CASE MANAGEMENT
Deep Enteroscopy to Evaluate Small Bowel Bleeding

A 50-year old female loses consciousness at home and is brought by ambulance to a local emergency department (ED) with massive lower gastrointestinal (GI) bleeding. Four years earlier, she underwent a Puestow procedure (partial pancreatectomy with lateral Roux-en-Y pancreaticojejunostomy) for chronic pancreatitis and had an uncomplicated recovery. Upon presentation at the ED, her hemoglobin is 5.9 g/dL, and she is resuscitated with 8 units of packed red blood cells (PRBCs). She undergoes several diagnostic studies, including esophagogastroduodenoscopy (EGD), colonoscopy, push enteroscopy,* a tagged RBC scan (bleeding scan), and angiography, none of which reveals the source of hemorrhage. Bleeding stops spontaneously, and she is discharged to home on an acid suppressor. Her hemoglobin normalizes.

* A procedure that uses a dedicated small bowel enteroscope or a pediatric or adult colonoscope to reach further into the small bowel than standard EGD.

What is IU Health Physicians?
IU Health Physicians brings together Indiana University School of Medicine faculty physicians, IU Health-affiliated physicians and private practice physicians to form the fastest-growing, most complete, multi-specialty practice group in Indiana. This unique partnership gives our highly skilled doctors access to innovative treatments using the latest research and technology.

Our goal is to provide seamless patient care through an integrated and coordinated delivery health system. It will also improve access for patients and referring physicians, provide an excellent environment for world-class scientific research, and further our academic commitment to tomorrow’s health-care professionals.
Three months later, the patient presents at the ED with another lower GI bleed. Her hemoglobin is 7.6 g/dL, and she is given 4 units of PRBCs. The previous diagnostic studies are repeated, and capsule endoscopy** is also performed. The endoscopic images show coffee ground content in the small bowel, but once again, the bleeding site cannot be identified. The patient is transferred to IU Health for evaluation of recurrent GI bleeding of unknown source.

Obscure GI Bleeding and the Small Bowel

Obscure GI bleeding is defined as bleeding of unknown origin that persists or recurs after an initial negative EGD and colonoscopy. Although mid acute GI bleeding resolves spontaneously in approximately 40 percent of patients,** persistent iron deficiency anemia and frank bleeding require further investigation.

“The most common source of obscure GI bleeding is the small bowel, with bleeding typically caused by vascular lesions scattered throughout the upper intestine,” explains Michael Chiorean, MD, associate professor of clinical medicine at the Indiana University School of Medicine. “These angioectasias are most often seen in people over age 50 who have a history of smoking and/or heart, lung, or renal disease, and they may result from chronic blood oxygen depletion. Some individuals with obscure small bowel bleeding require transfusions as often as every other week, perhaps as much as 100 units of PRBCs annually.”

When obscure bleeding develops in patients with cardiovascular disease, it can be particularly dangerous because treatment for bleeding requires discontinuation of antiplatelet and/or anticoagulant therapy, thereby increasing the risk for stent occlusion (in those who have undergone angioplasty) or stroke (in those with atrial fibrillation). The solution to this dilemma is self-evident: identify and treat the source of the bleeding to allow patients to resume taking their life-saving medications. Historically, however, the source of small bowel bleeding has been notoriously difficult to pinpoint.

“Throughout most of the 20th century, the small bowel was considered the ultimate black hole of gastroenterology,” Dr. Chiorean says. “This 18-foot (550 centimeter) tortuous segment of the GI tract is not easily accessible by standard endoscopy instruments, and radiographic studies—even virtual endoscopy—miss 95 percent of small bowel angioectasias because they tend to be very subtle, with a density comparable to adjacent bowel and a surface that is flush with the bowel lining.”

“The small bowel can be effectively evaluated with intraoperative enteroscopy,” Dr. Chiorean acknowledges. “But this is the diagnostic modality of last resort owing to the high potential for complications, such as ileus, infection, and pneumonia; mortality rates that range from two to 10 percent; and the need for a minimum one-week hospital stay following the procedure.”

Capsule endoscopy, which became available in the late 1990s, was a major breakthrough in small bowel visualization and has largely replaced radiologic imaging. Nonetheless, this passive, uncontrolled endoscopic technique has significant limitations. Abnormalities in some areas of GI tract may be missed because of rapid capsule transit times, resulting in blurred, uninterpretable images. Conversely, slow transit times in other areas may lead to battery failure before the entire small intestine can be examined. Strictures or tumors can impede capsule movement, causing obstruction. Finally, capsule endoscopy is a diagnostic procedure only—no intervention is possible.

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Gastroenterologists at IU Health have a high index of suspicion that the patient is bleeding from the area of the pancreatocjejunostomy. The length and angulation of the small bowel at the anastomosis creates a major challenge for access with standard endoscopes, making her a good candidate for deep enteroscopy.

Deep Enteroscopy

Deep enteroscopy is an endoscopic technique that provides complete small bowel visualization together with the opportunity for therapeutic intervention, including cautery, biopsy, polypectomy, tattoo, hemostasis, dilation, and foreign body retrieval. The major indication for the procedure is obscure overt bleeding, fecal occult blood, or iron deficiency anemia with no source detected on conventional EGD or colonoscopy, but the technique is also used for a variety of other indications (Table 1).

** A video camera the size of a large chalky pill is swallowed and wirelessly transmits images to an external receiver as it passes through the intestinal tract.
Instrumentation
Approximately 75 percent of deep enteroscopy procedures performed at IU Health use a double-balloon enteroscope (DBE), an instrument developed by a Japanese physician and introduced in the United States in 2004. The two-part instrument consists of an endoscope and an overtube, each having a balloon (Figure 1). The scope is advanced through the overtube by a push and pull motion that pleats the small bowel (Figure 2) in a manner similar to putting on a sock.

Spiral enteroscopy, the newest modality for small bowel diagnosis and treatment, is performed with a small enteroscope and an overtube that has helical spirals on its surface that advance the tube by rotation rather than push and pull (Figure 3).

Procedure, Effectiveness, and Complications
Deep enteroscopy is an outpatient procedure performed under deep sedation or general anesthesia. Depending on whether the small bowel is accessed antegrade or retrograde, the procedure takes approximately 75 to 90 minutes. Challenges include previous GI surgery and obesity, both of which can make it difficult or impossible to advance the endoscope.

“Once the scope is properly positioned within the small bowel (Figure 4), and the bleeding source(s) is identified, the gastroenterologist can intervene to achieve hemostasis (or perform other interventions),” Dr. Chiorean says. “Most patients experience a 60 to 80 percent reduction in small bowel bleeding following deep enteroscopy, and in some individuals, bleeding stops completely.”

Potential complications associated with deep enteroscopy include those common to all endoscopic procedures: aspiration pneumonia, infection, and sedation-related issues. The most common problem reported after the procedure is abdominal cramping, which occurs in two to 20 percent of examinations and is linked to the use of air for insufflation.

“Complications that appear to be increased after deep enteroscopy compared with standard endoscopic procedures include pancreatitis, GI hemorrhage, and perforation,” Dr. Chiorean points out. “Among patients undergoing standard upper endoscopy, the risk of perforation is one in 10,000 examinations (0.01 percent). In contrast, the risk of perforation with antegrade deep enteroscopy is 0.2 percent, and it is somewhat higher in patients with surgically altered anatomy.

“In patients with obscure bleeding, capsule endoscopy is usually the preferred third-line test after negative endoscopy and colonoscopy because of its ability to visualize the small bowel, ease of administration, and low potential for complications,” continues Dr. Chiorean. “When capsule endoscopy is inconclusive, or when it identifies small bowel lesions requiring endoscopic therapy or biopsy, deep enteroscopy is performed.”

Spiral enteroscopy, the newest modality for small bowel diagnosis and treatment, is performed with a small enteroscope and an overtube that has helical spirals on its surface that advance the tube by rotation rather than push and pull.
DBE is used to reach the area of previous surgery. A visible vessel, likely an artery at the level of the blind end of the Roux limb, bleeds briskly after air insufflation and gentle probing with the scope (Figures 5-7). The area is first injected with epinephrine to slow the bleeding, after which two hemostatic clips are placed over the vessel, leading to complete cessation of bleeding (Figure 8).

Post-procedure angiography two days after DBE shows a possible small aneurism that does not require intervention. The patient is discharged to home. Following an uneventful recovery and three years of follow-up, she has no evidence of recurrent bleeding.

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References

Dr. Chiorean received his medical degree from the University of Medicine and Pharmacy in Cluj-Napoca, Romania and completed a residency in internal medicine and a fellowship in gastroenterology at the Mayo Clinic in Rochester, MN. His research interests include inflammatory bowel disease (IBD), colorectal neoplasia in IBD, small bowel imaging and therapeutics, gastrointestinal injury induced by nonsteroidal anti-inflammatory drugs or Helicobacter pylori, and natural orifice transluminal endoscopic surgery (NOTES).

Dr. Chiorean is certified by the American Boards of Internal Medicine and Gastroenterology, is a fellow of the American Gastroenterological Association, and is a member of American Society of Gastrointestinal Endoscopy, the American College of Gastroenterology, and the Crohn’s and Colitis Foundation of America. He is the principal investigator or site co-investigator for more than 15 ongoing clinical trials, the author of numerous journal articles, and has lectured in the United States and abroad.

Dr. Chiorean has received honoraria as an advisor for Spirus Discovery and Given Imaging.