

COMMONLY PERFORMED RADIOGRAPHIC TESTS IN GASTROENTEROLOGY

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Gastroenterologists often order radiographic tests to help diagnose diseases of the gastrointestinal tract. Common complaints that may lead to such testing include abdominal pain, nausea, vomiting, heartburn, diarrhea, constipation, blood in the stool, bloating, weight loss, and abnormal laboratory tests. This chapter describes the more commonly performed radiographic tests.

Abdominal X-ray

An abdominal X-ray may be ordered to evaluate nausea, vomiting, or abdominal pain, to exclude a blockage, perforation, or paralysis of the intestinal tract. These X-rays may be performed in the standing and flat positions. Organs absorb different amounts of the radiation and this is seen on a film as varying degrees of black, white, or gray. In some instances, another test, called a PET scan may be ordered.

Barium Esophagram (Barium Swallow)

Barium studies, also called contrast studies, involve use of a liquid agent that when swallowed provide an X-Ray image of the inside of the intestine in relation to the wall of the organ and surrounding structures. Barium is a thick, white chalky substance. A barium esophagram, or barium swallow, may be ordered for patients with difficult or painful swallowing, coughing, choking, a sensation of something stuck in the throat, or chest pain. The test is performed when a patient drinks the barium and X-ray images or a video is made. Sometimes you are asked to swallow a barium tablet if you have trouble swallowing. This enables the doctor to detect a subtle narrowing in the esophagus called a stricture.

Upper Gastrointestinal Series and Small Bowel Follow Through X-ray

An upper gastrointestinal series is a barium study evaluating the esophagus, stomach, and first part of the small intestine. This test is ordered to search for causes of nausea, vomiting, abdominal pain, or weight loss, to name a few. It is performed much the same way as the barium esophagram, except additional time is required to take pictures as the barium travels further in the intestinal tract. A small bowel follow-through x-ray utilizes the same principles and requires abdominal x-ray films to be taken over many hours. This last test is often ordered to evaluate intestinal bleeding of an unknown source, chronic diarrhea, or abdominal pain.



Barium Enema

A barium enema also requires the use of barium but in a different manner. Patients must undergo a bowel-cleansing regimen (taken orally) to eliminate residue from the colon. On the day of the exam, a small tube is inserted in the rectum and barium contrast is introduced throughout the colon. X-ray films are then made and the colon anatomy is visualized. Abnormal findings may include colon cancer, polyps, intestinal inflammation, and structural abnormalities such as areas of narrowing (strictures) or diverticulosis, which may explain the patient's symptoms. The federal statute that was enacted in 1997 to provide a colorectal cancer screening benefit for Medicare beneficiaries envisions only limited use of barium enema for colorectal cancer screening, essentially only for patients who cannot or will not receive either a flexible sigmoidoscopy or colonoscopy. In such a patient, Medicare rules permit a barium enema if the patient's physician attests that for this patient, results of barium enema will be equivalent to or better than a colonoscopy or flexible sigmoidoscopy.

Abdominal Ultrasound, Doppler Ultrasound, and Doppler Mesenteric Ultrasound

An ultrasound is a non-invasive imaging test, which uses sound waves to create images of organs. Normal and abnormal tissues and organs contain different acoustic properties. When an abnormality is present, such as a gallbladder stone or changes in the appearance and size of the liver, as seen in cirrhosis, a characteristic appearance is noted on the ultrasound. The test is performed with the placing of an ultrasound probe onto the skin over the organ(s) of interest. An abdominal ultrasound may evaluate the gallbladder, liver, bile ducts, pancreas, kidneys, and the abdominal cavity. The addition of a continuous sound wave, called "Doppler," is done to evaluate blood flow in vessels, both arteries, and veins. A Doppler ultrasound of the liver determines if the veins to and from the liver are open and not narrowed or obstructed. A Doppler mesenteric ultrasound evaluates the three main arteries that carry blood to the intestinal tract for any narrowing or stenosis.

Computed Tomography (CT) Scan and Computed Tomography (CT) Angiography or Venography

A computed tomography scan, or CT scan, results in multiple high-resolution cross-sectional images, (high quality pictures of the body as if it were being sliced across the middle) every 5-10 millimeters, which are created by movement between the X-ray beam and the film. A computer then reconstructs the images. This exam is usually done with oral contrast (usually barium), which the patient consumes hours before the exam, and intravenous contrast (such as iodine), which is intravenously injected into the patient at the time of the exam. Gastroenterologists may order this test to evaluate abdominal pain, to exclude an abscess (an area of infection), and to evaluate organs such as the liver, pancreas, small intestine and colon. A CT angiography or CT venography are specific CT scans that evaluate either abdominal arteries or veins, respectively. These tests are ordered when a condition with low blood flow to the intestinal tract is strongly suspected.



Virtual Colonoscopy

Virtual colonoscopy, or more appropriately, virtual colonography, employs the principles of computed tomography with image reconstruction to produce a 3-D or “virtual” exam of the colon. This test has received much attention over the last few years because it has been suggested as an additional option for colon cancer screening. This test requires a bowel preparation, is performed without sedation, carries some reported risks of radiation exposure and involves introducing air into the bowel through the rectum which often produces patient discomfort. If an abnormality is noted via a virtual colonoscopy, such as a polyp or growth within the colon, a complete colonoscopy must then be done. At present, the exam does not reliably detect small lesions in the colon. Some advocates of this procedure maintain that the small polyps that are not usually detectable via this technique, may be left in the bowel without treatment, even if they are cancerous or precancerous. This view is at odds with the more conservative posture of gastroenterologists that all polyps pose a potential health risk, and need to be detected and removed as early as possible.

Magnetic Resonance Imaging (MRI), Magnetic Resonance Cholangiopancreatography (MRCP), and Magnetic Resonance Angiography (MRA)

Magnetic resonance imaging, or MRI, is a noninvasive technique that involves radiofrequency radiation in a high magnetic field to produce high resolution images of the body in various directions. A non-iodine contrast agent, usually gadolinium, is injected at the time of the exam. This test is performed to evaluate intra-abdominal organs, such as the liver or pancreas, for masses or cysts. When the bile and pancreas ducts are examined with MRI, this test is called MRCP. The arteries that carry blood to the intestinal tract may be examined with a specific MRI known as MRA, or MR angiography. Often times the MRI exam is done after an abnormality is found on an ultrasound or CT scan or if additional information is needed to explain a patient’s symptom.

Gastric Emptying Study

A gastric emptying study is a nuclear imaging study done to evaluate the ability of the stomach to empty. Delayed gastric emptying, or gastroparesis, may result from a number of conditions, most commonly from diabetes mellitus. This may result in nausea, vomiting, bloating, sensation of early fullness during eating, or abdominal pain. The test is performed by administration of a meal that contains small amounts of a substance usually technetium sulfur. Images are taken of the stomach over time. Normally, within a set time, a certain amount of gastric contents exits the stomach and empties into the small intestine. This test demonstrates the amount of contents remaining in the stomach, and if the amount is below the established cut-off values, delayed stomach emptying is diagnosed.



Cholescintigraphy (HIDA Scan)

Another nuclear scan, cholescintigraphy, commonly known as a HIDA scan, evaluates the function of the gall bladder. This test may be ordered to diagnose or exclude acute or chronic inflammation of the gallbladder, obstruction of the bile ducts, and the presence of a bile leak. Nuclear contrast is injected intravenously and images are taken. Much like a gastric emptying study, if the amount of bile emptied from the gall bladder is below the normal range, there may be a problem with gallbladder function.

Positron Emission Tomography (PET) Scan

Positron emission tomography, commonly known as PET scan, is a newer, noninvasive technique that is very sensitive in detecting gastrointestinal cancer. This test is increasingly ordered for this purpose and may be ordered with a CT scan. A chemical called 18-fluorodeoxyglucose, or FDG, is administered and tissues or areas containing cancer take up this chemical. This in turn leads to positive areas of uptake on images that are captured on film. Often times, this test is ordered to evaluate for distant spread of a tumor (metastasis). Examples of gastrointestinal tumors for which this test may be ordered include esophageal, stomach, pancreas, and colon, to name a few.

