RECENT DEVELOPMENTS RESULTING IN AN INCREASING OPERABILITY RATE FOR CANCER OF THE STOMACH

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Although little has been contributed to the technical aspects of gastric surgery since the days of Billroth, Hoffmeister, and Polya, developments in the past two years have enabled us to double the operability rate of cancer of the stomach and to reduce simultaneously the mortality rate to nearly half of its previous figure. Since 1938 the number of gastric resections for cancer of the stomach at the Cleveland Clinic has risen from 15 per cent to 30 per cent of all cases seen. At the same time the mortality rate for these operations has fallen from 25 per cent prior to 1939 to 15 per cent in the thirty-three cases having resections in the past two years. If cases requiring total gastrectomy or modifications of this procedure entailing esophago-gastrostomy or esophago-enterostomy are excluded, the mortality rate in partial gastrectomy for cancer of the stomach has been reduced to 7 per cent.

These results have not been obtained as a consequence of technical advances in gastric surgery, nor are they the result of earlier diagnosis. The widening of operability and the lowering of the mortality rate are, I believe, largely the result of the use of sulfapyridine, and of improvements in the technic of anesthesia.

Prior to 1939, the vast majority of gastric resections for cancer were performed under ether anesthesia, and the incidence of postoperative pneumonia was high. Fifty per cent of the postoperative deaths in this period resulted from pulmonary complications. With the use of sulfapyridine, pneumonia can be prevented or cured, and the mortality rate of gastric surgery reduced.

In subtotal gastrectomy for advanced carcinoma, even when the patient is anemic, emaciated, and in poor condition, the danger of peritonitis is slight. The greatest danger always has been pneumonia. Since this complication now can be avoided or treated successfully, the surgeon may feel safe in performing radical gastrectomies in elderly patients who would not have been expected to survive in the days before the development of sulfapyridine and sulfathiazole. These changes have necessitated a revision of our standards of operability for cancer of the stomach.

The prognosis of patients with cancer of the stomach always has been poor. Only a small percentage of all patients subjected to resection of the stomach for cancer have lived five years without recurrence. In spite of this, perhaps no operation is attended by more brilliant initial results than gastric resection for carcinoma.

The patient who prior to operation had continuous gastric distress,

who was anemic, could not eat, and had lost 30 to 40 pounds in weight, often is transformed by partial gastrectomy to a healthy-looking, comfortable individual. Even though he may harbor carcinoma in the retroperitoneal glands or in the liver, he is given a year, two years, or three years of comfort and well-being before succumbing to metastases. Such palliation of symptoms is well worth while and is desirable because both patient and physician can live in the hope that the disease may have been eradicated completely.

If these results can be obtained without subjecting the patient to too much risk of postoperative death, both surgeon and physician are happy that palliation and a chance of cure can be afforded. However, if the risk of operation is considered great, and even though the patient is willing to assume that risk, the surgeon and physician are loath to assume the responsibility.

A hospital death always is unwelcome and, for this reason, patients with advanced carcinoma of the stomach or aged patients who were not good operative risks were rarely subjected to radical gastric resections. With the lowering of the operative mortality in gastric surgery, there should be a widening of the standards of operability, and many more patients should be given palliation of their symptoms and a chance of cure by gastric resection.

A second factor of value in the management of the bad risk case has been the increasing use of local anesthesia. Although the use of local infiltration anesthesia and a splanchnic block is by no means new, only recently with the development of the short action barbiturates designed for intravenous use has local anesthesia become satisfactory to both patient and surgeon.

A gastric resection does not require deep anesthesia and absolute relaxation. In fact, local anesthesia with its quiet respiration and absence of straining is often preferable to the deepest general anesthetic. The use of sodium pentothal, given as an *analgesic* agent in conjunction with infiltration of the abdominal wall and splanchnic region with novocaine, results in comfort to the patient and affords a quiet relaxation which is ideal for the surgeon. The depression of a general anesthetic agent is obviated; hard breathing and inhalation of mucus is avoided; the blood pressure is not depressed such as in spinal anesthesia; and the patient's nervousness and discomfort is controlled at will by adding additional small amounts of pentothal. Two or 3 cc. of a 5 per cent solution of sodium pentothal given slowly will result in a quiet analgesia characterized by a complete absence of excitation or euphoria. The patient becomes drowsy and may fall asleep, but is always easily roused. If he complains of discomfort, an additional 1 or 2 cc. may be added. As a rule, 10 cc. will suffice to complete a gastric resection.

In the majority of cases, the abdomen can be opened without discomfort under local anesthesia. Following this, the patient is given 3 or 4 cc. of pentothal and the splanchnic region is infiltrated with novocaine. The tumor then is delivered and resected. During the suturing of the lines of anastamosis there is rarely any discomfort. Only during periods of traction on the stomach or mesentery does the patient experience any discomfort, and at these times the addition of small amounts of pentothal quickly allays all pain. A small additional dose often will facilitate closure.

Only the very nervous individual fails to react satisfactorily to this

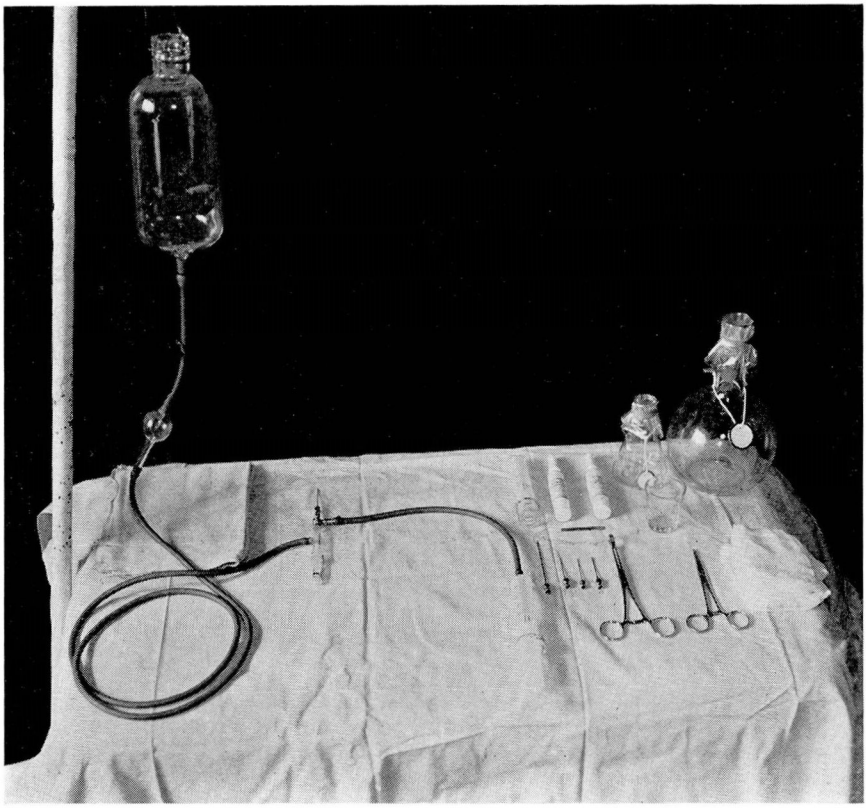

FIGURE 1: Apparatus for intermittent administration of sodium pentothal during abdominal operation.

type of anesthesia. If the patient continues to complain, it probably is better to give 3 or 4 cc. of pentothal as an aid to the induction of a general anesthesia rather than to give large doses of this drug (Fig. 1). I wish to emphasize that *pentothal is recommended as an analgesic, not as an anesthetic agent* for prolonged abdominal operations.

With the increasing use of local anesthesia, and with the early use of

sulfapyridine or sulfathiazole in the prophylaxis and treatment of pneumonia, we not only have extended the scope of operability to older patients and to patients with greater degrees of anemia, debility, and emaciation, but also have undertaken a higher percentage of gastric resections upon patients having lesions high in the cardia, or involving adjacent organs by direct continuity. The following case reports illustrate some of the more hazardous technical procedures which have been carried out by this technic.

Case 1: Total gastrectomy for infiltrative carinoma of the stomach.

History: The patient was a forty-four year old man who had experienced burning upper abdominal pain for three months prior to entry. He had lost ten pounds in weight.

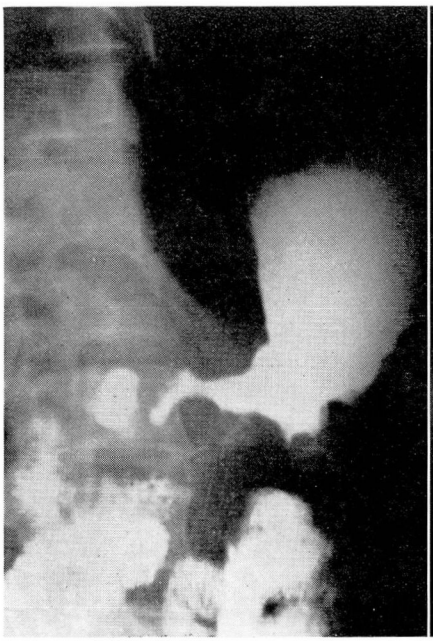

FIGURE 2: Roentgenogram showing extensive infiltrating carcinoma of the stomach requiring total gastrectomy.

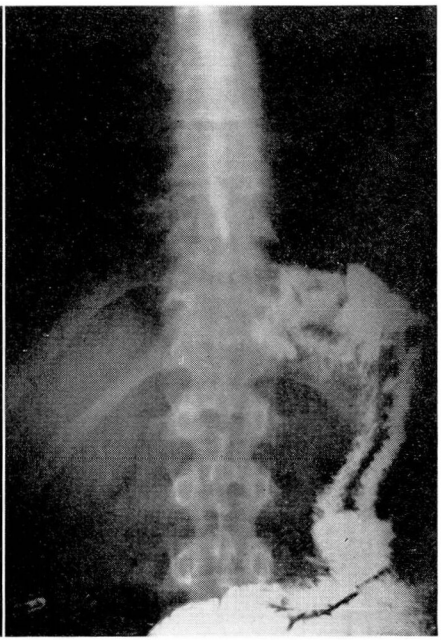

FIGURE 3: Postoperative roentgenogram showing esophago-enterostomy following total gastrectomy for carcinoma.

Physical examination revealed no abnormalities. Roentgen examination of the stomach showed an extensive filling defect in the distal two thirds (Fig. 2).

Operation: Under local anesthesia, supplemented by nitrous oxide oxygen and ether, the abdomen was explored. Exposure was obtained by cutting the costal cartilages of the lower ribs on the left and reflecting the costal cartilage upward, care being taken to avoid opening the pleura. The ligament of the left lobe of the liver also was cut close to the diaphragm and the left lobe of the liver was retracted. Excellent exposure of the esophagus was thus obtained. The

entire wall of the stomach from pylorus to esophagus was thickened. Several lymph glands along the lesser curvature were enlarged and hard. The jejunum was brought up through a rent in the mesocolon and anastomosed to the posterior wall of the esophagus by a row of interrupted silk sutures. The entire stomach then was resected. The anastomosis was completed by a row of continuous catgut sutures both anteriorly and posteriorly and by a row of interrupted silk sutures anteriorly. Finally, the diaphragmatic and esophageal peritoneum was mobilized and sutured over the line of anastomosis to the jejunum with interrupted silk sutures. An entero-anastomosis was performed, and the abdomen was closed without drainage.

Course: The immediate postoperative course was stormy, the patient's temperature rising to 104° F. and pulse rate rising to 140 on the first postoperative night. In response to sodium sulfapyridine given intravenously, the temperature and pulse reaction subsided. A roentgenogram of the chest revealed bronchopneumonia. By the tenth postoperative day, the temperature and pulse had fallen to normal levels. After removal of the nasal tube which had been inserted before operation and which was kept in the jejunum during the first week, he was able to swallow food and fluids without discomfort. The patient was discharged on the eighteenth postoperative day. A roentgenogram taken one month after operation showed the barium entering the small bowel without obstruction (Fig. 3). The patient, however, has failed to gain weight in a satisfactory manner and still has some abdominal distress, possibly the result of metastasis, although no evidence of distant metastasis was found at the time of operation. In view of the diffuse infiltration of the lymph glands the prognosis is poor.

Pathological Report: The wall of the stomach was diffusely thickened and edematous and the mucosa was diffusely hemorrhagic. There was an irregular ulcer, 2 cm. by 3 cm. in diameter on the lesser curvature and extending into the anterior and posterior walls. There were numerous enlarged lymph nodes on both lesser and greater curvatures, but these were soft and not suggestive of metastatic carcinoma.

Microscopic Examination: A section from the ulcerated area showed highly undifferentiated adenocarcinoma infiltrating all coats of the stomach and extending into the omental fat. A number of lymphatics were filled with tumor cells. A section taken near the greater curvature showed the mucosa to be intact, but the submucous coat was diffusely infiltrated with carcinoma. Sections of two omental lymph nodes showed diffuse involvement with carcinoma.

Comment: This type of carcinoma of the stomach probably offers the poorest prognosis as to longevity and possibility of permanent cure. When the carcinoma has disseminated itself through the lymphatics and has diffusely invaded the lymphatic channels, the chances of removing the entire growth are minimal. The most favorable cases are those in which there is a definite localized tumor without infiltration of the lymphatics or extensive lymph note metastasis.

Case 2: Lymphosarcoma of stomach; esophago-enterostomy with preservation of a portion of the fundus.

History: The patient was a fifty-two year old man who complained of epigastric pain of one year's duration. He had lost twenty pounds in weight and the symptoms had increased in severity despite the use of a modified Sippy diet.

The physical examination was essentially negative. Roentgen examination of the stomach showed an extensive filling defect with infiltration of the walls of the entire pars media and extending into the pars pylorica of the stomach.

Operation: Under local and splanchnic anesthesia supplemented with

sodium pentothal and nitrous oxide analgesia, the abdomen was explored. There was a firm neoplasm involving the entire lesser curvature of the stomach from pylorus to esophagus. A few large firm glands were palpable in the mesentery along the lesser curvature. Since the greater curvature of the stomach was not involved, it was decided to resect all of the lesser curvature and to leave a portion of gastric mucosa on the side of the greater curvature to increase the capacity for food. The entire lesser curvature and the greater part of the stomach on the greater curvature then was resected. The esophagus and a portion of the fundus were anastomosed to the jejunum by the posterior Polya technic. Because the jejunum was carried so high on the lesser curvature side, an entero-enterostomy was performed.

Course: The postoperative convalescence was uneventful. The patient left the hospital on the fourteenth postoperative day. Five weeks after operation he

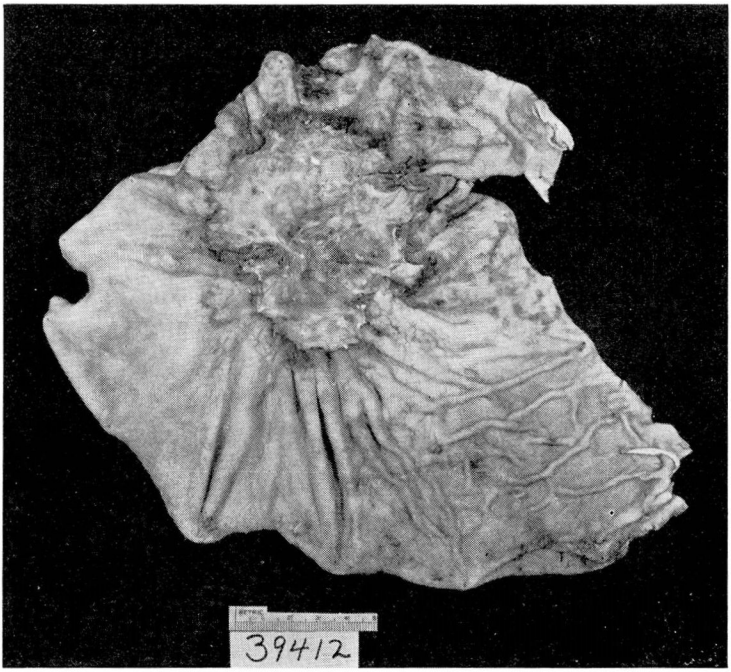

FIGURE 4: Lymphosarcoma of the stomach.

had gained seven pounds. He stated that his appetite was very good and that he was free from pain.

Pathological Report: The specimen consisted of a large part of the stomach, including the pyloric ring and very little of the duodenum. On the lesser curvature there was a very large, irregular, ulcerated lesion measuring 8 cm. longitudinally and 8.5 cm. transversely. The margin of the ulcer was outlined by hyperemic mucosa which was not thickened and was slightly overhanging. The ulcer extended to this outlined margin. The base of the ulcer was covered by a thick layer of plastic exudate. The wall of the stomach was considerably thickened at the site of the ulcer and there was quite marked induration of the fat of

the lesser omentum. There were numerous considerably enlarged, lesser omental lymph nodes. On the anterior wall there was another small ulcer 1.5 cm. in diameter similar in gross characteristics and extending to the muscular coats. On the posterior wall just beyond the distal border of the large ulcer there was another early ulcerated lesion 1.5 cm. in diameter (Fig. 4).

Microscopic Examination: Sections of the stomach showed ulceration with complete loss of mucosa and a lymphosarcomatous growth involving the submucous and mucous coats chiefly, but also involving the muscular coat in some areas. Sections of numerous lesser and greater omental lymph nodes showed lymphosarcomatous involvement.

Comment: Several patients with lymphosarcoma of the stomach have done well following gastric resection alone and others have responded favorably to roentgen therapy. If a recurrence of the tumor occurs in this case a course of roentgen ray therapy will be given.

Case 3: Extensive carcinoma of stomach with direct extension of tumor into the pancreas and liver; gastric resection.

History: The patient was a fifty-seven year old man who gave a history of anorexia and vomiting of eight months' duration with a loss of twenty-five pounds in weight.

Physical examination was essentially negative, except for the finding of a large, hard epigastric mass. Roentgen examination of the stomach showed a large filling defect involving the entire pars pylorica.

Operation: Under local anesthesia with a splanchnic block, the abdomen was opened and the stomach exposed. The lesion involved the entire lower half of the stomach, and the left lobe of the liver by direct extension. It was fixed posteriorly to the pancreas which also had been invaded by direct extension of the tumor. In spite of the extensiveness of the local lesion, the omental lymph nodes were not very much enlarged and no nodules were palpable in the liver. Resection of the lesion, therefore, was decided upon. The portion of the liver invaded by the carcinoma was about two inches in diameter and after electrocoagulation of the liver tissue this area was resected along with the carcinoma. There was no bleeding and no apparent leakage of bile. Because the body of the pancreas had been similarly invaded, the anterior surface of this organ likewise was resected with the primary lesion. The stomach was anastomosed to the jejunum by the posterior Polya technic. Two rubber tissue drains were left in the pancreatic bed.

Course: The postoperative course was uneventful except for the development of a pancreatic fistula which discharged large amounts of clear fluid, but showed no tendency to digest the skin. The patient left the hospital on the eighteenth postoperative day and was eating well without distress. Two months later he had gained fifteen pounds, and he stated that he never felt better in his life. The fistula closed spontaneously one month after operation.

Pathological Report: The specimen consisted of the distal end of the stomach in which there was a large tumor mass with a central irregular ulcer 7 cm. by 13 cm. in diameter. All coats of the stomach were infiltrated by the tumor and were from 2.5 to 3 cm. in thickness. Attached to the lesser curvature was a piece of liver tissue 3 cm. in diameter and 1 cm. in thickness.

Microscopic Examination: Sections of the tumor showed a highly undifferentiated adenocarcinoma infiltrating all coats of the stomach and extending into the mesenteric fat. Of the thirteen lymph glands examined, only two were involved by metastasis.

Comment: In spite of the fact that this tumor is highly undifferentiated and infiltrating, the absence of extensive lymph node involvement makes the prognosis better than that in Case 1, in which lymph nodes, lymphatics, and the entire gastric wall were diffusely infiltrated. A similar case of a large, highly undifferentiated, infiltrating carcinoma of the stomach involving the liver by direct extension was subjected to gastric resection over a year ago, and the patient is still gaining weight, eating well, and is free from symptoms.

SUMMARY

1. The operability of carcinoma of the stomach has been doubled and, at the same time, the mortality rate has been nearly halved.

2. This improvement in operability and mortality figures is attributed largely to advances in anesthesia and to the control of postoperative pneumonia with sulfapyridine and its derivatives.

3. In view of the diminished operative risk, we believe that the operability rate of carcinoma of the stomach should be further increased. In this way, palliation and a chance of cure will be afforded to many patients with carcinoma of the stomach who, in the past, have been considered to be inoperable.

4. A case of lymphosarcoma of the stomach, a case of carcinoma of the stomach with direct extension to the pancreas and liver, and a case of carcinoma of the stomach in which total gastrectomy was performed are reported.