

# Imaging of the Postoperative Colon



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## KEYWORDS

- Colorectal surgery • Colectomy • Postoperative complications • Colon cancer • Rectal cancer
- Colon

## KEY POINTS

- The appearance of the abdomen and pelvis after colon resection can vary significantly depending on the choice of surgery.
- Imaging abnormalities can be normal, and even expected, in a postoperative patient.
- Clinical data such as laboratory abnormalities and multiple prior examinations are often required to differentiate recurrent/residual malignancy from postoperative changes.

## INTRODUCTION

Colorectal surgery is commonly performed for a wide range of pathologies. The choice of surgical procedure and technical approach is often determined by the extent of disease and surgeon experience and preference.<sup>1,2</sup> The use of fluoroscopic evaluation of the colon has declined significantly in recent years, with newer technologies such as computed tomography (CT) colonography gaining traction with radiologists and referring physicians. Most recently, the US Preventative Services Task Force (USPSTF) recommendations no longer include double-contrast barium enema (DCBE) as a method of screening, while American College of Radiology (ACR) appropriateness criteria rating for DCBE are a 6 out of 9 (may be appropriate) compared with a 9 (usually appropriate) for CT colonography.<sup>3</sup> CT has become a primary imaging modality, often performed in the setting of clinical symptoms that may reflect perforation, intra-abdominal abscess, or other postoperative complications.<sup>4–11</sup> However, CT has been shown to have a low sensitivity for the evaluation of anastomotic leaks in postoperative patients, while fluoroscopy

has continued to demonstrate superior accuracy.<sup>12–14</sup> Despite the overall changes in referral and utilization, fluoroscopic evaluation is still used in the postoperative setting, specifically for the evaluation of postoperative anatomy and integrity of the anastomosis.<sup>15,16</sup>

This article will not be a comprehensive discussion regarding the details of colorectal surgical procedures, but will highlight some of the important imaging features and pitfalls in evaluating patients after they have undergone colorectal surgical procedures. The procedures that will be discussed include segmental colectomy, abdominoperineal resection (APR), anterior resection, Hartmann procedure, and ileal pouch-anal anastomosis (IPAA).

## SEGMENTAL COLECTOMY

Segmental colon resections include ileocecal, right, transverse, and left colectomies, and are based on the location of the diseased segments typically from either inflammatory bowel disease, or colonic malignancies, unresectable polyps, inflammatory diverticular disease without complications, volvulus, or bleeding.<sup>1,11,17</sup> When there is a

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malignant neoplasm, wider margins are typically performed as well as mesenteric, omental, and lymphatic drainage nodal resections.

Common complications include anastomotic leak (2%–3%), wound complications, postoperative hemorrhage, ileus, and recurrence of neoplasm, and less commonly ureteral injury. Trocar site complications such as hernias can also be seen. A stomal or parastomal hernia with herniation of bowel or fat at the site of the stoma can be seen after stoma creation (**Fig. 1**). Bowel herniation without accompanying fat stranding, fluid accumulation, or thickening of bowel wall to suggest strangulation is typically not concerning.<sup>18</sup> On imaging, expected postresection findings include absence of excised bowel segments, anastomotic clips or sutures, and typically displacement of viscera into now unoccupied postoperative spaces.<sup>2</sup>

In the early postoperative period, clinical suspicion for leak may warrant radiographic evaluation, for which water-soluble contrast enema has demonstrated greater sensitivity than CT imaging.<sup>12,19</sup> Past studies have demonstrated a reduction in adverse events with routine leak testing<sup>20</sup> and a link between anastomotic leakage and poor long-term outcomes.<sup>21–23</sup> Subsequently, fluoroscopic studies may be indicated for strictures, obstruction and functional status, or to assess anatomy. Fluoroscopic studies may be limited by overlapping loops of contrast-opacified bowel, whereas CT allows better assessment of extraluminal fluid collections and planning for drainage procedures. In some cases, CT or magnetic resonance (MR) enterography may be preferred, particularly with inflammatory bowel disease (IBD) patients to evaluate the extent of



**Fig. 1.** Axial contrast-enhanced CT image of parastomal hernia (*arrow*) with opacified bowel and mesenteric vessels. No inflammatory changes or fluid are seen surrounding the involved bowel and the patient was asymptomatic.

small and large bowel involvement and associated complications.<sup>24,25</sup>

## ABDOMINOPERINEAL RESECTION

An APR involves complete rectosigmoid, anal, and perineal resection with creation of a permanent end colostomy, typically in the left lower abdomen. An APR is typically performed for low-lying rectal or anal malignancies or anorectal complications of IBD.<sup>26,27</sup> Postoperative imaging involves recognition of drains and/or packing material used to close the perineal defect, which can be confusing if not appropriately diagnosed. In patients undergoing preoperative radiation treatment, radical pelvic surgery, or who have large cutaneous defects, myocutaneous flaps or mesh can be used to augment the reconstruction (**Fig. 2**).<sup>28,29</sup> This may involve rectus, gracilis, or gluteal muscle flaps, which are felt to reduce the incidence of healing complications including abscess or perineal herniation. Denervation can cause these flaps to demonstrate on MR scan initial increased T2 signal followed by fatty infiltration and subsequent increased T1 signal. Denervation atrophy can also result in thinning of the muscle flap on subsequent examinations.<sup>30,31</sup>

APRs are less well-tolerated and have more complications compared with other sphincter-sparing procedures.<sup>27,32</sup> On CT, the uterus, seminal vesicles, and prostate are typically posteriorly displaced into the presacral space (**Figs. 3 and 4**).<sup>9</sup> There is often a presacral soft tissue mass, which can resemble recurrent tumor, but should be stable to decreased in size over time.<sup>33–35</sup> The presacral changes can range from minimal to more substantial, but residual scarring can persist indefinitely. A persistently normal carcinoembryonic antigen (CEA) level is



**Fig. 2.** APR with myocutaneous flap. Rectus muscle flap and associated feeding artery seen along the left hemipelvis (*arrow*).

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