CARCINOMA OF THE STOMACH

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Carcinoma of the stomach is commonly considered a hopeless condition. The rate of operability, not more than 25 per cent, has not increased during the past decade. The incidence of this lesion is rising, it attacks the stomach more frequently than any other organ in the body, except the uterus, and it has been estimated that 38,000 persons in the United States alone die annually from carcinoma of the stomach. The situation of the lesion may be such that it is well advanced before tangible symptoms occur and its removal then may be impossible.

On the other hand, in 60 per cent of our cases, the lesion was situated in the pyloric third of the stomach. When the lesion occurs in this area, it usually causes characteristic symptoms early in the course of the disease. Early diagnosis and resection are possible.

Since the roentgen examination is established as the most important procedure in the detection of an early lesion, we believe the chief means of making advancement in treatment, that is, to increase the rate of operability, is to demand a reliable roentgen examination in the presence of less clinical evidence than has been the custom in the past.

Most of our patients with gastric carcinoma had had symptoms 6 to 12 months before a reliable roentgen examination was made. Since most of these patients had lesions in the resectable area of the stomach, the pyloric third, roentgen examinations, made earlier in the course of the disease, should have resulted in the discovery of a larger number of operable lesions.

One of our most difficult tasks is to make known the fact that the patient has an incurable cancer of the stomach. The purpose of this discussion is to present a review of our experience with this lesion, from the standpoints of both the clinician and the roentgenologist. Since the roentgen examination is of greatest significance, details relative to the procedures we have found most helpful will be given. Physicians and laymen alike are now "cancer conscious," and we believe anyone in the carcinoma age who has gastric symptoms which persist one month or longer should have a thorough examination, including a reliable roentgen examination. In this way, more operable lesions will be discovered and at least some progress will be made as compared with no progress during the past ten years.

Advancement has been made in the early diagnosis of carcinoma elsewhere in the body, many of which, at one time, were considered hopeless. The woman with a lump in her breast or the one who has a bloody discharge does not wait as long as formerly before demanding an exact

diagnosis. But the patient with significant dyspepsia still procrastinates too long before demanding an exact diagnosis.

If we are sufficiently "cancer-conscious," we will not wait until the obsolete text-book picture of gastric carcinoma is present before demanding a reliable roentgen examination. We must make the diagnosis, if possible, while the patient appears normal, before there is a palpable tumor or a reduction in hemoglobin and red blood cell count, or loss in weight.

There are physicians who, when confronted with characteristic evidence of gastric carcinoma, deliberately avoid roentgen examination. They sincerely believe that nothing can be done by way of curing the patient, so why subject him to the trouble and expense of a roentgen examination? From our experience, we firmly believe that at least one roentgen examination is indicated under such circumstances. If gastric carcinoma is found to involve an unresectable area of the stomach, the condition is truly lamentable. But, since our experience shows that more than one-half of these lesions are in a resectable area, too much emphasis cannot be placed on the value of a trustworthy roentgen examination as early in the course of the disease as the first appearance of the patient in the physician's office. These patients, sooner or later, realize that they are not making satisfactory progress, so they seek aid elsewhere and we see too many of these tragic cases, tragic because the primary lesion is most often in the pyloric third of the stomach, and could have been resected if diagnosis had been made at the time the patient first consulted the physician.

Although the number of cures in relation to the incidence of the disease is appallingly small, approximately 50 per cent of the patients are alive and with no evidence of recurrence three years after operation if the growth is limited to the walls of the stomach at the time of the resection[1]. Gatewood[2], in reviewing a series of cases in which operation had been performed at the Presbyterian Hospital in Chicago, found that, of those patients who survived operation, 46.1 per cent lived more than three years, and 39.5 per cent survived more than five years, regardless of the extent of involvement of lymph nodes at the time of resection. When dealing with gastric carcinoma involving the distal third of the stomach, we know that, if a curative resection cannot be done, at least palliative types of operations are justifiable, because these patients may live in comparative comfort for years.

The size of the growth in the pyloric segment does not necessarily determine the extent of metastases or operability. If physical examination does not revel evidence of fixation and there is no demonstrable evidence of metastases, such as in the cul-de-sac of Douglas as determined by rectal examination, or in the cervical glands, we believe

exploratory operation is justified, regardless of the size of the lesion. Large lesions may metastasize late while early lesions may metastasize early. A polypoid type of lesion, although palpable on physical examination, may be limited to the pyloric segment of the stomach. An infiltrative type of lesion too often involves more of the stomach than is detectable by roentgen examination, and, although physical examination reveals entirely normal findings, the patient may have an unresectable cancer of the stomach.

Age Incidence: In our series, 80 per cent of the patients were between the ages of 40 and 70 years, the usual carcinoma age, but nearly 10 per cent were below the age of 40. Patients who have not attained the usual carcinoma age are not immune to gastric carcinoma any more than they are immune to carcinoma elsewhere in the body.

Sex: Approximately 70 per cent of the patients were males, 30 per cent were females.

Heredity: Eighteen per cent gave a history of carcinoma in the family.

Duration of Symptoms: A review of the histories of 600 cases reveals that symptoms had been present for the following lengths of time: 1 to 3 months—19 per cent; 3 to 6 months—15 per cent; 6 to 12 months—24 per cent; 12 to 18 months—12 per cent. Thus the largest group had had symptoms 6 to 12 months before a diagnosis was made.

There was a history highly suggestive of previous benign ulcer in approximately 5 per cent of the patients.

Symptoms

Since there are no characteristic symptoms which apply to all cases of early gastric carcinoma, we believe that any adult person who has persistent, chronic indigestion (so-called "stomach trouble") should be considered as having carcinoma until the roentgen examination shows no evidence of this disease. This applies particularly to an individual who has had perfect digestion until a few months prior to seeking medical attention. The onset of indigestion in many of our patients started during a severe "cold," bronchitis, or an attack of influenza. Alterations in diet or the use of patent medicines may have given relief of symptoms for weeks at a time, but sooner or later the patient realizes that, regardless of self-treatment, his indigestion persists.

The type of symptoms will, of course, depend upon the location and character of the lesion. At least four syndromes should be kept in mind. A lesion near the cardia often produces dysphagia while a lesion at or near the pylorus produces early symptoms of obstruction. On the other hand, a lesion in the pars media, the so-called "silent area" of the stomach, may produce no symptoms other than unusual weakness

and anemia until far advanced. In the relatively small group of cases wherein there is a history highly suggestive of previous peptic ulcer, with remittent attacks over years of time, there is usually a significant change in symptoms which suggests either complications or malignant change.

The most characteristic group of symptoms occurs in the case of a lesion situated at or near the pylorus, and this is the condition with which we are particularly concerned because symptoms occur early and complete resection is often possible in the early stages. The first symptom is usually an unexplainable loss of appetite. Then distress in the epigastrium occurs, usually coming on 15 to 30 minutes after eating. The distress may be described as a sense of fullness, weight, or oppression, and later becomes a dull pain. Belching is prominent. Finally, food causes not only distress but nausea and vomiting also. The patient slowly becomes weaker, thinner, and paler. A lump may be discovered in the upper abdomen, and this may mean that a hopeless stage has been reached. If possible, the diagnosis should be made before physical examination reveals any evidence of abnormality.

Although these symptoms are characteristic of carcinoma at the pylorus of the stomach, it is obvious that similar symptoms occur in the presence of any obstructing lesion in this area. However, the clinician must always think first of the possibility of carcinoma when these symptoms are present, particularly if there has been no antecedent indigestion and the symptoms have been present continuously for a relatively short period of time. Some patients with a malignant lesion in this area will have symptoms highly suggestive of peptic ulcer and will obtain temporary relief by taking frequent feedings and alkalies, while other patients will have indeterminate symptoms.

Bleeding, as determined by benzidine tests for occult blood in the stools, is a common finding, but massive hemorrhage in patients having gastric carcinoma is unusual in our experience. Perforation is also uncommon in our experience.

Cachexia is a late sign and usually signifies the hopeless stage.

Physical Examination

Emphasis has been placed upon the fact that the chance for cure applies chiefly to those patients who have no abnormal findings on physical examination. Occasionally, there will be evidence of metastasis in the liver, omentum, cul-de-sac, or cervical lymph nodes before the primary growth can be palpated. If a palpable mass in the upper abdomen is present, it may be tender. It usually is not fixed. Not only does it move with respiration but it can be moved on change of posture by the patient, particularly on deep inspiration. The mass may be felt

when the patient is sitting, standing, or leaning forward, if not while he is lying on his back. Evidence of pyloric obstruction may be present.

Laboratory examinations, such as gastric analyses and blood counts, frequently show abnormalities even though the patient may have a resectable lesion. Gastric analyses usually show a diminution in acidity, and blood counts reveal a hypochromic anemia, but normal findings may be present, and occasionally hyperacidity is found. The most severe degree of anemia is encountered when dealing with lesions in the pars media of the stomach, because, due to the absence of symptoms, these lesions are usually far advanced before the physician is consulted.

Pathology

The clinician and roentgenologist are chiefly interested in the gross characteristics of the lesion, such as size, situation, whether or not it is causing obstruction, its operability, the resulting size and shape of the stomach as a whole, and other clinical features encountered in each individual problem.

Although pathologists have devised many classifications of carcinoma of the stomach, certain gross features predominate as emphasized by Kantor[3]. Mixed types of lesions are commonly encountered, but the chief characteristic gross involvement may be a polypoid lesion, an infiltrative lesion, or an ulcerating carcinoma.

In the *polypoid group*, a polypoid mass or masses project into the lumen of the stomach. This includes adenocarcinoma, the medullary and colloid forms of carcinoma, as well as papillary carcinoma which arises in a pedunculated polyp, and other tumors such as adenomata which have undergone malignant change.

In the *infiltrative group*, the gross findings consist chiefly of a thickening of the gastric wall. Scirrhous carcinoma is sometimes associated with linitis plastica which was formerly regarded as benign. Due to the excessive growth of connective tissue, detailed study of the microscopical sections is necessary to establish an accurate diagnosis. Scirrhous carcinoma is usually a slowly growing tumor which involves all coats of the stomach, particularly the submucosa and the muscularis. On the other hand, diffuse medullary carcinoma and lymphosarcoma[4], from the gross standpoint of malignant tumors, are included in this group, and these lesions are highly malignant.

Ulcerations develop in any of the previously mentioned forms of carcinoma, but from the gross anatomical standpoint the ulceration may seem to be the predominant change. In our experience, carcinoma does not develop in benign ulcers in more than 5 per cent of the cases.

The size and shape of the stomach are altered according to the type and extent of the growth, as well as its location. Carcinoma at the

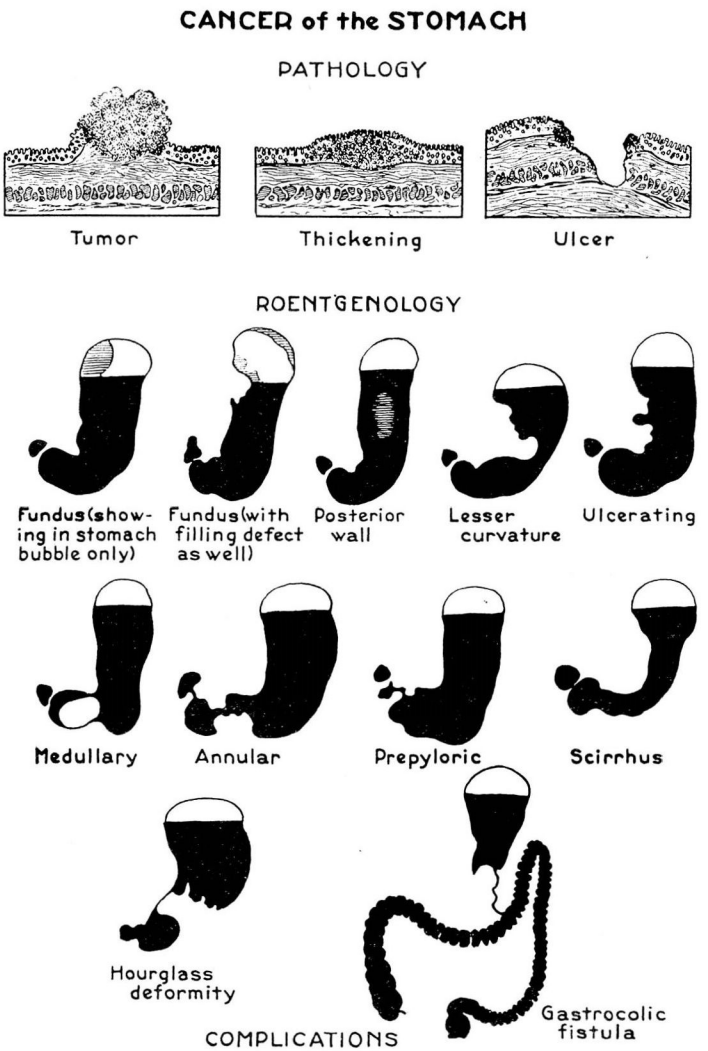

FIGURE 1: Types of pathological changes and roentgen findings in carcinoma of the stomach. (By kind permission of Kantor, J. L.: Synopsis of Digestive Diseases, St. Louis, C. V. Mosby Co., p. 116, 1937.)

cardiac end may contract the stomach, an hour-glass deformity may be due to cancer in the pars media, and dilatation of the stomach may be caused by a growth at the pylorus.

Metastases occur in the regional lymph nodes and the liver. During the original examination, palpation of all superficial lymph nodes is a routine procedure. Involvement of the left supraclavicular gland (Virchow's gland) is more rare in our experience than the occasional metastases in the cul-de-sac (Blumer's shelf). Peritoneal metastases, including bilateral metastases to the ovaries (Krukenberg's tumors),

may produce symptoms and findings which are more predominant than those attributable to the primary lesion in the stomach. In our experience, metastasis to bone is rare, occurring in not more than 6 per cent of cases. It should be emphasized that not all enlarged lymph nodes encountered at exploration are due to metastases.

Roentgen Examination

When the gross pathological findings are kept in mind, the interpretation of the roentgen findings, particularly in the case of an early lesion, are facilitated (Fig. 1). In order to make the roentgen examination available to the largest possible number of patients, the cost of this examination should be as low as adequate procedures will permit. One or two films are sufficient for purposes of record if the findings at fluoroscopic examination show the presence of a large lesion. When fluoroscopy is not used or if the findings are questionable, the examination should not be considered adequate unless serial films are taken with the patient in several different positions. *A reliable opinion cannot be based on the inspection of one or two films alone unless the lesion is large.*

Early lesions on the anterior or posterior wall, at or near the stoma of a gastro-enterostomy, or in the cardiac end of the stomach are most easily visualized when only a small amount of barium suspension is used. In fact, such lesions may be obscure if the stomach is examined only when completely distended with the opaque medium. On the other hand, evidence of an early infiltrative process in the wall of the stomach may be apparent only when this viscus is completely filled with the barium suspension. At this time, lack of flexibility of a certain segment, particularly if the peristaltic waves skip this area, is revealed to best advantage.

Methods Used in the Roentgen Examination

A summary of the methods which have proved most important in our experience[5] are as follows: By considering the fluoroscopic examination as divided into two stages, one during and after the ingestion of a small amount of barium suspension, and the other during and after the ingestion of the remainder of the barium meal, equal importance is attached to both phases of the examination. During the first stage, emphasis rests on a minute study of the mucosal markings, while during the second stage, emphasis is placed on evidence of induration, lack of flexibility, peristalsis, and motility of the stomach. Films are made in various positions while only a few mouthfuls of barium are in the stomach if the initial fluoroscopic findings are abnormal; otherwise, the second part of the fluoroscopic examination continues with the first.

In using palpatory manipulation, it is important to make certain that the marginal contours of the gastric antrum, pylorus, and duodenal bulb, each in turn, are visualized by making pressure proximal thereto, before making any pressure directly on these areas. Otherwise, spasm may be induced and it may be necessary to send the patient out of the fluoroscopic room for some time, from five to thirty minutes sometimes being necessary before the examination can be continued, or a recheck examination the following day may be required.

Examination in all positions should never be omitted because a globular viscus is being examined. In order to detect the presence of an early lesion, we must remember that it may not involve either the lesser or the greater curvature of the stomach; it may be situated on the anterior or posterior wall and may be visualized with difficulty.

The following routine procedure is used: While the patient is standing, he turns slowly from the extreme left (left side of the body to table) to the extreme right position. When examining a high steerhorn stomach in an obese individual, the patient turns entirely around. In addition to observing any deformity of the gas bubble while the patient is standing, in order to make certain that no abnormality exists in the cardiac end of the stomach, the patient is placed in the supine and Trendelenburg positions and rotated into both the left and right oblique positions. To exclude the presence of diaphragmatic hernia, the patient is instructed to take a deep breath (Trendelenburg position), hold it, and bear down as though at stool. The increase in intra-abdominal tension while the patient is in these positions will materially aid in disclosing any evidence of abnormality in the cardiac end of the stomach. Then the usual fluoroscopic examination in the supine and prone positions with the table in the horizontal position, the patient turning from side to side, is made. *Unless recent hemorrhage or questionable perforation is present, palpatory manipulation is used in order to visualize all parts of the stomach.* Films are made at the most advantageous time and with the patient in the most advantageous positions to show the lesion. If the findings are easily demonstrated, only one or two films are made. If the fluoroscopic findings are negative, three films are made routinely, because occasionally an early lesion is missed on fluoroscopic examination. These films are made while the patient is in the supine position, to exclude a possible lesion in the cardiac end of the stomach, the prone position, to exclude a possible lesion involving the body and antrum of the stomach, and the right oblique position, to exclude a possible lesion in the anterior or posterior wall of the stomach, as well as to remove possible spinal compression on the gastric antrum. In the case of an early lesion which is situated below the costal border, a compression device may be used while taking some of the films, usually during the first

stage of the examination when the patient has only a small amount of barium suspension in the stomach. An additional check on the examination of the mucosal markings, which is advisable if spasm is a confusing factor, is obtained by making films as the stomach empties, at intervals of one-half hour. In cases showing abnormal initial fluoroscopic findings, we routinely make retention films four to six hours after the ingestion of the barium meal.

Interpretation of Roentgen Findings

The interpretation of the roentgen findings is obvious when the lesion is large. In this discussion we are primarily interested in the early lesion. Correct interpretation of the presence of a polypoid type of growth is a simple matter compared with the detection of an early infiltrative type of lesion. In order to visualize the gross pathological changes mentioned, it is helpful to contrast the roentgen findings in the two groups. In this way, the early changes from the normal findings are more apparent (Table I).

Table I

Roentgen Findings in Carcinoma of the Stomach

	POLYPOID GROUP (Projection into Gastric Lumen)	INFILTRATIVE GROUP (Thickening of Gastric Wall)
Predominant Deformity	Filling defect; subtraction from general lumenal contour	Usually no filling defect
	Filling defect corresponds with palpable mass on fluoroscopic examination	
Mucosal markings	Rugae terminate abruptly	Rugae terminate gradually if at all
General size of stomach	Usually normal. Large if obstructed	Usually smaller than normal Loss of expansibility
General shape of stomach	Usually normal, aside from filling defect, unless pyloric obstruction is present	Usually asymmetrical, distorted by contractures; occasional X-shaped deformity
Flexibility	Normal except in area of filling defect	Marked loss of flexibility
Pyloric Function	Normal unless obstruction is present	Usually gaping of pylorus Markedly increased motility
Peristalsis	Absent in involved area	Absent in involved area
Gastric Retention	Present if lesion involves pylorus	May be present if lesion is annular
Differential Diagnosis	Persistent pylorospasm. Benign gastric neoplasms. Hypertrophic rugae	Persistent pylorospasm. Prepyloric ulcer. Hypertrophy pyloric muscle. Linitis plastica. Gastric syphilis. Malignant lymphomata. Gastric tuberculosis.

An early roentgen finding, unless the lesion involves the pylorus, is a gaping of the pylorus or rapid emptying of the stomach, regardless of the type or location of the growth in the stomach. It is well known that patients who have low gastric acidity often have stomachs which empty rapidly. Rapid emptying is a predominate feature in the case of infiltrative lesions and there is usually a dilatation of the duodenal bulb due to the rapid emptying mentioned. The stomach may be empty before the films are exposed unless they are made soon after the ingestion of the barium meal.

The dilatation of the stomach due to a *malignant* obstructing lesion is usually less pronounced than that caused by a benign obstructing lesion, possibly due to the relatively short duration of the lesion, the early gaping of the pylorus which may, in part, be due to infiltration of the gastric wall, particularly in the infiltrative type of lesion. During exploration, the pathological changes in the infiltrative type of lesion are often found to be more extensive than the roentgen examination would indicate, while in the case of the polypoid type of lesion the findings on exploration are likely to be less extensive than was contemplated.

In a consideration of the third group, the lesions which are predominantly *ulcerating carcinomata*, one must remember that gastric carcinoma is encountered more commonly than benign gastric ulcers. In our experience, benign gastric ulcer is rare. The roentgen criteria which have been found important have been discussed elsewhere[6]. A fixed routine has been established, namely, if operation is not performed a neoplastic process is not excluded unless progress roentgen examinations show a marked diminution or a disappearance of the gastric deformity in two to four weeks while the patient is on medical management for ulcer, irrespective of symptomatic relief or disappearance of occult blood in the stools. A history of recurring attacks of indigestion for a long period of time does not exclude a malignant process at the time the roentgen examination is made.

A roentgen diagnosis of an ulcerating neoplasm is made when any one or more of the following criteria are present: the niche has a large transverse diameter, 2.5 cm. (the size of a quarter) or larger; it has an irregular border; it is associated with a filling defect, a subtraction from the general luminal contour of the stomach although diminutive in size; or it is situated at or near the greater curvature of the stomach. The meniscus sign[7] and overhanging border[8] of the ulcer are pathognomic of a neoplastic process.

From the standpoint of location alone, we regard any ulcer in the pyloric third of the stomach with suspicion, even though it is on the lesser curvature. Gastric resection is often the treatment of choice

in this instance, even though the ulcer is benign. Singleton[9] has reported 4 cases of ulcer in the prepyloric area which were proved benign by serial microscopical sections. Thus, an ulcer in this area is not necessarily a part of a neoplastic process, but in our experience such lesions are more often malignant than benign.

Other findings which are frequently associated with an ulcerating neoplasm are the following: the spastic phenomena which are often associated with a benign ulcer are not only absent but peristalsis itself is usually sluggish, adjacent rugae are usually obliterated, and the lesion is generally not tender on palpation during the fluoroscopic examination.

The gastric ulcer is usually benign if the niche is small and has a smooth, clear-cut outline without evidence of an associated filling defect, is situated on or near the lesser curvature at the incisura angularis or proximal thereto, and the adjacent rugae show no abnormality other than possible accentuation and convergence toward the crater. Localized tenderness and spastic phenomena, such as an incisura on the greater curvature opposite the ulcer, pylorospasm, or a six-hour gastric retention may or may not be associated findings. However, the roentgen diagnosis of "benign gastric ulcer" is not made unless there is a marked diminution or disappearance of the gastric deformity on progress roentgen examinations. The differential diagnosis, from the roentgen standpoint, must include the conditions mentioned in Table I.

Diagnosis

In our experience, the interpretation of the roentgen findings has coincided with the findings on exploration in 97 per cent of the cases wherein exploration was performed. Therefore, we believe the roentgen examination is the most important single diagnostic procedure in the early diagnosis of gastric carcinoma. Gastroscopy and intragastric photography are assuming increasing importance but, at the present time, we believe these procedures are adjuncts to a reliable roentgen examination.

Treatment

Although the treatment of gastric carcinoma is too often hopeless, an increasing number of cures are being obtained by radical resection. The situation of the lesion may be such that it is well advanced before symptoms occur and its removal may be impossible, but if the lesion is situated in the pyloric third of the stomach, if there is no evidence of fixation of the primary growth or evidence of metastases, we believe exploration is indicated, regardless of the size of the lesion. While the infiltrative type of lesion is often more extensive than the roentgen or exploratory findings would seem to indicate, a large polypoid lesion,

even though palpable on physical examination, may be a localized process. In any event, if the lesion is situated at or near the pylorus, exploration and gastro-enterostomy are usually indicated because palliative procedures in this instance may result in comparative comfort to the patient for long periods of time.

The only treatment of cancer of the stomach is surgery, directed toward either the removal of the growth or to palliation if the growth is not resectable.

In our experience, roentgen therapy is effective only in lymphosarcoma of the stomach. In gastric cancer, roentgen therapy has not only failed to influence the course of the disease but it has actually increased the patient's discomfort.

SUMMARY

1. The value of the roentgen examination in the detection of early gastric carcinoma has been considered.

2. The importance of a reliable roentgen examination in an adult who has had gastric symptoms which have persisted one month or longer has been emphasized.

3. When the lesion involves the pyloric segment of the stomach, exploration is indicated regardless of the size of the lesion, if there is no fixation of the primary growth and there is no demonstrable evidence of metastasis.

4. The chief means of making advancement in the treatment of this dreaded disease, that is, to increase the rate of operability, is to demand a reliable roentgen examination on less clinical evidence than has been the custom in the past, on the part of both the clinician and the layman.

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