CARCINOMA

OF THE

COLON

A Clinical and Pathological Study of Six Cases,

Presented for the PATTISON PRIZE in CLINICAL SURGERY,

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INTRODUCTION
In choosing a subject for clinical study many considerations had to be taken into account. In the first place it was felt that the choice should be a fairly common condition, so that more cases might be seen than those actually reported. This serves two purposes. It permits cases being selected which illustrate different aspects of the disease rather than reporting on a rare condition of which only a very limited number of cases has been seen by the writer. Furthermore from a student's point of view it is more essential to study the common types of disease, which, if pursued fully, are just as interesting as rare conditions. On the hand it was equally essential that a subject should be found on which it was possible to make personal investigations, in addition to recording and discussing the surgeon's management of the case. In this respect it is obviously impossible for a student to take a very active part in the performance of the operations, but it is possible to make a full examination of any specimens removed. Taking into account these varying considerations it was felt that carcinoma of the colon would be a very suitable subject.

From a total of fifteen cases studied by the writer during the period April 1938 - April 1939 six cases have been selected. They have been chosen to illustrate as far as possible the varying manifestations of carcinoma of the colon. No cases of carcinoma of the rectum have been included as it was felt that
that both clinically and pathologically this disease constituted a separate problem. A method of classifying rectal carcinomata has however been applied to growths in the colon in accordance with a suggestion made by Sir John Fraser (1938). As few attempts have been made to classify colon cancers systematically, this part of the work proved most interesting. It is to this aspect that the majority of the references given at the end apply. The author has attempted to illustrate this part as fully as possible by photographing the essential features of all the specimens. In this way it is possible to contrast the tumours of the colon with the classified tumours of the rectum.

As the six cases are all concerned with the same disease, the records are first presented, and a commentary follows on all the cases together. In order however to facilitate reference a summary of the features and points of interest has been included at the end of each case.

My thanks are due to the late Sir David Wilkie, Sir John Fraser, and Mr. J. J. M. Shaw for permission to report on cases under their charge; and also to Dr. R. F. Ogilvie for permission to examine and photograph specimens obtained at post-mortem.
CASE I.

CARCINOMA OF THE ASCENDING COLON.

PATRICK McGUIRE.
PATRICK McGUIRE, aet. 66 yrs. Retired Labourer.
Old Toll House,
Monkton Hall Road,
Musselburgh.

Recommended by Dr. Aitchison, Bridge Street,
Musselburgh.

Admitted to R. I. E. 11. 5. 38.

COMPLAINT.
Flatulence and indigestion 14 mths.
Colicky abdominal pain 5 mths.

HISTORY.
The patient retired in April 1937, and from that time his first symptoms date. He noticed that he was not digesting his food as well as formerly, and was troubled with wind. These symptoms did not generally bear any particular relation to meal-times, though on some occasions just after food he felt "blown up," and experienced general abdominal discomfort. He could not localise the discomfort to any special area. He experienced this trouble for some time, and then obtained a little relief. The trouble returned again in July, and this time was more severe. At the same time he suffered a little from constipation. He then consulted his doctor, who advised him to take alkaline powders and cascara. This afforded him a little relief, but he still remained fairly constipated, except for short periods of diarrhoea.
which he associated with the taking of cascara and Epsom salts. He was still troubled with general abdominal discomfort at intervals of about two months. He did not notice any relation between his periods of discomfort and the diarrhoea. This state continued until January 1938. During this time he had no other complaints, and was able to work in the garden. During the latter part of the year the abdominal discomfort was becoming more severe and more frequent. He had not weighed himself since his retirement, and did not know whether he had lost any weight. His appetite remained good all the time.

At the beginning of January 1938 he began to have colicky pains across the lower part of the abdomen. The pain began in the midline, and spread across to the right iliac region. At the same time he was troubled with sleeplessness owing to the pain. He told again consulted his doctor who/him that "it was a pain that would come and go" and advised him to continue taking cascara, salts, and alkaline powders.

Later the sleeplessness became more severe, and during February he did not feel so fit for his work in the garden. The abdominal discomfort and pain became still more severe and frequent. He had trouble with his bowels and evacuation was unsatisfactory, as he felt that "there was still more to come away". He was also troubled with borborygmi.

At some periods during 1938 the stools were red with blood, as he suffered from piles. They were never black or darkly coloured. Sometimes he passed
passed a loose motion in the morning, but there was never any urgency in going to stool.

During April 1938 his symptoms became more severe, and he was unable to work regularly in his garden. So far he had never vomited. He thought he was now losing a little weight, but his appetite remained good.

On 10th May 1938 he retired to bed in the evening with severe pain across the lower part of the abdomen. He was unable to get any sleep that night. On the morning 11th May the pain was worse, and he had a severe attack of vomiting. The vomit consisted of bitter green matter. He had been unable to move his bowels for the last two days. His doctor was accordingly summoned and he was at once sent in to hospital by ambulance.

He had never had any trouble with his water, and had no other complaints.

He was in France during the war, but had never been to any tropical parts.

Previous Health.

He has always suffered from bronchitis during the winter months and is troubled by neuritis in the left arm. He is unable to recollect any serious illnesses.

Social History.

He has a comfortable four-roomed house. He does not now take any alcohol, though formerly he partook of it freely. He smokes a pipe - 5 ozs. per week.
Family History.

His father died during his childhood following an acute attack of bronchitis. His mother is also dead - cause of death unknown.

He has a wife alive and well, also three daughters all alive and well and married: one son 24 yrs. totally crippled since birth.

PHYSICAL EXAMINATION.

The patient is a well-developed adult male of average intelligence. His general attitude does not suggest that he is in pain, but his cheeks are somewhat sunken, and his complexion sallow. His appearance with dark lines beneath his eyes has a tired look. The colour of the mucous membranes indicates a slight degree of anaemia.

Alimentary System.

Tongue is moist, and covered with a thin white fur.

Teeth are all false, but the plates fit well, and he can chew his food without any difficulty.

Abdomen inspection showed that marked distension was present. This was most noticeable over the caecum, which formed a distinct elevation in the right iliac region. The distension was general, and not confined to the flanks. The umbilicus was not everted. The skin of the abdomen looked healthy, and there was no apparent reduction in the subcutaneous fat, but, owing to the distension, it was difficult to decide definitely whether there had been any loss of weight.
The appearance of the skin in other parts did not suggest that there had been any great loss. There was free movement with respiration.

On palpation no local tenderness or rigidity could be found in any part, nor was any tumour palpable. The ballooning of the caecum was not due to any palpable growth, as it could be easily collapsed on pressure.

The liver was just palpable below the costal margin, but there was no definite enlargement. The extent of the liver dullness was normal. The spleen was not palpable.

Examination of the hernial orifices revealed no abnormality even on coughing.

Percussion gave a tympanitic note over all the abdomen, especially over the caecum. There was no free fluid in the flanks.

There was no visible peristalsis, but rumblings could be heard with the stethoscope.

**Per Rectum** pressure anteriorly met a firm enlarged prostate. No nodules could be felt in the pelvic peritoneum. No tumour was palpable in the rectum, which was ballooned and contained a little faeces. The bowel walls were freely movable. Some discomfort was caused by examination. No blood was left on the examining finger. External piles were visible.

**X ray Examination.** 11. 5. 38.

Straight X ray of pelvis. No soft tissues were seen. Osteoarthritis of the lumbar spines.
Calcification in the arteries of pelvis. Gaseous
distension of small and large bowel. No fluid levels.

It was not possible to arrange for the administra-
tion of a barium enema before operation. The site
of obstruction could not be determined in the straight
X ray.

No sigmoidoscopic examination was carried out.

Respiratory System.

A full examination revealed no gross abnormality. There was a slight degree of emphysema. Expansion of the lungs at the bases was satisfactory. Percussion gave a markedly resonant note. The breath sounds were faint and vesicular in type, with a prolonged expirat-
ory murmer. There were no rales.

Cardio-vascular System.

Pulse was regular and of good volume. The rad-
ial artery was palpable and slightly hardened. Blood pressure 128/80.

Heart sounds faint and closed in all areas.

There was no enlargement of the heart.

Urinary System.

No abnormality was discovered in the urine. The patient said that occasionally he had to get up at night to micturate, but these symptoms have never been very troublesome. They are probably associated with the enlarged prostate felt per rectum.

PROVISIONAL DIAGNOSIS.

The history, the wasted and sallow appearance of the patient, and his age, all suggest a cancerous condition affecting the colon. There are indeed few
few other conditions which might have given rise to such clinical features. In particular they are:

1. Ileo-caecal tuberculosis. The patient is beyond the age when this is common, and there was no history of tuberculosis at an earlier period. The caecum was nor drawn up, nor could any long segment of gut be felt as a hyperplastic tuberculous mass.

2. Colitis with atonic distension. In such a condition there would probably have been marked improvement under medical treatment. The progressive nature of the lesion does not support this diagnosis.

3. Recurrent subacute volvulus. The absence of a palpable tumour in the left iliac region, and of acute exacerbations rule this out.

4. Uraemia. This was excluded by examination of the urine and blood pressure. Only occasionally does uraemia cause colonic symptoms.

5. Diverticulitis of the colon. This disease, when associated with a stricture, leads to symptoms identical to those produced by a scirrhous carcinoma of the descending colon. In such a condition a large segment of the colon is involved and this may be palpable as a firm indurated mass. It is not however possible definitely to differentiate these two conditions without administering a barium enema. Even then it may be difficult.

To decide the exact site of the carcinoma without a barium enema is also difficult. There can be little doubt that the neoplasm is of a scirrhous nature producing constriction of the bowel with
with consequent constipation and abdominal distension. The points in favour of a scirrhouss carcinoma of the pelvi-rectal junction are:

(1) The history of unsatisfactory evacuation of faeces. The sensation that there is still more to come away is usually associated with a lesion low down on the left side.

(2) Constricting growths are commoner in the distal colon. A growth in the proximal colon is more usually of the proliferative type, causing diarrhoea rather than constipation, and much wasting.

(3) A tumour on the right side is usually palpable, while those on the left side frequently cannot be felt.

None of these points however are definitely decisive. Tumours of the colon may be very deceptive in the symptoms and signs which they produce. The features of this case might be reproduced by a tumour in any part of the large bowel. Nevertheless the pelvi-rectal region is the commonest site of carcinoma of the colon, and accordingly it was considered that the growth was most probably in that part.

TREATMENT.

Preoperative. On admission an enema was given and returned with a good result. Subsequently the bowels were kept open with aloin pills and enemata.

On 14th May one hour before operation he was given an injection of morphine gr. $\frac{1}{3}$ and atropine gr. $\frac{1}{100}$. 
Operation, 14. 5. 38. at 11.30 a.m. Mr. W. Mercer.

Anaesthesia. Gas, Oxygen, and Ether.

The abdomen was opened by a left oblique incision, the muscles were incised in the line of incision, and the peritoneal cavity opened. The pelvic colon was brought to the surface, and carefully palpated. No tumour could be felt in the rectum, so the colon was traced proximally. A tumour was eventually found at the hepatic flexure. The original opening was therefore closed.

The abdomen was reopened by a right para-rectal muscle-splitting incision. The caecum was found, and pulled over to the left side of the abdomen. The parietal and visceral peritoneum was thus put on the stretch. The peritoneum was then further incised along the lateral side of the colon, allowing the caecum to be further retracted.

Dissection was then carried out around the hepatic flexure, especial care being taken to avoid damage to the second part of the duodenum. Thus the tumour-bearing area was separated from the abdominal wall posteriorly.

The terminal ileum was then found. An aperture was made in its mesentery about 6 ins. from the ileo-caecal junction. A crushing-clamp was applied to the bowel at this point: the bowel was then divided. The proximal end was closed with a double purse-string suture.

The transverse colon was then found, and a
a similar opening was made in its mesocolon near the hepatic flexure. A de Petz clamp was applied. The bowel was stitched and divided between the rows of clips. The bleeding vessels supplying the ascending colon and hepatic flexure were secured by several ligatures inserted with Cleveland's pedicle needle. The rest of the peritoneum was then cut. The lymph glands in the neighbourhood were removed; except for the paracolic glands in the immediate region of the tumour, there was no widespread lymphatic involvement. The terminal part of the ileum, caecum, ascending colon, and proximal part of the transverse colon were removed. The opening in-to the part of the transverse colon remaining was closed with a double catgut suture. A lateral iso-peristaltic anastomosis was then established between the ileum and transverse colon. The anastomosis was secured by double rows of catgut sutures anteriorly and posteriorly. While the anastomosis was performed the rest of the abdominal cavity was carefully packed off, and protected by towels.

One or two interrupted catgut sutures were then inserted to close up the bare area left by the extensive resection.

A rubber drain was inserted into the right side of the abdomen. The wound was then closed in layers, and the skin edges opposed with silk-worm gut.

Post-operative Treatment.

The two principal features of the treatment after operation were the administration of fluids and the securing of rest. Dehydration was prevented by
**THE ROYAL INFIRMARY OF EDINBURGH.**

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<th>Result</th>
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**Motions**

- Urine, ozs.
- Sp. Gr.
- Reaction
- Chlorides
- Albumen

**Day of Dis.**

- Operation
- Drain and clips out
- Stitches out
- U.P.
- Discharged
## THE ROYAL INFIRMARY OF EDINBURGH

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**Age**: 66 yrs  
**Disease**: Carcinoma of Colon  
**Result**: 

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**Name:** Patrick McGuire  
**Age:** 66 yrs  
**Disease:** Carcinoma of Colon  
**Result:**
by giving glucose saline intravenously. Sleep and rest were obtained by the administration of omnopon.

The details of the administration of hypnotics are on the chart. Fluids were administered as under:

14. 5. 38. 9.0p.m. 400 c.c. Glucose saline.
15. 5. 38. 9.45p.m. 400 c.c. Glucose saline.
15. 5. 38. 2.15a.m. 400 c.c. Glucose saline.
15. 5. 38. 7.0a.m. 400 c.c. Glucose saline.
16. 5. 38. 12.5a.m. 400 c.c. Glucose saline.
16. 5. 38. 10 a.m. Intravenous drip removed.

PROGRESS.

15. 5. 38. Slept well: general abdominal pain.
16. 5. 38. Has developed troublesome cough with thick white sputum.
17. 5. 38. Still troubled with cough. Much discomfort from "windy" pains.
22. 5. 38. Comfortable. Drain and clips out.
25. 5. 38. Feeling much better: more cheerful.
Very comfortable.
28. 5. 38. Stitches out. Allowed up for 20 minutes at fireside.
30. 5. 38. Has been up for a short time each day.
24. 6. 38. Reported from Convalescent Home. Very well. Has developed a median nerve paralysis on left side.
PLATE 1.  PATRICK McGUIRE

Annular Carcinoma of the Ascending Colon. Ulceration and necrosis; dilated caecum; enlarged gland on the left.  x 1
24. 8. 38. Reported. Very well. To have massage for nerve paralysis.


1. 2. 39. Reported. Gaining weight. General condition very good with no signs of recurrence. To continue massage for hand.

PATHOLOGICAL REPORT.

1. Macroscopic examination.

An annular stricture of the bowel about 1½ ins broad is situated immediately proximal to the hepatic flexure. The growth is more extensive on the medial aspect, but it has completely encircled the bowel leaving a narrow lumen. The centre of the tumour is superficially ulcerated, showing a yellow circular band in the midst of the white ring. The edges of the carcinoma are roughened, reddened, and congested.

Proximal to the stricture the bowel is hypertrophied and dilated. On the serous surface the growth is only visible as a narrowing of the intestinal tube, and there was no evidence of involvement of the peritoneum. A lymph gland at the side of the colon was hard and enlarged.

2. Microscopic examination.

The slide shows the site of origin of the growth with an area of neighbouring non-malignant colonic tissue. The carcinomatous cells are in some parts arranged in small acini, but in places these regular
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The slide shows the site of origin of the growth with an area of neighbouring non-malignant colonic tissue. The carcinomatous cells are in some parts arranged in small acini, but in places these regular
PLATE 2.

Extensive ulceration; muscle infiltration; origin of malignant cells from the proliferating acini. x 10

PATRICK MCGUIRE.
PLATE 5.

Cells arranged in irregular acini, breaking down into less regular arrangement in the centre: intra-acinar mucin. x 200

PLATE 6.

Spread of malignant cells by finger-like processes; well-marked reactionary fibrosis. x 60
PLATE 3.

Ulcerated surface; dilated blood vessels; extensive lymphocytic infiltration; well-formed acini. x 70

PLATE 4.

Malignant cells arranged in fairly well-formed acini, - Grade II -. Slight fibrosis. x 70
find any tumour cells within the blood vessels. The
tumour is evidently of a fairly malignant type, as shown by the extensive local spread, the rather poor attempt at acinar formation, the slight reactionary fibrosis, and the numerous mitotic figures. The lymph gland examined showed no evidence of malignant infiltration, and the enlargement was chiefly due to the absorption of infected material from the ulcerated surface. It is not, however, possible to exclude glandular involvement by the examination of one single gland.

The degree of malignancy and the amount of spread are of paramount importance in stating the prognosis. Accordingly in this case and the following ones it will be useful to follow a standard classification.

Cases may be grouped according to the depth of penetration of the bowel wall, and the presence or absence of secondary growths in the lymph glands (Dukes). "A" cases are those in which the tumour is limited to the wall of the colon. "B" cases are those in which the carcinoma has spread by direct continuity to the extra-colonic tissues, but has not yet invaded the lymph nodes. "C" cases are those in which metastases are present in the regional nodes.

A method of classification according to the histological appearances of the tumour may be employed (Broders). Four grades of malignancy are recognised:

Grade 1. The acini are well-formed and lined by well-differentiated columnar cells.
Grade 2. The acini are markedly irregular, and the lining is of a more primitive type.

Grade 3. The acini have mostly lost their lumina, and the appearance is that of solid columns of cells.

Grade 4. Colloid carcinomata i.e. a true mucoid carcinoma, not an adenocarcinoma showing secondary mucoid degeneration which is of a low grade of malignancy.

These two methods of grouping are not entirely satisfactory, but they afford an opportunity of assessing the general malignancy of the tumour. The two methods often do not exactly correspond; for example a well-differentiated adenocarcinoma may metastasise rapidly to the neighbouring lymph nodes. On the whole the correspondence is fairly close. In this case the tumour is classified as A 2.

PROGNOSIS

Here only the individual's expectation for freedom of recurrence will be discussed. The operative risks and general considerations in making out the prognosis will be discussed in the commentary.

In any case of carcinoma it is difficult to give an exact prognosis, as it is never possible to make absolutely certain that no secondary deposits have been left. In this case it would appear that all the cancerous tissue has been removed, as the lymph glands were but little enlarged, except for the paracolic group which were removed. Nevertheless lymph spread
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Grade 4. Colloid carcinomata i.e. a true mucoid carcinoma, not an adenocarcinoma showing secondary mucoid degeneration which is of a low grade of malignancy.

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spread is fairly rapid on the right hand side, and some infected glands higher up may have been left within the abdomen. There was no clinical evidence of blood spread.

Accordingly the prognosis is on the whole favourable. Even if there are secondary deposits, the patient should live for a few years, as the great bulk of the tumour has been removed. His general health has otherwise been good, except for the "winter bronchitis". Thus it is to be expected that he will enjoy a few years in fair health.

SUMMARY.

1. **History.**

   Flatulence, indigestion, general discomfort, and occasional periods of diarrhoea and constipation for 14 mths.

   Colicky pain, more severe diarrhoea, and slight loss of weight for 5 mths.

   Vomiting, severe abdominal pain, and constipation 2 days.

2. **Examination.**

   Distended abdomen. No palpable mass.

3. **Operation.**

   Carcinoma of ascending colon immediately below hepatic flexure. Forster's operation.

4. **Progress.**

   No sign of recurrence and very well 9 mths. after radical operation.
5. **Pathology.**

Annular stricture with mass on medial aspect.

Histologically A 2.

**POINTS TO NOTE.**

1. Long history of vague abdominal discomfort before onset of chronic obstruction.
2. Admission as a case of acute obstruction.
3. No palpable tumour. Symptoms alone lead to faulty diagnosis of site of obstruction.
4. Radical cure by one-stage operation.
5. Association of carcinoma and median nerve neuritis.
CASE II.

CARCINOMA OF THE
PELVI-RECTAL JUNCTION.

JAMES PORTEOUS.
JAMES PORTEOUS. aet. 68 yrs. Night Watchman. 
143, Dairy Rd.
Edinburgh.

Recommended by Dr. Norman Stewart, 30 Polwarth Terrace, Edinburgh.

Admitted to R.I.E.
Ward 31. 17. 7. 38.
Ward 13 18. 7. 38.

COMPLAINT.
Colicky abdominal pain and indigestion 2 yrs.
Vomiting 1 mth.
Abdominal distension 4 days.

HISTORY.
About two years ago he began to have a feeling of discomfort and fullness in the lower part of the abdomen. This was associated with spasms of colicky pain also referred to the hypogastric region. The pain bore no relation to the taking of food, and was not affected by taking food. In spite of treatment with cascara and salts the pain continued, and he began to have a great deal of flatulence. At the same time he lost his appetite and suffered from heart-burn and water-brash. These symptoms were never very severe and he was able to continue at his work. His bowels at the time were rather costive, but he was able to keep them moving by taking purgatives.

A month ago he began to vomit - the matter brought up was bile-stained and very bitter. It was never
never dark coloured. The vomiting became so severe that finally he brought up everything he took except fluids. During the past month these symptoms together with the colicky pain and indigestion have been getting progressively worse.

Four days ago he noticed that his abdomen was becoming distended, and each day this became more marked. The bowels last moved on 16/7/38. The vomiting has recently become more severe, and he has been bringing up brown coloured material.

His bowels have been very constipated recently with occasional intermittent attacks of diarrhoea which last about three to four days. He has not noticed any blood or mucus in the stools. Borborygmi have been troublesome during the past two years.

He has lost a great deal of weight, but does not know any exact figures.

He has had no urinary symptoms and no cough.

**Previous History**: Nothing to note.

**Family History**: His father died of pulmonary tuberculosis at the age of 48; his wife died of tuberculosis in 1912. Nothing else to note.

**PHYSICAL EXAMINATION**.

The patient on the whole looks well for his years. There is a slight sallowness of the skin, but he is not markedly anaemic. He lies on his side with his knees drawn up as in that position the discomfort due
due to the swollen abdomen is less noticeable.

Tongue furred and moist.

Teeth all artificial.

Abdomen was greatly distended especially in the region of the large intestine which could be clearly defined through the thin abdominal wall. The skin of the abdomen was wrinkled, and the subcutaneous fat was greatly reduced in amount. The abdominal wall moved freely with respiration.

Palpation did not yield much information. There was no local tenderness or rigidity and no abnormal mass could be felt. The caecum could be felt greatly distended. The liver and spleen were not enlarged, and the kidneys were not palpable. There was no abnormality of any of the hernial orifices.

Percussion revealed dullness in the flanks in which there was a little free fluid. There was no visible peristalsis, but many borborygmi could be heard with a stethoscope.

Per rectum nothing could be felt except dilated bowel.


Respiratory system. Vesicular breath sounds with no accompaniments. No abnormality was discovered.

Urinary system. No abnormality was discovered in the urine.

PROVISIONAL DIAGNOSIS.
The onset of acute intestinal obstruction
obstruction following a period of chronic obstruction for a few months in an old patient forms a syndrome characteristic of a scirrhoues carcinoma of the colon. In such cases chronic renal disease must always be excluded by examination of the heart and urine. Volvulus and diverticulitis would however cause similar symptoms.

Quite apart from the underlying cause, acute obstruction of the colon is obviously present. The vomiting, complete constipation, and the abdominal distension make this clear. This is ample justification for immediate operation to relieve the tension. At the same time the underlying condition may be more fully explored.

**TREATMENT.**

**Operation 18. 7. 38.** Mr. Jeffrey.

Scopolamine; morphine; spinal anaesthesia.

The abdomen was opened by a midline incision below the umbilicus. On opening the peritoneal cavity the large bowel was found to be grossly distended; the caecum in particular was about six times its normal size. On closer examination the wall of the gut could be felt to be greatly hypertrophied. The dilated colon was traced round until a small hard annular stricture was found immediately above the pelvic-rectal junction. No evidence could be found of spread of the malignant disease.

A de Pezzer catheter was then inserted through a stab wound made into the caecum; the opening was then
then closed tightly around the catheter, which was brought to the surface through a right grid-iron incision made specially for this purpose. The caecum at this point was stitched to the margins of the peritoneum.

Both incisions were then closed in layers with interrupted sutures.

**Progress.**

Immediately after operation the patient's condition was critical, but soon the general condition began to improve with the relief afforded by the caecostomy, which functioned very satisfactorily.

The respiratory system was somewhat affected and two days after operation it was possible to detect some crepitations and dulness at both lung bases. After a week however these cleared up satisfactorily. Three weeks after the preliminary caecostomy his condition had so improved, that it was possible to carry out the radical operation.

**Operation. 9. 8. 38.** Mr. Adamson. Scopolamine-morphine spinal anaesthesia.

The abdomen was reopened by a left oblique incision and the muscles were divided in the line of the incision. The gross distension of the bowel had subsided and it was found possible to remove the growth which was situated just above the pelvi-rectal junction. It was firmly bound down by adhesions, which were divided. A loop of pelvic colon including the growth was thus freed and brought to the surface
surface. The vessels in its mesocolon were ligated and the mesocolon was divided. The colon proximal and distal to the growth was then cut between crushing clamps, and the diseased segment removed.

The raw area thus left on the posterior abdominal wall was covered by reuniting the peritoneum. The colon proximal to the first clamp was opposed and sutured to that distal to the second clamp. The whole, with the clamps still attached, was brought to the surface, and the wound was closed in layers around it.

Immediately after operation an intravenous drip was put up and fluid administered as under:

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<tr>
<th>Time</th>
<th>Fluid</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>3.00 p.m.</td>
<td>normal saline</td>
<td>800 c.c.</td>
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<tr>
<td>5.30 p.m.</td>
<td>glucose saline</td>
<td>400 c.c.</td>
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<td>6.25 p.m.</td>
<td>normal saline</td>
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<td>9.30 p.m.</td>
<td>normal saline</td>
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<td>4.00 a.m.</td>
<td>normal saline</td>
<td>400 c.c.</td>
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<td>11.30 a.m.</td>
<td>normal saline</td>
<td>400 c.c.</td>
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<tr>
<td>3.00 p.m.</td>
<td>glucose saline</td>
<td>400 c.c.</td>
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Sleep and rest were insured by subcutaneous injection of morphine gr. 1/6 at 6.30 p.m. on the day of operation. Thereafter sleep was obtained without the aid of hypnotics.

**PROGRESS.**

10. 8. 38. Slept well; pain at the site of the wound. Intravenous drip taken down. Proximal crushing clamp removed.

11. 8. 38. Slept well; comfortable. Distal crushing clamp removed.

14. 8. 38. Progressing satisfactorily. More
<table>
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<th>James Porteous</th>
<th>Age</th>
<th>Disease</th>
<th>Result</th>
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<td>August 1938</td>
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<td>Carcinoma of Colon</td>
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**Temperature Fahrenheit Scale:**

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**Day of Dis.**

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<th>Rectal Emesis</th>
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More cheerful.

18. 8. 38. Stitches cut.
20. 8. 38. Lower loop of bowel has sloughed and the bowel retracted.
25. 8. 38. Enterotome applied between the adjacent spurs of bowel.

2. 9. 38. Bowels working well, but the wound is very slow in closing. The caecostomy opening has closed.

2. 9. 38. Transferred to Western General Hospital. i.s.q.

Patient stayed six days at the Western General Hospital. The caecostomy remained closed: the bowels were working normally, but there was a slight leak through the colostomy. At Mr. Illingworth's suggestion he was transferred for convalescence to the Northern General Hospital on 15. 9. 38.

After a few days at the Northern General Hospital the colostomy entirely reopened, and all the faeces subsequently were passed per colostomy. The colostomy functioned satisfactorily, but showed no signs of reclosing. After a prolonged stay his general health improved substantially, and he was able to regulate and attend to the colostomy unaided. He put on weight and his general and local condition was excellent. He was supplied with a colostomy belt and discharged on 8. 4. 39. There were no signs of a recurrence.
PLATE 7.
Posterior half of bisected specimen, showing an annular growth with extreme constriction of the Pelvis-rectal junction of the Colon. Some medial proliferation of growth, and appearance of polypoidal hyperplasia immediately proximal to it.
PATHOLOGICAL REPORT.

1. Macroscopic examination.

A small, hard, string stricture of the bowel is situated immediately above the pelvi-rectal junction. The line of growth is very fine, and the appearance is as though a ligature had been tied round the bowel. At the site of the tumour the mucous membrane is extensively ulcerated. The adjacent mesocolon is involved by the spread of the disease. Many dense adhesions surround the peritoneal coat of the bowel. Above the site of stricture the bowel is dilated and hypertrophied; the mucous lining is intact. A few small nodules resembling polypi can be seen above the growth. The neighbouring lymph glands were apparently not involved. (Pl.7)

2. Microscopic examination.

Section shows a well-differentiated carcinoma spreading through the muscular coat with well-marked subperitoneal deposits. The mucous membrane is extensively ulcerated, and the bowel wall is lined by collections of malignant cells with little supporting stroma. The ulceration is destroying several dilated blood vessels running near the mucous surface. There is considerable fibrosis in the deeper layers, but the amount varies (Pl.12A and B). The cells are arranged in poorly-formed acini; a few mitotic figures may be seen.

3. Conclusion.

The lesion is an adenocarcinoma of a fairly
PLATE 8.

Origin of the malignant cells; extensive invasion of muscular coats and large subperitoneal deposits

x 6
PLATE 9.
Acini invading muscle coats with well-marked reactionary fibrosis, Grade II. x 100

PLATE 10.
Spread of malignant cells in the submucous tissue, with unaffected normal acini on right. x 100
PLATE II.

Acini breaking down into large masses of undifferentiated cells, Grade III.

x 100
PLATE 12 A.
Well-differentiated acini and little fibrosis. x 100

PLATE 12 B.
Extensive fibrosis with compression of acini. x 100
fairly slow-growing type. The characteristics of the cells are on the whole well-maintained: in most parts some attempt has been made at acinar formation. The neighbouring lymph glands are apparently not involved, though it is impossible to decide this point accurately without extensive microscopic study. Spread has however taken place to the paracolic tissue. This growth could accordingly be classified as B 2.

The presence of numerous small polypi is interesting as this is recognised precancerous condition. This will be further discussed in the commentary.

PROGNOSIS.

In this case the prognosis is very difficult to assess. As regards the type of tumour the outlook is fairly good: the rate of growth is not too rapid and spread is localised.

The failure of the colostomy to close was disappointing. This may be due to many causes. Here the most probable explanation was the low situation of the growth in the colon: as a result considerable tension was exerted on the lower segment, which was accordingly unable to join up with the upper part. A common cause of failure of restoration of continuity in Paul-Mikulicz operations is a recurrence of the disease and here this possibility must be remembered. There is however no evidence to suggest that malignancy has again supervened; indeed the improvement in his general condition favours the view that the parts are healthy.
POINTS TO NOTE.

1. Long history of chronic obstruction culminating in acute obstruction - typical features of annular stricture of distal colon.
2. Relief of acute obstruction by caecostomy.
3. Interval of 3 weeks before radical operation.
4. Paul-Nikulicz operation with subsequent application of enterotome.
5. Failure to re-establish continuity of bowel.
6. Type of growth, a ring stricture with marked fibrosis.
CASE III.

CARCINOMA OF THE ASCENDING COLON.

MARY FRASER.
Miss MARY FRASER  aet. 55 yrs. Domestic servant
13, Gladstone Street, Hawick.

Recommended by Dr. D. A. Hadden, 19 Buccleugh Street, Hawick.

Admitted. 5. 8. 38.

COMPLAINT.

- Pain in right iliac fossa 8 mths.
- Vomiting 3 mths.

HISTORY.

About eight years ago patient strained herself; since then she has had intermittent attacks of pain in the right iliac fossa. It is dull and aching in character, and does not radiate in any direction. This pain was never associated with any other symptoms.

Since the beginning of 1938 the pain has been much worse, and is almost continuously present. It sometimes begins in the midline below the umbilicus, and radiates over to the caecum. The pain is not affected by taking food. At times she has noticed a fullness in the right iliac fossa, which disappears on pressure. This is most noticeable after meals.

Her appetite has always been good, but she cannot eat much at each meal. She is greatly troubled by vomiting, especially if she takes much solid food. This liability to vomit has been present for several years, but during the last three months the attacks
attacks have been more severe and more frequent. The
vomit is usually bile-stained fluid, and has never
been dark in colour or foul-smelling. She is also
troubled with water-brash and flatulence.

The bowels have always been regular, and she has
never suffered from constipation or diarrhoea. She
has not lost any weight, but recently she has been
feeling weaker. She has had no urinary symptoms, but
has been troubled with cough for several weeks.

**Previous History.**

She has always been anaemic, and has suffered
frequently from pleurisy.

**Family History.**

Father and mother both dead - cause of death
unknown. One sister alive and well.

**Social History.**

She has lived all her life in rather poor cir-
cumstances and has often been undernourished.

**PHYSICAL EXAMINATION.**

Patient is extremely deaf. Colour good. She is
rather emaciated and not in very good condition.

**Alimentary System.**

**Teeth.** All artificial: plates fit comfortably.

**Tongue** moist and clean. Tonsils slightly en-
larged.

**Abdomen** is thin and scaphoid and moves freely
with respiration. There is an obvious fullness in
the right iliac fossa, but otherwise there is little
apparent distension. The skin is healthy and the
the subcutaneous tissue is reduced in amount. On palpation there is tenderness in the right iliac fossa, but no rigidity. A hard tender mass, dull on percussion, about the size of a golf-ball, can be felt in this region. It was freely mobile. There were no other palpable masses. The liver and spleen were not enlarged, and there was no free fluid in the flanks. There was no visible peristalsis, and, as heard by stethoscope, the intestinal movements were not exaggerated.

Per rectum no definite abnormality could be felt. The lumen was ballooned and contained some faeces. Firm pressure on the right lateral wall caused pain.

Cardiovascular system

Pulse good volume, regular: artery wall not hardened. Apex beat just external to the midclavicular line: heart sounds closed in all areas. Blood pressure 130/84.

Respiratory system.

Movement of the chest wall was restricted at the left base, where there was also dullness on percussion and diminished breath sounds. There were no accompaniments. There was no abnormality in any other part of the chest, particularly at the apices.

X-ray examination. 7. 8. 38.

Bar enema. There is a filling defect in the middle of the ascending colon producing marked narrowing of the lumen. The appearances are those of an annular carcinoma.
PLATE 13.
Right. Left.
Filling defect in the ascending colon with marked narrowing of the lumen.
X-Ray.

MARY FRASER.
PROVISIONAL DIAGNOSIS.

This involves a consideration of the causes of a palpable mass in the right iliac fossa producing a narrowing of the lumen as shown in the X-ray. The two commonest conditions associated with such signs are carcinoma of the colon and ileo-caecal tuberculosis. Further possibilities are appendix abscess, actinomycosis, and tumours arising from the posterior abdominal wall; the history however does not suggest these conditions.

The long history of pain in the right iliac region rather suggests the diagnosis of ileo-caecal tuberculosis. Nevertheless the symptoms have undoubtedly increased in severity during the last few months. It is difficult to decide whether the long-standing history of pain in the iliac fossa has anything to do with the tumour. The fact that the caecum has not been drawn up, and that there are no signs of tuberculosis elsewhere rather suggests that the condition might be neoplastic.

From the clinical examination the case would appear to be most probably a carcinoma of the colon. It is not possible on clinical grounds alone to make a definite diagnosis. The X-ray examination does not help to distinguish the condition beyond doubt, though the restricted area of colon involved suggests an annular carcinoma.

As is recorded later, it was not possible to decide at operation the exact nature of the tumour,
tumour, and microscopic examination was necessary before a final diagnosis could be made. Nevertheless the presence of such a tumour in a woman of 55 yrs is sufficient reason for an exploratory laparotomy to establish definitely the nature of the growth.

TREATMENT.

Preoperative.

The usual treatment was carried out as detailed later.


The abdomen was opened by a right oblique muscle-splitting incision. On opening the peritoneal cavity a tumour of the ascending colon with small nodules on the peritoneal coat of both the caecum and terminal portion of the ileum was found. It was not possible to decide at the time of operation whether the condition was malignant or tuberculous. There was no evidence of spread to the liver or pelvic peritoneum. The mesenteric glands were not enlarged.

The peritoneum binding the caecum and ascending colon to the posterior abdominal wall was then cut on the lateral side, and the affected part of the gut mobilised and drawn forward. It was separated from the kidney and the second part of the duodenum by blunt dissection. By continuing the dissection it was found possible to mobilise the proximal part of the transverse colon, the ascending colon, caecum, and terminal foot of the ileum.
Two clamps were then applied about 1 foot from the termination of the ileum, and the bowel was divided between them. The end of the proximal part of the ileum was then ligatured, and invaginated through a purse-string suture.

The middle of the transverse colon was then denuded of its muscular coats, clamped, and divided. The free end of the distal part of the transverse colon was then ligated and the stump invaginated through a purse-string suture.

The terminal portion of the ileum, caecum, ascending colon, together with its tumour, and proximal part of the transverse colon were removed.

The two blind ends of the bowel were thus brought into apposition and a lateral anastomosis was performed between them close to their ends. The raw area left by the removal of the parts was then closed by approximating and stitching together the parietal peritoneum. The wound was then closed in layers, the skin being approximated by stitches of Scotia gut.

Post-operative Treatment.

An intravenous drip was installed after operation and 800 c.c. of glucose saline were administered.

PROGRESS.


14. 8. 38. Another restless night with a few hours of sleep after morphine. Complains of wind and general abdominal pain.
# The Royal Infirmary of Edinburgh

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- 97°F
- 98°F
- 99°F
- 100°F
- 101°F
- 102°F
- 103°F
- 104°F
- 105°F

**Temperature Centigrade Scale:**

- 36°C
- 37°C
- 38°C
- 39°C
- 40°C
- 41°C

**Pulse & Resp.**

- Pulse: m  
- Resp: m
PLATE 14.
Carcinoma of the Ileo-caecal junction producing narrowing of lumen; spread into Caecum. x 1
15. 9. 38. Had a good night's sleep and now feels much better and more cheerful. Slight pain at site of wound.


23. 8. 38. Stitches out: very comfortable.

28. 8. 38. Allowed up for a short time at fireside: feels very well.

1. 9. 38. Discharged to Convalescent Home after making an excellent and uninterrupted recovery. Wound soundly healed.

16. 9. 38. Reported from Convalescent Home. There is the suspicion of a firm mass in the right iliac fossa. To go home meantime.


29. 3. 39. Reported. General health good, but has not gained any weight since operation. No evidence of disease locally or elsewhere. To have iron tonic.

PATHOLOGICAL REPORT.

1. Macroscopic examination.

A tumour about the size of an orange was found encircling the bowel at the junction of caecum and ascending colon. The lumen had been narrowed to the
The mucous coat is thickened by the proliferation of the malignant cells. Small nodules of growth in the submucosa. A few deposits also in subperitoneal coats.

MARY FRASER.
PLATE 16.
Acini breaking down into unorganised groups of malignant cells.
  x 60

PLATE 17.
Large group of malignant cells without signs of acinar formation; Grade III.
  x 60
PLATE 18.
Ulcerated surface with a few poorly-formed acini; several blood-vessels near the surface. x 90
a fairly malignant type, as there is no attempt at differentiation. There is little general reaction on the part of the stroma. It is surprising that the lymph glands examined showed no signs of metastases as malignant cells were definitely present in the perivascular lymphatics.

Macroscopically the condition somewhat resembled hyperplastic ileo-caecal tuberculosis, but microscopic examination at once showed the condition to be cancerous. The carcinoma is type B 3.

PROGNOSIS:

The fact that the condition has been definitely proved to be carcinomatous makes the outlook more serious. At operation the local disease was apparently removed effectively, and there appeared to be no spread to the neighbouring lymph glands. Histologically the growth shows fairly malignant characteristics, but it has been removed at a fairly early stage. There was no evidence of blood-stream metastases, but it is never possible to exclude a deep-seated deposit in the liver. The more proximally situated a carcinoma is in the colon, the greater is the danger of metastases, both by the lymphatic and blood streams.

The mass that appeared in the right iliac fossa after discharge from the Convalescent Home was probably of inflammatory origin, and disappeared satisfactorily. Reporting on subsequent occasions there has never been any evidence of recurrence or metastases. Her general health has not improved as rapidly
rapidly as might have been expected. On the other hand she has never been a very strong woman, and there is no evidence that this is due to the continued presence of malignant disease. She has now been in good health for seven months after the operation.

On the whole the prognosis is favourable, as the condition has been recognised at a fairly early stage. The diseased parts have apparently been adequately removed, and there are no signs of a recurrence.

SUMMARY.

1. **History.**

   Pain in right iliac fossa for 8 mths; indigestion and vomiting; no loss of weight, but increasing weakness.

2. **Examination.**

   Little distension: tender mass in right iliac fossa. X-ray shows annular stricture in ascending colon.

3. **Operation.**

   Tumour near ileo-caecal junction: nature not definitely determinable. Forster's operation.

4. **Progress.**

   Rapid recovery. No evidence of recurrence 7 mths. after operation, but not gaining weight.

5. **Pathology.**

   Large mass spreading into ceacum, and also spreading round bowel producing narrowing of lumen. Histologically B 3.
POINTS TO NOTE.

1. Absence of signs of obstruction.
2. Vagueness of history.
3. Presence of palpable mass.
4. Difficulty in exact diagnosis.
5. Radical cure by one-stage operation.
CASE IV.

CARCINOMA OF THE ASCENDING COLON.

MARY FINDLAY.
Mrs. MARY FINDLAY, aet. 73 yrs. Housewife.

47A William Street, Edinburgh.

Recommended by Dr. Thorp, 13, Manor Place, Edinburgh.

Admitted 14.12.38.

COMPLAINT.

Lump in right side.

HISTORY.

For the last five years patient has suffered from a griping pain "like cramp" in the right iliac fossa; occurring for a few seconds every month. This pain was not associated with any symptoms in any other part. During the last 8 - 9 months this pain has been coming on more frequently and has been becoming more severe in nature, occasionally doubling her up. She was able to relieve it by pressure over the painful area. At the same time she was conscious of her bowels moving within her, and was disturbed by loud borborygmi.

About 6 months prior to admission she became aware of a lump in her right side which she noticed by accident. It was not painful or tender to touch. The lump has slowly increased in size. The bowels, previously always regular, became increasingly constipated. She was obliged to take medicines regularly in order to keep them open. She never noticed any abnormality in the stools; there were occasional attacks of diarrhoea which she associated with the
the taking of medicine.

Her appetite has always been good and has not deteriorated recently. Her digestion has been excellent and she can take any type of food without any difficulty. There has never been any nausea or vomiting. She has suffered no loss of energy, and never feels tired after performing her daily duties. She has not weighed herself, but does not think she has grown thinner.

**Previous History.**

She has never had any serious illness, and has always kept very well.

**Family History.**

Father and mother died during her childhood; cause of death not known. Five children all alive and well.

**PHYSICAL EXAMINATION.**

Sallow-complexioned old woman with a dry inelastic skin. Mucous membranes pale.

**Alimentary System.**

- **Tongue** clean and moist. **Fauces** healthy.
- **Teeth.** all artificial.
- **Abdomen** moves freely with respiration. Slight general distension, especially in hypogastrium. Abdominal wall thin, the skin being loose and wrinkled. A hard fixed mass about the size of a cricket-ball can be felt in the right iliac region. It is not tender, and is associated with no muscular guarding; dull on percussion. No demonstrable free fluid in the flanks.
PLATE 19.
Diverticulosis of the Descending Colon. X-RAY.

MARY FINDLAY.
PLATE 20.
Complete hold-up of the Barium
in the ascending colon. X-RAY

MARY FINDLAY.
No diminution of liver dullness. Liver and spleen not palpable.

_per rectum._ The ampulla was dilated and contained a little faeces. No peritoneal nodules or other abnormalities could be felt.

**Cardiovascular System.**

Heart sounds closed in all areas. Apex beat within mid-clavicular line. Pulse regular; artery wall slightly sclerotic. Blood pressure 150/90.

**Respiratory System.**

No cough; fair chest expansion; vesicular breath sounds without accompaniments; no dullness at the bases.

**Urinary System.**

Trace of albumen in the urine. No other abnormal constituents.

**X ray Examination.**

Bar enema. Marked diverticulosis of sigmoid and descending colon. The barium is held up proximal to the hepatic flexure. The appearances are those of a carcinoma of the ascending colon. (Pl. 19, 20)

**PROVISIONAL DIAGNOSIS.**

The presence of a palpable tumour, related to the colon, of fairly recent origin and slowly increasing in size, associated with an alteration in the regularity of the bowel forms a syndrome characteristic of carcinoma of the colon. The age of the patient is beyond that usually associated with ileo-caecal tuberculosis, and the tumour appears to be above the caecal region. Thus the condition is almost certainly a
a carcinoma of the colon, and an exploratory operation is fully justified.

TREATMENT.

Preoperative Treatment.

The usual treatment was carried out. Particular attention was paid to the bowels which were rather constipated.


Abdomen was opened by a right oblique muscle-cutting incision. On opening the peritoneal cavity a small quantity of blood-stained fluid was drained. The neoplasm was found to be a ring stricture encircling the ascending colon about one inch above the cæcum. A few of the local glands lying along the medial side of the colon were found enlarged and hardened; otherwise there was no evidence of spread of the disease. None of the neighbouring viscera were involved by local spread. There were no palpable nodules in the pelvis or liver.

The peritoneum was incised lateral to the colon, and the colon was turned medially. A few retrocolic enlarged glands were found, but the duodenum was not adherent. The colic vessels were found and ligated. The transverse colon was freed to about three inches beyond the hepatic flexure. Here the peritoneal and muscular coats were divided, and the bowel was crushed and ligated, and finally divided by cutting diathermy.
The stump of the distal end was invaginated through a double purse-string suture.

The ileum was then isolated six inches from its termination, crushed, ligated, cut by diathermy, and the proximal end invaginated through a purse-string suture. The intervening ileum, caecum, ascending colon together with its tumour, and transverse colon were then removed along with the fat and enlarged glands in the related mesentery.

An iso-peristaltic side to side ileo-transverse colostomy was carried out between occlusion clamps. A single catgut stitch between ileum and colon was inserted both proximal and distal to the site of anastomosis. A calcified ovary was also removed.

The wound was then closed in layers with drainage tube inserted into its depths.

Post-operative treatment.

The patient withstood the operation extremely well; the pulse was strong and the general condition good. No intravenous drip was considered necessary. Blood pressure 135/80.

PROGRESS.

20.12.38. Restless night, but slept for an hour or two after the morphine. Slight general abdominal pain.


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PLATE 21.

Massive growth involving the Ileo-caecal angle, and spreading round the Ascending Colon, producing narrowing of the lumen. x 1
23.12.38. First dressing: tube removed as there was little discharge from wound.


31.12.38. Stitches out: wound healing very satisfactorily.

1.1.39. Allowed up for a few minutes while bed was made. Slight reactionary rise of temperature.

5.1.39. Allowed up at fireside.

10.1.39. Discharged home. Patient has made a rapid and highly satisfactory recovery, and is now feeling very well.

PATHOLOGICAL REPORT.

1. Macroscopic Examination.

A large growth was found involving the colon immediately above the ileo-caecal junction. The mass of the tumour is situated on the medial side of the bowel, but the growth has spread round the bowel as a band about two inches broad, producing marked narrowing of the lumen. The mucus membrane at the site of the growth is extensively ulcerated. The serous surface has not been involved. The related glands are enlarged.

2. Microscopic Examination.

The tumour is composed of groups and clusters of spheroidal cells completely irregularly arranged. These cells may actually be traced from the proliferating glands. In the actual section (Pl. 23) the
PLATE 22.
Early stages of proliferation in the mucous membrane: large sub-peritoneal collection of malignant cells. x 7.
PLATE 23.
The early stage of Carcinoma of the Colon; the acini show early malignant proliferation. The muscularis mucosae has not yet been penetrated. x 100

PLATE 24.
Commencing ulceration of the mucous membrane and early malignant change in the acini. A group of malignant cells are seen beneath the ulcerated surface, and a dilated blood vessel. x 60
PLATE 25.
A large collection of malignant cells with little attempt at acinar formation, Grade III. x 100
the muscle coats have not been destroyed, and local spread is limited to the submucosa which in parts is extensively involved. A large deposit of malignant cells may be observed lying external to the muscular coats (Pl. 22). These cells have spread either by contiguity from a point where the muscular coat has been perforated or by the lymphatics. Many mitotic figures can be seen. There is little fibrous tissue proliferation. The lymph glands were not involved.

3. **Conclusion.**

As there are no signs of acinar formation, and the cells are rapidly dividing the appearance suggests that the tumour is of fairly malignant type. On the other hand the serous surface has not been affected and the tumour appears to have been removed at an early date. The amount of spread is much less than would have been expected from this type of tumour. Possibly this is influenced by the age of the patient, as slower rates of growth are often found in older people. This tumour is classified as A 3.

**PROGNOSIS.**

In view of the fact that the patient stood the operation extremely well, and that spread of the disease was not in evidence the prognosis is good. The tumour itself was of a highly anaplastic type (Grade III), and there is accordingly the danger of fairly rapid spread. Nevertheless as often happens in such cases the growth has been extremely local, and thus there is every possibility that the whole of the
the tumour has been removed.

SUMMARY.

1. **History.**
   
Pain for many years in right iliac fossa. Aware of lump in right side for 6 mths prior to admission. Increasing constipation with occasional diarrhoea. No loss of weight.

2. **Examination.**
   
Fixed palpable mass in right iliac fossa. Xray shows hold-up in ascending colon.

3. **Operation.**
   
Neoplastic ring stricture immediately above ileo-caecal junction. Forster's operation.

4. **Progress.**
   
Rapid recovery.

5. **Pathology.**
   
A bulky growth spreading round the bowel wall and thus producing a stricture.

POINTS TO NOTE.

1. Except for the palpable mass the symptoms rather suggest that the lesion might be in the distal colon, e.g. no loss of weight and increasing constipation.

2. Surprisingly rapid recovery in spite of the patient's age.

3. Presence of a ring stricture type of growth in the ascending colon.
CASE V.

CARCINOMA OF THE HEPATIC FLEXURE.

MARION BEATTIE.
Miss MARION BEATTIE aged 45 yrs. Domestic servant.
19, Donaldson Road,
 Methil by Leven.

Recommended by Mr. Todd, Shotley House, Leven.

Admitted. 23. 11. 38.

COMPLAINT.

Pain and vomiting 4 days.

HISTORY.

On 19, 11. 38 the patient was suddenly seized with severe epigastric pain an hour or so after lunch. The pain was quickly followed by vomiting, which was both copious and repeated. This first attack soon passed, but half an hour later she experienced further pain, this time more generalised. After this, attacks of spasmodic colicky pain were frequent, and they were always associated with severe vomiting. The vomited material at first was green, but later became dark and foul-smelling.

Both for two days before, and also after the onset of the pain, the bowels had refused to move in spite of medicines and enemata. The abdomen was noticed to be enlarging considerably.

For about two years she has suffered from a dull gnawing pain in the epigastric region, often most severe immediately after food. She was frequently troubled by borborygmi. The bowels at the same time were becoming more and more constipated. She had not
not noticed any blood or mucus in the motions, nor had there been any intermittent periods of diarrhoea. For a month or so prior to admission defaecation every 4 - 5 days was the rule. She did not think she had lost any weight. Appetite good. No cough. No frequency of micturition. No pain in other parts.

**Previous History.**

For many years she has suffered from periodic attacks of indigestion, but there is no history suggesting any definite lesion in the alimentary tract. Nothing else to note.

**PHYSICAL EXAMINATION.**

The patient appears pale and thin with well-marked hollows beneath the eyes. The mucous membranes are definitely pale. She is obviously weak and slightly shocked, paying little attention to her surroundings and unable to cooperate fully.

**Alimentary System.**

**Teeth** are in fairly good condition and there are sufficient present to permit satisfactory mastication.

**Tongue** is clean and moist.

**Abdomen** presents a dry inelastic skin and shows signs of loss of weight. There is a slight general movement on respiration, but no visible peristalsis. The abdomen is protuberant and tympanitic especially in the central areas. There is a generalised tenderness which is most marked in the caecal region, where a diffuse freely-movable mass is palpable. There
There was no rigidity or muscular guarding in any part. The liver and spleen were not enlarged. No free fluid could be demonstrated in the flanks. No abnormality was found at the hernial orifices. Per rectum there was slight tenderness on all sides. There was no definite ballooning of the rectum, nor was there any palpable mass. There was no blood or mucus left on the examining finger, and no faeces were present.

Cardiovascular System.

The pulse was regular but of poor volume. Artery wall not palpable. Blood pressure 110/85.

The heart sounds were faint, but closed in all areas. Apex beat was in 5th space in midclavicular line.

Respiratory System.

No cough. Chest expansion was good. No dullness. Vesicular breath sounds without any accompaniments.

Urinary System.

No abnormality was found in examination of the urine.

PROVISIONAL DIAGNOSIS.

This is obviously a case of acute intestinal obstruction. The typical features of the case - the abdominal pain without rigidity, the vomiting, and the failure to evacuate the bowel - render this diagnosis beyond doubt.
There was no rigidity or muscular guarding in any part. The liver and spleen were not enlarged. No free fluid could be demonstrated in the flanks. No abnormality was found at the hernial orifices. Per rectum there was slight tenderness on all sides. There was no definite ballooning of the rectum, nor was there any palpable mass. There was no blood or mucus left on the examining finger, and no faeces were present.

**Cardiovascular System.**

The pulse was regular but of poor volume. Artery wall not palpable. Blood pressure 110/85. The heart sounds were faint, but closed in all areas. Apex beat was in 5th space in midclavicular line.

**Respiratory System.**

No cough. Chest expansion was good. No dullness. Vesicular breath sounds without any accompaniments.

**Urinary System.**

No abnormality was found in examination of the urine.

**PROVISIONAL DIAGNOSIS.**

This is obviously a case of acute intestinal obstruction. The typical features of the case - the abdominal pain without rigidity, the vomiting, and the failure to evacuate the bowel - render this diagnosis beyond doubt.
Nor is it difficult to decide the cause of the obstruction. Strangulated external hernia may be excluded by the careful examination of the usual sites for a hernia. In an adult the only other common causes of acute obstruction are:

- Bands or adhesions.
- Volvulus.
- Gall stone ileus.
- Tuberculous stricture.
- Carcinomatous stricture.

There is no history of previous intra-abdominal trouble which might have led to the presence either of adhesions or of gall stones. In volvulus the initial shock would have been greater, the onset much more acute, and the palpable mass more probably in the left iliac fossa. A tuberculous stricture is always difficult to differentiate, but there is no demonstrable tuberculous lesion to which such a stricture might be secondary.

The history of loss of weight with gradually increasing constipation in a middle aged person is very suggestive of carcinoma of the colon. The onset of acute obstruction following on the chronic obstruction is also very typical.

**TREATMENT.**

Prior to operation a pint of normal saline with 5% glucose was administered intravenously.
Operation 23. 11. 38. Mr. Jeffrey. Morphine scopolamine spinal anaesthesia.

The abdomen was opened by a right gridiron incision. A grossly-distended caecum was found, and on tracing up the ascending colon a carcinomatous ring stricture of the hepatic flexure was found. Much clear free fluid was present, but the shining lustre of the peritoneum was still preserved. The right gridiron incision was then closed.

The abdomen was reopened through a right paramedian incision in order to anastomose the last loop of ileum to the transverse colon using the enterostomy frame and clamps on the ileum. The anastomosis was carried out in the usual manner, with linen thread and the colon and ileum were retained in apposition by two catgut sutures proximal and distal to the anastomosis.

The hepatic flexure did not appear grossly adherent to any neighbouring structure. It was further verified that there was no evidence of spread of malignant disease to any other part, particularly the liver and peritoneum.

Considerable difficulty was experienced in uniting the peritoneum; a portion at the middle of the wound was merely approximated by deep through-and-through silk-worm gut sutures, as the action of the spinal anaesthetic was coming to an end. It was not considered safe to administer a further inhalation anaesthetic.
Post-operative Treatment.

The intravenous drip was reestablished and fluid was administered:

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Progress.

24.11.38. Vomiting of brown material has continued, though less in severity. General condition slightly improved: has had a little sleep. No pain.

25.11.38. Vomiting has subsided, but some pain is experienced at the site of the wounds. General condition slightly worse. Temperature swinging.


27.11.38. Abdominal pain worse: some distension now present relieved to a certain extent, by a flatus enema.

28.11.38. General condition now much worse. Muddy toxic hue about the face.
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Day of Dis.: 21st - 33rd
Patient very weak. Given E. coli vaccine intramuscularly.

29. 11. 38. Patient died.

POST-MORTEM EXAMINATION.

1. General.

Deep surface of the iliac wound was healthy. Deep surface of the paramedian wound was infected. The peritoneum and transversalis fascia had separated a little exposing the muscle.

2. Serous Sacs.

Peritoneal sac contained 10 ozs. sero-fibrinous fluid, chiefly in the pelvis: there was no subphrenic infection. Pleural sacs each contained 5 ozs. clear serous fluid.

3. Respiratory System.

Larynx and trachea were congested. Lungs were less collapsed at the bases and heavier than normal. There was oedema of lungs and bronchiolitis.

4. Alimentary System.

Annular stricture was found at the hepatic flexure causing acute obstruction. When opened the stricture was seen to be a typical raised carcinomatous ulcer. The caecum and ascending colon were greatly distended, but there was no ulceration of the mucous membrane. The carcinoma could be readily dissected off the duodenum. The stoma was infected, and the appearances suggested an infection starting in the region of the stoma, and spreading both to the wound
PLATE 26.
Lung; showing massive pulmonary oedema and desquamation of the bronchioles. x 60

PLATE 27.
Liver; secondary deposits of cells in well-formed acini, Grade I; fibrosis and compression of liver cells; intra-acinar collection of mucin. x 60
PLATE 28.
Liver; secondary deposits with acini less well formed, Grade II. x 80

PLATE 29.
Liver; acini poorly-formed and approaching Grade III. Marked fatty degeneration of liver cells with "signet-ring" appearance. x 60
mucoid degeneration. This growth is classified as C 2.

2. Lung. Section shows gross oedema and desquamation of the lining cells of the bronchioles. The alveoli are oedematous and collapsed. There are few signs of any infection, and thus the condition may be said to be chiefly one of oedema.

**CAUSE OF DEATH.**

The immediate cause of death was peritonitis secondary to infection of the stoma, between the ileum and colon. The toxaemia due to the peritonitis lead to general circulatory failure as shown by the collection of fluid in the lungs and pleura.

Although the carcinoma had only produced definite symptoms recently, there can be little doubt that it was a longstanding process causing general ill-health. The onset of acute obstruction rendered the patient's condition very poor. Thus she was unable to withstand the operation to relieve the obstruction. Both her general condition and the local condition of the bowel were so lowered that it was impossible to resist infection of the wounds by organisms normally saprophytic in the bowel.

The actual cause of acute obstruction was blockage of the narrowed lumen at the site of the stricture by impaction of faeces.

The other features of this exceptionally interesting case will be discussed in the commentary.
SUMMARY.

1. History.
   Increasing constipation associated with vague abdominal symptoms for 2 yrs.
   Onset of symptoms of acute intestinal obstruction 4 days prior to admission.

2. Examination.

3. Operation.
   Preoperative administration of saline. Carcinoma of hepatic flexure. Ileo-transverse colostomy.

4. Progress.
   Gradual weakening until death 6 days after operation.

5. Pathology.
   Annular stricture at hepatic flexure with little local spread. Blood stream metastasis in liver.
   Histologically C 2.
   Cause of death was peritonitis spreading from stoma.

POINTS TO NOTE.

1. Sudden onset of acute obstruction.
2. Operability of tumour.
3. Presence of hidden metastasis in liver.
5. Cause of death.
CASE VI.

Carcinoma of the Descending Colon.

Samuel Campbell.
SAMUEL CAMBELL, aet 56 yrs. Moulder.
12, Brodie Street,
Carron Road,
Falkirk.

Recommended by Dr. Grant, 82 Graham Road, Falkirk.
Admitted 28. 1. 39.

COMPLAINT.
Diarrhoea 6 mths.

HISTORY.
An attack of diarrhoea began suddenly in June 1938, which patient described as dysentery. This continued persistently for a month, and then abated slightly, leaving him weak and exhausted. He had never previously had any trouble with his bowels, which up to this time moved regularly once a day without any difficulty.

During August his general condition improved slightly while on holiday, but since then he has suffered from alternating attacks of diarrhoea and constipation. During the period of diarrhoea he frequently had to rise three or four times at night to move the bowels; this state usually lasted for about five days. At no time had he noticed any blood in the stools, nor any change in their colour. A period of constipation of about a fortnight's duration then often followed.

The periods of diarrhoea have recently been becoming more severe. They have been associated with colicky pain felt in the epigastric region. At the
the same time he has suffered from attacks of "wind" relieved by the diarrhoea. His digestion has not been good, and recently he has lost his appetite. He has lost a considerable amount of weight during the last few months and now has no energy to go about his ordinary tasks. Borborygmi have been troublesome. He has suffered from nausea and epigastric discomfort after meals. There has been no actual vomiting.

He has been aware of a lump in the left side of the abdomen for the last three months. It has never caused him any pain, but has been slowly increasing in size. At first he had not associated it in any way with his symptoms.

He has no pain in any other parts. No urinary symptoms: no pain on defaecation.

Previous History.
Patient has always kept extremely well and has had no serious illness.

Family History.
Father and mother both dead. Father died of "old age". Mother died during his childhood: cause of death not known.

PHYSICAL EXAMINATION.
Thin tired appearance with markedly sunken cheeks, and slight twist of face due to congenital torticollis.

Alimentary System.
Tongue clean and moist. Fauces and tonsils healthy.
Teeth poor condition. The molars are extensively carious.

Abdomen moves freely with respiration. There is a marked fullness to the left of the umbilicus, but no general abdominal distension. Peristalsis may be observed in the colon above the tumour moving from right to left. There is a hard mass about the size of an orange lying to the left of the umbilicus. It is freely movable within the abdomen, not tender, dull on percussion, and unassociated with any muscular guarding. Liver and spleen were not clinically enlarged. No free fluid in the flanks.

Per rectum no abnormality was discovered.

Cardiovascular System.
Heart sounds closed in all areas. Pulse regular: artery wall not hardened. Blood pressure 135/85.

Respiratory System.
Vesicular breath sounds. Normal resonance.
No cough.

Urinary System.
No abnormality in the urine.

PROVISIONAL DIAGNOSIS.
In this case it is necessary to consider the conditions which might give rise to a swelling in the left side of the abdomen associated with intestinal symptoms. It must be remembered that any tumour, not primarily connected with the intestine, might secondarily involve it and thus give rise to symptoms.
The two conditions in the descending colon which might cause such a swelling are carcinoma and diverticulitis. Considering the shortness of the history, the age of the patient, and the persistence of the symptoms, especially the loss of general condition, the former appears much more probable.

Many of the neighbouring viscera might give rise to a tumour involving the intestine e.g. kidney or pancreas. There are however no symptoms indicating that any organ other than the colon is primarily involved.

The mobility of the tumour on the whole rules out the possibility of a tumour arising from the abdominal walls. There is the possibility of a sarcoma arising from any connective tissue in relation to the colon, but on the clinical evidence available it is not possible to differentiate this condition.

In view of the patient's gradual loss of condition there is no doubt that an exploratory laparotomy is advisable, together with a radical resection of the tumour if such is possible.

TREATMENT.

Preoperative Treatment.

29. 1. 39. An intravenous drip was established and fluid administered:

- 8.30 p.m. Glucose saline 500 c.c.
- 9.0 p.m. Glucose 5% 400 c.c.
- 9.40 p.m. Glucose saline 400 c.c.
- 6.45 a.m. Glucose saline 400 c.c.

The abdomen was opened by a left oblique muscle-cutting incision. On opening the peritoneal cavity a large tumour was found involving the pelvic colon and the jejunum about 12 ins. from the duodeno-jejunal flexure. The large and small intestine and the omentum were thus inextricably bound together. Except for the involvement of the small intestine the tumour was not adherent to any other structure. The neighbouring lymph nodes in the mesocolon and mesentery were greatly enlarged. There were no palpable nodules in the liver or pelvis. It was accordingly resolved to remove the tumour after freeing it from its connection with the jejunum.

The omentum lying on the medial side of the tumour was divided, and the growth mobilised by dividing along clamps and ligating the mesentery lying in relation to it.

The jejunum entering and leaving the tumour was clamped, ligated and divided, and the stumps of the viable ends were invaginated through purse-string sutures.

The peritoneum on the lateral side of the colon was then divided and after division of some fine adhesions the mass was turned medially. The descending colon was isolated and divided between clamps. The distal end of the pelvic colon was similarly divided between clamps.
By further dissection along the mesentery the tumour was entirely freed and removed along with the enlarged glands in the related mesocolon and mesentery.

The blood-supply to the cut ends of the small intestine was found to be satisfactory and a lateral isoperistaltic anastomosis was carried out between clamps.

The proximal and distal ends of the colon were brought into apposition and the stumps of the colon, with the crushing clamps still attached, were brought to the surface. The wound was closed in layers around them, and the skin margins approximated with silk wound sutures. The wound was then painted with b.i.p.p.

Post-operative Treatment.

The intravenous drip was reestablished and fluid administered:

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PROGRESS.


2.2.39. Colostomy has moved satisfactorily. Very well.


8.2.39. General condition unchanged.

9.2.39. Still much the same. Pulse weaker. Clamp on the distal loop of colon has sloughed off.

10.2.39. General condition more satisfactory. Colostomy has been moving satisfactorily. Some local inflammatory reaction around fomented.


13.2.39. Inflammation around colostomy has subsided. Slight general improvement.


16.2.39. Still very weak, but feels much better.

20.2.39. Much more comfortable. Temperature has settled; administration of M. and B. 693 tablets to be stopped.

22.2.39. Up for a short time while bed was made.

24.2.39. Up at fireside for 20 minutes.


20.3.39. Is now fit to stand operation to attempt closure of colostomy.

Operation. 23.3.39. Mr. Shaw. Ethyl chloride and Ether anaesthesia.

The colostomy opening was first examined by inserting the finger. The posterior wall of the upper loop of bowel felt rather indurated, and gave the suspicion of neoplastic infiltration. It was decided not to interfere further with the condition of this part of the bowel.

The colostomy openings were then freed from the surrounding skin and subcutaneous tissues, which were reflected. The blood supply was very free, and it was necessary to control numerous bleeding points. A rubber tube 3 ins. long was then inserted, one end in each colostomy opening. The openings were joined over the tube with two layers of sutures, thus invaginating the margins of the junction. The skin and subcutaneous
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subcutaneous tissues were then drawn over the site of the colostomy, and the margins approximated with silk-worm gut sutures.

**PROGRESS.**


28.3.39. Slight discharge from wound at site of former colostomy. Has not yet passed the rubber tube.


3.4.39. Closure of colostomy broken down. Rubber tube passed per colostomy. Faeces all passing per colostomy.

4.4.39. Fitted with colostomy belt.

5.4.39. Discharged home.

**PATHOLOGICAL REPORT.**

1. **Macrosopic Examination.**

Examination of the external aspect showed that the jejunum and descending colon were closely bound together within a large tumour growing from the medial part of the colon (Pl.30 and 31). Several enlarged glands were lying in the mesentery and mesocolon. Both the colon and small intestine proximal to the growth were slightly dilated and hypertrophied. (The photographs give a false impression, as the specimen has
has been inflated). About 1 1/2 feet of jejunum and 10 ins. of colon had been removed. Externally the tumour involved about 2 ins. of colon, but local infiltration had occurred for 8 ins. into the mesentery. The bulk of the tumour was lying around the jejunum (Pl. 30).

On cutting into the specimen the tumour was found to involve about 5 ins. of the colonic wall. No definite ulceration of the mucous membrane had occurred except at one point where a fistula 1/2 in. in diameter led directly into the jejunum. The wall of the colon at this point was up to 1/2 in. thick and excessively hard. At one part there was a diverticulum 1 in. deep lined by thickened colonic mucosa - a second fistula in process of formation. The lumen of the colon was very slightly narrowed by the growth. Proximally the colonic mucosa was completely devoid of the normal rugae and strangely atonic and smooth.

On slitting up the jejunum the fistula was again seen (Pl.32). The growth had entirely encircled the wall of the jejunum and was exceptionally thick, up to 2 ins. in parts. The mucous membrane was completely necrotic on its inner surface for a distance of 6 ins. Above the growth the jejunum wall was slightly hypertrophied and dilated, but there was little actual narrowing of the lumen.

From this description and the photographs the enormous size of the tumour can readily be imagined. The whole specimen was 4 lbs. in weight and approxi-
Extensive growth involving Jejunum and Descending Colon. X 2/3
PLATE 31. POSTERIOR VIEW.

Shows medial spread of the extensive growth from the Colon. x 2/3
Complete disorganisation of interior of affected part; considerable ulceration and necrosis; wall of bowel two inches thick with cancerous growth.

\( \times 1 \)

Arrow points in direction of fistulous opening into Colon.
Cancerous growth involving 5 inches of the colon and showing a fistulous opening. Complete atrophy of the colonic mucosa.

Probe in fistula into Jejunum.
PLATE 34.
Origin of malignant cells from proliferating acini: large group of cells in submucosa. x 60

PLATE 35.
Malignant cells spreading through the muscularis mucosae in irregular clusters. x 60
PLATE 36.
Tissue from margin of tumor: strings of malignant cells without any suggestion of acinar formation: Grade III.

x 90

PLATE 37.
Malignant cells, showing irregularity in size, form, and nuclear content.

x 200
The lymph glands, though enlarged, were not found infiltrated with malignant cells in spite of exhaustive search. In very rapidly-growing tumours this is often the case and spread is limited to extensive involvement of the surrounding tissues. In these types of tumour it has been suggested that the proliferating cells compress or destroy the lymphatics before they can gain access to the glands.

The tumour is classified as B 3.

PROGNOSIS.

The outlook in this case is not good. The failure of the bowel to heal was almost certainly due to a recurrence of the tumour, as shown by palpation of the colostomy opening. Quite apart from this evidence the chances of removing entirely a tumour which had assumed such massive proportions were not very high.

To assess the patient's expectation of life is difficult. The removal of the great bulk of the tumour has undoubtedly been beneficial and will prolong his life. Occasionally when the site of origin has been removed the remaining malignant tissue only grows slowly and the patient may live for five years or more. On the other hand operative interference sometimes stimulates the growth and the patient rapidly succumbs.

In the circumstances the patient will probably live for one or two years; it is doubtful whether his general condition will show much improvement. There is a great danger that the tumour will continue invading the colostomy opening and cause obstruction or
or profuse haemorrhage. If this complication is avoided death will probably result from increasing cachexia due to local spread of the growth and metastases in the liver and peritoneum.

**SUMMARY.**

1. **History.**
   
   Diarrhoea, exhaustion, and loss of weight 6 mths.
   
   Lump in side 3 mths.

2. **Examination.**
   
   Large, hard, freely movable mass in left lumbar region.

3. **Operation.**
   
   Tumour involving descending colon and jejunum.
   
   Resection of tumour and affected parts of colon and jejunum. Colon brought to surface with "on-dwelling clamps".

4. **Progress.**
   
   Slow: two blood transfusions.

5. **Operation.**
   
   Closure of colostomy over rubber tube. Suspicion of neoplastic infiltration.

6. **Progress.**
   
   Wound broke down. Establishment of permanent colostomy.

7. **Pathology.**
   
   Large carcinoma spreading extensively into jejunum. Jejuno-colic fistula. Histologically B 3.
POUNTS TO NOTE.

1. Short history in comparison with the size of the growth.

2. Diarrhoea and extreme wasting owing to the jejuno-colic fistula.

3. Extensive nature of the operation. Satisfactory recovery from operation aided by two blood transfusions.

4. Probable local recurrence necessitating a permanent colostomy.

5. Large proliferative type of tumour in the descending colon.
COMMENTARY.
Aetiology.

As in malignant disease in other parts of the body, little is known about the factors giving rise to carcinoma of the colon. The disease occurs in elderly subjects - the average age of the cases presented was 60 - 5 yrs, the youngest 45 yrs and the oldest 73 yrs. Occasionally cases have been recorded between 25 - 35 yrs, but such are excessively rare.

Only one condition is known which is definitely precancerous; that is polyposis of the colon. The appearance of these polypi is preceded by a generalized hypertrophy of the mucous and submucous coats, as though it were the seat of constant irritation. This condition is sometimes described as following chronic dysentery, but more often it is a hereditary disease, and is common in childhood. The descending and pelvic parts of the colon are the most often affected; the caecum is rarely involved. Polypi and cancer frequently coexist; it has been suggested that chronic irritation of a benign polypus may give rise to malignant proliferation. The contact of the papilloma with the adjacent mucous coat causes friction which leads to further proliferation and infolding of the mucous membrane. There is an associated excess of lymphoid tissue in the submucous layer. Then active mitoses occur in the infolded columns, and irregular malignant growth commences. Some small villous papillomata were noted in the specimen of Case 11. They were both proximal to the growth, but it is usually not possible to
to isolate the papilloma which became malignant. In specimens of cancer of the descending colon it is usual to find papillomata in about 75 per cent of cases. It is also recorded that about 25 per cent of cases of diffuse polyposis subsequently develop carcinoma. Nothing definite is known of the aetiology of polyposis, but it is striking that the disease is hereditary, as also is the predisposition to cancer.

Constipation is often stated to be a predisposing factor. In many cases it is probably the result of the cancer, and is of fairly recent origin. Carcinoma of the colon is usually of a slow-growing nature and may be present from 3-5 years without causing acute symptoms, though constipation may be present all the time. Such tumours may not act mechanically by blocking the lumen in the early stages, but by reflex inhibition of normal peristaltic activity. Nevertheless chronic irritation is an important factor in the production of cancer, and the passage of hard scybala might traumatise the mucous membrane in such a way that malignancy eventually resulted. It is interesting to note that this type of cancer starts at an age when active work is being abandoned, and the bowels tend to become somewhat costive. In the majority of cases, however, as in all the cases reported, the history is usually one of constipation occurring in a person who was previously perfectly regular as regards evacuation of the bowels.

The commonest sites of cancer in the alimentary
alimentary canal are at the upper and lower portions, the parts derived from the fore- and hind-gut. The reaction of the contents is there normally acid, as compared with the alkaline reaction of the contents of the small intestine which is peculiarly free from malignant disease. It has accordingly been suggested that the H-ion concentration may affect the liability of cells to malignant overgrowth. As however the acidity of the contents in these regions is a normal physiological factor, it seems that this cannot be of great importance in those who develop carcinoma of the colon. The small intestine is probably not subjected to so much irritation as the stomach and colon, because its contents are fluid. This is probably one explanation of its freedom from cancer.

Carcinoma of the colon is generally stated to be commoner in men than in women. The significance of this is not understood. The preponderance of men is only very slight.

The onset of carcinoma is no sudden change; it is most probably the result of a long-standing irritative process leading to destruction of the mucous membrane. In the early stages this is met by normal repair, but, if the irritation is long-continued, the mechanism of repair becomes modified, and increased proliferation of the lining cells results. This proliferation may eventually become uncontrolled, and finally carcinoma supervenes. The nature of the irritant is unknown; acting over a considerable period it
It usually gives rise to no general symptoms, and the early changes are thus of a pathological, rather than a clinical, nature. Some of the cases reported, in particular Case IV, give a history of chronic pain and discomfort, but it is not possible to say that these were symptoms of an ulcerative process. Indeed, the early precancerous changes are extremely obscure,
Anatomy and Physiology.

In any account of cases of carcinoma of the colon full attention must be paid to the structure and function of the organ under consideration, as this alone forms the rational basis for the appreciation of the abnormalities revealed in the cases.

Three features require special attention in the anatomical considerations of the colon, (1) development, (2) blood supply, (3) lymphatic drainage.

The large intestine is divided into two halves on a developmental basis. The right, or proximal half, extends as far as the left half of the transverse colon, is derived from the mid-gut, and depends chiefly on the superior mesenteric artery for its blood supply. The left, or distal half, is derived from the hind-gut, and is supplied by the inferior mesenteric artery. There are many other clear-cut distinctions between the two halves of the colon. The proximal colon receives its parasympathetic supply from the vagus, is relatively poorly supplied with mucin-producing cells, possesses a loosely attached mucosa, and is mainly concerned with absorption. The distal colon is supplied by the pelvic splanchnic nerves, has a large supply of goblet cells and a firmly-attached mucosa, and serves principally as a storage chamber. The contents of the two halves are also different: in the proximal half they are semi-fluid, and in the distal half inspissated. These differences, of course, do not appear abruptly, but
but constitute a gradual change as the colon is traced distally. Thus it is not surprising that the tumours discussed show various types of clinical features and pathology corresponding to their site in the colon.

In comparative anatomy the colon affords an interesting study. While in most animals the small intestine only varies slightly as regards length and size, the colon shows most astounding variations from the immense sacculated gut of the herbivora to the small thick-walled colon of the carnivora. Man at the present time is at a period of transition. Probably originally herbivorous, he is slowly becoming a facultative carnivore. Such a change throws an immense strain upon the colon, as it involves exposure to a content and flora which must be met by suitable adaptations. Frequently the response is inadequate, as is shown by the number of disorders to which the colon is subject, such as constipation, colitis, diverticulitis, and finally carcinoma.

The blood supply is an important consideration in all operations on the colon. The superior and inferior mesenteric arteries send out branches like the spokes of a wheel; these anastomose near the colon so that a more or less continuous circumferential artery is formed - the marginal artery. In spite of this anastomosis, injury to a main vessel is very serious as the marginal artery alone is unable to restore the circulation. This fact determines the extent of the operation for malignant disease. The terminal branches
branches from the marginal artery are the long and short vessels. The long vessels divide into anterior and posterior branches and pass superficial to the mesocolic taenia and deep to the amesocolic taeniae, where they pierce the muscular coat and constitute a relatively scanty anastomosis in the submucous layers. The majority of the short vessels sink into the mesocolic aspect of the bowel, which is thus assured of a fairly good vascular supply in contrast to the opposite entirely aspect supplied by the long vessels. While the long vessels are lying in the subserous layers they are intimately related to the appendices epiploicae, and especial care must be taken not to damage them in that situation.

Many other anatomical and physiological factors were of importance in the cases recorded, but it is not possible to consider them all. The path taken by malignant cells in their spread along the lymphatic tracts will be described later. In conclusion the chief difficulties in any operation determined by the structure and function of the colon may be summarised. They are :-

(1) The precarious blood supply.
(2) The highly infective content.
(3) The varied thickness and uneven contour of the bowel wall.
(4) The liability to flatulent distension.
Clinical Features.

Typically, lesions in the proximal half of the colon give rise to constitutional symptoms, those in the distal half to obstructive symptoms. This is due mainly to the fact that tumours in the caecum and ascending colon are of a bulky, fungating, ulcerated type, not readily causing obstruction to the passage of the liquid faecal matter. In the descending and pelvic colons the growth is usually of the string stricture type and readily obstructs the passage of solid faeces.

Carcinoma of the ascending colon usually produces symptoms of chronic indigestion, vague epigastric discomfort, and loss of appetite. The stomach and ascending colon are both supplied by the vagus and it is possible that these symptoms are of a reflex nature. Later, as the tumour develops, the bowel wall becomes ulcerated, and blood loss and toxic absorption occur, giving rise to a secondary anaemia and general weakness. Such a course was followed by Cases III and IV. Occasionally the finding of a lump is the sole symptom, but more usually this is associated with other intestinal symptoms, as in the cases just quoted. Occasionally pain is experienced locally (Case III), or the pain commences in the midline and radiates to the site of obstruction (Case I). Usually there is no complaint of constipation with such lesions; in this Case IV is exceptional, but this symptom is undoubtedly here associated with the stricture of the bowel (Pl. 21).
Such tumours by reason of the vagueness of the symptoms may be present for a long period before the diagnosis is made. Cases III and IV thus show the symptoms described as characteristic of carcinoma of the right half of the colon, namely indigestion, general weakness, anaemia, localized pain and palpable tumours.

To turn to the other extreme, it is found that a carcinoma of the pelvic colon causes constipation and later complete obstruction. There may be occasional periods of diarrhoea due to the secretions of the mucous cells together with a little fluid faecal matter escaping past the stricture. Such a train of symptoms is demonstrated in Case II. Unless a tumour is exceptionally large (as in Case VI) it is seldom palpable on the left side.

Such cases may be taken as more or less typical examples, but when the remaining three cases are studied it is at once apparent that the disease, whatever its situation, may not always produce the classical clinical features. Case I gave a clinical history which suggested a growth low down in the pelvic colon, indeed the complaint of unsatisfactory evacuation of faeces is usually associated with a carcinoma of the rectum. Yet when the abdomen was opened the growth was found to be an annular stricture at the hepatic flexure (Pl. I). The obstructive symptoms associated with this case were not severe, doubtless owing to the still fluid nature of the contents of the hepatic
hepatic flexure. Nevertheless it shows that the type of growth, as well as the site of growth, is of importance in determining the clinical features of the case.

Sometimes the symptoms and signs of acute obstruction may be the first definite changes produced by the carcinoma. This is illustrated in Case V where the preceding symptoms were of a vague and indefinite character, except for the increasing constipation, which may quite well occur without any organic lesion in the colon. It is interesting to note that here also the growth was of the ring stricture type and situated at the hepatic flexure. With a lesion in such a situation intermittent periods of diarrhoea might have been expected, especially as the stricture was not very tight. Indeed such a case history is usually associated with a string stricture in the pelvic colon as Case II.

Occasionally in more advanced cases additional symptoms may be produced by the involvement of neighbouring structures such as the lumbar and sacral nerves, bladder or small intestine. Case VI is an interesting example of this spread. Here the jejunum was involved by local infiltration and a jejuno-colic fistula (Pl. 33) was established. This lead to the diarrhoea, which was a prominent feature in the clinical history, though the presence of the fistula was not suspected. The reason why the condition was not diagnosed clinically was due to the fact that the diarrhoea had been intermittent, and not persistent, as might have been expected.
Furthermore no abnormality was detected in the faeces and the degree of wasting was not out of proportion to the size of the tumour. It would accordingly appear that much of the food was following its normal course through the alimentary canal, in spite of the presence of the fistula. This is not surprising as the tumour itself was causing no obstruction, and in such circumstances the food usually prefers to follow the natural pathway.

To sum up, the cases have been chosen to show the greatest variety of clinical features:

1. Two cases of bulky tumours at the beginning of the ascending colon with general constitutional symptoms. (Cases III and IV).

2. One case of string stricture in the pelvic colon, slowly progressing to acute obstruction. (Case II).

3. One case of stricture at the hepatic flexure with anomalous symptoms. (Case I).

4. One case of stricture at the hepatic flexure proceeding abruptly to acute obstruction. (Case V).

5. One case complicated by extension to the jejunum. (Case VI).
Diagnosis.

As in all cases of cancer it is essential that this should be made early; yet it is in the early stages that a growth in the colon may cause few detectable symptoms. It is extremely difficult to make a complete diagnosis by symptoms alone, as is illustrated in Case I, where the history of tenesmus seemed to suggest a tumour low down in the intestine while the true site was actually at the hepatic flexure. In the majority of cases the patient is not sent in for advice until there is either a palpable mass, or acute or subacute obstruction. Of the cases reported two were sent in as acute obstructions, three had palpable tumours, and one had both a palpable mass and symptoms of acute obstruction. Thus it will be seen that diagnosis on symptoms alone is difficult. Nevertheless the carcinoma does give rise to symptoms for a considerable period before any very definite evidence is offered. These symptoms are most commonly loss of strength with anaemia, loss of weight, indigestion, irregularity of the bowel, and borborygmi. It is good practice to insist on a barium enema X-ray examination in all patients over 60 years of age who develop such symptoms for no apparent cause.

The majority of tumours can be revealed by X-rays, and in the two cases so examined they gave accurate information as to the site of the growth. (Pl.13, 19, and 20). Occasionally a negative X-ray report is received, and subsequent laparotomy reveals a growth.
In such cases the use of a combined barium and air enema may demonstrate a lesion not shown by the usual method. Nevertheless a negative report from the radiologist must not be the deciding factor against an exploratory operation where the symptoms are highly suggestive of a growth in the colon. In the cases of growths situated low in the colon a sigmoidoscopic examination may be helpful.

In cases allowed to progress until complete obstruction has developed the most noticeable feature on examination may be swelling and tenderness in the right iliac fossa due to distension of the caecum (cf case II and V). In a patient first seen at this stage the diagnosis must be made from appendix abscess which is usually easy when the antecedent history is considered.

Reference has been made to the differential diagnosis in the cases reported. In general the most difficult condition to distinguish is hyperplastic ileo-caecal tuberculosis. In this connection particular interest is attached to Case III.

Finally it is not possible to overestimate the immense importance of early diagnosis. It is only in this way that the chances of freedom from recurrence can be improved. The operation is rendered much safer if it can be carried out before the onset of the cachexia invariably associated with obstruction. Four of the cases reported showed definite signs of obstruction. Early diagnosis of cancer of the colon will lead to the prevention of obstruction by earlier treatment.
Preoperative Treatment.

As the preoperative treatment of these cases is usually left in the hands of the nursing staff, it is rather apt to be neglected in a review of cases. Nevertheless it is a matter of supreme importance, as, carefully carried out, it may contribute greatly to the success of the operation. The details have not been included in the text in the individual cases, as the same routine was followed in all. Notes of any special measures have been made, while the routine measures have been recorded in the charts.

If a colostomy is carried out as a preliminary measure, the following preoperative treatment is carried out, provided of course the operation is not done as an emergency. On the day before operation, the patient is put on a light diet. This is as follows:

- **Breakfast.** Porridge, milk, tea, and toast.
- **Dinner.** Chicken soup, and milk pudding.
- **Tea.** Bread and butter, and cup of tea.
- **Supper.** Cup of milk.

The patient is encouraged to drink orange juice and glucose. Early in the afternoon he is given a dose of castor oil. This is followed by a soap and water enema at night. A rectal wash-out is usually given early in the morning. On the evening before operation the skin is shaved and cleaned with spirit. It is then painted with iodine, and covered with a sterile square secured in position by a bandage.

Before the radical resection the same general
general measures are carried out as regards diet. In addition an attempt may be made to raise the Patient's immunity by administering vaccines. A combined B. coli and streptococcal vaccine is given subcutaneously 10 days before operation and repeated 3 days before operation (Case II). Some surgeons prefer an intraperitoneal injection in an attempt to raise the local as well as the general immunity. On the day before operation the colostomy and lower bowel are washed out through the artificial anus if present. Otherwise the soap and water enema, as detailed above, is given. Finally it is most essential that a good night's rest is ensured before operation, by the use of hypnotics if necessary.

If the operation is to be done under a spinal anaesthetic morphine gr. ½ and scopolamine gr. I/100 are given 2½ hours beforehand, and the patient's bed is screened off to ensure absolute quiet. Morphine gr. I/6 and scopolamine gr. I/200 may be repeated 1 hr. before operation if necessary.

If the operation is likely to be very severe an intravenous drip may be established on the day prior to operation. The administration of fluid can then be continued during the operation (Case VI). This measure helps materially to counteract the shock; glucose saline is especially beneficial.

Such was the general scheme of preoperative treatment, but it was modified in certain circumstances. Thus immediately before the preliminary operation in
in Case II the patient was given anti-gas-gangrene serum to minimise the risks of infection by commensal organisms in view of the devitalised condition of the bowel.

There has been much discussion as to the efficiency of preoperative vaccine immunization. The method described was used by Sir David Wilkie for 28 years with consistently good results. Other methods include the intraperitoneal injection of amniotic fluid, but it is doubtful whether they are any more successful. Some doubt exists whether it is possible to raise the patient's resistance by any specific measures. All, however, are agreed on the importance of good general preoperative treatment.
Anaesthesia.

Five of the major operations were performed under spinal anaesthesia. The other major operation was carried out with gas, oxygen, and ether. The question of the choice of an anaesthetic is of much importance, for recent investigations have shown that many of the complications and fatalities following major operations were due directly or indirectly to the anaesthetic employed. Much of the success of the anaesthetic depends on proper preoperative care. The patient must be adequately prepared by generous intake of fluid, glucose, and, if necessary, blood, by the elimination of fear, and by the reduction, as far as possible, of shock. The actual choice of anaesthetic is to a certain extent a matter of personal preference. Here it is proposed to consider the types of anaesthetic used, and their success in the individual cases.

In the presence of acute intestinal obstruction spinal anaesthesia is probably the anaesthetic of choice. This was used in Cases II and V under such circumstances. Its advantage is that it gives a degree of relaxation otherwise not obtainable, thus ensuring a minimum exposure of the bowel and easy access to the seat of obstruction. Its great disadvantage is the fall in blood pressure which it is so apt to produce. This is a thing definitely to be avoided, especially in late cases. In such cases, and in feeble subjects with a low blood pressure, gas and oxygen supplemented by regional and local anaesthesia is preferable. In
In all the cases admitted as "acute obstructions" ample fluid was administered to restore the blood volume and chloride loss, before administration of the anaesthetic if necessary. In case V difficulty was found in suturing the wound, probably due to the fact that the operation had taken longer than was anticipated when the anaesthetic was injected.

For the deliberate radical operation spinal anaesthesia was used in four cases, and gas, oxygen, and ether in one. Both forms have their advantages, and the choice is probably a matter of preference for the surgeon. For operations on the upper part of the abdomen, and in subjects with low blood pressure it is better avoided. The spinal anaesthetics gave excellent relaxation and were extremely satisfactory. Furthermore there is no tendency towards post-operative vomiting, and often patients are able to take a little fluid or milk on the evening of operation. Ephedrine is always injected prior to spinocain to counteract the depressor effect on the vasomotor nerves. Preliminary administration of a basal narcotic such as scopolaflamine and morphine is essential (see "preoperative treatment").

Gas, oxygen, and ether was employed in case I with equal success. There should be few post-operative complications if free pulmonary ventilation is secured at the end of the operation. Mc.Guire certainly did suffer from a little post-operative respiratory trouble, but as he was a chronic sufferer from bronchitis, this was scarcely a fair test of this form of anaesthesia.
To repeat, both methods gave satisfactory results, and in the cases presented, the choice was a matter of individual preference.
Operative Treatment.

The treatment of the cases may be said to have depended on two main factors, (1) the degree of obstruction (2) the site of the tumour. It may be stated without hesitation that an immediate radical excision is not justifiable in the presence of acute obstruction. In the case of chronic obstruction of a mild degree it may be possible to obtain relief by medical measures and proceed to the radical operation in a few days, as in Case 1. Otherwise in the presence of obstruction a decompression operation must first be carried out.

In the absence of obstruction three to four days should be spent in preparatory treatment to build up the patient's strength and resistance as already detailed. Two types of standard operation were used, depending on the site of the growth. In tumours of the proximal half of the colon a single-stage resection followed by an ileo-transverse colostomy was carried out. The last few inches of the ileum, the caecum, ascending colon, and proximal part of the transverse colon were removed. Such an extensive excision is necessary as any more limited procedure would interfere with the blood supply of the parts left, if at the same time an adequate removal of lymph glands were carried out. This is usually termed Forster's operation. This was the line of treatment in cases 1, III, and IV. The advantages of this operation are (1) it is completed in one stage, thus shortening the period of residence in hospital and also convalescence (2)
(2) A wide extirpation of the lymph-bearing area is possible (3) an anastomosis is carried out in regions assured of a good blood supply. Some authorities advocate a multiple-stage operation for this situation, but in the absence of obstruction the advantages are doubtful.

Tumours of the distal colon were dealt with by mobilization and two-stage operations. Insecurity of the blood supply, increased risk of sepsis, and difficulty in efficient mobilization all render immediate resection and anastomosis highly dangerous. The method of Paul and Mikulicz, slightly modified, was used in cases 11 and V1. The tumour is removed at the first stage and both stumps of the colon are brought to the surface. Later, continuity is restored by the application of an enterotome (Case 11) or by operation (Case V1). Such two-stage operations give an additional margin of safety, but complete extirpation of the lymphatic tracts is rarely possible. A further disadvantage is the prolonged convalescence which may become very tedious; this is well seen in case 11 and V1. Here the original Paul-Mikulicz method was modified by the application of "ondwelling clamps". This is of especial value in dealing with large growths in the descending colon (case V1) or growths low down in the pelvic colon. With this method it is frequently possible to deal with tumours which otherwise appear well-nigh inoperable. In several cases the lower stump has sloughed for an inch or two below the clamp,
clamp, but without untoward result (cf. case 11 p. 29.)

In cases in which there is any degree of obstruction a preliminary operation to relieve the tension within the bowel is required. Such was the condition in cases 11 and V. In proximal colon lesions decompression may be insured by an ileo-transverse-colostomy, if the ileo-caecal valve is functioning. This is an especially valuable step in the performance of Forster’s operation, as it ensures adequate drainage of the site of operation. At the same time the abdomen may be explored, the exact site of the lesion determined, and the presence or absence of metastases ascertained. The great danger is that infection may start at the stoma between the devitalised bowel walls, and give rise to a diffuse peritonitis (Case V). In cases of acute obstruction caecostomy is the operation of choice (Case 11); it is easily carried out and the chances of post-operative infection are considerably lessened. At the later operation the incision is well out of the way, and the opening acts as an efficient safety valve. When the cause of the obstruction is removed the opening usually closes of its own accord (Case 11). After decompression has been carried out, an ample period should be left before attempting extirpation of the growth. Tumours of the colon grow slowly, and time may well be allowed for thorough emptying of the bowel and subsidence of oedema.

Certain general principles in the operative technique may now be considered. Before any decisive
A decisive step is taken it is essential to know the extent of spread. The only contra-indications to operation are metastases in the liver or peritoneum. Spread by contiguity of carcinoma of the colon should not be considered a bar to operation. Even though neighbouring organs are extensively involved, multiple resections may be carried out (Case VI). Boldness in this field of surgery is often amply rewarded. Finally the importance of proper pre- and post-operative care cannot be overemphasised. The ultimate success of the operation depends just as much on the condition of the patient as on the operative technique. Case IV is an excellent example of what can be accomplished with an old and fragile patient.
Post-operative Treatment.

The patient is returned to bed as soon as possible after operation. If a spinal anaesthetic has been used, the foot of the bed is raised onto 6-ins. blocks. An electrically-heated shock cage is generally applied. If necessary an intravenous drip is established to replace lost fluids; as resection of the colon is a serious operation, this is usually required.

On the first night a little milk may be allowed at supper-time provided there has been no vomiting. There is not usually much sickness after a spinal anaesthetic. A little water may be given to drink, and it adds much to the patient's comfort if the mouth is kept moist, as well as preventing the onset of complications such as parotitis.

On the second day a light diet may be given, if it is acceptable to the patient, such as:-

Breakfast. Tea and toast.
Dinner. Soup and milk-pudding.
Tea. Tea and toast.
Supper. Milk.

On the third day it is usual to start liquid paraffin t.i.d. after meals. The diet is the same as on the second day. If there has been much discharge from a drain in the wound, it may be necessary to change the dressing now, but otherwise it is left until the fifth day. A flatus enema is usually given on the third night if the bowels have not moved. It consists of 2oz. Mg. $\text{SO}_4$, 2oz. glycerine, 2oz. aq. menth. pip.
It is warmed and administered slowly by tube and funnel. An attempt is made to get the patient to retain it for a short time, as its action is then much more effective.

On the fourth day the diet may be increased slightly by the addition of strained porridge, steamed fish, and a lightly-boiled egg. On the following days the diet is slowly increased, as tolerated by the patient. If the bowels are moving too freely the administration of the paraffin is stopped.

On the fifth day the first dressing is normally carried out. The soiled gauze is removed, iodine is painted on the stitches and the rubber dam drain is removed. If a tube drain has been inserted it is loosened at this stage. A dry gauze dressing is then applied.

The second dressing is carried out on the twelfth day. The stitches are removed, the tube drain is taken out, the wound is painted with iodine, and a dry gauze dressing applied.

The above description applies to a simple resection, as for a tumour involving the ascending colon. If a Paul-Mikulicz operation, or one of its modifications, has been carried out, the after-treatment is necessarily somewhat modified by the presence of a colostomy. If the colon has been brought to the surface with crushing-clamps attached, the proximal clamp is usually kept on 24-48 hours, provided there is no undue sickness or discomfort. This allows the peri-
peritoneal cavity to become shut off, and thus minimises the risk of infection. The distal clamp is kept in position until it sloughs off - usually a matter of 10 days or so.

Dressings are carried out when necessary. The wound is cleaned with spirit and B.I.P.P. is applied to the line of incision. Plenty of vaseline is applied to the colostomy and the surrounding skin to lessen the irritation. The functioning of the colostomy is regulated with liquid paraffin; it is very advantageous to try and ensure a motion at a set time each day. This is especially important if the colostomy is permanent, but is difficult to manage during the early stages. It adds greatly to the patient's comfort when he is discharged.

After discharge it is essential to rebuild the patient's strength. The carcinoma has usually caused considerable loss of weight. A good nourishing diet with an adequate supply of the essential amino-acids and vitamins is thus necessary. Occasionally the tumour so interferes with the absorption of vitamins that deficiency symptoms appear - most often revealed as a neuritis due to the inadequate assimilation of vitamin B. Possibly the neuritis in Case 1 is of this type.

With proper post-operative care the patient rapidly puts on weight; this affords a very good indication of the success of the operation.
Two principal types of carcinoma are generally recognised in the colon, (1) the proliferative type, (2) the annular stricture. The former occurs chiefly in the caecum and ascending colon, the latter in the transverse and descending colon. These are not absolute types and many intermediate varieties are found.

The pelvic colon is usually accepted as the commonest site of carcinoma; here it is commonly low down at the pelvi-rectal junction. Such a growth is generally of the sclerosing type, and produces obstructions at an early date. Case II (Pl.7) is a typical example.

The ascending colon comes second in the list of frequency of involvement. A common site for the growth is the extreme proximal end of the ascending colon (Case IV Pl.21). Many growths, at first sight apparently caecal carcinomata, are really in the ascending colon (Case III Pl.14). Such growths tend to be of the fungating type, and do not produce marked symptoms of obstruction. In the two cases (III and IV) reported the growth had encircled the bowel, and the lumen was considerably narrowed (Pl.14 and Pl.21); indeed the narrowing was just as great as in Case II where symptoms of acute obstruction occurred. In these cases therefore the fluid contents of the bowel were able to pass strictures which, situated more distally, would quickly have caused obstruction.

The section of the human colon immediately
immediately distal to the ileo-colic valve possesses no definite sphincteric mechanism. It corresponds however to a part in lower animals which has a well-defined sphincteric tract. It tends, like the pyloric canal of the stomach, to be the seat of an annular carcinoma. In Pl.14 and Pl.21 it is interesting to note that, while there is considerable exuberance of growth in some parts, the bowel wall itself is the seat of an annular stricture. In contrast the caecum is usually involved by the non-obstructing fungoid type of growth.

In the other parts of the colon intermediate forms of growth are found. Usually the more proximal the situation, the more exuberant the growth. Tumours in the distal colon are usually accompanied by much sclerosis, but occasionally more extensive types are found (Case VI Pl's 30 - 33).

Microscopically the tumour is typically columnar-celled adeno-carcinoma. Usually the cells are fairly well differentiated, and are arranged in poorly-formed acini. Occasionally, and especially in the proximal part of the colon, the acinar arrangement is lost, and solid clumps of cells are found (Pl.25). The amount of supporting tissue also varies and is usually greater in the sclerosing types of growth in the distal colon (Pl.9). Not infrequently the tumour undergoes mucoid degeneration, and the mucoid character may be reproduced in the metastases (Pl.27). A rare colloid type of growth of high malignancy, corresponding to the
the colloid carcinoma of the stomach, has been described; it usually occurs in the caecum.

The tumour spreads by three methods, (I) local infiltration, (2) lymphatic permeation, (3) bloodstream. The last method of spread is uncommon, and is to be regarded as an accident due to chance invasion of a vein. It may occur in any type of tumour, and its chances of occurrence are not usually proportional to the malignancy of the growth. In this connexion Case V is of great interest. Here the tumour was well differentiated (Pl. 28) and local spread had not occurred to any great extent; indeed it was definitely removable surgically. At the preliminary operation no metastases were detectable in the liver, yet at post-mortem definite evidence was found of bloodstream invasion. This case shows that it is never possible to make certain at operation that the tumour has not metastasised to the liver. Probably a fairly heavy invasion of a vein is necessary, as odd malignant cells may be destroyed by the living endothelium. This may explain the rather surprising fact that bloodstream metastases are comparatively rare, in spite of the vascularity of some of the growths.

The two chief methods of spread are thus by local direct extension and by the lymphatics. The former is usually a matter of slow gradual growth in continuity with the primary tumour. Growth takes place more readily in the circular than the longitudinal direction and thus at first the tumour is
is limited to the mucous and submucous coats and en-
circles the bowel (Pl.10). Later the muscular coats
are invaded by root-like processes (Pl.6) and the
neighbouring organs may be involved (Case VI Pl.30
and Pl.31). This local spread is a slow process and
it is probably many months before the muscular walls
are perforated. It has been estimated that it takes
about one year before a tumour completely grows round
the bowel.

Spread by lymphatics is usually of fairly late
occurrence, but is of great importance, as it influ-
ences the prognosis to a considerable extent. The
degree of spread can only be estimated by a very thor-
ough and exhaustive examination of all the lymph
glands draining the affected part. This unfortunately
was not possible in all these cases. One very impor-
tant fact is however brought out, namely that enlarged
lymph glands do not necessarily mean malignant glands.
The glands which are largest and most easily found
are usually inflammatory, the enlargement being due
to septic infection from the ulcerated surface of the
bowel; the malignant glands are commonly small, and
are thus easily overlooked. Accordingly the presence
of numerous enlarged glands is no contraindication to
a radical operation. At the same time it is essent-
ial that the related lymph glands are removed. The
normal absorptive function of the caecum and ascending
colon requires an adequate lymph drainage. The number
of glands in relation to this part of the gut is
is greater than in the distal colon which has little absorptive function. Thus the lymph glands are more liable to be involved early in tumours of the proximal part.

In the colon the lymph vessels follow the courses of the main arteries. The lymph glands themselves may be divided into four main groups. (1) The epicolic glands are situated on the wall of the gut. (2) The paracolic glands lie in relation to the medial side of the colon behind the parietal peritoneum; in the case of the transverse colon they are arranged between the two layers of its mesentery. (3) The intermediate glands lie in relation to the main branches of the vessels; (4) The central group are situated on the superior and inferior mesenteric trunks. The lymph passes from the glands in the order mentioned, but some efferents from the bowel may pass directly to the paracolic or intermediate groups, so that the latter must be removed during the course of the operation. In practice these glands cannot be removed without ligature of some of the main branches of the arteries; accordingly a larger segment of bowel has to be removed than is actually required by the extent of the disease in order that the blood supply of the parts left may not be imperilled (Cf p. 87 ). In removing retroperitoneal lymph glands the overlying peritoneum must also be taken away. The raw area thus left is covered by undermining and approximating the cut edges of the parietal peritoneum.
The majority of the glands examined histologically were taken from the epicolic group. These were found involved in Case V alone; here the disease had only affected one gland. The paracolic glands were healthy. This shows how slowly the lymphatic spread occurs; even in Case VI with an extremely massive tumour the lymph nodes were all healthy.

Further reference must be made to the grading of tumours, more particularly to the method and its significance. This system was originally applied to carcinoma of the rectum, but has been applied to these cases as no other definite classification of tumours of the colon has been suggested. It seems reasonable to assume that carcinomata of the colon will show characteristics somewhat similar to those of the rectum. The slightly modified classification of Broders original scheme suggested by Wilkie and Quarry Wood (1933), has been followed. The grouping is that of Dukes (1932 and 1937). At this point it is advantageous to contrast the results of classification of these colon tumours with the findings in the rectum.

From a study of the photomicrographs it is at once obvious that the histological appearance of cancers in the two regions is very similar. This is best brought out by a comparison of the photographs with plates in the original paper of Wilkie and Quarry Wood (1933) Thus:

Grade I. Pl.27 (Fig.17 p.330 (Wilkie & Q.Wood 1933)
(Fig.26 p.335
(Fig.27 p.337
Grade II. Pl. 4,9,28 (Fig.18 p.330  
(Fig.28 p.338  
(Fig.29 p.339  
Grade III. Pl. 17,25,36 (Fig.19 p.330  
(Fig.30 p.340

A careful study of these illustrations show that in Grades I, II, and III it is possible to classify these tumours in the colon in a manner exactly comparable to that employed in the rectum. The writer has not had the opportunity of examining a Grade IV tumour in the colon.

The significance of the grading must be fully understood, especially in its relation to prognosis. The group of the tumour refers to the condition found at operation, and affords an idea of the extent of the operation necessary for radical cure. The grouping thus depends on two factors, (1) The age of the tumour, (2) The rapidity of growth. The grading of the tumour depends solely on the histological characters, and affords an index of the rate of growth. It thus follows that a tumour of a highly anaplastic type is more likely to have spread to the regional glands by the time that surgical treatment is undertaken. It is not so much the type of tumour as the extent of its growth that determines the prognosis, but the more malignant types spread more rapidly. Thus both the grade and the group must be considered together in assessing the prognosis.

Considerable difficulty was experienced in
in classifying the tumours. The grading cannot be carried out satisfactorily without very extensive microscopical examination of all the related glands which requires much labour and time. In the grading it is not always easy to decide the actual type of the tumour. One field may be distinctly Grade I, while a neighbouring field on the same slide appears to belong to Grade III (Pls. 27, 28, and 29). It is only by surveying the slide as a whole and taking an average that the grading can be satisfactorily accomplished.

In cases of mucoid degeneration the site of the deposit of mucin varies. In true colloid tumours (Grade IV) the mucin is intracellular producing the "signet-ring" appearance. In the less malignant types it is situated in the extracellular spaces especially within the interior of the acini (Pl. 27).

The pathological findings in the six cases may with advantage be summarised and contrasted. The tumours producing stricture of the bowel belong to Grade II, while the three cases of a more proliferative nature are Grade III. In none of the Grade III cases was there any involvement of the regional glands, though local spread was extensive. Two of the cases of annular stricture (Cases I and V) were situated at the hepatic flexure which is an uncommon site; the third case was in the pelvic colon, a typical position. The most interesting tumour is undoubtedly that in Case VI; here the growth was of a proliferative nature despite
despite its situation in the descending colon. The extensive local spread gave rise to a jejuno-colic fistula. The other growths of a proliferative type (Cases III and IV) were situated in the ascending colon. A comparison of all the illustrations of the macroscopic specimens will at once show that the tumour in Case VI is by far the bulkiest.
Prognosis.

Many factors influence the prognosis, both in regard to operation and the late results.

The prognosis in regard to operation depends upon the situation and extent of the growth, the age and general condition of the patient, and the severity of the symptoms.

Carcinomata situated at the extreme proximal and distal ends of the colon are probably the most serious. The former grow rapidly and produce great deterioration in the general condition; the latter are difficult of access and complete extirpation of the lymphatic tracts is rarely possible. Tumours in the transverse colon are liable to give rise to extensive lymphatic dissemination. This may prove an important point in Case 11 where the growth was situated in the pelvic colon. Probably as far as site is concerned tumours involving the ascending colon such as Cases 1, 111 and 1V carry the most favourable prognosis. In general the statistics show that the mortality is greater in left colon operations. The operative mortality on the right colon is about 13 per cent., and on the left about 17 per cent.

The extent of the tumour is of great significance in assessing the prognosis. Multiple procedures, such as resection of jejunum (Case V1) greatly increase the danger. Nevertheless extensive local spread is no barrier to operation, which should always be as radical as possible, as only in this way can a good end-result be assured.
The general condition of the patient is probably the most important factor in considering operative mortality. In cases complicated by ileus, anaemia, and general wasting the prognosis is decidedly worse. In such cases however much improvement may be obtained by proper preoperative care. Again any operation in the presence of acute obstruction is fraught with well-recognised dangers: this is a special danger in operations on the distal colon. It may be said that the longer the deleterious carcinomatous lesion has been present, the poorer will be the condition of the patient and the greater the operative risks.

The causes of early post-operative death are of two types (1) Conditions arising from the local operative procedures (2) General operative risks e.g. embolism, hypostatic pneumonia etc. Only the former will be considered. Case V affords an example of the commonest cause, namely peritonitis spreading from an anastomosis. This is due to necrosis of the bowel wall along the lines of the suture possibly due to a poor blood-supply. The factor of tension on the suture line is also very important. "Avoidance of tension is the watchword of the surgery of the colon".

The ultimate life prognosis depends on the successful extirpation of all the malignant cells. The possibility of doing this may be assessed to a certain extent by considering the grade and group of the tumour. The greater the spread and the more anaplastic the cells, the less chance is there of complete
complete removal. On a five-year period the survival rate of Group A cases is probably over 90 per cent. Unfortunately no figures have been published so far on a graded basis, and it requires several years of observation before any accurate statistics can be published. It is obvious that such statistics would form a very valuable prognostic index, and it is for this reason that an effort has been made to classify the cases reported.

The figures published of all cases of carcinoma of the colon are extremely encouraging, and show this type of cancer to be one of the most favourable for operative treatment. On the average just over 50 per cent of the cases are alive and well five years after operation. Actual figures show 57.6 per cent of cases in right colon tumours and 47.7 per cent in left colon tumours. Considering the average age of the patients and often their desperate state on admission such figures are very gratifying. With earlier diagnosis and improved methods of treatment this branch of surgery will doubtless give still more favourable results.

Finally a word may be said about the condition of the patients when they were seen reporting. The writer was immensely impressed not so much by the fact that they were alive as by the quality of the health that they enjoyed. Once again they were able to become active and useful citizens pursuing their former occupations. This indeed was the most pleasing feature in collecting and recording these cases.


Fraser, Sir J. (1938) Brit. Jour. Surg. XXV, 647 "Malignant Disease of the Large Intestine".


