

## Faecal stasis and diverticular disease in ulcerative colitis

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**SUMMARY** The incidence of faecal stasis and of diverticular disease has been studied in a group of 399 patients with ulcerative colitis. Sixty-one patients had faecal stasis and 23 patients had diverticular disease. Pathological studies demonstrated an increase in the thickness of the inner spiral muscle in colitis patients with faecal stasis. The thickening was not as great as that seen in diverticular disease. Preliminary studies on the motility patterns in patients with faecal stasis show a higher mean activity in the pelvic colon than in normals but not as great as that seen in diverticular disease. Pressure studies in patients with faecal stasis have shown hypotonia in the proximal colon associated with dilatation.

The possible significance of these results is discussed. It is suggested that ulcerative colitis may initiate a motility disturbance which leads to muscle thickening similar to that in diverticular disease. Diverticula associated with ulcerative colitis are usually not involved in the mucosal inflammatory process.

It is recognized that constipation may occur in patients with proctocolitis (Royal Society of Medicine, 1909; Sim and Brooke, 1958; Neffzger and Acheson, 1963; Goligher, de Dombal, Watts, and Watkinson, 1968), and in up to one third of patients with proctitis (Lennard-Jones, Cooper, Newell, Wilson, and Jones, 1962a). Constipation as a prominent disability was described in six patients with distal proctocolitis all of whom had severe disease with retention of faeces in the proximal colon (Lennard-Jones, Langman, and Jones, 1962b).

We have studied this association as part of a retrospective survey involving 399 patients with ulcerative colitis (Jalan, Prescott, Sircus, Card, McManus, Falconer, Small, Smith, and Bruce, 1969). In view of the possibility that the cause of the constipation could be in disordered motor activity of the large bowel, we have examined the incidence and possible significance of diverticular disease when this occurred in association with ulcerative colitis. Differences have been sought in the clinical and pathological features of those colitis patients with constipation, both

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with and without diverticular disease, from those of the remainder of the series. Large bowel motility was studied in a small number of patients.

### Method

The retrospective study covers the period 1950 to 1967 (inclusive). The primary source of the data was the case records, the information being transferred to cards and the material analysed by Atlas computer.

The diagnosis of faecal stasis in colitis was made when a change of bowel habit occurred becoming less frequent than normal and/or the need for laxatives. Radiological evidence of faeces in the proximal colon was usually obtained. Barium often persisted in the right half of the colon a week or even a month after a barium enema (Figs. 1 and 2). Diverticular disease was diagnosed on the presence of one or more diverticula with or without radiological evidence of motor or inflammatory abnormality in the colon. In the whole series there were 173 males and 226



Fig. 1 Barium mass in the ascending colon in a patient with faecal stasis one day after barium enema.



Fig. 2 Same patient as in Figure 1. Barium mass still present 18 days later.

females. One hundred and ninety-one patients were in a first attack of colitis and 208 in relapse.

#### MOTILITY STUDIES

Motor activity of the proximal colon was assessed in eight patients and four controls using a radiotelemetry capsule (Solartron capsule); pressure waves were recorded from the frequency change, 'movement activity' from the signal strength, and progression from the change in the 'edge' of the radiomagnetic field (Smith and Ridgway, 1962).

Pressure activity in the sigmoid zone and rectum was examined in five patients with faecal stasis, 29 patients with uncomplicated diverticular disease, and in 14 control subjects by peranal passage of miniature balloons on air-filled polythene tubes. These were connected by Statham transducers to electromanometers within a photorecording device; basal tone was recorded and meals or prostigmine (0.5-1 mg) were used as stimuli.

#### PATHOLOGY

Histological material from 15 patients with faecal stasis was available for study. Studies of the colons of 26 patients with ulcerative colitis but without faecal stasis served as controls. The intact specimens of resected colon were not available at the time of this study, but the pathologists' original reports of the microscopic appearances of these were analysed and considered,

together with a review of the remaining blocks and sections from known sites in the colon. An eye-piece micrometer was used to measure the maximum thickness of the circular muscle coat in sections from the descending and sigmoid colon.

#### Results

##### CLINICAL ASSESSMENT

##### Incidence

Faecal stasis was present in 15.8% of patients with ulcerative colitis. In some cases constipation was the major source of disability and such patients correspond to those described by Lennard-Jones *et al* (1962b). Of 79 patients with disease confined to the rectum, 21 had stasis. This incidence of 26.6% is similar to that reported by Lennard-Jones and his colleagues (1962a) in proctitis. It is rare in the young (Fig. 3).

We also confirmed the commoner incidence of faecal stasis in females (Table I). Five out of the six cases of stasis described by Lennard-Jones *et al* (1962b) were female.

##### Previous history

Twenty per cent of the patients with faecal stasis reported constipation before the onset of colitis compared with 5.3% of the patients without stasis. It is emphasized that a history of

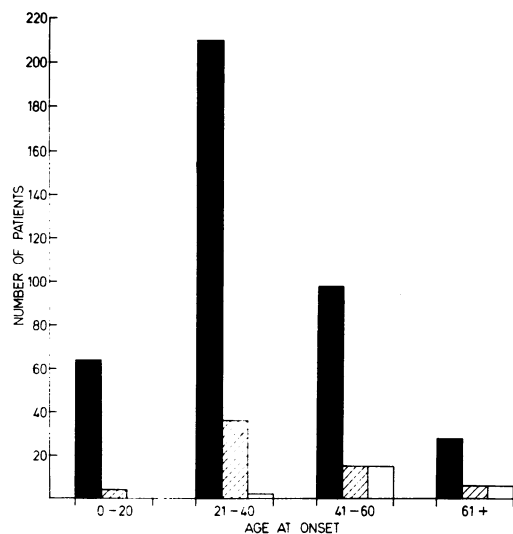


Fig. 3 Age incidence of faecal stasis (shaded area) and diverticular disease (unshaded) associated with ulcerative colitis. The total number of patients is shown by the black areas.

Sex	Faecal Stasis	
	With	Without
Male	18	155
Female	43	183

Table I Sex incidence in patients with faecal stasis<sup>1</sup>  
<sup>1</sup> $\chi^2 = 4.98$ ,  $df = 1$ ,  $0.025 < P < 0.05$ .

constipation is subjective. Frequencies shown are of visits to the lavatory (Table II). Faeces are not always passed on each occasion but often only mucus, mucopus, or blood without faeces.

No. of Motions	Faecal Stasis	
	With	Without <sup>1</sup>
0-4	17	70
5-8	33	153
9+	11	113

Table II Frequency of bowel motion in patients with faecal stasis<sup>2</sup>

<sup>1</sup>In two patients bowel frequency was not recorded.  
<sup>2</sup> $\chi^2 = 6.00$ ,  $df = 2$ ,  $0.025 < P < 0.05$ .

#### Length of history

Stasis is relatively more common in patients with disease of short duration (Table III), and incidence is the same in the first attacks as in relapses and in colitis of gradual or sudden onset.

#### Severity, extent, and prognosis

A scoring procedure was used to classify patients

Length of History (yr)	Faecal Stasis	
	With	Without
<1	35	159
1-9	13	123
10+	13	56

Table III Length of history in patients with faecal stasis<sup>1</sup>

<sup>1</sup> $\chi^2 = 5.25$ ,  $df = 2$ ,  $0.05 < P < 0.1$ .

into three grades of severity: mild, moderate, and severe (Jalan *et al*, 1969). The variables used were fever, number of bowel movements, and erythrocyte sedimentation rate. A significant relationship between stasis and severity of disease was not established (Table IV). A larger proportion

Severity	Faecal Stasis	
	With	Without
Mild	34	156
Moderate	15	83
Severe	12	109

Table IV Severity of colitis in patients with faecal stasis<sup>1</sup>

<sup>1</sup> $\chi^2 = 3.72$ ,  $df = 2$ ,  $0.10 < P < 0.20$ .

of patients with faecal stasis had a normal barium enema or partial 'left-sided' colitis as compared with the remaining patients (Table V). Faecal stasis was observed in only seven subjects with extensive involvement of the colon. Likewise the incidence of colonic stricture and of toxic

Extent	Faecal Stasis	
	With	Without
Normal	21	58
Partial left <sup>1</sup>	31	118
Entire	7	124
Not known	2	38

Table V Extent of bowel involvement (radiological) in patients with faecal stasis<sup>2</sup>

<sup>1</sup>Includes 10 patients with right-sided and segmental colitis two of which are in the group of patients with faecal stasis.  
<sup>2</sup> $\chi^2 = 24.56$ ,  $df = 3$ ,  $P < 0.0005$ .

dilatation was less than that found in the subjects without stasis (Table VI). Not surprisingly, therefore, the outcome in patients with faecal stasis is good so that the phenomenon is predominantly an expression of the better prognosis of subjects with distal involvement regardless of the severity of the attack (Table VII). Furthermore a higher proportion of patients with stasis show decreasing severity with time, and a smaller number exhibit continuous disease as compared with the non-stasis group.



	Faecal Stasis		
	With	Without	
Colonic stricture	1	17	} <sup>1</sup>
No colonic stricture	60	321	
Toxic dilatation	3	52	} <sup>2</sup>
No toxic dilatation	58	286	

Table VI Toxic dilatation and colonic stricture in relation to faecal stasis<sup>1</sup>

<sup>1</sup>P > 0.1 (exact test)

<sup>2</sup> $\chi^2 = 3.93$ , df = 1,  $0.025 < P < 0.05$ .

Outcome	Faecal Stasis	
	With	Without
Clinical remission	53	211
Improved	3	20
Surgical survivors <sup>1</sup>	5	74
<b>Death</b>		
Medical treatment	0	16
After surgery	0	17
Total	61	338

Table VII Outcome of first referred attack in patients with faecal stasis

<sup>1</sup>All patients undergoing surgery had had previous medical treatment.

Twenty-three patients in whom colitis and diverticular disease coincided were similarly analysed. Seven of these had faecal stasis. The incidence of faecal stasis in patients with colitis and diverticular disease is not different from the rest of the population of colitis. In respect of sex, age at onset, previous bowel habit, site of attack, onset of colitis, extent of involvement, severity, and prognosis, no differences emerge from those

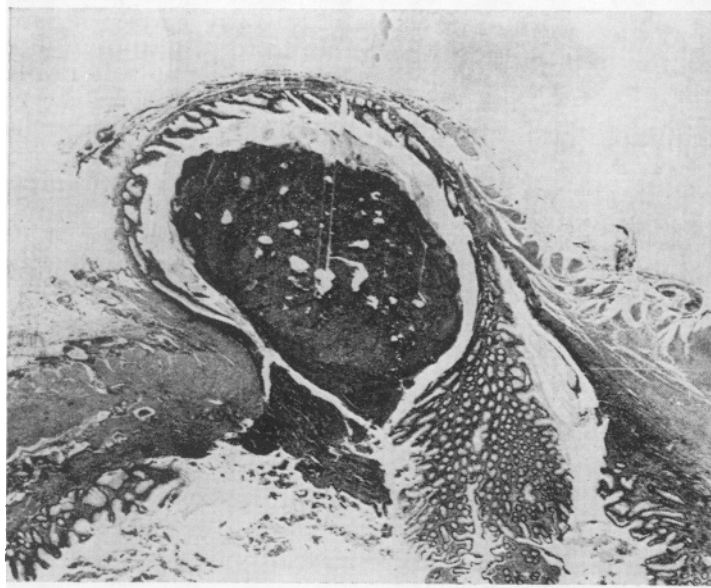


Fig. 4

characteristics in the group of colitics without diverticular disease.

#### PATHOLOGY

The incidence of pericolicitis, submucosal fibrosis, and destruction of ganglion cells was the same in the two groups of patients with and without stasis. As already shown in the clinical assessment, the proportion of patients with limited or distal colitis was much greater in the group of patients with faecal stasis and proximal dilatation of the colon was much commoner. In the latter subjects, the mucosa of the proximal colon tended to be rather thin, but only in three was this a notable feature (< 0.3 mm); all had associated diverticular disease.

It is of interest that in three patients the inflammatory changes of ulcerative colitis were slight or absent in the mucosal portion of the diverticula (Figs. 4 and 5). Of six patients with colitis and with diverticular disease and faecal stasis, in only three was the diagnosis of diverticular disease made by radiology. Only one patient had an organic obstruction, a kink in the bowel apparently caused by pericolic fibrosis.



Fig. 5

Figs. 4 and 5 Diverticulum (left) in a case of ulcerative colitis. Inflamed mucosa and granulation tissue can be seen at the neck, but the inflammation does not extend into the compressed diverticular mucosa ( $\times 15$ , haematoxylin and eosin). Magnified (above) view of junction of compressed and inflamed areas. ( $\times 75$ , haematoxylin and eosin).



Fig. 6 Descending colon in a case of ulcerative colitis and faecal stasis, but without diverticular disease, to illustrate the thickness (1.8 mm) of the muscular coat ( $\times 40$ , haematoxylin and eosin).

#### Thickness of muscle layers

Information on the thickness of the circular muscle (Fig. 6) of the colon in colitis patients with faecal stasis, in diverticular disease associated with faecal stasis, and in two control groups of patients with ulcerative colitis without faecal stasis and patients with diverticular disease but no ulcerative colitis is summarized in Table VIII. The last group (diverticular disease) were patients operated upon for the disease. No significant difference appears in the mean values for circular muscle thickness among patients with faecal stasis associated with ulcerative colitis whether diverticular disease was present or not ( $t = 1.00$ ,  $0.3 < P < 0.4$ ) but the patients with faecal stasis alone showed a greater variance ( $F = 5.86$ ,  $0.01 < P < 0.05$ ). The combined group of all patients with faecal stasis in ulcerative colitis shows a highly significant increase in muscle thickness over the control patients with uncomplicated ulcerative colitis. The second control group of patients with diverticular disease alone show a highly significant increase in muscle thickness as compared with that of the patients with faecal stasis and colitis. An increased variance of muscle thickness was also present in this group.

#### MOTILITY

##### Right colon

Recordings of motility were obtained when the capsule reached or was just distal to the ileocaecal junction, which was recognized radiologically (Fig. 7), and by the change in the character and the frequency of the waves from an ileal to a colonic pattern. At the ileocaecal junction in normal subjects ileal frequency of waves (7-10 per min) falls to the colonic level (2 waves per min). In four subjects with faecal stasis studied the colonic pressure waves were small in three and in the fourth subject were almost absent. Fluoroscopic examination of the capsule revealed rotational movements but little or no pressure change was recorded; records of the signal strength showed rapid, irregular falls consistent with orientational movements of the capsule (Fig. 8). There appeared to be a loss of propulsion, with the capsule rotating in the faecal stream entering from the terminal ileum. In these four cases the capsule took four to five days at the minimum to pass this area. (The average transit through the right colon in eight normal subjects was six and a half hours.)

In three of the subjects with faecal stasis the basal pressure across the ileocaecal junction dropped as in normals, but remained lower than normal. This contrasted with five patients with colitis without faecal stasis who either showed patterns similar to those of the normal controls or, as in two subjects, revealed a slight rise in basal pressures.

	Group		
	1 (Control) Ulcerative Colitis Only	2 Faecal Stasis with Ulcerative Colitis <sup>1</sup>	3 (Control) Diverticular Disease Only
No. of patients	26	15	15
Muscle thickness (mm)			
Range	0.6-2.1	0.8-2.8	1.2-5.5
Mean	1.18	1.63	3.26
SD	0.40	0.52	1.28
Test on variances	Group 1 v group 2 $F = 1.69$ , $P > 0.05$		Group 3 v group 4 $F = 6.11$ , $P < 0.01$
Test on means	$t = 3.07$ , $0.001 < P < 0.005$		$t = 4.55$ , $P < 0.001^*$

Table VIII Circular muscle thickness in ulcerative colitis in patients with faecal stasis and diverticular disease

<sup>1</sup>Including six patients with diverticular disease and faecal stasis. Range: 1.1-1.9, mean 1.48, SD 0.26.

<sup>2</sup>Welch's modification of t test for different variances applied.

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