



## Perspectives in Colonoscopy Perforation During Gastroenterology Fellowship

Diagnostic and therapeutic colonoscopy represents one of the mandatory skillsets of gastroenterology (GI) training. This is typically done in a step-up fashion of learning basic (e.g., colonic navigation, prevention of looping), intermediate (e.g., forceps biopsy, basic polypectomy), and advanced techniques (e.g., large polyp resection).<sup>1</sup> At any point during the training process, complications can develop, and colonic perforation still stands as the most disruptive complication for patients, families, and healthcare professionals, with reported mortality rates of up to 5%.<sup>2</sup> While feared by trainees, colonoscopy perforations are rare and may not even occur during a 3-year GI fellowship. Several studies have shown that the risk of perforation is 1:1,400 for diagnostic and 1:1,000 for therapeutic colonoscopy.<sup>2</sup> Therefore, a trainee who performs 400–500 colonoscopies has approximately 1:2 to 1:3 odds of encountering a colonic perforation during training. These estimates may be higher in trainees exposed to endoscopic mucosal resection (EMR) or submucosal dissection (ESD), which carry perforation risk of 1% and 5%, respectively.<sup>2</sup>

Limited endoscopic experience is a risk factor for colonoscopy perforation. Compared with GI physicians, colonoscopy performed by GI trainees or surgeons carries a higher risk of perforation.<sup>3,4</sup> In early stages of training, this may be associated with mechanical damage (e.g., retroflexion in a small rectum, fixed angulation, excessive looping) or air insufflation. Later during fellowship, perforations are more likely to be caused by therapeutic interventions. Removal of difficult polyps (e.g., large polyps, cecal location) is associated with higher risk of perforation. During the first years in practice, gastroenterologists should be cautious and ask the opinion of a more experienced endoscopist before starting a possibly complex polypectomy. Selecting which polyps are removable and recognizing personal technique limitations are skills that every competent gastroenterologist should develop to reduce colonoscopy complications and assure complete polyp resection.

Colonic perforations caused by mechanical injury are typically large and can be detected during the procedure. In contrast, perforations caused by endoscopic interventions are smaller in size and more frequently have a delayed presentation. When a perforation is found during the procedure, the first rule is not to panic. The gastroenterologist in charge should decide whether conservative, endoscopic, or surgical management is preferred. Calling a surgeon, an advanced endoscopist, and a senior gastroenterologist into the endoscopy suite as quickly as possible helps to make a multidisciplinary decision based on local expertise. In the last 20 years, there has been increasing experience with the use of different devices for endoscopic closure of colonic perforations. This ranges from the simple use of through-the-scope clips to more complicated methods, such as over-the-scope clips, endoscopic suturing, colonic stents, or glue.<sup>5</sup> While these techniques are usually learned during advanced endoscopy training, any GI fellow should be familiar with the use of at least through-the-scope clips for perforation closure. Surgery should be avoided if possible, as this is associated with increased mortality, prolonged hospital stay, and postoperative morbidities.<sup>6</sup>

Fellows may encounter consults or patient calls for abdominal pain following a colonoscopy. This requires immediate clinical evaluation to rule out delayed perforation. In the presence of diffuse peritoneal signs or hemodynamic instability, surgery is typically indicated. If the pain is localized and the patient is stable, an upright X-ray or cross-sectional imaging must be obtained. If free air is not the cause, the pain could be explained by postpolypectomy coagulation syndrome or other reasons, and it likely can be managed conservatively. The presence of free air on imaging typically leads to surgery, but conservative management should be considered in select cases. Sometimes free air can be detected on imaging following EMR or ESD in the absence of true perforation.<sup>7</sup> In these situations, pain may be transient or completely absent, and conservative management is preferred.

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Correspondence: Jorge D. Machicado, UPMC Presbyterian, M2, C-Wing, 200 Lothrop St, Pittsburgh, PA 15213 (machicadoj@upmc.edu).



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Operator stress and burnout can follow a colonoscopy perforation.<sup>8</sup> GI fellows are less used to morbid complications than trainees in surgical specialties, despite the mandatory training in internal medicine. For any fellow who encounters this complication, sharing the experience with other fellows, experienced faculties, mentors, or the program director can be helpful to reduce stress and to learn from others' experiences with colonoscopy perforation. Fellows should present this complication in a morbidity and mortality conference to enrich the education of other fellows who may not encounter this during training. A discussion should be focused on the mechanism of the perforation, precipitating factors, treatment options, and future preventive strategies.

Jorge D. Machicado, MD  
University of Pittsburgh  
Pittsburgh, PA

Associate Editor  
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