

Gastric carcinoma: is radical gastrectomy worth while?

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Summary

Total gastrectomy as the treatment of choice for gastric carcinoma was evaluated by a number of centres during the decade 1945–55. The operative mortality was found to be higher, the 5-year survival rate was lower, and the undesirable digestive side effects were greater than those following subtotal resection. The very radical subtotal resections with miniature gastric remnants were also found to result in postgastrectomy symptoms quite similar to those of total gastrectomy. Technical refinements of oesophagojejunal anastomoses and the use of nutritional supplements and antianaemic therapy have reduced but have not eliminated the sequelae of radical gastrectomy.

A review of 15 reports of gastric cancer treatment from 8 countries suggests that in recent years total gastrectomy has been utilised in 25.4% of resections, with an average operative mortality of 21.7% and a 5-year survival of 12.3%. Radical resection or total gastrectomy is recommended for certain specific conditions, but for the usual antral gastric cancer subtotal resection distal to the vasa brevia with preservation of the gastric fundus and spleen is recommended

Introduction

More than 30 years ago we reported on a series of 26 patients with cancer of the stomach who were operated upon at Johns Hopkins Hospital, Baltimore, during 1944 and 1945 (1). In 21 cases total gastrectomy was performed, with 2 immediate postoperative deaths, a mortality of slightly less than 10% which motivated an evaluation of total resection as the procedure of choice when treating many cases of malignant gastric tumour then being removed by subtotal re-

section. The procedure was compared both with radical mastectomy for cancer of the breast and with abdominoperineal resection for cancer of the rectum. Despite the low operative mortality and the suggestion that this procedure be used more often, the report concluded with the statement that 'gastrectomized patients present problems associated with adequate intake and absorption of food, sometimes persisting for months after operation which at present prevent the recommendation of the procedure as the operation of choice for all malignant tumors of the stomach which are amenable to surgical treatment'.

Two years later Scott and Longmire (2) published a series of 63 total gastrectomies with a 9.5% operative mortality at Johns Hopkins Hospital, Baltimore. The majority of patients, who survived the operation without evidence of recurrence for 6 months or longer, adjusted themselves to a normal mode of living. In this report theoretical reasons were presented to support the view that total gastrectomy was a more effective treatment for cancer of the stomach than subtotal resection.

The period of surgery during the 1940s and 1950s, which saw the advent of aids such as antibiotics, readily available banked blood, and markedly improved anaesthesia, was characterised by an aggressive surgical approach to tumours of all kinds. An extension of the principle of en-bloc resection in treating various neoplasms was tested with the goal of removing the primary tumour, its extensions, and any involved lymph nodes. When dealing with malignant diseases the limits beyond which local organ and tissue removal would be unrewarding were not yet clearly defined. Therefore the use of total gastrectomy, at times associated with the excision of all or

parts of other organs—pancreas, spleen, liver, and transverse colon—was being considered and evaluated in many institutions during that era.

Evaluation of total gastrectomy versus subtotal resection

A group of surgeons associated with Dr Frank Lahey at the Lahey Clinic in Boston were among the earliest investigators to evaluate total gastrectomy in the United States. In 1957, after a 10-year period and experience with 246 total gastrectomies having an operative mortality of 8.2% in contrast to an operative mortality of 5.7% after partial gastrectomy, Dr Samuel Marshall of that clinic arrived at the following general principles concerning their experience with total gastrectomy up to that time (3):

'A) The mere fact that the operative mortality of total removal of the stomach has steadily decreased does not justify the routine use of such extensive surgery unless a higher rate of curability or an improvement of life expectancy after surgical resection can be confidently expected in an increasing number of patients subjected to this more radical procedure.

'B) Nutritional problems, weight loss, post-prandial discomfort, dumping syndrome, and anemia are just a few of the difficulties encountered after total gastrectomy.

'C) Of patients who had total gastrectomy at the Lahey Clinic 14.1% lived over five years.

'D) There is no convincing evidence at this time that total gastrectomy should be employed as a routine procedure in the surgical treatment of gastric cancer.'

Marshall went on to state, 'In my opinion, however, radical partial resection of the stomach, with resection of the omentum and lymph nodes plus excision of the spleen, is still the most satisfactory method of treatment in the majority of cases of gastric cancer. Furthermore, total gastrectomy must be employed in about one-third of all cases of gastric cancer.' One report at that time indicated that a radical subtotal resection should have a proximal gastric pouch no larger than a man's thumb.

In a retrospective review of 91 total gastrectomies and 117 subtotal gastrectomies performed at Johns Hopkins Hospital from 1940 to 1950 Rush and Ravitch in 1960 (4) found that the operative mortality for total gastrectomy was 12.8%, but the operative mortality for subtotal gastrectomy during the same per-

iod was 8.8%. The 5-year survival after total gastrectomy was 9%; after subtotal gastrectomy it was 25%.

Recognising that many patients treated by total gastrectomy would have been inoperable by subtotal resection and that the total gastrectomy group therefore included a group of more advanced cancer cases, they evaluated 48 total gastrectomy patients whose lesions were supposedly confined to the distal stomach and thus possibly amenable to subtotal resection. The 5-year survival of this group was 10.5% compared with 25% in the subtotal group. They attributed the lower 5-year survival for total gastrectomy in these supposedly comparable groups in part to the severe nutritional difficulties encountered in some cases of total resection. It should be noted that a Roux-en-Y type of oesophagojejunostomy was used in only 4 of their cases and they noted that patients with such anastomoses had fewer intestinal symptoms.

Among the patients surviving total gastrectomy for 5 years, 45% in their series developed pernicious anaemia. However, the value of the routine use of vitamin B₁₂ to prevent the development of this late complication after total gastrectomy was not commented upon and was apparently not fully appreciated or used at that time.

In the last 2 years of their study total gastrectomy was performed at Johns Hopkins Hospital in approximately 22% of gastric cancer cases in which resection was performed. The authors concluded that total gastrectomy should not be utilised as the operation of choice for gastric cancer but that 'the operation should be reserved only for those lesions so large that they dictate removal of the entire stomach for extirpation'.

This 1960 study, which attempted as fairly as possible to compare the results of total versus subtotal resection for cancer of the stomach, was at best a retrospective analysis of a limited number of cases in which certain suppositions were made that were difficult to substantiate. These cases included most of the earliest total gastrectomies ever performed at that hospital, in which advantage was rarely taken of later anastomotic techniques or modern nutritional support. To our knowledge a truly prospective randomised clinical trial of total versus subtotal gastrectomy for

comparable cases of cancer of the stomach has never been conducted. Despite the excellent results from total gastrectomy currently being reported by some groups (5), the present accumulated indirect evidence of the overall superiority of subtotal resection in most cases of gastric cancer is probably sufficient to obviate such a clinical trial.

On the basis of the surgical experience at the University of Minnesota Gilbertson (6) presented strong evidence in 1969 that the most extensive en-bloc resections with efforts to eradicate all regional lymph nodes were self-defeating. Within that period of aggressive surgical approach operative mortality rose and a decline of 5-year survival occurred even among patients having wide excision of involved lymph nodes.

The University Co-operative Gastric Cancer Study (7) clearly identified again that tumour penetration through the gastric wall with serosal involvement and lymph-node metastases were two highly important prognostic indicators, as proved by 5-year survival being reduced in so-called curative resection cases from 39.5% to 12.5% when lymph nodes were involved and from 34.5% to 15.5% when there was serosal involvement.

The disappointing results of extensive resections for cancer of the stomach substantiated by numerous series have led us to believe that gastric cancer early in its course, probably after involvement of the most proximal group of lymph nodes and certainly when there is serosal involvement, becomes a systemic or generalised disease in a high percentage of cases. We must therefore conclude that radical excision is indicated only under highly specific conditions.

This concept has in a way been challenged by Imanaga and Nakazato (8) at the Aichi Cancer Center Hospital in Japan. In their study of 1678 patients operated upon for gastric cancer between 1964 and 1973 they found serosal involvement to have a substantially worse effect on survival than that of regional lymph-node metastases. In the absence of serosal invasion, even when lymph nodes were implicated, recurrence usually took the form of haematogenous metastasis to the liver rather than peritoneal disease. Thus they felt that it was possible, when there was

no serosal involvement, to eradicate all local disease by operation even when local lymph nodes were affected. Such resection could not, of course, eliminate the spread that had already occurred via the blood stream, leading to subsequent liver implication. It should be pointed out, however, that 368 of their 931 patients undergoing a curative resection had neither lymph-node nor serosal involvement. This is a remarkably high percentage of 'early' or localised cases, not found in other countries with anything like this frequency.

We recently analysed our experience with 501 cases of gastric cancer at UCLA Hospital during the 20 years between 1956 and 1975, noting certain features of the disease occurring in the first decade (1956-65) and comparing them with those in the second decade (1966-75) (9). The lack of significant improvement in the treatment results in these two periods substantiates the findings of others who compared results in earlier years (10,11). Total gastrectomy was utilised in 27 of 132 curative resections (20%) with an operative mortality of 15% and 5-year survival of 10%, results quite similar to observations in many other series.

Analysis of international results

Fifteen reports of gastric cancer treatment from 8 countries have been analysed, emphasising the utilisation and results of total gastrectomy and other extended resections (see table). Different methods of reporting among these series have made it necessary to interpolate certain results for comparative purposes and to omit some series from the analysis in specific categories. Therefore the following summarised results must be considered approximate.

Total gastrectomy was utilised in 25.4% of the resections (highest, 48.8%, in the 1960-70 series of Desmond (15) and lowest, 6.5%, in the 1957-66 series of Cady (10)). The average operative mortality was 21.7% (varying from a low of 13.9% in Lewin's 1953-59 series (16) to 33% reported by Bittner (12)). The average 5-year survival was 12.3%. (The best 5-year survival was 20% reported by Cady (10), who incidentally performed total gastrectomy less frequently than any other group.) Although the 50% 5-year survival for antral lesions with nodes removed

Analysis of 15 reports of treatment for gastric cancer from 8 countries

Author	Country	Date of series	No of gastric resections	Total resections (%)	Operative mortality total gastrectomy (%)	5-year survival total gastrectomy (%)	Remarks
Adashek (9)	USA	1956-75	132	20.4	15	10	*All patients 70 yr or older. **All resected patients at 2 yr. *Curative resection ulcerative or polypoid cancer.
Bittner (12)	Germany		74*	32	33	41**	
Cady (10)	USA	1957-66	199*	6.5	21	20	
Cartia (13)	Italy	1960-74	325	11.7	13.1	5.2	*18.8% for extended operation.
Costello (14)	England	1960-70	215	27.3	14	12	
Desmond (15)	England	1953-59	115	48.8	13.9*	15	
Lewin (16)	Sweden	1956-72	482	27.8	Nécessité-35% Elective-24%	Antral lesion, nodes removed- 50. Fundus-40	
Lorat-Jacob (5)	France			31.3		23**	
Lundh (17)	International	1966-72	476	27	23*	23**	*Overall operative mortality. **4-yr survival of all resections for cure.
Marquand (18)	France	1959-72	160		18.75	17	*Operative mortality of total and subtotal resections. **5-yr survival rate for all resections.
Minc (19)	Japan	1955-63	277	13.3	9.7*	22**	
Moritz (20)	Austria	1933-65	605		14.8*	9.6	*All resections 1956-65. *Results of total and subtotal combined. **4-yr.
Quinton (21)	France	1966-76	54	41.0	13.0*	25.7**	
Schrock (22)	USA	1940-75	87*		15	9**	*All total gastrectomies. **13.7% of curative resections.
Wolff (23)	Germany	1964-69	268	18.2	30*	13.2	*Postoperative mortality for total and proximal gastrectomy.

and the 40% 5-year survival for fundic lesions reported by Lortat-Jacob and associates (5) from France are eminently superior, they have not been calculated in the total survival figure because it could not be determined that the reporting method was comparable to those of other series. The lowest 5-year survival of 5.2% was reported by Cartia (13) in his 1960-74 series.

Discussion

After the initial exploration and evaluation of total gastrectomy and extended total gastrectomy, including resection of primary and secondary lymph nodes and all or a part of contiguous organs during the 1940s and 1950s the use of such procedures was generally restricted to certain conditions. It was found that operative mortality remained considerably higher than that of subtotal gastrectomy. Moreover, despite the minimisation of digestive symptoms achieved by technical improvements in reconstruction methods such as the Roux-Y oesophagojejunostomy, the Hunt-Lawrence modification of the Roux-Y, or the jejunal segment interposition between oesophagus and duodenum, as well as improved nutrition owing to parenteral nutritional support, elemental dietary supplements, and prophylactic vitamins, patients who underwent total gastrectomy continued to experience significantly more undesirable nutritional side effects than those who had undergone subtotal gastrectomy. However, it also became apparent that the radical subtotal resections which left miniature gastric reservoirs likewise subjected patients to undesirable sequelae, the intensity and frequency of which resembled those encountered after total gastrectomy, with the possible exception of a lack of susceptibility to macrocytic anaemia. Therefore it had to be concluded that some of the radical subtotal resections proposed as alternatives to total gastrectomy really offered little if any advantage.

In some series extended gastrectomies with extensive regional lymph-node resection were found to increase operative mortality, actually decreasing the 5-year survival (6). As the incidence of gastric carcinoma continued its dramatic decline in the US and other Western countries and as surgeons performed this technically demanding procedure less fre-

quently the operative mortality for total gastrectomy rose from the 5-8% attained in several clinics during the 1940s and 1950s to the 15-20% figure reported today.

As decades passed without recognisable improvement in resection results it became tragically apparent that, with the detection methods available, by the time of the first examination cancer of the stomach had spread beyond the limits of our most radical resections in the majority of patients.

Despite the extensive work in Japan which found substantial numbers of patients whose gastric cancer was confined to the superficial inner layers of the gastric wall and their demonstration of the excellent results achieved by resection in such cases (24), identification of such patients in other countries continues to be infrequent.

The concept of Imanaga and Nakazato (8) recommending that lymph-node involvement in the absence of serosal tumour penetration be treated more aggressively by extensive lymph-node dissection must be evaluated further. Their approach differs from the previously evaluated aggressive surgical procedure inasmuch as it does not necessarily involve radical removal of the stomach but selects cases without extensive gastric-wall and serosal invasion when aggressively attacking the lymphatic pathways of spread.

In addition to our efforts to achieve earlier diagnosis it is imperative to devise an operation for our patients suffering from the very common antral cancer that, in the absence of metastasis, clears the tumour in the gastric wall while leaving a sufficient gastric reservoir to minimise postgastrectomy sequelae. Moreover, it must be an operation that can be performed widely, with reasonable safety. The technique we have proposed (25) is in part based on the studies of Zininger (26), who observed that microscopic spread of cancer cells in the gastric wall was limited to 6 cm proximal to the gross tumour margin and 3 cm distal to the pylorus. The proposed resection will of course have to be modified according to the location and extent of the specific tumour, but for common distal antral lesions the line of resection will be 6 cm proximal to the gross limits of the tumour and 3 cm distal to the pylorus, with removal

of the lesser and greater omenta. The left gastric vessels are divided at the coeliac axis and the lymph nodes at that site are removed. The line of resection on the greater curvature is below the vasa brevia and the spleen is not removed. Alimentary continuity is restored by a Billroth I or II anastomosis, although we prefer the Schoemaker modification of the Billroth II gastrojejunostomy.

This operation can be performed with minimal operative risk and will achieve a 'cure' of most patients in whom a cure can be anticipated from resectional therapy.

Notwithstanding this recommendation, we believe that total gastrectomy should still be strongly considered in patients with cancer and achlorhydria, when cancer arises after a previous gastric resection, or in cases of gastric polyposis, cancer involving the gastric cardia, extensive neoplastic involvement of the stomach without distant metastasis, and a family history of gastric cancer. Modern surgical techniques and supportive measures enable total gastrectomy to be performed with reasonable safety and a minimum of disabling side effects.

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