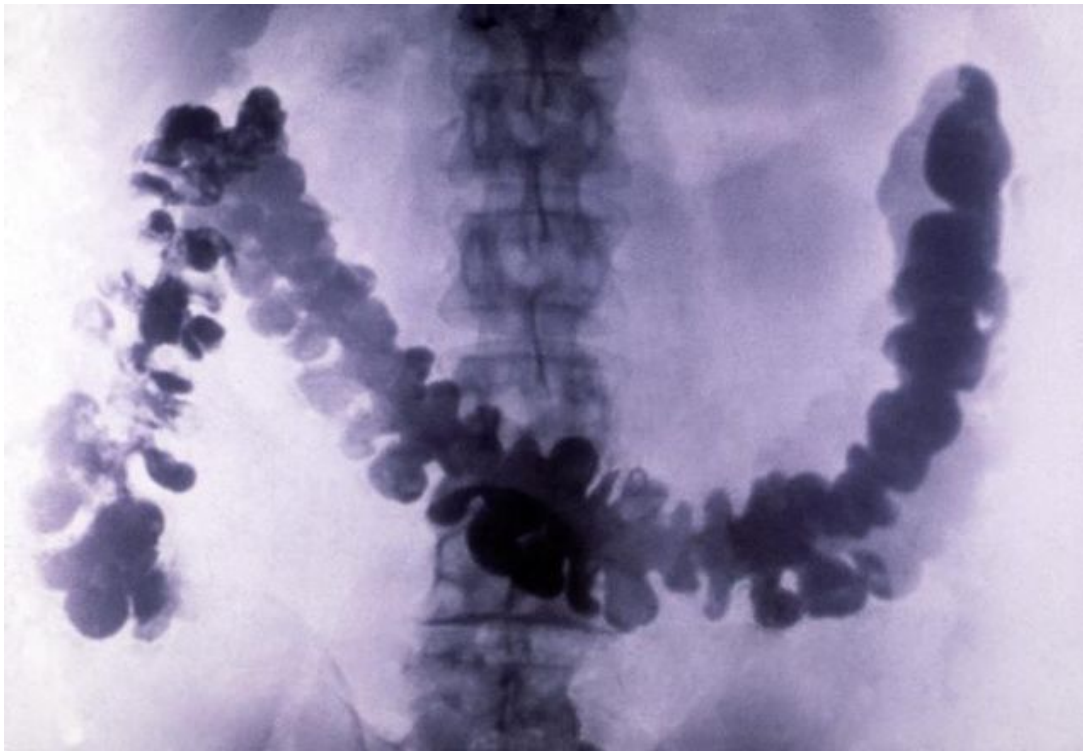


Medical Imaging: Fluoroscopy

[See online here](#)

Fluoroscopy is an imaging technique that employs X-rays to visualize real-time images or videos of the body. The examined organ is made radio-opaque by using some form of the dye. In the past, fluoroscopy studies were performed in patients suspected to have structural esophageal or upper gastrointestinal lesions and such structural abnormalities were visualized after a barium swallow. Nowadays, fluoroscopy is reserved for the diagnostic workup of esophageal motility disorders including achalasia and esophageal sphincter diseases such as gastroesophageal reflux disease.



Fluoroscopy and Its Safety

Fluoroscopy uses conventional X-rays to obtain live still pictures or a video of the patient's body. At one time, fluoroscopy was associated with high doses of radiation. However, recent modifications of fluoroscopy equipment **minimize the amount of radiation and lower the associated risks.**

Modern fluoroscopy machines have a display that shows the duration and cumulative radiation dose to the patient. This can guide the making process of the doctor's decision and **can make the doctor terminate the procedure** if the duration is considered too long.

Fluoroscopy machines now use **better X-ray filters to minimize radiation** injury with

lengthy procedures. Additionally, the irradiated fields now are much smaller than in the past. Images can now be digitally stored, which means the doctor can refer to previous images without re-exposing the patient to radiation again. Finally, **accurate laser localization is now used to identify the target precisely** so that unnecessary repetitions can be avoided.

Clinical Indications for Fluoroscopy

Today, fluoroscopy is used for diagnostic applications, including **cardiovascular interventions, to monitor catheter introduction** and diagnosing gastrointestinal disease. It is considered inferior to endoscopy, which can also be therapeutic. Additionally, fluoroscopy uses **ionizing radiation**, so it is contraindicated in pregnant women.

Use of Barium

Esophageal functional and motility disorders can be visualized and assessed with fluoroscopy. Barium is used to make the stomach, esophagus, or oropharynx opaque to X-rays; however, if it leaks from a perforated viscus, it leads to **barium toxicity**. Thus, its use in clinical practice is becoming less common.

Gastroesophageal Reflux Imaging

Upper gastrointestinal series study

Patients presenting with heartburn or other symptoms suggestive of **gastroesophageal reflux disease** should undergo an upper gastrointestinal series study with contrast enhancement.

The main goal of the upper gastrointestinal series is to **identify the anatomy of the esophagus and exclude strictures**. Barium esophagograms, or barium swallows, are the main methods used to identify structural abnormalities of the esophagus, esophageal hiatus, strictures, ulcers, or hiatal hernias.

Barium esophagogram

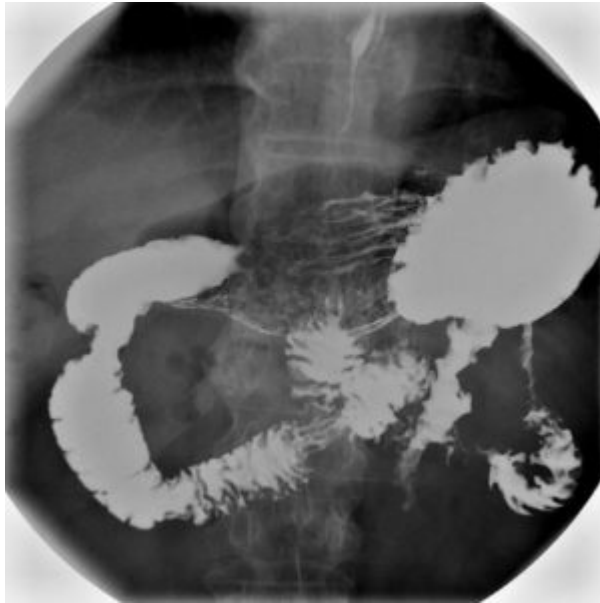


Image: "X-ray of the stomach with both positive (bariumsulphate) and negative (CO2)contrastmedia" by Lucien Monfils. License: [CC BY-SA 3.0](#)

Typically, the barium esophagogram is **performed on multiple phases**. The patient is instructed to swallow a high-density barium solution, and double-contrast views are taken with the patient in the upright and prone positions. A lower-density barium suspension is also used in the subsequent step. Finally, mucosal relief images are obtained.

Esophagitis is better visualized with double-contrast imaging. Esophageal strictures, rings, or hiatal hernias are better visualized with single-contrast techniques.

Single- versus double-contrast imaging

Single-contrast imaging	Double-contrast imaging
<ul style="list-style-type: none"> • Uses only a contrast agent to fill the bowel lumen • Used to see filling defects 	<ul style="list-style-type: none"> • Uses air and a contrast agent to distend the bowel and coat the wall • Used to see mucosal abnormalities of the wall

Fluoroscopy

While these images can be obtained with routine radiographs, fluoroscopy makes it easier to visualize the reflux part of the disease. Additionally, fluoroscopy can produce a live video of the barium swallow study. However, the degree of confidence fluoroscopy results is low. Therefore, these studies are usually used to detect severe esophageal lesions that are known to complicate the endoscopy procedure afterward but are **not specific enough to confirm a diagnosis of esophageal reflux disease.**

Achalasia Imaging



Image: "Achalasia2010" by James Heilman, MD. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

Achalasia is an **esophageal motor disorder** that is characterized by an increased tone in the lower esophageal sphincter. Peristalsis movements are absent in the distal portion of the esophagus, and the lower esophageal sphincter tends to show **poor coordination with swallowing in the patient**. Patients with achalasia present with dysphagia to solids and liquids, chest pain, and regurgitation that are unresponsive to proton pump inhibitors.

Esophageal motility testing

Typical presentation

Esophageal motility testing is indicated **in any patient suspected to have achalasia**. It consists of manometry testing of the **pressure of the lower esophageal sphincter and testing for peristalsis**. Patients with a residual lower esophageal sphincter pressure of 10 mmHg or more and absent peristalsis in the distal part of the esophagus are diagnosed with achalasia.

Use of barium in atypical presentation

Unfortunately, this **typical picture is not seen in all patients with achalasia**. Patients with less than optimum imaging benefit from barium swallow and esophagogram studies, especially when combined with fluoroscopy. The **barium study's goal is to provide supporting evidence for the diagnosis of achalasia**.

The main findings of barium swallow studies in achalasia include the **bird's beak deformity and esophageal dilation**. The correlation between the degree of esophageal dilation and the severity of the symptoms is not always straightforward.

Patients with a normal barium swallow study who have symptoms and signs of achalasia should still undergo esophageal manometry testing and possibly endoscopy.

Patients with symptoms and signs suggestive of esophageal obstruction should also undergo a **computed tomography scan to exclude esophageal carcinoma, strictures, or other malignant diseases**. Oral contrast with computed tomography scanning of the upper gastrointestinal tract can provide excellent images for 3D

reconstruction of the upper gastrointestinal tract.

Obsolete Fluoroscopy Procedures

Small Bowel Follow-Through

This technique is **no longer used in clinical practice** because the diagnostic yield of small bowel follow-through ranged between 0 and 20%. Computed tomography enterography and capsule endoscopy provide more reliable diagnoses. The small bowel follow-through used contrast to visualize the stomach and the upper part of the small intestine to rule out conditions such as duodenal disease.

Barium Enema and Colon Cancer

A barium enema is **no longer commonly used** to evaluate patients for colon cancer because of its **very high false-negative rate** (22%). Colonoscopy, computed tomography scans, and magnetic resonance imaging studies are now standard practices. If a colonoscopy is incomplete, a double-contrast barium enema should be performed.

After the barium enema, a carcinoma can appear like an apple core lesion with the fluoroscope. This is due to stricture formation and ulceration. Polyps and adenomatous polyposis can be visualized easily with a barium enema study.

References

Panchbhavi, Vinod K. 2014. "[Fluoroscopy.](http://emedicine.medscape.com/article/1890603-overview)" Available at:
<http://emedicine.medscape.com/article/1890603-overview>

Sawyer, Michael A.J. 2015. "[Gastroesophageal Reflux Imaging.](http://emedicine.medscape.com/article/368861)" Available at:
<http://emedicine.medscape.com/article/368861>

Taylor, Catherine R. 2017. "[Colon Cancer Imaging.](http://emedicine.medscape.com/article/367061-overview#a2)" Available at:
<http://emedicine.medscape.com/article/367061-overview#a2>

Legal Note: Unless otherwise stated, all rights reserved by Lecturio GmbH. For further legal regulations see our [legal information page](#).

Notes