

Appendicitis

National Digestive Diseases Information Clearinghouse



National Institute of
Diabetes and Digestive
and Kidney Diseases

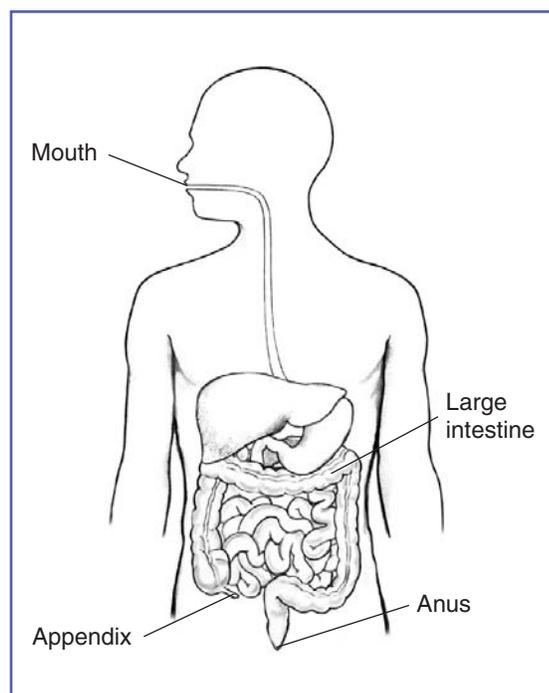
What is appendicitis?

Appendicitis is inflammation of the appendix. Appendicitis is the leading cause of emergency abdominal operations.¹

What is the appendix?

The appendix is a fingerlike pouch attached to the large intestine in the lower right area of the abdomen, the area between the chest and hips. The large intestine is part of the body's gastrointestinal (GI) tract. The GI tract is a series of hollow organs joined in a long, twisting tube from the mouth to the anus. The movement of muscles in the GI tract, along with the release of hormones and enzymes, helps digest food. The appendix does not appear to have a specific function in the body, and removing it does not seem to affect a person's health.

The inside of the appendix is called the appendiceal lumen. Normally, mucus created by the appendix travels through the appendiceal lumen and empties into the large intestine. The large intestine absorbs water from stool and changes it from a liquid to a solid form.



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¹Spirit MJ. Complicated intra-abdominal infections: a focus on appendicitis and diverticulitis. *Postgraduate Medicine*. 2010;122(1):39–51.

What causes appendicitis?

An obstruction, or blockage, of the appendiceal lumen causes appendicitis. Mucus backs up in the appendiceal lumen, causing bacteria that normally live inside the appendix to multiply. As a result, the appendix swells and becomes infected.

Sources of blockage include

- stool, parasites, or growths that clog the appendiceal lumen
- enlarged lymph tissue in the wall of the appendix, caused by infection in the GI tract or elsewhere in the body
- inflammatory bowel disease (IBD), which includes Crohn's disease and ulcerative colitis, long-lasting disorders that cause irritation and ulcers in the GI tract
- trauma to the abdomen

An inflamed appendix will likely burst if not removed.

Who gets appendicitis?

Anyone can get appendicitis, although it is more common among people 10 to 30 years old.¹

What are the symptoms of appendicitis?

The symptoms of appendicitis are typically easy for a health care provider to diagnose. The most common symptom of appendicitis is abdominal pain.

Abdominal pain with appendicitis usually

- occurs suddenly, often waking a person at night
- occurs before other symptoms
- begins near the belly button and then moves lower and to the right

- is unlike any pain felt before
- gets worse in a matter of hours
- gets worse when moving around, taking deep breaths, coughing, or sneezing

Other symptoms of appendicitis may include

- loss of appetite
- nausea
- vomiting
- constipation or diarrhea
- an inability to pass gas
- a low-grade fever that follows other symptoms
- abdominal swelling
- the feeling that passing stool will relieve discomfort

Symptoms vary and can mimic the following conditions that cause abdominal pain:

- intestinal obstruction—a partial or total blockage in the intestine that prevents the flow of fluids or solids.
- IBD.
- pelvic inflammatory disease—an infection of the female reproductive organs.
- abdominal adhesions—bands of tissue that form between abdominal tissues and organs. Normally, internal tissues and organs have slippery surfaces that let them shift easily as the body moves. Adhesions cause tissues and organs to stick together.
- constipation—a condition in which a person usually has fewer than three bowel movements in a week. The bowel movements may be painful.

How is appendicitis diagnosed?

A health care provider can diagnose most cases of appendicitis by taking a person's medical history and performing a physical exam.

If a person does not have the usual symptoms, health care providers may use laboratory and imaging tests to confirm appendicitis. These tests also may help diagnose appendicitis in people who cannot adequately describe their symptoms, such as children or people who are mentally impaired.

Medical History

The health care provider will ask specific questions about symptoms and health history. Answers to these questions will help rule out other conditions. The health care provider will want to know

- when the abdominal pain began
- the exact location and severity of the pain
- when other symptoms appeared
- other medical conditions, previous illnesses, and surgical procedures
- whether the person uses medications, alcohol, or illegal drugs

Physical Exam

Details about the person's abdominal pain are key to diagnosing appendicitis. The health care provider will assess the pain by touching or applying pressure to specific areas of the abdomen.

Responses that may indicate appendicitis include

- **Rovsing's sign.** A health care provider tests for Rovsing's sign by applying hand pressure to the lower left side of the abdomen. Pain felt on the lower right side of the abdomen upon the release of pressure on the left side indicates the presence of Rovsing's sign.
- **Psoas sign.** The right psoas muscle runs over the pelvis near the appendix. Flexing this muscle will cause abdominal pain if the appendix is inflamed. A health care provider can check for the psoas sign by applying resistance to the right knee as the patient tries to lift the right thigh while lying down.
- **Obturator sign.** The right obturator muscle also runs near the appendix. A health care provider tests for the obturator sign by asking the patient to lie down with the right leg bent at the knee. Moving the bent knee left and right requires flexing the obturator muscle and will cause abdominal pain if the appendix is inflamed.
- **Guarding.** Guarding occurs when a person subconsciously tenses the abdominal muscles during an exam. Voluntary guarding occurs the moment the health care provider's hand touches the abdomen. Involuntary guarding occurs before the health care provider actually makes contact and is a sign the appendix is inflamed.

- **Rebound tenderness.** A health care provider tests for rebound tenderness by applying hand pressure to a person's lower right abdomen and then letting go. Pain felt upon the release of the pressure indicates rebound tenderness and is a sign the appendix is inflamed. A person may also experience rebound tenderness as pain when the abdomen is jarred—for example, when a person bumps into something or goes over a bump in a car.

Women of childbearing age may be asked to undergo a pelvic exam to rule out gynecological conditions, which sometimes cause abdominal pain similar to appendicitis.

The health care provider also may examine the rectum, which can be tender from appendicitis.

Laboratory Tests

Laboratory tests can help confirm the diagnosis of appendicitis or find other causes of abdominal pain.

- **Blood tests.** A blood test involves drawing a person's blood at a health care provider's office or a commercial facility and sending the sample to a laboratory for analysis. Blood tests can show signs of infection, such as a high white blood cell count. Blood tests also may show dehydration or fluid and electrolyte imbalances. Electrolytes are chemicals in the body fluids, including sodium, potassium, magnesium, and chloride.
- **Urinalysis.** Urinalysis is testing of a urine sample. The urine sample is collected in a special container in a health care provider's office, a commercial facility, or a hospital and can be tested in the same location

or sent to a laboratory for analysis. Urinalysis is used to rule out a urinary tract infection or a kidney stone.

- **Pregnancy test.** Health care providers also may order a pregnancy test for women, which can be done through a blood or urine test.

Imaging Tests

Imaging tests can confirm the diagnosis of appendicitis or find other causes of abdominal pain.

- **Abdominal ultrasound.** Ultrasound uses a device, called a transducer, that bounces safe, painless sound waves off organs to create an image of their structure. The transducer can be moved to different angles to make it possible to examine different organs. In abdominal ultrasound, the health care provider applies gel to the patient's abdomen and moves a hand-held transducer over the skin. The gel allows the transducer to glide easily, and it improves the transmission of the signals. The procedure is performed in a health care provider's office, an outpatient center, or a hospital by a specially trained technician, and the images are interpreted by a radiologist—a doctor who specializes in medical imaging; anesthesia is not needed. Abdominal ultrasound creates images of the appendix and can show signs of inflammation, a burst appendix, a blockage in the appendiceal lumen, and other sources of abdominal pain. Ultrasound is the first imaging test performed for suspected appendicitis in infants, children, young adults, and pregnant women.

- **Magnetic resonance imaging (MRI).** MRI machines use radio waves and magnets to produce detailed pictures of the body's internal organs and soft tissues without using x rays. The procedure is performed in an outpatient center or a hospital by a specially trained technician, and the images are interpreted by a radiologist. Anesthesia is not needed, though children and people with a fear of confined spaces may receive light sedation, taken by mouth. An MRI may include the injection of special dye, called contrast medium. With most MRI machines, the person lies on a table that slides into a tunnel-shaped device that may be open ended or closed at one end; some machines are designed to allow the person to lie in a more open space. An MRI can show signs of inflammation, a burst appendix, a blockage in the appendiceal lumen, and other sources of abdominal pain. An MRI used to diagnose appendicitis and other sources of abdominal pain is a safe, reliable alternative to a computerized tomography (CT) scan.²
- **CT scan.** CT scans use a combination of x rays and computer technology to create three-dimensional (3-D) images. For a CT scan, the person may be given a solution to drink and an injection of contrast medium. CT scans require the person to lie on a table that slides into a tunnel-shaped device where the x rays are taken. The procedure is performed in an outpatient center or a hospital by an x-ray technician, and the images are

interpreted by a radiologist; anesthesia is not needed. Children may be given a sedative to help them fall asleep for the test. A CT scan of the abdomen can show signs of inflammation, such as an enlarged appendix or an abscess—a pus-filled mass that results from the body's attempt to keep an infection from spreading—and other sources of abdominal pain, such as a burst appendix and a blockage in the appendiceal lumen. Women of childbearing age should have a pregnancy test before undergoing a CT scan. The radiation used in CT scans can be harmful to a developing fetus.

How is appendicitis treated?

Appendicitis is typically treated with surgery to remove the appendix. The surgery is performed in a hospital; general anesthesia is needed. If appendicitis is suspected, especially in patients who have persistent abdominal pain and fever, or signs of a burst appendix and infection, a health care provider will often suggest surgery without conducting diagnostic testing. Prompt surgery decreases the chance that the appendix will burst.

Surgery to remove the appendix is called an appendectomy. A surgeon performs the surgery using one of the following methods:

- **Laparotomy.** Laparotomy removes the appendix through a single incision in the lower right area of the abdomen.
- **Laparoscopic surgery.** Laparoscopic surgery uses several smaller incisions and special surgical tools fed through the incisions to remove the appendix. Laparoscopic surgery leads to fewer complications, such as hospital-related infections, and has a shorter recovery time.

²Heverhagen J, Pfestroff K, Heverhagen A, Klose K, Kessler K, Sitter H. Diagnostic accuracy of magnetic resonance imaging: a prospective evaluation of patients with suspected appendicitis (diamond). *Journal of Magnetic Resonance Imaging*. 2012;35:617–623.

With adequate care, most people recover from appendicitis and do not need to make changes to diet, exercise, or lifestyle. Surgeons recommend limiting physical activity for the first 10 to 14 days after a laparotomy and for the first 3 to 5 days after laparoscopic surgery.

What are the complications and treatment of a burst appendix?

A burst appendix spreads infection throughout the abdomen—a potentially dangerous condition called peritonitis. A person with peritonitis may be extremely ill and have nausea, vomiting, fever, and severe abdominal tenderness. This condition requires immediate surgery through laparotomy to clean the abdominal cavity and remove the appendix. Without prompt treatment, peritonitis can cause death.

Sometimes an abscess forms around a burst appendix—called an appendiceal abscess. A surgeon may drain the pus from the abscess during surgery or, more commonly, before surgery. To drain an abscess, a tube is placed in the abscess through the abdominal wall. The drainage tube is left in place for about 2 weeks while antibiotics are given to treat infection. Six to 8 weeks later, when infection and inflammation are under control, surgeons operate to remove what remains of the burst appendix.

What if the surgeon finds a normal appendix?

Occasionally, a surgeon finds a normal appendix. In this case, many surgeons will remove it to eliminate the future possibility of appendicitis. Occasionally, surgeons find a different problem, which may also be corrected during surgery.

Can appendicitis be treated without surgery?

Nonsurgical treatment may be used if surgery is not available, a person is not well enough to undergo surgery, or the diagnosis is unclear. Nonsurgical treatment includes antibiotics to treat infection.

What should people do if they think they have appendicitis?

Appendicitis is a medical emergency that requires immediate care. People who think they have appendicitis should see a health care provider or go to the emergency room right away. Swift diagnosis and treatment can reduce the chances the appendix will burst and improve recovery time.

Eating, Diet, and Nutrition

Researchers have not found that eating, diet, and nutrition play a role in causing or preventing appendicitis. If a health care provider prescribes nonsurgical treatment for a person with appendicitis, the person will be asked to follow a liquid or soft diet until the infection subsides. A soft diet is low in fiber and is easily digested in the GI tract. A soft diet includes foods such as milk, fruit juices, eggs, puddings, strained soups, rice, ground meats, fish, and mashed, boiled, or baked potatoes. People can talk with their health care provider to discuss dietary changes.

Points to Remember

- Appendicitis is inflammation of the appendix.
- The appendix is a fingerlike pouch attached to the large intestine and located in the lower right area of the abdomen. The inside of the appendix is called the appendiceal lumen.
- An obstruction, or blockage, of the appendiceal lumen causes appendicitis.
- The most common symptom of appendicitis is abdominal pain. Other symptoms of appendicitis may include loss of appetite, nausea, vomiting, constipation, diarrhea, an inability to pass gas, a low-grade fever, abdominal swelling, and the feeling that passing stool will relieve discomfort.
- A health care provider can diagnose most cases of appendicitis by taking a person's medical history and performing a physical exam. If a person does not have the usual symptoms, health care providers may use laboratory and imaging tests to confirm appendicitis.
- Appendicitis is typically treated with surgery to remove the appendix.
- Nonsurgical treatment may be used if surgery is not available, a person is not well enough to undergo surgery, or the diagnosis is unclear. Nonsurgical treatment includes antibiotics to treat infection.
- Appendicitis is a medical emergency that requires immediate care.
- If a health care provider prescribes nonsurgical treatment for a person with appendicitis, the person will be asked to follow a liquid or soft diet until the infection subsides.

Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and other components of the National Institutes of Health (NIH) conduct and support basic and clinical research into many digestive disorders, including appendicitis.

Clinical trials are research studies involving people. Clinical trials look at safe and effective new ways to prevent, detect, or treat disease. Researchers also use clinical trials to look at other aspects of care, such as improving the quality of life for people with chronic illnesses. To learn more about clinical trials, why they matter, and how to participate, visit the NIH Clinical Research Trials and You website at www.nih.gov/health/clinicaltrials. For information about current studies, visit www.ClinicalTrials.gov.

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Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This publication was originally reviewed by Jason A. Brodsky, M.D., Shady Grove Adventist Hospital, Rockville, MD.

You may also find additional information about this topic by visiting MedlinePlus at www.medlineplus.gov.

This publication may contain information about medications and, when taken as prescribed, the conditions they treat. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (1-888-463-6332) or visit www.fda.gov. Consult your health care provider for more information.

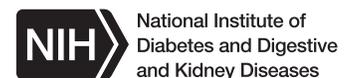
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The National Digestive Diseases Information Clearinghouse (NDDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1980, the Clearinghouse provides information about digestive diseases to people with digestive disorders and to their families, health care professionals, and the public. The NDDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about digestive diseases.

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