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D1 Versus D2 Lymphadenectomy for Gastric Cancer

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Abstract

Significant variability exists throughout the world in the extent of lymphadenectomy that is performed for gastric adenocarcinoma. D2 lymphadenectomy is the standard lymphadenectomy performed in high incidence countries such as Japan and South Korea, and less extensive lymphadenectomies are often performed in lower incidence countries such as the United States. This article reviews the evidence on the extent of lymphadenectomy that should be performed for gastric adenocarcinoma.

Keywords

gastric adenocarcinoma; lymphadenectomy; surgery; stage; survival

INTRODUCTION

Controversy over the extent of lymphadenectomy in the treatment of gastric adenocarcinoma has persisted for decades. This controversy stems from differences in the global epidemiology of gastric cancer, and the subsequent differences in experience and outcomes between centers in the Eastern and Western hemispheres. There is little disagreement among gastric cancer experts that the minimum lymphadenectomy that should be performed for gastric adenocarcinoma beyond an early mucosal or submucosal tumor should be at least a D1 lymphadenectomy. The majority of Japanese and South Korean surgeons believe that D2 lymphadenectomy improves outcomes to the extent that they would not consider a randomized trial of D1 versus D2 lymphadenectomy. Two large, prospective randomized trials performed in the United Kingdom and the Netherlands in the 1990s failed to demonstrate a survival benefit of D2 over D1 lymphadenectomy [1,2], but these trials have been criticized for high surgical morbidity and mortality rates in the D2 group. Several studies since those trials have suggested that more extensive lymphadenectomies may be beneficial in certain patients with gastric adenocarcinoma.

Epidemiology

Gastric cancer is the second leading worldwide cause of cancer death and the fourth most common cancer with over one million new cases estimated to occur each year [3]. Nearly three-quarters of cases occur in developing countries, and nearly half of cases occur in Eastern Asia. The incidence of gastric adenocarcinoma varies tremendously throughout the world and country-by-country. Forty-two percent of gastric cancer cases occur in China due to its high incidence and large population [4]. The highest incidence of gastric cancer is found in South Korea at 66.5–72.5 per 100,000 males and 19.5–30.4 per 100,000 females

[5]. The incidence in the United States is only one-tenth of this with 21,320 new cases and 10,540 deaths expected in 2012 [6].

As the incidence of gastric cancer has wide global variability, different countries have adopted different strategies for gastric cancer surveillance. In the United States, gastric cancer detection is still largely based on symptomatic presentation [7]. In Japan, radiographic gastric cancer screening was first performed in the early 1960s and became national policy for citizens over the age of 40 in 1983 [8]. Japanese census data reported that 13% of the population underwent screening in 2004. In 1999, South Korea initiated a campaign recommending either upper endoscopy or upper GI series every 2 years starting at age 40 [9]. Nearly half of South Korean national health insurance recipients are eligible to receive this screening at no cost, and participation in this program was 29.1% in 2008. These screening programs, combined with high social awareness, are responsible for a substantial number of gastric cancer patients presenting in early stages in Japan and South Korea, with nearly half of patients presenting with T1 disease (i.e., tumor invading lamina propria or submucosa) [10,11]. H. pylori screening and eradication systems are also beginning to show effectiveness and hold promise for contributing to a global decline in gastric cancer in the future [12,13].

Current Nodal Station and Lymphadenectomy Definitions

The lymph node stations surrounding the stomach have been precisely defined by the Japanese Gastric Cancer Association (JGCA), formerly known as the Japanese Research Society for Gastric Cancer [14] (Table I and Fig. 1). Previously the JGCA divided these stations into four levels (N1 through N4) based on analysis of lymphatic flow and the likelihood of gastric cancer to metastasize to each station, and these designations change based on the primary location of the tumor (i.e., upper third, middle third, and lower third) [15]. The anatomic definitions of the lymph node stations have remained constant during further revisions of the classification system [16] but the N designation of the stations as a component of D1 or D2 resection has changed as guidelines have been revised. The JGCA recently abandoned their N designation of nodal stations in order to more closely adopt and avoid confusion with International Union Against Cancer (UICC)/American Joint Committee on Cancer (AJCC) staging [17]. Staging of tumors near the esophagogastric junction remain an area of discrepancy between the JGCA and UICC/AJCC staging systems. Nodal stations for a D1 and D2 are now defined by the operation performed rather than the location of the tumor. Table II shows the lymph node stations which should be removed for a D1 and D2 lymphadenectomy in the recently updated JGCA guidelines [18]. D1 lymphadenectomy along with proximal gastrectomy and pylorus preserving gastrectomy are only recommended for T1N0 disease.

The Maruyama Index and Retrospective Justification of D2 Lymphadenectomy

Japanese standardization of gastric cancer pathology, first published in 1962, predates the UICC and AJCC staging systems [17]. Centers in Japan and South Korea have performed extended lymphadenectomies for gastric cancer for decades. At the National Cancer Center (NCC) in Japan, gastric cancer surgeons routinely perform D2 or greater lymphadenectomies and meticulously dissect out and label each station before submitting the surgical specimen to pathology. NCC pathologists then examine and document positive and negative nodes for each separate nodal station. Since the late 1980s, Japanese investigators have tracked the rates of gastric cancer metastasis to specific nodal stations [19]. In 1989, the NCC database of 3,843 cases was used to create the Maruyama computer program [20]. This program estimates the risk of metastasis to each lymph node station based on the input of eight variables: Sex, age, endoscopic or Bormann's classification, depth of invasion, maximal diameter, location (upper, middle, or lower third), position

(lesser or greater curvature, anterior or posterior wall, or circumferential), and WHO histological classification. By matching input variables to a large database of patients, the program gives a percent likelihood of disease in each of the lymph node stations.

The NCC database has not only been used to determine the incidence of lymph node metastasis in each nodal station but also to estimate the 5-year survival of patients who had lymph node metastasis to any given station [21]. An estimate of the added 5-year survival benefit of dissecting each nodal station is calculated by multiplying the frequency of metastasis to the station by the 5-year survival rate of patients with metastasis to this station. This estimate assumes that survival with unresected lymph nodes containing gastric adenocarcinoma approaches zero-percent at 5 years. This analysis has provided a rational basis for the boundaries of D2 lymphadenectomy, showing retrospective evidence of long-term survival after removal of node stations beyond the boundaries of a D1 lymphadenectomy. Long-term survival is dismal when positive nodes are found beyond the boundaries of a D2 resection, suggesting that gastric adenocarcinoma has progressed to a systemic disease once cancer has spread beyond D2 nodes. The accuracy of the Maruyama system has been analyzed for Western patients, with over 80% correlation between statistical predictions and pathologic data for most lymph node stations in one German [22] and one Italian study [23].

Regional Differences in Lymphadenectomy for Gastric Adenocarcinoma

Despite the high incidence of gastric adenocarcinoma in Japan and South Korea, gastric cancer patients are typically referred to tertiary centers for surgical care. Two-thirds of all gastric cancer surgeries in South Korea are performed at 16 high-volume institutions, which perform at least 200 gastric cancer surgeries per year. Thus gastric cancer surgeons at high-volume institutions in Korea gain tremendous experience in the surgical management of gastric cancer. In contrast, the majority of gastric cancer surgeries in the United States are performed at non-referral centers. A “high volume” institution in the United States has been defined in some studies as an institution performing more than 15–20 gastrectomies per year [24,25].

As noted earlier, the standard lymphadenectomy for gastric adenocarcinoma in Japan and South Korea for any tumor beyond a T1 tumor is a D2 lymphadenectomy. Lymphadenectomy is not standardized among United States surgeons, and the performance of a D1 lymphadenectomy is not a trivial undertaking for surgeons without significant experience in upper gastrointestinal surgery. Even a D1 lymphadenectomy during a distal gastrectomy requires dissection of all nodal tissue off the head of the pancreas, dissection of the right gastric nodes off the porta hepatis, and dissection of the left gastric nodes off the celiac axis. In the Intergroup 0116 trial published in 2001, patients were randomized after gastric cancer surgery to no further therapy or chemoradiation, and more than 50% of operations were less than a D1 lymphadenectomy (a.k.a. D0 lymphadenectomy) [26].

Despite the performance of less extensive lymphadenectomies in the United States, surgical morbidity and mortality rates for gastric adenocarcinoma are generally much higher in the United States than in South Korea and Japan. Seoul National University Hospital performs almost 1,000 gastric cancer operations per year, and recently reported a morbidity rate of 18% and mortality rate of 0.5% [27]. In a prospective, randomized trial from 24 Japanese institutions of D2 versus extended para-aortic lymphadenectomy, the morbidity rate was 20.9–28.1%, and the mortality rate was 0.8% [28]. In the United States, single institutions series have reported morbidity rates following gastrectomy of up to 40% [29]. A recent review of Medicare records found that over 80% of patients were operated on at centers that performed 20 or less gastrectomies per year, with inpatient mortality rates from 4.1–9.5% depending on comorbidities [25].

Staging and Locoregional Recurrence after D1 versus D2 Lymphadenectomy

Lymphadenectomy for cancer generally serves three purposes: Staging of disease, prevention of loco-regional recurrence, and improvement in overall survival. In terms of staging of disease, additional lymph nodes examined generally provide additional information on extent of disease. The AJCC Cancer Staging Manual recommends a minimum of 16 lymph nodes be examined [30]. Population-based studies have demonstrated that it is difficult to be confident that a gastric cancer is truly node negative when fewer than 10 lymph nodes are examined [31,32]. Tumors categorized as N1 (1–2 positive nodes) may truly be N2 (3–6 positive nodes) or even N3a (7–15 positive nodes) as more lymph nodes are harvested [31,33]. Finally it is impossible to be categorized as N3b if less than 16 lymph nodes are harvested.

In centers where less than D2 lymphadenectomies are generally performed, 16 lymph nodes are often not examined. An analysis of over 6,000 gastric cancer patients treated at 691 United States hospitals found that less than 40% of patients undergoing surgical resection had at least 15 lymph nodes examined [34]. In a study from the United Kingdom analyzing 18 hospitals, only 31% of the 699 surgical resections resulted in 15 or more lymph nodes analyzed [35]. In our analysis of the SEER database, we found that only one-third of 18,043 resected gastric cancer patients had 16 or more lymph nodes examined [36]. Furthermore, analysis of patients in AJCC stage I–IV found wide ranges in actual overall survival among subgroups within a given stage. For example, subgroups of patients who were AJCC stage IIB had overall survivals ranging from 14 to 53%.

There is some indirect evidence that more extensive lymphadenectomies result in lower rates of loco-regional recurrence. Loco-regional recurrence after potentially curative surgery for gastric adenocarcinoma can be quite high. In a 1982 series from the University of Minnesota, 107 patients with gastric adenocarcinoma underwent second-look laparotomy, and 80% had a recurrence [37]. Of these recurrences, 88% were loco-regional, 54% were peritoneal, and 29% were distant. More recently in United States Intergroup 0116 trial, 177 of 275 patients (64%) in the surgery only group developed recurrent disease [26]. In terms of the site of first relapse, 29% had local recurrence, 72% had regional recurrence, and only 18% had distant recurrence. Rates of loco-regional recurrence are generally lower in reports from both Western and Asian institutions that perform more extensive lymphadenectomies. In a series of 367 patients with recurrent gastric adenocarcinoma from Memorial Sloan-Kettering Cancer Center over 15 years, 81% of patients had a D2 or greater lymphadenectomy and the median number of lymph nodes removed was 22 [38]. Of patients that recurred, loco-regional recurrence was the initial and only site of recurrence in 26% of patients and was a component of initial recurrence in 54% of patients. Yoo et al. examined 508 patients who developed recurrent disease after curative gastrectomy at Yonsei University in South Korea. Nineteen percent of patients had loco-regional recurrence only as the first site of recurrence and 32.5% of patients had loco-regional recurrence combined with peritoneal or distant recurrence as the initial site of recurrent disease. In the patients with only loco-regional site as the site of first recurrence, the anastomosis was the most common location of recurrence followed by lymph nodes. In the Japanese prospective randomized trial of adjuvant S-1 chemotherapy, 188 (35.5%) of 530 patients treated with surgery suffered a recurrence [39]. The site of first recurrence in these 188 patients was local in 7.9% and in lymph nodes in 24.5%.

Overall Survival Following D1 versus D2 Lymphadenectomy

Western opinion on D2 lymphadenectomy are often still based on two large randomized control trials conducted in the 1990s. A United Kingdom Medical Research Council (MRC) trial randomized patients with histologically proven gastric adenocarcinoma to D1 or D2

lymphadenectomy performed by 32 European surgeons [2,40]. An operative booklet and videotapes were produced to standardize the procedure between surgeons. Over 7 years, 737 patients underwent laparotomy, with 337 (46%) excluded for advanced disease, before 200 potentially curable patients were recruited to each arm. In-hospital mortality was high in both groups compared to high volume Asian centers, and significantly higher in the D2 versus D1 arm (13 vs. 6.5%). No adjuvant chemotherapy or radiation was provided. There was no significant difference in overall survival at 5 years (D1 35%; D2 33%; $P = 0.43$). The authors found that much of the additional mortality in the D2 group could be attributed to the performance of distal pancreatectomy and splenectomy (as part of the lymphadenectomy) for many patients in the D2 group. The Dutch trial conducted at 80 different centers in the Netherlands randomized 711 patients from a pool of 996 undergoing laparotomy to receive D1 or D2 lymphadenectomy [1,41]. Participating surgeons received a booklet and a videotape, and an experienced Japanese surgeon was present for the first 4 months of the study to supervise operations. Patients undergoing D2 resection were over three times more likely to undergo splenectomy (37 vs. 11%) and over ten times more likely to undergo distal pancreatectomy (30 vs. 3%). Patients in the D2 group had significantly higher rates of complications (43 vs. 25%; $P < 0.001$) and post-operative death (10 vs. 4% $P = 0.004$). Overall survival at 5 years was not statistically different (45% for D1; 47% for D2).

These trials from the 1990s may no longer be relevant to current practice as evidence now suggests that there is no benefit to routine resection of the spleen or distal pancreas as part of a D2 lymphadenectomy. Pancreas-preserving D2 lymphadenectomy has been shown to reduce peri-operative morbidity and mortality and improve overall survival in a large Japanese series published in 1995 [42]. Prospective studies in both the East and West have additionally shown that avoidance of routine splenectomy improves morbidity and mortality [43–45].

Patients that undergo D2 lymphadenectomy as a standard part of surgical resection of gastric adenocarcinoma generally have better stage-for-stage overall survival figures compared to patients undergoing less extensive lymphadenectomies. Table III demonstrates 5-year overall survival results from four large databases based on the 6th American Joint Committee on Cancer (AJCC) staging system. D2 lymphadenectomies are generally performed at the NCC in Tokyo, Japan, and at Seoul National University Hospital (SNUH) in South Korea. The median number of examined nodes at both these institutions is greater than 25–30, and there is a remarkable similarity in the 5-year survival figures from these two institutions. In the United States Surveillance Epidemiology and End Results (SEER) database, most patients had either a D0 or D1 lymphadenectomy and the median number of examined nodes is 10–11 [36]. For stages I–III, stage for stage overall survival is 14–30% lower for SEER database patients. At Memorial Sloan-Kettering Cancer Center, where about 80% of patients receive a D2 lymphadenectomy [38], stage for stage overall survival is intermediate between SEER database patients and NCC/SNUH patients [46].

Some or possibly all of the differences in stage for stage overall survival in patients undergoing varying lymphadenectomies can be attributed to stage migration. With the routine performance of D2 lymphadenectomy, a greater number of nodes are examined. More extended lymphadenectomies may discover additional positive nodes, and thus a patient may be assigned a more advanced stage after undergoing D2 lymphadenectomy than would be assigned after D1 lymphadenectomy. A large comparison between Japanese and Western cohorts suggested that analysis of additional nodes as a result of D2 lymphadenectomy shifted nearly a third of patients from N1 to N2 disease [47]. A recent retrospective analysis of patients treated at Kaiser Permanente Los Angeles Medical Center over the last decade demonstrated that D2 lymphadenectomy discovered additional positive

nodes beyond D1 boundaries in 39% of patients, altering nodal status (N0 vs. N+) in 20% of patients and resulting in a higher N stage in 16% by 7th edition AJCC standards [48].

Differences in outcomes between centers performing D1 and D2 lymphadenectomy may also be in part due to global differences in epidemiology and biology. In terms of patient demographics, Western patients compared to Eastern patients are generally: (1) older; (2) have a higher body mass index; (3) have a lower incidence of *H. pylori* infection; (4) have more proximal tumors; (5) present with later stage disease; and (6) receive different adjuvant therapies [49]. Many of the factors more common in Western patients are negative prognostic factors for gastric adenocarcinoma. A recent comparison was performed between patients treated with R0 resection between 1995 and 2005 at Memorial-Sloan Kettering Cancer Center (MSKCC) in New York and Seoul St. Mary's Hospital [50]. The median age of United States patients was 10 years greater than that of Korean patients (69 vs. 59 years old). Thirty-nine percent of United States patients had upper third or GE junction tumors compared to only 9.4% of Korean patients, and 59% of United States patients had intestinal type tumors compared to 49% of Korean patients. D2 lymphadenectomy was performed in similar percentages of patients (84 and 89%), but there were more nodes examined in Korean patients than United States patients (97% of Korean patients with 15 nodes examined compared to 78% of United States patients). Overall survival of United States patients with middle or upper tumors was worse than that of Korean patients, but United States and Korean patients with distal tumors has similar overall survival. The investigators applied a previously validated nomogram designed to correct for differences in age, sex, tumor location, Lauren classification, number of lymph nodes resected (negative and positive), and depth of invasion [51,52]. After these adjustments, Korean patients still had a 30% better disease-specific survival than United States patients, suggesting that Asian patients generally may have more favorable tumor biology. One important confounding factor in this analysis was that it was necessary to exclude a significant fraction of United States patients who received chemotherapy, in order to compare them to patients in South Korea where adjuvant chemotherapy was not standard of care at the time of the study.

The effect of more extensive lymphadenectomies on overall survival for gastric cancer is still quite controversial. It is difficult to separate a true survival benefit from stage migration and possible differences in tumor biology, but a number of retrospective studies have shown a correlation between survival and extended lymphadenectomy. This seems particularly true for advanced disease. A study of 4,789 patients at Seoul National University Hospital found that for patients with stage IIIB disease, those who had more than 35 lymph nodes removed had better survival than those who had less than 20 nodes removed [53]. The total number of positive nodes was not statistically different between these two groups leading the authors to conclude that this improvement in survival was due to surgical control of disease rather than stage migration. The German Gastric Carcinoma Study Group found in an analysis of 1,654 patients that those patients who underwent a D2 lymphadenectomy (>25 lymph nodes) had a significantly improved survival rate compared to patients who had a standard lymph node dissection [54]. Despite the greater number of lymph nodes examined, there was no statistically significant difference in stage-distribution. The difference in 5-year survival was particularly dramatic for stage II disease (pT2N1: 51.1 vs. 27.9%, $P=0.0037$; pT3N0: 53.1 vs. 26.3%, $P=0.005$). This survival benefit remained significant between D1 and D2 groups when the patients most likely to be under-staged (examined lymph nodes <15) were removed from the D1 group in analysis.

More recent studies may help reshape Western opinion regarding the question of long-survival benefit of D2 versus D1 lymphadenectomy. A recent prospective trial in Taiwan randomized 110 patients to D1 surgery and 111 to D3 surgery (additional dissection of the hepatoduodenal ligament, superior mesenteric vein and retro-pancreatic area) with

preservation of the pancreas and spleen [55]. This study demonstrated an overall survival advantage of more extensive lymphadenectomy over D1 lymphadenectomy, with overall 5-year survival being 59.5% compared to 53.6%, respectively ($P = 0.041$). However, the clinical benefit of this statistical observation has been questioned by Western audiences [56]. Fifteen-year follow up for the Dutch trial was recently reported [57]. Inspection of the 15-year survival curve reveals an initial dip in the D2 arm reflecting the higher peri-operative mortality, but between years 4 and 5 the survival curves cross and continue to diverge with 8% higher survival in the D2 arm at 15 years (29 vs. 21%; $P = 0.34$). This result is not statistically significant, but the crossing of the survival curves suggest that there may be a long-term survival benefit to D2 lymphadenectomy that was able to compensate for the initial higher peri-operative mortality in this group. Patients undergoing D2 lymphadenectomy had a significantly lower rate of disease-specific death (37 vs. 48%; $P = 0.01$) than those undergoing D1 lymphadenectomy. More patients in the D1 arm had local recurrence of disease at the time of death (41 vs. 30%, $P < 0.05$).

Can Western Surgeons Perform D2 Lymphadenectomies Safely?

The Italian Gastric Cancer Study Group has performed more recent prospective trials addressing outcomes following spleen and pancreas-preserving D2 lymphadenectomies in Western patients [58,59]. Eighteen surgeons at 9 Italian centers underwent extensive training in D2 lymphadenectomy. A phase II trial of D2 lymphadenectomy was then instituted in which all surgeries were performed by these teams of two attending surgeons. Of the 191 patients enrolled onto the study, 106 patients (55%) were ultimately found to be ineligible usually due to more extensive disease. The mean number of lymph nodes removed was 39 (range 22–93). Overall postoperative morbidity and mortality were impressively low at 20.9 and 3.1%, respectively. Subsequent to this study, the surgeons from the five highest volume centers performed a randomized trial of D1 versus D2 lymphadenectomy [60]. Of 267 randomized patients, total morbidity and mortality was 12.0 and 3.0% in the D1 group and 17.9 and 2.2% in the D2 group. Survival results are pending. The experience of the Italian Gastric Cancer Study Group demonstrates that following a period of fairly rigorous training, Western surgeons can perform D2 lymphadenectomies on Western patients with results morbidity and mortality results approaching those of high volume centers in Asia.

SUMMARY

There are significant differences in the extent of lymphadenectomy performed between different institution and different countries. D2 lymphadenectomy is the standard lymphadenectomy performed in Japan and South Korea for all resectable tumors except for T1 tumors. Less extensive lymphadenectomies are generally performed in lower incidence countries such as the United States. There is no disagreement that a D1 lymphadenectomy is the minimum lymphadenectomy for gastric adenocarcinoma, yet this minimum standard may not be met for the majority of patients in the United States [26]. There is no doubt that less extensive lymphadenectomies result in understaging of patients [47]. Less extensive lymphadenectomies also likely result in increased loco-regional recurrence, and may affect decisions regarding adjuvant chemotherapy versus chemoradiation. In terms of overall survival, the effects of more extensive lymphadenectomy are difficult to discern. The Dutch and United Kingdom trials published in the 1990's of D1 versus D2 lymphadenectomy demonstrated that when D2 lymphadenectomy is performed with excess morbidity and mortality there is no survival benefit compared to D1 lymphadenectomy. If D2 lymphadenectomy is performed with low morbidity and mortality, there also may be a benefit in overall survival at least in Chinese patients [55], but this potential benefit needs to be demonstrated by future prospective, randomized trials in Western patients.

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Fig. 1.
Location of lymph node stations according to the Japanese Gastric Cancer Associations [16].
A: Perigastric lymph nodes stations 1–6. **B:** Second tier lymph node stations 7–12 and 14.

TABLE I

Regional Lymph Nodes of the Stomach

Number	Description
1	Right paracardial
2	Left paracardial
3	Lesser curvature
a	Along branches of left gastric artery
b	Along 2nd branch and distal part of right gastric artery
4	Greater curvature
sa	Along short gastric vessels
sb	Along left gastroepiploic vessels
d	Along 2nd branch and distal part of right gastroepiploic artery
5	Suprapyloric along 1st branch and proximal part of right gastric artery
6	Infrapyloric along 1st branch and proximal part of right gastroepiploic artery
7	Left gastric artery
8	Common hepatic artery
a	Anterosuperior group
p	Posterior group
9	Celiac artery
10	Splenic hilum
11	Along splenic artery
p	Along proximal splenic artery
d	Along distal splenic artery
12	Hepatoduodenal ligament
a	Along proper hepatic artery
b	Along bile duct
p	Along portal vein
14	Along superior mesenteric vessels
v	Along superior mesenteric vein
a	Along superior mesenteric artery

Adapted from Ref. 16.

TABLE II

Extent of Lymphadenectomy

Extent of gastrectomy	D1 dissection	D2 dissection
Total gastrectomy	1–7	D1 + 8a, 9p, 11p, 11d, 12a
Distal/subtotal gastrectomy	1, 3, 4sb, 4d, 5, 6, 7	D1 + 8a, 9, 11p, 12a
Proximal gastrectomy	1,2,3a, 4sa, 4sb, 7	N/A

Adapted from Ref. 18.

TABLE III

5-Year Overall Survival by AJCC 6th Edition Stage

	<u>SEER</u>	<u>MSKCC</u>	<u>NCC, Japan</u>	<u>SNUH, Korea</u>
	<u>Stomach</u>	<u>Stomach</u>	<u>Stomach</u>	<u>Stomach</u>
	n = 32,531	n = 1038	n = 6,730	n = 12,026
Lymphadenectomy	D0, D1	D2 > D1	>D2	>D2
Median nodes examined	10–11	22	>30	>30
IA	78	92	91.5	94.4
IB	58	85	84.6	84.2
II	34	49	69.3	68.5
IIIA	20	32	50.4	47.3
IIIB	8	11	30.6	31.6
IV	7	11	5.4	17.2