tion of its occurrence in man is claimed by English authors to be that of John Hunter (1728-93) and by French authors to be that of Duverney (1648-1730).

In 1825 Mayer described a case occurring in the intestine and peritoneum of a pig, but the first full account of the disease in humans is attributed to Bang (1876); who found this condition at necropsy in a female who died of volvulus of the colon. In 1899 came the first report of the condition by Hahn, who found it in the living subject. Since that time, according to Koss, who has reviewed the available literature very fully, 213 cases have been reported, the vast majority from Central Europe.

A further case, reported below, shows the classical features as described, with the exception that the condition was found to be present in the distal colon—a rare site in a rare disease.

Case History

A married woman aged 49 was first seen in January, 1952, complaining of the passage of bright red blood inter-

mittently on defaecation and associated with diarrhoea and lower abdominal pain. The pain was not severe, but the whole syndrome had been present for 18 months. She had no other complaints apart from long-standing constipation before the onset of the present symptoms, and her weight was steady at about 11 st. (70 kg.). Her previous history contained nothing relevant—an appendicectomy at the age of 19 and hysterectomy at 39. She had been a chronic sufferer from asthma.

Showing filling defects in sigmoid colon and splenic flexure due to gas cysts.

She was admitted to hospital, and, apart from some deep tenderness in the left iliac fossa and a minor degree of haemorrhoids, nothing abnormal was found on either abdominal or rectal examination. Her blood picture was normal. Sigmoidoscopy was performed and the bowel was normal to 23 cm. At this level several polypoid masses were seen filling the lumen of the colon; these were sessile, and measured from 0.5 to 1.5 cm. in diameter. The surface was translucent and of a bluish hue, the appearance being more like that of lymphangiomatosis than polyposis. There was some evidence of recent haemorrhage from the surface of the cysts.

Examination by a barium enema showed rounded translucent filling defects in the sigmoid colon and the splenic flexure (see Fig.). It was decided to perform laparotomy to elucidate further the diagnosis and the extent of the involvement of the bowel.

On opening the lower abdomen the diagnosis was at once evident. Masses of gas cysts were found, involving 6 in. (15 cm.) of a redundant sigmoid colon and 4 in. (10 cm.) of the splenic flexure and distal transverse colon with a normal descending colon between. These cysts presented a similar appearance to that seen at sigmoidoscopy and were aggregated around the entire circumference of the bowel but stopping short of the mesentery. No other abnormality was demonstrated in the abdominal cavity. In view of the symptoms, it was decided to excise the distal colon, and this was performed with end-to-end suture of the transverse colon stump to the pelvi-rectal junction.

Convalescence was uneventful and the patient was discharged from hospital 12 days later free from symptoms. When seen at the out-patient department two months later she had fully recovered from her operation, and her bowel action was normal and her pain and bleeding had gone.

Pathological Report.—"The specimen consists of distal transverse colon, splenic flexure, and descending and sigmoid colon, and shows the typical submucous and subserous gas-filled cysts. The phenomenon of 'skipping' is well illustrated. Microscopically the cysts bear evidence of an endothelial lining with commencing giant-cell formation. No portal of entry for the 'air' has been demonstrated in the colon."

Conclusions

Enteric pneumatosis is a condition in which the intestinal lymphatic channels become blocked and distended by gas, producing multiple gas cysts both subserous and submucous in position.

The condition occurs mainly in men between the ages of 30 and 50, is accompanied by vague digestive and abdominal symptoms, and would appear to be subject to spontaneous resolution. Intestinal obstruction has been pointed out as the most likely complication.

The case reported above is of interest apart from the rarity of the condition in that barium enema and sigmoidoscopic evidence of the disease was found and had not previously been reported in the literature.

The distribution of the cysts in this case seems to differ from that of cases previously noted, and the all-important symptom of haemorrhage on defaecation led the patient to seek medical advice.

I wish to thank Dr. W. MacCullagh Wilson, of the Coventry and Warwickshire Hospital, for his help with the pathological investigation of the specimen.

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ULCERATIVE COLITIS AND CARCINOMA OF THE LARGE INTESTINE

BY

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That ulcerative colitis apparently predisposes to cancer of the colon or rectum seems now to be widely accepted. Upon the correct assessment of this risk the whole therapeutic policy towards the disease might well depend. I have been unable to find any report in which such cancer risk has been estimated, although there are many papers which record the occurrence of this complication of colitis.

The purpose of this communication is to report a further five cases of malignant disease of the intestine arising in the course of colitis, and to consider these cases, in conjunction with reports by other authors, in an attempt to estimate the cancer risk.

Clinical Material

Between January 1, 1947, and December 31, 1951, 154 patients with the diagnosis of idiopathic ulcerative colitis were admitted to St. Bartholomew's Hospital under the care of the physicians and surgeons and to the Gordon Hospital under Dr. E. R. Cullinan's care.

Three of these have gone abroad; their fate is unknown, and they have not been included in the discussion which follows. A further 25 have been excluded from the series on the grounds of incomplete investigation and uncertainty of diagnosis. No case of proctitis without evidence of colonic involvement has been included.

Table I gives the age and sex distribution of the remaining 126. Table II shows the result of a combined postal and personal attendance follow-up by January 1, 1953. Table III sets out the period for which each patient has been under surveillance since January 1, 1947, with additional information concerning the recognition of cancer of the bowel. In this Table the follow-up is recorded as finishing if colectomy is performed, as, of course, cancer of the large intestine can no longer occur. Table IV classifies the patients according to duration of the disease.

In addition to the five cancer cases recorded here, it should be stated that a further four cases have occurred in the period under review. These have been excluded from the current study because, the diagnosis of cancer having been made elsewhere, the patients were referred to us for treatment of the growth.

TABLE I.—Age (in 1952 or at death) and Sex Distribution. The Ages at Which Cancer of the Large Intestine Appeared are Shown

Age Group	Male	Female	Total	Cancer Diagnosed
0-14	0	0	0	
15-19	4	2	6	
20-24	2	2	4	
25-29	13	11	24	1
30-34	4	17	21	
35-39	7	11	18	
40-44	11	9	20	1
45-49	3	5	8	
50-54	5	7	12	2
Over 55	4	9	13	1
Total	53	73	126	5

TABLE II.—Results of Follow-up

Alive		Dead		Not Traced	Total
No Known Cancer	Has Cancer	No Known Cancer	With Cancer		
98	1	19	4	4	126

TABLE III.—Cases Grouped According to Length of Follow-up. The Last Column is Obtained by the Assumption that the Patients on the First Line have Been Followed-up for an Average of Six Months, Those on the Second Line for One and a Half Years, and So On

No. of Years of Follow-up Completed	No. of Patients	Follow-up Ended by Colectomy	Follow-up Ended by Death	Large-gut Cancer Found	Approx. No. of "Patient-Years"
0	25	8	11	2	12½
1	12	7	5	0	18
2	28	4	2	0	70
3	28	3	3	2	98
4	14	2	2	1	63
5	19	0	0	0	104½
Total patient-years					366

TABLE IV.—Distribution of Cases According to Duration of Symptoms

Duration of Symptoms to Date, till Death, or till Colectomy	Total No. of Cases	History Ended		Carcinoma Found
		By Colectomy	By Death	
0-4	30	9	6	
5-9	50	9	7	1
10-14	21	4	2	1
15-19	12	1	3	1
20-24	8	1	2	
25-29	4	0	2	1
30 and over	1	0	1	1

Case Reports

Case 1.—A 51-year-old housewife was referred to St. Bartholomew's Hospital in October, 1949, because she had had bloody diarrhoea for 20 years, with slight remissions. Medical in-patient treatment in other hospitals had helped her little. Physical examination revealed a mobile tender swelling in the left hypochondrium, and this was shown radiologically to be a colonic neoplasm, the rest of the colon showing the changes of ulcerative colitis. Total colectomy and ileostomy were performed. The operation specimen showed a carcinoma in the left half of the transverse colon, with the characteristic changes of chronic ulcerative colitis affecting the whole of the remainder of the colon. Histologically, the growth was described as "moderately anaplastic" and one out of 27 lymph nodes was infiltrated with carcinoma cells. In 1953 she was free from recurrence of growth, and plans for ileo-rectal anastomosis were being considered.

Case 2.—A 26-year-old unmarried carpenter was first seen at St. Bartholomew's Hospital in 1935, with a two-year history of bloody diarrhoea. Sigmoidoscopy showed the changes of ulcerative colitis, but the colon was not x-rayed. Appendicostomy was performed, with temporary improvement. This closed spontaneously two years later. Remissions and relapses continued until 1945, after which he became well for two and a half years. In August, 1949, he reported the appearance of alternating constipation and diarrhoea, with small stools. Barium enema revealed a carcinoma at the junction of the descending and pelvic colon, with chronic colitic changes above the growth. Exploration confirmed the presence of the growth, but numerous peritoneal metastases were seen, and no curative treatment was possible. No biopsy was taken. Palliative caecostomy was performed, and death occurred five months later. Necropsy was not permitted.

Case 3.—A married clerk aged 50 was referred to St. Bartholomew's Hospital by his doctor in February, 1949. He had had bloody diarrhoea from 1918 intermittently until 1922, when a caecostomy was performed. Thereafter there were a number of minor relapses of the colitis symptoms, and a very severe one. For several years a prolapsed caecum had been troublesome, and because of this he was sent to this hospital. Examination showed the rectum to be greatly stenosed; right hemicolectomy and ileostomy were carried out; the left colon was to have been removed later. The operation specimen showed the appearances of ulcerative colitis throughout its length, but not spreading to the ileum. He remained well until May, 1950, when left iliac pain and abdominal distension appeared. A mass could be felt in the abdomen, and laparotomy revealed a large carcinoma of the descending colon, with many peritoneal metastases. Biopsy showed a mucoid adenocarcinoma. He returned home and died in January, 1951. No necropsy was performed.

Case 4.—A married woman, aged 63, was referred to the Gordon Hospital by her doctor in April, 1951, with a history of bloody diarrhoea intermittently since 1925, more continuous since a severe relapse in 1935. In 1935 ulcerative colitis was diagnosed, and after eight months' hospital in-patient treatment she had to some extent improved. Symptoms remained troublesome, but six months before we saw her she became much worse, with 20 to 30 bowel actions a day and much blood and mucus. On examination she was found to have a carcinoma of the rectum, and laparotomy revealed peritoneal metastases. She died on the eighth post-operative day. *Necropsy report:* Carcinoma of rectum of mucoid type, peritoneal secondary deposits, severe generalized ulcerative colitis: confirmed histologically.

Case 5.—A married woman aged 25 first attended at the Gordon Hospital in August, 1949, with a six-year history of bloody diarrhoea for which she had had three previous periods of in-patient treatment at other hospitals. Barium enema and sigmoidoscopy showed the typical appearances of ulcerative colitis throughout the colon. After six weeks' in-patient medical treatment she was much improved. For two years she was fairly well, but in September,

1951, she reported a lump in the breast, an abdominal mass, and pain in the chest. Laparotomy revealed carcinomatosis peritonei, and she died two weeks later. *Necropsy report*: primary colloid cancer of the transverse colon, with generalized metastases; the whole colon was affected by extensive and severe ulcerative colitis, without spread to the ileum. The diagnosis was confirmed histologically.

Discussion

During the period of observation of 126 patients with ulcerative colitis, five cases of carcinoma of the rectum or colon have been found. That this is not an unusually high proportion is suggested by other reports. Rice-Oxley and Truelove (1950) found 4 cases out of 129; Counsell and Dukes (1952) discovered 7 cases with this complication in a group of 63; Lyons and Garlock (1951) reported that 9 in their series of 226 showed malignant change; Dennis (1945) noted 2 certain cases and 1 probable case of bowel cancer in his series of 82 cases of colitis; Kirsner *et al.* (1948) reported 2 in a selected group of 100; Lahey (1949) found 17 in a series of 600; Brown *et al.* (1951) found 7 in 147; and Sloan *et al.* (1950) reported 109 cases of intestinal malignancy in a group of 2,000 cases of ulcerative colitis.

Earlier papers (Feder, 1938; Willard *et al.*, 1938; Hurst, 1935) do not record this complication. Up to 1945 Lynn, in his review of the literature on this subject, found that 98 cases had been reported, and he stated that by collecting the reported series together he found that 28 cases had arisen in 1,467 patients with colitis. In a more recent paper Felsen and Wolarsky (1949) reported that they had found no cases of intestinal malignant disease in a study of 855 patients with ulcerative colitis. It is difficult to reconcile the negative findings of the last-named with the recent reports from so many other centres. Nevertheless, even including this series, the average ratio of cancer to total cases in the post-war reports is about 3.7%.

Most clinicians would feel that this figure is so small as to have little weight in the decision whether a particular patient should have his colon removed. It is important to recognize, however, that this figure does not represent the chance of a patient *eventually* developing cancer of the diseased intestine, but only the cancer incidence over a particular time—in the majority of reports an unspecified time. If, for example, all the patients in the accumulated series had been observed for an average of 10 years each, 3.7% incidence represents 3.7 cases for every 100 of the population at risk, during a period of 10 years, or 3.7 per 1,000 living per year.

In England and Wales in 1950 (Registrar-General, 1952), 16,389 deaths were registered as being due to neoplasm of the colon and rectum. A guess that this represents an annual incidence of 20,000 new cases cannot be very wide of the mark. A negligible number of these occur below the age of 25, and the population over that age in 1950 was 28½ million. This gives an annual incidence in the population of England and Wales over the age of 25 of 0.7 per 1,000 living. The estimated annual incidence in the U.S.A. is 0.88 per 1,000 (Bargen, 1949).

So that, by our quite generous guess that every patient in all these reports has been followed up for an average period of 10 years, we derive the result that cancer of the rectum and colon in these cases is five times more common than among the population as a whole.

If we apply the same principle to the much smaller group formed by my own cases we obtain the figure of 366 patient-years (Table III) in which five carcinomas have occurred—an annual incidence of 14 per 1,000, or twenty times the national figure. This calculation is unsatisfactory because of the extremely small number of cases. It is worthy of note, however, that the small group here reported closely follows the pattern of other accounts. Thus the proportion of cancer cases to colitis cases is very close to the average figure of the other reports: the relatively youthful incidence of cancer in this site as compared with the com-

monest ages in the whole population is commented on by others (for example, Sauer and Bargen, 1949); that the growths appear especially in those who had had colitis for many years (Lahey, 1949; Counsell and Dukes, 1952) is borne out in our series, in which four out of the five cancer patients had had colitis for 15 years or longer.

This method of assessing the cancer morbidity in the present series as compared with the general population is, for lack of data, crude and involves a good deal of guesswork. It is not possible, with the information at my disposal from other publications, or with the small numbers in my series, to analyse these figures with greater refinement. It seems reasonable to deduce that in the reports I have quoted carcinoma of the rectum and colon has occurred at least five times as often as one would have expected if they had been a sample of the normal adult population.

Conclusions

The fallacy of reporting an "incidence" in the neighbourhood of 4% without reference to time has been illustrated. It would appear that such an incidence represents a cancer risk to these patients which is many times that for the "average" person. Cancer of the rectum and colon in the general population is by no means a rare disease (being responsible for 1 in 30 of all deaths), and a possible fivefold increase in our patients is therefore no mere academic observation. One feels that until long-term study has produced more cases and an opportunity for more exact examination of survival times and cancer incidence, the increased risk of malignant disease in the rectums and colons of these patients should be held to be an important factor when the question of surgical intervention is being considered.

Summary

Five cases of carcinoma of the large intestine occurred in 126 cases of ulcerative colitis. Case reports of the carcinoma cases are presented.

An attempt is made to assess the cancer risk for this site in ulcerative colitis, with reference to this and other reported series.

It is suggested that the cancer risk for this site in patients with ulcerative colitis is not less than five times that for the population as a whole.

ADDENDUM.—Since this paper was written, the workers at the Mayo Clinic have published an analysis of cancer mortality in a series of 1,500 cases of ulcerative colitis. They conclude that carcinoma of the rectum and colon is 20 to 30 times commoner as a cause of death in this disease than in the population as a whole (Bargen, J. A., Sauer, W. G., Sloan, W. P., and Gage, R. P., *Gastroenterology*, 1954, 26, 32).

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