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## X-ray (Radiography), Upper GI Tract

### What is Upper Gastrointestinal (GI) Tract Radiography?

Upper gastrointestinal tract radiography, also called an upper GI, is an x-ray examination of the pharynx, esophagus, stomach and first part of the small intestine (also known as the duodenum). Images are produced using a special form of x-ray called fluoroscopy and an orally ingested contrast material called barium.

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.

Fluoroscopy makes it possible to see internal organs in motion. When the upper GI tract is coated with barium, the radiologist is able to view and assess the anatomy and function of the esophagus, stomach and duodenum.

An x-ray examination that evaluates only the pharynx and esophagus is called a barium swallow.

In addition to drinking barium, some patients are also given baking-soda crystals (similar to Alka-Seltzer) to further improve the images. This procedure is called an air-contrast or double-contrast upper GI.

On occasion, some patients are given an orally ingested iodinated contrast material, which is a clear liquid, instead of barium. For example, the alternative oral contrast could be used if a patient recently had surgery on their upper gastrointestinal tract.

### What are some common uses of the procedure?

An upper GI examination helps evaluate digestive function and can detect:

- ulcers
- tumors
- inflammation of the esophagus, stomach and duodenum
- hiatal hernias
- scarring
- blockages
- abnormalities of the muscular wall of GI tissues



The procedure is also used to help diagnose the cause of symptoms such as:

- difficulty swallowing
- chest and abdominal pain
- reflux (a backward flow of partially digested food and digestive juices)
- unexplained vomiting
- severe indigestion
- blood in the stool (indicating internal GI bleeding)

## How should I prepare?

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

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.

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 ([www.RadiologyInfo.org/en/safety/](http://www.RadiologyInfo.org/en/safety/)) for more information about pregnancy and x-rays.

To ensure the best possible image quality, your stomach must be empty of food. Therefore, your doctor will likely ask you not to eat or drink anything (including any medications taken by mouth, especially antacids) and to refrain from chewing gum after midnight on the day of the examination.

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, removable dental appliances, eye glasses and any metal objects or clothing that might interfere with the x-ray images.

## What does the x-ray 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. 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 an image intensifier 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 digital image recording plate.

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 bright white, this special x-ray technique makes it possible for the physician to view joints or 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 frequently compared to current x-ray images for diagnosis and disease management.

## How is the procedure performed?

A radiologic technologist and a radiologist, a physician specifically trained to supervise and interpret radiology examinations, guide the patient through the upper GI series.



As the patient drinks the liquid barium, which resembles a light-colored milkshake, the radiologist will watch the barium pass through the patient's digestive tract on a fluoroscope, a device that projects radiographic images in a movie-like sequence onto a monitor. The exam table will be positioned at different angles and the patient's abdomen may be compressed to help spread the barium. Once the upper GI tract is adequately coated with the barium, still x-ray images will be taken and stored for further review.

Children usually drink barium contrast material without any objection. If a child will not drink the contrast, the radiologist may need to pass a small tube into the stomach to complete the examination.

Very young children may be placed on a special rotating platform to help turn them into slanted positions. This allows the radiologist to see all the organs. Older children will be asked to hold very still and may be asked to hold their breath for a few seconds while the x-ray pictures are taken.

Older children may undergo a double-contrast upper GI series. The patient will swallow baking-soda crystals that create gas in the stomach while additional x-rays are taken.

When the examination is complete, you will be asked to wait until the radiologist determines that all the necessary images have been obtained.

This exam is usually completed within 20 minutes.

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

Occasionally, patients find the thick consistency of the barium unpleasant and difficult to swallow. The liquid barium has a chalky taste that may be masked somewhat by added flavors such as strawberry or chocolate.

Being tilted on the examination table and having pressure applied to the abdomen can be uncomfortable for some patients. The examination may also make you feel bloated.

If you receive gas-producing crystals, you may feel the need to belch. However, the radiologist or technologist will tell you to try to hold the gas in (by swallowing your saliva if necessary) to enhance the detail on the x-ray images.

In some medical centers, the technologist can minimize patient movement by automatically tilting the examining table. These actions ensure that the barium is coating all parts of the upper GI tract. As the procedure continues, the technologist or the radiologist may ask you to drink more barium. You may hear the mechanical noises of the radiographic apparatus moving into place during the exam.

After the examination, you can resume a regular diet and take orally administered medications unless instructed otherwise by your doctor.

The barium may color your stools gray or white for 48 to 72 hours after the procedure. Sometimes the barium can cause temporary constipation, which is usually treated by an over-the-counter laxative. Drinking large quantities of fluids for several days following the test can also help. If you are unable to have a bowel movement or if your bowel habits undergo any significant changes following the exam, you should contact your physician.

## 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 are often necessary, and your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a suspicious or questionable finding needs clarification with additional views or a special imaging technique. A follow-up examination may be necessary so that any change in a known abnormality can be detected over time. Follow-up examinations are sometimes the best way to see if treatment is working or if an abnormality is stable over time.

## What are the benefits vs. risks?

### Benefits

- Upper GI tract radiography is an extremely safe, noninvasive procedure.
- The results of the upper GI series usually lead to accurate evaluation of the esophagus, stomach and duodenum.
- 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 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

([www.RadiologyInfo.org/en/safety/](http://www.RadiologyInfo.org/en/safety/)) for more information about radiation dose.

- Occasional patients may be allergic to the flavoring added to some brands of barium. If you have experienced allergic reactions after eating chocolate, certain berries or citrus fruit, be sure to tell your physician or the technologist before the procedure.
- There is a slight chance that some barium could be retained, leading to a blockage of the digestive system. Therefore, patients who have a known obstruction in the GI tract should not undergo this examination.
- Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. See the Safety page ([www.RadiologyInfo.org/en/safety/](http://www.RadiologyInfo.org/en/safety/)) 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 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 Upper Gastrointestinal (GI) Tract Radiography?

Mild irritation of the lining of the stomach or esophagus is difficult to detect, as well as ulcers smaller than 1/4 inch in diameter. The test will detect larger ulcers. It can also suggest the presence of underlying infection with the bacterium, *Helicobacter pylori*, the most common cause of ulcers; but additional noninvasive tests such as a blood test or breath test may be required to confirm this infection. Finally, biopsies of any abnormal areas cannot be performed with this test.

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