AN EXPERIMENT IN THE EARLY DIAGNOSIS OF GASTRIC CARCINOMA*

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THE RECORD of the patients with carcinoma of the stomach at the Presbyterian Hospital, we believe, is not unusual. During the 35 years from 1908 to 1942, inclusive, 1204 people with carcinoma of the stomach were admitted to the hospital. Of this number 231 underwent resection, of whom 64 died as a result of the operation, leaving 167 who were discharged after radical surgery. Even this number includes a few cases in which the surgeon knew he left tumor behind, or the pathologist demonstrated unsuspected tumor cells at the limit of the resection. We face the fact, then, that of all the people who came to the hospital during this period with this condition less than 15 per cent left it with any possibility that their disease had been arrested.

There are several obvious means by which this record could have been improved, which we have attempted in recent years to employ: (1) A more alert attitude on the part of the internists into whose hands the patients usually come first, so that early carcinomas are less often overlooked. (2) Better technic on the part of the radiologists and gastroscopists in demonstrating suspected lesions. (3) Willingness on the part of the surgeons to operate when, after careful study, some suspicion of carcinoma still exists. (4) Wider resections, and resections of tumors formerly considered inaccessible. In our clinic, as in many others throughout the country, this is being done. (5) A lower operative mortality rate. Our rate has dropped from 33.8 per cent for the period 1908 to 1937, to 17.9 per cent for the period 1938 to 1942, and to 4.7 per cent for the year 1942.

We believe that all these factors have played their part in raising our resectability rate from 14.8 per cent for the period 1908 to 1937, to 36.5 per cent for the past five years. Before 1938, less than one patient in ten with gastric carcinoma left the hospital with any possibility of arrest of his disease; now during the past five years the ratio approaches three in ten. Whether this apparent improvement will result in more five-year survivors, there has not yet been time to tell. It will follow, probably, that the rate of arrest will not keep pace with the resectability rate but rather with another

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factor, namely, the proportion of cases that come to surgery free of metastases. Our reason for this belief lies in the following statistics. Of the 97 patients who survived resection prior to April, 1938, 25 (25.8 per cent) lived five years, or more, apparently free of their disease. This is a most encouraging figure, which shows that radical surgery for carcinoma of the stomach under proper circumstances does offer hope of cure. But it is significant that of these 25 survivors only four were shown to have metastases at the time of operation. When one recalls that these four were the sole survivors of about 900 with presumable metastases who were admitted during this period, the importance of early diagnosis becomes obvious.

This does not mean that the measures which were taken to improve our results have been futile. Certain advances have been made. The number of admitted cases who were found to have no metastases prior to 1938 was about 6 per cent; during the past five years it has been nearly 10 per cent. Of importance, too, is the fact that a greater proportion of cases without metastases have survived resection. Perhaps, also, more cases with metastases will prove to have been saved by the wider resections now being undertaken. In other words, we are providing our surgeons with a more hopeful group of cases, and they are being better treated. But it is still true that the great majority of cases enter the hospital already hopelessly ill, and it is within this group that improvements must be made if the death rate from carcinoma of the stomach among the general population is to be significantly reduced.

TABLE I

CARCINOMA OF THE STOMACH
1908-1942 (Inclusive)

	1908–1937	1938–1942	Total
Admissions	960	244	1204
Operations not for cure	471	95	566
Resections	142	89	231
Resection rate	14.8%	36.5%	19.2%
Resection operative mortality	33.8%	17.9%	27.7%
Metastases absent	56	24	80
Metastases absent (survived resection)	41	21	62

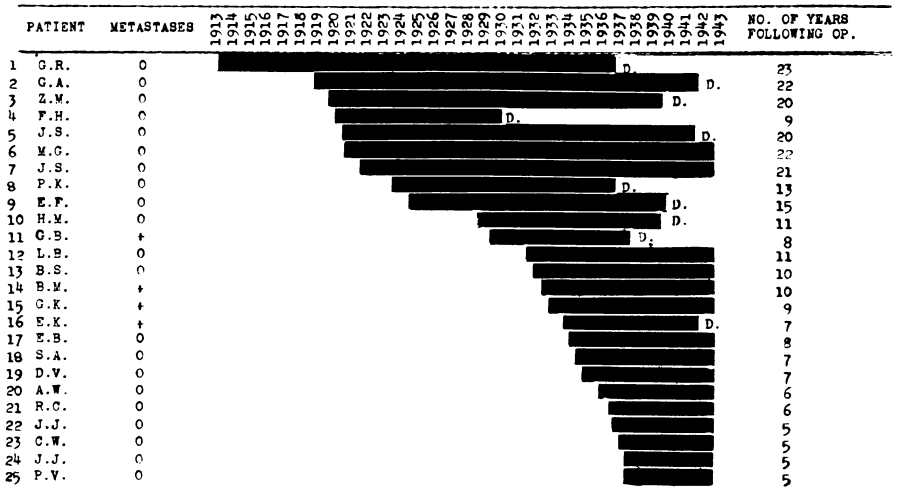
It is this large group which comes to the doctor too late for attempts to cure that is the main subject of our study. They come too late usually because the early symptoms of gastric carcinoma escape their notice or do not seem to them important. To them may be added, unfortunately, the patients whose gastro-intestinal studies were delayed because the doctor whom they first consulted failed to elicit complaints or appreciate their significance. Clearly, if the surgeon waits for these people to come to him, they will continue to come too late. Therefore, he must reach out and bring them in to study before they are aware of trouble, if possible while their disease is yet asymptomatic. Much has been done for pulmonary tuberculosis by mass studies of people who did not suspect that they had the disease, and we have made an experimental attempt similarly to attack gastric carcinoma.

The attempt consisted of mass roentgenologic studies of men and women who were not suspected of having gastric lesions. The subjects of the study were people over the age of fifty who had no digestive symptoms of appreciated significance. It was impossible to limit the group precisely, because few people have no digestive symptoms whatever. In selecting our cases we tried to include only those people who ordinarily would not have received

CHART 1

CARCINOMA OF THE STOMACH
FOLLOW-UP RESULTS AFTER PARTIAL GASTRECTOMY

LIVED 5 YEARS OR MORE WITHOUT EVIDENCE OF RECURRENCE



a gastro-intestinal study, so that if they had a gastric lesion it would not ordinarily have been discovered. Maintaining this prerequisite, we first studied patients from the Surgical Follow-up Clinic, who had been treated for conditions other than gastric. We endeavored subsequently to examine every person over the age of fifty who came to the hospital, whether as a patient or a relative or friend. It was not difficult to persuade most of these people to come for examination and they were usually happy and grateful to know the result. We saw little evidence of arousing undue fear of cancer. This part of the study really comes under the province of public health. Controlled groups such as members of large corporations or civic departments should be the easiest to handle.

The study is yet incomplete but the results are beginning to be of interest. Two thousand, four hundred and thirty-two persons have been examined, of whom 491 have been reexamined a year, or more, later, making a total of 2923 examinations. Nineteen cases have been deducted from this study because they were admitted to it in error, in that they had important gastric symptoms. This leaves a net of 2413 new cases that have been studied. Of these, three had proven unsuspected malignant gastric tumors, two of which were carcinomas and one of which was a lymphosarcoma. The inci-

dence of unsuspected malignant tumors found was, therefore, 1.24 per thousand. These three cases underwent subtotal gastric resection.

The method of study is essentially a rapid fluoroscopic examination of the stomach. It is based on the belief that an experienced roentgenologist rarely requires more than a minute to satisfy himself by gastric fluoroscopy that he is dealing with normal findings. No attempt was made during our rapid examinations to determine more than the one fact, namely, did the stomach show evidence of abnormality or did it not? If nothing abnormal was noted, the patient was dismissed. If any suggestion of abnormality was seen, the patient was brought back for further careful study at a later time. The examination was made in the erect position only, unless something suspicious was found in the fundus, in which case the patient was also examined prone. The first thousand cases received a single stomach film to check the rapid fluoroscopic examination, but, as nothing was found on any of the films that had not been noted at fluoroscopy, the films were thereafter omitted. Using the present routine, it is possible to examine as many as 40 patients an hour. The chief difficulty has been not the speed of the examination but the handling of the patients, guiding them back and forth from the dressing rooms, keeping them flowing steadily into the fluoroscopic room, *etc.* It has required two assistants and a stenographer to keep the examiner busy.

The objection has been raised to this method that, inasmuch as errors are frequently made at roentgenologic examinations of the stomach under the best circumstances, one might infer that so rapid an examination as we employ would lead to many more. It must be recalled, however, that at our rapid examination only one point is determined, namely, the presence or absence of an abnormality. Our experienced roentgenologists in their routine practice, over the years, have not required more time to make this determination, so that the rapid examination should in this respect be as accurate as the routine studies. Admittedly, the examination is as good as the roentgenologist, and no better. It must be done by someone with experience. One cannot expect perfection of the method. Only trial can tell how accurate it will prove to be, but even if it were only 50 per cent reliable it still might discover many early carcinomas that now go on to the inoperable stage. The study has not progressed far enough to prove or disprove the value of mass examinations of people in this manner. Unfortunately, the entire project is for the time being interrupted by war conditions. We are merely recording our findings thus far.

The most encouraging aspect lies in the three malignant lesions found and the nature of them. The first, a lymphosarcoma, was discovered at fluoroscopy because of a persistent area of flattening near the pylorus. This was confirmed by further roentgenologic studies, but at operation our senior surgeon was unable to appreciate any lesion even with the stomach opened and, therefore, did not resect. Some months later, at the site of the suspicious roentgenologic finding, an obvious tumor developed which was then resected and proved to be a lymphosarcoma. The patient later died of her disease. The note-

worthy fact in this case is the discovery by quick fluoroscopic study of a lesion so small that an experienced surgeon could not appreciate it at operation. The second case of malignant disease found was a double carcinoma of fungating type in the fundus of a 60-year-old man who came to the hospital

CHART II

CARCINOMA OF THE STOMACH
FOLLOW-UP RESULTS AFTER PARTIAL GASTRECTOMY
1938 - 1942 ALIVE WITHIN 5-YEAR PERIOD

	PATIENT	METASTASES	1938	1939	1940	1941	1942	1943	NO. OF YRS. FOLLOWING OPERATION
1	J.R.	0							4
2	L.M.	+							4
3	G.B.	0							4
4	M.S.	0							4
5	C.J.	0							4
6	M.M.	+							4
7	H.F.	+							3
8	G.G.	+							3
9	D.S.	+							3
10	M.S.	+							2
11	G.B.	0							2
12	J.K.	0							2
13	A.S.	+							2
14	E.K.	+							2
15	R.J.	+							2
16	D.Q.	+							2
17	J.B.	0							2
18	M.M.	+							2
19	H.S.	+							2
20	H.S.	0							1
21	L.S.	+							1
22	J.O.	0							1
23	M.K.	0							1
24	W.S.	+							1
25	L.S.	+							1
26	C.M.	+							1
27	J.L.	0							1
28	G.W.	+							1
29	P.C.	+							1
30	N.L.	+							1
31	P.H.	+							1
32	I.B.	+							1
33	J.J.	+							1
34	A.A.	+							1
35	E.F.	+							1
36	R.W.	+							
37	H.S.	+							
38	C.S.	+							
39	C.N.	0							
40	S.M.	+							
41	A.R.	+							
42	H.J.	0							
43	G.A.	0							
44	A.B.	0							
45	L.S.	+							
46	T.F.	0							
47	F.S.	+							

because of a urethral stricture. Slight gastric symptoms were present but had not attracted his attention. A subtotal gastric resection was performed. No evidence of metastases was found either at operation or at pathologic examination. The third malignant lesion occurred in a man, age 54, who came to the hospital because of a large hydrocele. This carcinoma was situated near the pylorus. It presented an ulcerated area less than one centimeter in diameter. The tumor had penetrated the muscularis mucosae and invaded the submucosa but had entered the muscularis only at one small area. It had not metastasized. This is one of the earliest gastric carcinomas ever found at the hospital.

The nature of these three tumors has been a source of great encouragement to us. Two were very small when discovered, showing that tumors of this size can be discovered by our method. The two carcinomas which were found had not metastasized, which places them in the group of relatively good prognosis. There is no reasonable doubt that these three patients would have come to operation far later if they had been allowed to progress to the symptomatic stage.

There were five other cases who underwent gastric resection because of suspicion of gastric carcinoma but in whom only benign single or multiple ulcers were found. They were subjected to extensive roentgenologic study, and most of them to conservative therapy and gastroscopy before operation. Some of them had symptoms before being brought in for their first rapid fluoroscopy, but none had any intention of consulting a doctor about them. We have felt for some time that it is safer to resect stomachs in people over age 50, with persistent gastric ulcerations than to wait perhaps for a carcinoma to become all too obvious. One of the five died of a postoperative pulmonary embolus. The other four are symptom-free. These cases illustrate the difficulty in making an exact diagnosis in gastric lesions, even with all the diagnostic aids available.

An additional 15 cases were brought back for careful study because the first rapid fluoroscopic examination suggested some abnormality that might be due to a new growth. Their lesions were all considered to be benign, and were not subjected to operative exploration.

An interesting by-product of the study has been the relatively large number of abnormalities other than carcinoma that have been discovered. These include conditions both functional and organic. Five hundred and twenty-eight such instances were noted. The greater percentage, of course, were functional derangements. However, there was a surprising number of organic derangements. For example, 54 instances of deformed duodenal bulb were found, without symptoms of ulcer. Some of these had actual craters, but the majority showed the deformity of previous ulcers only. These were in people who "had never had any trouble with their stomach." There were seven instances of cardiospasm and 25 cases of diaphragmatic hernia, two of which were rather large. An idea of the incidence of other irregularities was obtained, such as anomalies of position of the stomach and duodenum, diverticula of the stomach and duodenum, evidence of "gastritis," *etc.* One polypus of the stomach was found. Ninety abnormalities within the thorax were noted and occasionally gallstones, *etc.*

The cost of the examination has been approximately 48 cents a person. This does not include the cost of the roentgenologist's services or the overhead charges for the roentgenologic equipment, but the actual cost of secretarial and technical help, stationery, films, *etc.* One of the chief difficulties has been to get people for examination as fast as we wanted them. While the method is still in the experimental stage, we have not been able to interest life insurance companies or city institutions in helping us to obtain

larger numbers of people for study. We have been limited to the people who have come to our own institution, although we could have well handled many times this number.

The study should be continued for many years to prove its value. We are particularly interested in seeing what evidence we can discover of the accuracy of the method. It is as yet too early to say what proportion of new growths we may have missed. Among the 491 people that we examined a year or more after their first examination, no tumors were found. We are aware of one error which happened on a morning when a junior roentgenologist was making the examinations and somehow overlooked a very large and obvious growth. The case is not included in our series because the patient had severe symptoms, but we must, in honesty, make mention of it. Otherwise, so far as we know, we have missed no tumors.

Whether this method is a practical one for reducing the large number of incurable gastric carcinomas that come to our hospitals we cannot yet say. At least one thing should come of it, if nothing else, and that is an opportunity to learn more about the characteristics of early gastric carcinoma, for our experience so far has, unfortunately, been chiefly with its late manifestations.