



## X-ray (Radiography) - Lower GI Tract

Lower gastrointestinal tract radiography or lower GI uses a form of real-time x-ray called fluoroscopy and a barium-based contrast material to help detect disease and abnormalities and diagnose symptoms such as pain, constipation or blood in the stool. It can often provide enough information to avoid more invasive procedures such as colonoscopy.

Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, medications you're taking and allergies, especially to contrast materials. Your doctor will instruct you on how to cleanse your bowel, restrict you to clear liquids on the day before your procedure, and

not allow you to eat or drink anything after midnight. Take your regular medication with sips of water. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.



## What is Lower GI Tract X-ray Radiography (Barium Enema)?

Lower gastrointestinal (GI) tract radiography, also called a lower GI or barium enema, is an x-ray examination of the large intestine, also known as the colon. This examination evaluates the right or ascending colon, the transverse colon, the left or descending colon, the sigmoid colon and the rectum. The appendix and a portion of the distal small intestine may also be included.

An x-ray (radiograph) is a noninvasive medical test that helps physicians diagnose and treat medical conditions. Imaging with x-rays involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body. X-rays are the oldest and most frequently used form of medical imaging.

The lower GI uses a special form of x-ray called fluoroscopy and a contrast material called barium or a water soluble iodinated contrast.

Fluoroscopy makes it possible to see internal organs in motion. When the lower gastrointestinal tract is

filled with barium, the radiologist is able to view and assess the anatomy and function of the rectum, colon and sometimes part of the lower small intestine.

## What are some common uses of the procedure?

A physician may order a lower GI examination to detect:

- benign tumors (such as polyps).
- cancer.
- ulcerative colitis (inflammatory bowel disease).
  
- Hirschsprung disease in children (a blockage of the large intestine).

The procedure is frequently performed to help diagnose symptoms such as:

- chronic diarrhea.
- blood in stools.
- constipation.
- irritable bowel syndrome.
- unexplained weight loss.
- a change in bowel habits.
- suspected blood loss.

Images of the small bowel and colon are also used to diagnose inflammatory bowel disease, a group of disorders that includes, fecal incontinence, Crohn's disease and ulcerative colitis.

## 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. Just follow your doctor's instructions. 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.

## What does the x-ray equipment look like?

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.

## How does the procedure work?

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 and are frequently compared to current x-ray images for diagnosis and disease management.

## How is the procedure performed?

The lower GI examination is usually done on an outpatient basis and is often scheduled in the morning to reduce the patient's fasting time.

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.

## **What will I experience during and after the procedure?**

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.

## Who interprets the results and how do I get them?

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. risks?

### 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.
- No radiation remains in a patient's body after an x-ray examination.
- 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. See the Safety page for more information about pregnancy and x-rays.

## 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. This ensures that those parts of a patient's body not being imaged receive minimal radiation exposure.

## What are the limitations of Lower GI Tract Radiography?

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.

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