

## Routine colonic endoscopic evaluation following resolution of acute diverticulitis: Is it necessary?

Amit K Agarwal, Burzeen E Karanjawala, Justin A Maykel, Eric K Johnson, Scott R Steele

Amit K Agarwal, Department of Surgery, University of Texas Health Science Center-Houston, Houston, TX 77030, United States

Burzeen E Karanjawala, Department of Surgery, University of Texas Health Science Center-Houston and Lyndon B. Johnson General Hospital, Houston, TX 77026, United States

Justin A Maykel, University of Massachusetts Memorial Medical Center, Worcester, MA 01605, United States

Eric K Johnson, Scott R Steele, Colon Rectal Surgery, Department of Surgery, Madigan Army Medical Center, Tacoma, WA 98431, United States

**Author contributions:** Agarwal AK and Karanjawala BE contributed equally to this work; Agarwal AK, Karanjawala BE and Steele SR designed research; Agarwal AK, Karanjawala BE and Steele SR performed research; Makel JA and Johnson EK contributed expertise knowledge and performed critical revision on the paper; Agarwal AK, Karanjawala BE and Steele SR authored the paper and helped with critical revision.

**Correspondence to:** Scott R Steele, MD, Chief of Colon Rectal Surgery, Department of Surgery, Madigan Army Medical Center, Tacoma, WA 98431, United States. [harkersteele@mac.com](mailto:harkersteele@mac.com)  
Telephone: +1-253-9682200 Fax: +1-253-9685900

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### Abstract

Diverticular disease incidence is increasing up to 65% by age 85 in industrialized nations, low fiber diets, and in younger and obese patients. Twenty-five percent of patients with diverticulosis will develop acute diverticulitis. This imposes a significant burden on healthcare systems, resulting in greater than 300000 admissions per year with an estimated annual cost of \$3 billion USD. Abdominal computed tomography (CT) is the diagnostic study of choice, with a sensitivity and specificity greater than 95%. Unfortunately, similar CT findings can be present in colonic neoplasia, especially when perforated or inflamed. This prompted professional societies such as the American Society of Colon Rectal

Surgeons to recommend patients undergo routine colonoscopy after an episode of acute diverticulitis to rule out malignancy. Yet, the data supporting routine colonoscopy after acute diverticulitis is sparse and based small cohort studies utilizing outdated technology. While any patient with an indication for a colonoscopy should undergo appropriate endoscopic evaluation, in the era of widespread use of high-resolution computed tomography, routine colonic endoscopic evaluation following resolution of acute uncomplicated diverticulitis poses additional costs, comes with inherent risks, and may require further study. In this manuscript, we review the current data related to this recommendation.

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**Key words:** Colonic evaluation; Colonoscopy; Diverticulitis; Acute diverticulitis; Colonic neoplasia; Endoscopy

**Core tip:** Acute diverticulitis accounts for greater than 300000 hospital admissions a year in the United States alone. Current guidelines suggest that routine colonic evaluation is recommended following recovery from an episode of acute diverticulitis to confirm the diagnosis and exclude malignancy. Current data suggests that the presence of colonic neoplasia after an optimal high-resolution computed tomography that demonstrates uncomplicated diverticulitis will be low. Accordingly, routine colonic endoscopic evaluation following treatment of computed tomography-diagnosed acute uncomplicated diverticulitis may deserve further study.

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## INTRODUCTION

Diverticulitis and diverticulosis pose significant medical challenges in Western countries, with rising incidence over the past century<sup>[1]</sup>. People living in industrialized countries have a lifetime risk of about 60% for developing colonic diverticula<sup>[2]</sup>. Acute diverticulitis is one of the most common causes of hospital admission, affecting up to 25% of patients with diverticulosis. The annual cost of managing diverticular disease in the United States has been estimated at \$3 billion (US dollars), with greater than 300000 yearly admissions<sup>[3,4]</sup>.

The evaluation and management of acute diverticulitis has continues to evolve over the past few decades. Today, there is a significant increase in the use of computed tomography (CT) to confirm the diagnosis (Figure 1A, B) of acute diverticulitis, and a trend toward conservative management over surgical resection<sup>[5,6]</sup>. Surgery is typically reserved for those with Hinchey III/IV diverticulitis, free perforation, multiple episodes of acute diverticulitis, or chronic symptoms. With image-guided drainage by interventional radiology and broad-spectrum antibiotics, most patients with sizeable pericolic or pelvic abscesses do not require immediate surgical intervention. In the surgical arena, the traditional approach of a Hartmann's procedure is also being challenged, with increasing using of resection and primary anastomosis (with or without diverting ileostomy), and select patients undergoing laparoscopic lavage and drainage along with antibiotic therapy<sup>[7-9]</sup>.

Current internationally accepted guidelines recommend routine colonic endoscopic evaluation after an episode of acute diverticulitis to confirm the diagnosis and exclude malignancy<sup>[10]</sup>. Factors such as positive family history, smoking, lack of dietary fiber, and age place all patients at a higher risk for developing colonic neoplasias<sup>[11,12]</sup>, and for diverticular disease. It is therefore not surprising that clinical trials have identified an age-related increase in the prevalence of advanced colonic neoplasia in patients with diverticular disease<sup>[12,13]</sup>. Even though epidemiologic data vary worldwide, multiple autopsy studies confirm this age-related increased risk of colonic neoplasia of about 6% in patients younger than 40, and up to 65% in patients older than 80<sup>[14,15]</sup>. Based on these trials, small-to-medium sized cohort studies, and some individual case reports, some authors advocate routine colonic evaluation after recovery from an episode of acute diverticulitis.

In 2006, the American Society of Colon and Rectal Surgeons (ASCRS) published their guidelines for the diagnosis and treatment of acute sigmoid diverticulitis<sup>[16]</sup>. They evaluated the level of evidence supporting routine follow-up endoscopy in the outpatient setting, after recovery from an acute episode and found it to be low-grade; however, they continue to support the recommendation. Based in part on the relative safety of endoscopy, and the potential catastrophic consequences of missing a malignancy, they recommended that after resolution of an initial episode of acute diverticulitis, the colon should

be adequately evaluated to confirm the diagnosis. This can be performed *via* colonoscopy or contrast enema X-ray (with flexible sigmoidoscopy) to exclude other diagnoses, primarily colonic neoplasia, ischemia, and inflammatory bowel disease. In 2014, the ASCRS published an update to their clinical guidelines for the treatment of sigmoid diverticulitis. Again, they support the recommendation for endoscopy to exclude other diagnoses after an acute episode of diverticulitis has resolved, typically in 6-8 wk. They, however, again note that the quality of evidence for this recommendation remains poor<sup>[17]</sup>. So, where does this recommendation come from?

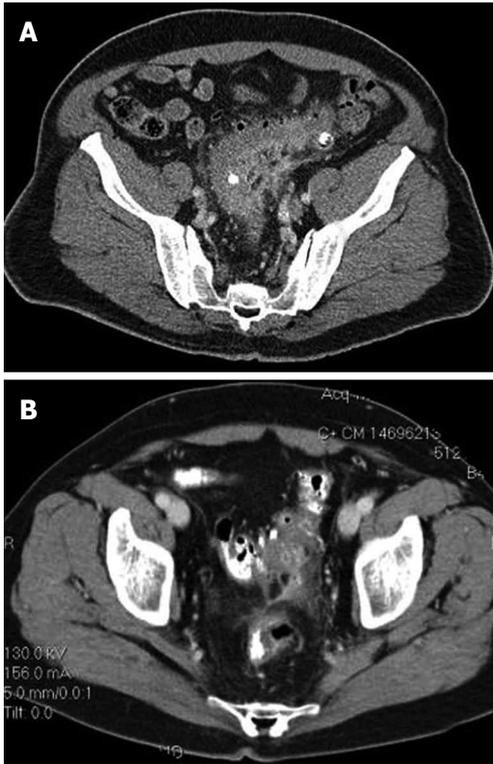
A review of the literature suggests this recommendation dates back to the era preceding the widespread use of high-quality cross-sectional imaging to diagnose acute diverticulitis. Accordingly, this may reflect the limited reliability of earlier diagnostic methods rather than a true indication of the colonic neoplasia risk<sup>[18]</sup>. More recently, improvements in the accessibility of computed tomography have led to CT's increased use in the diagnosis and management of acute diverticulitis. Furthermore, technological improvements in the resolution and quality of computed tomography has allowed for a better evaluation of the affected colonic segment and accurate staging of diverticular complications<sup>[19]</sup>. This improvement in technology may also allow for differentiation of diverticular disease from other pathological conditions.

Currently, there are no completed or planned prospective randomized control trials evaluating the potential benefit of routine colonic endoscopic evaluation after an episode of uncomplicated diverticulitis. Therefore, the purpose of this manuscript is to review the literature and critically analyze the utility of routine colonic endoscopic evaluation following recovery from an episode of acute diverticulitis to determine its necessity.

## CHANGING TRENDS

### Historical background

For decades, the management of diverticulitis has included endoscopic evaluation to rule out alternate diagnoses, including malignancy. Reported rates of additional diagnoses are up to as many as 37% of individuals, with malignancy rates approaching 17%<sup>[20]</sup>. Because of the presumed association of diverticulitis with other pathologies, endoscopy was found to be routinely indicated and would assist in surgical decision-making (Figure 2). In the past, the radiographic diagnosis of diverticulitis with barium enema proved to be inaccurate, leading to missed lesions including advanced pre-malignant neoplastic tumors that subsequently progressed to malignancy. Boulos *et al*<sup>[21]</sup> looked at a small cohort of 65 patients diagnosed with symptomatic diverticular disease. Barium enema identified 17 polyps and 2 carcinomas. Subsequent colonoscopy demonstrated no polyps in 9/17 patients, one polyp was found to be carcinoma, and only one of the two carcinomas was confirmed. In the 46 patients who were diagnosed with diverticulosis, polyps were subsequently identified in 8 and carcinoma in 3 patients. Barium en-



**Figure 1** Computed tomography imaging demonstrating acute diverticulitis. A: Computed tomography (CT) imaging demonstrating acute, uncomplicated diverticulitis. Reproduced with permission from Stocchi L. Current indications and role of surgery in the management of sigmoid diverticulitis. *World J Gastroenterol* 2010; 16(7): 804-817; B: CT imaging demonstrating acute diverticulitis with localized perforation with a small amount of extraluminal air. Reproduced with permission from Stocchi L. Current indications and role of surgery in the management of sigmoid diverticulitis. *World J Gastroenterol* 2010; 16 (7): 804-817.

ema was, therefore, inaccurate 35% of the time. In these patients, neoplasia was identified in 31% of patients and malignancy in 7.7%. Other studies<sup>[22-24]</sup> reaffirmed these findings. Given the inaccuracy of barium enema and the relatively high incidence of neoplasia and malignancy, colonoscopy was felt to be an improvement in overall accuracy; therefore, it was recommended in patients with symptomatic diverticular disease.

**Evolving trends in the management of diverticulitis**

Because of an evolving trend toward nonoperative management, the accuracy of diagnostic studies remains paramount. Recently published reviews<sup>[25,26]</sup> examined the natural history of uncomplicated diverticulitis and the indications for surgery. In patients presenting with uncomplicated diverticulitis and followed for 8.9 years, recurrence occurred in 13.3% of patients and only 3.9% had a second recurrence. In addition, the rate of complicated recurrence after a bout of uncomplicated diverticulitis is rare, occurring only 5% of the time. Furthermore, commonly held notions that young age and number of occurrences portended a worse prognosis may not hold true. Further data suggests that age of onset less than 50 years and 2 or more recurrences do not increase the risk



**Figure 2** Colonoscopy demonstrating a polyp arising within a diverticulum in the descending colon. Histology confirmed this to be a tubulovillous adenoma with well-differentiated adenocarcinoma confined to the mucosa. Reproduced with permission from Fu KI, Hamahata Y, Tsujinaka Y. Early colon cancer within a diverticulum treated by magnifying chromoendoscopy and laparoscopy. *World J Gastroenterol* 2010; 16 (12): 1545-1547.

of complications and need for subsequent colectomy. Therefore, the decision to proceed with surgery should be based on the risks of recurrent diverticulitis, surgical risk, and symptom resolution. Even select patients with complicated disease may undergo non-operative management rather than a mandatory surgical resection<sup>[17]</sup>. With the advent of image-guided percutaneous drainage, patients with perforated diverticulitis and an isolated abscess can be treated (at least initially) with drainage and antibiotic therapy<sup>[7-9]</sup>. Newer investigations are also looking at laparoscopic washout and drainage without resection in select patients<sup>[27-30]</sup>.

On the other hand, patients with malignancy obviously require surgical resection. Previously, even despite an “inaccurate” diagnosis of diverticulitis in a patient who in reality harbored a malignancy, a surgical resection may have resulted in the same endpoint - operative removal of that segment of bowel. In that scenario, the patient would be appropriately diagnosed and potentially would have received the appropriate therapy for their cancer. Yet, surgeons may not always include a complete lymphadenectomy in a patient with known diverticular cases versus readily following standard principles with oncological resection in a known colon cancer case. Furthermore, as we have moved towards non-operative management in diverticular disease, identifying patients who have synchronous cancer becomes even more important, as missing a diagnosis of advanced adenoma or colorectal malignancy may result in progression of the disease from resectable to non-resectable (at least for cure). With this in mind, and being more concerned about the risk of missing malignancy - especially as non-operative management is becoming more frequent in diverticulitis, most practitioners have elected to follow the guidelines and to perform routine endoscopy.

**Association between diverticulitis and malignancy**

One area of persisting controversy deals with whether an association exists between diverticulitis and advanced co-

lonic neoplasia (Figure 2), and, if so, is there an increased incidence of colonic neoplasia in patients diagnosed with diverticulitis? In 2013, a multidisciplinary working group from the Netherlands developed national guidelines including the epidemiology, classification, diagnostics and treatment of acute left-sided diverticulitis in all its aspects based on an evidence-based review of the international literature. The guidelines stated that colonoscopy in the acute phase of diverticulitis was not recommended for diagnostic purposes and that there was no place for routine endoscopic evaluation after an episode of acute left-sided diverticulitis<sup>[31]</sup>. Krones *et al.*<sup>[32]</sup> examined two subgroups of patients - those with an initial diagnosis of cancer and those with an initial diagnosis of diverticulitis - to evaluate the presence of the other diagnosis in each. They further categorized the groups based on age and performed an age-stratified analysis. Of 512 patients with diverticular disease, 28 patients (5.5%) were identified with synchronous or metachronous advanced colonic neoplastic lesions. In patients undergoing resection for diverticulitis and its associated complications, a reduced rate of advanced colonic neoplasia was seen with an odds ratio of 0.13-0.43. Based on this data, the authors concluded that there is no association between the two disease processes as previously suspected. With this study, it is important to understand that the authors are describing colonic neoplasia in the remaining colon after resection of the segment with diverticular disease. Unfortunately, they do not comment on synchronous (or occult) neoplasia in the resected segment. They also do not comment on how many of these patients had a previous colonoscopy, and what percentage had never undergone a colonoscopic evaluation. Thus, one cannot infer that the patient was harboring malignancy in the diseased segment. In addition, the authors do not separately report advanced neoplastic lesions and colorectal cancer; but rather, group them together in their report.

A subsequent study<sup>[33]</sup> looked at the association between diverticulitis and colonic neoplasia and compared it to the general population. The expected lifetime risk of malignancy is about 4%-5% and advanced adenomas is about 20%. Looking at the results for 288 patients, five patients (1.7%) had carcinoma and 18 patients (6.3%) were found to have colorectal adenomas. Based on the lifetime risk of carcinoma and malignancy, this population was expected to have 17 colorectal cancers and 69 adenomas. Therefore, the risk of malignancy and adenomas was less than expected, and the authors concluded that there was not an increased risk of malignancy in patients with a diagnosis of diverticulitis.

As we look at how the diagnosis of diverticulitis has changed, we have moved from clinical diagnosis with confirmation by barium enema to confirmation with CT. With improvements in multi-slice CT, this modality provides much more information, including the ability to better diagnose perforation and abscess, and it provides more information regarding the colon and surrounding soft tissues. In 309 patients with CT diagnosed diverticu-

litis who underwent follow-up colonoscopy within one year of diagnosis, Lau *et al.*<sup>[34]</sup> found eighty-two patients (28%) with adenomatous polyps, and 9 patients (2.8%) had colorectal carcinoma. In addition, the authors cross-referenced the national cancer registry and identified additional patients with a CT diagnosis of diverticulitis who were later found to have malignancy. With this additional data, 23 patients (2.1%) were diagnosed with malignancy within one year. Brar and colleagues<sup>[35]</sup> looked at those patients with acute diverticulitis confirmed by CT scan and managed non-operatively and reviewed the endoscopy and pathology results. In this retrospective review, 458 patients were identified with a diagnosis of diverticulitis and who underwent non-operative management. Of these, 249 patients (54%) had subsequent endoscopy within one year of admission. Their primary end point was the incidence of clinically significant neoplasia. They identified 77 patients (30.9%) with polyps, 19 patients (7.6%) with advanced adenoma, and 4 patients (1.6%) with invasive adenocarcinoma. In total, clinically significant neoplasia was identified in 23 patients (9.2%). Once again, we must point out that none of these studies comment on the location of malignancy in relation to the location of diverticular disease. These patients may have developed neoplasia in different segments of the colon, leaving it unrelated to the diverticular disease. While colonic wall thickening and pericolic inflammation could be secondary to diverticulitis or malignancy, if malignancy is identified elsewhere, the CT findings become less relevant in attempting to differentiate the two disease processes. Given the widespread use of CT imaging to confirm the diagnosis of diverticulitis, additional information is gleaned from the images that may help to differentiate diverticulitis from malignancy, or, at the very least, identify patients at higher risk of an associated malignancy in the setting of acute diverticulitis that would necessitate the use of endoscopy to aid in diagnosis.

### Higher risk patients

So should we abandon endoscopy in this setting altogether? Simply stated, no. Obviously, if a patient has something in their evaluation that would dictate any need for a colonoscopy (*i.e.*, diagnostic dilemma, concerning radiographic finding, due for elective routine screening), colonoscopy should be performed. However, if diverticulitis alone should not be considered as an indication for colonoscopy, can we identify patients that are at higher risk of harboring malignancy in the absence of these other baseline risks? Brar *et al.*<sup>[35]</sup> further subdivided their patient population into complicated and uncomplicated diverticulitis. This subgroup analysis only considered patients with pericolic or pelvic abscess at time of presentation for the complicated diverticulitis group because those presenting with obstruction or fistula were managed operatively. In their analysis, they found that 9 patients (5.4%) in the uncomplicated group had advanced adenoma; whereas, in those patients presenting with abscess, 14 patients (18.9%) had advanced adenoma. Four

**Table 1 Summary of articles *n* (%)**

	Year	Patients	Endoscopies	Patients with nonmalignant colonic polyps/neoplasia	Patients with malignancy	Comments
Krones <i>et al</i> <sup>[32]</sup>	2006	512	NR	NR	28 (5.5)	Looked at patients with malignancy and synchronous diverticulosis and patients with diverticulosis/diverticulitis and synchronous or metachronous malignancy
Lam <i>et al</i> <sup>[33]</sup>	2010	288	NR	23 (8)	5 (1.7)	Looked at all patients with diverticulitis. Reviewed pathology report for those undergoing resection
Lau <i>et al</i> <sup>[34]</sup>	2011	1088	319 (29.3)	82 (26)	9 (2.8)	Recommend routine colonic evaluation, especially in patients with complicated diverticulitis
Brar <i>et al</i> <sup>[35]</sup>	2013	458	249 (54.4)	77 (30.9)	4 (1.6)	Age and abscess are independent predictors of malignancy on multivariate analysis
Elmi <i>et al</i> <sup>[36]</sup>	2013	1034	402 (38.9)	78 (19.4)	9 (2.2)	Also evaluated CT findings and risk of malignancy
Total:				260 (20.7)	55 (3.1)	

For reference, lifetime risk of non-malignant neoplastic lesions and malignancy is about 20% and 4%-5%, respectively. CT: Computed tomography; NR: Not recorded.

patients (5.4%) presenting with complicated diverticulitis were found to have invasive malignancy, while there were none identified in the uncomplicated diverticulitis group. The investigators also looked at age as a risk factor for advanced neoplasia. On multivariate analysis, both age (OR = 1.04, 95%CI: 1.01-1.08) and presence of intra-abdominal abscess (OR = 4.15, 95%CI: 1.68-10.3) were determined to be independent risk factors. Looking at patients with complicated diverticulitis, Lau and associates<sup>[34]</sup> found the odds of malignancy with the presence of abscess is 6.7-fold (95%CI: 2.4-18.7), 4-fold (95%CI: 1.1-14.9) with local perforation, and 18-fold (95%CI: 5.1-63.7) in patients with concomitant fistula as compared to uncomplicated diverticulitis. Therefore, in patients above the age of 50 or those presenting with complicated diverticulitis, colonoscopy should be considered.

### Radiographic clues

As mentioned above, CT imaging provides more information regarding the colon and surrounding soft tissues than barium enema alone, and these details may be useful in evaluating patients with diverticulitis and the risk for associated malignancy. Elmi *et al*<sup>[36]</sup> looked at 402 patients with CT diagnosed diverticulitis who underwent colonoscopy at any time after CT. They identified 78 patients (19.4%) with polyps, 55 patients (13.7%) with adenomatous polyps, and 9 patients (2.2%) with invasive malignancy. Importantly, the authors looked at each case of diagnosed colorectal cancer and identified the locations of malignancy and diverticular disease. In 8 of 9 cases, both were in the same segment of the colon, thus making it important to attempt to identify those patients with CT findings that are more predictive of malignancy. The authors further analyzed their group based on CT findings and the predictive value of these characteristics for malignancy. They looked at wall thickness > 6 mm, abscess, fistula, presence of mesenteric or retroperitoneal lymphadenopathy, localized mass, localized perforation, obstruction, and enhancement on CT. Of these characteristics, the highest odds ratios for malignancy were seen for presence of abscess (OR = 4.67, 95%CI: 1.12-19.43),

presence of lymphadenopathy (OR = 23.35, 95%CI: 5.56-97.90), obstruction (OR = 24.43, 95%CI: 2-297), and localized mass (OR = 24.43, 95%CI: 2-297.85). Based on these findings, the authors concluded that those patients with wall thickness > 6 mm, abscess, lymphadenopathy, or obstruction should undergo colonoscopic evaluation to rule out malignancy, as these findings are more suggestive of a malignant rather than benign process, such as diverticulitis.

A summary of the currently available systematic reviews on the topic of colonic evaluation in the setting of acute diverticulitis is presented in Tables 1 and 2.

## RISKS OF ENDOSCOPY

In deciding whether or not to pursue an endoscopic evaluation of the colon after resolution of an episode of acute diverticulitis, it is important to realize that there are risks involved with this invasive procedure. While patients experience discomfort and pain during and after the procedure, this is typically self-limited. In other cases, however, pain may persist and may signify a serious adverse event, such as perforation, hemorrhage, or the development of acute diverticulitis. A recent retrospective cohort study<sup>[41]</sup> looked at over 43000 individuals who underwent colonoscopy. The authors observed 4.7 serious adverse events per 1000 screening colonoscopies and 6.8 per 1000 follow-up colonoscopies. Performance of polypectomy increased this rate (relative rate = 2.64). Age was also observed to be associated with increased risk of serious adverse events with the highest relative rate (3.21) seen in individuals from 75 to 85 years of age. Thus, if follow-up endoscopy is truly not needed in patients presenting with acute diverticulitis, then we are unnecessarily exposing our patients to the risks (albeit low) associated with this invasive procedure.

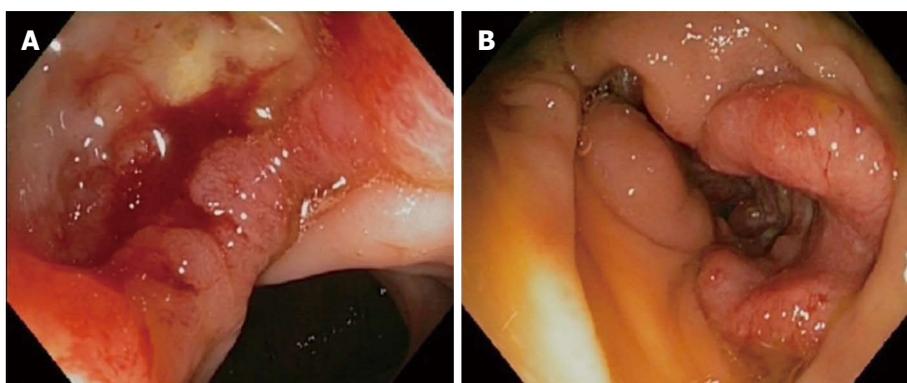
## CAN IMAGING REPLACE ENDOSCOPIC EVALUATION?

In addition to the risks associated with invasive endos-

**Table 2 Recent systematic reviews n (%)**

	Year	Included articles	Patients	Endoscopies	Patients with nonmalignant colonic polyps/neoplasia	Patients with malignancy	Comments
Sai <i>et al</i> <sup>[37]</sup>	2012	10	771	430 (55.8)	NR	14 (2.1)	Patients evaluated within 24 wk with surgery, colonoscopy, or barium enema
Sharma <i>et al</i> <sup>[38]</sup>	2014	11	3358	1970 (58.7)	220 (19.5)	22 (1.6)	Also examined uncomplicated <i>vs</i> complicated diverticulitis and found proportional estimate of risk of 0.7% and 10.8%, respectively
de Vries <i>et al</i> <sup>[39]</sup>	2014	9	2490	1468 (59)	278 (19.9)	17 (1.16)	Only examined patients presenting with uncomplicated diverticulitis
Daniels <i>et al</i> <sup>[40]</sup>	2014	8	1796	1796 (100) <sup>1</sup>	363 (20.2)	29 (1.6)	

<sup>1</sup>Study only documented the patients who underwent endoscopy and did not document those who did not have endoscopy. For reference, lifetime risk of non-malignant neoplastic lesions and malignancy is about 20% and 4%-5%, respectively.



**Figure 3 Endoscopic image.** A: An inflamed diverticulum with erythema and fibrinous deposit at its orifice; B: A malignant-appearing tumor in the colon. Reproduced with permission from www.EndoAtlas.org, World Endoscopy Organization.

copy, we should point out that it can be difficult to differentiate acute diverticulitis from malignancy *via* the colonoscope (Figure 3). So, can imaging help us in this respect? When attempting to differentiate acute sigmoid diverticulitis from sigmoid colon cancer, CT imaging has previously had poor results using older technology. In 1999, Chintapalli *et al*<sup>[42]</sup> identified CT findings that were predictive of diverticulitis and those predictive of malignancy in a retrospective fashion based on 58 CT scans reviewed by five radiologists. Pericolonic inflammation and segment involvement > 10 cm in length were significant findings for diverticulitis; whereas, pericolonic lymph nodes and luminal mass were most significant for colon cancer. The same five radiologists then prospectively reviewed 72 CT scans. An unequivocal diagnosis was made in 16/40 (40%) cases of diverticulitis and 21/32 (66%) cases of colon cancer. While they were able to identify findings consistent with each diagnosis, their subsequent evaluation showed a poor ability to provide the correct diagnosis. Newer technology however may make results like this obsolete.

One modality that is showing promise is the use of T2-weighted and diffusion-weighted magnetic resonance imaging (MRI). A small study published in 2013 compared CT and MRI. In 30 patients - 15 with sigmoid colon cancer and 15 with a recent episode of acute sigmoid diverticulitis - CT and MRI findings were compared

with respect to sensitivity and specificity of each. The sensitivity and specificity of CT for diagnosis cancer and diverticulitis were 66.7% (10/15) and 93.3% (14/15), respectively. For MRI, the sensitivity and specificity were 100% (14/14) and 100% (14/14), respectively. This study shows promise for the use of MRI in the differentiation of diverticulitis and cancer, but obviously a larger one is needed to confirm these results<sup>[43]</sup>.

CT-colonography (CTC) is also touted as a viable alternative to colonoscopy in patients diagnosed with colorectal disease, including diverticular disease. In a prospective evaluation of colonoscopy and CTC, 108 patients were evaluated with both modalities - half of patients underwent colonoscopy followed by CTC, while the other half underwent the studies in reverse order. Even though patients were sedated for colonoscopy but not for CTC, they found colonoscopy to be more painful and uncomfortable ( $P < 0.001$ ). Diverticulosis and polyps were detected in 94% and 20% with colonoscopy, and in 94% and 29% with CTC, respectively. Sensitivity and specificity for CTC in the detection of diverticular disease was 99% and 67%; whereas, for detection of polyps, the sensitivity and specificity were 47% and 75%. No cancer was identified in this patient group. This modality shows promise in the diagnosis and evaluation of the colon in diverticular disease, especially in cases of incomplete colonoscopy or in situations where colonoscopy

resources are limited. However, in cases where neoplasia is suspected, endoscopy with biopsy remains the appropriate modality for definitive diagnosis<sup>[44]</sup>.

## CONCLUSION

The evaluation and management of diverticulitis continues to change, and the routine use of endoscopy is being re-evaluated. Given the advancements in CT imaging, diverticulitis is now more easily diagnosed and differentiated from other pathologies. With the widespread availability of this improved diagnostic test, the need for endoscopy in the setting of diverticulitis diagnosed with CT may be less critical. In patients with other indications for endoscopy, such as age greater than 50 years or rectal bleeding, colonoscopy should be pursued, if not performed prior to their presentation with diverticulitis. In patients who present with complicated diverticulitis (perforation with abscess, obstruction) or those with concerning findings on CT, endoscopy should be considered given the increased risk of malignancy seen in these subgroups. In the future, other modalities, such as MRI or CT-colonography may obviate the need for endoscopy in patients with negative imaging, but currently, it is still recommended to perform endoscopy in individuals recovering from diverticulitis, especially in those deemed high-risk for malignancy. In these high-risk patients, the benefits of potentially diagnosing neoplasia or malignancy would most definitely outweigh the risks of endoscopy. In terms of future directions, it may be interesting to evaluate patients who develop acute diverticulitis after having undergone previous colonoscopy. Many are scheduled for endoscopic exam after resolution of diverticulitis without regard to prior endoscopic results and timing. It is likely that following standard screening guidelines for timing of surveillance colonoscopy is adequate, but this has not been investigated in the setting of acute diverticular disease.

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