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

I. DIAGNOSIS

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SUMMARY

The developing recognition of the true incidence of Crohn's disease of the colon is described, stressing the difficulty of distinguishing between ulcerative colitis and Crohn's disease. The histological differences between the two diseases are summarized. Some of the important clinical findings of 35 patients treated over the last 2½ years are recorded. The clinical features and differential diagnoses of Crohn's disease of the colon are discussed and the difficulty of separating the granulomatous from the ulcerative colitis on clinical grounds alone is described. Special investigations are non-contributory but the findings derived from sigmoidoscopic examination, barium enema and rectal biopsy may be conclusive. The importance of distinguishing between the two forms of colitis is stressed.

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DIAGNOSIS

Crohn's disease was originally described as a regional ileitis,[1] but it was soon found that the disease could extend into the large bowel.[2] In the past, two patterns of distribution were commonly described. With ileocaecal disease, a continuous segment of inflammation involved the distal ileum, caecum and a length of ascending colon.[3] In other patients, a variable number of inflamed segments were found in the small and the large bowel which were separated by lengths of normal intestine.[4] When the disease was first recorded the underlying pathological changes were not known,[5,6] and in retrospect it seems that the initial concentration on ileal inflammation was unfortunate in that it diverted attention from similar lesions developing in other parts of the intestinal tract. In particular, the number of cases involving the colon has been underestimated until the last few years.

As early as 1930, Bargen and Weber[7] described a migratory segmental ulcerative colitis and, soon after the initial description of regional ileitis, Crohn and Berg[8] reported cases with segmental variants of ulcerative colitis. However, it was not until the 1950s that Wells[9] and later Brooke[10] pointed out the granulomatous rather than ulcerative nature of the inflammatory process in these patients. Most difficulty is experienced in distinguishing between classical ulcerative colitis and Crohn's disease when the latter affects the whole length of the colon and it is only during the last decade and in particular since the papers of Lockhart-Mummery and Morson[11,12] that the histological features of the two diseases have been described in detail. Since then many cases of primary colonic Crohn's disease have been reported but the difficulty of distinguishing between the granulomatous disease and ulcerative colitis continues to be a major clinical problem.

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PATHOLOGY

Anatomical Distribution of Colonic Lesions

The inflammatory changes of Crohn's disease are characteristically discontinuous whether it involves the small or large bowel.[12] Less commonly, the whole of the large bowel may be evenly affected. When the disease is segmental, right-sided ileocolitis is not an uncommon distribution pattern. In others a number of skip lesions may be present in the large bowel, and occasionally the changes may be confined to the rectum. Whatever part of the bowel is affected by Crohn's disease, perianal inflammation develops not uncommonly.[13] There is a marked tendency for the disease to recur at other sites in the gastrointestinal tract after a segment has been excised or even when the patient has been treated conservatively.[14,15] Granulomatous lesions have been described in the mouth,[16] the oesophagus,[17,18] the stomach,[19,20] and the skin,[21] quite apart from the usual sites in the small and large bowel. Continuity with disease of the bowel need not be demonstrated.

Microscopic Features

Under the microscope features are often present which serve to distinguish Crohn's disease from ulcerative colitis.[12,22] The inflammation is usually transmural, characterized by oedema and lymphoid infiltrates, and all layers of the bowel are thickened (Fig. 1). Deep fissure ulcers are often prominent between the 'cobblestones' (Fig 1(F)) and they reflect the tendency of the ulceration to penetrate through the wall. Sarcoid-like granulomata are present in about three-quarters of the specimens examined, either in the bowel wall or in regional lymph nodes. Frequently the epithelial lining remains surprisingly normal and the blood vessel dilatation which is such a feature of ulcerative colitis is characteristically absent. Sometimes, contrary to the literature, we have encountered hyperplastic polypoid appearances similar to those seen in chronic ulcerative colitis. Table I summarizes some of the histological differences which have been used to separate Crohn's disease of the colon and ulcerative colitis. In most cases differentiation is possible but some workers have suggested that the dividing line between the two has been drawn too sharply.[23,24]

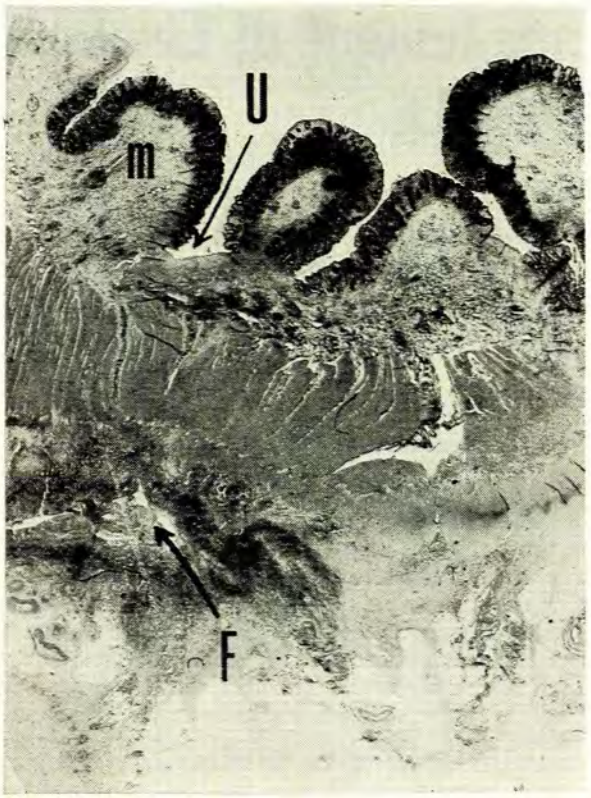

Fig. 1. Low-power micrograph (× 6) of the wall of the colon thickened by Crohn's disease. M = oedematous lumps of mucosa and submucosa. U = ulcers between adjacent lumps. F = deep ulcer or fissure.

Macroscopic Appearances

At laparotomy the affected segments of the bowel are thick, indurated and the surface is reddened[25] (Fig. 2(A)). Signs of inflammation may be obvious on the peritoneal surface itself and tubercles can often be seen. Occasionally these subserous tubercles may be found to spread so widely in the bowel wall that a diagnosis of miliary tuberculosis may be considered.[26,27] With Crohn's disease the mesentery of the colon is thickened and its fat extends onto the wall of the bowel (Fig. 2(B)). Regional lymph nodes are frequently enlarged. These marked changes seen at laparotomy are quite unlike the usual appearances of the colon with ulcerative colitis, where the serosal surface often remains remarkably normal in spite of extensive underlying ulceration of the mucosa. When the inflamed bowel is examined from within, a typical 'cobblestone' appearance can be seen in about 25% of cases of Crohn's disease[22] (Fig. 3). The surface of the mucosa is thrown into heaped lumps by an oedematous and infiltrated submucosa (Fig. 1(M)). The pallor of the lumps reflects the lack of blood vessel dilatation. Quite frequently, however, a typical 'cobblestone' appearance is not seen, and the surface of the mucous membrane may be flat, and may contain ulcerations of the aphthoid or serpiginous type.

Cases Treated Surgically

We have operated on 35 patients with Crohn's disease during the last two years (Table II). Nine had ileocaecal disease and in 6 surgery was confined to the treatment of perianal fistulae or abscesses. The remaining 20 had inflammatory lesions which were predominantly in the large bowel. A further 3 cases were initially considered

TABLE I. COMPARISON OF SOME IMPORTANT HISTOLOGICAL FEATURES OF ULCERATIVE COLITIS AND CROHN'S DISEASE

	Classical colitis	Crohn's disease
Spread through wall	Mucosal and submucosal unless fulminating disease	Transmural
Spread along bowel	Always continuous inflammation	Often discontinous
Mucosa		
Mucous secreting cells	Grossly impaired with marked regenerative changes visible in remaining lining epithelium	Slightly impaired
Excessive vascularity	A marked feature	Seldom prominent
Lamina propria	Infiltrated with polymorphs, eosinophils and lymphocytes	Characteristic lymphocytes and plasma cell infiltration
Crypt abscesses	Very common	Fewer
Paneth cells	Common	Rare
Precancerous changes	May occur	Absent
Submucosa	Often normal or reduced width	Increased
Sarcoid foci	Never	A feature in all layers (60 - 75%)
Lymphoid hyperplasia	Mucosa and submucosa	In all layers
Fissuring	Never	A feature
Lymph nodes	Reactive hyperplasia only	Non-specific reactive hyperplasia or specific sarcoid foci
Anal lesions	Non-specific inflammation	Non-specific inflammation or sarcoid foci

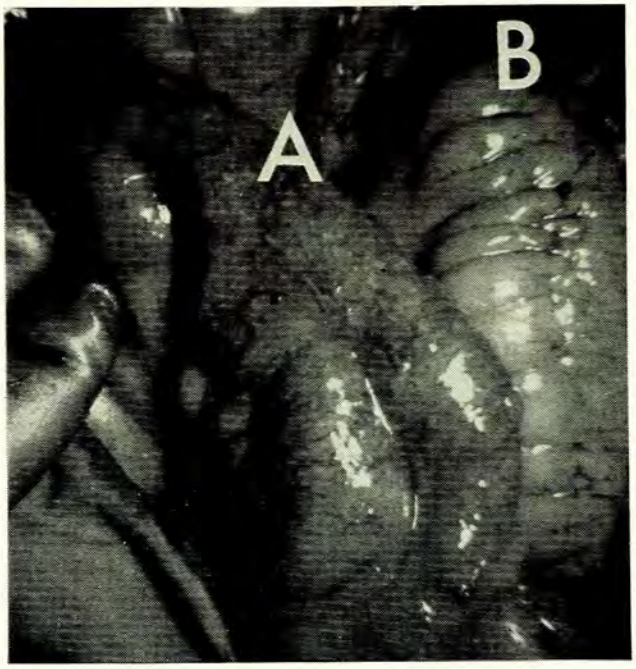

Fig. 2. Macroscopic appearance of Crohn's disease of sigmoid colon seen at laparotomy. A = grossly inflamed segment. B = mildly inflamed segment with fat infiltration of mesocolon.

Fig. 3. Mucosal surface of the colon with typical pale 'cobblestone' appearance due to oedematous mucosa and submucosa with deep fissure ulcers between adjacent lumps.

TABLE II. PATIENTS WITH CROHN'S DISEASE OF COLON AND ANUS

Site	Mode of presentation: Chronic	Acute	Total
Ileocaecal lesions	6	3	9
Lesions predominantly or wholly in colon	18	2	20
Anal lesions			
Known colonic disease		2	
No colonic lesion known	1	3	6
		Total	35

to be suffering from Crohn's disease but the diagnosis was changed to ulcerative colitis after the specimen of the colon became available for histological examination.

CLINICAL PRESENTATION

Family History and Associated Diseases

There is probably a genetic susceptibility to the development of Crohn's disease and it is not rare to find other members of the family suffering from the same condition or from classical ulcerative colitis.[28] There is a particular association of the disease with ankylosing spondylitis,[29] and polyarthritis, eczema and hay fever which may occur in the patient or in one of his relatives.[28] The incidence of Crohn's disease per 100 000 people at risk in the Oxford region between 1951 and 1960 was found by Evans and Acheson to be 6·5 cases per year.[30] Further analytic study has not been undertaken but the number of all cases and in particular those with colonic disease appears to be increasing.[31,32]

CLINICAL FINDINGS

Chronic Symptoms

The initial diarrhoea and general malaise may be very similar in Crohn's disease and ulcerative colitis and in many patients it is impossible to diagnose the underlying disease process from the character of the symptoms. Both diseases tend to occur in young patients and the onset of symptoms is usually gradual. Linder *et al.*[33] described the disease to be apparent in more than half the patients before the age of 21. With ulcerative colitis the frequent bowel actions are often composed of mucus and blood and may contain pus. Crohn's disease, on the other hand, more frequently causes a truly faecolent diarrhoea, which is accompanied by abdominal pain and often the faeces may not contain blood.[34] Many patients with a quite long history of diarrhoea may first seek medical attention because of a complication of the disease and some of these present with symptoms which are not immediately referable to the gastro-intestinal tract. Anaemia and unexplained pyrexia or the development of psychological problems may cause diagnostic difficulty.[32,35] The symptoms are very variable and the disease in the colon has often been present for a considerable time between the onset and the diagnosis being made.[36]

Acute Exacerbations

Symptoms may develop rapidly or a patient with chronic disease may undergo an acute exacerbation but this occurs much more commonly with ulcerative colitis than it does with Crohn's disease. However, patients with Crohn's disease of the colon occasionally do require surgical treatment in an acute emergency.[37] Three of 9 patients with ileocaecal disease had urgent surgery for an obstruction, a perforation and for severe haemorrhage. Two of the 20 patients with disease confined to the colon were operated upon during the acute stage of their illness. In one the inflammation became fulminating and the patient developed a toxic megacolon, and the other had an exploratory laparotomy after developing a mild peritonitis following a short history of abdominal pain and diarrhoea. Patients with small-bowel Crohn's disease are much more likely to develop acute symptoms or local complication than those with primary colonic lesion.[38,39]

It has been noticed that many patients who subsequently develop ileal Crohn's disease have had a previous appendicectomy. Occasionally true Crohn's inflammation of the appendix may be found,[40] and this happened in one of our patients with extensive disease of the transverse and descending colon on whom an appendicectomy had previously been performed. When the appendix was subsequently re-examined microscopically, sarcoid-like granulomata were found. Quite frequently a laparotomy is performed for suspected appendicitis and the pathology turns out to be an acute terminal ileitis. By no means all of these patients have Crohn's disease. Sjöström[41] has shown that in 21 of 29 cases the inflammation was found to be due to a pseudo-tuberculosis organism, but 5 of the remaining 8 cases in which the antibody was negative, and in which no organism was found, developed Crohn's disease.

DIFFERENTIAL DIAGNOSIS

Lesions Other than Colitis

Although the greatest difficulty still lies in the differentiation of Crohn's disease from ulcerative colitis, a large number of other lesions in the intestine may cause diagnostic error.[36] These include haematoma in the wall of the bowel due to a bleeding diathesis, polyarteritis, small and large bowel tumours, the infiltration of a reticulosis, stercoral ulceration, and inflammatory masses resulting from an infected appendix. Carcinoma of the caecum may develop in young patients and such a tumour was the cause of abdominal pain and a mass in the right iliac fossa in a 27-year-old man who initially received treatment for Crohn's disease before the barium enema was examined by an expert radiologist. The presence of an abdominal mass in a patient with colitis is a major point against the diagnosis of ulcerative colitis.

Special Infections of the Colon

In the past, tuberculosis infection of the intestine was described quite commonly and typical hypertrophic ileocaecal disease is still seen in some countries.[42] Most of the patients with granulomatous disease of the ileocaecal region recorded during recent years have been shown to have Crohn's disease. Lee and Roy found acid-fast bacilli in only 2 out of 15 cases.[43] Even the finding of acid-fast organisms does not prove the infection to be tuberculous and Anscombe, Keddie and Schofield[44] stressed that the organisms must be found in regions where histological evidence of tubercles with central caseation are demonstrated and that final proof rests on the identification of *Mycobacterium tuberculosis* by culture or animal inoculation. All workers stress the difficulty of proving a positive diagnosis[45] and the diminishing incidence of tuberculous disease of the bowel.[46] Bruce has gone as far as stating that 'the lesion commonly known as hypertrophic ileocaecal tuberculosis seems to have disappeared'.[47] Nevertheless, evidence remains that tuberculosis *can* infect the ileocaecal region, however rarely, and the diagnosis of the infection and its distinction from ileocaecal Crohn's disease is a matter of considerable practical importance because the administration of corticosteroids to a patient with active tuberculosis could prove disastrous.[27] Tuberculosis has not been shown to affect the colon alone without involving the small bowel.

In tropical countries where amoebiasis is endemic, both the clinical presentation and the radiographic appearances of the colon may cause diagnostic difficulty. The oedema, spasm, loss of haustral pattern and ulcerations may give an appearance on barium enema examination which closely resembles idiopathic ulcerative colitis.[48,49] In the chronic stage the fibrosis and granulomatous reaction may produce an amoeboma or mass which could be mistaken for Crohn's disease although it more closely resembles a tumour.[50] In Africa, bilharzia may cause granulomatous inflammation in the colon particularly when the schistosomal infection is heavy or caused by multiple organisms. Ragged mucosal ulceration, strictures and, in particular, the multiple polyps which develop may closely simulate the appearances seen with Crohn's disease.[51,52] The inflammatory changes are usually most severe in the descending colon and rectum and gross retrorectal thickening may occur. In other parts of the world where *Schistosoma mansoni* infections take place the colonic disease is usually much less severe than the chronic infections which result from schistosomal organisms in Africa.[53] Lymphogranuloma venereum is another infection which may cause rectal fibrosis which could be mistaken for Crohn's disease.[54] Actinomycosis rarely infects the gastro-intestinal tract, but when it does, it could be a cause of diagnostic difficulty. Ross *et al.*[55] recorded 6 cases of abdominal actinomycosis. Four had had ileocaecal inflammation, which included a history of diarrhoea in 1, colicky pain, the presence of a mass in the right iliac fossa and the development of abscesses and sinuses after appendicectomy.

One non-infective disease entity may give rise to diagnostic difficulty in non-tropical countries. A period of ischaemia of the colon may have three possible results. The bowel can return to normal, fibrosis may result in a stricture, or transmural gangrene may occur. In the first two circumstances the clinical syndrome which develops during the acute episode has been called ischaemic colitis.[56,57] The symptoms may closely resemble an acute attack of ulcerative colitis or Crohn's disease although

it usually presents in an older group of patients with an acute onset of severe abdominal pain and bloody diarrhoea (Table III). Spontaneous improvement occurs within a short time unless the bowel becomes gangrenous. Recently a number of young women have been reported to develop the lesion while taking the contraceptive pill. If barium enema examination is carried out during the acute stage of inflammation the wall of the colon is found to be thickened and rigid and the lumen narrowed and indented by large filling defects which result from oedematous haemorrhagic swellings of the mucosa and submucosa. These may give an appearance indistinguishable from the pseudopolyps of ulcerative colitis or the 'cobblestones' of Crohn's disease, but they are often bigger and have been described as being the size and shape of thumbprints (Fig. 4). In Table III it can be seen that the clinical findings in patients with ulcerative colitis and Crohn's disease may be very similar. The history and clinical examination alone usually provide insufficient evidence to differentiate between the two, though blood is seen more commonly in the stools with classical colitis and perineal infection and fistulae more commonly with Crohn's disease. It is extremely rare to find abdominal mass in patients with uncomplicated ulcerative colitis. More help may be obtained from sigmoidoscopic examination, barium enema and rectal biopsy.

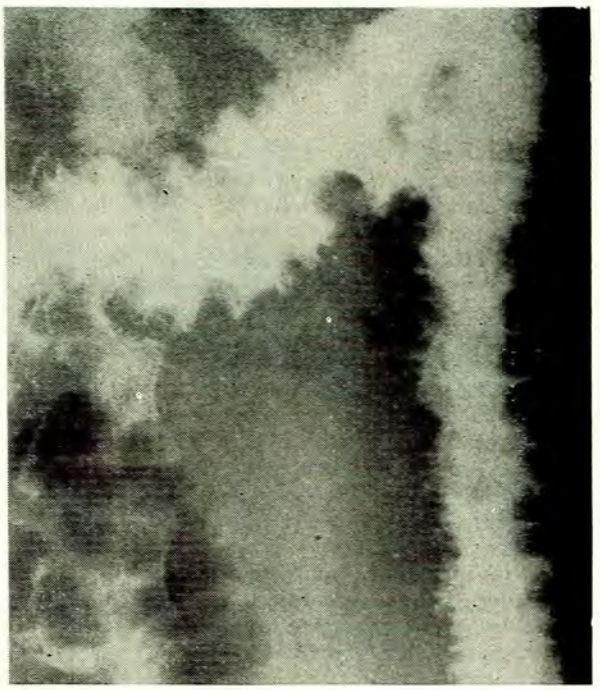

Fig. 4. X-ray film of splenic flexure of a patient outlined during barium enema showing large 'thumb-print' filling defects resulting from ischaemic colitis.

SPECIAL INVESTIGATIONS

The stools should always be examined and cultured to exclude specific infections, but no special biochemical abnormalities are found with Crohn's disease or ulcerative colitis. The tuberculin reaction is of no diagnostic value in Crohn's disease,[58] and the Kveim test is usually found to be negative,[59] although Mitchell *et al.*[60] found 23 of the 45 patients they studied to have a positive test.

Sigmoidoscopy

Although the inflammation of Crohn's disease does not frequently extend into the rectum, when it does so a classical 'cobblestone' appearance may be seen on sigmoidoscopic examination. In most, however, cobble-stoning may not be present but granulomata may be found in some patients on histological examination of the rectal biology. The finding of an entirely normal rectal mucous membrane, both through the sigmoidoscope and on rectal biopsy in a patient known to have a segment of active colitis proximal to the reach of the sigmoidoscope, is highly suggestive of Crohn's disease. In other patients the classical appearance of ulcerative colitis can be seen and the disease can be proved on examining the rectal biopsy. Finally, a group of patients exists with mild non-specific changes which could be caused by either inflammatory process. In these patients barium enema examination

TABLE III. COMPARISON OF SOME IMPORTANT CLINICAL FINDINGS IN ULCERATIVE, CROHN'S AND ISCHAEMIC COLITIS

	Classical ulcerative colitis	Primary colonic Crohn's disease	Ischaemic colitis
Age	**Often young**	**Often young**	**Middle-aged or elderly**
Onset	**Gradual or acute**	**Gradual**	**Acute emergency**
Bowel habit	**Bloody diarrhoea with mucus**	**Commonly diarrhoea without blood**	**Acute bloody diarrhoea with pain**
Abdominal findings	**No abnormality**	**No abnormality, rarely a mass palpable**	**Tenderness**
Perineal problems	**Fairly common**	**Very common**	**No relation**
Sigmoidoscopy	**Always inflamed when active**	**May be normal, mildly inflamed or have characteristic 'cobble-stoning'**	**Normal**
Rectal biopsy	**Always abnormal**	**May be normal, show mild non-specific inflammation or granulomata**	**Normal**

has proved to be the single most important test in the diagnostic separation of the two diseases.

X-ray Findings

In patients with ileocaecal disease typical appearances of regional ileitis[61] are seen extending into the caecum which is often grossly distorted. The wall of the affected bowel is rigid and the lumen narrow and skip lesions may be seen. When multiple lesions are present in the colon the appearances are very similar to those of the small bowel in segmental ileitis except for the minor changes which result from anatomical differences between large and small bowel. Strictures may occur in ulcerative colitis but they result very much more commonly from Crohn's disease.[62]

Fig. 5 illustrates the film of a young man who developed an external fistula on the skin of the left flank (Fig. 5(F)). A number of segments of colon were thick-walled and narrow and the appearance is very like the 'string sign' in the ileum. The stricture of the transverse colon has a 'cobblestone' appearance (Fig. 5(C)). Detailed examination of the lining of the colon may show longitudinal ulcers and deep transverse fissures and eccentric scarring may produce pseudo-diverticula.[63,64]

A coarse cobblestone pattern of the mucus membrane is seen in 25% of patients and although it may be very characteristic of Crohn's disease it is often difficult to distinguish it from the appearance of the pseudopolyps of ulcerative colitis. Fig. 6 illustrates a narrowed segment of descending colon with a cobblestone identation of the lumen. The curious appearance seen in Fig. 7 graphically illustrates what is meant by a cobblestone surface but this X-ray appearance of the caecum after barium enema is in no way characteristic of the usual films obtained.

A more important X-ray sign is the 'spiking' which results from fissure ulcers extending deep into the colonic wall. Fig. 8 illustrates the appearance of spiked ulceration in the rectum. Some of the ulcers are penetrating the wall to form fistulae. Once again, the greatest diagnostic difficulty is experienced in those patients in whom the colon is diffusely involved.

CONCLUSION

Crohn's disease of the colon has been diagnosed more frequently during the last few years than previously.

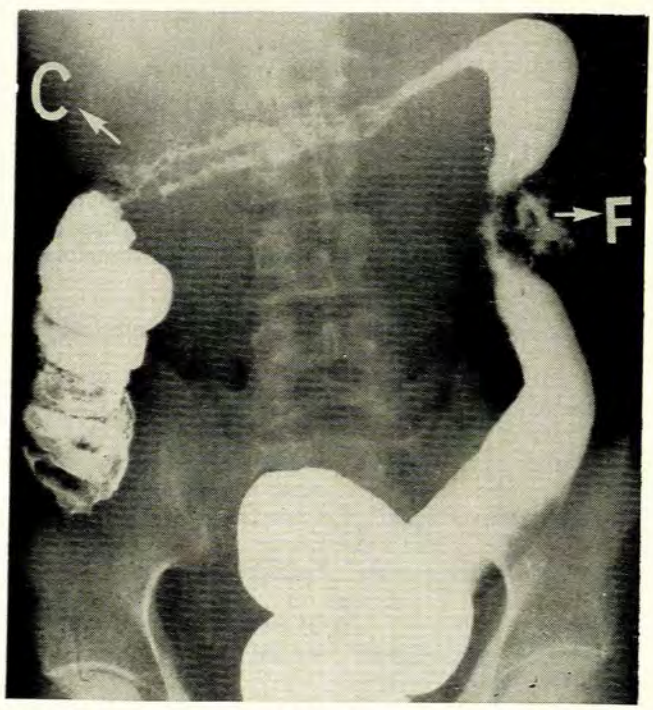

Fig. 5. X-ray film of a barium enema examination of a patient with multiple segments of Crohn's disease of the colon who developed colocutaneous fistula from the descending colon.

Fig. 6. Coarse 'cobblestone' appearance of strictured descending colon.

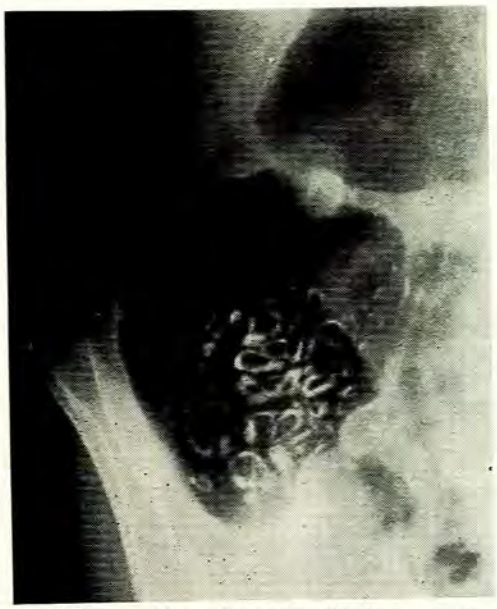

Fig. 7. X-ray film taken after barium enema showing atypical but graphic appearance of 'cobblestones' due to Crohn's disease affecting the caecum.

Fig. 8. X-ray film of barium examination of rectum in patient with Crohn's disease showing deep spiked ulcers.

Although the increase may have resulted from a better recognition of the disease, many clinicians consider that there has been a real increase in the number of cases. When the disease is confined to the large bowel the diagnosis is still difficult particularly when distinguishing Crohn's disease from ulcerative colitis. However, the separation of the two can frequently be made by careful study of the history, examination, sigmoidoscopic and rectal biopsy findings and by the expert use of a barium enema examination. Numerous other pathological entities, both infective and non-infective may cause difficulty when they result in segmental or localized lesions of the colon and great care must be taken to exclude malignant disease even in young patients. The separation of Crohn's disease from classical colitis is of great practical importance to the surgeon and it influences both the timing and type of surgical treatment required.

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