

Routine Radiology

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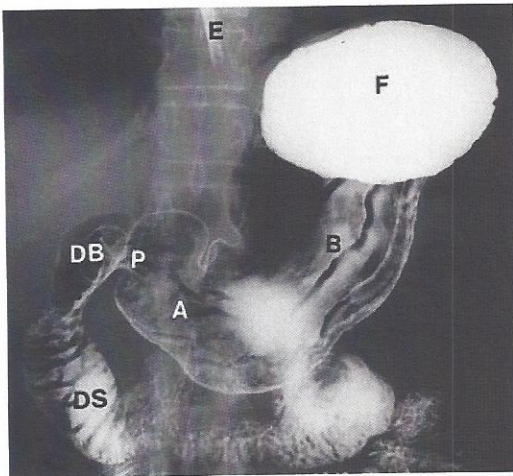
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Also known as a radiograph, an x-ray is a noninvasive medical test that helps physicians diagnose and treat medical conditions. It involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body.

Fluoroscopy

Fluoroscopy is a type of medical imaging that shows a continuous x-ray image on monitor, creating an “x-ray movie”. It is used to diagnose or treat patients by displaying the movement of a body part of an instrument or dye (contrast agent) through the body. For example, it can view movement through the GI tract, visualize blood flow to organs, and view fractures and fracture treatments. Major risks include radiation-induced injuries to the skin and underlying tissue, and the small possibility of developing a radiation-induced cancer some time later in life. However,

the benefit of the fluoroscopy far outweighs the small cancer risk associated with the procedure.



Upper Gastrointestinal Tract X-Ray

Occasionally called an upper GI, this procedure is an x-ray examination of the pharynx, esophagus, stomach, and first part of the small intestine (duodenum). Images are produced using a fluoroscopy and an orally ingested contrast material known as barium, which is used to make parts of the gastrointestinal tract opaque. 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 known as an air-contrast or double-contrast upper GI. This procedure 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

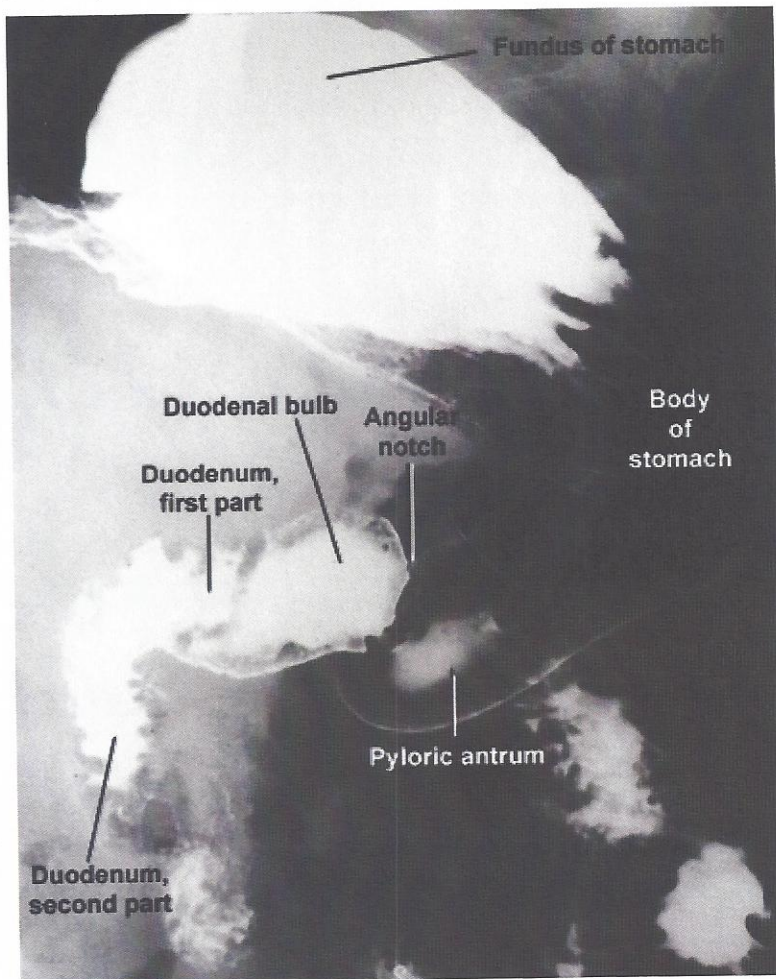
* A hiatal hernia occurs when part of your stomach pushes upward through your diaphragm. In most cases, a small hiatal hernia doesn't cause problems, and you may never know you have a hiatal hernia unless your doctor discovers it when checking for another condition. But a large hiatal hernia can allow food and acid to back up into your esophagus, leading to heartburn.

The upper GI 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)

Before the procedure, the stomach must be empty of food to ensure the best possible image quality. Therefore, the doctor will likely ask the patient 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. The patient may be asked to remove some or all of their clothes and to wear a gown during the exam. They 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.

A radiologic technologist and a radiologist (a physician specifically trained to supervise and interpret radiology examinations) guide the patient through the procedure. 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. 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.

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 the patient feel bloated.

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 the patient to drink more barium.

The radiologist will interpret the results and send them to the referring physician to discuss with the patient.

Lower Gastrointestinal Tract X-Ray

This procedure is also called a lower GI. It is an x-ray examination evaluates the right or ascending colon, the transverse colon, the left or descending color, the sigmoid colon, and the rectum. The appendix and a portion of the distal small intestine may also be included. The lower GI also uses fluoroscopy and the contrast material barium. 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. A physician may order a lower GI in order to detect:

- Benign tumors (such as polyps)
- Cancer
- Causes of other intestinal illnesses

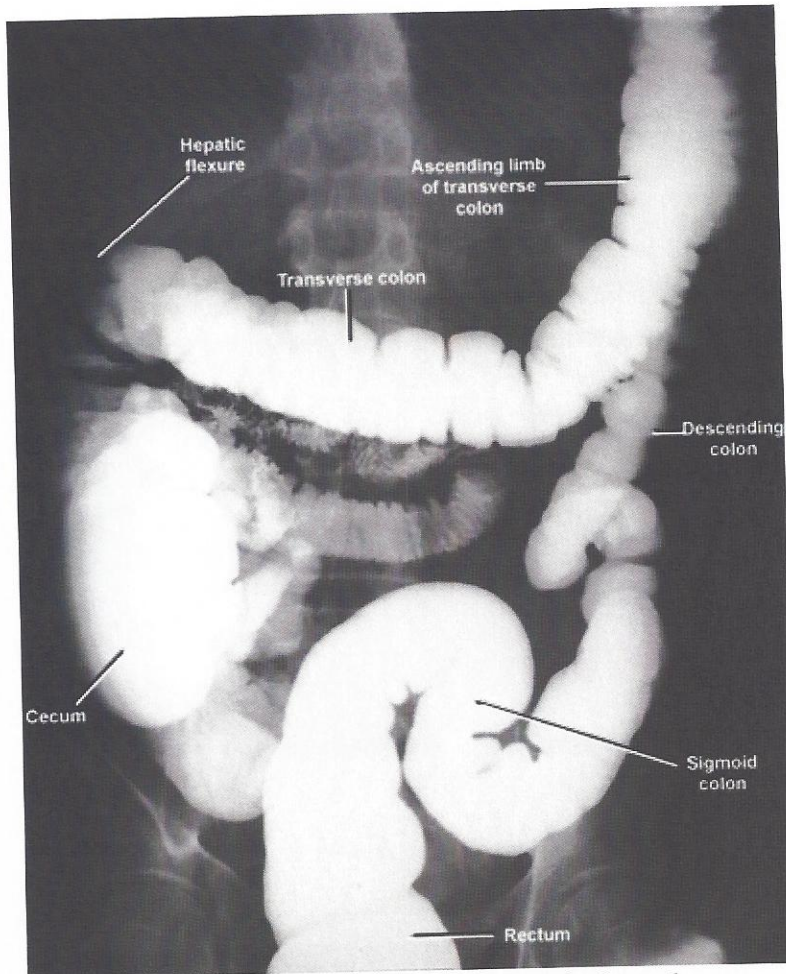
The procedure is frequently performed to help diagnose symptoms such as:

- 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**.

*Crohn's disease is an inflammatory bowel disease that causes inflammation of the lining of the digestive tract. It can lead to abdominal pain, severe diarrhea, and even malnutrition. It can also involve different areas of the digestive tract in different people. The inflammation caused by Crohn's disease often spreads deep into the layers of affected bowel tissue. It can be painful and sometimes leads to life threatening complications. There is no known cure, but therapies can help reduce the sign and symptoms.

**Ulcerative Colitis is also an inflammatory bowel disease that causes long lasting inflammation in part of the digestive tract. It is a chronic condition, so symptoms develop over time rather than suddenly. It usually affects only the innermost lining of the large intestine (colon) and rectum. It



only occurs through continuous stretching of your colon. There is no known cure, but therapies are available and may help reduce the signs and symptoms.

On the day before the procedure the patient 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, the patient should not eat or drink anything. The patient 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. An enema preparation involves injecting liquid into the intestine through the rectum, or

administering food or drugs to help clear the bowel.

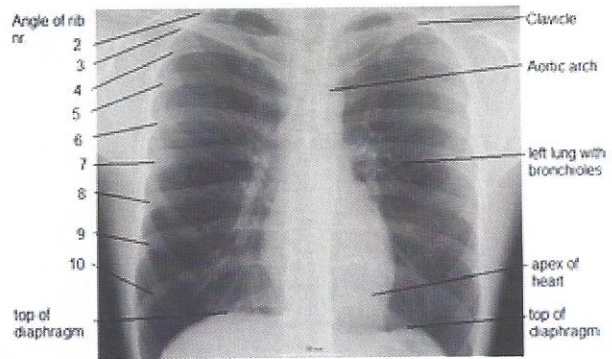
The exam is usually scheduled in the morning to reduce the fasting time of the patient. A radiology technologist and a radiologist also guide the patient throughout the exam. The patient is positioned on the examination table and an x-ray film is taken to ensure the bowel is clean. After performing a 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.

The patient 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.

Chest X-Ray

The chest x-ray is the most commonly performed diagnostic x-ray examination. It takes images of the heart, airways, blood vessels, and bones of the spine and chest. The chest x-ray is performed to evaluate the lungs, heart and chest wall. It is the first imaging test used to help diagnose:

- Shortness of breath
- A bad or persistent cough
- Chest pain or injury
- Fever



Physicians use the examination to help diagnose or monitor treatment for conditions such as

- Pneumonia*
- Heart failure and other heart problems
- Emphysema**
- Lung cancer
- Other medical conditions

*Pneumonia is inflammation of the lung caused by infection. Bacteria, viruses, fungi or parasite can cause pneumonia.

**Emphysema occurs when the air sacs in the lungs are gradually, making one progressively more short of breath. It is one of several diseases known as chronic obstructive pulmonary disease. Smoking is the leading cause of emphysema. As it worsens, emphysema turns the spherical air sacs (clustered like bunches of grapes) into large irregular pockets with gaping holes in their inner walls. This reduces the amount of oxygen that reaches the bloodstream. Emphysema also destroys the elastic fibers that hold open the small airways leading to the air sacs. Thus, air is trapped in the lungs. Treatment cannot reverse the damage; it may only slow the progression.

A chest x-ray requires no special preparation. Patients will be asked to remove some or all of their clothes and to wear a special gown during the exam. Jewelry, removable dental appliances, eye glasses and any metal objects or clothing that might interfere with the x-ray images are removed.

On a chest x-ray, the ribs and spine will absorb much of the radiation and appear white or light gray on the image. Lung tissue absorbs little radiation and will appear dark on the image. Typically, two views of the chest are taken, and one from the back and the other from the side of the body as the patient stands against the image recording plate. The technologist, an individual specially trained to perform radiology examinations, will position the patient with hands on hips and chest pressed against the image plate. For the second view, the patient's side is against the image plate with arms elevated. The patient 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.

Bone X-Ray

A bone x-ray makes images of any bone in the body, including the hand, wrist, arm, elbow, shoulder, foot, ankle, leg, knee, thigh, hip, pelvis, or spine. A bone x-ray is used to:

- Diagnose fractured bones or joint dislocation
- Demonstrate proper alignment and stabilization of bony fragments following treatment of a fracture
- Guide orthopedic surgery, such as spine repair/fusion, joint replacement, and fracture reductions
- Look for injury, infection, arthritis, abnormal bone growths, and bony changes seen in metabolic conditions
- Assist in the detection and diagnosis of bone cancer
- Locate foreign objects in soft tissues around or in the bones

The technologist positions the patient on the x-ray table and places the x-ray film holder or digital recording plate under the table in the area of the body being imaged. When necessary, sandbags, pillows or other positioning devices will be used to help you maintain the proper position. The patient 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 blurred image. Two or three images will typically be taken around a joint (knee, elbow, or wrist). A bone x-ray examination is usually completed within five to 10 minutes. While x-ray images are among the clearest, most detailed views of bone, they provide little information about muscles, tendons or joints.

Video Fluoroscopic Swallowing Exam (VFSE)

A video fluoroscopic swallowing exam (VFSE) is also sometimes called a modified barium swallowing exam (MBS) is a radiologic examination of the swallowing function. It uses fluoroscopy. The patient is observed swallowing a substance, such as barium, that can be seen on fluoroscopy to evaluate his or her ability to swallow safely and effectively. Patients are often observed swallowing various consistencies and textures, ranging from thin barium to barium-coated cookies. The VFSE is used in patients of all ages with dysphagia, or difficulty swallowing. It is used primarily for evaluation of the swallowing function and any evidence of aspiration, which is liquid or food going into the airway (the trachea) instead of staying in the pharynx and esophagus. In order to help a patient swallow more safely and efficiently, experts such as speech pathologists may suggest certain maneuvers such as chin tuck or tilting or turning the head while swallowing. The VFSE may also be performed because of a known or suspected swallowing problem or because of the presence of conditions that are strongly associated with swallowing difficulty such as:



- Coughing and/or choking while eating or drinking
- Coughing, choking or drooling with swallowing
- wet-sounding voice
- Changes in breathing when eating or drinking
- Frequent respiratory infections
- Known or suspected aspiration pneumonia
- Masses on the tongue, pharynx or larynx

- Muscle weakness, or myopathy, involving the pharynx
- Neurologic disorders likely to affect swallowing

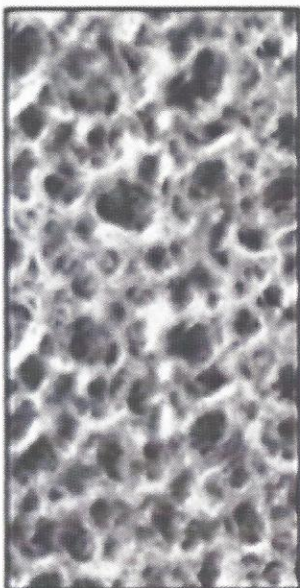
The patient will be positioned upright on a chair or stool or be standing on a platform. The patient will be directed to eat and drink controlled amounts of foods and liquids in a variety of consistencies to which barium has been added. The speech pathologist may try to help the patient swallow better by using different cups or utensils or changing the patient's body position. As the patient eat and drink, the x-ray camera will be moved near their throat. The speech-language pathologist and radiologist will watch the patient swallow in real-time through a fluoroscope. The imaging portion of this procedure is usually completed within 15 minutes.

Bone Densitometry (DEXA)

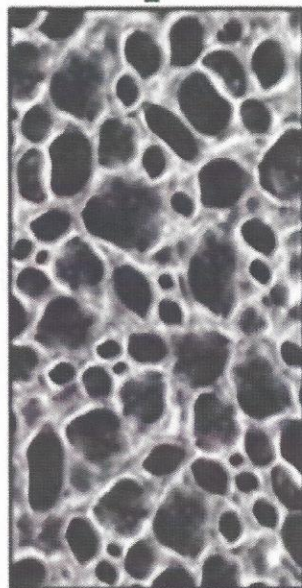
Bone density scanning, also called dual-energy x-ray absorptiometry (DXA) or bone densitometry, is an enhanced form of x-ray technology that is used to measure bone loss. DXA is today's established standard for measuring bone mineral density (BMD). DXA is most often performed on the lower spine and hips. DXA is most often used to diagnose osteoporosis, a condition that often affects women after menopause but may also be found in men. Osteoporosis involves a gradual loss of calcium, as well as structural changes, causing the bones to become thinner, more fragile and more likely to break. DXA is also effective in tracking the effects of treatment for osteoporosis and other conditions that cause bone loss. The DXA test can also assess an individual's risk for developing fractures. The risk of fracture is affected by age, body weight, history of prior fracture, family history of osteoporotic fractures and life style issues such as cigarette smoking and excessive alcohol consumption. These factors are taken into consideration when deciding if a patient needs therapy.

On the day of the exam the patient may eat normally. The patient should not take calcium supplements for at least 24 hours before their exam.

Normal Bone



Osteoporosis



The DXA machine sends a thin, invisible beam of low-dose x-rays with two distinct energy peaks through the bones being examined. One peak is absorbed mainly by soft tissue and the other by bone. The soft tissue amount can be subtracted from the total and what remains is a patient's bone mineral density.

This examination is usually done on an outpatient basis.

In the Central DXA examination, which measures bone density in the hip and spine, the patient lies on a padded table. An x-ray generator is located below the patient and an imaging device, or

detector, is positioned above. To assess the spine, the patient's legs are supported on a padded box to flatten the pelvis and lower (lumbar) spine. To assess the hip, the patient's foot is placed in a brace that rotates the hip inward. In both cases, the detector is slowly passed over the area, generating images on a computer monitor.

The peripheral tests are simpler. The finger, hand, forearm or foot is placed in a small device that obtains a bone density reading within a few minutes.

An additional procedure called Lateral Vertebral Assessment (LVA) is now being done at many centers. LVA is a low-dose x-ray examination of the spine to screen for vertebral fractures that is performed on the DXA machine. The LVA test adds only a few minutes to the DXA procedure.

The test results will be in the form of two scores:

T score — this number shows the amount of bone the patient has compared with a young adult of the same gender with peak bone mass. A score above -1 is considered normal. A score between -1 and -2.5 is classified as osteopenia (low bone mass). A score below -2.5 is defined as osteoporosis. The T score is used to estimate the patient's risk of developing a fracture.

Z score — this number reflects the amount of bone the patient has compared with other people in the same age group and of the same size and gender. If this score is unusually high or low, it may indicate a need for further medical tests.

Small changes may normally be observed between scans due to differences in positioning and usually are not significant.

Personnel of Routine Radiology

Radiology technicians and technologists, also called radiographers usually perform diagnostic imaging examinations like x-rays, computed tomography, magnetic resonance imaging and mammography for physicians to diagnose possible internal medical issues. They use x-ray machines to capture internal images of a patient. The radiographer prepares a patient for radiologic exams and tests by

- Explaining the procedure
- Removing jewelry and other articles through which x-rays cannot pass
- Positioning patients so that the parts of the body can appropriately radiographed
- Using instruments, they measure the thickness of the section to be radiographed and set controls on an x-ray machine to produce images of the appropriate density, detail, and contrast

In addition to preparing patients and operating equipment, radiology techs also keep patient records and adjust and maintain equipment. They also may prepare work schedules, evaluate purchases of equipment, or manage a radiology department.

An associate's degree is the most prevalent form of education among radiologic technologists and technicians, though some may receive a certificate. Radiology techs can learn more about different types of medical imaging either through a hospital or college educational program.

It is not the job of the radiology tech to actually diagnose diseases or medical conditions. Doctors will order images and then pick them up for interpretation. A good tech will understand the images they take, so that they know when more or better images are needed. This saves doctors time and, in turn, could save a patient's life. Radiology techs must also take care of their equipment. The machines used for diagnostic imagery are worth hundreds of thousands of dollars. Following proper procedures for maintenance and cleaning is an important part of the job every day.

A radiologist examines and diagnoses disorders and diseases of the human body using x-ray and radioactive materials. They consult with patients to determine the appropriate course of treatment. They treat benign and malignant growths with exposure to x-rays and radioisotopes. To be a radiologist, a degree in medicine from an accredited school and a license to practice is required. They may be required to have at least 2-4 years of radiology experience. A four year undergraduate degree is required before one can move on to proper medical courses. Those wishing to be a radiologist will have to take on a number of varied subjects such as inorganic and organic chemistry, mathematics, biology and physics in this time. This course is generally very important for the medical school. They will be required to spend at least one year to finish a non-radiology residency and at least four years to complete a radiology residency. After the residency is over, the radiologists would have to go for board certification. There are different exams that one will be required to complete successful, such as a physics exam, a clinical exam, a written cognitive exam, a cancer exam, etc. After all this, the radiologist can either practice or enter a fellowship program in a radiologic sub-specialty, but the fellowship will take a few more years.

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