Outcome and treatment of acute diverticulitis
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Yield of colonoscopy after recent CT-proven uncomplicated acute diverticulitis: a comparative cohort study

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Submitted
ABSTRACT

Background Current guidelines recommend routine follow-up colonoscopy after acute diverticulitis to confirm the diagnosis and exclude malignancy. Its value however has recently been questioned because of contradictory study results. Our objective was to compare the colonoscopic detection rate of advanced colonic neoplasia (ACN), comprising colorectal cancer (CRC) and advanced adenoma (AA), in patients after a CT-proven primary episode of uncomplicated acute diverticulitis with average risk participants in a primary colonoscopy CRC screening program.

Methods A retrospective comparison was performed of prospectively collected data from cohorts derived from two multicenter RCTs executed in the Netherlands between 2009 and 2013. 401 uncomplicated diverticulitis patients and 1,426 CRC screening participants underwent colonic evaluation by colonoscopy. Main outcome was the diagnostic yield for ACN, calculated as number of diverticulitis patients and screening participants with ACN relative to their totals, with differences expressed as odds ratios (OR). The histopathology outcome of removed lesions during colonoscopy was used as definitive diagnosis.

Results AA detection was similar (5.5% vs. 8.7%; OR, 0.62 [95% CI, 0.38-1.01]; P = 0.053). CRC was detected in 1.2% (5/401) of diverticulitis patients versus 0.6% (9/1,426) of screening participants (OR, 1.30 [95% CI, 0.39-4.36]; P = 0.673). ACN was diagnosed in 6.7% (27/401) of diverticulitis patients versus 9.1% (130/1,426) of screening participants (OR, 0.71 [95% CI, 0.45-1.11]; P = 0.134). ORs were adjusted for age, family history of CRC, smoking, BMI and cecal intubation rate.

Conclusions ACN detection does not differ significantly between patients with recent uncomplicated diverticulitis and average risk screening participants. Routine follow-up colonoscopy after primary CT-proven uncomplicated left-sided acute diverticulitis can be omitted; these patients can participate in CRC screening programs. Follow-up colonoscopy may be beneficial when targeted at high risk patients, but such an approach first needs prospective evaluation.
INTRODUCTION

Current international guidelines recommend the use of ultrasonography (US) or computed tomography (CT) to diagnose acute diverticulitis, grade the severity of disease and assess for complications [1-4]. Subsequent colonic evaluation, preferably colonoscopy, is advised to confirm the diagnosis and exclude other diagnoses, colorectal carcinoma (CRC) in particular [1-3, 5-9]. Importantly, the recommendation for colonoscopy is merely based on expert opinion and dates back to the time before widespread use of CT to diagnose acute diverticulitis. With high sensitivity (94%) and specificity (99%) of CT for diagnosing diverticulitis, and a sensitivity ranging between 50% and 100% for the identification of alternative diseases, the need for routine colonoscopy after CT-proven acute diverticulitis can be questioned [10].

Recently several, mostly retrospective, studies assessing the yield of routine colonic evaluation after an episode of acute diverticulitis have been published [11-25]. The results are contradictory but some authors deem current practice unnecessary. Furthermore, colonoscopy is invasive, burdensome, costly, time-consuming, can be accompanied by procedure-related morbidity [26], and its availability is limited.

Therefore, it is important to clarify whether it is justified to prioritize patients with a CT diagnosis of acute diverticulitis above those eligible for population-based screening for CRC. We hypothesized that the detection of advanced colonic neoplasia (ACN), comprising CRC and advanced adenoma (AA), in diverticulitis patients is equivalent to or lower than in individuals eligible for primary colonoscopy screening. In a prospective, comparative cohort study we compared the diagnostic yield of patients following a CT-proven episode of uncomplicated acute diverticulitis with average risk participants in a primary colonoscopy screening program for CRC. Hereby, conclusions on the indication and current recommendation for routine colonoscopy after a primary episode of uncomplicated acute diverticulitis can be drawn.

Methods

Design

This study was a retrospective comparison of prospectively collected data of two cohorts; a primary colonoscopy screening population and a cohort of uncomplicated acute diverticulitis patients. The cohorts were derived from two multicenter randomized clinical trials (RCTs) that were performed in the Netherlands in the period June 2009 – August 2010 and June 2010 – April 2013 respectively [27, 28]. Ethical approval for both trials was obtained and all participants gave informed consent. Both trials were registered in the Netherlands Trial Registry: NTR1829 and NTR2069 respectively (http://www.trialregister.nl) and the DIABOLO trial also at ClinicalTrials.gov: NCT01111253.
Participants

Data for the screening cohort were collected in the randomized, multicenter ‘Colonoscopy or Colonography for Screening’ (COCOS) trial [27, 29]. This cohort consisted of individuals from the general population, randomly selected from the regional municipal administration, aged 50–75 years, and living in the wider Amsterdam and Rotterdam regions. Only those participants who were randomly invited for primary colonoscopy screening and decided to participate were included in the current study. The overall design of this study as well as its main results in terms of participation and diagnostic yield have been published before [27, 29].

The diverticulitis cohort consisted of adult patients with CT-proven uncomplicated left-sided acute diverticulitis. None of included patients had a previous attack of diverticulitis; all patients had a primary episode. These patients were included in one of 22 hospitals, all teaching hospitals from different regions in the Netherlands and two large academic tertiary referral centres, participating in the DIABOLO Trial. This trial was a multicenter RCT investigating the cost-effectiveness of treatment strategies with or without antibiotics for uncomplicated acute diverticulitis [28]. Patients who had undergone follow-up colonoscopy within 6 months were included in this study. Collected data were stored anonymously.

Colonoscopy

Colonoscopies in the screening cohort were performed at one of two participating centres by a dedicated study team of experienced gastroenterologists (≥ 1000 colonoscopies) and done according to the standard quality indicators as defined by the Society of Gastrointestinal Endoscopy [30]. A strict study protocol was used and research staff attended all colonoscopies and prospectively recorded (in case report forms) colonoscopy quality indicators and data on polyp detection, as the main outcome of the COCOS trial was the yield of colonoscopy.

In the diverticulitis cohort all colonoscopies were performed according to local protocol by experienced gastroenterologists and/or colorectal surgeons. The colonoscopy findings were collected prospectively as well, though polyp removal and registration were not protocoled. At the time both trials were performed, there was no national CRC screening program in The Netherlands.

Study parameters and outcomes

Baseline characteristics in the screening individuals were collected from the regional municipal administration, asked via a pre-colonoscopy consultation and through a questionnaire. Data regarding diverticulitis patient baseline characteristics were collected from hospital admission forms and a questionnaire. Furthermore, the hospital records
of all diverticulitis patients were reviewed to identify patients who underwent colon surgery and were diagnosed with CRC. CT reports were used to determine the modified Hinchey classification [31] and extract CT signs suggestive of complicated disease or malignancy. The interval between the acute diverticulitis episode and colonoscopy was registered. In both cohorts the quality of the colonic evaluation was determined by assessing the endpoint of colonoscopy, colon visualization and reasons for an incomplete procedure. Procedure-related adverse events were recorded as well.

The primary outcome was the diagnostic yield of colonoscopy for ACN, comprising CRC and AA. This was calculated as number of acute diverticulitis patients and screening individuals with ACN, relative to the total number of patients and individuals respectively. We used the histopathology outcome of removed lesions as definitive diagnosis. All polyps were recorded and lesions were subsequently classified as 1: serrated polyp, including hyperplastic polyps, sessile serrated lesions and/or traditional serrated lesions, 2: adenoma, including tubular adenoma, tubulovillous adenoma and/or villous adenoma, or 3: carcinoma. Dysplasia was assessed as either low or high grade. Histology was defined according to the Vienna criteria. AA was defined as an adenoma ≥ 10 mm, or with a ≥ 25% villous component, or with high-grade dysplasia [32]. ACN comprised CRC and AA altogether. Of all lesions localization was recorded. All parameters were collected in case report forms.

**Sample size calculation**

We hypothesized that the rate of ACN, as detected with colonoscopy, in the diverticulitis cohort would lie at or below the rate in the screening population. Therefore we used a non-inferiority design. The screening cohort ACN rate was 9% [33]. We considered a 2% absolute increase in ACN (increase from 9% to 11%) in the diverticulitis cohort to be a clinically relevant difference and to be inferior. For the alternative hypothesis we assumed the ACN rate in the diverticulitis cohort would be lower than the rate in the screening cohort. We would then expect the ACN rate in the diverticulitis cohort to be 6.75%. Sample sizes of 350 patients in the diverticulitis cohort and 1400 individuals in the screening cohort would provide an 80% power to detect a non-inferiority margin difference of 2% between the group rates. The power was computed for the case when the actual diverticulitis cohort rate would be 6.75%. The test statistic used was the one-sided Z test (pooled). The significance level of the test was targeted at $P < 0.05$.

**Statistical analysis**

Continuous variables were summarized as either means with corresponding standard deviations or medians with interquartile range depending on normality. Student t-test was used for comparing continuous variables when data were normally distributed; in other cases Mann-Whitney U test was used. Normality was assessed using Q–Q plots and
by performing the Shapiro-Wilk test. Categorical variables were compared using the Chi Square, Fisher’s exact test or Linear-by-Linear Association when appropriate. Differences in diagnostic yield of colonoscopy for the primary outcome were expressed as odds ratios (OR) with 95% confidence intervals (CI) and ORs were also calculated adjusted for significant patient and endoscopy characteristics. Statistical significance was defined as a two-sided $P < 0.05$. Statistical analysis was performed using SPSS, version 21.0 (SPSS Inc., Chicago, IL, USA).

**Results**

**Subject inclusion**

During the study period, 570 patients presented at the emergency department with clinical suspicion of uncomplicated acute diverticulitis. Of these, 57 were excluded on the basis of DIABOLO trial exclusion criteria [28] and premature termination of study. Of
513 remaining patients with a CT proven diagnosis of primary left-sided uncomplicated acute diverticulitis another 112 patients were excluded since they did not undergo follow-up endoscopy at all, not within a 6 months interval or they were evaluated by means of sigmoidoscopy, leaving 401 patients for analysis. Of the 6,600 individuals from the general population invited for screening colonoscopy, 1,426 participated in the screening program. (Fig. 1)

**Patient characteristics**

The clinical characteristics of included and excluded diverticulitis patients were similar, with the exception of a shorter duration of gastrointestinal complaints in excluded patients (median duration, 3 [IQR, 1-5] vs. 3 [IQR, 2-5]; \( P = 0.039 \)). Table 1 compares the characteristics of the diverticulitis patients with the screening individuals. The diverticulitis patients were significantly younger (median age, 57 vs. 60 years; \( P < 0.001 \)), had a higher body mass index (median 26.9 vs. 26.0; \( P = 0.002 \)), and were more often smokers

**TABLE 1 Characteristics of diverticulitis patients and screening individuals***

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Diverticulitis patients (N=401)</th>
<th>Screening individuals (N=1426)</th>
<th>( P )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>57 (49-65)</td>
<td>60 (55-65)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Male</td>
<td>191 (47.6%)</td>
<td>726 (50.9%)</td>
<td>0.246 †</td>
</tr>
<tr>
<td>Family history of CRC ‡ (1 vs 6 missing)</td>
<td>38 (9.5%)</td>
<td>218 (15.3%)</td>
<td>0.003 †</td>
</tr>
<tr>
<td>Smoking (14 vs 9 missing)</td>
<td></td>
<td></td>
<td>&lt; 0.001 †</td>
</tr>
<tr>
<td>Never</td>
<td>169 (42.1%)</td>
<td>890 (62.4%)</td>
<td></td>
</tr>
<tr>
<td>Stopped</td>
<td>113 (28.2%)</td>
<td>312 (21.9%)</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>105 (26.2%)</td>
<td>215 (15.1%)</td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>26.9 (24.5-30.3)</td>
<td>26.0 (23.8-28.7)</td>
<td>0.002</td>
</tr>
<tr>
<td>Duration of complaints (days)</td>
<td>3.0 (2.0-5.0)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Modified Hinchey classification [31]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a</td>
<td>371 (92.5%)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1b</td>
<td>30 (7.5%)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Recovery at endoscopy §</td>
<td>338 (84.3%)</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

CRC, colorectal carcinoma; BMI, body mass index; AD, acute diverticulitis; NA, not applicable; * Data are numbers with percentages in parentheses or medians with interquartile ranges (IQR); † Group differences were tested with the Fisher’s Exact test, Pearson \( \chi^2 \) test or Linear-by-Linear Association, as appropriate; ‡ A family history of CRC was defined as having at least one affected first-degree relative; § Recovery was defined by all of the following criteria: outpatient, normal diet (defined by tolerating solid food and more than 1L of fluid orally), temperature < 38.0 °C, and Visual Analog Scale pain score < 4, with no use of daily pain medication and resuming to pre-illness working activities.
or ex-smokers ($P < 0.001$). Significant more screening individuals had a family history of CRC; 15.3% as compared to 9.5% in the diverticulitis cohort ($P = 0.003$). The median duration of gastrointestinal complaints in the diverticulitis patients was 3 days. The majority (92.5%) was classified as Hinchey 1A diverticulitis and most patients (84.3%) were recovered at the time of endoscopy.

**Colonoscopy characteristics**

The median time interval between the diagnosis diverticulitis and colonoscopy was 55 days. In 92.3% (370/401) of diverticulitis patients diverticula were described in the endoscopy report. The cecum was intubated in 91.3% (366/401) of the diverticulitis patients compared to in 98.2% (1,401/1,426) of the screening individuals ($P < 0.001$). In a total of 79 subjects visualization of the colon was incomplete; in 14.2% (57/401) of diverticulitis patients and 1.5% (22/1,426) of screening individuals ($P < 0.001$). In 42% (24/57) of diverticulitis patients and in 23% (5/22) of screening individuals with incomplete visualization fecal contamination was the cause. Furthermore, difficult anatomy of the colon was the cause of incomplete visualization in 37% (21/57) of diverticulitis patients versus in 36% (8/22) of screening individuals. In the diverticulitis cohort, stricture or stenosis was accountable for this difficult anatomy in majority of cases. In the screening cohort pain was an important cause as well and accounted for 27% (6/22) of cases of incomplete visualization, whereas in the diverticulitis patients pain was cause in only 14% (8/57).

The number of procedure-related serious adverse events did not differ significantly between the two cohorts; 0.7% (3/401) in the diverticulitis cohort versus 0.4% (5/1,426) in the screening cohort ($P = 0.384$). In each cohort two post-polypectomy bleedings occurred. No colonic perforations were reported.

**Main outcomes**

Table 2 presents main outcomes and additionally the total number of lesions and its characteristics for the two cohorts. The number of subjects with polyps (38.7% vs 49.6%), serrated polyps (13.2% vs. 27.2%) and adenoma (19.0% vs. 29.4%) detected at colonoscopy was significantly lower in the diverticulitis cohort than in the screening cohort ($P < 0.001$). Further, AA was detected less often in the diverticulitis cohort (5.5% vs. 8.7%; crude OR, 0.61 [95% CI, 0.38-0.97]; $P = 0.036$ and adjusted OR, 0.62 [95% CI, 0.38-1.01]; $P = 0.053$). CRC was diagnosed in 1.2% (5/401) of diverticulitis patients and 0.6% (9/1426) of screening individuals (crude OR, 1.99 [95% CI, 0.66-5.97]; $P = 0.205$ and adjusted OR, 1.30 [95% CI, 0.39-4.36]; $P = 0.673$). The number of subjects with ACN did not differ significantly between both cohorts; 6.7% (27/401) of diverticulitis patients versus 9.1% (130/1,426) of screening individuals (crude OR, 0.72 [95% CI, 0.47-1.11]; $P = 0.132$ and adjusted OR, 0.71 [95% CI, 0.45-1.11]; $P = 0.134$). ORs were adjusted for age,
family history of CRC, smoking, BMI and cecal intubation rate, since these characteristics were significantly different between groups.

Most lesions were localized left-sided; 100% (5/5) versus 77.8% (7/9) of CRCs (P = 0.505), and 77.4% (24/31) versus 71.5% (123/172) of ACNs (P = 0.498) in diverticulitis patients and screening individuals, respectively. The median age at diagnosis ACN did not differ significantly between the two cohorts (61 vs. 62 years; P = 0.554).

ACN and CRC patients in the diverticulitis cohort
The median time interval between the initial diagnosis diverticulitis and the diagnoses CRC and ACN was 48 days (IQR, 35-91) and 66 days (IQR, 48-84) respectively (Table 2). Of five CRCs (in three men and two women), four were diagnosed by colonoscopy within 3

### TABLE 2 Outcomes compared on subject level and total numbers of lesions with characteristics within cohorts

<table>
<thead>
<tr>
<th>Lesion type (and characteristics)</th>
<th>Diverticulitis patients (N=401)</th>
<th>Screening individuals (N=1426)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N with lesion (and characteristics)</td>
<td>total lesions</td>
<td>N with lesion (and characteristics)</td>
</tr>
<tr>
<td>Polyp</td>
<td>155 (38.7%) 330</td>
<td>707 (49.6%) 1782</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Serrated polyp</td>
<td>53 (13.2%) 113</td>
<td>388 (27.2%) 745</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hyperplastic</td>
<td>109</td>
<td>633</td>
<td></td>
</tr>
<tr>
<td>Sessile</td>
<td>4</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Adenoma</td>
<td>76 (19.0%) 103</td>
<td>419 (29.4%) 776</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Tubular</td>
<td>87</td>
<td>675</td>
<td></td>
</tr>
<tr>
<td>Tubulovillous</td>
<td>15</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>Villous</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Lesion size ≥ 10mm</td>
<td>10 (2.5%) 11</td>
<td>95 (6.7%) 121</td>
<td>0.002</td>
</tr>
<tr>
<td>HG dysplasia</td>
<td>4 (1.0%) 7</td>
<td>34 (2.4%) 42</td>
<td>0.111</td>
</tr>
<tr>
<td>AA</td>
<td>22 (5.5%) 26</td>
<td>124 (8.7%) 163</td>
<td>0.036 †</td>
</tr>
<tr>
<td>Time to diagnosis (days)†</td>
<td>71 (53-85) NA</td>
<td>514 (39-91) NA</td>
<td></td>
</tr>
<tr>
<td>CRC</td>
<td>5 (1.2%) 5</td>
<td>9 (0.6%) 9</td>
<td>0.205</td>
</tr>
<tr>
<td>Time to diagnosis (days)†</td>
<td>48 (35-91) NA</td>
<td>83 (64-105) NA</td>
<td></td>
</tr>
<tr>
<td>ACN</td>
<td>27 (6.7%) 31</td>
<td>130 (9.1%) 172</td>
<td>0.132</td>
</tr>
<tr>
<td>Time to diagnosis (days)†</td>
<td>66 (48-84) NA</td>
<td>121 (84-184) NA</td>
<td></td>
</tr>
</tbody>
</table>

HG, high-grade; AA, advanced adenoma; NA, not applicable; CRC, colorectal carcinoma; ACN, advanced colonic neoplasia.
* Group differences between diverticulitis patients with lesions and controls with lesions were tested with the Pearson χ² test or Fisher’s Exact test, as appropriate, and P-values are unadjusted.
† Values are medians with interquartile ranges (IQR).
‡ Not significant anymore (P=0.053) after adjustment for age, family history of CRC, smoking, BMI and cecal intubation rate.
months; one was detected with an interval of 130 days. Of 27 ACN patients in all but five the diagnosis was made within a 3-month interval.

In only one CRC patient diverticula were described in the endoscopy report. Review of the CT reports showed that in all five CRC patients inflammation involving the sigmoid colon was described, with diverticulitis designated as potential diagnosis by the radiologist, but without diverticula being reported. Furthermore, other CT signs inconsistent with uncomplicated diverticulitis were present: two patients were classified with a small abscess (Hinchey 1b), three had localized perforation, one had free fluid, three had suspicious lymph nodes and in two CRC was specifically mentioned by the radiologist as alternative diagnosis for diverticulitis. Two CRC patients did not meet the criteria for recovery within the 6 months follow-up period.

**DISCUSSION**

We compared the colonoscopic yield of ACN, comprising CRC and AA, between patients with a recent primary episode of CT-proven uncomplicated left-sided acute diverticulitis and average risk participants in a population CRC screening program by colonoscopy. The detection rate of CRC, AA and ACN did not differ significantly between the groups.

This study is the first cohort study that directly compared the diagnostic yield of follow-up colonoscopy after uncomplicated acute diverticulitis with the yield of screening colonoscopy in an asymptomatic population with adequate power. The control cohort in this study was relatively homogenous. We included participants who were randomly selected from the population registry and who all underwent a primary screening colonoscopy. The diverticulitis cohort consisted of consecutive patients from more than 20 large teaching hospitals throughout the Netherlands. Therefore, our results are representative for the general Dutch population and most likely for other large urban health region populations. Further, research staff prospectively recorded various data ensuring accurate and optimal data registry.

A number of potential limitations should also be acknowledged. We did not include patients with complicated diverticulitis. As a consequence our results cannot be extrapolated to this category of diverticulitis patients. Further, the cohorts in our study were different for some baseline characteristics. The diverticulitis patients were significantly younger than the screening individuals, but ages at diagnosis ACN did not differ significantly between the two cohorts. Higher age is a known risk factor for the development of ACN [34]. A lower age in the diverticulitis cohort could therefore have led to a lower ACN rate. Furthermore, the two cohorts were unbalanced with regard to the BMI, which was significantly higher in diverticulitis patients. Overweight and obesity are known
to be moderately associated with an increased risk of CRC in men and similar trends exist for adenoma [35]. The results of a recent nested case-control study performed within a large Italian CRC screening program indicate that this association exists, but for right-sided CRC only [36], which was not found in our diverticulitis cohort. Smoking and family history positive of CRC, also known risk factors significantly associated with ACN detected by colonoscopy [34], were unevenly distributed between the cohorts and could have effected detection rates. However, we do not expect these differences have influenced our results since similar outcomes were obtained when ORs were adjusted for these confounding factors.

The cecal intubation rate was significantly lower in the diverticulitis cohort than in the screening cohort. Also several earlier, mostly retrospective, cohort studies evaluating the yield of colonoscopy after acute diverticulitis reported similar completion rates of about 90% [19-20, 23-25]. Though the 95% quality indicator level [37] was not reached in our diverticulitis cohort, the cecal intubation rate was well above the 80.7% achieved in a series of 12,835 colonoscopies in a Italian prospective study of routine clinical practice [38]. In our study, inadequate bowel preparation (i.e., fecal contamination) was found to be the most frequent reason for incomplete visualization (42% vs 23% in the screening cohort). Fecal contamination, luminal narrowing and stenosis as encountered in our cohort, and not unusual in diverticulitis patients, are known factors related to cecal intubation failure. Diverticulosis also is known to be associated with lower completion rates [39-41]. This may have led to an underestimation of the true colonic neoplasia prevalence in the diverticulitis cohort. Further, endoscopists who participated in the diverticulitis study did not remove all detected lesions as they were considered benign or irrelevant, which is according to daily practice. Endoscopists in the screening cohort were instructed to remove all detected lesions. Lastly, withdrawal time was not registered in the diverticulitis group. This may have resulted in a shorter inspection time and in worse polyp detection in this group, consequently [29, 42-43].

The CRC rate in our diverticulitis cohort is lower than the pooled prevalences of three recent meta-analyses [44-46]. In 2012 Sai et al. published a systematic review concerning colonoscopy after a CT diagnosis of acute diverticulitis to exclude CRC. Patients with follow-up by means of surgery or barium enema were included as well [44]. Their meta-analysis of 771 patients resulted in an estimated pooled CRC prevalence of 2.1% (95% CI, 1.2-3.2). Based on a comparison with a calculated estimated prevalence of 0.68% among United States adults older than 55 years their conclusion was that there are limited data to support the recommendation to perform colonoscopy after a CT diagnosis of acute diverticulitis. By including patients with radiological features suspicious for neoplasia, it can be expected this has resulted in a higher yield of CRC at subsequent colonoscopy. More recently, Sharma et al. performed a similar meta-analysis of 1,970 diverticulitis patients with colonic evaluation by means of sigmoidoscopy, CT colonography, colo-
noscopy, or contrast enema studies. They found a pooled proportional estimate of 1.6% (95% CI, 0.9–2.8) and concluded the risk of CRC after a radiological proven episode of uncomplicated acute diverticulitis is low [45]. Some of included studies in these meta-analyses dealt with patients without an imaging proven diagnosis, with complicated or persistent diverticulitis, or with patients with CT patterns of tumor-like lesions and are in our opinion not comparable to our population [11-15]. But most cohorts are more or less comparable to ours since authors included mainly patients with an imaging proven diagnosis of uncomplicated acute diverticulitis and found CRC and ACN rates of 0-2.7% and 3.4-9.2% respectively [16-25]; in accordance with the results of our study. A third recent meta-analysis included only patients with a recent diagnosis of uncomplicated acute diverticulitis that had to be confirmed by US and/or CT imaging, thus diverticulitis patients comparable to ours [46]. In 1,796 patients an estimated pooled CRC prevalence of 1.5% (95% CI, 1.0-2.3) was found. Importantly, most studies included in these meta-analyses were retrospective, all lacked an adequate control group and in none statistical power calculations were done.

When we consider the CRC patients in our diverticulitis cohort, we can notice that none had diverticula described in the CT report. Furthermore, three CRC patients had one of more signs at CT that could have raised suspicion for malignancy [24, 47-49]. Nevertheless, in these cases the radiologist reported diverticulitis as most likely potential diagnosis. Though occasionally diverticulitis may occur concomitantly with CRC, in some cases of a presumed episode of diverticulitis, especially when diverticula are absent both on imaging and endoscopy, you may conclude afterwards the diagnosis acute diverticulitis was a wrongful diagnosis and CRC was missed at primary assessment. The diagnostic approach should be different between patients with ‘clear diverticulitis’ and with ‘doubtful diverticulitis’, i.e., when a diagnostic dilemma exists.

In summary, we showed that colonoscopic detection of ACN after uncomplicated acute diverticulitis is comparable to that in an average risk screening cohort. This study may have some clinical implications; follow-up colonoscopy after a primary episode of CT-proven uncomplicated left-sided acute diverticulitis can be omitted. Follow-up colonoscopy may be beneficial when targeted at high risk patients, but uniform description of ‘high risk’ is challenging and such an approach first needs prospective evaluation. This will result in less patient burden and colonoscopy-related adverse events. Further, it will restrict national health care costs. Patients with uncomplicated acute diverticulitis patients may then participate in a national CRC screening program after adequate therapy and the disappearance of symptoms.
REFERENCES


