Problems in the Surgical Management of Crohn's Disease of the Colon*

II. TREATMENT

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SUMMARY

Differences in the natural history of ulcerative colitis and colonic Crohn's disease which influence the choice and type of surgical treatment are discussed. The progressive nature of Crohn's disease is stressed. Drugs employed in the medical management of the disease are described with particular attention being drawn to their importance during surgical treatment. The indications for surgical treatment are outlined. Important complications of the disease, which we have encountered, are described. The types of surgical treatment employed in 35 patients with Crohn's disease of the colon treated during the last 2½ years are presented with some details of the operative technique we have found to be important. No patient has died and the results have been good.

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The difficulties encountered when trying to distinguish between ulcerative colitis and Crohn's disease of the colon have been described.[1-4] The cause of each condition remains enigmatic and no specific cure is known for either. Excision of the diseased portion of the bowel plays an important part in the treatment of both diseases, but the aim of the operation and the length of intestine which has to be resected often differ.

With ulcerative colitis the inflammation is characteristically confined to the mucous membrane of the colon and the rectum, although ulcers may penetrate the deep layers of the wall when the disease becomes severe or fulminating. A 'backwash' ileitis may develop in severe cases but it usually improves after the colon has been resected.[5] Most authorities therefore agree that the disease can be eliminated by removing the entire colon and rectum, and this has led to the adoption of panproctocolectomy as the operation of almost universal choice. Others advocate that the rectum should be preserved[6,7] to spare the patient the problems which result from a permanent ileostomy. Even then most of the colon should be removed and a distinct hazard will still exist that inflammatory changes in the remaining rectum may become progressive or result in the development of complications.

Crohn's disease, on the other hand, seems to differ in at least 3 fundamental ways: the granulomatous inflammation can occur anywhere in the gastro-intestinal tract, lengths of normal bowel often remain between diseased segments, and there is a tendency for the inflammatory changes to recur even after resection of all the visibly diseased part of the intestine.

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Progressive Nature of the Disease

It has been suggested that those patients who are treated surgically are more likely to develop further gastro-intestinal inflammation than are patients who are managed medically.[8] Patients with ileal involvement are said to have a better prognosis than those with colonic disease alone,[9] and some workers consider that there is less tendency for the disease to recur after treatment if the inflammation was confined to the small bowel.[10] However, Truelove[11] has stressed the progressive nature of the disease, and has shown that there is an equal tendency for it to spread to other parts of the gut, whether the original lesion was situated in the small or the large bowel. New lesions usually develop proximally to those which have been treated, and their appearance is often accompanied by an exacerbation of symptoms, although in some patients radiological evidence of spread may be found during an asymptomatic period.[12] Even when cases are treated conservatively, the rate of recurrence is high, and it has been recorded in as many as 50% of patients.[13]

Goligher *et al.*[8] studied patients with Crohn's disease who were treated in Leeds over a 30-year period. Recurrences tended to develop in two peaks, the first at 18 months - 2 years, and the second about 5 years after the initial operation. The mortality after 415 operations was 5·8%, which was considerably higher than the percentage of patients who died while on conservative treatment. However, there is a definite mortality from the disease itself. Prior *et al.*[14] recorded 295 patients studied for up to 38 years and showed that twice as many died as could be expected in the general population. Death resulted from complications of the inflammatory disease, as a result of complications of steroid administration, or from a tendency to develop malignant tumours of the gastro-intestinal tract.

Because of the higher mortality which results from surgical treatment, the question has been asked whether Crohn's disease should ever be treated by operation except in those cases in which a complication makes surgery unavoidable. It is probable that improvements in the management and prevention of postoperative complications during recent years will have made the operations safer, but even in the Leeds study, the duration and severity of symptoms which patients suffered during medical treatment were significantly reduced by the operation.[8] At least 57% of patients were 'very satisfied' with their treatment and only just over 1% considered the result to be 'poor' or 'very poor'.

Medical Treatment of Crohn's Disease

There are no drugs which have been shown specifically to cure Crohn's disease of the large or small bowel, and

none of those which are used has been assessed by controlled therapeutic trial. However, the same agents which benefit ulcerative colitis has been used for the treatment of Crohn's disease of the colon. Of these, sulphasalazine, ACTH[15,16] and the corticosteroids frequently have a beneficial effect, especially when used during the early stages of the disease.[17] The long-term results are not as encouraging[18] and the relief is often only symptomatic, but radiological evidence of improvement may occur. In one of our patients with extensive disease of the colon which was maximal in the splenic flexure, the radiological changes returned so nearly to normal that a diagnosis of ischaemic colitis was considered. Subsequently, the inflammation recurred, and Crohn's disease was confirmed when the colon was excised and examined histologically.

Both drugs have been employed in combination or alone for mild symptoms, but patients with severe symptoms or complications have usually received a course of steroids by the time they come to surgery. Unfortunately, the symptomatic improvement is rarely permanent. Howel-Jones and Lennard-Jones[18] reported 22 of 30 cases so treated to have an initial improvement, but only 3 required no further treatment. In 7 it was found impossible to discontinue the administration of the steroids without the disease flaring up. Roberts and Naish[19] found that patients with diffuse involvement of the colon but no obstruction to the lumen, did well on steroids, but that there was a tendency for symptoms to relapse when the treatment was discontinued. Most of the patients on whom we carried out elective surgery had already had, or were still receiving, steroids at the time of operation, and a course of the drugs was usually required to cover the operation and the immediate postoperative period. We have prescribed prednisolone in preference to the other drugs because it has less effect on the retention of salt or the loss of potassium from the body.

It is possible that long-term administration of steroids may reduce the incidence of recurrence,[20] and Roberts and Naish[19] found the drugs to be valuable in the treatment of an established recurrence. Only 5 of 25 of such patients required further surgery. After 'double-barrelled' ileostomy steroids have been used locally by direct installation into the distal stoma (see below). Recently further doubt has been cast on the usefulness of long-term administration of steroids by Cooke and Fielding[21] who studied 300 patients with Crohn's disease and showed that twice as many deaths occurred in the group receiving steroids when compared with those who had not received the drugs. No evidence of long-term benefit of the steroids emerged from the study.

Antibiotics were used in the past[22] but have no place in the treatment of Crohn's disease other than as an adjunct to surgery. Drugs causing constipation, such as codeine or diphenoxylate, may aggravate the abdominal pain associated with the diarrhoea.[23]

In 1965 Winkleman and Brown[24] reported the use of nitrogen mustard for Crohn's disease on 13 patients with apparent successful results. Since then Brooke *et al.*[25] have used the immunosuppressive drug azathioprine on some patients found to be refractory to all the usual means of therapy, including surgery. The initial results were encouraging, particularly in those patients who developed fistulae, and in a subsequent paper[26] and in other studies[27] a number of successes have again been recorded. This mode of therapy is of considerable interest, but long continued administration of immunosuppressives is not without danger, particularly if further surgery is required, and the exact value of the treatment has not been firmly established. X-ray therapy has been advocated[28] but the results were not sufficiently encouraging to warrant further trial.[29]

It has been our experience, and that of Dr Truelove and his colleagues, that the majority of cases with Crohn's disease of the colon in Oxford have required surgical treatment at some time during the course of the disease.

Indications for Surgery

There is no general agreement on the precise indications for surgical intervention. Some authors advocate conservative management for as long as possible and suggest that surgery should be reserved for those with prolonged disability or severe complications.[30] Others employ early radical surgery, for symptoms such as diarrhoea and pain, for anaemia, protein deficiency or weight loss, for a persistently raised ESR while on treatment, or for one or more of the complications.[31] Table I illustrates the cases we have treated. Five patients with ileocaecal disease and 13 with primary colonic inflammation were treated by surgery because of a failure to obtain a remission of symptoms on medical treatment alone. Four with ileocaecal disease and 2 with colonic inflammation had emergency operations for a severe complication. A further 5 patients with primary colonic disease underwent elective surgery because of a

TABLE I. PATIENTS WHO HAD SURGICAL TREATMENT FOR CROHN'S DISEASE

Site of disease	Operation	No. of patients	Total
Ileocaecal disease	Laparotomy alone for diagnosis of a mass	1	
	Resection of previous ileotransverse colostomy	2	
	Right hemicolectomy	5	
	Double-barrelled ileostomy	1	
			9
Predominantly or wholly colonic disease	Subtotal colectomy ...	2	
	Caecoproctostomy ...	2	
	Panproctocolectomy .	3	
	Double-barrelled ileostomy	9	
	Closure of previous ileostomy	4	
			20
Known colonic disease + anal complication	Anal surgery	2	
Anal disease 'alone'	Anal surgery	4	
			6
		Total	35

major complication. These included 3 with abdominal fistulae, 1 with a rectal carcinoma, and 2 boys in whom puberty was delayed because of the continued steroid administration. Two of the 6 patients with peri-anal disease had emergency drainage of abscesses. It will be seen that complications played an important part in the indications for surgery in our patients and for the type of operation which was employed.

MAJOR COMPLICATIONS OF CROHN'S DISEASE

Table II illustrates the complications encountered in our patients.

TABLE II. COMPLICATIONS OF CROHN'S DISEASE ENCOUNTERED IN 35 PATIENTS

Local			
Obstruction			1
Perforation			1
Peritonitis			1
Fistulae/sinuses or abscesses	abdominal	4	
	anal	6	
Toxic megacolon			1
Massive haemorrhage			1
Carcinoma			1
Systemic			
Infections: Skin			1
Infections: Eyes			1
Infections: Arthritis			1
Infections: Septicaemia			1
Non-infected: Ankylosing spondylitis			1
Non-infected: Polyarthropathy			2
Non-infected: Venous thrombosis			1
Non-infected: Physical retardation			2
Non-infected: Hepatobiliary disease (? infection)			3

Fistulae

The presence of a fistula, whether internal, external or peri-anal, was the most common complication which required surgical treatment. In 3 patients an abdominal fistula became external. Two opened spontaneously through the scar of a previous operation and one resulted from the drainage of an abscess in the right iliac fossa. In the others the tracks were blind intraperitoneal sinuses rather than fistulae, and these were usually demonstrated on barium enema examination. A 55-year-old man was thought to have suffered from ulcerative colitis for 21 years. He developed an abscess in the ischiorectal fossa which subsequently discharged faeces. Fig. 1 illustrates the barium enema appearance before the abscess developed, showing the sinus tract (Fig. 1 (F)) arising from a segment of active disease in the sigmoid colon.

All intra-abdominal fistulae were treated by resection of the diseased portion from which they developed. Double resection may be required but the distal end of an internal fistula which opens into another segment of bowel can be closed by simple catgut suture if the second piece of intestine is not grossly diseased.[32] The fistulae may be multiple and they have been noted to penetrate the diaphragm and extend into intrathoracic structures.[33]

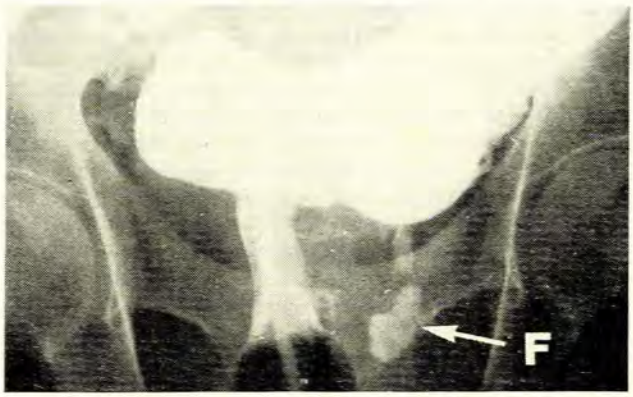

Fig. 1. Barium enema examination of a 55-year-old man with Crohn's disease of the descending colon and rectum. F=fistula from sigmoid colon to ischiorectal fossa.

Crohn's Disease of the Peri-anal Region and Skin

Peri-anal complications have been reported by Morson to occur in 75% of patients with large-bowel Crohn's disease and in 25% of those with small-bowel inflammation.[34] Abscesses and fistulae may precede the development of symptoms from intestinal disease by many years. Six of the 19 cases described by Gray *et al.*[35] developed intestinal lesions up to 5 years after initial treatment in the peri-anal region. The fistulae and fissures are often surprisingly painless, and characteristically there may be a marked absence of induration. Large ulcers may develop with irregular undermined edges and a very indolent appearance. However, in some patients the lesions do not appear to be different from the usual non-specific peri-anal inflammatory disease, and the diagnosis of Crohn's disease can only be made after microscopic examination of the biopsy specimen. Mountain[36] reported a group of patients with giant ulcers in the peri-anal region or surrounding an ileostomy stoma. Distant or metastatic ulceration was seen in 3 of his patients. He and others,[37] have noted typical granulomatous inflammation in large ulcers which have developed in the submammary region. These cutaneous ulcers are extremely resistant to the usual forms of medical and surgical treatment. We have not encountered severe fistulae and inflammation is lower in our series than in others where it has been recorded in as many as 81% of 75 patients.[35]

All 6 of our patients were treated by local incision of abscesses or by the standard method of excising a fistula. Two were known to have underlying colonic inflammation but they have not yet required abdominal surgery. All have healed except 1 patient who still has a small granulating area at the site of the fistula 8 months after it was excised.

Obstruction

Intestinal obstruction is seen quite commonly with Crohn's disease of the small bowel and although partial blockage may be the cause of obstructive symptoms in patients with colonic disease, a complete blockage is rare. One patient presented with a stricture in the ileocaecal region which was treated by emergency hemicolectomy.

Perforation

Acute free perforation of the colon into the peritoneal cavity results very rarely from Crohn's disease,[39] although fistulae frequently penetrate all layers of the bowel. The perforations which have been described are more common in the small bowel.[40] A young man presented with abdominal pain suggestive of acute appendicitis but at laparotomy he was found to have a perforated ileocaecal mass which was resected.

Haemorrhage

The loss of blood from the colonic mucosa results much less frequently from Crohn's disease than it does from ulcerative colitis[41] because the inflammation is not commonly associated with marked dilatation of blood vessels and friability of the mucus membrane. However, the ulceration can erode a large vessel. A young Scandinavian girl known to have ileocaecal Crohn's disease was admitted as an emergency because of severe rectal bleeding, and a hemicolectomy was carried out after 16 pints of blood had been transfused. Examination of the specimen showed deep ulceration in the ascending colon.

Toxic Megacolon

The term toxic megacolon was coined by Roth and his colleagues[42] to describe the gross dilatation of the transverse colon which may develop during a fulminating course of ulcerative colitis. It is not an uncommon complication of classical colitis. Similar dilatation has been noted to result from severe amoebic infection of the large bowel.[43,44] In 1967 a 24-year-old man was reported to have developed gross dilatation of the colon during a fulminating course of colonic Crohn's disease,[45] and since then a number of similar cases have been collected.[46]

Case report. Fig. 2 illustrates the appearance of the abdominal X-ray, taken in a supine position, of a middle-aged woman known to have extensive Crohn's disease of the colon. She had allowed her general health to deteriorate and had lost considerable weight. The symptoms became more severe and she was admitted in a state of cachexia with abdominal distension and tenderness. Her general condition did not respond to medical treatment and a 'double-barrelled' ileostomy was carried out as an emergency because it was felt she was too ill for colectomy. The immediate postoperative course was excellent but 3 weeks after returning home she developed a Gram-negative septicaemia which caused profound shock. The hypertension lasted some hours before adequate treatment could be instituted and although she has subsequently done well, the shock resulted in bilateral gangrene of her legs which were both amputated, one above and one below the knee.

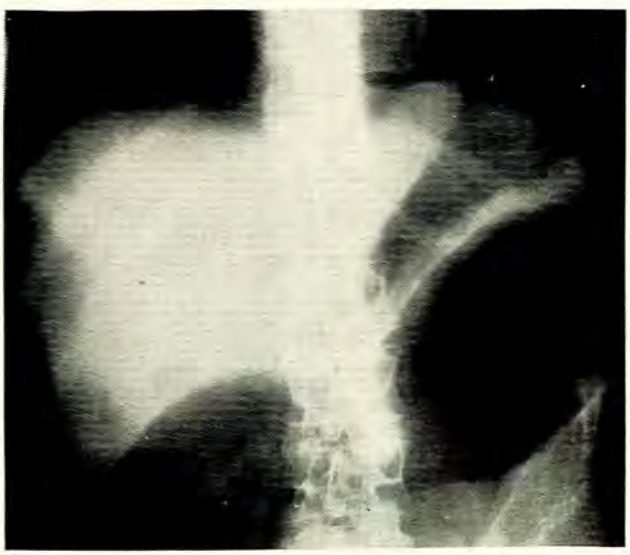

Fig. 2. Plain supine X-ray of the abdomen of a middle-aged woman with Crohn's disease of the large bowel who developed a 'toxic megacolon'.

Carcinoma and Crohn's Disease

A malignant tumour of the colon is another well-recognized complication of ulcerative colitis. Malignancies have been recorded in association with Crohn's disease of the small bowel.[47,48] Atwell *et al.*[49] noted an incidence of carcinoma of 4·8% in patients with Crohn's disease of the colon[49] and in Oxford by 1967, 3·7% of the patients were found to have developed tumours. Since then a similar ratio has been maintained in new patients.[50] Although other workers[51] accept this association, Hywel-Jones[52] concluded that the risk of malignancy had not yet been established for Crohn's disease. The epithelial changes which have been described in the colon and rectum in ulcerative colitis in association with a malignant disease had not been found in Crohn's disease of the large bowel.[53]

Case report. A 65-year-old man was found on barium enema to have a narrow descending colon after complaining of watery diarrhoea, abdominal colic and the occasional passage of blood in his stools. He was known to suffer from ankylosing spondylitis and plantar fasceitis. Sigmoidoscopy revealed the rectum to be mildly inflamed with a polypoid carcinoma visible at 10 cm from the anal verge. He was treated by subtotal colectomy and excision of the rectum, and is well 2½ years later. Fig. 3 illustrates the macroscopic appearance of the tumour and surrounding mucous membrane which did not have a 'cobble-stone' appearance. Histological examination confirmed the presence of active Crohn's disease.

The Liver in Crohn's Disease

Inflammatory changes in the portal tract occur in ulcerative colitis and Crohn's disease particularly when the colon is involved. Perrett *et al.*[54] have shown that 57% of the patients with Crohn's disease and hepatic complications had Crohn's disease of the colon, and that these patients also had a high incidence of systemic complications. Of 39 patients who underwent liver biopsy, 19 had histological abnormalities, the most common of which were pericholangitis, focal necrosis and fatty change. Three of our patients were found to have extensive changes on liver biopsy but only 1 previously had been suspected to have liver damage because of abnormal biochemical tests. However, this complication probably occurs more frequently than is generally suspected. Sclerosing cholangitis[55] and suppurative pylephlebitis[56] have been described in association with Crohn's disease.

Ureteral Involvement in Crohn's Disease

Recently it has been pointed out that obstruction to the ureters may occur quite frequently as a result of granulomatous infiltration from the bowel and that it may pass

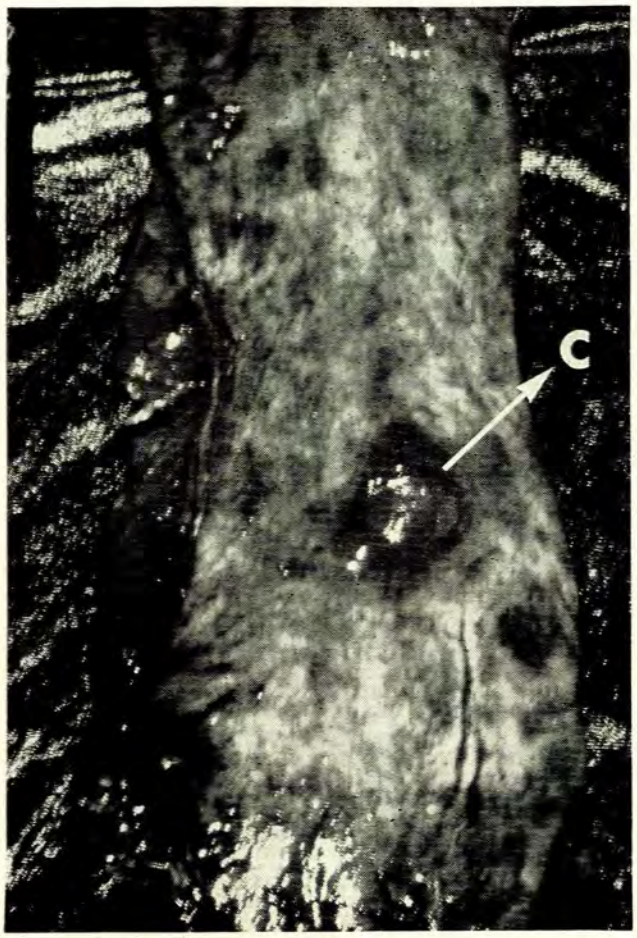

Fig. 3. Macroscopic appearance of the rectal mucosa after resection of the colon showing inflammatory changes but no 'cobblestone' appearance and a polypoid carcinoma of the rectum (C).

unrecognized.[57,58] It was not found in any of our patients but it seems important to carry out intravenous pyelography before surgery to exclude this complication.

TYPES OF SURGERY EMPLOYED

There is no standard operation which has gained universal acceptance for the treatment of any type of Crohn's disease of the small or large bowel. Crohn has described the early operations which were performed.[59] At first it was the policy to excise a diseased segment, but this was often carried out in two stages. An ileotransverse colostomy was employed initially, to short-circuit the inflammatory mass which was usually situated in the caecal region. In the original series of patients described, a residual segment was found to have healed when the second operation was carried out 3 weeks after the initial bypass. Thereafter defunctioning ileocolostomy was frequently employed for disease of the ileocaecal type, but the operation is not now commonly used as the results have not proved to be sufficiently satisfactory. Atwell *et al.*[60] reported a 5% mortality of 39 patients on whom a short-circuit operation was performed and 92% recurrence of disease. Of 146 patients who were treated by primary resection, only 50% developed recurrent disease.

Most surgeons now advocate limited single-stage resection of the colon for localized disease and total colectomy if the disease affects the large bowel diffusely.[60] The aim is to resect all tissue which is involved and frozen-section microscopic examination can be employed to check whether the ends of the bowel are the sites of active inflammation. After resection an immediate end-to-end anastomosis is usually carried out to restore continuity of the bowel. Table I lists the operations which were undertaken in the cases presented.

Limited Resections

Right hemicolectomy was found to be a useful form of limited resection in 5 patients with ileocaecal disease. In 2 others, a subtotal colectomy and rectal excision was required for extensive left-sided disease. It extended to the rectum but the caecum and ascending colon could be retained as an end-colostomy. When the disease affects most of the colon but spares the rectum, total colectomy and ileorectal anastomosis has been advocated as the operation of choice. We have used the technique of caecoproctostomy or caecosigmoidostomy after excising the major part of the colon in an attempt to retain the ileocaecal sphincter as well as the rectum. Fig. 4 illustrates the important stages of this operation. After the excision the remaining caecum should be rotated in an anticlockwise direction for the anastomosis. If it is rotated in the opposite direction, the vascular pedicle may become twisted and undergo torsion. The appendix should be removed and a drainage caecostomy should be performed. In one patient the result has been good but the second has required further surgery

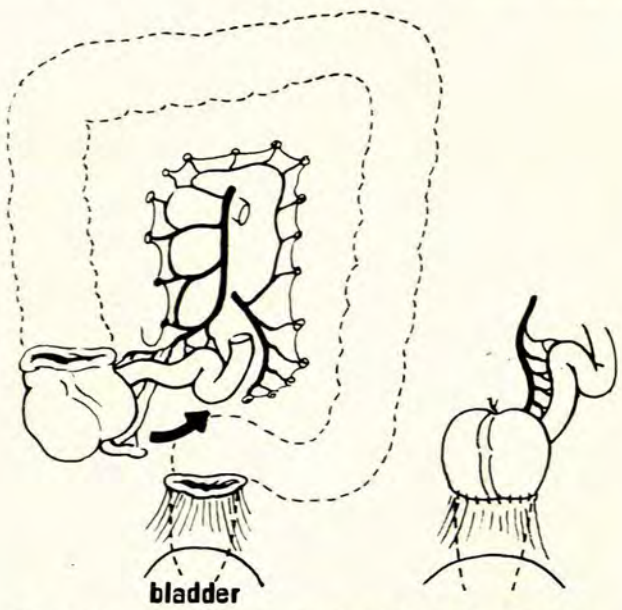

Fig. 4. Caecoproctostomy. After most of the colon has been removed the caecum is rotated in an anticlockwise direction (arrow) and anastomosed to the rectum after the appendix has been removed.

after a fistula developed through the drain wound 4 weeks after the colectomy.

Wide Resection

Panproctocolectomy is not infrequently required to remove extensive disease involving the colon and rectum, and some surgeons advocate radical surgery for most cases of colonic Crohn's disease. A well-known hazard of the standard operation is the dysfunction of the bladder and sex organs which may follow surgical damage to the autonomic nerves in the pelvis. We have devised a technique of perimuscular dissection of the rectum in an attempt to prevent such an injury and have successfully carried it out in 3 patients with Crohn's disease and 11 with ulcerative colitis.[61]

External Diversionary Ileostomy

Since 1965 a diversionary ileostomy has been employed in Oxford for the treatment of some patients with Crohn's disease of the colon. Truelove *et al.*[62] coined the term 'double-barrelled' ileostomy for the operation which we employ and it has gained current usage but it gives a false impression of the technique employed. The ileum is divided and brought out through separate stomata on to the abdominal wall and the term 'split' or 'bridge' ileostomy would be more descriptive.

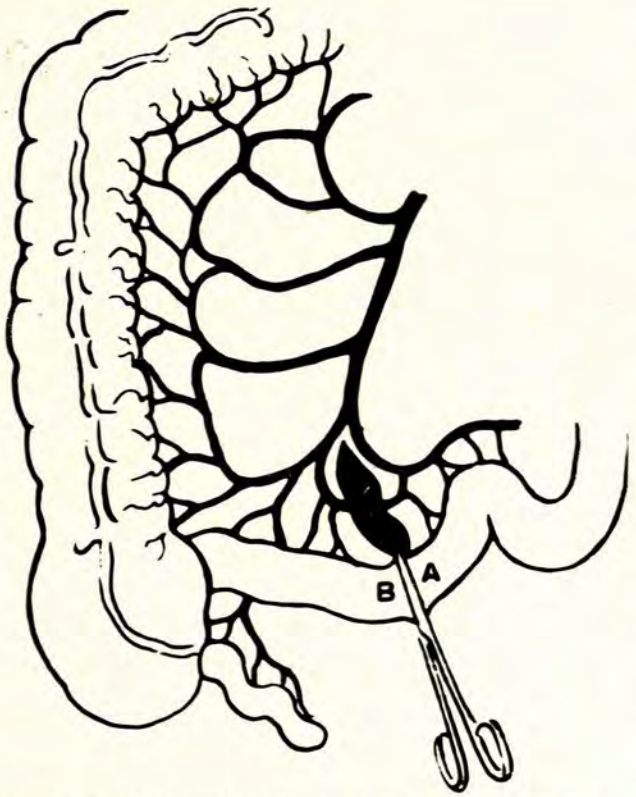

Fig. 5. 'Double-barrelled' ileostomy site for ileal division 23 cm from ileocaecal valve.

Fig. 5 illustrates the point of division of the ileum about 23 cm from the ileocaecal valve when the disease is confined to the colon. The proximal ileostomy is functional and it is brought out as a spout in the standard position in the right iliac fossa (Fig. 6(A)). The distal end is

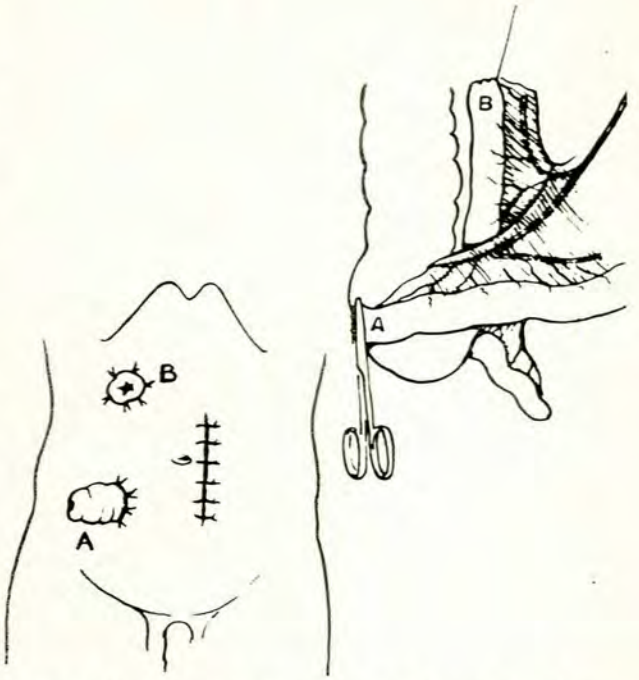

Fig. 6. 'Double-barrelled' ileostomy. A=Proximal or functional spout ileostomy. B=Distal ileostomy.

opened in the subcostal region and the bowel wall is then stitched flush with the skin with interrupted catgut sutures (Fig. 6(B)). It is important to close the defect which lies between the divided mesentery and the parietal peritoneum after the two ends of the ileum have been brought onto the skin to prevent intestinal obstruction caused by the herniation of the small bowel through this opening.

This type of operation has been adopted in the treatment of Crohn's disease by some centres,[63-66] and most surgeons who have used it have found the technique helpful in the treatment of some patients but others have doubted its usefulness.[67] Some patients have undergone the operation in an attempt to achieve healing of the inflamed segment. In others the diversion has been part of a staged technique of resection carried out because of the poor general condition of the patient.

Case report. A 25-year-old Belgian male had suffered extensive colonic Crohn's disease for several years which had resulted in a state of chronic weight loss with severe diarrhoea and pain. A double-barrelled ileostomy was performed in 1968 after an exacerbation of diarrhoea, while on steroids. His weight subsequently increased from 66·15 kg to 77·81 kg in a year, and a panproctocolectomy was then carried out. Except for the development of an abscess at the ileostomy site he made an uneventful recovery.

Two boys who suffered delay of puberty because of the administration of steroids were treated by ileostomy. Both were able to discontinue the drugs and both have under-

gone normal development without a recrudescence of their symptoms. In some patients the distal stoma has been used to administer steroids locally to the affected bowel. The results of this mode of treatment have not yet been studied in detail by us. At the present time we consider the technique to have been very useful in a large number of patients, both to diminish the degree of inflammation and allow the lesions to heal in some and to improve the general state of health in others. We have been able to close the ileostomy in 3 of our cases without a resection being required, and previous cases at Oxford have been followed for as long as 8 years after closure without recurrent disease developing.

RESULTS OF SURGERY

No patient with Crohn's disease has died as a result of surgery during the last 2½ years. Two problems in the postoperative period have been found to be troublesome. Abscesses in the peritoneal cavity have been noted in 7 patients; most have been superficial and have settled soon after adequate drainage but one patient developed 4 recrudescences of infection up to 18 months after the original operation. The postoperative administration of steroids seemed to result in the abscesses remaining remarkably symptomless in 4 patients, 2 of whom did not even develop a pyrexia or leucocytosis. The steroids did not appear to delay healing of the wounds but great care was taken to hold the rectus sheath with non-absorbable monofilament nylon sutures, and suction drains were used to eliminate dead space.

Fistulae developed in the postoperative period in 1 patient after hemicolectomy and 1 after caecosigmoidostomy. Both have required further surgery. In most patients the symptomatic improvement after surgery had been good and although at least 1 patient with ileocaecal disease is known to have developed a recurrence, he has not yet required further treatment. The result of surgery for complications has also been good particularly when fistulae were present.

CONCLUSION

The treatment of Crohn's disease is beset by numerous problems which require the complementary interest of physician and surgeon.

Surgery is frequently required in the treatment of Crohn's disease of the colon, rectum and anal region and the results are often good. It is indicated for established complications and has proved extremely useful to reduce the severity of the symptoms which have not responded to conservative management. However, surgical treatment does not cure the disease or prevent its natural tendency to progress to fresh sites in the gastro-intestinal tract, and the patients must be warned that they will have to be supervised for many years.

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