ORIGINAL ARTICLE

Multivisceral Resection for Locally Advanced Gastric Cancer

An Italian Multicenter Observational Study

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Importance: The role of multivisceral resection, in the setting of locally advanced gastric cancer, is still debated. Previous studies have reported a higher risk for perioperative morbidity and mortality, with limited objective benefit in terms of survival. Conversely, recent studies have shown the feasibility of enlarged resections and the potential advantage of extended resection for clinical stage T4b gastric adenocarcinoma with good long-term results.

Objective: To analyze the role of multivisceral resection for locally advanced gastric cancer with particular attention to the brief and long-term results and to the prognostic value of clinical and pathologic factors.

Design: Prospective multicenter study using data from between January 1, 1995, and December 31, 2008.

Settings: Seven Italian surgery centers.

Patients: A total of 2208 patients underwent curative resections for gastric carcinoma at the centers. Among them, 206 patients presented with a clinical T4b carcinoma. One hundred twelve underwent a combined resection of the adjacent organs with a gastrectomy owing to suspicion or direct invasion of these organs by the gastric cancer.

Main Outcomes and Measures: Clinical and pathologic variables were prospectively collected and the feasibility and efficacy of multivisceral resection for locally advanced clinical T4b gastric cancer were assessed.

Results: Postoperative mortality and complication rates of patients who underwent a gastrectomy with a combined resection of the involved organs were 3.6% and 33.9%, respectively. Pathologic factors revealed that the nodal involvement was present in about 89.3% of patients and the mean (SD) number of pathologic lymph nodes was 14.8 (16.6). The overall 5-year survival rate was 27.2%. The completeness of resection and lymph node invasion represent independent prognostic parameters at multivariate analysis.

Conclusions and Relevance: Our study indicates that patients undergoing extended resections experience acceptable postoperative morbidity and mortality rates, and an en bloc multivisceral resection should be performed in patients when a complete resection can be realistically obtained and when lymph node metastasis is not evident.

JAMA Surg. 2013;148(4):353-360

PATIENTS WITH LOCALLY ADvanced gastric cancer have a poor prognosis, in particular when compared with patients with early gastric cancer. Globally, an extensive radical surgery, aiming at an R0 resection, seems to be the most important indicator of long-term survival.[1-3]

Some studies have shown the feasibility of enlarged resections and the potential advantage of extended resection for cT4N0 gastric adenocarcinoma to improve the R0 resection rate of these lesions.[4,5] Conversely, other studies have reported a higher risk for perioperative morbidity and mortality, with limited objective benefits in terms of survival, suggesting this approach only for selected

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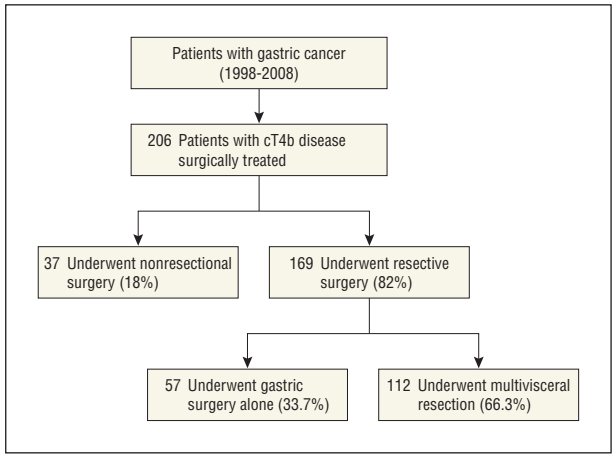


Figure 1. Consort diagram of the study.

cases.[6,7] Many potential clinicopathologic factors, such as age, tumor size, macroscopic type, depth of invasion, nodal status, distant metastasis, number of resections, and type of resection, have been proposed[8-12]; however, the prognostic value of multivisceral resections in this subset of patients remains controversial.

The aim of this multicenter Italian study was to evaluate the feasibility and efficacy of multivisceral resection of stage T4 gastric cancer, with particular attention to potential pathologic and surgical prognostic factors.

METHODS

In this observational multicenter study, data were collected from the medical records of 2208 patients who underwent resection with curative intent for histologically confirmed gastric carcinoma from January 1, 1995, through December 31, 2008. Patients were operated on at 7 Italian centers experienced in gastric cancer treatment: Digestive Surgery, Catholic University of Rome (n=546); Institute of Surgical Sciences, University of Siena (n=495); First Division of General Surgery, University of Verona (n=498); Clinica Chirurgica Generale 2, University of Padua (n=233); Surgery Unit, University of Florence (n=226); Department of Surgical Sciences, University of Insubria, Varese-Como (n=165); and General Surgery, Arco Hospital, Trento (n=45). Among them, 206 patients (9.3%) presented with a clinical stage T4b carcinoma.

Institutional review board approval had been preliminarily obtained in each center for the research purpose use of the data, stemming out from standard clinical practice, since no additional interventions were planned (multicenter observational study).

Eligibility criteria included clinical stage T4b gastric resection, according to the seventh edition of the TNM staging system of the American Joint Committee on Cancer. Patients with distant metastases (eg, hepatic, lung, peritoneal dissemination, or extraregional lymph nodes—superior mesenteric artery, middle colic artery, and paraaortic lymph nodes), with less than 15 lymph nodes dissected, and with previous neoplastic diseases and hematologic pathologies, as well as those who underwent emergency procedures and neoadjuvant treatments, were excluded from the study.

TREATMENTS

Patients with clinical T4b gastric cancer who underwent surgery were treated with the following surgical modalities: nonresective surgery, resective surgery without multiorgan resection, and resective surgery with multiorgan resection.

Patients who underwent nonresective surgery because of the extension of disease (mesenteric vessels or hepatic hilum or diaphragmatic jatum involvement) were treated with gastric bypass or jejunostomy. In patients who underwent resective surgery, the operative procedures were total gastrectomies and distal subtotal gastrectomies. D1, D2, or more extended lymph node dissection was performed in all patients, according to the rules of the Japanese Research Society for Gastric Cancer. Extensive surgery (multiorgan resection) because of suspicion of direct tumor invasion was defined as combined resection of adjacent organs (eg, spleen, gallbladder, left pancreas, liver, and colon).

The most used regimens of adjuvant chemotherapy were epirubicin hydrochloride, cisplatin, and fluorouracil for a mean of 3 cycles after surgery, depending on clinical response or the occurrence of adverse effects.

DATA AND STATISTICAL ANALYSES

Patients were followed up until death or until December 31, 2010. Follow-up data were obtained from our database or by direct telephone interview with the patient or next of kin, in the case of a patient's death. Major complications and 30-day mortality rates were recorded for the whole population.

To analyze the feasibility of multiorgan resections, the incidence of major complications and perioperative mortality were analyzed and compared among the following groups: patients who underwent nonresective surgery, patients who underwent resective surgery without multiorgan resection, and patients who underwent resective surgery with multiorgan resection. Survival analysis was focused on patients who underwent multiorgan resection. Survival curves were conducted according to the Kaplan-Meier method and compared by means of the log-rank test. Multivariate analysis to identify the independent prognostic factors was performed by using the Cox proportional hazard regression model with forward stepwise procedure. Differences were considered significant at the $P<.05$ level.

All statistical analyses were conducted using SPSS version 14.0 for Windows (SPSS).

RESULTS

From January 1, 1995, to December 31, 2008, 206 consecutive patients underwent surgery for potentially resectable clinical T4b gastric cancer. The consort diagram shown in **Figure 1** summarizes the surgical modality of treatment adopted.

Synthetically, 37 patients underwent nonresective surgery, while 169 patients underwent resective surgery (57 without multiorgan resection and 112 with multiorgan resection).

SHORT-TERM RESULTS

The overall postoperative mortality rate among the 206 patients was 3.4% (7 patients). Mortality occurred only in patients who underwent resective surgery and 4 belonging to the multiorgan resected group with a mortality rate of 3.6%. The main complications and the comparison between the 3 groups are reported in **Table 1**. Major postoperative complications occurred in 65 patients: 9 subjects (24.3%) in the nonresection surgery group, 18 (31.6%) in the gastrectomy-alone

Table 1. Postoperative Outcomes

	No./No.			
	Nonresectional Surgery	Gastrectomy Alone	Multiorgan Resection	*P* Value
Postoperative mortality	0/7	3/7	4/7	.55
Major complications	9/65	18/65	38/65	.38
Sepsis	1/11	5/11	5/11	.36
Anastomotic leak	1/14	5/14	8/14	.50
Bowel infarction	0/4	2/4	2/4	.47
Pancreatic complications[a]	1/18	3/18	14/18	.50
Respiratory complications[b]	0/6	5/6	1/6	.26
Cardiac complications[c]	1/4	3/4	0/4	.06
Other[d]	2/8	2/8	4/8	.90

[a] Pancreatic fistula, acute pancreatitis, pancreatic necrosis, and pancreatic abscess.
[b] Pneumonia and postoperative respiratory insufficiency.
[c] Myocardial infarction, arrhythmia, and cardiogenic shock.
[d] Ictus cerebri, renal failure, and hepatic dysfunction.

group, and 38 (33.9%) who underwent multiorgan resection. No significant differences were found among the 3 groups, showing that the enlarged resections did not affect mortality (P=.55) and morbidity (P=.38) after surgery.

Focusing on multiorgan resection, complete demographics, including preoperative and perioperative sample characteristics, are shown in **Table 2**. More than 1 organ simultaneously resected occurred in 35 cases (31.3%), and the most common resected organs were the pancreas (n = 46) followed by the colon (n = 43). Postoperative complications occurred in 38 cases including anastomotic leak (n = 8), sepsis (n = 5), bowel infarction (n = 2), pancreatic fistula (n = 3), respiratory complications (n = 1), and others (n = 4). Five patients died of sepsis, anastomotic leak, and bowel infarction. No statistically significant difference on postoperative complications or perioperative mortality were found according to the number or kind of resection. The pathologic examination revealed that the mean (SD) size of tumors was 7.9 (3.8) cm.

The pathologic TNM status revealed a real nearest-organ infiltration (pT4b) in 98 cases (87.5%), while the lymph node involvement was as follows: N0 = 12; N1 = 34; N2 = 33; N3 = 33 cases, considering a mean (SD) of excised lymph nodes of 35.3 (21.2). A complete resection was obtained in 43 patients (38.4%), while microscopic (R1) and macroscopic (R2) residual disease was observed in 30 (26.8%) and 39 (34.5%) patients, respectively.

Peritoneal cytology was performed in 36 cases; among 18 of the nonresected cases, cytology resulted positive. Hyperthermic intraperitoneal chemotherapy was administered in 7 cases (6.3%).

After surgery, patients underwent adjuvant chemotherapy. Adjuvant treatment was substantially, not homogeneously, administrated in our cohort of patients as it was planned according to the opinion of the referring physician (taking into account the completeness of resection, the general clinical condition of the patient, and the surgical and pathologic findings); for this reason, it was not taken into consideration for statistical analysis.

LONG-TERM OUTCOMES

The median follow-up duration was 18.7 months (range, 1-155 months). From the Kaplan-Meier overall long-term survival function, it emerged that 1-year, 3-year, and 5-year survival rates were 60.7%, 30.3%, and 27.2%, respectively. Plots of the survival functions are reported in **Figure 2**. The long-term survival rates and log-rank test results are summarized in **Table 3**. In the whole population, evidence for different survival functions was found for patients who had a complete resection vs those who did not ($P < .001$). In fact, patients with R0 disease had a 5-year survival rate of 43.7% vs 31.4% and 0% for patients with R1 and R2 disease, respectively ($P < .001$), as plotted in **Figure 3**. No significant differences were found between pT4a and pT4b, while patients with the tumor size greater than 7 cm showed a smaller survival rate (20.0%) with respect to the lower ones (40.4%), with a P value of about .04. Another powerful indicator of long-term survival was represented by N status (pN0 = 53.3% vs pN+ = 21.5%; P = .006). In particular, the estimated 5-year survival rates were 53.3%, 40.4%, 26.5%, and 0% for pN0, pN1, pN2, and pN3 statuses, respectively ($P < .001$; **Figure 4**). Also, having more than 15 metastatic lymph nodes showed a significantly different 5-year survival rate (11.2%) compared with patients with fewer metastatic lymph nodes (39.7%; P = .002).

Lower survival rates were found for patients who underwent peritoneal resection (20.5%) and spleen resection (14.7%; P = .04) (Table 3). The estimated 5-year survival rates were 45.3% and 38.4%, respectively.

The Cox multiple regression analysis confirmed with strong evidence the role of the completeness of resection and the pathologic N involvement as risk factors affecting survival. Selected output from the survival analysis is reported in **Table 4**.

The most powerful indicator of survival was the completeness of resection. The Cox multiple regression analysis confirmed that incomplete resection represented a risk factor for earlier death. In particular, it was estimated that

Table 2. Clinical and Pathologic Outcomes in Patients Undergoing Multiorgan Resection

Feature	No. (%)
Male/Female, No.	71/41
Age, mean (SD), y	63.5 (12.4)
Follow-up, mean (SD), mo	24.9 (29.5)
Tumor site	
Antrum	22 (19.6)
Body	45 (40.2)
Fundus	21 (18.8)
Cardias	9 (8.0)
Plastic lynitis	13 (11.6)
Gastric stump	2 (1.8)
Gastric surgery	
Total gastrectomy	76 (67.9)
Subtotal gastrectomy	33 (29.5)
Degastrogastrectomy	3 (2.7)
Resected organs	
Spleen	8 (3.9)
Colon	43 (38.4)
Pancreas	46 (41.1)
Liver	17 (15.2)
Peritoneum/abdominal wall	21 (18.8)
Diaphragm	6 (5.3)
Other (kidney, adrenal, gallbladder, lung)	14 (12.2)
Multiple resections, >1 adjacent organ	35 (31.3)
pT	
pT4a	14 (12.5)
pT4b	98 (87.5)
Tumor size, mean (SD), cm	7.9 (3.88)
pN	
pN0	12 (10.7)
pN1	34 (30.1)
pN2	33 (29.5)
pN3	33 (15.2)
No. of lymph nodes excised, mean (SD)	35.3 (21.2)
No. of pathologic lymph nodes, mean (SD)	14.8 (16.6)
Lymphadenectomy	
D1	43 (38.4)
D2	30 (26.8)
D3	39 (34.5)
Lauren classification	
Intestinal	32 (34.4)
Diffuse	43 (46.2)
Nd	18 (19.4)
Completeness of resection	
R0	43 (38.4)
R1	30 (26.8)
R2	39 (34.5)

patients with R+ died at about 1.81 times (95% CI, 1.36-2.39; $P < .001$) the rate of patients who did not have R+ disease. The presence of N+ disease showed an impact on survival with a hazard ratio of about 1.83 (95% CI, 1.42-2.36; $P < .001$). These data were confirmed at the Cox multivariable regression analysis, as labeled in Table 4. Therefore, additional risk factors were found from the statistical analysis. In particular, the Cox univariate regression analysis confirmed the number of pathologic lymph nodes (hazard ratio = 1.02; 95% CI, 1.01-1.03; $P = .04$) and tumor size (hazard ratio = 1.74; 95% CI, 1.01-1.14; $P = .02$) as risk factors for earlier death.

With respect to the organ resected, only the peritoneal resection, for infiltration or suspicion, increased the risk for death to 1.78 (95% CI, 1.02-3.10; $P = .04$), while

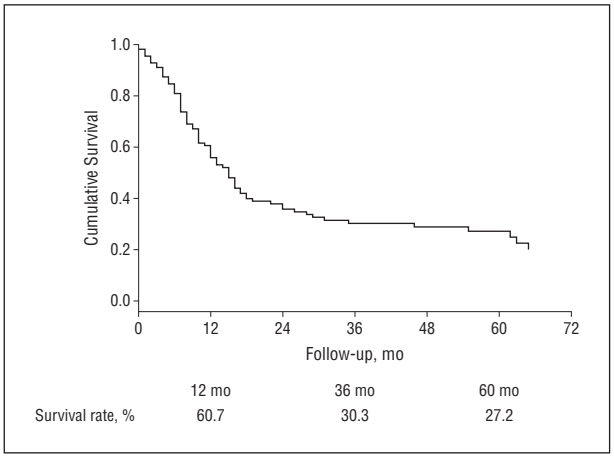


Figure 2. Overall survival curve.

spleen resection did not show a statistically significant worsening of death risk.

Finally, it was estimated that patients with positive peritoneal cytology showed a hazard ratio of 1.55 (95% CI, 1.01-1.83).

COMMENT

The term *locally advanced gastric cancer* refers to tumors infiltrating or adherent to adjacent organs and/or structures with or without lymph node involvement in patients without distant metastasis; out of radiation-based and chemotherapy-based protocols, gastric carcinomas are considered unresectable if there is evidence of peritoneal involvement, distant metastases, or locally advanced disease such as invasion or encasement of major blood vessels.[13]

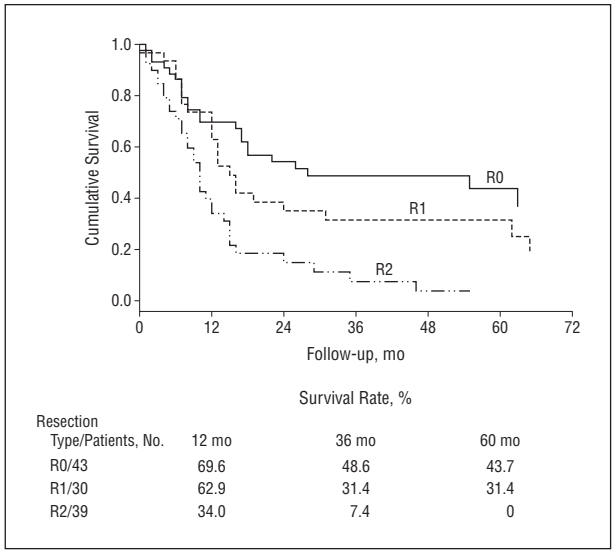
Gastric cancer with T4 invasion represents a unique condition. In some cases, the radical resection of tumor could increase the surgical difficulties and their potential complications, and it is particularly true when we consider the organ, particularly the pancreas, the esophagus, the duodenum, and the liver. In addition, T4 invasion is currently linked with the major tendency of lymph nodes and peritoneal diffusion with a lower rate of survival. For all these considerations, the indication of surgery is not completely defined in terms of the number of resections and type of resection needed and further investigation is required.

The postoperative complication rates in cases of additional organ resection with gastrectomy have been reported to be higher when compared with patients undergoing gastrectomy alone.[14,15] Therefore, the increase in overall complications seems to be implicated as a reason for the decrease in overall survival; for these reasons, there has been skepticism to perform multivisceral resections in patients with T4 disease.

Kasakura and colleagues[15] found that there was no survival difference between patients who underwent gastrectomy alone compared with patients with additional organ resection, but there was a higher complication rate. Other retrospective studies evaluating the outcomes of patients who underwent total gastrectomy alone or with

Table 3. Five-Year Survival Rates and Log-Rank Test Results

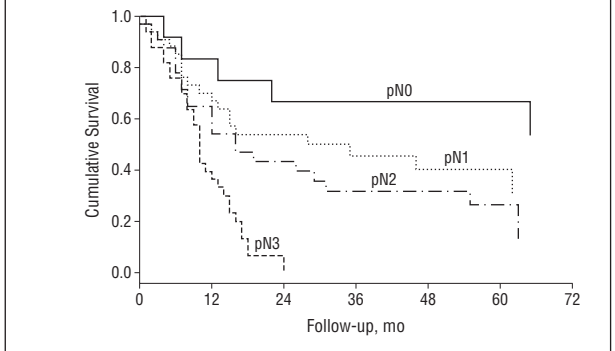
Feature	5-Year Survival, %	Log-Rank Test Result *P* Value
Organ		
Spleen	15.7	.04
Colon	29.1	
Pancreas	24.1	
Liver	41.2	
Peritoneum	20.5	
Diaphragm	26.2	
Other organs	25.8	
Gastric resection		
Total gastrectomy	22.7	.22
Subtotal gastrectomy	35.0	
Degastrogastrectomy	66.7	
Organ resection		
Single	32.5	.38
Multiple	17.2	
Completeness of resection, %		
R0	43.7	<.001
R1	31.4	
R2	0	
Tumor size, cm		
<7	40.4	.04
>7	22.0	
pT status		
pT4a	14.3	.20
pT4b	29.6	
pN status		
pN0	53.3	<.001
pN1	40.4	
pN2	26.5	
pN3	0	
Nodal status		
N0	53.3	.006
N+	21.5	
No. of pathologic lymph nodes		
<15	39.7	.002
>15	11.2	
Cytology		
Negative	31.4	.04
Positive	16.7	



Survival Rate, %

Resection Type/Patients, No.	12 mo	36 mo	60 mo
R0/43	69.6	48.6	43.7
R1/30	62.9	31.4	31.4
R2/39	34.0	7.4	0

Figure 3. Survival rate according to the completeness of resection.



Survival Rate, %

Nodal Status/Patients, No.	12 mo	36 mo	60 mo
N0/12	83.3	66.7	53.3
N1/34	66.9	45.4	40.4
N2/33	54.1	31.7	26.5
N3/33	36.4	0	0

Figure 4. Survival rate according to the nodal status.

splenectomy, pancreaticosplenectomy, or esophagectomy have shown a survival disadvantage for gastrectomy with additional organ resection.[16-19] Other studies[4,6,10] have reported a lower survival rate in patients undergoing organ resection involving more than 1 organ. In our study, major postoperative complications occurred in the 3 groups of patients (nonresectional surgery, gastrectomy alone, and multiorgan resection groups) with no significant differences, showing that the enlarged resections did not affect mortality and morbidity after surgery and that acceptable postoperative morbidity and mortality rates can be achieved.

As shown in the **Table 5**, taking into account the poor homogeneity of the studies in the literature, our experience has demonstrated that gastrectomy with additional organ resection for gastric cancer can be achieved with acceptable perioperative morbidity and mortality, and some authors[5] recommend performing resection in patients with T4 gastric carcinoma regardless of curability.

LONG-TERM RESULTS AND PROGNOSTIC FACTORS

Most studies have shown an advantage, in terms of 5-year survival, in patients who underwent gastrectomy with multivisceral resections when compared with patients who underwent gastrectomy alone or palliative surgery.[4,8,22] Extended surgery is recommended because a better local control for gastric cancer can be achieved, with negligible 5-year survival rates (19.9% to 38.0% in different series; Table 4). Our study confirmed this datum with a 5-year survival rate of 27.2%.

Prognostic factors for T4 gastric cancers after multiorgan resection were largely investigated and, among the features considered, great variability remained. Nevertheless, the most recurrent features, believed to be inde-

Table 4. Cox Univariate and Multivariate Regression Hazard Models

Feature	Cox Univariate Regression Model, HR (95% CI)	*P* Value	Cox Multivariate Regression Model, HR (95% CI)	*P* Value
Sex	1.01 (0.99-1.03)	.29		
Age ≥65 y	0.97 (0.60-1.55)	.89		
Site of tumor	0.99 (0.81-1.21)	.94		
Bormann classification	1.19 (0.76-1.90)	.44		
Lauren classification	0.73 (0.42-1.26)	.26		
Multiple resection	1.22 (0.76-1.95)	.39		
Spleen	1.48 (0.94-2.35)	.09		.49
Colon	0.78 (0.49-1.22)	.28		
Pancreas	1.04 (0.66-1.63)	.85		
Liver	0.73 (0.40-1.38)	.35		
Peritoneum	1.78 (1.02-3.10)	.04		.71
Diaphragm	0.52 (0.16-1.65)	.27		
Other organs	1.10 (0.53-2.32)	.78		
Tumor size, cm				
< 7	1.74 (1.01-1.14)	.02		.39
>7	0.04 (0.38-3.01)	.04		
pT	0.71 (0.38-1.32)	.28		
pN	1.83 (1.42-2.36)	<.001	1.77 (1.28-2.43)	<.001
No. of lymph nodes	1.00 (0.99-1.01)	.87		
No. of pathologic lymph nodes				
<15	1.02 (1.01-1.03)	<.001		.92
>15	2.08 (1.30-3.33)	<.002		
Type of lymphadenectomy	1.00 (0.71-1.40)	>.99		
R (R0, R1, and R2)	1.81 (1.36-2.39)	<.001	1.64 (1.15-2.34)	.006
Cytology	1.35 (1.01-1.83)	.04		

Abbreviation: HR, hazard ratio.

Table 5. Recently Published Series

Source	Cases, No.	% Postoperative Morbidity	% Postoperative Mortality	% 5-Year Survival	Negative Prognostic Factors
Isozaki et al,[20] 2000	86	NR	NR	35	Tumor location; N+; depth of invasion; extent of lymph node dissection
Saito et al,[12] 2001	156	NR	NR	38	R+ resection; peritoneal and liver metastasis
Dhar et al,[19] 2001	150	31.3	2.6	25.1	Splenectomy; esophageal invasion
Piso et al,[21] 2004	33	36	9	24	R+ resection
Carboni et al,[8] 2005	65	27.7	12.3	21.8	R+ resection
Martin et al,[4] 2002	268	NR	3.7	32	Depth of invasion; nodal status
DY Kim et al,[5] 2006	95	NR	NR	19.9	N+ status
Oñate-Ocaña et al,[11] 2008	74	39	10.7	35	M+ status; albumin levels; presence of ascites
JH Kim et al,[22] 2009	34	11.7	0	37.8	R+ resection
Ozer et al,[10] 2009	56	37.5	12.5	28.1	Advanced age; N+ status; resection >1 additional organ
Jeong et al,[7] 2009	47	31.7	3.3	31.5	R+ resection; N3 status
Fukuda et al,[23] 2011	53	28.6	4.2	34.1	Peritoneal cytology
Present series	112	33.9	3.6	27.2	R+ resection; N status

Abbreviation: NR, not reported.

pendent prognostic factors, were completeness of resection, number and type of resected organs, lymph node metastasis, depth of invasion, and peritoneal spreading.

COMPLETENESS OF RESECTION

As shown in our study, the most powerful prognostic factor was the completeness of resection, and, to our knowledge, almost every study confirms this aspect. The 5-year survival rate in patients with T4 gastric cancer undergoing curative resection (R0 resection) ranges from 23% to 46% (Table 1), and this rate decreases in cases of R+ resection, ranging from 17.5% to 0%.[5-8] Although the study by Kim and colleagues[5] recommends performing resection in patients with locally advanced gastric carcinoma, regardless of curability, the power of completeness of resection is globally demonstrated and further studies are needed to evaluate the cost-benefit balance,

considering the higher perioperative risks for morbidity and mortality.

NUMBER OF RESECTED ORGANS

Although some studies have demonstrated that the number of resected organs is associated with poor prognosis,[4,6,10] in our study, we did not find that the number of resected organs was an independent predictor of survival and there was no statistically significant difference in the survival of patients who underwent en bloc resection of 1 organ when compared with those who had 2 or more resected organs, showing, as in other series, that the involvement of several organs should not be a contraindication for surgery.[5,7,22]

TYPE OF RESECTED ORGANS

The most common combined resected organs were the spleen, the pancreas, and the transverse colon. Many studies have investigated the influence of the type of resected organ but have reported contrasting data. In particular, some studies[18,19] have reported that patients with colon or mesocolon invasion had a significant survival advantage over those with other organ invasions, while some authors have advanced the hypothesis that transverse mesocolon invasion should be reconsidered in the current T staging.[24] Our study did not confirm the advantage of colonic invasion when compared with other organs, but our datum on colon invasion is not pure and contains both colon and mesocolon involvement. The data on splenectomy are more contrasting. Some studies have shown that splenectomy was a negative predictor of survival in the treatment of gastric cancer,[19,25] while other studies found no differences in survival or have reported mixed conclusions depending on the stage of disease[4,7,20,26]; the data about pancreatic resections are not dissimilar and are often reported together with splenectomy.[18,21] Our study showed that patients who underwent splenectomy had a lower rate of survival, but these data should be taken with caution because the risk for lymph node involvement is more probable.

Finally, even in case of esophageal involvement, there are contrasting data. Several authors have suggested that esophageal invasion does not adversely affect long-term results, while, for example in the study by Dhar and colleagues,[19] the presence of esophageal invasion was an independent negative prognostic factor in patients with T4 gastric carcinoma, with a relative risk of 2.11.

Our work confirms that splenectomy, pancreaticosplenectomy, colectomy, or any other organ resection were not found to be predictors of poor survival on multivariate analysis.[5,7,16] Finally, the positive peritoneal washing cytology was, in the recent study by Fukuda and colleagues,[23] the only independent poor prognostic factor for patients with T4 gastric cancer who could be treated with potentially curative resection. In univariate analysis, our study confirmed that positive peritoneal washing cytology and the peritoneal invasion were identified as negative prognostic factors at long-term survival, but our database lacks data because in some cases, peritoneal washing cytology was not performed and no definitive affirmation should be noted.

LYMPH NODE INVOLVEMENT AND DEPTH OF INVASION

The depth of invasion and the presence and extent of lymph node metastasis are the most powerful determinants of survival following an R0 resection and, in our study, represented independent risk factors for death. In fact, our study confirmed the importance of N involvement and the number of pathologic lymph nodes, as well as the dimension of the tumor, the latter only in the univariate analysis. In the study by Martin and colleagues,[4] in which only the patients who underwent complete resection were considered, both nodal status and T status were independent prognostic factors at multivariate analysis, while the T dimension was confirmed only in univariate analysis. Therefore, to our knowledge, the importance of lymph node involvement is reported in almost all studies, highlighting the negative power of the presence of lymph node involvement (N+)[4,5,20,27] or only the extensive lymph node metastatic diffusion (N3+)[7] or the number of lymph nodes involved.[9]

CONCLUSION

Despite the limitations of our study, mostly owing to its retrospective nature, we can conclude that patients undergoing extended resections experience acceptable postoperative morbidity and mortality rates. An en bloc multivisceral resection should be the therapeutic choice in patients with good clinical conditions affected by locally advanced gastric cancer where a complete resection can be realistically obtained and when lymph node metastatic involvement is not evident.

Accepted for Publication: July 16, 2012.
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Conflict of Interest Disclosures: None reported.

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