

Chapter 1 : Lower GI Exam (Barium Enema)

Small bowel obstruction (SBO) accounts for 80% of all mechanical intestinal obstruction, the remaining 20% results from large bowel obstruction. It has a mortality rate of ~5%.

The small bowel follow-through SBFT demonstrates findings of long segmental strictures in the ileum with pseudosacculations consistent with Crohn disease. The inflammation leads to fibrofatty proliferation causing asymmetric straightening and shortening along the mesenteric side of the bowel, with the uninvolved wall along the antimesenteric side forming redundant saccules. The skip involvement is typical of Crohn disease. Narrowing of the lumen may be due to a combination of spasm, which may not cause significant upstream obstruction, or fibrosis and proliferation of smooth muscle, which is associated with upstream dilatation. Jejunal diverticulosis does not involve luminal narrowing as seen in this case. Small bowel ischemia may resemble acute Crohn disease with smooth fold thickening, but in this case, the folds are effaced due to marked wall thickening. Carcinoid can cause a mesenteric shortening similar to Crohn disease, but the luminal narrowing would not result in the long strictures seen in this case and would be fixed, leading to a greater degree of obstructions. The SBFT demonstrates the findings of Crohn enteritis with excellent mucosal detail and is superior to cross-sectional imaging for the evaluation of early disease. Real-time fluoroscopic observation can distinguish between strictures and segments of peristalsis. It is limited in its ability to evaluate extraintestinal manifestations of disease and is not ideal for frequent follow-up due to radiation dosage concerns. Textbook of gastrointestinal radiology, 4th ed. A long segment of ileum demonstrates wall thickening, T2-hyperintense mural signal, restricted diffusion, and mucosal enhancement. These findings are highly suggestive of active Crohn disease, as compared to chronic disease. Note that some enhancement may be seen with fibrotic disease, but the intensity tends to be less than with active disease. Additional findings of active disease not shown in this case include mesenteric vascular engorgement comb sign, prominent enhancing regional mesenteric lymphadenopathy, mucosal ulcerations, and fistulous disease. With effective treatments available for Crohn disease, the goal is to develop a treat-to-target strategy that will alter the natural history of the disease and prevent irreversible fibrostenotic lesions as well as the penetrating extraintestinal complications. Small bowel lymphoma demonstrates aneurysmal dilatation of bowel loop along with regional lymphadenopathy and would not typically show preferential mucosal enhancement. Abdom Imaging ;40 5: Small bowel MR enterography: Insights Imaging ;3 3: The CT demonstrates mild uniform circumferential wall thickening of the terminal ileum. The colon is not fully distended, but the cecum and ascending colon also demonstrate mild wall thickening. There is a small amount of free fluid present. The appendix is not shown, but the abnormality involves the ileum and the ascending colon and is not concentrated at the cecal tip. The wall thickening is regular and mild, not mass-like, and therefore unlikely to be neoplastic. Adenocarcinoma of the ileum is annular and constricting, and the lumen is normal in this case. Crohn disease not included in the options could have this appearance. Infections involving the ileum and right colon are usually caused by *Yersinia* as in this case, *Campylobacter*, or *Salmonella* species. Tuberculous infection also involves this area and may mimic Crohn disease. With infectious ileocecolitis, lymphadenopathy not shown in this case is commonly present. CT is widely available and the scan time minimal, which is helpful for a patient in significant pain. The examination may be performed as a CT enterography study with an attempt at maximizing bowel distention for optimal wall analysis. If the patient is too ill to tolerate the oral contrast, a standard CT with intravenous contrast will still be sufficient to assess the extraintestinal tissues for complications such as an abscess or fistula. MR enterography involves no ionizing radiation and will be able to assess the bowel wall for thickening and enhancement, evaluate the degree of bowel dilatation in the setting of known strictures, and image the extraintestinal tissues. Given her history of a hysterectomy, small bowel loops may be crowded in the pelvis and difficult to separate on a barium small bowel follow-through. Cross-sectional imaging is more appropriate, and given the superior spatial resolution of CT over MR, the CT enterography or conventional CT would be the ideal choice. With the findings suspicious for early Crohn disease, investigation of the more proximal small bowel to determine extent of involvement is indicated.

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Cross-sectional imaging with either CT or MR is insensitive for the evaluation of early disease. The small bowel follow-through is more sensitive for early changes such as aphthae or erosions. A capsule endoscopy will also detect early changes of Crohn but probably should not be attempted as an initial small bowel study in a patient with potential stricturing disease. Expert Rev Gastroenterol Hepatol ;4 4: Only gold members can continue reading. Log In or Register to continue Share this:

Chapter 2 : The Radiology Assistant : Small bowel obstruction - Case 1

The small bowel (or small intestine) is the section of bowel between the stomach and the colon. It has distinctive mucosal folds, valvulae conniventes, and is made up of three functional units: duodenum jejunum ileum Radiographic features Fl.

How should I prepare for the procedure? Your physician will give you detailed instructions on how to prepare for your lower GI imaging. You should inform your physician of any medications being taken and if there are any allergies, especially to iodinated contrast materials. Also inform your doctor about recent illnesses or other medical conditions. On the day before the procedure you will likely be asked not to eat, and to drink only clear liquids like juice, tea, black coffee, cola or broth, and to avoid dairy products. After midnight, you should not eat or drink anything. For adults but not usually in children, it is important that your colon be completely empty for the procedure. You may also be instructed to take a laxative in either pill or liquid form and to use an over-the-counter enema preparation the night before the examination and possibly a few hours before the procedure. You can take your usual prescribed oral medications with limited amounts of water. You will be asked to remove some of your clothes and to wear a gown during the exam. You may also be asked to remove jewelry, removable dental appliances, eye-glasses and any metal objects or clothing that might interfere with the x-ray images. Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the Safety page for more information about pregnancy and x-rays. Infants and children may undergo lower GI radiography. Usually, there is no special preparation, but your doctor will give you detailed instructions to prepare your child for the examination. The use of barium and the taking of x-ray images is similar to that described for adults. The equipment typically used for this examination consists of a radiographic table, one or two x-ray tubes and a television-like monitor that is located in the examining room. Fluoroscopy, which converts x-rays into video images, is used to watch and guide progress of the procedure. The video is produced by the x-ray machine and a detector that is suspended over a table on which the patient lies. X-rays are a form of radiation like light or radio waves. X-rays pass through most objects, including the body. Once it is carefully aimed at the part of the body being examined, an x-ray machine produces a small burst of radiation that passes through the body, recording an image on photographic film or a special detector. Fluoroscopy uses a continuous or pulsed x-ray beam to create a sequence of images that are projected onto a fluorescent screen, or television-like monitor. When used with a contrast material, which clearly defines the area being examined by making it appear dark or by electronically reversing the image contrast to white, this special x-ray technique makes it possible for the physician to view joints or internal organs in motion. Still images or movies are also captured and stored electronically on a computer. Until recently, x-ray images were maintained on large film sheets much like a large photographic negative. Today, most images are digital files that are stored electronically. These stored images are easily accessible for diagnosis and disease management. A radiology technologist and a radiologist, a physician specifically trained to supervise and interpret radiology examinations, guide the patient through the barium enema. The patient is positioned on the examination table and an x-ray film is taken to ensure the bowel is clean. After performing a rectal examination, the radiologist or technologist will then insert a small tube into the rectum and begin to instill, using gravity, a mixture of barium and water into the colon. Air may also be injected through the tube to help the barium thoroughly coat the lining of the colon. In some circumstances, the radiologist or referring physician may prefer a water and iodine solution rather than barium. Next, a series of x-ray images is taken. You must hold very still and may be asked to keep from breathing for a few seconds while the x-ray picture is taken to reduce the possibility of a blurred image. The technologist will walk behind a wall or into the next room to activate the x-ray machine. The patient may be repositioned frequently in order to image the colon from several angles. Some x-ray equipment will allow patients to remain in the same position throughout the examination. When the examination is complete, you may be asked to wait until the radiologist determines

that all the necessary images have been obtained. Once the x-ray images are completed, most of the barium will be emptied through the tube. The patient will then expel the remaining barium and air in the restroom. In some cases, additional x-ray images will be taken. A barium enema is usually completed within 30 to 60 minutes. As the barium fills your colon, you will feel the need to move your bowel. You may feel abdominal pressure or even minor cramping. Most people tolerate the mild discomfort easily. The tip of the enema tube is specially designed to help you hold in the barium. If you are having trouble, let the technologist or radiologist know. During the imaging process, you will be asked to turn from side to side and to hold several different positions. At times, pressure may be applied to your abdomen. With air contrast studies of the bowel air contrast barium enema , the table may be moved to an upright position. After the examination, you may be given a laxative or enema to wash the barium out of your system. You can resume a regular diet and take orally administered medications unless told otherwise by your doctor. You may be able to return to a normal diet and activities immediately after the examination. You will be encouraged to drink additional water for 24 hours after the examination. Your stools may appear white for a day or so as your body clears the barium liquid from your system. Some people experience constipation after a barium enema. If you do not have a bowel movement for more than two days after your exam or are unable to pass gas rectally, call your physician promptly. You may need an enema or laxative to assist in eliminating the barium. A radiologist , a physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care or referring physician , who will discuss the results with you. Follow-up examinations may be necessary. Your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a potential abnormality needs further evaluation with additional views or a special imaging technique. A follow-up examination may also be necessary so that any change in a known abnormality can be monitored over time. Follow-up examinations are sometimes the best way to see if treatment is working or if a finding is stable or changed over time. What are the benefits vs. Benefits X-ray imaging of the lower GI tract is a minimally invasive procedure with rare complications. Radiology examinations such as the lower GI can often provide enough information to avoid more invasive procedures such as colonoscopy. Because barium is not absorbed into the blood, allergic reactions are extremely rare. X-rays usually have no side effects in the typical diagnostic range for this exam. Risks There is always a slight chance of cancer from excessive exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk. The effective radiation dose for this procedure varies. See the Safety page for more information about radiation dose. In rare cases, the barium could leak through an undetected hole in the lower GI tract producing inflammation in surrounding tissues. Even more rarely, the barium can cause an obstruction in the gastrointestinal tract, called barium impaction. Iodinated contrast administered rectally may cause allergic reactions, but this is very rare. Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. A Word About Minimizing Radiation Exposure Special care is taken during x-ray examinations to use the lowest radiation dose possible while producing the best images for evaluation. National and international radiology protection organizations continually review and update the technique standards used by radiology professionals. Modern x-ray systems have very controlled x-ray beams and dose control methods to minimize stray scatter radiation. A barium enema is usually not appropriate for someone who is in extreme abdominal pain or who has had a recent colonic biopsy. If perforation of the colon is suspected, the enema should be performed with a water-soluble contrast solution. X-ray imaging is not usually indicated for pregnant women.

Chapter 3 : Small Bowel | Radiology Key

Small bowel lymphoma demonstrates aneurysmal dilatation of bowel loop along with regional lymphadenopathy and would not typically show preferential mucosal enhancement. The patient's chronic symptomatology does not suggest acute gastroenteritis.

Study the coronal reconstructed CT-image. Stenotic lesion in the duodenum as a result of an adenocarcinoma yellow arrow. Not possible to separate from the pancreas red arrow. Pre-stenotic dilatation of the duodenum. The typical imaging representation of a small bowel adenocarcinoma is a focal unilocular, circumferential mass with shouldering of the margins and obstruction. Less frequently adenocarcinomas present as an intraluminal polypoid mass, which can lead to intussusception. Ulceration is a quite common feature. Extraluminal infiltration can present as fatstranding. Here another example of a duodenal carcinoma presenting as irregular wall thickening in the distal duodenum arrows. Adenocarcinomas often show moderate enhancement, while carcinoid tumors show bright enhancement. Metastases to the liver and peritoneum occur frequently. The images show a circumferential mass with shouldering of the margins. Adenocarcinoma in the jejunum Large adenocarcinomas can mimic a lymphoma as in this case. The images show an irregular mass in the proximal jejunum. Although it is a large circumferential growing mass, the lumen is not obstructed. There is a large conglomerate of hypodense lymph nodes in the adjacent mesentery, consistent with necrotic lymph node metastases lower image. This proved to be an adenocarcinoma, but these findings could very well represent a lymphoma. Here the endoscopic image of the tumor. Here a patient with extensive wall thickening of the proximal jejunum with aneurysmatic dilatation. On top of our differential diagnostic list would be a lymphoma, but this proved to be an adenocarcinoma. Adenocarcinoma in the jejunum Features that favour adenocarcinoma are fat stranding due to mesenteric fat infiltration and lymph node metastases. In lymphoma fat stranding is uncommon, but lymph node metastases do occur and are usually more bulky. The images show a short obstructing circular mass in the jejunum yellow arrow with enlarged lymph node red arrow. This proved to be an adenocarcinoma. Adenocarcinoma in the jejunum Post-contrast T1W-image with fatsat left and T2W-image right show an obstructing mass in the jejunum with shouldering arrow. There is prestenotic dilatation. Top images show a circular mass in the proximal jejunum with FDG uptake yellow arrows. Lower MR-images show the same jejunal mass with shouldered borders and mesenteric lymphadenopathy red arrows , consistent with adenocarcinoma. First study the images. The red arrow indicates the sigmoid, which is filled with feces. So this is not a small bowel feces sign. Obstructing lesion in the ileum with shouldering leading to small bowel obstruction yellow arrow. At surgery this proved to be an adenocarcinoma. Here an adenocarcinoma in the proximal jejunum. These tumors are mostly found with endoscopy. The jejunum is the second most prevalent site. There is a thickened wall of the ileum with adjacent mesenteric infiltration with foci of extraluminal air indicating perforation. This proved to be an ulcerating adenocarcinoma in a patient with M. The diagnosis is seldom made pre-operatively due to lack of typical imaging features. This patient does not have an adenocarcinoma. Diffuse wall thickening in the distal ileum. Here another adenocarcinoma located in the jejunum. There are multiple lymph nodes red arrow and there is fat stranding yellow arrows. It should not be mistaken for mesenteric panniculitis as these large necrotic lymph nodes are pathologic. The distal ileum is the most common site, owing to the large amount of lymphoid tissue that is present in the distal ileum. The typical presentation of a small bowel lymphoma is a thick walled infiltrating mass with aneurysmal dilatation without obstruction. Aneurysmal dilatation is based upon destruction of the bowel wall and the myenteric nerve plexus. Here a typical presentation figure. There is irregular wall thickening of the terminal ileum with aneurysmatic dilatation. Lymphoma in the proximal jejunum A less common presentation is as an intraluminal polypoid mass or a large excentric mass with extension into the surrounding soft tissues with possible ulceration and formation of fistulas. As mentioned before, large adenocarcinomas and lymphomas can have similar imaging appearances. Bulky mesenteric or retroperitoneal lymphadenopathy and splenomegaly are findings that support the diagnosis of a lymphoma. Infiltration of the mesenteric fat favours the diagnosis of an adenocarcinoma. Here a typical lymphoma presenting as a large thick walled mass in the

proximal jejunum with FDG uptake. Dilated lumen at the site of the mass and prestenotic dilatation of the duodenum red arrow First study the images and take special notice of the first image. Reversed fold pattern indicating celiac disease Ileal-ileal intussusception yellow arrow , in a patient with multifocal small bowel lymphoma not all lesions shown here. Mesenteric lymphadenopathy red arrows. Here another patient with celiac disease. There is an irregular mass in the jejunum with luminal dilatation. There is infiltration of the mesentery. Pathology showed a T-cell lymphoma in celiac disease. This is a type of T-cell lymphoma that affects the small intestine in patients with celiac disease. EATL lymphoma in a patient with celiac disease. Here another example of a T-cell lymphoma in celiac disease. Carcinoid tumor Small intraluminal mass in the ileum yellow arrow. Associated spiculated mesenteric mass with adjacent desmoplastic reaction in small bowel carcinoid. Carcinoid tumors are rare neuroendocrine tumors. Neuroendocrine tumors of the small can be divided in well-differentiated - also known as carcinoid and poorly differentiated - small or large cell neuroendocrine carcinoma. Here we will discuss the carcinoid tumors. The incidence of carcinoid tumors increased over the last decades, exceeding that of adenocarcinoma, making it the most common small bowel malignancy. The most common location of a carcinoid is the appendix, usually as an incidental finding following appendectomy. It is uncommon to diagnose a carcinoid of the appendix on imaging studies. These images are of a patient who presented with peritoneal metastases. The primary tumor proved to be a carcinoid of the appendix. The second most common location is the distal ileum. The stomach, colon and rectum are rare locations. Small bowel carcinoids are multiple in about one third of cases. Here a typical carcinoid presenting as a large mesenteric mass with desmoplastic reaction and retraction of adjacent small bowel loops with wall thickening arrows. Carcinoid with calcification and desmoplastic reaction. Obstructive small bowel ileus based on intraluminal component of carcinoid. Note small liver metastasis arrow. Carcinoid metastases The likelihood of metastases is related to the size of the tumor. Liver metastases are usually hypervascular and can show central necrosis. Most of the lymph node metastases show calcifications, similar to the primary tumor. Multiple livermetastases of a carcinoid tumor. Four years after the initial CT multiple liver metastases are seen. Notice hypervascular enhancement pattern in the late arterial phase. It commonly occurs in patients who have liver metastases. Symptoms include flushing and diarrhea and less frequently bronchospasm and heart failure. The heart failure is the result of serotonin-induced fibrosis of the cardiac valves, notably the tricuspid and pulmonary valves. The images show a carcinoid tumor presenting as a hypervascular mass red arrow with desmoplastic reaction yellow arrow. Carcinoid presenting as hyperenhancing lesion in the late arterial phase Carcinoid tumors are slowly growing tumors that may go unrecognized for many years. They start as small submucosal lesions images. As the carcinoid grows, thickening of the bowel wall occurs, leading eventually to extension outside the bowel wall. Carcinoid tumors can cause an intense desmoplastic reaction with retraction of bowel loops and fibrosis, sometimes leading to bowel ischemia. However, when the carcinoid is small the findings are non-specific. It can present as a small submucosal nodule with arterial enhancement image and sometimes they lead to intussusception. These tumors most frequently occur in the stomach, followed by jejunum and ileum. Occurrence in colon, rectum, esophagus and appendix is rare.

Chapter 4 : Learning Radiology - Small Bowel Obstruction, SBO

Small bowel tumors can be detected on standard abdominal CT in patients with non-specific symptoms However if the CT findings are unclear or if a small bowel tumor is suspected clinically, CT-enterography or MRI-enterography or enteroclysis is performed.

Chapter 5 : Gastrointestinal Radiology

Preferred examination In small-bowel obstruction imaging, certain radiologic investigations can be used to confirm the diagnosis and severity of the obstruction, but not its etiology.

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Introduction. The small bowel has been a challenging organ for clinical and radiologic evaluation. The ideal small bowel imaging method should be noninvasive, not use ionizing radiation, and be able to depict the small intestinal lumen, bowel wall, and surrounding structures.

Chapter 7 : Small bowel | Radiology Key

o Small bowel obstruction, as the term is used here, is due to physical and organic changes which produce mechanical obstruction to the passage of the bowel contents somewhere in the small bowel o The bowel proximal to the point of obstruction dilates with swallowed air and secreted fluid.

Chapter 8 : The Radiology Assistant : Small Bowel Tumors

A small bowel follow-through is an X-ray examination of the small intestine that can help rule out conditions such as obstructions, IBD, Crohn's, and more.

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The small bowel generally lies centrally within the abdomen, "framed" by the large bowel. On imaging, the small bowel can be differentiated from the large bowel based on the presence of plicae circulares (circular folds), which traverse the entire diameter of the lumen.