Imaging modalities used in colon include plain radiographs, barium enema, US, CT, PET CT and MRI. Barium enema (BE) is declining in popularity and is replaced by colonoscopy and CT colonography. In this article, several colonic abnormalities will be demonstrated, using case-based approach, and emphasizing on imaging findings.

**Case 1.** A 59-year-old man performed barium enema for a colonic check-up.

Barium enema shows a pedunculated polyp with lobulated contour at the distal descending colon (arrows). The polyp was removed endoscopically, and proved to be a tubulovillous adenoma.
Both non-neoplastic polyps (such as hyperplastic polyps) and neoplastic polyps (adenomatous polyps) may look similar at BE or CT colonography. However, hyperplastic polyps tend to be sessile type, and small, less than 5 mm in size. Adenomatous polyps could be both sessile or pedunculated type, and any polyps of 10 mm or larger tend to be neoplastic adenomas. The risk of malignancy increases with increasing size of adenomatous polyps. Risk of cancer is approximately < 0.01% for polyps of 5 mm or less, < 1% for polyps of 6-9 mm, 1-5% for polyps of 10-20 mm, and 10% for polyps > 20 mm(1). At present time, CT colonography is replacing BE as the imaging of choice for colorectal cancer screening. CT colonography is more sensitive than BE for detection of colonic polyps, particularly polyps of small size(2).

**Case 2.** A 67-year-old man presented with constipation and abdominal pain.

Plain radiographs show colonic dilatation without gas in the distal colon, suggestive of distal colonic obstruction. Plain CT confirms colonic obstruction at the rectosigmoid colon with perilesional lymphadenopathy (arrows), indicative of primary colon cancer. Surgery confirms that the lesion is moderately-differentiated adenocarcinoma.

Colonic obstruction is less common than small bowel obstruction, accounting for only 20% of all bowel obstruction. The most common cause of colonic obstruction in adult is colon cancer, followed by acute diverticulitis(3). Other uncommon etiologies include colonic volvulus, ischemic stricture, hernia, and fecal impaction. CT is currently the most widely used modality for assessment of colonic obstruction because of its ability to diagnose, as well as identify the site and the cause of obstruction.
**Case 3.** A 46-year-old man presented with abdominal pain, and distension.

![Case 3](image)

Plain abdominal radiographs show markedly dilated cecum rotating to the LUQ, indicative of cecal volvulus. Double bowel wall sign and free air along the right paracolic gutter (arrows) are suggestive of perforation. CT confirms abnormally dilated cecum with minimal free fluid.

Cecal volvulus is a torsion of cecum around its own mesentery, which often results in obstruction, and perforation. Cecal volvulus is less common than sigmoid volvulus occurring in about 11% of all intestinal volvulus. It is generally the abnormality of somewhat young patients at the age of 30-60 years old. It usually occurs when cecum is not fused with retroperitoneum, a congenital variant(4).
Case 4. A 55-year-old man presented with fever and abdominal pain.

Sigmoid colon is the most common site of colonic diverticulosis, accounting for about 95% of patients with diverticulosis. The sigmoid exerts the highest pressure within the colon because it is the narrowest portion, and contains the most dehydrated stool. The high intraluminal pressure of the sigmoid leads to the high frequency of sigmoid diverticulosis. Diverticulitis is a common complication of colonic diverticulosis. It is the result of obstruction of the diverticulum leading to inflammation, bleeding, and perforation. CT is the imaging of choice in a patient suspicious for diverticulitis. It helps confirming the diagnosis and excluding other abdominal or pelvic disease. CT can be used to accurately plan a percutaneous intervention.
Case 5. A 45-year-old male presented with fever and abdominal pain.

Figure 5. Case 5

CT scan reveals dilated appendix with air bubbles dissecting its wall and ruptures into the peritoneal cavity (arrows). Findings are consistent with rupture acute appendicitis.

Acute appendicitis is the most common cause of acute abdomen, particularly in children and young adults. CT is highly sensitive and specific modality for the diagnosis of acute appendicitis. The need for IV contrast is debatable and varies from institution to institution. CT is also useful for alternative diagnosis if the appendix is normal. Conditions mimic acute appendicitis include right-sided diverticulitis, epiploic appendagitis, omental infarction, and mesenteric adenitis⁶. 
Case 6. A 45-year-old man presented with abdominal distension.

CT shows ascites with a large omental cake (arrow, D). Implantations with mass effect along the surface of the liver and spleen are noted, giving the “scalloping appearance” (arrows, C). Findings are suggestive of pseudomyxoma peritonei. A rim-calcified cystic lesion at the RLQ is consistent with appendiceal mucocele (arrows, A and B). Surgery confirms appendiceal mucocele with foci of adenocarcinoma.

Pseudomyxoma peritonei refers to accumulation of gelatinous fluid secondary to rupture of a mucinous tumor, most commonly appendiceal tumor/appendiceal mucocele. Occasionally mucin-producing adenocarcinoma of the GI tract or ovary may be a cause of pseudomyxoma peritonei. Differential diagnosis of omental cake includes peritoneal carcinomatosis, pseudomyxoma peritonei, peritoneal mesothelioma, TB peritonitis, and disseminated lymphoma. Scalloping sign is a unique finding of pseudomyxoma peritonei, secondary to thick, gelatinous content(7).
**Case 7.** A 67-year-old man presented with acute abdominal pain and diarrhea.

![Barium enema](image1)

![CT and US findings](image2)

![Pathological specimen](image3)

**Figure 7.** Case 7

Barium enema shows diffuse thickened wall of the sigmoid colon, showing “thump-printing pattern”. CT and US confirm thickened colonic wall. Findings are suggestive of ischemic colitis. Surgery confirms infarcted colon.

Ischemic colitis is the inflammation of the colon secondary to vascular insufficiency. It is usually a disease of the elderly with atherosclerosis resulting in a low-flow state. In young individuals, ischemic colitis is usually secondary to vasculitis or hypercoagulable state. Location of ischemia is related to anatomy of mesenteric vessels. SMA involvement affects the right-sided colon, from the cecum to splenic flexure. IMA involvement affects the left-sided colon, from splenic flexure to rectum. Watershed areas of low flow state affect the splenic flexure (Griffith’s point) and rectosigmoid colon (Sudeck’s point)(8).
Case 8. A 17-year-old boy working at the gas station.

Upright abdomen shows evidence of a large amount of free air under the dome of diaphragm (arrows, A). Supine abdomen shows double bowel sign (Rigler sign), air outlining the falciform ligament, and along both paracolic gutters (arrows, B). Findings are consistent with bowel perforation. Further history reveals that his friend was inserted the gas hose into his rectum while he was asleep, and accidentally blew the air causing colonic perforation. Unfortunately, the patient was expired after surgery.

Colonic perforation usually produces much free air and fecal content within the abdomen. Trauma to the colon is the most common cause of the perforation, although spontaneous colonic perforation may occur in elderly with chronic constipation(9). Signs suggest intra-abdominal free air in the plain radiographs include double bowel wall sign (Rigler sign), football sign, falciform ligament sign, lateral umbilical ligament sign, urachus sign, and lucent liver sign(10).
**Case 9.** A 78-year-old man presented with abdominal pain and distension.

Plain abdominal radiographs show inverted “U” or bean-shaped appearance of dilated bowel loop rising from pelvis to LUQ and relatively absence of rectal air. Findings are consistent with sigmoid volvulus. Barium enema confirms the “bird beak” appearance from the twisted sigmoid colon (arrow).

Sigmoid is the most common site of colonic volvulus, followed by cecum and transverse colon. It usually occurs in elder patients with chronic constipation or psychiatric/neurologic conditions, associated with redundant sigmoid mesocolon. There is approximately 60% recurrent rate after rectal tube decompression. Therefore, elective surgery is usually required as a definitive treatment.(11)
Case 10. A 44-year-old man presented with nausea and vomiting and previous history of car accident.

Plain abdominal radiographs show marked dilatation of the colon, particularly transverse colon, with collapse of the descending colon (arrows, A). Herniation of splenic flexure into the left hemithorax is noted (arrow, B). Findings are suggestive of colonic obstruction with transitional zone at splenic flexure. CT scan confirms herniation of the splenic flexure into the left thorax, associated with atelectasis of the left lung (arrow, D). Left pleural effusion suggests possible strangulation. Surgery confirms left diaphragmatic hernia (probably post trauma) with obstruction of the herniated splenic flexure.

Diaphragmatic hernias are defined as congenital or acquired defect of the diaphragm. There are 2 main types of congenital diaphragmatic hernias; Bockdalek hernia and Morgagni hernia. Acquired diaphragmatic hernias are hiatal hernias and post-traumatic diaphragmatic hernias. Post-traumatic diaphragmatic hernias most commonly occur on the left side, where there is no protection from the liver as on the right side. Undiagnosed diaphragmatic rupture may lead to herniation years after the initial injury(12).

Conclusions

Ten diseases of colon are illustrated, emphasizing on the imaging appearances. These cases are as following:
1. Trauma pathology: post-traumatic colonic perforation, and post-traumatic diaphragmatic hernia with colonic obstruction.

2. Neoplastic pathology: tubulovillous adenoma, primary colon cancer, and mucinous adenocarcinoma of the appendix with pseudomyxoma peritonei.

3. Infection/inflammatory pathology: ischemic colitis, sigmoid diverticulitis with perforation, and ruptured appendicitis.


REFERENCES