

William F. Erber, M.D., P.C.
Gastroenterology and Endoscopy
Diseases of the Digestive Tract, Liver and Pancreas
Board Certified

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Esophageal manometry

How the Test is Performed

During esophageal manometry, a thin, pressure-sensitive tube is passed through your nose, down the esophagus, and into your stomach.

Before the procedure, you receive numbing medicine inside the nose. This helps make the insertion of the tube less uncomfortable.

After the tube is in the stomach, the tube is pulled slowly back into your esophagus. At this time, you are asked to swallow. The pressure of the muscle contractions is measured along several sections of the tube.

While the tube is in place, other studies of your esophagus may be done. The tube is removed after the tests are completed. The test takes about 1 hour.

How to Prepare for the Test

You should not have anything to eat or drink for 8 hours before the test. If you have the test in the morning, do not eat or drink after midnight.

Tell your health care provider about all medicines you are taking. These include vitamins, herbs, and other over-the-counter medicines and supplements.

How the Test will Feel

You may have a gagging sensation and some discomfort when the tube passes through your nose and throat.



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Why the Test is Performed

The esophagus is the tube that carries food from your mouth into the stomach. When you swallow, muscles in your esophagus squeeze (contract) to push food toward the stomach. Valves, or sphincters, inside the esophagus open to let food and liquid through.

They then close to prevent food, fluids, and stomach acid from moving backward. The sphincter at the bottom of the esophagus is called the lower esophageal sphincter, or LES.

Esophageal manometry is done to see if the esophagus is contracting and relaxing properly. The test helps diagnose swallowing problems. During the test, the doctor can also check the LES to see if it opens and closes properly.

The test may be ordered if you have symptoms of:

- Heartburn or nausea after eating ([gastroesophageal reflux disease, or GERD](#))
- Problems swallowing (feeling like food is stuck behind the breast bone)

Normal Results

The LES pressure and muscle contractions are normal when you swallow.

What Abnormal Results Mean

Abnormal results may indicate:

- A problem with the esophagus that affects its ability to move food toward the stomach ([achalasia](#))
- A weak LES, which causes heartburn (GERD)



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- Abnormal contractions of the esophagus muscles that do not effectively move food to the stomach ([esophageal spasm](#))

Risks

Risks of this test include:

- Slight nosebleed
- Sore throat
- Hole, or perforation, in the esophagus (this rarely happens)

Alternative Names

Esophageal motility studies; Esophageal function studies

References

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Vaezi MF. The esophagus: anatomy, physiology, and diseases. In: Flint PW, Haughey BH, Lund VJ, et al., eds. *Cummings Otolaryngology Head and Neck Surgery*

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- [Achalasia](#)
- [Esophageal spasm](#)
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ADDITIONAL MOTILITY TESTING:

<http://www.aboutgimotility.org/site/about-gi-motility/motility-testing/>

Esophagram

An esophagram is a radiographic study of the esophagus in which the patient swallows barium (a contrast agent) and the radiologist visualizes the esophagus and stomach under fluoroscopy. This test can help detect if there is a problem with a stricture (narrowing) in the esophagus or if a hiatal hernia is present. It can also give a rough estimate of the degree of esophageal muscle contractions.

Esophageal manometry

Esophageal manometry involves a small diameter tube passed through the nose into the esophagus. The nose and throat of the patient are numbed prior to this procedure. Once the tube is in position, the patient is asked to swallow. Measurements of esophageal function are made by the use of pressure readings of the muscle contractions (motility) of the esophagus. Lower esophageal sphincter muscle pressure can also be taken. This test helps physicians interpret whether there is a problem with motility of the esophagus or the function of the lower esophageal sphincter (LES).

Ambulatory 24-hour pH probe

An ambulatory 24-hour pH probe is a test that consists of a small tube passed through the nose into the esophagus at the level of the LES. A pH sensor at the tip of the tube allows measurements of acid exposure in the esophagus to be collected on a portable computer. The pH probe is worn for 24 continuous hours. The tube is then removed and the results from the computer are interpreted. These results are compared to what we know is the normal acid exposure in the esophagus. This is considered the "gold standard" for determining if the patient has reflux disease, or GERD.

A special pH-measuring device more recently has been developed that is clipped to the lining of the esophagus, so no tube through the nose into the esophagus is necessary. The pH sensor sends a message to a portable computer that collects data about esophageal acid exposure over 24 hours. The clipped probe in the esophagus slowly detaches itself from the esophagus and is ultimately passed in the stool and discarded.



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Impedance

Impedance is a test is offered at few medical centers. It involves the same type of procedure as a 24-hour pH test (a tube is passed through the nose into the esophagus at the level of the LES). It measures liquid movement from the stomach into the esophagus. This test may be important for people with reflux symptoms who are having bile reflux, not acid reflux, and therefore have normal results from a 24-hour pH probe. Unfortunately, impedance testing cannot be done with the current 24-hour pH-measuring device that is clipped to the lining of the esophagus.

Adapted from [IFFGD Publication #510](#) by William E. Whitehead, PhD, Co-Director, Center for Functional GI & Motility Disorders Center Professor of Medicine, Division of Digestive Diseases Professor of Psychology University of North Carolina, Chapel Hill, NC, and IFFGD Publication #529 by Mark H. DeLegge, MD, FACP, Digestive Disease Center, Medical University of South Carolina, SC.

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Testing of the Stomach

Gastric Tests

Gastric emptying

Tests used to evaluate patients with delayed or altered gastric emptying usually include upper endoscopy (EGD) to look inside the stomach through an endoscope passed through the mouth into the esophagus and stomach, and gastric emptying scintigraphy (a nuclear medicine study) to measure how quickly food leaves the stomach. The test of gastric emptying involves eating food that has a radioactive substance added to it, so that the rate of emptying of the stomach can be measured with a special camera.

Another, less frequently used test is the electrogastragram, which measures small electrical currents that come from the stomach muscle and that indicate whether the 3 per minute contractions of the lower stomach are occurring normally. The contractions of the stomach can also be measured directly by passing a tube with pressure sensors on it down the nose and into the stomach.

A newer device that uses a wireless capsule, which the patient swallows has recently been introduced to measure gastric emptying. The device monitors and records data on a small portable receiver as the capsule passes through the GI tract. The data collected is later evaluated by the doctor.

Adapted from [IFFGD Publication #510](#) by William E. Whitehead, PhD, Co-Director, Center for Functional GI & Motility Disorders Center Professor of Medicine, Division of Digestive Diseases Professor of Psychology University of North Carolina,



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Chapel Hill, NC, and IFFGD Publication #529 by Mark H. DeLegge, MD, FACP, Digestive Disease Center, Medical University
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Testing of the Small Intestine

Small Intestinal dysmotility

Small bowel manometry (antroduodenal manometry)

A test that is used to detect intestinal motility abnormalities is small bowel manometry (antroduodenal manometry). This involves placing a long tube with pressure sensors on it that passes through the stomach and into the small intestine. It is important to record several of the housekeeper wave fronts to be sure of the diagnosis. In some clinics this is done by recording for five hours or more while the patient lies on a bed in the clinic, but in other clinics, the pressure sensors are connected to a battery-operated computer and the patient is sent home to return the next day.

Adapted from [IFFGD Publication #162](#) by William Whitehead, PhD, Co-Director, Center for Functional GI & Motility Disorders Center Professor of Medicine, Division of Digestive Diseases Professor of Psychology University of North Carolina, Chapel Hill, NC, and NIH Publication No. 05-4333, November 2004; the text of which is not copyrighted.

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Testing of the Large Intestine

Structure of the colon

Barium enema

There are multiple methods available to examine the structure of the colon. One method uses a contrast material that can be seen on x-ray (barium enema) to outline the anatomy of the colon. A barium enema consists of the injection of radiation-dense barium through the anus into the colon. The doctor may then see the colon outline on x-ray films.



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Constipation

Colonic transit time (Sitzmark) study

A colonic transit time (Sitzmark) study is a simple but effective method of studying how well the bowel propels food along. Normally, it takes only a little time for food that is eaten to progress through the small intestine into the colon. It then may take longer periods for the remaining material to pass through the colon and to be expelled as stool. There are several ways of performing the study. In some laboratories, for example, three capsules containing small markers are swallowed, one on each of three successive mornings (Days 1, 2 & 3). On the following day (Day 4) and three days later (Day 7) a plain x-ray of the abdomen is taken. All of the markers seen on the x-rays of each day are counted and added together. This number is the total transit time. This test is very useful for detecting different types of constipation.

Scintigraphic emptying and transit

Scintigraphic or nuclear medicine studies may be performed by labeling a material with a low-grade nuclear isotope and then following the progress of the material through the intestine. The emissions from the isotope are picked up by a special camera and the data is analyzed by a computer. The radiation dose is very small, even compared with standard contrast x-rays. This technology may be used to evaluate emptying of the stomach, transit through the intestines or emptying of the rectum.

Adapted from [IFFGD Publication #114](#) by W. Grant Thompson, MD, FRCPC, Emeritus Professor of Medicine, University of Ottawa, Ontario, Canada, [IFFGD Publication #111](#) by Bruce A. Orkin, MD, Division of Colon and Rectal Surgery, The George Washington University, Washington, DC, and [IFFGD Publication #162](#) by William Whitehead, PhD, Co-Director, Center for Functional GI & Motility Disorders Center Professor of Medicine, Division of Digestive Diseases Professor of Psychology University of North Carolina, Chapel Hill, NC.

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Testing of the Anorectal and Pelvic Floor Area

Defecating proctography

Defecating proctography, fecogram, and defecography all refer to a study in which the rectum is filled with a semi-solid paste with a consistency of soft stool containing contrast. The individual sits on a commode within an x-ray machine and is then asked to relax, to squeeze, to tense the abdomen and to evacuate the material. X-ray films and video are taken during each phase. The study is then analyzed for anatomic defects such as internal or complete rectal prolapse, enterocele or rectocele, anorectal angles and function of the puborectalis muscle and emptying. This study is particularly useful when evaluating complaints of constipation and difficult evacuation.



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Manometry

Manometry tests the anal canal and provides information about the strength of the anal sphincter muscles. The test measures the pressures in the rectum and in the anal canal and is helpful in defining the strength or weakness of the anal muscles and the sensation and reflex activity of the rectum. It helps to identify the nature of anorectal disorders such as incontinence, constipation and pain. The test is performed with the individual lying comfortably on an examination table on his or her left side. The test takes about 30 minutes and is well tolerated by most people.

Balloon capacity and compliance

A balloon capacity and compliance test studies the function of the rectum and its ability to expand and contract. The test takes about 45 minutes and is performed with the individual on his or her left side on an examination table. An empty, soft, latex balloon attached to a thin plastic catheter is lubricated and gently placed through the anus into the rectum. The balloon is slowly filled with warm water while measurements of volume and pressure are recorded.

Balloon evacuation study

A balloon evacuation study tests pelvic floor relaxation and opening of the anal canal. It is useful in determining how easy or difficult it is to pass a bowel movement. A thin catheter with a small balloon is placed in the rectum. The balloon is gently blown up to different small volumes and the patient is asked to push the balloon out. The maximal volume balloon able to be evacuated is determined.

Pudendal nerve terminal motor latency

Pudendal nerve terminal motor latency tests the pudendal nerves, which are the main bundles of nerve fibers going to the anal sphincter muscles. These nerves may be injured by direct trauma, by age, by stretching during childbirth, or during prolonged straining during bowel movements. A specially designed probe with stimulating and recording electrodes is mounted on the physician's gloved finger which is then placed into the rectum. A very small current is used to stimulate the nerve through the rectal wall. The response of the muscle is recorded and the time from stimulation to response is calculated.

Electromyography (EMG)

Electromyography (EMG) tests the electrical activity in the anal sphincter and pelvic floor muscles. The electrode reads the electrical activity produced by the muscles and amplifies it.



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Ultrasound

Ultrasound is an imaging technique that allows parts of the body beneath the skin to be "seen" without the use of radiation such as x-rays. Sound waves are beamed through the tissues, and the waves bounced back are read and displayed. Imaging of the rectum looks for lesions such as rectal polyps. Ultrasonography of the anal sphincters may be used to search for defects and injuries of these muscles.

Adapted from IFFGD Publication #111 by Bruce A. Orkin, MD, Professor of Surgery; Director, Division of Colon and Rectal Surgery and Director, Colorectal Physiology Laboratory at the George Washington University in Washington, DC.

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