

GASTRIC ULCER*

THE SIGNIFICANCE OF THIS DIAGNOSIS AND ITS RELATIONSHIP TO CANCER

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GASTRIC AND DUODENAL ULCER have been discussed so frequently under the general heading of "Peptic Ulcer" that a serious confusion has resulted regarding the proper management of these two distinct entities. Early symptoms in both diseases are much alike and the conservative measures, found adequate in uncomplicated duodenal ulcer, will also be temporarily effective for gastric ulcer. The greater frequency of acute duodenal lesions, compared to those in the stomach, has enhanced the standardization of the treatment of duodenal ulcer. This regimen applied to the more rare gastric ulcer has often proved disastrous. We believe that the time has come for a clarification of our ideas concerning the management of gastric ulcer and that every effort should be made to stress the seriousness of this lesion.

The difficulty in the differential diagnosis between ulcer and cancer of the stomach in our clinic has impressed us so forcibly that we feel justified in reporting our experience concerning the matter. We had already formed some ideas from certain cases falling into our hands for treatment but were surprised to find the evidence so clear to us when the available material was evaluated. The records of all patients, treated in our hospital during the ten-year period ending January 1, 1940, who have had the diagnosis of gastric ulcer, have been carefully analyzed for this purpose.

TABLE I
GASTRIC ULCER
Error in Diagnosis of Cancer

	No. of Cases	Per Cent
(A) Entire group		
Original diagnosis ulcer.....	277	
Final diagnosis cancer.....	39	14
(B) Patients treated medically*		
Original diagnosis ulcer.....	175	
Final diagnosis cancer.....	13	7.4
(C) Patients treated by gastro-enterostomy		
Postoperative diagnosis ulcer.....	23	
Cancer proved by follow-up studies.....	4	17
(D) Patients treated by resection*		
Preoperative diagnosis ulcer.....	69	
Cancer proved histologically.....	30	43

* Several patients are included in both groups B and D.

This study deals with 277 patients whose original diagnosis was gastric ulcer (Table I). Thirty-nine of them, or 14 per cent, finally proved to have

* Read before the American Surgical Association, White Sulphur Springs, W. Va., April 28, 1941.

cancer. Seventeen cases with a preoperative diagnosis of cancer proved to have benign ulcer. This makes a total of 255 cases of ulcer for analysis (Table II). The diagnostic methods were the usual ones employed in a large general hospital. The clinical diagnosis was based on the history, physical examination, and the laboratory data; this was confirmed by roentgenographic studies in all cases and by gastroscopy in many of them. When the ulcer was a large one or in one of the areas of the stomach where cancer is more likely (Fig. 1), or if there had been a poor response to conservative treatment, the patient was usually transferred to the surgical department.

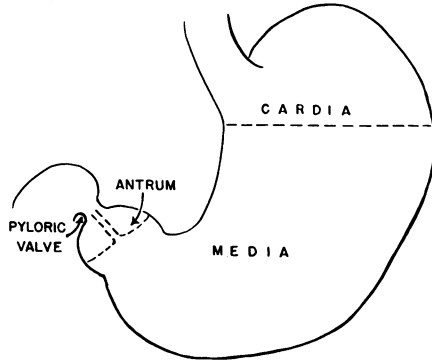


FIG. 1.—Anatomic divisions of the stomach.

In evaluating the percentage of error in diagnosis, each opinion was given its *pro rata* credit and no case, whose combined preoperative diagnosis was less than 50 per cent in favor of one diagnosis, was used in arriving at the diagnostic error. The opinion of the pathologist was accepted as final. In 69 cases subjected to gastric resection with a preoperative diagnosis of ulcer, 30, or 43 per cent, had a final diagnosis of cancer. In 18 of these patients, the error was made by all observers. In the remaining 12 cases, there was an opinion favoring the diagnosis of ulcer in from 50 to 90 per cent of those

TABLE II
GASTRIC ULCER, 1930-1939
Massachusetts General Hospital

Final Diagnosis Ulcer*	Cases	Deaths	Patients Dying in Hospital (Per Cent)
Medically treated			
1930-1934.....	59	3	5.1
1935-1939.....	103	4	3.9
Total.....	162	7	4.3
Surgically treated (acute perforations excluded)			
1930-1934.....	62	8	12.9
1935-1939.....	31	2	6.4
Total.....	93	10	10.7
Total cases.....	255	17	7.5

* The original diagnosis of cancer was made on 17 of this group.

who participated in the management of the problem. If one wishes to take the most optimistic attitude and work out the percentage values on the basis of including only half of those cases where there was some divided opinion, the result is bad enough, since it is at best a 35 per cent error.

We have all performed radical gastric resection under the diagnosis of

cancer, only to have the pathologist bring us the good news that the lesion proved to be benign ulcer. In the same decade of this study, 344 cases with a preoperative diagnosis of cancer that were either resectable or upon whom a palliative operation was possible, there were 17 with a final diagnosis of benign ulcer—a diagnostic error of 5 per cent. If we take our percentage error in both groups of cases into consideration, we still have much to be desired in the more favorable lesion for cure.

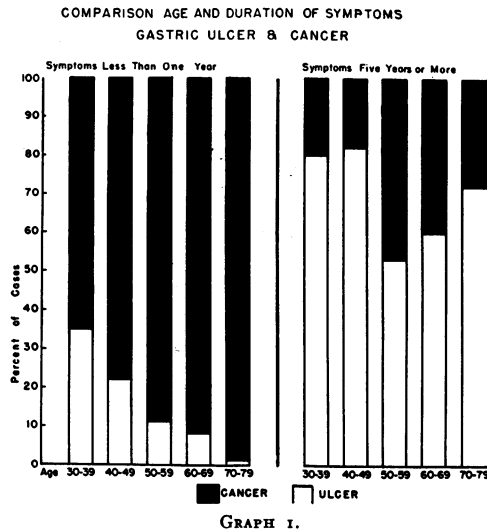
In 175 patients treated medically under the diagnosis of ulcer, 13 were eventually proven to have cancer—a diagnostic error in this group of 7.4 per cent. Twelve of them finally came to operation after an average interval of ten months from the original observation.

During the period covered in this report, 23 patients with gastric ulcer were treated by conservative surgery, usually gastro-enterostomy, with or without cauterization of the ulcer. Four of these patients later died of cancer, thus illustrating, more graphically, the difficulty of the surgeon to make a true diagnosis when the lesion is actually under observation. This is also a very strong argument in favor of partial gastrectomy when gastric ulcer is subjected to any surgical procedure.

Naturally, we have concerned ourselves with the reasons for our high percentage of diagnostic error when dealing with gastric ulcer. These factors were studied as follows: (1) The age of the patient and the duration of symptoms; (2) the location of the lesion; (3) the size of the ulceration; (4) the hydrochloric acid level of the gastric contents; (5) the rate of healing under medical therapy; and (6) the type of pain or discomfort complained of by the patient.

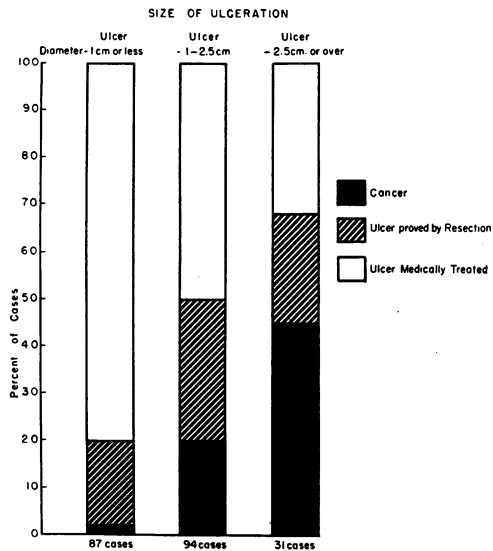
We expected to find that patients complaining of indigestion, hyperacidity, and gaseous eructations for the first time after age 50, would have cancer rather than ulcer. These data are illustrated in Graph 1. Here, we see that this is an important diagnostic point, since patients beyond the fifth decade, with a gastric ulceration causing symptoms of less than one year, are over five times as likely to have cancer as ulcer. On the other hand, those patients with symptoms of five or more years have exactly the reverse ratio of ulcer to cancer.

It seems evident to us, then, that conservative therapy in this older age-group has little to support it, nor is the incidence of ulcer in any group of cases great enough to make one certain he is not dealing with cancer.



That ulcerative lesions in some locations in the stomach are more likely to be cancer has been well-established. Holmes and Hampton¹ have previously stressed this point. In the group of cases under discussion, we have represented the percentage values in Figure 2. We have no difficulty in making up our minds regarding the treatment of ulcerative lesions arising in the fundus and in the prepyloric regions of the stomach, since the chance of cancer so far outweighs the risk of surgery. In the more common site on the lesser curvature, where 50 per cent of all gastric ulcers occur, we have been prone to feel safe on the basis that most of these lesions are benign. However, we actually find many of our mistakes in diagnosis are in lesser curvature ulcers. Thus, the physician, believing that this peptic ulcer will behave like others, fails to take into consideration the possibility of cancer. He then neglects to keep such a patient under observation until the lesion is completely healed, and he often is not actually aware of the true situation until the opportunity for cure is entirely lost.

The size of the ulceration is of some importance, and this is illustrated in Graph 2. In only two of our cases, with final diagnosis of cancer, was the lesion under 1 cm. in diameter. The incidence of cancer increases progressively with the diameter of the ulcer. The majority of lesions over 2.5 cm. in diameter, proved by resection, turn out to be carcinoma. Between the diameters of 1 to 2.5 cm., the margin of error is such that not so much importance can be attached to the size. The average diameter of the benign lesion was 1.7 cm., while those showing cancer averaged 2.3 cm. The size of the crater then, although of some help in the differential diagnosis, is not a reliable guide. The margin of error is exactly 50 per cent in ulcerations of 2 cm. in size. One huge ulcer requiring total gastrectomy proved to be benign.



GRAPH 2.

The hydrochloric acid level has been taught for years to be an important differential diagnostic guide in gastric ulcerations. This is illustrated in Graph 3. Here, we see that acidity and cancer are compatible. An occasional benign ulcer will have achlorhydria, but it is clear that one should not often stress this possibility. It will be observed that the percentage of cases with free acid in the stomach is just as high with "ulcer-cancer" as it is with benign ulcer. There has been far too much emphasis on the acid

levels in relationship to the innocence of the lesion. A gastric analysis, negative for acid, is of help, but one with acidity is of no aid in the differential diagnosis between benign ulcer and cancer.

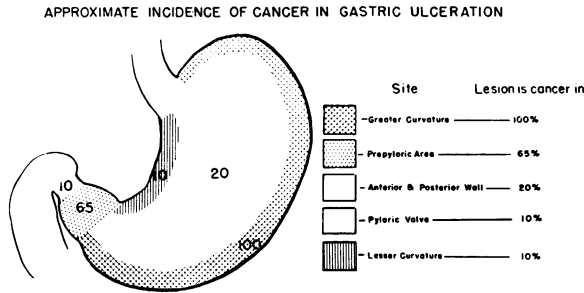
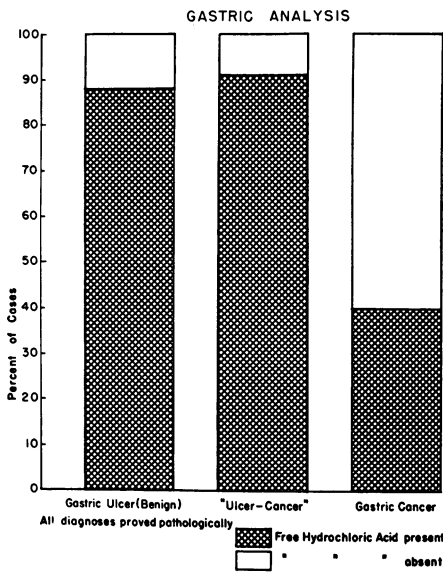


FIG. 2.

The rate of healing of gastric ulcers under medical supervision has interested us. Although it is not possible to graphically illustrate such a study, we have been able to form some opinion concerning it. In order to get a



GRAPH 3.

base-line in regard to healing, we believe it is important that all patients with gastric ulcer should be admitted to the hospital for treatment, where conditions for cure can be made ideal and failure of the lesion to heal becomes of real significance. Too often, these patients are given the ambulatory advice handed out with impunity to patients with duodenal ulcer. The individual loses his symptoms and fails to return for a check-up. The physician then often interprets the absence of pain as such a favorable sign that he fails to insist on roentgenologic and gastroscopic confirmation of healing. Even when this is done, the report usually indicates a diminution in the size of the ulcer, and the impression is not made upon the patient regarding the importance of observations until complete healing has taken place. We have

operated upon one patient with cancer and involved lymph nodes in a lesser curvature ulcer that completely healed after two months of medical therapy, according to roentgenographic and gastroscopic examination. Thus, it seems to us important that these patients should be followed under ideal hospital

management until complete healing has occurred. Even this cannot be construed as certain proof that the ulcer is benign, and such a healed ulcer should be again observed after a month's time as any evidence of recurrence demands surgery. If this program were insisted upon in this group of patients, a considerable number could be spared death from cancer. Of course, it is impossible to make a rule regarding the length of observation justifiable in all cases. We do feel however that, under proper conditions in the hospital, one should expect complete healing in one month if the lesion is benign.

The type of pain an ulcer of the stomach produces is not of as much importance as we thought it might be. We were of the opinion that the more vague the symptoms of indigestion, the more likely the lesion would prove malignant. Also, patients who have uncontrollable pain on a strict diet often prove to have cancer. On the other hand, it has been proved repeatedly that a decrease in the amount of pain occurring under treatment does not indicate that the ulcer is benign.

Although the physician is willing for his patient to submit to surgery, if he is convinced that the lesion is cancer, it is hardly to be expected that he should trust the surgeon with a benign ulceration of the stomach. This attitude has been brought about by the surgeon himself, since he has been slow in developing a sound surgical procedure for such lesions. Also, it has taken time and experience to evaluate methods that seemed in the beginning, for one reason or another, to offer cure in the majority of cases operated upon. The morbidity and mortality in this field of surgery has brought about a natural reaction on the part of physicians to evade the surgeon if possible. We believe now that we have evidence to warrant making a fresh endeavor to convince our medical colleagues that gastric ulcer should be fundamentally a surgical disease. We are willing that he continue to treat early, small ulcerations in the safer zones within the stomach, particularly in the younger patients. We do feel, however, that his treatment should be on a different basis than that used in duodenal ulcer. He should follow the patient with gastric ulcer until the lesion is completely healed and then check by roentgenograms and gastroscope at frequent intervals. He should be suspicious of any lesion that tends to recur or one that heals imperfectly within a short period of time. If he would take this attitude, in order to allow his patient to have an early and favorable operation for cancer alone, he would be justified in his position in the matter.

Under this regimen, a certain number of patients would have gastric resection for benign ulcer. Can the surgeon justify himself on this score? Our mortality figure of 6 per cent in a group of 53 primary resections may be representative since these are from a large teaching hospital, where many minds and many hands enter the picture (Tables III and IV). It is necessary to train surgeons and we do not defend such a mortality rate on any other basis. Personal series show even better results as do those from private clinics. There have been no fatalities in 36 resections for gastric ulcer in

our own personal cases, but this is beside the point. The internist must anticipate morbidity and mortality and the surgeon must be able to offset these difficulties if he makes a bid for these cases. In the 51 survivors from primary subtotal gastrectomy for gastric ulcer, we have only two patients

TABLE III
GASTRIC ULCER—SURGICAL THERAPY (M. G. H. 1930-1939)
(Acute Perforations Excluded)

	No. of Cases	Deaths	Mortality (Per Cent)
Subtotal resection	56	5*	8.9
Posterior gastro-enterostomy	22	3	13.6
P. G. E. plus local excision	7	1	14.3
Local excision	6	1	16.7
Pyloroplasty plus excision	1	0	0
Total gastrectomy	1	0	0
Total	93	10	10.7

* Two deaths occurred in patients who had had previous gastric surgery.
Mortality of primary subtotal resection is 6 per cent.

TABLE IV
GASTRIC ULCER—SURGICAL THERAPY

	Resections	Other Operations	Total Cases	No. of Deaths	Mortality (Per Cent)
1930-1934	30	32	62	8	12.9
1935-1939	26	5	31	2	6.4

who have had recurrent symptoms. This is worthy of note when we consider the morbidity frequently associated with prolonged conservative treatment. At least 12 per cent of the patients under observation for gastric ulcer have had continued or recurring symptoms. Therefore, we feel that the results of proper surgery for gastric ulcer justify that form of therapy. This agrees with the conclusions of St. John, *et al.*,² based on meticulous follow-up data and of Walters and Clagett.³

Perhaps the strongest argument in favor of gastric resection for ulcer is based on the comparative data in Table V. In a group of 93 patients subjected to gastrectomy for cancer between 1932 and 1936, reported by Parsons and Welch,⁴ from our clinic, we have an operative mortality rate of 25 per cent. Including these operative deaths, there were 20 per cent of five-year cures. In the small series that we can end-result, there were 30 gastrectomies performed under the diagnosis of benign ulcer—all of whom proved to have cancer. The operative mortality in this group was 10 per cent, and including these deaths, the five-year rate of cure was 40 per cent (Table V). Although we realize that the percentage values in so few cases are open to criticism, we believe it is fair to call attention to the likelihood of a lower mortality rate and a higher cure rate if the resection has been undertaken on the assumption that the lesion is ulcer and not cancer. In other words, the more

benign the lesion appears, the more likely the final cure. It is important to point out in this connection that the surgeon must have in mind the possibility of malignancy when carrying out gastrectomy for ulcer. The operation carries no more risk if the omentum and the lymph nodes of the lesser curvature are included in the resection. If this attitude is adopted in all questionable cases, the cure-rate will be even higher than 40 per cent in those having these early malignant lesions. This opinion is based on the fact that the nodal areas were not included in the resections for ulcer performed between 1930 and 1936.

TABLE V
PROGNOSIS OF GASTRIC CARCINOMA
All Cases of Resected Cancer (1932-1936)* Preop. Diagnosis Ulcer (1930-1939)

Number of cases.....	93	30
Operative mortality.....	25%	10%
Five-year curability rate†..	20%	40%

* Previously published.

† This is calculated from years 1930-1936, and includes operative deaths.

We recommend immediate surgery for any one of the following indications—if:

- (1) The ulcer is of short duration and the patient is over fifty years of age.
- (2) The ulcer is over 2.5 cm. in diameter.
- (3) There is no free hydrochloric acid in the stomach.
- (4) The ulcer is in the greater curvature or in the prepyloric region.
- (5) The ulcer is chronic and on the lesser curvature.

We recommend hospital observation and treatment for one month—if:

- (1) The ulcer is acute and in a young patient.
- (2) The ulcer is under 1 cm. in diameter.
- (3) The ulcer is on the lesser curvature or the anterior or posterior wall.

If healing is complete in one month, repeat observations should be made one month after discharge from the hospital.

If healing is not complete in one month, by roentgenologic and gastroscopic examinations, then surgery is advisable.

CONCLUSIONS

Gastric ulcer is, fundamentally, a surgical lesion. This is the direct antithesis of our present concept regarding duodenal ulcer.

Gastric ulcer cannot be distinguished from cancer in a high percentage of cases.

The gastric cancers that simulate gastric ulcer comprise an especially favorable group for cure. On this basis alone, surgery should be the treatment of choice.

The end-results of gastric resection for ulcer seem to substantiate this same form of treatment even if the ulcer is proved to be benign.

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- ³ Walters, Waltman, and Clagett, O. T.: The Surgical Treatment of Chronic Gastric Ulcer. *Surg., Gynec., and Obstet.*, **71**, 75, 1940.
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DISCUSSION.—DR. RALPH COLP (New York, N. Y.); The logical viewpoints expressed by Doctors Allen and Welch in their excellent presentation will probably meet with the full approval of those interested in this subject. Gastric ulcer, aside from its serious complications of hemorrhage, penetration, and perforation, presents the added hazard of the possibility of carcinoma, and the less likely danger of a carcinomatous transformation of an ulcer. Klein states the latter occurred only twice in a careful pathologic study of 141 cases of chronic ulcer.

In 1936, Dr. Percy Klingenstein reported all cases of chronic gastric ulcer, 165 in number, which were operated upon during a ten-year period (1925-1935) at the Mount Sinai Hospital, New York. The majority of patients gave a long-standing history of ulcer symptoms which ultimately failed to respond to medical therapy. There was a smaller group with an acute history, manifested by serious bleeding in 25 instances, and by signs of impending perforation in others. In over 20 per cent of these cases, a diagnosis of carcinoma was made by the roentgenologist, and 12 per cent, in which a benign lesion had been diagnosed clinically, were subsequently proven to be malignant.

For purposes of discussion, these ulcers may be grouped into those occupying the pyloric and prepyloric region; those situated at or near the reentrant angle and on the posterior wall of the stomach, and those located in the cardia. The lesions in the latter group of 29 cases were situated well proximal to the reentrant angle and some were juxta-esophageal. Many of these, as well as others, were complicated by adhesions to or penetration into the pancreas. A subtotal gastrectomy with removal of the ulcer was performed in 158 cases. The operative mortality was 15 per cent, contributed to mainly by cases with acute and serious gastric hemorrhages; by those with lesions in the cardia; and by those complicated by either previous gastric procedures, or long-standing pyloric stenosis.

During the past three and one-half years, Doctor Klingenstein and I have operated upon 28 consecutive cases of gastric ulcer. There were six other cases in which a benign lesion was suspected but in which a malignant one was found at exploration. We were not forced to operate upon any case with hemorrhage in the acute stage. We made it a rule to explore all prepyloric ulcers because, clinically, it is extremely difficult to differentiate between ulcer and carcinoma in this region. However, cases with pyloric stenosis were not operated upon until the blood chemistry determinations were normal.

A subtotal gastrectomy was performed in 23 cases, and a palliative gastric resection without removing the cardiac ulcers, the procedure advocated by Madelener and Florcken, was performed in five instances.

No one will deny that most gastric ulcers respond favorably to medical treatment, but, unfortunately, some malignant lesions, too, grow smaller under rest and appropriate diet. But in all cases, if certain well known and established criteria have not fully satisfied either clinically, roentgenologically, and by gastroscopic examination, after a three-week period of an ulcer cure, then surgical exploration should be insisted upon.

Subtotal gastrectomy is undoubtedly the operation of choice. It removes the ulcer radically, and if the case proves malignant, the chances of cure may be materially enhanced. Penetrating juxta-esophageal and high-lying ulcers, even if they do not respond to medical treatment, should be explored, but not radically resected. If they prove malignant, they are inoperable at this stage, and if they are benign, they will disappear following a palliative gastrectomy. The operative mortality in subtotal gastrectomy will be

reduced if these high-lying lesions and cases with acute hemorrhage are treated more conservatively.

The follow-up results in gastric ulcer are excellent, and are superior to those obtained from subtotal gastrectomy for duodenal ulcer. No recurrent gastric or gastrojejunal ulcers have been observed.

DR. WALTMAN WALTERS (Rochester, Minn.): The objections to a routine medical regimen in all cases of gastric ulcer are that in some of them the lesion, instead of being a small gastric ulcer, is in reality an ulcerating carcinoma, and in others the medical regimen has little effect on the ulcer. In about 10 per cent of cases, roentgenologic or gastroscopic examinations will not assist in the differential diagnosis between a malignant and a benign gastric ulcer. It has been said that a trial course of medical treatment serves as a diagnostic aid, for, if the patient is relieved of symptoms, if roentgenographic examination demonstrates that the ulcer has disappeared, and if blood disappears from the stools, then the lesion is benign. Clinical experience, however, has demonstrated that in some cases of malignant gastric ulceration these criteria may seem to be satisfied but that the lesion does not heal; it only *seems* to have done so, for, as Schindler has shown, the carcinomatous process may extend from the margin of the ulcer into the crater, obliterating it.

The incidence of malignant changes in gastric ulcers has been stated to be from 10 to 20 per cent. Walton said that the statistics of Stewart now are generally accepted. He concluded that in 9.5 per cent of cases chronic ulcer becomes carcinomatous and that carcinoma originates in a chronic ulcer in 17 per cent. Katsch, however, reported an incidence of 20 per cent. Finsterer found that in 532 cases of resection for gastric ulcer the ulcer was carcinomatous in 141, an incidence of 20.9 per cent. In the 1907-1938 series, reported from the Mayo Clinic by Doctors Walters, Gray and Priestley, 10 per cent of the carcinomata were reported as gastric ulcers and 1 per cent as benign lesions.

The risk of the operation for gastric ulcer should not exceed a maximum of 5 per cent, and it is possible to operate upon a large series of patients who have gastric ulcer with a mortality rate of considerably less than 5 per cent. In point of fact, in 278 cases in which partial gastrectomy was performed at the Mayo Clinic in 1939 for benign ulcers of the stomach or duodenum, the mortality rate was 4 per cent. Partial gastrectomy for gastric ulcer was performed in 89 cases, with a mortality rate of 2.2 per cent. In 1940, partial gastrectomy for gastric ulcer was performed in 88 cases, with one death. Excision or gastro-enterostomy or both were performed in 17 cases, with no mortality. The cases were selected carefully, and partial gastrectomy was performed only when the nature of the lesion and the condition of the patient warranted this procedure.

On reviewing 272 cases of chronic gastric ulcer in which operation was performed at the Mayo Clinic from January 1, 1933, to December 31, 1936, inclusive, Clagett and I found that 66.9 per cent of the ulcers were at or above the incisura angularis, 15 per cent were on the posterior wall, and 1.5 per cent were on the greater curvature. The remainder were below the incisura angularis.

In several of the cases at the clinic the ulcer appeared, on roentgenologic examination, to be located very high on the lesser curvature, and for this reason it was thought that operative removal would be difficult; it was found at operation, however, that perforation of the lesion to the capsule of the pancreas had given an erroneous idea of the amount of the stomach between the ulcer and the esophagus. In these cases there was actually much more uninvolved stomach than the roentgenogram indicated. On other occasions, the early division of the gastrohepatic omentum at a very high level assisted in mobilizing the upper part of the stomach so that unusually high lesions could be removed without too great difficulty.

During 1938 and 1939, at the Mayo Clinic, in 26 cases partial gastrectomy was performed for cardial gastric ulcer, with one death, a mortality of 3.8 per cent.

I have referred to these cardial ulcers because frequently I have seen patients with such lesions in whom the excuse for a course of medical treatment, even though the lesion was large, and in many cases had been complicated by hemorrhage, was that the lesion was probably located too high to be removed safely. The fallacy of this opinion is borne out not only by the fact which has been brought out, namely, that the lesions appear roentgenographically to be higher than they really are, but in a group of cases in which

such lesions were removed surgically, the operative mortality was only slightly higher than that for similar operations for gastric ulcer located at the lower levels on the lesser curvature or the body of the stomach.

In regard to some of the points on technic brought out in the discussion of Doctor Allen's paper, I sincerely believe that as time passes and anterior anastomosis after resection is performed in more cases, experience will show that posterior anastomosis is preferable in cases in which resections are performed for duodenal ulcer. My reason for this statement is my experience abroad, where many more resections have been performed for duodenal ulcer and the posterior method has proved the method of choice. Furthermore, in my own experience in cases in which the anastomosis is necessarily made anterior to the colon, because of the longer loop of jejunum used in the anastomosis, retention in that proximal loop develops in a definite percentage of cases, and entero-anastomosis has to be performed later. This procedure interferes with some of the physiologicochemical effects of the operation, so that the reduction of gastric acidity is not as great. You will recall that 25 per cent of the unfavorable results in resections for bleeding ulcers which I reported were in cases in which entero-anastomosis was performed.

Theoretically, the Billroth I-type of operation should be an excellent type of operation. In selected cases of carcinoma, its results have been excellent and similar results can be expected when it is used in the treatment of gastric ulcer. When employed in the treatment of duodenal ulcer, it fails to produce a relative achlorhydria in 75 per cent of the cases, and the incidence of recurring duodenal ulceration is high. For example, on follow-up study in our series of bleeding ulcers, recurrent bleeding ulcers were found in four of 19 cases in which the Billroth I-type of anastomosis was employed. In 26.6 per cent of the 15 cases in the whole series, in which results were unsatisfactory, the Billroth I-type of anastomosis had been employed. It is true that these poor results occurred after resection for jejunal ulcers. It might be assumed that the Billroth I-type of anastomosis is the best type in such cases, but such has not been my experience. I have performed Billroth I resections in many cases for duodenal ulcer, gastric ulcer, and gastric carcinoma. The incidence, in my experience, of recurring ulcer after this type of operation performed for duodenal ulcer has been comparable to that following gastro-enterostomy. On the other hand, in the treatment of selected cases of gastric ulcer or gastric carcinoma it has a definite place and the results are equally as favorable as those from the Pólya-type of operation.

DR. FORDYCE B. ST. JOHN (New York, N. Y.): We are in complete accord with Doctor Allen's conclusions, in that we feel they represent a definite tendency in the right direction based on appreciation of potential dangers in ulcer of the stomach which are all too often missed until too late. We have had similar experiences because of our own errors in diagnosis, and that of our medical friends, the roentgenologist and the gastroscopist.

The newer problem of antral gastritis has introduced an "X" factor which may furnish potential danger in differential diagnosis.

Aside from these factors of danger, we should remember that, fundamentally, we are dealing in carcinoma of the stomach with a lesion, advanced on admission to most of our clinics, and in which, in the study of the biologic characteristics of this tumor, one must realize that about 66 per cent are of the invasive type, difficult to cure under any circumstances, and only about 33 per cent are of the so-called fungating type, or the more favorable lesion. In a study of 147 resections of cancer of the stomach at the Presbyterian Hospital, we had no cases of longevity in the invasive type, whereas in the more favorable smaller group, postoperative survivors were found living and well up to 23 years after resection.

DR. J. SHELTON HORSLEY (Richmond, Va.): Doctor Allen has very effectively presented the case of cancerous change in gastric peptic ulcers. This is peculiarly appropriate because at present certain gastro-enterologists are claiming that practically never is gastric cancer developed upon peptic ulcer.

Doctor Allen has given an excellent résumé of the probable changes from peptic ulcer to gastric cancer, but there are exceptions to all of those rules. I had a patient, a man age 31, who had what appeared to be a gastric peptic ulcer. The free hydrochloric

acid was 74°. He proved to have a small round cell carcinoma. He recovered from the partial gastrectomy, but eight months later had a recurrence, from which he died. Of course, this is exceptional, but the exception must be borne in mind.

Another patient, Mrs. L. E. H., age 70, had had gastric symptoms at intervals for about 15 years. A few months before entering the hospital, roentgenologic examination showed a defect in the pyloric end of the stomach. A partial gastrectomy was performed, December 10, 1928. There was a lesion on the lesser curvature about one inch from the pyloric sphincter. The ulcer was not deep but was somewhat infiltrating. Several sections showed the typical appearance of a peptic ulcer, some with regenerating epithelium and leukocytic infiltration. In one section, however, there were two adjacent acini that gave the typical histologic appearance of cancer. There were mitotic figures, a diaster, irregular nuclei, and invasion of the basement membrane. There can hardly be any disagreement as to the fact that the histologic appearance of these two acini showed cancer, and yet everywhere else that it was examined the histologic appearance was that of peptic ulcer. There appears to be no other logical explanation of this case, with the history of gastric disturbance for 15 years, than that the malignancy developed upon a peptic ulcer.

In regard to the treatment of peptic ulcer, I think in most cases a partial gastrectomy is indicated. If the ulcer is penetrating into the head of the pancreas, a type of Billroth I partial gastrectomy, which I have performed for many years, is suitable. The stomach can be divided about its middle between Payr clamps, the distal portion lifted up, and the penetrating ulcer is shaved off with a cautery along with a thin layer of adjacent pancreatic tissue. The stump of the stomach can then be brought over and attached to the stump of the duodenum more readily than this short stump of the duodenum can be closed. There are a few recurrences after this operation, but they can be treated more satisfactorily than a recurrence after a Billroth II-type of partial gastrectomy.

DR. ROSCOE R. GRAHAM (Toronto, Can.): I should like to present data showing the relation of the site of a gastric ulcer to carcinoma. In the personal cases operated upon, in which the lesion was definitely prepyloric, we found that 94 per cent were carcinoma, and only 6 per cent were benign. The group from the esophagus to the incisura showed 40 per cent malignant and 60 per cent benign. Thirty-five per cent of the latter had an organic hour-glass as evidence of their chronicity.

Singleton and Sommers, of the Roentgenologic Department of the Toronto General Hospital, studied a group in which there were 189 prepyloric gastric cancers, and during the same period they found 120 benign prepyloric ulcers. In the group of gastric cancer, ulceration was the only evidence of malignancy in 24, and in 17, or 85 per cent of those, the crater was less than 2.5 cm. in diameter. This supports Doctor Allen's contention that a small ulcer may be malignant, and justifies his suggestion that, even if the person be under age 50, he will operate upon a prepyloric ulcer under 2.5 cm. in diameter. There were eight cases in which carcinoma had probably developed upon a benign ulcer base. We are very anxious that all prepyloric ulcers be proven benign. This means excision, even though the ulcer be small.