epidemic in Singapore in late 1958 and early 1959 have been analysed. Sabin type II vaccine was fed to about 200,000 of the half-million children under 10 years of age, beginning in the twelfth week of the epidemic. For each subsequent week estimates were made of the child populations in three categories: unvaccinated, vaccinated less than eight days, and vaccinated eight or more days previously. It is shown that the number of patients (8) who developed paralytic poliomyelitis less than eight days after vaccination was close to that expected at the rates in unvaccinated children (10.02), whereas the five cases observed in children vaccinated a longer period before onset were many fewer than the expected number of 39.46. It is concluded that a week after feeding the Sabin type II strain a substantial reduction in the risk of paralytic disease occurred as a result of vaccination.

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RESULTS OF SURGERY IN CANCER OF LARGE INTESTINE IN A NON-TEACHING HOSPITAL

BY

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The large bowel is regarded by many as a site in which carcinoma, surgically treated, has a favourable prognosis, and this belief is supported by many reviews. Boyd (1955, p. 223) gives five-year survival rates of 55–60% for the right colon, 45–50% for the left colon, and 35–40% for the rectum. He adds that the five-year survival rate for early cases exceeds 80%. Many of the series reviewed have been of cases treated in special centres which do not provide a surgical service for the whole community.

Review of Series

The present group of cases includes all the patients with carcinoma of the large bowel, including those with acute obstruction, admitted to the two surgical units of the Royal Northern Infirmary, Inverness, a hospital of 220 beds, during the period 1944–53. All the deaths in the series are attributed to the carcinoma which brought the patient to hospital. Those untraced are presumed to have succumbed to their disease.

A total of 284 cases were admitted in the 10-year period. During this time there were 17,281 new surgical admissions, giving an incidence of colon and rectum carcinoma of 1 in 61. This is an average of four cases per general practitioner working in the area, so that

TABLE I.—Age Incidence

Age	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80+
No. of patients	1	1	10	22	66	98	68	18

TABLE II.—Sex Incidence and Site

	Right Colon	Transverse and Left Colon	Rectum	Total
Males	16	63	81	160
Females	24	67	33	124

the family doctor referred one patient with carcinoma of the large bowel every two and a half years.

Age and Sex Incidence.—The ages of the patients ranged from 19 to 87 years, with the largest number in the seventh decade, and a rapid fall off in numbers in the preceding and following decades (Table I). There was an overall male preponderance of 160 males to 124 females, due to the larger number of rectal tumours in the male group (Table II).

Site Incidence (Fig. 1).—Approximately two-thirds of the tumours occurred in the rectum and pelvic colon, with rather more than one-third in the rectum. The remaining one-third were fairly evenly distributed round the remainder of the colon.

FIG. 1.—Site incidence.

It is difficult to separate the high rectal growth from the low growth in the pelvic colon, but this was regarded as unimportant for the purpose of this review.

The average duration of the presenting symptom was fairly constant in each yearly group at seven to eight months. This is an inaccurate and minimum estimate, as many of the acutely ill obstructed cases gave a short history of a few days. It is not possible to divide this delay into that which was attributable to the patient and that to the medical adviser.

The investigation of these patients followed the well-established pattern and calls for no comment except to draw attention to a considerable delay in diagnosis which occurred on a few occasions when a barium follow-through was relied upon to show the colon. These were dyspeptic patients who turned out to have a right-sided colon tumour.

Treatment (Fig. 2).—In order to avoid a series of insignificantly small numbers, the treatment is divided

FIG. 2.—Total number of cases in each year, with number in which a radical operation was attempted and the operative mortality.

into three simple groups—no surgery, palliative surgery, and radical surgery. The main radical operations used were right hemicolectomy where applicable and a V

excision elsewhere in the colon. The limbs of this V tended to widen and its apex to advance towards the aorta as the series progressed. For rectal tumours perineal or abdomino-perineal excisions were used, and from 1950 onwards the synchronous combined abdomino-perineal operation was used almost exclusively. Of the 284 cases, 130 (46%) had a radical operation, 111 (39%) had a palliative procedure, and 43 (15%) had no treatment at all for their carcinoma. Of the latter, five were patients who refused surgery.

Results

Seven cases are untraced since leaving hospital. The total operative mortality (all deaths within 30 days of operation—radical, palliative, or exploratory) was 55 (20.5%). Of the 130 patients who had a radical operation, 23 (18%) died in the first month; 104 left hospital with a chance of cure, 49 of them surviving for five or more years; and three are known to have died in their second five-year period, one living for nine years and four months after a Hartmann operation for a low pelvic growth to die with enormous liver secondaries and his remaining large bowel healthy.

Of the 111 patients who had a palliative operation, 12 survived for over three years. There was no histological support for the diagnosis in three of the group who survived for over five years.

The great majority of the deaths (126) occurred in the first year after operation, both in the group undergoing resection and in those who had a palliative operation (Table III). The site of the tumour did not

TABLE III.—Number of Deaths During the First Five Post-operative Years

Surgery	Post-operative Year				
	1st	2nd	3rd	4th	5th
Radical	48	18	6	6	3
Palliative	78	13	9	6	2
Total	126	31	15	12	5

TABLE IV.—Site Incidence and Five-year Survival Rate in Patients Undergoing Radical Surgery

	Right Colon	Transverse and Left Colon	Rectum
No. of operations	15 (11%)	70 (54%)	45 (35%)
5-year survival	7 (14%)	24 (49%)	18 (37%)

seem to influence the prognosis in this series. The number of five-year survivors, after radical surgery, in the three main sites corresponds fairly closely to the number in which resection was performed at these sites (Table IV). The outlook is perhaps slightly better in tumours of the right colon.

Pathological Aspect

In 149 cases there was sufficient histological information to place these in one of Dukes's (1950) four stages (Table V). The chance of survival is closely related to the stage of the disease at the time of operation.

TABLE V.—Five-year Survival in the Four Pathological States (Dukes)

Grade:	I. Lesion Confined to Bowel Wall	II. Lesion through Bowel Wall	III. Related Nodes Involved	IV. Distant Meta- stases
No. in grade	32	54	52	11
Cases surviving five years	15 (47%)	9 (16.7%)	8 (15.4%)	None

TABLE VI.—Five-year Survival with Four Grades of Malignancy (Broders)

Grade:	I	II	III	IV
Total No.	53	67	33	11
No. of five-year survivors	10 (18%)	24 (35%)	6 (18%)	2 (18%)

In 164 cases a section of the tumour was available for examination, and these were placed in Broders's (1932) four grades (Table VI). Most of these sections were obtained from the specimen removed at operation, some were from pieces removed to confirm the diagnosis, and the rest were obtained during sigmoidoscopy. I found this grading difficult. The four broad groups into which the tumours fell are shown in Fig. 3. There is a higher proportion of five-year survivors in grade II; otherwise the numbers of survivors correspond to the total numbers in the grade. There is a difference of opinion concerning the prognostic value of grading one piece of tumour. Certainly in this series the histological picture was in many cases not uniform. Rankin and Graham (1939) were impressed by the constancy with which the pre-operative biopsy grading agrees with that of the whole specimen. Qualheim and Gall (1953), on the other hand, found uniformity in only 8 out of

FIG. 3.—Photomicrographs ($\times 125$) of typical examples of the four grades of malignancy used in this series.

30 resected tumours. Boyd (1955, p. 218) also doubts if Broders's grading is of prognostic value in the individual patient.

Discussion

In the present series Dukes's staging proved reliable in prognosis; Broders's grading was less helpful in my hands. If the patient survived the operative period and reached the first anniversary the outlook was good. Three patients did, however, succumb to their carcinoma in the second five-year period. In assessing the results the age-group of the patients must be considered, as excision of a large-bowel tumour cannot confer immortality. In this series 43 (15%) had no treatment for their carcinoma, this being thought too advanced for a short-circuit operation or colostomy. Five patients (1.8%) refused surgery.

There have been many pleas for a more radical outlook in the treatment of colon carcinoma, and Wangenstein *et al.* (1954) have encouraged surgeons to take a second look. Although the numbers in this series are not large enough to prove it, the impression obtained throughout the study was that the end-result was decided by the stage of the tumour at the time of operation rather than the extent of the latter. Earlier diagnosis is therefore the key to better results, but it must be remembered that the family doctor working in this area saw only four cases in 10 years. During this period many patients must have consulted him regarding constipation and slight bleeding from haemorrhoids. Aylett (1949) found an average of nine months' delay between the onset of the initial symptom and arrival at hospital in 155 cases of carcinoma of the rectum and suggested suitable public propaganda to encourage the seeking of medical advice early. Until we are certain that the medical delay is negligible it might be more profitable to concentrate on medical as opposed to public propaganda.

It seems that the published series are often not dealing with comparable groups of patients. Thus in Britain, Naunton Morgan (1955) gives St. Mark's figures for 477 cases of rectal and rectosigmoid carcinoma as 95% resectable, with an operative mortality of 3.2%. Muir (1956), summing up the outlook in colon carcinoma, finds 60% resectable with a 6% operative mortality and a 31% five-year survival rate. Yet the *British Medical Journal* (1955) quotes figures from the Registrar-General's office showing that of the cases of cancer of the rectum registered in 1945-6 at their initial hospital attendance, only 11% of the males and 17% of the females were alive at the end of five years. For the colon the figures were 10% and 14%. In America, Allen (1950) gives a resectability rate of 96% with an operative mortality of 2.4% during 1945-9. In Grinnell's (1953) series the five-year survival rate was 45.5% for the colon and 46.4% for the rectum in those cases in which resection was possible. On the other hand, Cameron, Chapnick, and McLean (1954) sum up the results in Detroit as follows: of 218 cases 40% were discharged presumably cured but only 15.3% were alive and well five years later.

It may be that in the near future surgery as a method of treatment will have to be compared with a non-surgical or part-surgical approach. Care will have to be taken to obtain a wide picture of present results, since it must be presumed that a large percentage of these cases are, in fact, dealt with in the general surgical units of non-teaching hospitals.

Summary

A series of 284 cases of carcinoma of the colon and rectum, the total number admitted to two general surgical units of the Royal Northern Infirmary, Inverness, during 1944-53, are discussed: 130 (46%) had a radical operation; 104 (37%) left hospital with the possibility of cure; seven cases were untraced; and 49 (17%) lived for five or more years.

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SPONTANEOUS RUPTURE OF THE COLON

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Constipation is such a common minor complaint that one is surprised to learn that it may on rare occasions be the cause of a grave acute abdominal condition which, in the absence of urgent surgical treatment, proves rapidly fatal. Yet such is the case. Since Huntley (1919) described the case of an Army officer subject to chronic constipation who collapsed from a tear in the rectosigmoid while straining at stool, a handful of similar cases have been recorded. There is a striking resemblance between most of the descriptions. The patient is troubled by constipation, which may have been aggravated by the ingestion of alkalis for the treatment of a peptic ulcer. He is suddenly taken with acute abdominal pain, more severe in the lower abdomen and left side to begin with. He rapidly becomes collapsed, and on reaching hospital the picture is one of perforation of a hollow viscus. At operation turbid free fluid with a faecal odour is found in the peritoneal cavity, but there is not much evidence of inflammatory change in the peritoneum, which is the more surprising when large lumps of solid faeces are found lying freely in the pelvis. The colon is loaded with faeces and a tear is found in the sigmoid on its antimesenteric border. The hole has a ragged margin, and, although there may be some bruising, a striking feature is the absence of inflammatory change in the