

Anatomic Problems of the Lower GI Tract

National Digestive Diseases Information Clearinghouse



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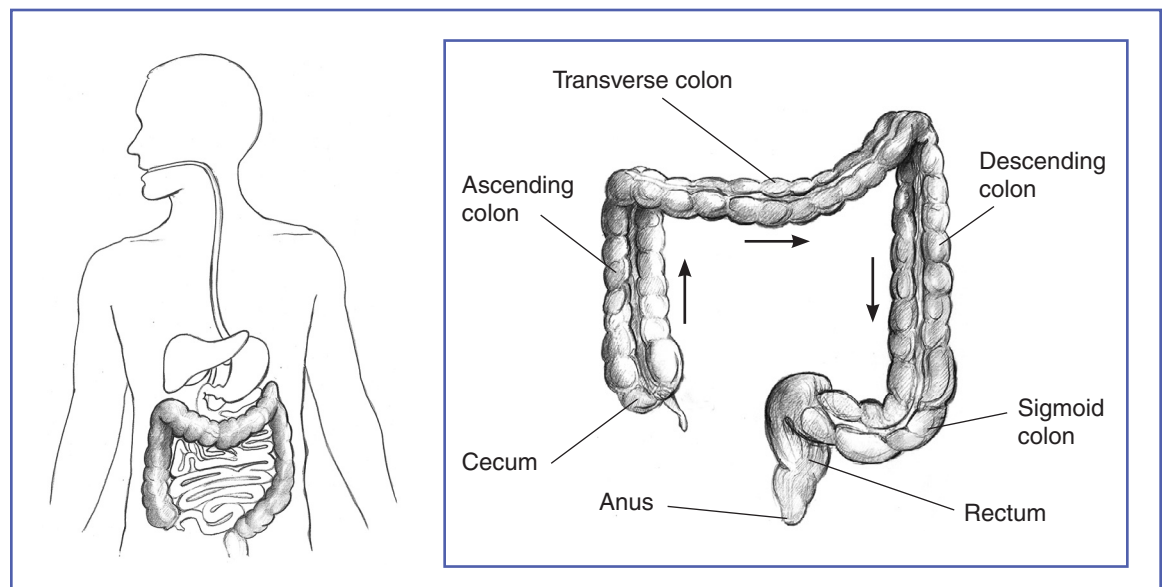
What are anatomic problems of the lower gastrointestinal (GI) tract?

Anatomic problems of the lower GI tract are structural defects. Anatomic problems that develop before birth are known as congenital abnormalities. Other anatomic problems may occur any time after birth—from infancy into adulthood.

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, allows for the digestion of food. Organs that make up the GI tract are the mouth, esophagus, stomach, small intestine, large intestine—which includes the appendix, cecum, colon, and

rectum—and anus. The intestines are sometimes called the bowel. The last part of the GI tract—called the lower GI tract—consists of the large intestine and anus.

The large intestine is about 5 feet long in adults and absorbs water and any remaining nutrients from partially digested food passed from the small intestine. The large intestine then changes waste from liquid to a solid matter called stool. Stool passes from the colon to the rectum. The rectum is 6 to 8 inches long in adults and is located between the last part of the colon—called the sigmoid colon—and the anus. The rectum stores stool prior to a bowel movement. During a bowel movement, the muscles of the rectal wall contract to move stool from the rectum to the anus, a 1-inch-long opening through which stool leaves the body.



The lower GI tract

How does the lower GI tract develop?

About 4 weeks into gestation—the 9-month period from conception to birth—the intestines of the developing baby, or fetus, consist of a thin, straight tube that connects the stomach and the rectum. Over the next 2 weeks, the rapidly developing intestines outgrow the baby’s abdomen and move into the umbilical cord, which connects the baby to the mother. During gestational weeks 10 to 12, the baby’s abdomen has grown large enough to hold the intestines, which return to the abdomen, rotating counterclockwise to their final position. The intestines are held in place by tissue called mesentery.

Anatomic problems of the lower GI tract may involve parts of organs being in the wrong place, shaped abnormally, or incorrectly connected to other organs. Anatomic problems that affect the large intestine or anus include

- malrotation
- volvulus
- intussusception
- fistula
- imperforate anus
- colonic atresia

What is malrotation?

Malrotation is when the intestines do not rotate completely or correctly during gestation. Malrotation can cause serious medical problems in some infants and children, while others may never develop problems. Surgeons estimate that problems with malrotation occur in a small percentage of cases and are usually diagnosed in the first month of life. Boys are more likely than girls to be diagnosed with malrotation during infancy, but problems identified later in childhood are equally likely in boys and girls. Malrotation rarely occurs in adults.

Malrotation can prevent the cecum—the beginning of the large intestine—from moving to its normal position in the lower right area of the abdomen. If this happens, bands of mesentery can block the small intestine, creating an intestinal obstruction—also called bowel obstruction—a life-threatening event and a medical emergency. Malrotation may also leave the mesentery only narrowly attached to the back of the abdomen. This incomplete attachment may result in the intestine twisting—a serious condition called volvulus—see “What is volvulus?”

Symptoms of Malrotation

Infants who have serious problems resulting from malrotation experience pain that can be severe, and they often vomit bile—a greenish-yellow fluid. Other symptoms may include

- abdominal tenderness, swelling, or bloating
- bloody or dark-red stools
- constipation—a condition in which a child has fewer than two bowel movements a week

- dehydration, or abnormal loss of body fluids—decreased tears and little or no urine or dark-yellow urine may be observed
- signs of shock—paleness, sweating, confusion, and rapid pulse
- weight loss

Older children with problems from malrotation may have the above symptoms as well as nausea, abdominal pain, diarrhea, or an abnormal growth rate, as compared with their peers.

Infants or children with any of the above symptoms should be evaluated immediately by a health care provider.

Diagnosis and Treatment of Malrotation

Doctors use x rays of the abdomen and imaging studies to diagnose intestinal problems related to malrotation.

- **Computerized tomography (CT) scan.** CT scans use a combination of x rays and computer technology to create three-dimensional (3-D) images. A CT scan may include the injection of a special dye, called contrast medium. CT scans require the child to lie on a table that slides into a tunnel-shaped device where the x rays are taken. CT scans can help diagnose malrotation. Infants and children may be given a sedative to help them fall asleep for the test.
- **Upper GI series.** An upper GI series may be done to look at the small intestine. No eating or drinking is allowed for 8 hours before the procedure, if possible. During the procedure, a child is given barium—a chalky liquid—to drink. An infant will lie on a table and is given barium through a tiny tube

placed in the nose that runs into the stomach. Infants and children may be given a sedative to help them fall asleep for the test. Barium coats the small intestine, making signs of malrotation show up more clearly on x rays.

The child may experience bloating and nausea for a short time after the test. For several days afterward, barium liquid in the GI tract causes stools to be white or light colored. A health care provider will provide specific instructions about eating and drinking after the test.

- **Lower GI series.** A lower GI series may be done to look at the large intestine. A health care provider may provide written bowel prep instructions to follow at home before the test. The child may be given a clear liquid diet for 1 to 3 days before the procedure. A laxative or enema may be used before the test. A laxative is medication that loosens stool and increases bowel movements. An enema involves flushing water, laxative, or sometimes a mild soap solution into the anus using a special plastic bottle.

Infants and children may be given a sedative to help them fall asleep for the test. For the test, the child will lie on a table while the doctor inserts a flexible tube into the child's anus. The large intestine is filled with barium, making signs of malrotation show up more clearly on x rays.

For several days afterward, barium liquid in the GI tract causes stools to be white or light colored. Enemas and repeated bowel movements may cause anal soreness. A health care provider will provide specific instructions about eating and drinking after the test.

The above tests are all performed at a hospital or outpatient center by an x-ray technician, and the images are interpreted by a radiologist—a doctor who specializes in medical imaging.

Surgery is almost always required to correct problems resulting from malrotation. A surgeon performs the procedure in a hospital and the child is given general anesthesia. With early diagnosis and treatment, surgery is usually successful and may involve

- repositioning the large and small intestines
- dividing the bands of mesentery blocking the small intestine
- removing the appendix, a 4-inch pouch attached to the cecum
- untwisting the large intestine if volvulus has occurred

What is volvulus?

Volvulus occurs when the intestine twists around itself and the mesentery that supports it, creating an obstruction. The area of intestine above the obstruction continues to function and fills with food, fluid, and gas. The mesentery may become so tightly twisted that blood flow to the affected part of the intestine is cut off. This situation can lead to death of the blood-starved tissue and tearing of the intestinal wall—a life-threatening event and a medical emergency.

Volvulus can be caused by malrotation or by other medical conditions such as

- an enlarged colon
- Hirschsprung disease, a disease of the large intestine that causes severe constipation or intestinal obstruction

- abdominal adhesions, or bands of scar tissue that form as part of the healing process following abdominal injury, infection, or surgery

Sigmoid volvulus—twisting of the sigmoid colon—accounts for the majority of cases, with cecal volvulus—twisting of the cecum and ascending colon—occurring less frequently.

Sigmoid Volvulus

Anatomic problems that increase a person's risk of developing sigmoid volvulus include

- an elongated or movable sigmoid colon that is not attached to the left wall of the abdomen
- a narrow mesentery connection at the base of the sigmoid colon
- malrotation that presents with problems in infancy

Sigmoid volvulus that occurs after infancy is more commonly seen in people who

- are male
- are older than age 60
- live in a nursing or psychiatric facility
- have a history of mental health conditions

Symptoms of Sigmoid Volvulus

Sigmoid volvulus symptoms can be severe and occur suddenly. Symptoms may include

- abdominal cramping
- bloody stools
- constipation
- nausea
- signs of shock
- vomiting

People with any of these symptoms should be evaluated immediately by a health care provider.

Other symptoms may develop more slowly but worsen with time, such as constipation, inability to pass gas, and abdominal swelling. People with these symptoms should also contact a health care provider.

Diagnosis and Treatment of Sigmoid Volvulus

Prompt diagnosis and appropriate treatment of sigmoid volvulus generally lead to a successful outcome. Doctors use x rays, upper or lower GI series, CT scans, and flexible sigmoidoscopy—another common diagnostic test—to help diagnose sigmoid volvulus.

- **Flexible sigmoidoscopy.** This test is used to look inside the rectum and lower colon. Sigmoidoscopy is performed at a hospital, outpatient center, or doctor's office by a gastroenterologist—a doctor who specializes in digestive diseases—or a radiologist. Infants and children may be given a sedative to help them fall asleep for the test. For the test, the person will lie on a table while the doctor inserts a flexible tube into the anus. A small camera on the tube sends a video image of the intestinal lining to a computer screen. The doctor can see sigmoid volvulus.

Children and adults can usually go back to their normal diet after the test, though cramping or bloating may occur during the first hour after the test.

If volvulus is found, the doctor may use the sigmoidoscope to untwist the colon. However, if the colon is twisted tightly or if the blood flow has been cut off, immediate

surgery will be needed. Surgery involves restoring the blood supply, if possible, to the affected part of the sigmoid colon. Sometimes the affected part of the colon must be removed and the healthy ends reattached, a procedure called an intestinal resection. Resection prevents volvulus from recurring; untwisting the volvulus with the sigmoidoscope may not prevent recurrence.

Cecal Volvulus

Cecal volvulus is twisting of the cecum and ascending colon. Normally, the cecum and ascending colon are fixed to the abdominal wall. If improperly attached, they can move and become twisted.

Symptoms of Cecal Volvulus

More commonly seen in people ages 30 to 60, cecal volvulus may be caused by abdominal adhesions, severe coughing, or pregnancy. People with cecal volvulus often have intermittent chronic symptoms—those that come and go over a longer period of time—including

- abdominal cramping or swelling
- nausea
- vomiting

People with any of the above symptoms should be evaluated immediately by a health care provider.

Other symptoms may develop more slowly but worsen with time, such as constipation, inability to pass gas, and abdominal swelling. People with these symptoms should also contact a health care provider.

Diagnosis and Treatment of Cecal Volvulus

Doctors use x rays, upper or lower GI series, and CT scans to diagnose cecal volvulus. Imaging shows whether the cecum is out of place and inflated with trapped air. Imaging may also show that the appendix, which is attached to the cecum, is filled with air. To treat cecal volvulus, surgeons use a procedure called cecopexy to reposition the cecum and attach it to the abdominal wall. If the cecum is seriously damaged by volvulus, the surgeon will perform intestinal resection surgery. Cecopexy and intestinal resection surgery have high rates of success and usually prevent the recurrence of cecal volvulus.

What is intussusception?

Intussusception is a condition in which one section of either the large or small intestine folds into itself, much like a collapsible telescope. The condition can cause obstruction and cut off blood flow to the affected part of the intestine—a life-threatening event and a medical emergency.

Malrotation increases the risk that an infant or young child will develop intussusception. Sometimes, a viral infection or growth in the small or large intestine—such as a polyp or tumor—can trigger intussusception, but most childhood cases have no known cause.

Intussusception, though uncommon, is the leading cause of bowel obstruction in young children in the United States. About 1,400 cases occur in the United States each year, nearly all of them in children younger than 1 year old. Intussusception is 1.5 times as likely to affect boys as girls.¹

¹Tate JE, Simonsen L, Viboud C, et al. Trends in intussusception hospitalization among US infants, 1993–2004: implications for monitoring the safety of the new rotavirus vaccination program. *Pediatrics*. 2008;121(5):e1125–e1132.

Symptoms of Intussusception

Infants or children with intussusception may have symptoms including

- abdominal pain, which may be intermittent
- bloody stools
- diarrhea
- fever
- lack of energy
- signs of dehydration
- stool mixed with mucus—a clear liquid made by the intestines that coats and protects tissues
- swelling or a lump in the abdomen
- vomiting with or without bile

Infants or children with any of the above symptoms should be evaluated immediately by a health care provider.

Diagnosis and Treatment of Intussusception

A range of tests may be required to diagnose intussusception. X rays of the abdomen may show an intestinal obstruction. Upper and lower GI series can locate the intussusception and show telescoping of the intestine. CT scans can also help diagnose the condition. If intussusception is not diagnosed promptly, it can cause serious damage to the affected part of the intestine.

In some cases, intussusception may be temporary and correct itself and, if no underlying problem is found, treatment is not required. When intussusception does not resolve on its own, doctors can usually correct the problem with a lower GI series, using air or barium to gently push the telescoped part of intestine into its proper position. However, intestinal resection surgery is sometimes necessary to successfully treat the condition.

What is a fistula?

A fistula is an abnormal passage, or tunnel, between two organs—called an internal fistula—or between an organ and the outside of the body—called an external fistula. In the lower GI tract, both internal and external fistulas can occur. Fistulas can develop during gestation or at any age after birth. Fistulas that develop during gestation are more common in boys than girls.

Fistulas may occur as a result of

- complications following surgery—the most common cause
- childbirth—a fistula can develop between a mother’s vagina and rectum
- Crohn’s disease, a chronic inflammatory bowel disease that can affect any part of the GI tract
- diverticulitis, an inflammation or infection of small pouches called diverticula that are created by bulging, weak spots on the colon
- infection
- trauma

Symptoms of Fistulas

Some people with a fistula in the lower GI tract have no symptoms; others may experience

- abdominal pain that begins in one spot and spreads throughout the abdomen
- dehydration
- diarrhea
- fatigue, muscle cramps, or slow growth due to malabsorption—a condition that occurs when the small intestine cannot absorb nutrients from food
- fever, with or without chills

People with any of these symptoms should be evaluated immediately by a health care provider.

Diagnosis and Treatment of Fistulas

External fistulas can be found during a physical examination. Internal fistulas can be seen during an upper or lower GI series, CT scan, or colonoscopy.

- **Colonoscopy.** Colonoscopy is used to look inside the rectum and entire colon for signs of fistulas. Colonoscopy is performed at a hospital or outpatient center by a gastroenterologist or a radiologist. The health care provider will provide written bowel prep instructions to follow at home before the test. The person may be asked to follow a clear liquid diet for 1 to 3 days before the test. Laxatives and enemas may be used before the test.

For the test, the person will lie on a table while the doctor inserts a flexible tube into the anus. A small camera on the tube sends a video image of the intestinal lining to a computer screen. The doctor can see signs of fistulas. In most cases, a light sedative, and possibly pain medication, helps keep the person relaxed.

Cramping or bloating may occur during the first hour after the test. Driving is not permitted for 24 hours after the test to allow the sedative time to wear off. Before the appointment, people should make plans for a ride home. Full recovery is expected by the next day.

Internal and external fistulas may close on their own, although this process could take weeks or months. The doctor may prescribe antibiotics to prevent or treat infection resulting from leakage of intestinal contents. Some people may need to stop eating and receive nourishment intravenously to ensure proper healing.

If a fistula does not close on its own, a surgeon may perform intestinal resection surgery.

What is imperforate anus?

Imperforate anus occurs during gestation and involves abnormal development of the rectum and anus. This condition results in a blocked or missing anus, which allows little or no stool to pass from the rectum. Imperforate anus is uncommon and occurs slightly more often in boys than in girls. Types of imperforate anus include

- an anus that is narrow or blocked by a thin membrane—this condition is also called anal atresia
- an anus that is missing or incorrectly placed
- a rectum that is not connected to the anus
- a rectum that is connected to the urinary tract or genitals by a fistula

Although most girls with imperforate anus have a less severe form of the condition, such as anal atresia, some are born with a more severe form of imperforate anus called cloaca—a common opening for the rectum, bladder, and vagina.

Symptoms of Imperforate Anus

Imperforate anus is observed when a newborn is first examined after birth. In addition to visible indications such as an incorrectly placed anus, imperforate anus may be associated with symptoms that include abdominal swelling and the absence of bowel movements.

Diagnosis and Treatment of Imperforate Anus

The severity of imperforate anus depends on where the blockage is situated—low, intermediate, or high—in relation to the set of muscles that support the rectum and other organs within the pelvic region. X rays of the abdomen and CT scans can help determine the severity of the condition. The doctor may perform other tests to look for abnormalities in the urinary tract.

Correcting imperforate anus almost always requires surgery, and the type of procedure depends on the location and severity of the defect. For example, a low imperforate anus may only require gently widening the anus. Sometimes anoplasty—a surgery to rebuild or move the anus—is needed within the first days after birth. Intermediate or high imperforate anus may require multiple surgeries done in stages. Girls with cloaca may require multiple extensive and complicated surgeries.

The outcome of surgery is measured by the child's ability to eventually control bowel movements. Most children treated for imperforate anus develop voluntary bowel movements at the usual age of toilet training. However, some children may not achieve good bowel control after surgery because the anal muscles do not develop properly. Factors affecting the outcome of surgery include

- location of the defect—treatment of low imperforate anus has a more successful long-term outcome than intermediate or high imperforate anus
- the child's sex—girls tend to have low imperforate anus, which can be corrected more easily and has more successful long-term results
- age at the time of surgery—the younger the child when surgery is done, the more successful the outcome

What is colonic atresia?

Colonic atresia is an extremely rare congenital anomaly that occurs when a section of the colon closes before birth. Symptoms appear in infants soon after birth and include vomiting, abdominal swelling, and the absence of bowel movements. Intestinal resection surgery is performed immediately after diagnosis.

Eating, Diet, and Nutrition

Eating, diet, and nutrition have not been shown to play a role in causing or preventing anatomic problems of the lower GI tract.

Points to Remember

- Anatomic problems of the lower gastrointestinal (GI) tract are structural defects.
- Anatomic problems that develop before birth are known as congenital abnormalities. Other anatomic problems may occur any time after birth—from infancy into adulthood.
- 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, allows for the digestion of food.
- The last part of the GI tract—called the lower GI tract—consists of the large intestine and anus.
- Anatomic problems of the lower GI tract may involve parts of organs being in the wrong place, shaped abnormally, or incorrectly connected to other organs.
- Anatomic problems that affect the large intestine or anus include malrotation, volvulus, intussusception, fistula, imperforate anus, and colonic atresia.
- Surgery is often needed to correct anatomic problems of the lower GI tract.
- Some anatomic problems of the lower GI tract can be corrected without surgery and others resolve without treatment or never cause problems.

Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducts and supports research into many kinds of digestive disorders, including anatomic problems of the lower GI tract. Researchers have found that a single gene plays an essential role in controlling normal intestinal development during gestation. Ongoing studies will demonstrate how the absence of the gene affects colon formation.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit www.ClinicalTrials.gov.

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