

Elective Total Gastrectomy for Cancer of the Stomach:

End Results

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There has been no apparent improvement in overall salvage of patients with cancer of the stomach treated by *elective* extended total gastrectomy from 1950–1964 as compared with those treated by partial gastrectomy during the preceding 20-year period, 1931–1950 at Memorial Hospital in New York City. Criteria of resectability have been extended in recent years, and, therefore, the two series of patients cannot be considered strictly comparable. In the 94 patients subjected to elective total gastrectomy for cancer of the stomach, more than half (55 patients) had cancer in the proximal 1/3 of the stomach. The results obtained in this group by total gastrectomy are inferior to those obtained in the earlier series by partial gastrectomy. Patients with carcinoma of the mid 1/3 of the stomach showed essentially the same 5-year survival by elective total gastrectomy (34.8%) as by partial gastrectomy (33.5%), while those with carcinoma of the distal 1/3 of the stomach showed a greater 5-year survival by elective total gastrectomy (43.7%) than by partial gastrectomy (29.8%). However, of significance is the fact that the incidence of nodal metastasis was 3 times greater in the patients undergoing elective total gastrectomy than in those undergoing partial gastrectomy. Despite this unfavorable finding, 5-year survival in the patients undergoing elective total gastrectomy for carcinoma of the mid 1/3 or distal 1/3 of the stomach was equal to, or better than, that found in those undergoing partial gastrectomy for lesions similarly located. On the basis of this finding alone, we believe that elective total gastrectomy is a worthwhile endeavor and should be performed for operable carcinomas arising in the mid 1/3 or distal 1/3 of the stomach.

AN ANATOMICALLY more thorough operation for gastric cancer has been regularly performed at Memorial Hospital in New York City since 1950. This

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procedure has consisted of total gastrectomy, resection of greater and lesser omenta, splenectomy, and resection of the body and tail of the pancreas.⁴ The senior author believed that gastric resection, as customarily performed in the past, was inadequate for control of most gastric cancers. This belief was sustained by a review of the course of 92 patients from the time of their "curative" resection until their death and autopsy. This review disclosed that only 4 patients had in fact been cured and that local recurrence of the cancer had developed in 74 patients, or in 4 of every 5 patients.⁵

Anatomical studies, furthermore, on surgical specimens following extended total gastrectomy, initially fixed in formalin and subsequently cleared in dioxane solution for recognition and sampling of *all* lymph nodes, revealed a high incidence of metastases in unsuspected regional lymph nodes.⁶

Sufficient time has now elapsed for evaluation of results thus obtained.

Clinical Material

During the 15-year period, 1950–1964, total gastrectomy was performed on 206 patients at Memorial Hospital. All of these operations were performed by the attending surgeons* of the Gastric Service, by the senior

* One or more extended total gastrectomy was performed by each of the following surgeons, listed alphabetically: Robert J. Booher, Lemuel Bowden, Richard D. Brasfield (deceased), Alexander Brunschwig (deceased), Joseph G. Fortner, Walter Lawrence, Jr., Gordon McNeer (deceased), Charles J. McPeak, Theo R. Miller, George T. Pack (deceased), Isabel Schamagel (deceased).

TABLE 1. *Elective Total Gastrectomy for Cancer of Stomach (1950-1964)*

	Males	Females	Total
Total no. patients	128	78	206
Obligate	64	48	112
Elective	64	30	94

surgical residents under the direct supervision of these attending surgeons, or by the late Alexander Brunschwig. All the recorded data in these 206 patients have been reviewed. It was apparent that more than half of these patients were subjected to total gastrectomy as a necessary or obligatory procedure in order to encompass completely the gastric neoplasm. Furthermore, in the early years of this study occasional instances of incomplete removal of the gastric cancer by total gastrectomy were encountered, due to unwarranted enthusiasm on the part of the surgeon when faced with an almost-but-not-quite operable lesion. It was learned early in this study that total gastrectomy was rarely a justifiable palliative procedure.¹

The intent of this paper is to determine the place for elective total gastrectomy in the management of operable gastric cancer. If 5 cm or more of the lesser curvature, either proximally or distally, is uninvolved by tumor, then subtotal resection of the stomach is at least technically possible. Both the operative report and the gross pathological findings of all 206 patients were reviewed. Ninety-four patients might have undergone subtotal rather than total gastrectomy as determined by this criterion, and thus appear to have undergone truly *elective* total gastrectomy. Further analysis will be based on these 94 patients only (Table 1).

Sex, Race and Age

There were 64 male patients and 30 female patients. There was 2 Negroes, one male and one female, but all remaining patients were Caucasian. Ages ranged from 39 years to 81 years with a median age of 63 years in the male patients and a median age of 62 years in the female patients.

Features of Operation

Total gastrectomy, with identifiable esophageal tissue proximally and duodenal tissue distally, was performed

TABLE 2. *Elective Total Gastrectomy: Extent of Operation*

Total gastrectomy alone		19
Extended total gastrectomy		60
+ resection of colon	6	
+ resection of liver	2	15
+ resection of distal esophagus	7	
Total		94

TABLE 3. *Elective Total Gastrectomy: Reconstruction after Resection*

e-to-s Esophagojejunostomy	36
e-to-s Esophagojejunostomy with lateral (Braun) anastomosis	38
e-to-e Esophagoduodenostomy	1
Roux-Y reconstruction	15
"Pouch" reconstruction	4
	94

in all 94 patients. For reasons not apparent in retrospective analysis 19 of these 94 patients did not have distal pancreatectomy performed as an integral part of the procedure, and 2 of these 19 patients furthermore did not undergo splenectomy. All the remaining 75 patients had extended total gastrectomy performed, including removal of the greater and lesser omenta, the body and tail of the pancreas, and the spleen along with the entire stomach. Six of these 94 patients also had resection of transverse colon, 7 others had resection of distal thoracic esophagus, and 2 others had marginal resection of the left lobe of the liver as well (Table 2).

Reconstruction following total gastrectomy was by end-to-side esophagojejunostomy alone in 36 patients, by end-to-side esophagojejunostomy with complementary jejunostomy in 38 patients, by esophagoduodenostomy in 1 patient, by Roux-Y esophagojejunostomy in 15 patients, and by "pouch" reconstruction (Lima Basto technique)² in 4 patients (Table 3).

Two patients received no blood replacement during surgery, while 2 patients required 8 units of blood each during surgery. Both the median and the average blood replacement during surgery in these 94 patients was 3 units (1500 ml).

Operating time in these 94 patients varied from 3 hours to 11 hours, with a median operating time of 6 hours.

Duration of postoperative hospitalization in the operative survivors varied from 9 days to 111 days, with a median postoperative hospitalization of 18 days (Table 4).

Pathology

Six of these 94 patients had primary lymphoma of the stomach, 5 classified as reticulum cell sarcoma, and 1 as lymphosarcoma. These were 2 primary leiomyosarcomas of the stomach and 2 epidermoid carcinomas,

TABLE 4. *Elective Total Gastrectomy: Median Values*

Median age 63 yrs. (males)	62 yrs. (females)
Operating time	6 hours
Blood replacement	1500 ml
P.O. hospitalization (in operative survivors)	18 days

TABLE 5. *Elective Total Gastrectomy: Pathology*

Gastric lymphoma	6
Leiomyosarcoma	2
Epidermoid Ca.	2
Gastric adenocarcinoma	84
	—
	94

the latter two undoubtedly primary esophageal cancers arising at the cardioesophageal junction but presenting clinically as gastric cancers. All of the remaining 84 patients had adenocarcinoma (Table 5).

At least one group of regional nodes contained metastatic cancer in 70 of the 94 patients, giving a 74.5% incidence of node metastasis.

In these 94 elective total gastrectomies the neoplasm occupied the proximal $\frac{1}{3}$ of the stomach in 55 patients, the mid- $\frac{1}{3}$ of the stomach in 23 patients, and the distal $\frac{1}{3}$ of the stomach in 16 patients (Table 6).

Postoperative-Complications

Cardiac complications occurred postoperatively in 24 patients. Six of the 14 male patients and 5 of the 10 female patients were known to have cardiac lesions preoperatively. The postoperative cardiac complications ranged from fibrillation to acute myocardial infarction with failure. Four deaths in these 94 patients were attributed primarily to cardiac complications: two patients died of cardiac decompensation, one patient died of acute myocardial infarction, and the fourth from a cerebral vascular accident.

Pulmonary Complications occurred in 59 patients. Some of these were undoubtedly influenced by the left thoracotomy, an integral part of the surgical procedure in most cases, including 24 instances of significant pleural effusion and 10 instances of persisting pneumothorax. Most of the pulmonary complications, however, were those of atelectasis (25 patients) and pneumonia (20 patients). The primary cause of death in one patient was staphylococcal pneumonia. Pneumonia was a contributing cause of death in 3 more patients.

Wound infection developed in 14 male and in 4 female patients. *Wound dehiscence* occurred in 2 male patients only.

Postoperative *thrombophlebitis* developed in 4 men

TABLE 6. *Extended Total Gastrectomy: Location of Tumor*

	Males	Females	Total
Proximal 1/3	40	15	55
Middle 1/3	14	9	23
Distal 1/3	10	6	16
Total	64	30	94

TABLE 7. *Elective Total Gastrectomy: Postoperative Complications*

	Males	Females	Total
Cardiac	14	10	24
Pulmonary	39	20	59
Wound	14	4	18
Anastamotic	12	7	19
None	9	2	11

and 1 woman, but was associated with sublethal pulmonary infarction in one male patient only.

Other complications were paralytic ileus in 5, jaundice associated with peritonitis in 5, parotitis in 2, renal failure in 2, and intestinal bleeding in one.

Eleven patients had uncomplicated postoperative courses (Table 7).

The most characteristic and troublesome complication in total gastrectomy is that of rupture of the esophago-enteric anastomosis. This occurred in 8 male and 6 female patients. There were 5 more patients with other anastamotic dehiscences. Seven of the 19 patients with anastamotic leaks succumbed. When this unfortunate complication occurred, our policy has always been to put the leaking anastomosis at rest, to treat the inevitable secondary infection aggressively, and to establish a distal feeding jejunostomy for nutritional support if and when feasible. In this manner 12 patients with leaking anastomoses were salvaged.

Results

Thirteen of the 64 male patients and 3 of the 30 female patients died as a result of the operative procedure and its complications. Postoperative deaths occurred from the third to the 170th postoperative day. An operative mortality rate of 17.0% for elective total gastrectomy is thus recorded.

Seventeen male and 5 female patients lived for more than 5 years, providing a 5-year salvage of 23.4%. Two male patients in this group subsequently died of gastric cancer at 68 months and 70 months following total gastrectomy, indicating an absolute 5-year cure rate of 21.2%. There have been no further deaths from gastric cancer in these survivors.

Thirteen male patients and 3 female patients have

TABLE 8. *Extended Total Gastrectomy: Microscopic Classification (Broders')*

	Males	Females	Total
Not graded	7	2	9 10.7%
Grade I	1	0	1 1.2
Grade II	18	7	25 29.9
Grade III	24	11	35 41.7
Grade IV	11	3	14 16.6
Total	61	23	84* 100.1%

* Remaining 10 patients had lesions other than adenocarcinoma.

survived without recurrence or metastases for more than 10 years since definitive surgery, and provide a 10-year cure rate of 17.0%. The longest surviving patient is living with the infirmities of age 19½ years following extended total gastrectomy. Twenty-three patients have died apparently free of recurrence or metastases of gastric cancer. Several of these patients, obviously, lived free of cancer for many years, dying ultimately of the attrition of age or of other disease.

Forty-nine patients died of further manifestations of gastric cancer from one month to 70 months following definitive surgery and only 7 of these 49 patients who ultimately died of gastric cancer lived for more than 3 years.

Discussion

It has been accepted that prognosis in gastric cancer is influenced by the size and gross characteristics of the neoplasm, by the degree of anaplasia of the lesion, and by the presence or absence of nodal metastases. The purpose of this analysis, however, is to determine the effectiveness of *elective* extended total gastrectomy for the control of gastric cancer as contrasted with conventional partial gastric resection irrespective of the size, gross characteristics, and microscopic appearance of the tumor. Actually, the Broders' classification of the tumors in 84 of these 94 patients is comparable to that which might be found in any random series of patients with gastric cancer (Table 8).

The initial thesis leading to the adoption of extended total gastrectomy for all resectable gastric cancers was based on demonstrable inadequacies of conventional gastrectomy. Extended total gastrectomy has been consistently performed by us for the past 20 years in the belief that a more adequate removal of the primary tumor and a more thorough dissection of regional lymph nodes has been accomplished thereby. If there were merit in the extended operation then some improvement in end results should have been accomplished merely as a result of the surgical procedure itself.

Despite this belief, we have demonstrated an absolute 5-year cure rate of only 21.2% and an apparent 10-year cure rate of only 17.0% in this series of 94 patients with gastric cancer subjected to elective total gastrectomy. During the preceding 20-year period, 1931-1950, there were 422 patients who were subjected to gastric resection with curative intent at Memorial Hospital, and a 5-year salvage of 21.6% was obtained in this group.³ This figure is practically identical with that obtained by extended total gastrectomy in the ensuing 15 years. Furthermore, the operative mortality rate for the earlier 20-year period of 18.0% is comparable to that of 17.0% for the more recent series of patients undergoing elective total gastrectomy.

TABLE 9. *Gastric Carcinoma: 5-year Salvage (Memorial Hospital, NYC)*

	Partial gastrectomy 1931-1950	Extended Total gastrectomy 1950-1964
Proximal 1/3	19.0%	12.7%
Middle 1/3	33.5	34.8
Distal 1/3	29.8	43.7
Total	21.6%	21.2%

It is certain that criteria of resectability have been extended. Undoubtedly some of the patients treated by extended total gastrectomy in recent years would have been adjudged non-resectable in earlier years. Many of the lesions in the proximal gastric segment, treated by total gastrectomy during the period under study, were routinely considered inoperable in the earlier period.

It is therefore of interest to note that more than half of the elective total gastrectomies were performed for lesions of the proximal ⅓ of the stomach (Table 6). Twenty-three patients had cancers of the mid-⅓ of the stomach and, 16 patients had cancers of the distal ⅓ of the stomach. Only 7 of the 55 patients with proximal gastric lesions survived for 5 or more years free of cancer (12.7%). Eight of the 23 patients with mid gastric lesions survived for 5 or more years free of cancer (34.8%), and 7 of the 16 patients with distal gastric lesions survived for 5 or more years free of cancer (43.7%). Comparative figures for the preceding 20 years (1931-1950) in the practice of Memorial Hospital are as follows: in 337 patients surviving curative resection there was a 19.0% 5-year salvage for lesions of the proximal ⅓ of the stomach, 33.5% 5-year salvage for lesions of the mid ⅓, and 29.8% 5-year salvage for lesions of the distal ⅓ (Table 9).

In the 7 surviving patients of the 55 with proximal lesions treated by extended total gastrectomy only 3 had positive lymph node metastases, one of whom had a primary lymphosarcoma of the stomach with metastases to 2 node areas. Because of the tendency of cancers in the proximal segment to extend into the esophagus and to metastasize to mediastinal lymphatics, it is probable that extended total gastrectomy, as heretofore

TABLE 10. *Gastric Carcinoma: 5-year Survivors (Incidence of Nodal Metastasis)*

	Partial Gastrectomy 1931-1950		Extended Total Gastrectomy 1950-1964	
Proximal 1/3	3/10	30%	3/7	43%
Middle 1/3			5/8	
Distal 1/3	14/55	25.5%	11/15	73%
			6/7	

described, can offer little more than can be obtained by proximal gastrectomy, and that early lesions without node metastases could be treated successfully either by partial gastrectomy or by total gastrectomy. We hold certain reservations about the desirability of esophago-gastric reconstruction as compared to esophago-jejunal reconstruction, but these are not pertinent to the present discussion.

In the smaller number of patients with cancers of the mid $\frac{1}{3}$ or distal $\frac{1}{3}$ of the stomach treated by extended total gastrectomy, however, most of the 5-year survivors had nodal metastases. Five of the 8 surviving patients with cancer of the mid $\frac{1}{3}$ of the stomach, and 6 of the 7 surviving patients with cancer of the distal $\frac{1}{3}$ of the stomach had such nodal metastases (11 of 15 patients, or 73%), contrasted with only 14 patients with positive nodes in 55 surviving patients treated by partial gastrectomy in the earlier Memorial Hospital series (14 of 55 patients, or 25.5%) (Table 10).

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