1. Q: What is the current, published rate of complications (i.e., perforation, bleeding) from colonoscopy that we should tell our patients?

A: Studies indicate that two to three per 1000 patients will have a serious adverse event requiring hospitalization in the 30-day period following a screening colonoscopy. Fortunately, serious complications such as severe bleeding and perforation are uncommon. However, the rate of serious complications has not decreased significantly over the past decade. A recent study that pooled 17 studies published from 2000 to 2008 examining 57,742 screening colonoscopy exams in asymptomatic individuals found serious complications (perforation, post-polypectomy syndrome, bleeding, diverticulitis, cardiovascular events, severe abdominal pain and death) in 2.8 per 1000 procedures. A more recent study of 21,375 patients found an overall serious complication rate of 2.01 per 1000 procedures (95 percent confidence interval [CI] 1.46–2.71). Minor complications of bloating and abdominal pain occur in one out of three patients. Unless physicians rigorously track their own complication rates, it is recommended that they cite published statistics to their patients during procedural consent. There is evidence in favor of a stepwise approach that takes patients’ preferences into account. A stepwise approach begins with a general statement, explaining that there are risks associated with invasive procedures and asking if the patient prefers to review the risks in detail. The physician can respond accordingly. I list the complications of bleeding, infection, perforation and missed lesions when patients want to review the risks beforehand. It is appropriate to discuss steps that are taken to minimize complications during a procedure, such as limiting use of force during insertion and judicious use of electrocautery.

2. Q: Which patients are considered to be at high risk for colonic perforation during colonoscopy?

A: Therapeutic procedures carry a higher risk compared with diagnostic studies alone. In the Clinical Outcomes Research Initiative (CORI) National Endoscopic Database study, all four patients experiencing a perforation were women, and two of them had undergone polypectomy (one with cautery and one without cautery). In previous studies reporting detailed information to determine risk factors, more than 85 percent of serious complications, including perforation and bleeding, resulted from polypectomy. The number of procedures performed may also impact the frequency of adverse events. For example, a Canadian study indicated that physicians performing fewer than 200 colonoscopy procedures per year had perforation rates twice that of those performing more than 200 per year (13/2400 vs 55/20,365, P=0.02; relative risk 2 [95 percent CI 1.1–3.7]). Physicians performing more than 300 procedures per year had the lowest rate of complications (2.5/1000; CI 1.7–3.4). This finding needs confirmation with ongoing monitoring of quality performance measures. Serious complications are not necessarily related to inexperienced physicians, as reported in at least one retrospective case series of colonoscope retroflexion in the rectum.

Patient characteristics may be a risk for adverse outcomes. In a recent meta-analysis, elderly patients were more likely to have adverse outcomes, including perforation and bleeding, resulted from polypectomy. In another study from Japan, hemodialysis patients with end-stage renal disease were found to have an inordinately high rate of colonic perforations. The authors found a high incidence of ß2-microglobulin deposition at the colonic perforation sites, characteristic of amyloidosis, which could have resulted in decreased elasticity of the colon wall. Although it has been suggested that prior abdominal surgery such as hysterectomy makes colonoscopy difficult, no such effect was noted in a large group of female patients undergoing screening colonoscopy. The authors achieved a high cecal intubation rate in both patients who had hysterectomies and the control group (95.7 vs. 98.7 percent, respectively, P=0.176) and no significant differences in sedation dose or pain perception.

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3. Q: Which perforations following colonoscopy can be managed conservatively, and which perforations require urgent surgery?

A: Ideally, a perforation is recognized during colonoscopy so that hemostatic clips or other devices may be used to attempt initial closure. Recently, a “target sign” has been proposed as an easily recognizable sign of perforation or near perforation within the defect created at the polypectomy site or the underside of the resection specimen. The target sign is a result of the defect in the muscularis propria and differential staining of the submucosal layer with dilute indigo carmine (0.04 percent). In this study, endoscopic closure was performed in all 10 patients recognized with this sign, with use of one to five hemostatic clips and without surgical intervention.

Colonic perforations can be managed conservatively when the patient initially is clinically stable. In these patients, the standard-of-care remains bowel rest, intravenous antibiotics and observation plus a surgical consultation. Surgery is required when signs of clinical deterioration or visible soilage of the peritoneal cavity occurs.

4. Q: What are the best ways of treating a patient with retained air following a colonoscopy?

A: Retained air following colonoscopy is one of the most common side effects of the procedure. Endoscopists may limit retained air by ensuring that examined segments of the colon are decompressed during withdrawal. However, this technique may be difficult to apply consistently in practice, especially in areas of the colon that are difficult to examine, such as the hepatic and splenic flexures and sigmoid. If overdistention is recognized following the procedure, a possible perforation should be considered. If a perforation is deemed unlikely, then a limited repeat colonoscopy may be offered to decompress the distended colon. Allowing patients to leave the recovery area with severe distention will increase patient discomfort and reduce patient satisfaction. Rectal tubes are of no benefit to patients in this predicament.

Two techniques recently studied to reduce pain after colonoscopy include carbon dioxide (CO₂) insufflation and water infusion. Use of CO₂ instead of air insufflation has resulted in a reduction in post-procedure pain, flatus and bowel distention. Warm water infusion, or the “immersion” technique, avoids air insufflation altogether and has been shown to reduce pain, primarily maximal pain, particularly in the setting of minimal or unsedated colonoscopy. Copious infusion of water during insertion may improve patient tolerance and reduce resistance in the left side of the colon. I recommend that physicians consider using the immersion technique, especially in patients with a history of difficult exams.

5. Q: What are the risks associated with various endoscopic treatments of benign anastomotic colonic strictures?

A: Endoscopic balloon dilation of benign anastomotic colon strictures appears generally to be safe, but perforation and, less commonly, bleeding or infection may occur. In patients with inflammatory bowel disease, balloon dilation of strictures is associated with a 2 percent risk of a major complication. A review of 13 studies including 347 patients, the technical success rate was 86 percent with an average 2.2 sessions per patient. Favorable outcomes occurred four times more often with strictures ≤ 4 cm than with those > 4 cm in length.

A recent, large study of endoscopic dilation of patients with Crohn's disease from a single center in Belgium found a serious complication rate of 5 percent based on all procedures but 8.7 percent using a per-patient, intention-to-treat analysis. For stricture dilation, the authors used stepwise inflation of an 18-mm through-the-scope balloon at maximum pressure for two minutes. If an adult colonoscope would not pass, inflation was repeated for another two minutes. All six patients who experienced a perforation required surgical resection. Caution, therefore, must be exercised when treating these strictures this aggressively.

Steroid injection is likely to improve the outcome in some patients but data are limited to retrospective case series. In our practice, we inject steroids in benign colon strictures if there has been no response to...
one or more balloon dilations. Incisional therapy with needle-knife electrocautery and balloon dilation has been reported to be successful in small, uncontrolled trials of refractory strictures. We use electrocautery incision sparingly and only after traditional balloon therapy has failed to provide adequate relief of obstructive symptoms.

6. Q: Barotrauma is a rare and likely underreported cause of colon perforation. Is barotrauma a result of excessive air insufflation, and, if so, how can it be prevented?

A: The colon, with its thin wall and high-compliance lumen, is particularly vulnerable to barotrauma. Barotrauma has been implicated in colonic perforations, particularly when no specific perforation site is identified after evaluation of a pneumoperitoneum. Other less serious manifestations of barotrauma include fine mucosal hemorrhage in the cecum and proximal ascending colon, which can be mistaken for angiodysplasia or mucosal inflammation. Excessive insufflation occurs as a result of malfunctioning or improperly maintained endoscopic equipment.

High pressures can develop in the right colon during colonoscopy when there is an excessive amount of torque or pressure in the region of the sigmoid colon. The more proximal colon may be sealed off and natural decompression may not occur. Shortening of the endoscope and generous use of suction during shortening maneuvers may help advance the colonoscope and minimize barotrauma.

7. Q: Are there any recognizable features of colonoscopy-induced splenic injury? How is this complication treated?

A: Splenic injury results from excessive force applied to the splenic flexure during insertion of the colonoscope. The specific mechanism of this rare complication may be due to direct pressure on the spleen or increased tension between adhesions or the splenocolic ligament and splenic capsule. Excessive looping or difficult procedures with an angulated splenic flexure is also associated with splenic injury.

Early recognition is extremely important to avoid a catastrophic outcome. Patients usually experience left upper abdominal pain and distention and may not be able to lie on their left side. Pain referred to the left shoulder (Kehr's sign) is due to irritation of the left hemidiaphragm. Patients may present immediately after the procedure or up to 10 days later. Computed tomography (CT) is the preferred diagnostic test.

Hemodynamic instability should prompt urgent radiologic and surgical evaluation. The spectrum of injury may vary from a subcapsular hematoma to frank rupture with intraperitoneal hemorrhage. After immediate resuscitation with fluids and blood products, laparotomy with splenectomy should be performed. Cases of splenic preservation with laparoscopy and arterial embolization have been reported.

8. Q: Should colonoscopy be repeated on all patients who present with a likely post-polypectomy bleed? Do you recommend a standard pre-procedure preparation for these patients?

A: The decision to repeat a colonoscopy for post-polypectomy bleeding should be an individualized clinical decision. Some patients with self-limited bleeding do not require repeat colonoscopy. Signs of ongoing blood loss, such as blood per rectum, tachycardia and hypotension, should prompt early investigation by colonoscopy and treatment.

Compared with severe, acute lower gastrointestinal bleeding from other causes, I do not recommend a bowel preparation for all patients for several reasons. First, many patients will develop bleeding shortly after polypectomy and have a relatively low burden of stool. Second, severe hemorrhage acts as a cathartic. Finally, the site of bleeding may be known from the recent intervention, and an oral purge may delay early intervention. Use of hemostatic clips has been our mainstay of therapy and their use negates any risk of electrocautery-induced gas explosions during an unprepared procedure. A bowel preparation may be very helpful when the bleeding is delayed (more than 48 hours after polypectomy), multiple, possible post-polypectomy bleeding sites are possible or blood loss is slow and ongoing.

9. Q: Is there any greater risk to removing a sessile serrated colon polyp compared with an adenoma?

A: There are no data to suggest that the rate of complications from polypectomy is higher for sessile serrated polyps compared with adenomas. Sessile serrated polyps tend to be found in the proximal colon and
often may be difficult to delineate due to their characteristic appearance as a thickened fold. Complete polypectomy may be aided with high definition imaging or vital staining. Depending on local expertise, the size or number of polyps may preclude safe polypectomy. Laparoscopic resection of the proximal colon is an acceptable form of definitive therapy.24

10. Q: Is there any additional risk to performing a cold-snare polypectomy compared with a cold biopsy for small colon polyps?
   A: With proper technique, cold-snare polypectomy appears to be as safe as cold biopsy. When considering the possibility of residual adenomatous tissue after incomplete polyp removal by cold biopsy, the long-term risk of cold-snare resection may be even lower. The real value of cold-snare polypectomy has been a reduction in the risk of post-polypectomy bleeding after removal of polyps 3 to 9 mm in size because of the avoidance of electrocautery.

11. Q: Should end-tidal CO2 monitoring (capnography) be performed to reduce the risk of complications of conscious or deep sedation during endoscopy? What type of training is recommended for endoscopists and the endoscopy staff?
   A: End-tidal CO2 monitoring may reduce the frequency of hypoxemia during moderate or deep sedation, and some authors consider it an improvement compared with current monitoring techniques.23 End-tidal monitoring is noninvasive and requires no special training of endoscopists and endoscopy staff. The visual respiratory pattern noted on the monitor is self-evident and serves as a supplement to current physical examination assessments as an early warning of apnea. The main barrier to adoption of end-tidal CO2 monitoring is the added cost.

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ADDITIONAL RESOURCES

  Course directors: Brenna Casey, MD, FASGE and Todd H. Baron, MD, FASGE.

References


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