How I Approach Colonoscopy in Anatomically Difficult Colons

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INTRODUCTION

About 20 years ago, I began recording procedure details and outcomes in patients referred for previous incomplete colonoscopy (1). The database of referred patients now includes 758 individuals with a failed cecal intubation by another gastroenterologist or surgeon, which to the best of my knowledge is the world's largest such experience by a substantial margin. Essentially, all these referrals are based on an anatomically atypical colon (1–4).

This review describes an approach to colonoscopy in anatomically challenging colons, which has permitted successful cecal intubation in >98% of the 758 referred patients. One advantage of the outlined approach is that it uses only standard instruments generally available in nearly all endoscopy units and specifically does not use balloon enteroscopes (5–9). My experience is that standard length colonoscopes are easier to use than enteroscopes for therapeutic procedures, and many patients are referred after a polyp was detected by a radiographic study performed after an incomplete colonoscopy or a polyp was seen during the previous incomplete colonoscopy but could not be reached. The outlined approach has been both effective and safe, with no perforations or splenic injuries in this population.

BARIUM ENEMA AND COMPUTED TOMOGRAPHY COLONOGRAPHY AFTER INCOMPLETE COLONOSCOPY

Although the use of barium enema and computed tomography colonography after an incomplete colonoscopy fulfill the standard of care to examine the entire colon, they both have poor sensitivity compared with modern colonoscopy (7,8). Furthermore, the same anatomic difficulties that made the colonoscopy incomplete frequently interfere with the technical quality of the barium enema or computed tomography colonography (9). In my opinion, the best course of action after incomplete colonoscopy is to usually make a second attempt at completing colonoscopy using the modified technical approach described below or to refer the patient to a regional center for complex colonoscopy (4).

THE FIRST STEP IS TO CLASSIFY THE ANATOMIC PROBLEM

There are only 3 anatomic causes of difficult cecal intubation, listed in Table 1 of decreasing frequency in a referral practice. Each underlying anatomic cause of difficult colonoscopy requires different instruments and techniques to optimize success.

COLONOSCOPY IN THE REDUNDANT COLON

The bowel must be well prepared to optimize the chance of success and get a high-quality examination (No one wants a repeat procedure in a redundant colon because the preparation was inadequate!). If the bowel preparation has previously been poor, use clear liquids and 2 days of preparation and more days of the same if needed. One gentleman I see every 5 years requires 5 days of clear liquids and 5 gallons of polyethylene glycol electrolyte lavage solution on successive days to achieve a clear colon. Of course, this is exceptional, but it makes the point that a redundant colon can hold an extraordinary amount of feces.

In patients with redundant colons, the colon is also frequently dilated. The experience at the time of the incomplete colonoscopy was usually that the endoscopist "ran out" of colonoscope length in the proximal colon. Loops in the instrument formed repeatedly and could not be overcome by positional change and abdominal pressure. When this happens in a first attempt at colonoscopy, consider withdrawing the colonoscope while suctioning gas and starting over using the method below. In a referred patient who has failed because of redundancy, start with the method described below. When the method is successful, make sure to describe it in the report, so that it will be used from the outset at the next colonoscopy.

The standard adult colonoscope is the best instrument in a redundant colon (1–4). Novices sometimes choose pediatric colonoscopes for all difficult colonoscopies, but they are inferior to adult colonoscopes in the redundant colon because pediatric instruments are more flexible and form more loops.

The most important technical step in a redundant colon is to fill the colon with water and not gas (3). Shut the gas off at the source, and infuse only water. There is no rule about how much water to pump, and no upper limit to the volume infused. There must at least be enough water infused to see the luminal direction. If the preparation is suboptimal, perform water exchange as needed to see the luminal direction. As gas pockets are encountered, remove them by suction. Water filling keeps the colon short (Figure 1), which is critical in the redundant colon.

In the redundant colon, the rest of the story lies in good basic technique and good help from the endoscopy team. Remove all loops as early as possible. Try abdominal pressure early to resist and prevent loop formation. The patient is often obese. Four hands on the abdomen, and sometimes more, may be needed. Start with standard locations (Figure 2). A common mistake is for the technician to simply push the abdomen directly in a posterior direction,

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Table 1. Anatomic causes of technically difficult colonoscopy in decreasing order of frequency in a referral center for complex colonoscopy

1. Redundant colon (often also dilated)
2. Angulated, narrowed sigmoid
3. Abdominal wall hernia

but success may be better achieved by pushing from the flank toward the midline or by pushing on the lower abdomen in a superior direction (Figure 2). If a loop in the scope is felt, remove the loop and apply pressure at that location. Keep encouraging staff to change positions and try new locations and angles. Massaging the abdomen may catch the side of the instrument and push the tip forward. Position change to supine may be useful in crossing the transverse or right colons, and the right lateral decubitus position is useful in moving from the ascending colon into the cecum. In the end, persistence will often be the difference. Of course, the patient must not be put at risk by pushing against fixed resistance or using large torque force in attempting loop reduction.

In very challenging circumstances, use of an overtube may be necessary to reduce sigmoid loop formation. Currently, we require an overtube in only 5% of referred patients with redundant colons (3). Even more rarely, an overtube plus enteroscope for added length is needed.

COLONOSCOPY IN THE NARROWED, ANGULATED SIGMOID

The most common cause of this anatomy is severe diverticular disease. The first scope should be the pediatric colonoscope. If that fails, a skinnier scope is chosen such as the ultrathin colonoscope (diameter 11.7 mm) or a push enteroscope. I often use the Olympus SIF-180 (diameter 9.2 mm and length 190 cm) (Figure 3). These thinner instruments also have a tighter turning radius in the bonding section (Figure 3). Upper endoscopes are often effective in passing the sigmoid angulation, but the short length can lead to failure to reach the cecum and necessitate exchanging the upper endoscope over a guidewire for a pediatric colonoscope (10).

As with the redundant colon, begin the examination underwater. This provides some straightening of severe sigmoid angles and eliminates barotrauma risk. Barotrauma, although rare, occurs only in patients with narrowed sigmoid colons. Only in rare instances will I convert to carbon dioxide gas insufflation to pass an angulated sigmoid colon.

To pass severe angulations, keep forward pressure into the angulation and simultaneously operate both the up-down and right-left controls. My preference is to use the "left hand scope grip" which allows instrument advancement with the left arm (Figure 4). Forward pressure is usually applied to keep the colonoscope tip in the turn. The left hand grip optimizes the opportunity for simultaneous up-down and right-left tip deviation by freeing both hands to manipulate the directional controls. Contrary to what some experts promote, I believe this form of steering is superior to torque steering in the severely angulated lumen. Certainly, some torque may be needed and can be maintained with the left hand scope grip if hand strength is adequate. As each small bend is passed in the strictured area, straighten the instrument. Once the severely abnormal sigmoid is passed, it is ok, although often not necessary, to begin gas insufflation.

DEALING WITH HERNIAS

The left inguinal hernia is easily solved by reducing the hernia manually before the procedure and keeping a hand over the hernia opening in the abdominal wall to prevent recurrence. Once the instrument tip has passed the sigmoid colon, the problem is solved.

In a referral practice, the more common but still rare problem is a large transverse colon hernia in the upper-mid abdominal wall. Again, the hernia should be reduced if possible by placing the patient supine and keeping the patient in that position. Filling the colon with water rather than gas helps to keep the colon in the abdominal cavity. If not fully reduced, the hernia will have a torsion point or narrowing at the inlet to the hernia and a second one at the outlet. Although the first narrowing is usually easily passed, fixed resistance may be felt in

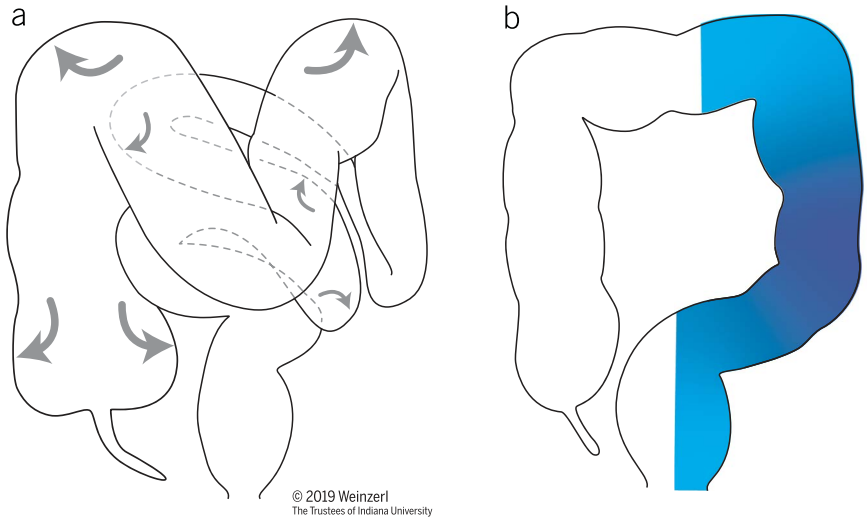

Figure 1. Schematics of the impact of gas vs water filling during insertion in redundant colon. (**a**) Gas insufflation in the left lateral decubitus position. Gas (arrows) dilates the colon and elongates the colon by moving the sigmoid into the mid abdomen and the transverse colon toward the pelvis. (**b**) Water filling in the left lateral decubitus position causes the sigmoid to lie down in the left abdomen, and the colon stays shorter and narrower compared with gas insufflation.

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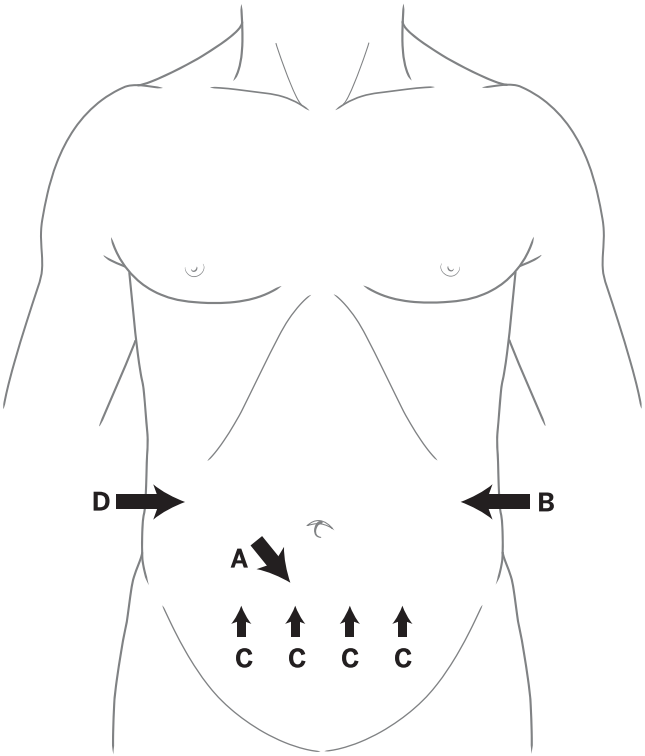

Figure 2. Standard locations and directions for abdominal pressure: A. to counter sigmoid looping. B. To assist passing the splenic flexure and transverse. C. To counter transverse looping. D. To pass from the ascending into the cecum.

attempting to pass out of the hernia back into the abdominal cavity. It is essential to not push through fixed resistance, and this problem can be insurmountable without hernia repair.

SUMMARY

Incomplete colonoscopy because of anatomic difficulties can be classified into 1 of 3 types (Table 1). Although balloon enteroscopes have been used successfully (5,6), standard instruments are just as successful when used skillfully, are widely available, and provide easier therapeutics in the proximal colon.

The keys to success are to classify the problem, select the correct instrument, fill the colon with water, use excellent basic technique, use liberal abdominal pressure in the redundant colon, and optimize tip steering in the angulated sigmoid colon.

Figure 3. Bending sections of full length instruments for passing angulated sigmoids. Left: pediatric colonoscope: Olympus PCF-H190 (diameter 11.7 mm). Center: Ultrathin Olympus PCF-PH190L (diameter 9.7 mm). Right: Olympus SIF-180 enteroscope (diameter 9.2 mm).

Figure 4. The left hand scope grip for maximizing tip control in passing severe sigmoid angulation. The insertion tube is placed between the 4th and 5th fingers of the left hand. With sufficient hand strength, applied torque can be maintained by the left hand. Advancement and withdrawal over short distances are achieved by forward and backward movements of the left forearm. The right hand is free to control the right-left control while the left hand controls the up-down. For best results, the left hand should stay 10–15 cm from the anal opening, so that forward movement with the left forearm can proceed as needed.

CONFLICTS OF INTEREST

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