. Increased pancreatic secretions caused by secretin administration will also distend the adjacent duodenum with fluid.