Section IV – Gastrointestinal Radiology

67. Based on the images from a CT colonography (Figures 1 and 2), what is the MOST LIKELY diagnosis?
   A. Adherent stool
   B. Lipoma
   C. Adenomatous polyp
   D. Impacted diverticulum

Findings:
Virtual image reveals a filling defect. Corresponding 2D image demonstrates a fluid and contrast-filled diverticulum compressing the colonic serosa.

Rationale:
A: Adherent stool would be contained within the lumen of the colon whereas this finding projects beyond the confines of the lumen into a diverticulum.
B: The internal attenuation of a lipoma would be that of fat rather than contrast (tagging agent) as in this case.
C: An adenomatous polyp would be homogeneous soft tissue attenuation.
D: Fecal material tagged with barium that becomes impacted within a diverticulum can simulate a polyp on 3D endoluminal views.
68. A double-contrast upper GI examination (Figure 3) was performed on a 52-year-old woman with abdominal pain. What is the MOST LIKELY diagnosis?

A. Gastric lymphoma  
B. Benign peptic ulcer  
C. Heterotopic pancreatic tissue  
D. Gastric adenocarcinoma

**Findings:**
A sharply defined mass with a central ulceration is present in the gastric antrum. Note, there is no adjacent fold thickening to suggest acute inflammation.

**Rationale:**
A: The radiographic findings are those of a submucosal mass - smooth, sharply defined, with a central ulceration - which is one of the manifestations of gastric lymphoma.
B: The transition between the "filling defect" and the more normal stomach is quite abrupt, more in keeping with a mass than the zone of edema surrounding an ulcer.
C: Although the antrum is a common location for a pancreatic rest, the lesion is much smaller with only a small central umbilication.
D: The lesion in this case is more characteristic of a submucosal mass than a mucosal lesion such as adenocarcinoma, which would be expected to be more lobular and irregular.
69. A small bowel series (Figure 4) was performed on a 63-year-old woman with abdominal pain. What is the MOST LIKELY diagnosis?

A. Scleroderma
B. Graft versus host disease
C. Lymphoma
D. Hemorrhage

**Findings:**
There is regular, symmetric fold thickening ("picket fence" appearance) and separation of loops involving a long segment of small bowel.

**Rationale:**
A: Scleroderma is not the correct answer, since this disorder manifests in the small bowel as dilation and more closely spaced small bowel folds due to selective fibrosis of the outer longitudinal layer, resulting in an accordion appearance.
B: Graft versus host disease can affect the small bowel, but usually appears as long segments of smoothly narrowed, featureless bowel ("ribbon bowel").
C: Although lymphoma can cause mural thickening leading to separation of loops and fold thickening, the folds are usually nodular, not regular and symmetric as seen in this case.
D: Small bowel mural hemorrhage manifests as regular fold thickening ("picket fence"). Ischemia, edema, and radiation enteritis can also give this appearance.
70. A coronal CT enterography image (Figure 5) was obtained from a 45-year-old man who presented with diarrhea. What is the MOST LIKELY diagnosis?

A. Lymphoma  
B. Hemangiomatosis  
C. Hepatocellular carcinoma  
D. Carcinoid tumor

**Findings:**
A small, intensely hypervascular mass is seen in the terminal ileum. There are also three homogeneously hypervascular hepatic masses.

**Rationale:**
A: Although lymphoma can cause both small bowel and hepatic masses, they are hypovascular, as opposed to the hypervascular masses seen in this case.
B: Hepatic hemangiomas of this size would more likely display a peripherally discontinuous, nodular enhancement pattern rather than the homogeneous hyperdense enhancement seen in this case.
C: Although multifocal hepatocellular carcinoma could present with multiple hypervascular hepatic masses, an ileal metastasis would be unusual.
D: This is the correct answer, as carcinoid tumor would characteristically present as a small hyperenhancing ileal mass and hypervascular hepatic metastases.
71. What is the MOST LIKELY diagnosis in this 44-year-old woman with no prior history of pancreatitis (Figures 6 and 7)?

A. Pseudocyst  
B. Neuroendocrine tumor  
**C. Mucinous cystic neoplasm**  
D. Adenocarcinoma

Rationale:
A: This would be likely if there was a history of pancreatitis.
B: Neuroendocrine tumors can occasionally be cystic but not most likely.
C: Best choice for unilocular cystic mass in pancreatic body/tail.
D: Although pancreatic adenocarcinoma can be necrotic, they do not present as a unilocular cystic mass.
72. A 54-year-old woman undergoes dynamic contrast-enhanced MRI (Figure 8). What is the MOST LIKELY diagnosis?

A. Focal nodular hyperplasia  
B. Cavernous hemangioma  
C. Bile duct cyst  
D. Hepatocellular carcinoma

Rationale:  
A: Focal nodular hyperplasia (FNH) has a fairly characteristic perfusional pattern not demonstrated here. By dynamic contrast enhanced multiphase hepatic MR, FNH has brisk and intense uniform enhancement during the arterial phase. During the arterial phase, FNHs are noted to have a lobulated or bosselated margin. In some cases, a central scar and a central feeding artery are shown during the arterial phase. FNHs have rapid washout to near isointensity by the portal and delayed phases of imaging. Delayed centripetal contrast wash in as shown in this case is not a feature of FNH.

B: Image illustrates some diagnostic features of cavernous hemangioma. Noncontiguous rounded to fluffy foci of peripheral enhancement are characteristic. Cavernous hemangiomas typically have delayed centripetal wash in. Uniform peripheral-to-central enhancement occurs relatively slowly in many cases. During late phase imaging, cavernous hemangiomas have the same intensity as the blood pool.

C: Bile duct cysts are common incidental findings in the liver. Bile duct cysts are derived from hamartomas that contain functioning cholangiocytes that are disconnected from the intrahepatic bile ducts. With time, the bile that is produced can pool to form a macroscopic cyst. Other than a small hepatic artery branch and a small portal venule that are sometimes identifiable as two discrete punctate foci of peripheral enhancement, bile duct cysts are uniformly avascular. Following contrast administration, there is no internal or rim enhancement of these cystic lesions during any phase of the dynamic MR scan.

D: Relatively large rounded fluffy discontinuous foci of peripheral enhancement as demonstrated in the image are characteristic of cavernous hemangiomas. This enhancement pattern is sufficiently specific to exclude hepatocellular carcinoma (HCC) in most cases. The enhancement pattern of HCC is variable and somewhat a function of size. At 3 cm, most HCCs have internal heterogeneous mosaic or variegated enhancement. Irregular areas of enhancement and hypointensity are admixed. Areas of internal enhancement can be web-like or patchy. Unlike cavernous hemangiomas that wash in with time, most larger HCCs washout with time and become hypointense to background hepatic parenchyma during delayed phase imaging.
73. You are shown a thick-slab MRCP image (Figure 9) of the biliary tree 1 year after orthotopic liver transplantation for primary sclerosing cholangitis (PSC). The operation included a biliary-enteric anastomosis. What is the MOST LIKELY diagnosis?

A. Choledocholithiasis  
B. Postoperative anastomotic stricture  
C. Posttransplant lymphoproliferative disorder  
D. Recurrent primary sclerosing cholangitis

**Rationale:**
A: Intraductal obstructing stone disease can cause dilatation of the common hepatic duct and intrahepatic ducts. In most cases of mechanical obstruction, the biliary tree is dilated, but smoothly tapering. The irregular ductal morphology, dominant hilar stricture and absence of an intraductal filling defect would make obstructing stone disease unlikely in this case.
B: There are multiple strictures, not just one.
C: Post-transplant lymphoproliferative disease (PTLD) is not common in liver recipients. This is likely related to dose minimization of immunosuppressants. When PTLD does occur after liver transplantation, the graft itself can be involved. Usually, PTLD manifests as multiple discrete intrahepatic masses, which would be unlikely to cause the diffuse distortion of the biliary tree depicted in the image. Occasionally, however, PTLD can be hilar and infiltrate along the scaffolding of the intrahepatic bile ducts, in which case, cholangiography could show changes similar to PSC. However, recurrent PSC as opposed to PTLD, remains the most likely probability.
D: Recurrent PSC in an hepatic allograft after recipient transplantation for PSC is not uncommon. It is estimated to occur in about 20% of patients transplanted for PSC. Recurrent PSC in a graft is a consideration for retransplantation in some patients.
A 63-year-old man presents with dull right upper quadrant pain (Figures 10 and 11). What is the MOST LIKELY diagnosis?

A. Abscesses  
B. Metastases  
C. Cavernous hemangioma  
D. Hepatocellular carcinoma

Rationale:

A: In the setting of infectious symptoms and signs, the presence of multiple hepatic masses suggests abscess. Hepatic abscess can be solitary or multiple. As in this case, hepatic abscess tends to have a multiloculated appearance that becomes more unifocal in appearance with increased coalescence and suppuration. At the time of presentation, most abscesses are predominantly hypodense and hypovascular in both the arterial and portal venous phases of contrast enhancement. Perilesional and intralesional inflammatory enhancement can occur, but is often not pronounced, and can often be absent. Image-guided aspiration of a suspected abscess for Gram stain and culture can establish the diagnosis and direct medical management with appropriate antibiotic selection.

B: Metastases are often multiple and hypovascular during both arterial and portal venous phases of contrast enhancement. They can have a variety of appearances to include unifocal to multiseptate. As in this case, the distinction between multiple hepatic abscesses and metastases requires consideration of clinical symptoms and signs, and ultimately aspiration of an index lesion. It should be remembered that metastases and other hepatic malignancies can become superinfected. When aspiration of pus from a liver lesion suggests abscess, superinfected malignancy is not excluded. Aspirated material should be sent for cytology as well as microbiology. If initial aspirated material does not reveal neoplasm, malignancy is still not excluded. All patients with hepatic abscess need follow-up CT to complete resolution. If lesions do not resolve, they should be rebiopsied for possible malignancy.

C: In up to 10% of cases, cavernous hemangiomas can be multiple. However, none of the lesions have features of cavernous hemangioma. In addition, the clinical symptoms and signs of infection are more consistent with multiple hepatic abscesses than multiple cavernous hemangiomas.

D: Hepatocellular carcinoma (HCC) is not uncommonly multifocal. Although HCC can be hypovascular at both arterial and portal venous phases of IV contrast-enhanced dynamic CT, the more common and diagnostic appearance is that of an arterial-phase hypervascular lesion with portal venous phase washout. Given the inconsistent imaging findings for multifocal HCC and the patient’s symptomatology, multifocal hepatic abscess is the more likely diagnosis in this case. Like metastases, HCC can become superinfected and can mimic hepatic abscess. Again, follow-up and biopsy of a nonresolving hepatic lesion after treatment for abscess is warranted to exclude the possibility of superinfected HCC.
75. A CT scan is performed (Figures 12 and 13) on an 85-year-old woman who presents with abdominal pain, anemia, and weight loss. What is the MOST LIKELY diagnosis?

A. Metastatic adenocarcinoma
B. Metastatic ovarian cancer
C. Lymphoma
D. Metastatic small bowel carcinoid

Findings:
CT findings reveal circumferential thickening of a segment of distal small bowel with aneurysmal dilatation and a large splenic lesion. There is also the caudal portion of an ovarian cyst.

Rationale:
A: Metastatic adenocarcinoma will almost always involve the liver when there are splenic metastases. Additionally, the small bowel lesion is non-obstructing, a finding more typical with lymphoma than adenocarcinoma.
B: Ovarian metastases rarely produce splenic metastases without concurrent liver metastases, and the small bowel thickening is circumferential. Serosal implants from ovarian carcinoma tend to be eccentric.
C: Detecting enlarged lymph nodes, a malignant cavitary lesion in the small bowel and a large mass in the spleen is highly suggestive of lymphoma.
D: Carcinoid tumors of the small bowel do not appear as cavitary small bowel masses, and they rarely produce splenic metastases without liver metastases.
76. A 26-year-old woman with dysphagia and odynophagia undergoes a barium swallow (Figure 14). What is the MOST LIKELY diagnosis?

A. Squamous cell carcinoma
B. Non-Hodgkin’s lymphoma
C. Crohn’s disease
D. CMV esophagitis

Rationale:
A: This patient is relatively young for primary squamous cell esophageal carcinoma, which usually appears as a large ulcerative constrictive mass.
B: Esophageal lymphoma usually appears on a barium swallow as a smooth submucosal mass.
C: These are classic findings for Crohn disease of the esophagus with ulcers, sinus tracts and intramural fistulae.
D: CMV esophagitis usually appears in immunocompromised patients as solitary or few long (2-3 cm) esophageal ulcers on a barium swallow. CMV esophagitis may also mimic Herpes with multiple discrete small superficial ulcers, although this is a less common presentation.
77. Which of the following statements is TRUE regarding appendiceal carcinoid tumors?

A. More common in distal appendix  
B. Often occur in the elderly  
C. Most unusual site for GI carcinoid tumors  
D. Worse prognosis than other GI sites

**Rationale:**
A: Greater than 70% of these tumors are found in distal one-third of the appendix.  
B: Appendiceal carcinoid is more common in young adults.  
C: Appendiceal carcinoid is the most common site of GI involvement.  
D: Appendiceal carcinoid has the best prognosis of all GI sites (greater than 90% 5-year survival).

78. A 38-year-old woman underwent a laparoscopic Roux-en-Y gastric bypass 3 years ago. What would be the MOST LIKELY presenting symptom of a gastrogastric fistula?

A. Regaining of previously lost weight  
B. Dysphagia  
C. Vomiting of intestinal contents  
D. Acute abdominal pain

**Rationale:**
A: This is the symptom most likely to occur from gastrogastric fistula.  
B: Dysphagia would not occur from gastrogastric fistula.  
C: Vomiting would not be an expected result of gastrogastric fistula.  
D: Breakdown of the staple line is a chronic process and would not cause acute abdominal pain.

79. During an upper GI examination, the field of view is switched from 15 inches to 12 inches. Assuming that the exposure rate is automatically controlled and that the system is functioning properly, what is the effect on the patient entrance exposure rate?

A. The exposure rate remains unchanged.  
B. The exposure rate increases.  
C. The exposure rate decreases.  
D. The effect on exposure rate cannot be determined from the information given.

**Rationale:**
A. Incorrect  
B. Automatic Exposure Rate Control (AERC) will compensate for the reduction in minification gain by increasing the exposure rate to the image receptor, and therefore to the patient.  
C. Incorrect.  
D. Incorrect.
80. What is the implication of a non-reducible hiatal hernia in a patient being considered for anti-reflux surgery?

A. Contraindication to laparoscopic surgery
B. Predisposes to postoperative dysphagia
C. May suggest need for a Collis gastroplasty
D. Surgery unlikely to provide symptomatic relief

Rationale:
A: A non-reducible hiatal hernia implies a short esophagus and may require a modification of the planned surgery (Collis gastroplasty) or esophageal lengthening procedure, but it can still be performed laparoscopically.
B: Post-operative dysphagia is usually due to improper surgical technique, such as an overly long or tight fundoplication.
C: In the presence of a non-reducible hiatal hernia, the addition of a Collis gastroplasty to the fundoplication results in "lengthening" of the esophagus, which prevents post-operative recurrence of the hiatal hernia or disruption of the fundoplication.
D: Provided that a Collis gastroplasty is performed in addition to the fundoplication, most patients will have an excellent operative result.

81. Which of the following intravenous gadolinium-based contrast media has the HIGHEST percent of biliary excretion?

A. Gadoxetate (Eovist)
B. Gadobenate dimeglumine (Multihance)
C. Gadofosveset trisodium (Vasovist)
D. Gadopentetate dimeglumine (Magnevist)

Rationale:
A: 50% biliary, 50% renal excretion.
B: 5% biliary excretion.
C: Incorrect.
D: Incorrect.
82. On contrast-enhanced CT of the abdomen, which of the following findings is MOST specific for pancreatic laceration?

A. Peripancreatic fluid
B. Fluid adjacent to 50% circumference of the SMV
C. **Linear low attenuation coursing through the pancreatic parenchyma**
D. Geographic areas of pancreatic parenchymal nonenhancement

**Rationale:**
A: Peripancreatic fluid is a secondary (nonspecific) sign.
B: Incorrect.
C: Correct. This is the most specific finding.
D: This describes a pancreatic contusion or pancreatic injury, but not necessarily a laceration.

83. What is the MOST common normal variant of the biliary system?

A. Trifurcation of the intrahepatic radicles
B. **Right posterior segmental branch emptying into the left hepatic duct**
C. Right posterior segmental duct emptying into the gallbladder
D. Left lateral segmental duct emptying into the right hepatic duct

**Rationale:**
A: This is the second most common variant.
B: Correct.
C: This is an uncommon congenital variant.
D: This is also an uncommon congenital abnormality.
84. Concerning nonalcoholic fatty liver disease (NAFLD), which of the following statements is TRUE?

A. It is more common in lean patients.
B. It is associated with normal insulin metabolism.
C. It is irreversible.
D. It can progress to fibrosis and cirrhosis.

**Rationale:**
A: Nonalcoholic fatty liver disease (NAFLD) is common but occurs more often in obese patients and less often in lean patients. The prevalence of NAFLD is 18.5% among obese patients compared to 2.7% among lean patients.
B: NAFLD is highly associated with non-insulin-dependent diabetes. Among NAFLD patients, 20-75% have type II diabetes. Although not the only metabolic abnormality, insulin resistance can be a predisposing factor in the development of NAFLD.
C: NAFLD is reversible in some cases. Gradual, controlled weight loss can reduce hepatic steatosis in these patients. Medications that have shown some promise in the treatment of NAFLD include metformin and the thiazolidinediones.
D: NAFLD is not necessarily innocuous. In adults, NAFLD can be associated with perisinusoidal fibrosis. The severity of fibrosis can vary. Mild-to-moderate fibrosis occurs in 76-100% of cases and cirrhosis in 7-16%. It has been estimated that 3 of 100 obese patients will ultimately develop liver failure and/or hepatocellular carcinoma as a consequence of NAFLD.

85. Concerning the pharynx and cervical esophagus, which of the following statements is TRUE?

A. The hypopharynx extends from the soft palate to the cricopharyngeus.
B. During normal swallowing, the larynx moves caudad.
C. The upper esophageal sphincter lies at the level of C3-C4.
D. The cricopharyngeus is cranial to the cervical esophagus.

**Rationale:**
A: The hypopharynx extends from the vallecula to the cricopharyngeus muscle.
B: The larynx normally elevates and moves anteriorly during swallowing.
C: It lies at C5-C6.
D: Correct. It is the true upper esophageal sphincter and the boundary between the pharynx and cervical esophagus.
86. Concerning esophageal motility, which one of the following statements is TRUE?

A. **Primary peristalsis is defined as a contraction wave that progresses in an aboral direction.**
B. Secondary peristalsis is initiated by a second swallow.
C. Normal resting pressure of the lower esophageal sphincter is 40 to 50 mm Hg.
D. **During diffuse esophageal spasm, the barium swallow demonstrates continuous non-propulsive esophageal contractions.**

87. What is the typical lead equivalency of aprons used in fluoroscopy?

A. 0.1 mm
B. **0.5 mm**
C. 0.5 cm
D. 1.0 cm

**Rationale:**
A. Incorrect.
B. Depending on the kVp, 0.5 mm Lead will reduce the x-ray intensity by 95% to 99%.
C. Incorrect.
D. Incorrect.

88. Concerning splenic lesions, which one of the following statements is TRUE?

A. Congenital splenic cysts are more common than posttraumatic splenic cysts.
B. Early peripheral contrast enhancement of splenic hemangiomas on CT is typical.
C. **Melanoma is the most common primary neoplasm to metastasize to the spleen.**
D. Splenic sarcoidosis characteristically presents as a solitary splenic mass.

**Rationale:**
A: Post-traumatic splenic cysts are significantly more common. A true congenital splenic cyst is actually somewhat rare.
B: No, early peripheral contrast enhancement is not seen commonly in splenic hemangiomas.
C: Correct.
D: No, splenic sarcoid usually has multiple nodules of varying size