

## Lower Gastrointestinal (GI) Tract Radiography (Barium Enema)

*This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.*

### What is Lower Gastrointestinal (GI) Tract 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 includes the right or ascending colon, the transverse colon, the left or descending colon, 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.
- causes of other intestinal illnesses.

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.
- abdominal pain.

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

### How should I prepare?

Your physician will give you detailed instructions on how to prepare for your lower GI imaging.

You should inform your physician of any medications you are taking and if you have any allergies, especially to barium or 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. 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 exam 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 may be asked to remove some or all of your clothes and to wear a gown during the exam.

You may also be asked to remove jewelry, eye glasses and any metal objects or clothing that might interfere with the x-ray images.

Women should always inform their physician or 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.

## What does the equipment look like?

The equipment typically used for this examination consists of a radiographic table, an x-ray tube and a television-like monitor that is located in the examining room or in a nearby room. When used for viewing images in real time, the image intensifier (which converts x-rays into a video image) is suspended over a table on which the patient lies. When used for taking still pictures, the image is captured either electronically or on film.



## 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 digital image recording plate.

Fluoroscopy uses a continuous 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 bright white, this special x-ray technique makes it possible for the physician to view internal organs in motion. Still images are also captured and stored either on film or electronically on a computer.

Until recently, x-ray images were maintained as hard film copy (much like a photographic negative). Today, most images are digital files that are stored electronically. These stored images are easily accessible and are sometimes compared to current x-ray images for diagnosis and disease management.

## How is the procedure performed?

The lower GI exam 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 equipment will allow patients to remain in the same position throughout the exam.

When the examination is completed, you will 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, the 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 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 turned into 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 exam. 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 will 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.

## 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 diagnostic range.

### Risks

- There is always a slight chance of cancer from exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
- The effective radiation dose from this procedure is about 8 mSv, which is about the same as the average person receives from background radiation in 3 years.
- 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 councils continually review and update the technique standards used by radiology professionals.

State-of-the-art x-ray systems have tightly controlled x-ray beams with significant filtration and dose control methods to minimize stray or 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.



*Normal air contrast barium enema*

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