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## ACCURACY OF DOUBLE CONTRAST BARIUM ENEMA AND SIGMOIDEOSCOPY IN THE DETECTION OF POLYPS IN PATIENTS WITH DIVERTICULOSIS

T. STEFÁNSSON, A. BERGMAN, A. EKBOM, R. NYMAN and L. PÄHLMAN

### Abstract

The sensitivity between double contrast barium enema (DCBE) and sigmoideoscopy in diagnosing neoplastic lesions in the sigmoid colon was compared in patients with diverticulosis. In 52 patients with severe diverticulosis ( $\geq 15$  diverticulas) the DCBE detected one out of 4 polyps found by sigmoideoscopy. In the remaining 54 patients with mild diverticulosis ( $< 15$  diverticulas) DCBE detected 7 out of 10 polyps found by sigmoideoscopy. Successful bowel preparation did not influence the outcome of the DCBE. Sigmoideoscopy was incomplete in 17 (16%) of the patients; females were more difficult to examine than males ( $p=0.012$ ), as were those with a previous pelvic operation ( $p=0.032$ ). We conclude that neither DCBE nor sigmoideoscopy alone is sufficient to detect all neoplastic lesions in the sigmoid colon in patients with sigmoid diverticulosis of the colon.

*Key words:* Colon; diverticulosis; —, polyp; —, sigmoideoscopy; barium enema examination.

Diverticulitis of the sigmoid colon is often regarded as the underlying cause of left-sided abdominal pain and/or bleeding. A barium enema is common clinical practice for patients with these symptoms. If the barium enema reveals diverticulosis, further diagnostic examinations are often considered unnecessary. However, there is an 18-fold risk of left-sided colonic cancer during the first year after first discharge with a diagnosis of diverticular disease of the colon (16). This implies that our diagnostic methods are not sensitive enough. The double contrast barium enema (DCBE) technique (2, 3, 6, 10, 20–22) is highly sensitive in detecting polyps in the colon proximal to the left flexure but diagnostic failures are not uncommon in the left colon, and particularly in the sigmoid colon (4, 12, 13). Different

reasons for the decreased sensitivity of DCBE in patients with diverticular disease of the sigmoid colon have been proposed; the presence of diverticulas creates problems for interpreting the films, or difficulties in cleaning the bowel due to either diverticulas or old age. The use of a flexible sigmoideoscope has been suggested as an alternative; however, it is not always possible to reach the upper limit of the sigmoid colon (9) or to detect polyps at the bends of the sigmoid colon (4, 17, 23).

The aim of this study was to prospectively compare the sensitivity of the 2 methods in detecting neoplastic lesions in the sigmoid colon in patients with sigmoid diverticulosis and to assess how the number of diverticulas, bowel preparation, or polyp size affected the sensitivity of DCBE. Furthermore we wanted to assess how age, gender, number of diverticulas, medical history of diverticulitis, or previous pelvic operation affected the bowel preparation for DCBE and sigmoideoscopy as well as the length of intubation on sigmoideoscopy.

### Material and Methods

All 115 patients referred to our Department of Diagnostic Radiology during the period January 15, 1991 to November 15, 1991, where DCBE revealed diverticulosis of the sigmoid colon, were considered for inclusion. Diverticulosis was defined to be present when there were 3 or more diverticulas in the sigmoid colon. Nine patients were excluded: 4 patients due to terminal cancer, 2 patients because of poor physical

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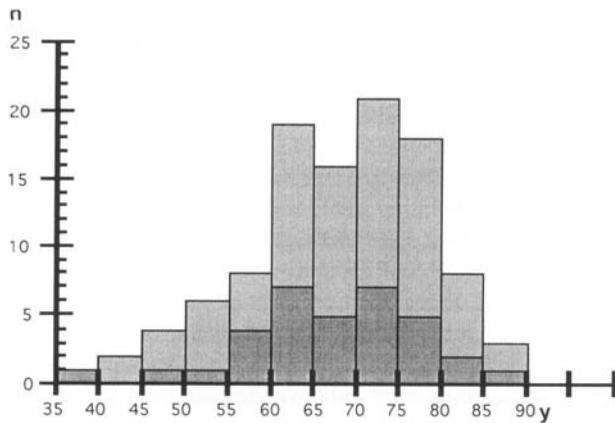


Figure. Age and sex distribution in 106 consecutive patients. Dark staples: men ( $n=34$ ), brighter: women ( $n=72$ ).

**Table 1**

*Reasons for referral to DCBE in 106 consecutive patients with diverticular disease of the colon*

1. Lower abdominal pain or tenderness	46
2. Change in bowel habits	24
3. Blood in feces	28
4. Weight loss	4
5. Pneumaturia	1
6. Lung metastases	1
7. Ascites	1
8. Pneumatosis coli	1
Total	106

condition, and 3 patients due to refusal. The age and sex distribution of the remaining 106 patients is given in the Figure. The reasons for referral for DCBE are shown in Table 1. Thirty-two of the patients (4 men and 28 women) had a medical history of diverticulitis. Seven women had previously been subjected to a pelvic operation. Sigmoidoscopy preceded the DCBE in 23 patients. These patients were included in the study when the diagnosis diverticulosis of the sigmoid colon was established by a subsequent DCBE.

The bowel preparation in all the patients was done according to a standard regimen: 3 days with low residue diet and fluids and the day before the investigation a combination of picosulfate and magnesium oxide (in one dose: 5 mg sodium picosulfate, 3.5 g magnesium oxide, 12.0 g citric acid and inactive ingredients as much as suffices up to 16.1 g) at 8 hours and 15 hours. Patients with a history of constipation were also given additional sodium picosulfate at days  $-3$  and  $-2$  and a sodium dioctylsulfosuccinate enema the day before the examination.

A suspension with 1 g/ml of Mixobar Colon 0.5 l in 15 ml water was used to fill the colon to the transversum. With single contrast technique spot films were taken over the rectum and the sigmoid colon followed by drainage of as much barium as possible. Air was then administered and the patient rotated several times to ensure coating of the

entire colon. Spot films over the lateral rectum, sigmoid colon, the flexures and cecum and overhead films in supine, oblique supine and prone positions were obtained.

High kV technique was used with 125 kV in the supine and prone positions and 133 kV in the lateral positions. Milliampere was adjusted automatically to obtain optimal results, 4 to 5 mAs in the supine and prone positions and about 10 mAs in the lateral positions, depending on the patient's mass. The interpretation of all films was done by the same radiologist, blinded for the result of the sigmoidoscopy.

The radiologist graded the bowel cleaning into 3 categories – clean, fair, and poor: “clean” without any fluid or feces in the colon and the mucosa easy to inspect; “fair” if the amount of fluid or feces being present did not interfere with the inspection of the mucosa; and “poor” if feces or fluid interfered with the inspection of the mucosa. The radiologist noted if the patients had less than 15 diverticulas or 15 diverticulas or more in the sigmoid colon. The number and localization of polyps in the sigmoid colon was mapped and the size recorded.

The sigmoidoscopy was done as soon as possible after the DCBE. The mean duration from DCBE to endoscopy was 2 weeks (range 0–6 weeks). The bowel preparation was the same as for DCBE, and the results were graded by the endoscopist using similar categories – clean, fair and poor: “clean”, an empty bowel with clean mucosa: “fair”, fluid in the bowel that could be suctioned off and some small fecal clumps which did not hinder the inspection of the mucosa; and “poor” where the presence of feces in the bowel did not permit an acceptable inspection of the mucosa.

Sigmoidoscopy was defined as successful when the sigmoidoscope reached 60 cm. The length of intubation was assessed in 4 categories: 20–40 cm, 40–50 cm, 50–60 cm and < 60 cm. All the sigmoidoscopies were done by experienced endoscopists. The instruments used were a 60-cm sigmoidoscope (Olympus P10S) and a 150-cm colonoscope (Olympus 100HL, IT10L or LB3W).

No medication was given to the patients before the examination. During endoscopy all polyps in the sigmoid colon were recorded, localization determined in distance from the anus and polyp size.

*Statistics.* The statistical analysis was done with the Mann-Whitney U-test for ordered categories (11). A p-value less than 0.05 was considered significant.

## Results

*Bowel preparation on DCBE.* Age, gender, a medical history of diverticulitis, or a previous pelvic operation did not affect the bowel cleaning. Patients with more than 15 diverticulas were, however, significantly cleaner compared to those with less than 15 diverticulas ( $p=0.03$ ) (Table 2).

*Bowel preparation on sigmoidoscopy.* Sex, number of diverticulas or a history of pelvic operation did not affect the bowel cleaning (Table 3). Patients younger than 70 years

**Table 2**

*Bowel preparation on DCBE in 106 consecutive patients by age, sex, number of diverticulas in the sigmoid colon, history of diverticulitis and history of pelvic surgery*

	Clean n=61	Fair n=33	Poor n=12	p-value
Age, $\geq 70 / < 70$	30/31	16/17	4/8	0.50 NS
Gender, male/female	22/39	11/22	1/11	0.17 NS
Diverticulas, $\geq 15 / < 15$	35/26	14/19	3/9	0.03 S
History of diverticulitis, + / -	21/40	10/23	3/9	0.51 NS
History of pelvic surgery, + / -	5/56	2/31	0/12	0.36 NS

S - significant, NS - not significant.

**Table 3**

*Bowel preparation on sigmoideoscopy in 106 consecutive patients by age, sex, number of diverticulas in the sigmoid colon, history of diverticulitis and history of pelvic surgery*

	Clean n=91	Fair n=11	Poor n=4	p-value
Age, $\geq 70 / < 70$	39/52	7/4	4/0	0.024 S
Gender, male/female	31/60	2/9	1/3	0.29 NS
Diverticulas, $\geq 15 / < 15$	42/49	8/3	2/2	0.16 NS
History of diverticulitis, + / -	25/66	7/4	2/2	0.014 S
History of pelvic surgery, + / -	7/84	0/11	0/4	0.27 NS

**Table 4**

*Length of bowel intubation during sigmoideoscopy in 106 consecutive patients by age, gender, number of diverticulas in the sigmoid colon, history of diverticulitis and history of pelvic surgery*

	20-40 n=5	40-50 n=8	50-60 n=4	60 cm n=89	p-value
Age, $\geq 70 / < 70$	4/1	3/5	1/3	42/47	0.90 NS
Gender, male/female	0/5	1/7	0/4	33/56	0.012 S
Diverticulas, $\geq 15 / < 15$	3/2	3/5	2/2	44/45	0.87 NS
History of diverticulitis, + / -	2/3	5/3	2/2	25/64	0.052 NS
History of pelvic surgery, + / -	2/3	1/7	0/4	4/85	0.032 S

were significantly cleaner than patients 70 years and older ( $p=0.024$ ) and patients with a medical history of diverticulitis were significantly more often graded as unclean compared to those without such history ( $p=0.014$ ).

**Sigmoideoscopy intubation.** In 17 patients the endoscopist failed to reach 60 cm. There was no significant difference in the success rate when comparing age groups and number of diverticulas. However, unsuccessful intubation was significantly more common among women ( $n=16$ ) than men ( $n=1$ ) ( $p=0.012$ ) and there was a higher failure rate among those with a history of a prior pelvic operation ( $p=0.032$ ) and, although not significant, a medical history of diverticulitis tended to result in a higher failure rate ( $p=0.052$ ) (Table 4).

**Neoplastic lesions.** Fifteen suspected lesions were found by DCBE, 8 of which were verified by sigmoideoscopy. Two of the 7 false-positive cases at DCBE were later operated upon due to diverticulitis and no polyp could be identified in the resected specimen. In the remaining 5 patients the sigmoideoscopy intubation was successful and was well beyond the diverticulosis area or the spot marked by the radiologist. Four patients were reexamined by DCBE and no polyps could then be found. The remaining patient refused reexamination. Fourteen lesions were found by sigmoideoscopy, 6 of which not found by DCBE at the first examination but at a reevaluation of the films 2 additional polyps were found in 2 patients. Among the remaining 4 patients one was not clean and the technical quality of the DCBE was poor (polyp size 10 mm) and 3 patients had a clean bowel and the technical quality was good but the polyps could not be detected even on the reevaluation; 2 of them were 5 mm in diameter and one was 10 mm in diameter.

Among patients with less than 15 diverticulas ( $n=54$ ) the DCBE detected 7 out of 10 polyps (sensitivity 0.7) compared to patients with  $\geq 15$  diverticulas ( $n=52$ ) where DCBE detected one out of 4 polyps found by sigmoideoscopy (sensitivity 0.25).

In patients with a clean bowel ( $n=61$ ) the DCBE detected 6 out of 10 polyps found by sigmoideoscopy (sensitivity 0.44) compared to patients graded as having fair or poor bowel preparation ( $n=45$ ) where the DCBE detected 2 out of 4 polyps (sensitivity 0.50). Of polyps  $\geq 10$  mm in diameter, 5 out of 8 were detected by DCBE (sensitivity 0.63) compared to polyps less than 10 mm in diameter where 2 (4 mm and 5 mm in diameter) out of 5 were detected (sensitivity 0.4).

## Discussion

The results indicate that DCBE was less sensitive than sigmoideoscopy in detecting polyps in patients with diverticulas in the sigmoid colon. This difference was most pronounced in patients with more than 15 diverticulas. Similar results have been reported in a retrospective study (1) which examined the results of barium enemas in 167 patients with a histologically proven malignant polyp in the sigmoid colon. In 58 patients without diverticulosis the sensitivity was 0.98 compared to 0.96 in 70 patients with 3 to 15 diverticulas and 0.80 in 39 patients with more than 15 diverticulas.

The decreased sensitivity in detecting neoplastic lesions in patients with diverticulosis of the colon is also confirmed in another study from Uppsala where 7 159 patients with a discharge diagnosis of diverticulosis or diverticulitis of the colon during the years 1965 to 1983 were followed up. During the first year after discharge there was an 18-fold risk of cancer in the left colon (16).

In the present study we used sigmoideoscopy as the standard to evaluate the sensitivity of DCBE. It has, however,

previously been shown that not all polyps are detected by sigmoidoscopy especially in the sharply angled bowel loops of the sigmoid colon (17, 23). Further credence to this is lent by the fact that we found only 4 polyps in 52 examinations in patients with 15 or more diverticulas compared to 9 polyps in 54 patients with less than 15 diverticulas. This finding implies that a decreased sensitivity also exists for sigmoidoscopy as the severity of sigmoid diverticulosis increases. It is also obvious that it is not sufficient to rely solely on sigmoidoscopy as we failed to intubate 17 (16%) of our patients. Our finding of an increasing sensitivity of DCBE to detect polyps associated with an increase in polyp size is supported by 2 other studies (14, 23). Although it is rare to have cancer in polyps less than 10 mm in diameter the diagnosis and subsequent removal of polyps of this size is important as it might lead to a decreased mortality in colorectal cancer later on (5, 7, 15, 24).

The success of the bowel preparation, however, did not seem to be a factor influencing the sensitivity of DCBE to detect polyps. This has also been reported in a study where DCBE and sigmoidoscopy were compared in 100 patients (19). Eight tumors were missed by DCBE in 8 patients, none because of poor bowel preparation but in 6 out of the 8 patients because of extensive diverticulosis.

On DCBE bowel cleaning was not affected by age or medical history of diverticulitis and patients with less than 15 diverticulas in the sigmoid colon had significantly worse bowel cleaning than patients with more than 15 diverticulas. However, the decreased sensitivity in detecting polyps on DCBE was most pronounced among patients with  $\geq 15$  diverticulas in our results as in other studies (1), indicating that the possibility to judge the bowel cleaning is also hampered in the case of severe diverticulosis. Further credence to this is lent by the findings on sigmoidoscopy where the bowel cleaning was significantly less successful in old patients or those with a medical history of diverticulitis. Intubation is difficult in women and in those with a previous pelvic operation or with a medical history of diverticulitis, probably due to distortion of the normal anatomy by operation and inflammation.

It has been reported that there is a decreased sensitivity to detect polyps in the sigmoid colon on DCBE (4, 12, 13). The results in the present study indicate that a more severe diverticulosis is associated with a decreased sensitivity of DCBE to detect polyps. Diverticulosis of the sigmoid colon is present in 20 to 50% of the population in the age groups referred for barium enema (8, 18) and could consequently be the major reason for the decreased sensitivity. Further prospective studies are, however, needed to establish if this is the case.

*We conclude* that neither DCBE nor sigmoidoscopy alone is sufficient to detect all neoplastic lesions in patients with severe diverticulosis of the sigmoid colon. In such patients both methods should be used. In the case of an incomplete intubation, further follow-up either by reexamination or surgery should be considered.

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