

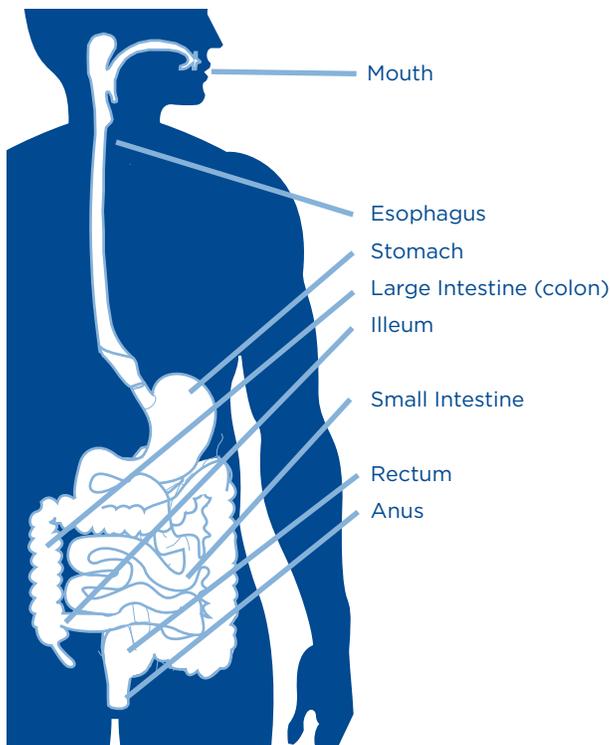


Small Bowel Bleeding and Capsule Endoscopy

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WHAT IS THE SMALL BOWEL?

The small bowel (or small intestine) is the longest portion of the intestinal tract. It is called "small" because it is thin or narrow compared to the "large" bowel, but it is much longer than the large bowel. The small intestine is the organ of nutrient absorption, and as such it is a vital organ. It is hard to reach with instruments passed by either the mouth or the anus because it is located between the stomach and the large bowel.



WHAT IS SMALL BOWEL BLEEDING?

Intestinal bleeding, including from the small bowel, occurs when an abnormality on the inner lining begins to bleed. It may bleed slowly (causing anemia or low blood count) or may cause a hemorrhage. Fortunately, only 3-5% of all

gastrointestinal bleeding comes from the small bowel, and most of these abnormalities lie within reach of the standard endoscope used to evaluate the stomach and upper small bowel. An endoscope is a tube instrument with a light and camera at one end passed through the mouth (after receiving a sedative). A longer instrument called an enteroscope can reach further into the small bowel.

WHY IS IT DIFFICULT TO FIND THE SOURCE OF SMALL BOWEL BLEEDING?

Determining the source of gastrointestinal (GI) bleeding that originates in the small bowel (the area of the intestine between the stomach and the colon) is one of the major diagnostic challenges facing gastroenterologists. Many small bowel causes of blood loss go undetected because the small bowel is long and hard to reach and therefore difficult to evaluate. The small bowel is constantly contracting and relaxing making visualization impossible for more than a few seconds. In addition, the small intestine is much more mobile than either the stomach or colon, making endoscopy much more difficult. X-ray studies may be unable to pinpoint exact locations of abnormalities so that if masses or bleeding lesions are found, their location is difficult to accurately describe to the surgeon for removal. Finally the small bowel is more than 17 feet long, which is much longer than any of the instruments currently available.

WHAT CAUSES BLEEDING FROM THE SMALL BOWEL?

The causes of bleeding in the small bowel are different from those in the colon or the stomach. The most frequent causes of large bowel (colon) bleeding are polyps, diverticulosis or cancer. Upper GI (esophagus, stomach or duodenum) bleeding sources are most frequently associated with ulcers. However, unlike the colon and the upper GI tract, 70-80% of small bowel blood loss that is significant enough to warrant investigation is caused by abnormal blood vessels that lie within the wall of the small bowel. These abnormal blood vessels called AVMs (arteriovenous

malformations) are invisible to standard X-rays. Other less common causes of small bowel bleeding include both benign (non cancerous) and malignant (cancerous) tumors, Crohn's disease (an inflammatory bowel disease) and ulcers.

WHAT TESTS ARE PERFORMED TO DETECT BLEEDING FROM THE SMALL BOWEL?

X-ray studies continue to have a role in the evaluation of small bowel bleeding, as 20-25% of bleeding episodes that originate in the small bowel are caused by abnormalities in the intestinal wall that can be seen by standard or specialized X-ray studies. Fortunately, most of the causes of bleeding in the small bowel are AVMs that, once treated, are of little consequence. However, both benign tumors as well as malignant cancers can be found in the small bowel, so X-ray testing remains a good initial test.

The two X-ray tests most commonly used in the evaluation of the small bowel are the small bowel follow-through and enteroclysis. The small bowel follow-through test is a series of abdominal X-rays that are taken at different times after a patient drinks a white chalky fluid called barium that shows up clearly on X-rays. The test allows the doctor to see the lining of the intestine for any irregularities as the barium flows along its course. The test is good for large abnormalities, but can miss many smaller ones. However, it is safe, easy to tolerate and can demonstrate irregularities in the bowel that are unreachable by standard endoscopy.

A second X-ray test, the enteroclysis study, is similar to the small bowel follow-through in that it uses barium to visualize the inner wall of the small bowel. It is more invasive because it requires a small tube called a catheter to be slowly advanced from the nose down the esophagus, through the stomach and into the small bowel, to allow for air and barium to be instilled. The advantage of this study is that pictures from enteroclysis have better resolution so abnormalities missed by the small bowel follow-through test may be detected. A disadvantage of the enteroclysis study is that it can be an uncomfortable examination due to the presence of the catheter and the use of air to distend the small bowel while taking pictures. The study is also not perfect at finding abnormalities. Two major limitations of these radiographic studies are 1) neither can detect AVMs that are the most common causes of small bowel bleeding and 2) if an abnormality is seen, there is no way to apply immediate treatment to stop the bleeding or to take biopsies to confirm a diagnosis.

The best way to find most of the causes of small bowel bleeding is to directly look at the small bowel with an endoscope. Most abnormalities that cause small bowel bleeding lie within reach of either a standard endoscope, or a much longer endoscope called an enteroscope that can reach further into the small bowel. If neither one of these is successful at finding the cause, surgical assistance may be needed where in the operating room, a surgeon pushes the endoscope through the intestine, allowing full examination of the entire small bowel. The advantage of endoscopy is that it allows the doctor to treat the cause of bleeding at the time of discovery (for blood vessels) or biopsy suspicious masses or polyps. Endoscopy is safe, reliable and effective, and is often used as a first step in the evaluation of bleeding that arises in the small bowel, although the technique involving surgery is generally reserved as a last resort. Recently, a new technique called capsule endoscopy has emerged as an effective way to evaluate the small bowel for bleeding.

WHAT IS CAPSULE ENDOSCOPY?

In 2000, a group of doctors from England reported the use of a new instrument for determining the causes of small bowel bleeding. The device, the endoscopic capsule, is 1 1/8 inches long and 3/8 inches wide, the size of a large pill, and held a battery with a 6 hour lifespan, a strong light source, a camera and a small transmitter. Once swallowed, the capsule begins transmitting images of the inside of the esophagus, stomach and small bowel to a receiver worn by the patient. After 6 hours the patient returns the receiver to the doctor who loads the information into a computer and then can review in detail the 6 hours of pictures of the capsule passing through the intestine looking for abnormalities that are possible sources of bleeding. The patient passes the capsule through the colon and it is eliminated in the stool and discarded. The capsule is safe, easy to take and has had only rare reported side effects. However, the capsule can get stuck in the small intestine if there has been prior abdominal surgery causing scarring or due to any other condition that causes narrowing of the small intestine. If the capsule becomes stuck, surgical removal is necessary.

HOW EFFECTIVE IS CAPSULE ENDOSCOPY AT DETECTING THE SOURCE OF SMALL BOWEL BLEEDING?

In an initial study, investigators showed that the capsule was better than routine endoscopy or enteroscopy at locating small beads that had been implanted into an animal's intestine. Other

studies have shown the capsule is more effective than small bowel X-rays at finding the cause of bleeding. In 2001, the first human studies reported that capsule endoscopy not only found all of the bleeding sources seen using standard endoscopy, but also an additional bleeding cause in 56% of patients for whom traditional endoscopy had not been successful. In 2002 and 2003, numerous scientific presentations showed the use of capsule endoscopy in obscure GI bleeding as a screening tool for patients with genetic predisposition for small bowel cancer, for small bowel Crohn's disease and for small bowel malabsorption. The capsule endoscope is now the new first line test for evaluation of small bowel GI bleeding in many medical centers.

However, capsule endoscopy technology is not perfect. Although it is better than other available techniques to detect sources of small bowel bleeding, capsule endoscopy does not detect all sources of small bowel bleeding. Like X-rays, the capsule is purely diagnostic and cannot be used to take biopsies, apply therapy or mark abnormalities for surgery. Moreover, the capsule cannot be controlled once it has been ingested, so that once it has passed a suspicious abnormality its progress cannot be slowed to better visualize the area.

Despite these limitations, it is increasingly clear that capsule endoscopy has a place in the evaluation of small bowel bleeding and that it will replace some standard diagnostic techniques currently in use. The technology is not yet at a point where it can adequately visualize enough of the colon wall. However, one day the use of the capsule endoscopy may be extended to routine colorectal cancer screening.

TREATMENT OF SMALL BOWEL BLEEDING

Whether diagnosed by routine endoscopy, enteroscopy or capsule endoscopy, once the cause of small bowel bleeding is determined, the treatment is straightforward. In cases of AVMs, a small amount of electric current can be delivered through the endoscope to destroy the abnormality. If the AVM is discovered during endoscopy, the treatment can be applied immediately without requiring further endoscopy. If found with the capsule, the options include a repeat endoscopy or an enteroscopy if the AVMs are within reach, or surgical assistance as described above to help reach the site. Polyps can be removed with an endoscope. Cancers require surgical removal. Other causes of small bowel bleeding can be treated medically (Crohn's disease).

CONCLUSIONS

Bleeding from the small bowel is a rare cause of GI blood loss. Cancers, inflammatory bowel disease and infection account for 20-25% of all small bowel bleeding, while AVMs account for the vast majority of causes. Endoscopic therapy is limited to the parts of the bowel within its reach and is the only minimally invasive way to apply direct treatment to bleeding sources or take biopsies. The development of the endoscopic capsule has changed the way in which gastroenterologists will approach GI bleeding from the small bowel. With further development and innovation, capsule endoscopy will improve the management of this condition.