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How to avoid and treat endoscopic complications

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A B S T R A C T

Colonoscopy is a common procedure performed for screening, diagnostic, or therapeutic indications; nevertheless, it is an invasive procedure that has associated risks. Complications of colonoscopy can be divided into four main categories: (1) bleeding, (2) postpolypectomy syndrome, (3) perforation, and (4) rarely, solid organ injury. In this review, we discuss strategies to avoid and treat complications of colonoscopy. Diligent biopsy and use of electrocautery and avoiding looping and blind advancement of the colonoscope minimize the risk of these complications. Management of complications ranges from non-operative conservative management, to minimally invasive endoscopic or laparoscopic techniques, to operative exploration.

Colonoscopy

Colonoscopy is a common procedure that provides a view of the inside of the colon and rectum. Colonoscopy can be performed in the elective outpatient setting or emergently in critically ill patients, and is useful as both a diagnostic and therapeutic procedure. Most colonoscopies in the Unites States are performed in asymptomatic healthy patients as a screening tool to detect polyps or colorectal cancer at its earliest stages. Colonoscopies may also be used to evaluate gastrointestinal symptoms, including abdominal pain, diarrhea, constipation, or gastrointestinal bleeding. Therapeutic indications for colonoscopy include endoscopic removal of polyps or gastrointestinal tumors, colonic decompression, dilation of strictures, stent placement, hemostatic control, or removal of foreign bodies.

The risk of mortality following colonoscopy is very low (0.007%)[1]; and serious complications are uncommon. In a meta-analysis of pooled data from 12 studies evaluating the complications following screening colonoscopy in asymptomatic patients, Whitlock et al.[2] reported serious complications, including hemorrhage, perforations, severe abdominal pain, diverticulitis, cardiovascular events, and death, at a rate of 2.8/1000 procedures. Similarly, in a study of over 2 million colonoscopies, Chukmaitov et al.[3] reported a rate of gastrointestinal adverse events requiring hospitalization in 1.98/1000 procedures. Both studies found that the rate of complications increased with the increasing complexity of the colonoscopy. Specifically, Whitlock et al.[2] found that 85% of the complications occurred in colonoscopies with polypectomy; and Chukmaitov et al.[3] found a progressive increase in the risk of adverse events in colonoscopies with cold forceps biopsy, ablation, hot forceps biopsy, and snaring.

How to avoid complications

The risk of colonoscopy must be assessed based on patient factors, endoscopist experience, and the planned procedure. Older adults have an increased risk of serious complications compared with younger patients; and patients with comorbid conditions, such as stroke, atrial fibrillation, heart failure, or chronic obstructive pulmonary disease, also have an increased risk of serious complications.[4] Patients with heart failure, renal insufficiency, liver dysfunction, or electrolyte abnormalities are particularly sensitive to the fluid shifts that may accompany mechanical bowel preparation and may require a balanced electrolyte solution. High-risk patients must also be evaluated for the risk of procedural sedation. Low-volume endoscopists have a higher rate of adverse events compared with high-volume endoscopists in both simple colonoscopies and colonoscopies with biopsies.[3,5,6] As expected, procedures that are more invasive, requiring electrocautery, application of hemostatic clips, dilation of strictures, placement of a stent, or polypectomy, are associated with an increased risk of complications. In the following sections, specific techniques are recommended to avoid and treat complications. These techniques are broken down into sections based on the complications discussed:

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bleeding, postpolypectomy syndrome, perforation, and solid organ injury.

Bleeding

Bleeding following diagnostic colonoscopy is uncommon; bleeding is more frequently associated with colonoscopies involving polypectomy, endoscopic mucosal resection, stricture dilation, or stenting. Bleeding occurs in 1–2% of polypectomies and the rate increases for polyps that are larger or more difficult to remove.[7–11] Patients with coagulopathies or taking anticoagulation or antiplatelet therapy are also at a higher risk of bleeding. A plan for reversing, holding, or continuing anticoagulation therapy depends on the bleeding risk of the planned procedure and the patient's risk of thromboembolic events.

Cold snare polypectomy is preferred over “hot” snare with electrocoagulation in patients with a higher risk of bleeding or patients taking anticoagulant or antiplatelet therapy. Approximately 5–7 days after the colonoscopy, the eschar associated with electrocoagulation sloughs off potentially leaving an exposed vessel that can bleed. Typically, patients have restarted their anticoagulants by this time and can have a significant amount of bleeding. Alternatively, cold snare polypectomy may result in immediate bleeding, but allows immediate endoscopic control with placement of one or multiple clips and monitoring of hemostasis. Figure 1 demonstrates a large polyp (A) and which was removed with snare and clipped for hemostasis (B).

Postpolypectomy syndrome

Postpolypectomy syndrome refers to focal symptomatic peritoneal inflammation following polypectomy, without bowel perforation, diffuse peritonitis, or pneumoperitoneum. The incidence cited in the literature varies from 0.3 to 50 per 10,000 colonoscopies. As with bleeding, the risk of postpolypectomy syndrome is increased when larger, more complicated polyps are removed.[10,12–14] In fact, signs of postpolypectomy syndrome have been reported in up to 40% of cases involving endoscopic submucosal dissection.[15]

Full-thickness electrocoagulation can lead to postpolypectomy syndrome or perforation. In general, “hot” biopsy forceps should not be used in order to avoid unintended thermal spreading. When it is necessary to use a “hot” snare, the polyp should be retracted away from the bowel wall into the bowel lumen prior to resection in order to maximize the distance between the current in the submucosa and the serosa.[16] The saline lift technique, during which saline is injected into the submucosa prior to polypectomy, may add an additional level of protection in preventing thermal spread by expanding the submucosal layer.[17]

Perforation

Perforation is the most feared complication of colonoscopy, but it is a rare complication, occurring in only 0.016–0.8% of diagnostic colonoscopies and up to 5% of therapeutic colonoscopies.[18,19] Perforation rates vary widely based on the extent of the intervention performed during the colonoscopy. There are three mechanisms described that may cause perforation of the colon during colonoscopy: (1) mechanical trauma secondary to increased pressure applied by the colonoscope, such as when blindly pushing by a difficult turn; (2) barotrauma secondary to overdistension of the colon, which most frequently perforates the cecum (due to Laplace's law); or (3) cautery-induced thermal injury that progresses after the colonoscopy into a full-thickness injury.

Looping of the scope in the colon is a major obstacle to successful completion of a colonoscopy and a potential cause of colonic perforation. The mobile mesentery of the sigmoid and transverse colon allows the scope to loop. When a loop is formed, paradoxical movement of the scope can occur, i.e., the tip of the scope moves backward while the endoscopist is pushing the scope forward. Several techniques are useful to avoid looping and reduce a loop that forms. Initially, during scope insertion, the endoscopist should primarily use clockwise rotation. This maneuver pins the mobile sigmoid against the pelvic side wall and minimizes the risk that a medially bent sigmoid loops on a mobile, narrow-based mesentery. Starting at the second rectal valve, the endoscopist can torque the scope clockwise while simultaneously applying suction and pulling the scope backward. This maneuver intussuscepts the colon, gathering it onto the scope and straightening it out, rather than forming a large omega loop. This maneuver can be repeated every 10–20 cm until the hepatic flexure is reached. Similarly, this maneuver can also be used to reduce an already formed loop. The scope is torqued clockwise while simultaneously applying suction and pulling back until the loop is reduced. When the loop is reduced, paradoxical motion is eliminated, and the scope freely advances forward. Hooking the end of the scope around the hepatic flexure prior to withdrawing it may also aid in this maneuver. There is always a potential to lose ground when attempting to reduce a large loop, therefore, it is important to keep the colon straight as the scope is advanced to avoid making the loop.

Alternative methods to decrease looping by stabilizing the colon include weighing it down from the inside or pinning it down from the outside. Weighing down the colon with the water makes it less mobile and less likely to form a large loop; as the scope is advanced, water irrigation can be used to fill the sigmoid colon. Abdominal pressure applied externally in the left abdomen downward toward the stretcher and the patient's pelvis pins the sigmoid colon laterally, preventing torque on a mobile, broad, mesenteric pedicle. A second hand can apply pressure upward to

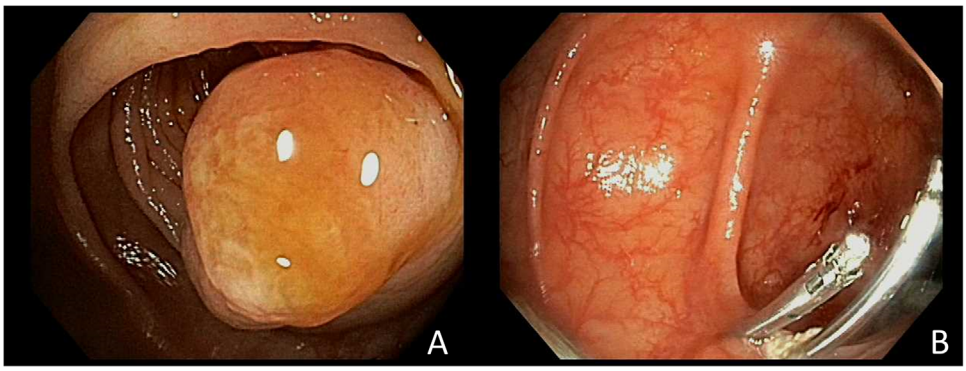

Fig. 1. Endoscopic clipping of polypectomy site. (A) Large polyp, subsequently removed with snare polypectomy. (B) Polyp site after endoscopic clip placement. (Adapted with permission from the personal library of Manoj Shirodkar, MD.)