

rather than upon half of them while they are desperately ill.

Summary

(1) The outcome of any attack of colitis depends on the severity of the attack, the extent of disease and the age of the patient at the time. (2) If surgery is to be used in a severe attack, it should be in the early stages. (3) Total involvement of the colon implies such a poor prognosis that prophylactic proctocolectomy may be justified in these patients. It may also be justified in patients over 60 even if the large bowel is not totally involved.

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Intraperitoneal Perforation of the Colon in Ulcerative Colitis [Abridged]

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Wilks & Moxon (1875), in their description of ulcerative colitis, realized the danger of perforation, mentioning the cæcum and rectum as possible sites where this was likely to occur.

Reports of more than 300 cases of perforation of the colon in ulcerative colitis have appeared, although most of these have been presented in papers of wider scope and many were merely listed or dealt with cursorily. In recent years smaller series of perforations have been published in which cases have been described in greater detail (Brown *et al.* 1951, Ripstein 1954, Lumb *et al.* 1955, Brooke 1956, Bruce & Cole 1962, Hickey *et al.* 1963, Edwards & Truelove 1964). It is now widely accepted that intraperitoneal perforation of the colon is the most lethal local complication of acute ulcerative colitis.

Clinical Material

The intraperitoneal perforations reported here were recorded during a survey of 465 patients with ulcerative colitis who attended the Colitis Clinic at Leeds during the period 1952–63. This is a retrospective study based on case histories,

operation notes and pathological data recorded at the time, and on interview during the latter half of 1963 with all but 8 of the 424 surviving patients, including everyone who survived a perforation.

The severity of each attack of colitis was classified as mild, moderately severe or severe, according to the criteria of Truelove & Witts (1955). The extent of colitis, assessed on the basis of repeated examination by sigmoidoscopy and barium enema, was described as being confined to the rectum, involving a substantial area of the colon distal to the hepatic flexure, or total involvement of the colon and rectum.

We have excluded from this analysis a patient who suffered a perforation of the terminal ileum four years after an ileorectal anastomosis.

Findings

Among the 465 patients surveyed, intraperitoneal perforation of the colon was recorded in 13 (2.8%); of these 9 had single perforations and 4 had double or multiple perforations. Altogether 20 colonic perforations were recorded, 7 of which were free, giving rise to a generalized faecal peritonitis, whilst the remaining 13 perforations were sealed off by adherent viscera or parietal peritoneum.

Anatomical site of perforation: The site of each of the 20 perforations is shown in Table 1. The majority were in the sigmoid colon, which was the site of perforation in 11 patients (one also had a perforation of the cæcum). Of the remaining 2 patients, one perforated at the splenic flexure and the other had multiple perforations of the cæcum and ascending colon.

Time of perforation: The clinical impression that perforation occurs commonly in initial attacks of colitis was borne out by this study; perforation occurred in 8 out of the 13 patients in their first episode. Our 465 patients suffered a total of 328 severe attacks of colitis and the incidence of colonic perforation is significantly higher in severe initial attacks (9.7%) than in severe subsequent attacks (1.8%).

Severity of colitis: No perforation was recorded whilst the patient was in remission. Perforation of the colon occurred in 10 of our patients during a severe attack. It also occurred during a

Table 1

The site of 20 perforations of the colon in 13 patients

Site	No. of perforations
Sigmoid	15
Cæcum	3
Splenic flexure	1
Ascending colon	1
Total	20

moderately severe attack in 2 patients and in one during a mild attack.

Further evidence of the association between severe attacks of colitis and perforation of the colon can be gained by considering the perforations which occurred during the initial attack of colitis. Of the 76 patients with a mild initial attack, none suffered a perforation in that attack, but of the 73 patients seen in a severe initial attack, 7 patients (9.7%) suffered one or more perforations of the colon.

Extent of disease: The extent of disease at the time of perforation was confirmed by examination of the colon in every patient. No patient with disease limited to the rectum suffered an intra-peritoneal perforation. Of the 204 patients with substantial involvement of the colon, 5 (2.4%) perforated, whilst among the 140 patients with total involvement of the colon and rectum, 8 (5.7%) had one or more perforations.

This is confirmed by consideration of the patients seen in their initial attack of colitis. None of the 72 patients in whose first attack the disease was limited to the rectum then suffered a perforation, but of the 41 patients in whose first attack the disease involved the whole colon and rectum, 6 (15%) perforated at that time.

Dilatation of the colon: Colonic dilatation (or toxic megacolon) has been said to predispose to perforation; and it is true that this complication was present in 5 of the 13 patients (38%) in whom perforation occurred. However, a further 20 patients came to emergency operation without having suffered a perforation and 9 of these (45%) were found at operation to have dilatation of the diseased colon. It thus appeared that the incidence of colonic dilatation in patients needing emergency surgery was around 40%, whether or not perforation had occurred.

Steroid therapy: The suspicion that steroid therapy predisposed to perforation of the colon in patients with ulcerative colitis is *not* supported by our observations. Four of our 13 patients with perforation received neither steroid nor ACTH therapy within twelve months prior to that perforation.

The effect of steroid therapy on the incidence of perforation during a severe attack was considered (Table 2). The 238 severe attacks suffered

Table 2
The effect of steroid therapy on the incidence of perforation in 238 severe attacks of colitis

	Severe attacks	
	Treated by steroids	Not treated by steroids
Total no. of severe attacks	164	74
Severe attacks where perforation occurred	7	3
Perforation rate	4.3%	4.1%

by the 465 patients surveyed were divided into two groups: 164 attacks treated by steroid therapy and 74 attacks which were not. The incidence of perforation is virtually identical in the two groups: 4.3% in the treated group and 4.1% in the untreated group.

Treatment and outcome: Of our 13 patients with perforation of the colon, most were treated by emergency excisional surgery, 10 having emergency ileostomy together with colectomy or proctocolectomy and one patient with a normal colon proximal to the sigmoid having simple sigmoid colectomy with anastomosis.

The other 2 patients were treated medically: one was admitted in a moribund state with a suspected perforation and died before surgery could be undertaken; the other, who also suffered from hypertension and a hemiplegia, was not suspected to have perforated. Both were found to have a perforation at post-mortem examination.

Three of the 11 patients treated surgically died, making a total of 5 deaths in 13 cases of perforation (38%). With an average follow-up of five years, 7 of the 8 survivors were in good or excellent general health; none then needed medical treatment.

Discussion

Incidence: Previous estimates of the incidence of perforation of the colon in ulcerative colitis have varied widely. Sloan *et al.* (1950) reported that this complication occurred in 2% of an unselected group of 2,000 patients, but Van Prohaska & Siderius (1962) found in a selected group of 88 that the incidence was 14%.

The overall incidence of perforation (2.8%) in our 465 patients is probably an underestimate, because perforation is most common during the first attack of colitis and many of our patients were seen long after this. Of the 204 patients who presented during their first attack, 11 (5.4%) suffered a perforation in this or subsequent attacks, and this incidence is probably a more accurate reflection of the occurrence of perforation in colitis.

Our results also show that this overall incidence of perforation can be misleading when considering individual patients. Although the overall incidence during the initial attack of colitis was 3.9%, it occurred in 9.7% of patients with a severe first attack, whilst among patients with total involvement at the first seizure 14.6% perforated at that time. Patients with a severe first attack and total involvement of the colon and rectum had an even higher risk of perforation; nearly one in five of them (19.2%) perforated during the primary onset.

Site of perforation: Previous series in which the site of perforation is stated (Sloan *et al.* 1950,

Brown *et al.* 1951, Bruce & Cole 1962) show an even distribution throughout the colon, it being slightly more common in the transverse than elsewhere. Both the present series and that of Edwards & Truelove (1964) suggest that the commonest site is in the sigmoid colon, 11 of our 13 patients having at least one perforation at this site.

Influence of steroid or ACTH therapy: The suspicion that steroid therapy might induce perforation in colitic patients has evoked controversy. Barger drew attention to this danger in 1955, and Brooke (1956) reported samples of colonic disintegration which were claimed only to occur in steroid-treated patients. Several other reports emphasize the dangers of steroid therapy for colitic patients (Rosenak *et al.* 1958), Keifer 1960, Bruce & Cole 1962). Other authors state with equal emphasis that steroids do not increase the risk of perforation (Goldgraber *et al.* 1957, Truelove & Witts 1959, Smith *et al.* 1962, Spencer *et al.* 1962, Korelitz & Lindner 1964).

Our own observations overwhelmingly support the view that steroid or ACTH therapy does not predispose to perforation of the colon. The incidence in attacks which were treated by steroids or ACTH (4.3%) and the incidence in those not so treated (4.1%) is almost identical. We believe that perforation of the colon is a consequence of ulcerative colitis itself – usually of a severe initial attack – which steroid therapy may be unable to prevent.

Treatment: The recovery rate in patients who are treated medically is difficult to determine, for perforation is difficult to diagnose in those seriously ill, and such patients may recover after an unsuspected perforation. However, the mortality rate in medically treated patients where perforation is known to have occurred may reach 100% (Jankelson *et al.* 1945).

High mortality also follows ileostomy with or without simple suture of the perforation (Jankelson *et al.* 1945, Chisholm 1946, Ripstein 1954). Limited surgery has been condemned by Brooke (1954) for such a colon is often disintegrating.

More recently small numbers treated by emergency colectomy have been reported (Ripstein 1954, Peskin & Davis 1960, Bruce & Cole 1962, Van Prohaska & Siderius 1962): a total of 32 patients were treated of whom 23 (70%) recovered. Our results are equally encouraging; 11 patients came to emergency colectomy and 8 recovered. It therefore seems that the treatment of choice for perforation of the colon is emergency colectomy.

It would, however, be misleading to regard perforation as an *indication* for emergency surgery, because the diagnosis of perforation may be

difficult. In a recent series Edwards & Truelove (1964) report that in half their patients with perforation the diagnosis was made at post-mortem and our findings reflect this difficulty. Over the past decade, 30 of our patients came to emergency operation because of a rapid deterioration in their condition. No fewer than 11 of them (37%) had one or more perforations and, although in 6 of the 11 perforation of the colon was suspected pre-operatively, in the remaining 5 there was no clinical evidence of it. In 3 patients who came to emergency operation with a confident pre-operative diagnosis of colonic perforation, none was found, although 2 of them had peritonitis.

We therefore believe that rapid deterioration in the condition of any patient despite intensive medical treatment warrants emergency colectomy; for in them the risk of perforation is great, and it is impossible to be certain that this lethal development has not taken place.

Summary

A survey of 465 patients with ulcerative colitis revealed 20 intraperitoneal perforations of the colon in 13 patients (2.8%). Perforation was most common in a severe initial attack with total involvement of the colon. No evidence is adduced that steroids play any part in causing perforation. Two patients treated medically died, but 8 of the 11 patients treated by excisional surgery survived. Emergency colectomy is suggested as the treatment of choice for intraperitoneal perforation of the colon in ulcerative colitis.

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