

Original Article

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First episode of uncomplicated diverticulitis does not increase the risk of colorectal cancer

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ABSTRACT

Introduction. Danish guidelines recommend colonoscopy after a case of acute diverticulitis to exclude colorectal cancer (CRC), but evidence in support this practice is limited. A series of studies has reported a low incidence of CRC in patients after they presented with acute diverticulitis, especially in uncomplicated cases. The purpose of this study was to investigate the incidence of CRC after acute diverticulitis detected during colonoscopy.

Methods. All patients seen between January 2010 and November 2017 with a first episode of acute diverticulitis and a subsequent computed tomography and colonoscopy were included.

Results. A total of 332 patients were included in the study. The incidence of CRC after a case of uncomplicated acute diverticulitis was 0.8%. The incidence of malignancy was 2.8% in the group of patients with complicated diverticulitis.

Conclusions. This study showed a low risk of CRC after a case of acute diverticulitis and no cases of CRC in patients with uncomplicated diverticulitis without clinical symptoms of CRC. This indicates that revising guidelines in regards to follow-up after diverticulitis may be warranted.

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Diverticulosis in the left colon is a common condition [1]. The incidence increases with age; about 5% of the population aged 30-39 years has diverticulosis of the colon in comparison with more than 60% at the age of 80 years or above. The most common sites of diverticulosis are the sigmoid colon and the descending colon [1]. The life-time risk of developing acute diverticulitis is 10-25% [2], and the prevalence of acute diverticulitis is rising, especially in the Western world [2].

It is widely believed that acute diverticulitis is caused by micro perforation due to increased intraluminal pressure or faecal impaction. This leads to localised inflammation [3]. However, the causality is not fully understood. In Denmark, the incidence of hospitalisation caused by acute diverticulitis is 71/100,000 [1].

If acute diverticulitis is suspected, a computed tomography (CT) of the abdomen with intravenous contrast should be performed to exclude abscess formation or perforation of the intestinal wall, also described as complicated diverticulitis. On a CT, acute uncomplicated diverticulitis is interpreted as localised thickening of the colonic wall and affection of the pericolic tissue. The sensitivity is 100%; the specificity, 95% [4]. In 70% of

the cases, the course of acute diverticulitis is uncomplicated and no need exists for surgical or non-surgical intervention [1].

European and American guidelines recommend colonoscopy after acute diverticulitis to exclude colorectal cancer (CRC) [5, 6]. Danish national guidelines support these guidelines and recommend colonoscopy [1]. Colonoscopy after acute diverticulitis is introduced based on expert opinions, but evidence of this practice is limited. A series of studies has reported a low CRC incidence after acute diverticulitis [7-13]. An RCT established that the risk of CRC after acute uncomplicated diverticulitis was 0.7% [14]. Recent Australian guidelines have changed recommendations and now only recommend colonoscopy after complicated diverticulitis or suspicious findings on CT or clinically suspected CRC [15].

In a screening population, 0.2% of the patients will experience a serious complication such as perforation or bleeding after a colonoscopy [16]. The risk of perforation is higher in a segment of the colon with diverticulosis, and 49% of perforations occur in approximation of diverticulosis [17]. The rate of completion is lower if the patient has diverticulosis, and the cecum is intubated in 91.3% of patients with diverticulosis compared with 98.2% of a screening population ($p < 0.001$) [8]. Furthermore, colonoscopy is associated with discomfort and pain.

The purpose of this study was to investigate the incidence of CRC in a Danish population with a first event of acute diverticulitis to assess the value of endoscopic evaluation. Secondary outcomes were exposure to other risk factors leading to increased incidence of CRC in patients with acute diverticulitis.

METHODS

All medical files were extracted for patients seen in the endoscopic unit or admitted in the ward between 1 January 2010 and 7 November 2017 with a ICD code of diverticulosis or diverticulitis (DK57, DK570, DK570A, DK570B, DK570C, DK571, DK571A, DK571B, DK572, DK572A, DK572B, DK572C, DK573, DK573A, DK573B, DK573C, DK573D).

These journals were systematically reviewed to establish whether the patient had been admitted to the surgical ward and if the primary reason for admittance was acute diverticulitis. Patients with diverticula/other diverticular disease but without acute diverticulitis were excluded.

Only patients who had their first episode of acute diverticulitis confirmed by CT with subsequent colonoscopy or sigmoidoscopy were included.

If the primary investigator had any doubts as to inclusion, the case was discussed with the chief physician of the endoscopy unit.

The exclusion criteria were previous history of diverticulosis or diverticulitis, no CT or no endoscopic follow-up. All other patients were eligible.

The following data were extracted from the files: patient demographics, patient history, the CT findings and endoscopic findings, including histological results.

According to the findings on the CT, the case was registered as either complicated or uncomplicated.

Complicated diverticulitis was defined as microperforation, perforation or abscess formation. The Hinchey classification was applied if a perforation or abscess was present. Microperforation was defined as small bubbles of air outside the intestinal lumen.

RESULTS

Overall, 332 patients were included in the study. The mean age was 59 years.

For further patient demographics, see [Table 1](#).

TABLE 1 Patient demographics (N = 332).

<i>Gender, n (%)</i>	
Male	126 (38)
Female	206 (62)
<i>ASA group, n (%)</i>	
1	186 (56)
2	97 (29)
3	49 (14)
Mean age, yrs	59

ASA = American Society of Anesthesiologists.

No endoscopic complications were registered.

Four cases (1.2%) of CRC were diagnosed at the endoscopic examination.

The four patients with CRC are described in the following. Two patients had complicated diverticulitis (Hinchey 1) one of whom was suspected of CRC based on the initial CT. Among the two remaining cases with uncomplicated diverticulitis and CRC, one was suspected of CRC based on the CT, and the final patient had a month-long history of B symptoms and abdominal pain, which should have triggered colonoscopy regardless.

The majority of patients presented with uncomplicated diverticulitis. The incidence of CRC in this population was 0.8%. The incidence of malignancy was 2.8% in the group of patients with complicated diverticulitis.

The results are summarised in [Table 2](#).

TABLE 2 Results (N = 332).

Uncomplicated diverticulitis, n _u (% of total)	260 (78.3)
<i>Complicated diverticulitis, n (% of total)</i>	
Microperforation	20 (6.0)
Hinchey 1	30 (9.0)
Hinchey 2	8 (2.4)
Hinchey 3	14 (4.2)
Hinchey 4	0
Subtotal: n _c	72 (21.7)
<i>Colonoscopy</i>	
Completed, n (% of subtotal)	107 (98)
Subtotal, n (% of total)	109 (32.8)
<i>Sigmoidoscopy</i>	
Completed, n (% of subtotal)	209 (93.7)
Subtotal, n (% of total)	223 (67.2)
<i>Endoscopic findings: colorectal cancer</i>	
In uncomplicated diverticulitis, n/n _u (%)	2/260 (0.77)
In complicated diverticulitis, n/n _c (%)	2/72 (2.8)
Subtotal, n (% of total)	4 (1.2)

The negative predictive value (NPV) of CT is 99.7%.

Further results are listed in Table 3.

TABLE 3 Computed tomography (N = 332).

CT-observed cancer?	n _{CT}	Cancer	PPV	Not cancer	NPV
		n _c /n _{CT} (%)		n _n /n _{CT} (%)	
Yes	3	2/3 (66)	66%	1/3 (33)	-
No	329	1/329 (0.3)	-	328/329 (99.7)	99.7%

NPV = negative predictive value; PPV = positive predictive value.

DISCUSSION

Our findings suggest a low risk of CRC following a first-time episode of acute diverticulitis in a Danish University hospital, and the risk is especially low for uncomplicated diverticulitis, 0.8%. The incidence of CRC is 0% if the patient presented with uncomplicated diverticulitis and no suspicious findings on CT and/or no symptoms of CRC. The symptoms include weight loss, night sweats, fatigue, bloody stools and change in bowel pattern for more than four weeks.

This cohort only represents patients who were admitted to hospital. Suspicion has been raised that a population exists that has received treatment for acute diverticulitis in primary healthcare without a CT or a colonoscopy. No data exist on this population and its size remains unknown. Guidelines still recommend colonoscopy after a case of diverticulitis. If the primary sector followed guidelines systematically, this would potentially mean an increase in the number of patients referred for a colonoscopy.

In the Danish screening population, the CRC detection rate was 5.9% in 2017 [18]. According to our findings, the prevalence is much lower when performing colonoscopy after a case of acute diverticulitis. Furthermore, an overlap between the patient population with diverticulitis and the screening population may be expected. This emphasises that the benefit of performing a colonoscopy after a case of acute uncomplicated diverticulitis is probably very limited.

A meta-analysis performed by Niv et al. investigated the incidence of CRC in an asymptomatic population. In a population of 68,324 patients, the incidence of invasive cancer was 0.78% (95% confidence interval (CI): 0.13-2.97%) [19]. Sharma et al. investigated the incidence of CRC after a case of acute diverticulitis in a meta-analysis. After a case of uncomplicated acute diverticulitis, the incidence of CRC was 0.7% (95% CI: 0.3-1.4%) [14]. This means that after a case of uncomplicated diverticulitis, the incidence of colorectal malignancy may fall in the same range as within an asymptomatic population. Our findings support this conclusion.

A sigmoidoscopy was performed in 67.2% of the patients in our study. Diverticulitis is often located in the sigmoid colon but a full colonic evaluation is necessary if the patient is suspected to harbour neoplasia in the colon. Patients were offered a sigmoidoscopy to investigate the sigmoid colon where the diverticula are located, as recommended in our local guidelines. If the diverticula were located in the right colon, a full colonoscopy was performed but other unknown factors might have contributed to the decision of conducting a full colonoscopy.

In our study, all of the patients were investigated endoscopically, and a CT was performed on admittance. It is widely accepted that all patients admitted with a clinical suspicion of acute diverticulitis need a CT to rule out abscess formation and perforation as this is not possible by clinical investigation alone. This practice requires that a CT is widely accessible and that radiologists are experienced in interpreting test results. Our study suggested a very high negative predictive value (NPV) of cancer if the CT raised no suspicion of CRC.

It is suspected that the rate of CRC is higher in patients with complicated diverticulitis, and our findings support this. However, due to a limited number of CRC, it is difficult to draw conclusions. In complicated diverticulitis, CT findings are harder to interpret and the inflamed area and/or abscess formation may harbour a cancer. Sharma et al. found an incidence of CRC of 10.4% (95% CI: 5.2-21.0%) in patients with complicated diverticulitis. The complicated cases represent five percent of the population with acute diverticulitis [14]. In a retrospective study, the CRC incidence was 0.5% for uncomplicated diverticulitis and 5.4% for complicated diverticulitis [10]. The presence of abscess formation means a seven-fold higher risk of CRC compared with uncomplicated diverticulitis ($p = 0.001$) [20]. Overall, the evidence suggests a higher risk of CRC after a case of complicated diverticulitis.

One strength of this study was the high number of patients included and the fact that all patients were evaluated

by both CT and endoscopy, which has not been the case in earlier studies. The limitations were the retrospective design and the lack of full colonoscopy in the majority of the patients. Many patients were not eligible for the study because they were either known with diverticular disease, had not received a CT or their follow-up did not include endoscopy.

Based on recent evidence, the future follow-up after a first case of acute diverticulitis may be a colonoscopy performed in selected patients with either complicated diverticulitis, unsuspected CT or symptoms of CRC. A national database study is warranted.

CONCLUSIONS

This study shows a low risk of CRC after a first case of acute diverticulitis and no cases of CRC in patients with uncomplicated diverticulitis without clinical symptoms of CRC. This indicates that revising guidelines should be considered in regards to followup after acute diverticulitis, since no evidence supports this aspect of the present guidelines.

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REFERENCES

1. Andersen JC, Bundgaard L, Elbrønd H et al. Danish national guidelines for treatment of diverticular disease. *Dan Med J*. 2012;59(5):C4453.
2. Stollman N, Raskin JB. Diverticular disease of the colon. *Lancet*. 2004;363(9409):631-9.
3. Williams R, Davis I. Diverticular disease of the colon. 5th ed. Philadelphia: Saunders, 1995.
4. Ambrosetti P, Jenny A, Becker C et al. Acute left colonic diverticulosis - compared performance of computed tomography and water-soluble contrast enema: Prospective evaluation in n 420 patients. *Dis Colon Rectum*. 2000;43(10):1363-7.
5. Rafferty J, Shellito P, Hyman NH et al. Practice parameters for sigmoid diverticulitis. *Dis Colon Rectum*. 2006;49(7):939-44.
6. Jacobs DO. Clinical Practice. Diverticulitis. *N Engl J Med*. 207;357(20):2057-66.
7. Horesh N, Saeed Y, Horesh H et al. Colonoscopy after the first episode of acute diverticulitis: challenging management paradigms. *Tech Coloproctol*. 2016;20(6):383-7.
8. Daniels L, Ünlü Ç, de Wijckerslooth TR et al. Yield of colonoscopy after recent CT-proven uncomplicated acute diverticulitis: a comparative cohort study. *Surg Endosc*. 2015;29(9):2605-13.
9. Brar MS, Roxin G, Yaffe PB et al. Colonoscopy following nonoperative management of uncomplicated diverticulitis may not be warranted. *Dis Colon Rectum*. 2013;56(11):1259-64.
10. Suhardja TS, Norhadi S, Seah EZ et al. Is early colonoscopy after CT-diagnosed diverticulitis still necessary? *Int J Colorectal Dis*. 2017;32(4):485-9.
11. Sallinen V, Mentula P, Leppäniemi A. Risk of colon cancer after computed tomography-diagnosed acute diverticulitis: is routine colonoscopy necessary? *Surg Endosc*. 2014;28(3):961-6.
12. Lecleire S, Nahon S, Alatawi A et al. Diagnostic impact of routine colonoscopy following acute diverticulitis: a multicenter study in 808 patients and controls. *United European Gastroenterol J*. 2014;2(4):301-6.
13. Andrade P, Ribeiro A, Ramalho R et al. Routine colonoscopy after acute uncomplicated diverticulitis - challenging a putative

- indication. *Dig Surg.* 2017;34(3):197-202.
14. Sharma PV, Eglinton T, Hider P et al. Systematic review and meta-analysis of the role of routine colonic evaluation after radiologically confirmed acute diverticulitis. *Ann Surg.* 2014;259(2):263-72.
 15. You H, Sweeny A, Cooper ML et al. The management of diverticulitis: a review of the guidelines. *Med J Aust.* 2019;211(9):421-7.
 16. https://dccg.dk/wp-content/uploads/2017/08/2014_screening.pdf.
 17. Korman LY, Overholt BF, Box T et al. Perforation during colonoscopy in endoscopic ambulatory surgical centers. *Gastrointest Endosc.* 2003;58(4):554-7.
 18. https://www.sundhed.dk/content/cms/45/61245_dts_%C3%A5srapport-2017_final.pdf.
 19. Niv Y, Hazazi R, Levi Z et al. Screening colonoscopy for colorectal cancer in asymptomatic people: a meta-analysis. *Dig Dis Sci.* 2008;53(12):3049-54.
 20. de Vries HS, Boerma D, Timmer R et al. Routine colonoscopy is not required in uncomplicated diverticulitis: a systematic review. *Surg Endosc.* 2014;28(7):2039-47.