BRITISH MEDICAL JOURNAL

LONDON SATURDAY FEBRUARY 9 1952

CARCINOMA OF THE STOMACH

BY

B. F. SWYNNERTON, D.M., M.R.C.P.

Late Senior Medical Registrar, Radcliffe Infirmary, Oxford

AND

S. C. TRUELOVE, M.D., M.R.C.P.

Assistant Physician in the Nuffield Department of Clinical Medicine, Oxford

Carcinoma of the stomach is one of the commonest neoplasms, and in 1949 accounted for the death of 8,096 men and 6,157 women (Registrar-General, 1951). It carries a bad prognosis, but examination of the literature reveals considerable discrepancies from one medical centre to another. We have therefore reviewed the experience of the Radcliffe Infirmary, which is well suited to this form of clinical study. Not only has it an efficient records department and a high standard of note-taking, but also, except in a few special branches of medicine, it functions as a community hospital and its patients are representative of the major illnesses in the area.

We have studied the case notes of all in-patients who were diagnosed as suffering from gastric carcinoma during the period 1938-49 inclusive, and have followed their progress. With the help of Miss Eva Spitz, almoner to the Nuffield Department of Clinical Medicine, and by making use of various sources of information—patients, relatives, friends, family doctors, food offices, and registrars of births and deaths—we have obtained satisfactory follow-up data in every case. The length of follow-up varies from 1 to 13 years.

Age and Sex.—Nearly twice as many men as women were admitted with the disease. In both sexes the peak case incidence occurs in the sixties, which is somewhat later than is given by many writers. From Table I, which sets out the distribution of cases by age and sex, it will be seen that gastric carcinoma is uncommon below the age of 30. Relatively more of the men develop the disease below the age of 60 (49% of the men, as opposed to 39% of the women). However, the difference is only at the borderline of statistical significance, so that it is of doubtful importance, particularly as the general

population contains a preponderance of women in the over-60 age groups.

Length of History.—The time between the onset of symptoms and admission to hospital varies greatly. Of every 100 patients, 46 were admitted within six months of their first symptoms, 36 between six months and two years, and 18 more than two years after. There was no difference between men and women. If age is taken into account, it is found that a significantly higher proportion of the patients over 60 reach hospital within six months of their first symptoms (Table II). We think

TABLE II

Age	No. of Patients	No. with History Less than 6 Months	%	Difference and Standard Error of Difference
Under 60	169	63	37.3	} 15.1 ± 5.1
Over 60	201	106	52.4	

that this is most probably due to the fairly wide recognition that dyspeptic symptoms in elderly patients are likely to be caused by malignant disease, so that they are investigated early.

Site of Lesion.—The precise site of the lesion was unknown in 34 patients, but in the remaining 341 it was as follows: pyloric end, 198 (58.1%); body, 73 (21.4%); cardiac end, 41 (12%); diffuse infiltrating, 29 (8.5%).

Age and sex have little influence on the site of the lesion. The only significant difference found was a higher incidence of the diffuse infiltrating form among the younger age groups; this occurred in 14% of the under-60 age group, as against 3.8% of older patients. Here we are dealing with a more invasive type of the disease rather than with its site, so that this difference is probably an example of the general finding that carcinoma is less invasive in elderly people.

Symptomatology

For early diagnosis a knowledge of symptomatology is of the utmost importance. The first symptom is one which deserves attention, and Table III shows a rough grouping of such symptoms in 371 patients in relation to the site of the neoplasm. (In the remaining four, carcinoma of the stomach was found at necropsy, the patients having been

TABLE I.—Case Distribution by Age and Sex

Age Group	Male		Female		Totals	
	No.	%	No.	%	No.	%
Under 30	4	1.7	3	2.1	7	1.9
30-39	9	3.9	9	6.3	18	4.8
40-49	44	18.9	16	11.3	60	16.0
50-59	57	24.5	27	19.0	84	22.4
60-69	85	36.5	59	41.5	144	38.4
70 and over	34	14.6	28	19.7	62	16.5
	233	100	142	100	375	100

admitted for some other condition.) It will be seen that in more than four out of every five patients the first symptom is one related to the gastro-intestinal tract. There is some indication that neoplasms of the fundal end of the stomach are more likely than others to present with constitutional symptoms (anaemia, weakness, lassitude, fever), but the difference is not striking.

TABLE III.—*First Symptoms in Relation to Site*

First Symptoms	Pyloric		Body		Cardiac		Diffuse		Un-known		Totals	
	No. of Pts.	%	No. of Pts.	%	No. of Pts.	%	No. of Pts.	%	No. of Pts.	%	No. of Pts.	%
Symptoms relating to G.I. tract	174	88.8	58	80.6	29	70.7	24	82.8	25	75.8	310	83.6
Constitutional	18	9.2	12	16.7	11	26.8	3	10.3	7	21.2	51	13.7
Due to secondaries	4	2.0	2	2.8	1	2.4	2	6.9	1	3.0	10	2.7
	196	100	72	100	41	100	29	100	33	100	371	100

Note: Four patients with no symptoms are excluded.

Of the 310 patients with symptoms classified as relating to the gastro-intestinal tract, 219 first complained of "indigestion." Less common first symptoms were vomiting (31 patients), constipation or diarrhoea (13), anorexia (11), lower abdominal pain (10), dysphagia (9), abdominal swelling (5), haematemesis or melaena (5), a palpable lump (3), perforation (3), and hiccup (1). Although a majority of patients present with "indigestion," this is extremely variable in its form, and includes slight epigastric discomfort or belching, epigastric pain related to meals, and continuous epigastric pain.

We have attempted to analyse the symptoms in more detail, particularly with respect to the dyspeptic group. Table IV shows in relation to the site of the lesion the main varieties of dyspepsia which occurred early in the patients' history, although they were not in all cases the first symptoms.

TABLE IV.—*Analysis of Early Dyspeptic Symptoms (251 Patients)*

	Pyloric	Body	Cardiac	Diffuse	Totals
Mild*	36	4	8	5	53 (21.1%)
Ulcer type	42	14	4	6	66 (26.3%)
Pain after meals unrelieved by food and alkalis	26	7	3	1	37 (14.7%)
Long history of vague dyspepsia	16	6	4	3	29 (11.6%)
Continuous pain	21	19	4	3	47 (18.7%)
Pyloric stenosis	16	1	0	2	19 (7.6%)
	157	51	23	20	251 (100%)

* Mild symptoms include vague abdominal discomfort, fullness, belching, regurgitation, etc.

It will be seen that any type of dyspepsia can occur with neoplasms in any situation within the stomach. Symptoms suggesting pyloric stenosis occur mainly in lesions of the pyloric end and, less commonly, in diffuse infiltrating lesions. Continuous epigastric pain was experienced more frequently with carcinoma of the body than with lesions elsewhere. But, with the exception of the symptoms of pyloric stenosis, the most striking fact about the findings is that the site exerts little influence on the type of dyspepsia met with early in the course of the disease. It is also worth noting that, although carcinoma of the pyloric end is very common, the picture of pyloric stenosis is found in only 10% of such cases during the early stages.

Dyspeptic symptoms are experienced by a larger number of patients at the time of their admission to hospital, and continuous epigastric pain and the pyloric stenosis syndrome are more commonly found, between them accounting for 50% of the dyspeptic symptoms. In other words, between the early stage of the disease and admission to hospital the

symptomatology has changed towards the conventional "textbook picture" of carcinoma of the stomach.

Dysphagia.—This is a fairly common symptom in carcinoma of the cardiac end of the stomach, and may occasionally occur with neoplasms in other situations. As an early symptom it was present in nine patients, eight of whom had a fundal neoplasm and one a carcinoma of the body. By the time of admission to hospital 13 of the 41 patients with fundal carcinomata and 4 patients with lesions elsewhere had dysphagia.

Haematemesis and Melaena.—Although rarely found as an initial symptom, frank bleeding from the gastro-intestinal tract is common in carcinoma of the stomach. Recognizable haematemesis or melaena occurred in 77 of the 375 patients, and were prominent symptoms in 28. It is sometimes held (for example, Harnett, 1947) that bleeding occurs most commonly from growths at the cardiac end. In the present series the site of the lesion appeared to have little influence on the liability to bleed.

Perforation.—There were eight cases of perforation, of which two occurred in hospital while the patients were under investigation. In three patients the perforation was the first symptom, and there was no previous history of dyspepsia. During the same period (1938–49) approximately 563 cases of perforation of the stomach or duodenum from all causes were treated in the Radcliffe Infirmary. Doll (1950) found 17 cases of perforated gastric carcinoma in a series of 452 gastric and duodenal perforations. He found that in a proportion of cases the diagnosis at operation was that of a simple lesion, and that the diagnosis of carcinoma was made only subsequently. Had all cases of perforation at the Radcliffe Infirmary been followed up in a similar manner it might well be that more cases of carcinoma would have been found.

Physical Examination

The physical examination may or may not be helpful in establishing the diagnosis of gastric carcinoma. The presence of an epigastric mass is of course strongly in its favour. In this series a mass was palpated on admission to hospital in nearly half the patients. A mass was found in 159 (54.1%) of the 294 patients with a "positive history," and in 19 (23.5%) of 81 patients with negative histories. (We defined a "positive history" as one which to us was suggestive of gastric neoplasm.)

It may be that this difference is mainly due to the more thorough abdominal examination of patients with histories suggestive of gastric neoplasm, but another explanation may also be valid—namely, that many gastric carcinomata may not give rise to dyspeptic symptoms until they are large enough to be palpated.

Associated Conditions

Chronic Gastric Ulcer.—In 26 of the 375 patients there was some evidence that the neoplasm might have arisen from a simple gastric ulcer. The relationship of ulcer to carcinoma is a controversial one, and we have discussed the evidence derived from the present series in a separate paper (Swynnerton and Truelove, 1951). For the moment it must serve to remark that we believe a minority only of these 26 patients were truly examples of "ulcer-cancer."

Pernicious Anaemia.—While some workers, such as Kaplan and Rigler (1945, 1947), believe that patients with pernicious anaemia are unduly prone to develop carcinoma of the stomach, others, such as Wilkinson (1945), disagree with this view. Among the 375 patients of the present series, four had a history of pernicious anaemia which clearly antedated the development of their carcinoma. Pernicious anaemia is an uncommon condition, so that these results, though by no means conclusive in themselves, conform with the findings of Kaplan and Rigler.

Double Carcinoma.—Carcinoma of the stomach was not the only malignant neoplasm experienced by five of the

patients, if we include their past histories. The relevant details of the other neoplasms were:

(1) Man aged 57: Papilliferous adenocarcinoma of kidney, removed three years previously. (2) Man aged 60: Adenocarcinoma, Broders's grade II of descending colon, removed five years previously. (3) Man aged 67: Polypoid carcinoma of recto-sigmoid junction concurrently. (4) Man aged 66: Squamous-cell carcinoma of tongue, concurrently. (5) Woman aged 61: Squamous-cell carcinoma of left nipple (Paget's disease), concurrently.

It has been stated that the incidence of multiple primary carcinoma is higher than would be accounted for by chance. Barrett, Miller, and Fessenmeyer (1949) quote 14 authorities whose figures vary from 0.3 to 6.8%, with an average incidence of 1.8% of all cancer cases.

Investigations

Radiology: Barium Meal

A barium meal is the most accurate single investigation in the diagnosis of carcinoma of the stomach. Among the present series, 297 patients were investigated by this method, and the radiologists reported a gastric abnormality in 90.5% of these at the first examination. If we include repeat examinations the figure rises to 95.6%. In 7.4% of cases, although an abnormality was detected, the radiologist did not interpret the findings as suggesting carcinoma. This should not detract from the value of the method, because it is the duty of the clinician to make the diagnosis; evidently in 83.1% the radiologist was able to state after the first examination that the lesion was probably malignant.

Fractional Test Meal

The fractional test meal is widely used as a diagnostic measure. It was performed in 183 patients. Table V shows the results according to the following arbitrary classifications: (1) achlorhydria; (2) hypochlorhydria—with peak values less than 20 ml. N/10 HCl per 100 ml.; (3) normal—20–60 ml.; and (4) hyperchlorhydria—over 60 ml.

It will be seen that achlorhydria is a common finding, but that one in every four patients has normal or unusually acid gastric secretions. The findings are similar in the two sexes.

It is interesting to compare these results with those obtained in simple gastric ulcer and duodenal ulcer. The results for the latter were obtained by selecting in sequence from the Radcliffe Infirmary records 100 cases in which the diagnosis appeared certain (Table V). The comparison

TABLE V.—Results of Fractional Test Meal in Gastric Carcinoma, Simple Gastric Ulcer, and Duodenal Ulcer

	Gastric Carcinoma (183 Cases)	G.U. (100 Cases)	D.U. (100 Cases)
Achlorhydria ..	58.5%	11%	2%
Hypochlorhydria ..	15.3%	14%	0%
Normal ..	21.3%	56%	55%
Hyperchlorhydria ..	4.9%	19%	43%

shows that, even on a single test meal, the occurrence of achlorhydria or hypochlorhydria is rare in duodenal ulcer. The practical importance of this finding arises from the circumstance that juxtapyloric lesions may be impossible to locate with exactitude on radiological grounds in the duodenum or pyloric antrum.

By contrast, achlorhydria or hypochlorhydria is found in one of four patients with simple gastric ulcer. In distinguishing between simple gastric ulcer and carcinoma it is clear that the fractional test meal has only limited value: on the one hand, the occurrence of achlorhydria would weigh in favour of carcinoma; on the other, and more important, the finding of normal or hyperchlorhydric gastric secretion is no bar to the diagnosis of carcinoma. This latter conclusion is well known to workers in the field of gastro-enterology but is not yet sufficiently appreciated by the medical profession as a whole.

Occult Blood

Stools were examined for occult blood in 157 patients. Occult blood was present in large or moderate amounts in 84%, and half the remainder showed a trace. The chief value of this test appears to be the focusing of attention on the gastro-intestinal tract in cases of anaemia and others without dyspeptic symptoms.

Gastroscopy

Gastroscopy was normally carried out only when there was some doubt about the diagnosis. In the 33 patients so examined the results were as follows: right diagnosis, 21; wrong diagnosis, 5; failed or unsatisfactory, 7.

Treatment and Prognosis

Table VI shows the prognosis for the whole series. It will be seen that the picture is a gloomy one. Four out of five patients are dead within a year of admission to hospital, and 19 out of 20 within five years. There is no appreciable difference between men and women.

TABLE VI.—Percentage Survival Rates of the Whole Series

Length of Follow-up	Totals		
	No.	No. Alive	% Alive
1 year ..	375	80	21.3
2 years ..	322	36	11.2
3 " ..	282	26	9.2
4 " ..	238	16	6.7
5 " ..	196	11	5.6
6 " ..	173	8	4.6
7 " ..	151	5	3.3

More useful information arises from constructing separate survival curves for the groups treated by radical surgery and all others (Table VII and Fig. 1).

TABLE VII.—Prognosis in Resected Group Compared with that of Remainder

Length of Follow-up	Resected Group			Remainder		
	No.	No. Alive	% Alive	No.	No. Alive	% Alive
1 year ..	114	60	52.6	261	20	7.7
2 years ..	87	32	36.8	235	4	1.7
3 " ..	72	23	31.9	210	3	1.4
4 " ..	57	14	24.6	181	2	1.1
5 " ..	43	10	23.3	153	1	0.7
6 " ..	38	8	21.1	135	0	0.0

FIG. 1.—Percentage survival rates in gastric carcinoma.

Although the two groups are not strictly comparable in that patients treated by resection are those in whom no widespread metastasis was found, the difference between them is so striking that it is fair to conclude that radical surgery offers the only chance of prolonged survival.

The non-resected group includes 46 patients who were treated by palliative operation and 76 who were explored and for whom nothing was done. Their survival rates do not differ greatly from patients receiving no treatment. There is some indication that palliative surgery may prolong life; but our numbers are small, and it seems likely that palliative surgery has no great influence on expectation of life, although it may be called for to relieve symptoms.

The high rate of fatality during the first year after resection is partly due to a considerable fatality rate in the immediate post-operative period (22%). It is evident that this must be included in any judgment of the value of surgery. Nevertheless, it is of some value to show the survival rates of those patients who survive operation (Table VIII), for two reasons:

(a) Many writers base their conclusions on the survival rates of patients who live beyond the immediate operation period. Although we regard this as an erroneous method of presenting the results of surgery, particularly when it is used in isolation, no comparison with their results is possible unless similar data are presented.

(b) It is reasonable to suppose that, with improved pre-operative and post-operative care arising from such circumstances as the widespread use of antibiotics, developments in anaesthesia, and the application of biochemical knowledge, the immediate post-operative fatality may decline and the prognosis for the resected group as a whole may in future approximate to that of the patients who survive operation.

TABLE VIII.—*Prognosis in Resected Group, Excluding Post-operative Deaths*

Length of Follow-up	No.	No. Alive	% Alive
1 year	89	60	67.4
2 years	68	32	47.1
3 "	59	23	39.0
4 "	46	14	30.4
5 "	34	10	29.4

Resectability

Altogether, 236 patients were submitted to laparotomy—an operation rate of 63%. It is, however, unfortunate that only 114 of the 375 patients (30%) were judged suitable for resection. During the time covered by our study the proportion of patients treated by resection increased from 22.7% in the first half of the time to 35.7% in the second. Table IX shows that an increased proportion of all age groups were treated by resection during the second period, and the most striking difference is shown in the patients aged 70 and over. We are unable to assess with any precision the extent to which this increased resectability rate was due to earlier diagnosis or to bolder surgery. Whether the recent increased resection rate will be justified by long-term results must await later study.

TABLE IX.—*Percentage of Patients Treated by Radical Resection in Relation to (a) Age, (b) Period of Time*

Age Group	1938-43			1944-50		
	No.	Re-sected	% Re-sected	No.	Re-sected	% Re-sected
Under 50	39	10	25.6	46	20	43.5
50-59	32	8	25.0	52	22	42.3
60-69	59	16	27.1	85	29	34.1
70 and over ..	21	0	0	41	9	22.0
Totals	151	34	22.5	224	80	35.7

Length of History and Prognosis

It is axiomatic in clinical medicine that the sooner a diagnosis of malignant disease is made the more likely is surgical resection to effect a cure. We were therefore interested to break down the "resected group" into subgroups according to the length of history (Table X, Fig. 2). Although the numbers are small the differences between the three groups are quite definite, and prognosis appears to improve with increasing length of history. This is well shown by considering three-year survivals only, as in Table XI, where the differences between the three groups are highly significant.

This result is at first sight surprising, because it might be taken to indicate that early diagnosis is disadvantageous. There are several more probable explanations of this seeming paradox, such as: (a) The patients with long histories may be examples of slowly growing malignant disease, in which secondary spread is slow. (b) The patients with long histories may contain a high proportion of the so-called "ulcer-cancers" with a good prognosis. (c) The patients with long histories may have been misdiagnosed, through simple peptic ulcers having been mistaken for malignant disease.

FIG. 2.—Percentage survival rates in relation to length of history of patients treated by resection.

TABLE X.—*Survival Data in Relation to Length of History*

Length of Follow-up	Length of History					
	Under 6 Months		6 Months-2 Years		Over 2 Years	
	No.	No. Alive	No.	No. Alive	No.	No. Alive
1 year	47	17	42	24	25	19
2 years	34	5	29	13	24	14
3 "	26	2	22	8	24	13
4 "	23	1	14	3	20	10
5 "	20	1	10	3	13	6

TABLE XI.—*Three-year Survival Figures*

Length of History	No.	No. Alive	%
Less than 6 months ..	26	2	7.7
6 months to 2 years ..	22	8	36.4
Over 2 years	24	13	54.2

$$\chi^2 = 12.683. \quad n = 2. \quad P < 0.01.$$

We were therefore driven to re-examine our data in the light of these and other possibilities. So far as misdiagnosis is concerned, further scrutiny of our data did not suggest that the criteria governing diagnosis were different in the various subgroups. With respect to the possibility that the patients with long histories were examples of "ulcer-cancers," it is worth mentioning that there were 10 patients in the resected group in whom there was some evidence that the carcinoma might have arisen in a simple ulcer. In one of these the carcinoma was found at operation to be quite distinct from a chronic ulcer, and a number of the remaining nine may have been examples of ulceration in a carcinoma for reasons which we have presented separately. However, even if we assume that all the nine patients were true examples of "ulcer-cancer" this circumstance does not account for the relationship between length of history and

prognosis, because if these nine patients are excluded the findings are unaltered (results not shown).

It will be recalled that in an earlier section it was shown that a significantly higher proportion of patients over 60 years of age were admitted with a short history. It is therefore possible that the poor prognosis of the patients with a short history might be due to their being unduly loaded with elderly patients, who are bad operative risks. That the elderly are less able to withstand operation is shown by the following figures for the group treated by resection:

Age	No.	Post-operative Deaths
Under 60	60	10 (16.7%)
Over 60	54	15 (27.8%)

We have therefore subdivided our data with respect to length of history and three-year survival rates to show what happens in two main age groups (Table XII).

TABLE XII

Age of Patient	Length of History							
	Under 6 Mths.		6 Mths. to 2 Yrs.		Over 2 Yrs.		Totals	
	No.	No. Surviving	No.	No. Surviving	No.	No. Surviving	No.	No. Surviving
Under 60 ..	8	1	14	7	17	7	39	15
Over 60 ..	18	1	8	1	7	6	33	8

Although the numbers are small they are consistent, and they indicate that the length of history is a more important prognostic sign than the age of the patient. Indeed, if we exclude post-operative deaths we are left with the following figures for three-year survivals:

Age	No. Surviving Operation	No. Surviving 3 Years
Under 60	35	15 (42.9%)
Over 60	24	8 (33.3%)

It will be seen that, although the older group of patients had a worse prognosis than the younger, the difference is not great.

The further possibility existed that the length of history might vary according to the site of the carcinoma within the stomach, and thus explain the association between length of history and prognosis. We have therefore analysed our data with respect to both length of history and site of lesion. The pyloric subgroup, which is the only sizable collection of patients, shows a marked association between the length of history and prognosis, which agrees with our finding for the resected group as a whole. The numbers in the other subgroups are small, but those for body of stomach are sufficient to show the same trend. We are therefore consistently finding that the longer the history the better the prognosis among the resected group. It is clear that the age distribution of the patients, the site of the lesion, and the possibility of "ulcer-cancer" do not serve to explain the good prognosis of patients with a long history in the resected group, and we believe that this association is due to the occurrence of slow-growing carcinomata.

We might therefore expect a close association between the length of history and the grade of malignancy as judged by Broders's classification. The figures in Table XIII show no such correlation.

TABLE XIII

Length of History	Broders's Classification	
	I and II	III and IV
Under 6 months	17	30
6 months-2 years	13	28
Over 2 years	9	17

Likewise, if the three-year survivals are related to both length of history and Broders's classification it is found that the length of history is much the more important factor in determining prognosis (results not shown).

Discussion

An outstanding finding in the present study is the marked prognostic significance of length of history among the patients treated by surgical resection. The longer the history the better the prognosis in this group of patients. For reasons which we have given, we believe that this finding is due to the likelihood that the neoplasm is a slow-growing one if symptoms have lasted for more than two years and the growth is still suitable for resection.

We are not the first to uncover this association, for several workers from the Mayo Clinic have come to the same conclusion. For example, Balfour (1937) reported that patients with a history of less than six months who survived resection had a five-year survival rate of 25% as opposed to one of 35% among patients with a history of more than one year, and similar findings were recorded in the later study by Walters, Gray, and Priestley (1942). Our findings are in the same direction, but the prognostic influence of length of history seems to be more pronounced. To some extent this may be due to the smaller numbers with which we have dealt.

This finding should not be taken to indicate that early diagnosis is of little consequence. On the contrary, we believe that every effort should be made to shorten the time between onset of symptoms and the making of the diagnosis. It is important to bear in mind that the improved prognosis with greater length of history applies only to the group of patients treated by resection. Our main concern must be with the prognosis of the whole group of patients with carcinoma of the stomach. Most patients are not suitable for resection by the time they are admitted to hospital, and when considering the good prognosis of the small group with a long history still fit to have a resection we must bear in mind that they are the residue of a much larger group, the majority of whom have died or have become unfit for operation before that amount of time has elapsed.

Early diagnosis is not easy. The symptoms are extremely variable, although it is fortunate that the great majority of patients have early symptoms referable to their gastro-intestinal tract, with some form of "indigestion" as the commonest manifestation. No reliance can be placed upon the type of indigestion, and physical examination is useless for early diagnosis. Undoubtedly, a barium meal is the surest way of demonstrating the presence of a neoplasm, and ideally it should be carried out as a routine in all patients over 40 who develop indigestion. (We find ourselves in sympathy with Jennings (1947), who, writing at a time of milk-rationing, remarked that "... the effect of demanding an x-ray diagnosis before signing a certificate for extra milk should lead to earlier cases being discovered.") If the barium meal is negative and the indigestion persists, further barium meals should be carried out. Gastroscopy may be useful as an ancillary to the barium meal, particularly in cases with some doubt about the diagnosis.

Summary

During the 12-year period 1938-49 inclusive, 375 patients with carcinoma of the stomach were treated in the Radcliffe Infirmary. Adequate follow-up data have been obtained for all of them.

Nearly twice as many men as women were admitted, and in each sex the peak case incidence occurred in the sixties.

There was great variation in the length of history before admission to hospital. Nearly half were admitted within six months of their first symptom, while at the other extreme nearly one in five had symptoms lasting for more than two years.

The commonest site of neoplasm was the pre-pyloric region and the least common the fundus.

More than four out of every five patients began their illness with symptoms referable to the gastro-intestinal tract, the majority suffering from some form of "indigestion." The type of indigestion was extremely variable.

An epigastric mass was felt in about half the patients by the time of admission to hospital.

A barium meal is the most accurate single diagnostic procedure. In nine out of ten patients the radiologists reported a gastric abnormality at the first examination, and in more than four out of five correctly interpreted the findings.

Achlorhydria was a common finding, independent of the age of the patient or the site of the neoplasm. On the other hand, normal or unusually acid secretions were found in one out of four patients, so that such findings should not be regarded as any bar to the diagnosis of gastric carcinoma.

Most patients had occult blood in their stools.

Laparotomy was carried out in 63% of the patients and resection of the growth in 114 (30% of the total 375). An increased proportion in all age groups were treated by resection during the second half of the period covered by this study.

Resection offers the only hope of prolonged life. For example, nearly a quarter of the resected group were alive after five years, compared with less than 1% of the remainder.

Among the resected group, the outstanding factor influencing prognosis was the length of history. Somewhat unexpectedly, the prognosis was found to improve with increasing length of history. The age distribution of the patients, the site of the lesion, and the possibility of "ulcer-cancers" do not explain this finding, and we conclude that it is due to the occurrence of slow-growing carcinomata.

We wish to thank the physicians and surgeons of the Radcliffe Infirmary for permission to make this study. We are grateful to the records officer, Miss Coombs, and her staff for their assistance; and to Miss Eva Spitz for her help in completing the follow-up of patients. Dr. A. H. T. Robb-Smith and Dr. Hugh Cowdell very kindly confirmed the histological classification in a number of cases. Clerical expenses were met by a grant from the Division of Medicine, Radcliffe Infirmary.

REFERENCES

- Balfour, D. C. (1937). *Ann. Surg.* 105, 733.
 Barrett W. D., Miller K. T., and Fessenmeyer, C. R. (1949). *Surg. Gynec. Obstet.* 89, 767.
 Doll, R. (1950). *British Medical Journal*, 1, 215.
 Harnett, W. L. (1947). *Brit. J. Surg.* 34, 379.
 Jennings, D. (1947). *Brit. J. Radiol.* 20, 522.
 Kaplan, H. S., and Rigler, L. G. (1945). *Amer. J. med. Sci.*, 200, 339.
 — (1947). *J. Lab. clin. Med.* 32, 644.
 Registrar-General (1951). *Statistical Review for the Year 1949 for England and Wales. Part I.* H.M.S.O. London.
 Swynnerton, B. F., and Truelove, S. C. (1951). *British Medical Journal*, 2, 1243.
 Walters, W., Gray, H. K., and Priestley, J. T. (1942). *Carcinoma and other Malignant Lesions of the Stomach.* Saunders, Philadelphia and London.
 Wilkinson, J. F. (1945). *British Medical Journal*, 2, 664.

The Ministry of Transport has just issued a notice (M.358) to shipowners and masters on the cleansing of fresh-water tanks and filters, and recommending the avoidance of sea water in washing up and cooking, especially when near a coast or in harbour. Filters do not guarantee bacteriological sterility, and need cleaning at least once a month.

A SURVEY OF 17,301 PRESCRIPTIONS ON FORM E.C.10

BY

D. M. DUNLOP, M.D., F.R.C.P.

Assisted by T. L. HENDERSON, M.B., Ch.B., M.R.C.P.Ed.,
 and R. S. INCH, M.B., Ch.B., M.R.C.P.Ed.

(From the Department of Therapeutics, University of Edinburgh, and the Clinical Laboratory, Royal Infirmary, Edinburgh)

The relative frequency with which different drugs are prescribed and the form in which they are dispensed is always a matter of interest to a department of therapeutics. In consequence the offer of a large number of representative prescriptions for analysis was gladly accepted. These forms (E.C.10) had already been passed by the Pricing Bureau, and, so that the investigation should be entirely anonymous, the prescriber's name had been deleted before the prescriptions were submitted for analysis.

Material and Method

The prescriptions surveyed covered the month of September, 1949. They had previously been divided by the Prescribing Committee as coming from three main areas in England, the distinction between the areas being based on supposed social or financial differences. The areas were classified as follows: (1) prosperous residential; (2) industrial; and (3) mixed suburban. Each area included four to six districts of dissimilar geographic and administrative distribution. For example, the industrial area represented industrial districts in the North, Midlands, and West of England. The choice of areas and the districts which they included were arranged by the Central Prescribing Committee in such a way as to ensure the widest possible scatter.

In each district the prescriptions came from one chemist only (four to six chemists per area). In consequence the number of doctors whose prescriptions are represented in this survey is smaller than we could have wished. As has been stated, the prescriptions were all anonymous, so that the exact number of doctors involved is impossible of computation, but is certainly not fewer than 140.

The number of E.C.10 forms submitted for analysis was 11,435, but as there were often several prescriptions on a single form the total number studied was 17,301. No practitioners' orders for stocks (Form E.C.10A) were submitted, and the survey gives no indication of the drugs dispensed personally by doctors.

All the information given on each form was tabulated on specially prepared sheets, each sheet containing 14 main headings and 45 subheadings. The information so derived was then transferred to punch cards. The prescriptions from each area were kept separate so as to allow of a comparison being made between them. Certain drugs which were only rarely prescribed were tabulated on a separate sheet and were not transferred to punch cards. This latter group comprised 412 items, representing 18 different preparations.

Results: (1) Proprietary or Non-Proprietary

Each prescription was classified as representing a proprietary or non-proprietary preparation. When the prescription contained both it was classified according to the