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MINIREVIEWS

Lymphadenectomy in gastric cancer: Contentious issues

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Abstract

The stomach is the sixth most common cause of cancer worldwide. Surgery is an important component of the multi-modality treatment of the gastric cancer. The extent of lymphadenectomy has been a controversial issue in the surgical management of gastric cancer. The East-Asian surgeons believe that quality-controlled extended lymphadenectomy resulting in better loco-regional control leads to survival benefit in the gastric cancer; contrary to that, many western surgeons believe that extended lymphadenectomy adds to only postoperative morbidity and mortality without significantly enhancing the overall survival. We present a comprehensive review of the lymphadenectomy in the gastric cancer based on the previously published randomized controlled trials.

Key words: Gastric neoplasms; Lymphadenectomy; Gastrectomy; Survival; Disease recurrence

Core tip: The only potentially curative option for the gastric cancer is surgery which may promise complete resection. Presently, D2 lymphadenectomy is the standard of care in an operable gastric cancer. Routine excision of spleen and pancreatic tail should not be undertaken as it increases the postoperative morbidity without adding significantly to overall survival.

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INTRODUCTION

As per GLOBOCAN 2012 data, the stomach is the sixth most common cause of cancer worldwide with an age-standardized incidence and mortality of 12.1/100000 and 8.9/100000 population[1]. Though the multimodality

management of the gastric cancer has gradually become the standard of care, surgery continues to be at the forefront of it[2]. Needless to say, complete surgical excision is the only potentially curable treatment available for an operable non-metastatic gastric cancer. In the last three decades, there has been a considerable debate related to the extent of lymphadenectomy in gastric cancer surgery at various surgical forums. The East Asian surgeons believe that the quality-controlled extended lymphadenectomy results in better locoregional control and leads to survival benefit in the gastric cancer; on the contrary, many western surgeons believe that the extended lymphadenectomy only adds to postoperative morbidity and mortality without significantly enhancing the overall survival. The present mini-review is an attempt to address this contentious surgical issue based on the information available from the published randomized controlled trials in this area.

Classification of lymphnode stations and types of lymphadenectomy

The lymph nodes stations of the stomach are categorized anatomically and identified numerically by the Japanese Gastric Cancer Association (JGCA) as published in the Japanese classification of gastric carcinoma: 3rd edition in 2011[3]. Table 1 displays the various lymph nodes stations and their anatomical definitions. Previously, in its description of 2nd edition of Japanese classification of gastric carcinoma, JGCA classified regional lymph nodes into three groups based on the location of primary gastric tumor[4]. These three groups of lymph node basins were used to describe the extent of lymph nodes dissection in a gastrectomy: D0 dissection - no dissection or incomplete dissection of the group 1 nodes; D1 - dissection of all the group 1 nodes; D2 - dissection of all the group 1 and group 2 nodes; and D3 - dissection of all the group 1, 2 and 3 nodes. This needs to be understood that each lymph nodal station would carry a different meaning for a particular primary tumor location - suprapyloric (station 5) falls under group 1 for an antral primary tumor while it would come under group 3 for proximal third gastric cancer. As expected, this classification was perceived to be quite complicated in the surgical fraternity, especially among western surgeons; and rightly so, it failed to garner widespread acceptance[5]. In order to bring uniformity in the extent of lymphadenectomy, JGCA remarkably simplified the definition of lymphadenectomy in its recent classification[6]. The lymph node stations 1-12 and 14v have been categorized as regional gastric lymph nodes while metastasis to any other node station classified as M1. The Japanese Gastric Cancer Guidelines 2010 (version 3) state that the extent of systematic lymphadenectomy is defined according to the type of gastrectomy indicated with the D level criteria.

For a total gastrectomy - D0 lymphadenectomy includes anything less than D1; D1 includes dissection of level 1 to 7; D1 + includes D1 lymph nodal dissection and stations 8a, 9 and 11p; D2 incorporates D1 lymph nodal dissection and stations 8a, 9, 10, 11p, 11d and 12a. For tumors involving the distal esophagus, D1+ includes dissection of 110 while D2 includes dissection of 19, 20 and 111. For a distal gastrectomy - D0 lymphadenectomy includes anything less than D1; D1 includes dissection of level 1, 3, 4sb, 4d, 5, 6 and 7; D1 + includes D1 lymph nodal dissection and stations 8a and 9; D2 incorporates D1 lymph nodal dissection and stations 8a, 9, 11p, and 12a.

RATIONAL AND EXTENT OF LYMPHADENECTOMY

The key point of debate related to the extent of lymphadenectomy has been to balance the oncological benefit vis-à-vis postoperative morbidity and mortality[7,8]. The oncological scenarios where survival is thought to be increased by the extended lymphadenectomy are few; moreover, there is paucity of level Ⅰ evidence confirming the survival benefit[8]. There is a widely held view among the western surgeons that malignant lymph nodes are indicators and not governors of survival[9,10]. Contrary to this view, Japanese surgeons have demonstrated that better loco-regional control through quality-controlled radical resections with extensive lymphadenectomy, leads to improvement in survival by preventing the loco-regional recurrences and thereby reducing the distant metastasis. There have been a few randomized controlled trials (RCTs), published in the last two decades, which compared various extents of lymphadenectomy in the gastric cancer surgery to assess the associated postoperative morbidity and mortality, and their impact on survival. (Table 2).

D1 vs D2 lymphadenectomy

The contentious issue of the extent of lymphadenectomy was a real dividing line between the Japanese surgeons and western surgeons in the 1990s. There are three published RCTs which have compared the D1 and D2 lymphadenectomy in the gastric cancer surgery.

The landmark Dutch trial was conducted by Dutch Gastric Cancer Group from August 1989 till July 1993[11]. They randomized 711 patients into two groups: One group had D1 dissection while the other group had D2 dissection. The D1 dissection included clearance of 1st tier lymph nodal echelons (stations 1-6) while D2 dissection incorporated additional clearance of 2nd tier lymph nodal echelons (stations 7-11). Distal pancreatectomy with splenectomy was done in all patients who had a D2 dissection in order to achieve adequate lymphadenectomy, while it was done selectively in a D1 dissection, when they were involved by the tumor. The eligibility criterion of the patients for inclusion in the trial was the presence of histologically confirmed gastric cancer without evidence of distant metastasis. The quality control was undertaken with the histopathological confirmation of lymph nodes and their number at a particular station. They coined two terms: "Contamination" and "non-compliance" to describe violation of the protocol. The "contamination"

Table 1 Anatomical definition of lymph node stations

Lymph node station	Label	Anatomical description
1	Right paracardial	Right paracardial LNs, including those along the first branch of the ascending limb of the left gastric artery
2	Left paracardial	Left paracardial LNs including those along the esophagocardiac branch of the left subphrenic artery
3	Lesser curvature	3a: Along the branches of the left gastric artery 3b: Along the 2nd branch and distal part of the right gastric artery
4	Left gastric curvature	4sa: Left greater curvature LNs along the short gastric arteries (perigastric area) 4sb: Left greater curvature LNs along the left gastroepiploic artery (perigastric area)
	Right greater curvature	4d: Rt. greater curvature LNs along the 2nd branch and distal part of the right gastroepiploic artery
5	Suprapyloric	Along the 1st branch and proximal part of the right gastric artery
6	Infrapyloric	Along the first branch and proximal part of the right gastroepiploic artery down to the confluence of the right gastroepiploic vein and the anterior superior pancreatoduodenal vein
7	Left gastric aretry	Along the trunk of left gastric artery between its root and the origin of its ascending branch
8	Common hepatic artery	8a: Anterosuperior LNs along the common hepatic artery 8p: Posterior LNs along the common hepatic artery
9	Celiac	Along the coeliac artery
10	Splenic hilum	Lymph nodes in the splenic hilum including those adjacent to the splenic artery distal to the pancreatic tail, and those on the roots of the short gastric arteries and those along the left gastroepiploic artery proximal to its 1st gastric branch
11	Splenic artery	11p: Proximal splenic artery LNs from its origin to halfway between its origin and the pancreatic tail end 11d: Distal splenic artery LNs from halfway between its origin and the pancreatic tail end to the end of the pancreatic tail
12	Hepatoduodenal ligamant	12a: Hepatoduodenal ligament LNs along the proper hepatic artery, in the caudal half between the confluence of the right and left hepatic ducts and the upper border of the pancreas 12b: Hepatoduodenal ligament LNs along the bile duct, in the caudal half between the confluence of the right and left hepatic ducts and the upper border of the pancreas 12p: Hepatoduodenal ligament LNs along the portal vein in the caudal half between the confluence of the right and left hepatic ducts and the upper border of the pancreas
13	Posterior pancreatic head	On the posterior surface of the pancreatic head cranial to the duodenal papilla
14v	Superior mesenteric vein	Along the superior mesenteric vein
15	Middle colic vessels	Along the middle colic vessels
16	Para-aortic	16a1: Paraaortic lymph nodes in the diaphragmatic aortic hiatus 16a2: Paraaortic lymph nodes between the upper margin of the origin of the celiac artery and the lower border of the left renal vein 16b1: Paraaortic lymph nodes between the lower border of the left renal vein and the upper border of the origin of the inferior mesenteric artery 16b2: Paraaortic lymph nodes between the upper border of the origin of the inferior mesenteric artery and the aortic bifurcation
17	Anterior surface of pancreatic head	On the anterior surface of the pancreatic head beneath the pancreatic sheath
18	Inferior border of the pancreatic body	Along the inferior border of the pancreatic body
19	Infradiaphragmatic	Infradiaphragmatic, predominantly along the subphrenic artery
20	Paraesophageal, esophageal hiatus	In the diaphragmatic esophageal hiatus
110	Paraesophageal, lower thoracic	In the lower thorax
111	Supradiaphragmatic	Supradiaphragmatic lymph nodes separate from the esophagus
112	Posterior mediastinal	Posterior mediastinal lymph nodes separate from the esophagus and the esophageal hiatus

LNs: Lymph nodes.

was considered when a surgeon dissected two or more lymph node stations which should not have been dissected; the "non-compliance" was considered when a surgeon did not dissect two or more lymph node stations which should, otherwise, have been dissected. It was thought that a high contamination in D1 dissection and a high noncompliance in D2 dissection would blur the distinction between operative procedures in the two groups and it would affect the conclusions. They reported a significantly high postoperative morbidity (43% *vs* 4%, $P < 0.001$) and mortality (10% *vs* 4%, $P < 0.004$) in the D2 dissection group as compared to the other group. Moreover, they reported no difference in 5-year survival in between the two groups (34% in D1 *vs* 33% in D2). Based on these results, they concluded that their data did not support routine D2 lymphadenectomy in gastric cancer patients. However, this trial drew a lot of criticism in view of a number of flaws. The participating surgeons had no previous experience of D2 lymphadenectomy; they were trained with the help of videotapes and booklets. There were a number of centres which were low volume centres for gastric resection, performing only a few in a year. The non compliance was very high in the D2 lymphadenectomy group, to the tune of 51%. The 11-year follow-up data of this trial (published in 2004) indicated similar survival in between the two groups

Table 2 Previously published randomized clinical trials addressing the extent of lymphadenectomy in gastric cancer

Ref.	Study period	Study groups	Median follow-up	Result	Conclusion
Cuschieri *et al*[14]	1986-1993	D1 = 200, D2 = 200	6.5 yr, overall	5-yr OS in D1 *vs* D2 - 35% *vs* 33%, (HR = 1.10, 95%CI: 0.87-1.39)	Classical Japanese D2 resection offers no survival advantage over D1 surgery
Songun *et al*[13]	1989-1993	D1 = 380, D2 = 331	15.2 yr, overall	5-yr OS D1 *vs* D2 - 21% *vs* 29%, (log-rank *P* = 0.34), subgroup analysis of patients without pancreatico-splenectomy, 15-yr OS in D1 *vs* D2 = 22% *vs* 35% (HR = 1.34, 95%CI: 1.09-1.65; log-rank *P* = 0.006)	Spleen preserving D2 resection should be recommended as the standard surgical approach to resectable gastric cancer
Degiuli *et al*[17]	1998-2006	D1 = 133, D2 = 134	6.7 yr, overall	5-yr OS in two arms D1 *vs* D2 - 66.5% *vs* 64.2%, (difference -2.3, 95%CI: -14.0 to 9.3; *P* = 0.695), 5-yr disease-specific survival in pathological tumour pT2-4 in two arms D1 *vs* D2 - 38% *vs* 59%; *P* = 0.055	No difference in overall 5-yr survival between D1 and D2 resection; D2 lymphadenectomy may be a better choice in patients with advanced disease and lymph node metastases
Wu *et al*[19]	1993-1999	D1 = 110, D3 = 111	94.5 mo, for survivors	5-yr OS in D1 *vs* D3 - 53.6% *vs* 59.5% difference between groups 5.9% (95%CI: -7.3 to 19.1), log-rank *P* = 0.041)	D3 dissection offers a survival benefit for patients with gastric cancer compared with D1 dissection
Sasako *et al*[21]	1995-2001	D2 = 260, D2 + PAND = 263	5.6 yr for D2 lymphadenectomy alone and 5.7 yr for D2 lymphadenectomy plus PAND 94.5 mo, for survivors	5-yr overall survival rate for D2 *vs* D2 + PAND -69.2% *vs* 70.3% HR for death 1.03 (95%CI: 0.77-1.37; *P* = 0.85)	No survival benefit with D2 lymphadenectomy plus PAND in curable gastric cancer as compared with D2 lymphadenectomy alone
Yonemura *et al*[22]	1995-2002	D2 = 135, D2 + PAND = 134	NS	5-yr overall survival rate for D2 *vs* D2 + PAND -52.6% *vs* 55.0% (χ^2 = 0.064; *P* = 0.801)	Prophylactic D4 dissection is not recommended for patients with potentially curable advanced gastric cancer
Kulig *et al*[20]	1999-2003	D2 = 141, D2 + PAND = 134	Results awaited	Results awaited	Results awaited

D1: D1 lymphadenectomy; D2: D2 lymphadenectomy; OS: Overall survival; HR: Hazard ratio; PAND: Para-aortic node dissection.

(30% for D1 *vs* 35% for D2, *P* = 0.53); risk of relapse in two groups was also shown to be similar (78% for D1 *vs* 65% for D2, *P* = 0.43)[12]. The 15-year survival data for the Dutch trial (published in 2010), however, swayed the evidence towards the D2 dissection; gastric-cancer-related deaths were significantly higher in the D1 group compared with the D2 group (HR = 0.74 for D2 *vs* D1, 95%CI: 0.59-0.93, *P* = 0.01), whereas death due to other causes was not different between the two groups (HR = 1.22 for D2 *vs* D1, 0.95-1.58, *P* = 0.12). Loco-regional recurrences were higher in D1 group compared to D2 group (40.7%, 155/380 *vs* 21.8%, 83/330). The 15-year overall survival for patients who had curative resections was 21% (95%CI: 17-26) for D1 and 29% (98 of 331, 24-34) for D2 (log-rank *P* value, 0.34); however, the difference in survival (25% for D1 *vs* 35% for D2, log-rank *P* value 0.08) in two groups became more evident if the postoperative deaths in two groups were excluded (4% in D1 and 10% in D2). Subgroup analysis showed that pancreatectomy and splenectomy, which were routinely done in D2 group as per the protocol, significantly lowered the overall survival. These findings led the authors to recommend spleen preserving D2 dissection in the patients with resectable gastric cancer[13].

Another landmark trial published in 1999 was MRC trial conducted by Cuschieri *et al*[14]. This was a large multicentric trial (patients recruited by 32 surgeons) which randomized 400 patients into two arms: 200 patients in one arm underwent D1 dissection which was defined as removal of lymph nodes within 3.0 cm of the tumor while another 200 patients in other arm had D2 dissection which incorporated additional removal of omental bursa, the hepatoduodenal and retroduodenal nodes (antral lesions), and the splenic artery/splenic hilar nodes and retropancreatic nodes by distal hemipan-creaticosplenectomy for middle and upper third lesions. The authors reported that D2 lymphadenectomy was associated with significantly higher postoperative com-plications (D2 *vs* D1, 46% *vs* 28%, *P* < 0.001); the postoperative mortality was also significantly higher in the D2 group (13%) than in the D1 group (6.5%; *P* = 0.04)[15]. The authors showed that the 5-year survival rates were 35% for D1 resection and 33% for D2 resection and there was no statistically significant difference in overall 5-year survival between these two arms (HR = 1.10, 95%CI: 0.87-1.39, where HR > 1 implies a survival benefit to D1 surgery) after a median follow-up of 6.5 years. Gastric cancer-specific survival was also similar in the D1 and D2 groups (HR = 1.05,

95%CI: 0.79-1.39) as was recurrence-free survival (HR = 1.03, 95%CI: 0.82-1.29). Based the findings of the trial, the authors suggested that the classical Japanese D2 resection offered no survival advantage over D1 resection. However, they did not refute the possibility that the D2 resection without pancreatico-splenectomy might be better than standard the D1 resection as there was a significant survival disadvantage in the group undergoing splenectomy with distal pancreatectomy (*P* = 0.01). This fact may also be responsible for confounding the results as 57% of the D2 group underwent distal pancreatectomy and splenectomy *vs* 4% in the D1 group. Though the D2 lymphadenectomy included more extensive lymph nodes dissection than the D1, there was a little difference in the median number of nodes examined with a mean of 13 in the D1 group *vs* 17 nodes in the D2 group.

The Italian gastric cancer study group (IGCSG) conducted another trial to compare the D1 and D2 lymphadenectomy in the gastric cancer[16,17]. The previous trials, MRC and Dutch trial, reported higher postoperative morbidity and mortality in the D2 lymphadenectomy. In order to address the safety concerns and survival benefits of D2 lymphadenectomy, IGCSG initiated multicentric RCT in 1998; they randomized 267 patients into two arms - D1 and D2 lymphadenectomy. The promising part of the trial was its strict quality controlled surgery - only those surgeons who had participated in their previous trial were asked to participate in the present trial in order to avoid bias related to surgical inexperience in D2 gastrectomy technique. However, the trial still had high contamination (17.3%) and non-compliance (33.6%) among the operated patients. In their initial publication of short term results of trial, the authors reported that the overall morbidity rate following D1 and D2 dissections was comparable (12.0% *vs* 17.9%, *P* value 0.178) as per intention to treat analysis; there was also no difference in the 30-d postoperative mortality rates (D1 *vs* D2, 3.0% *vs* 2.2%, *P* = 0.72). They concluded that the postoperative complications following D2 lymphadenectomy are not as high as they have been reported in previous randomized western trials in the specialized centers, and it should be considered a safe option for the radical management of gastric cancer in Western patients in an appropriate setting[17]. The authors published their long term results in 2014[16]. The median follow-up was 8.8 (range 4.5-13.1) years for surviving patients and 2.4 (0.2-11.9) years for those who died, and was not different in the two treatment arms. The overall 5-year survival was similar in two groups (D1 *vs* D2, 66.5% *vs* 64.2%, *P* value = 0.69). Subgroup analyses showed a 5-year disease-specific survival benefit for patients with pathological tumour 1 (pT1) disease in the D1 as compared to D2 (98% *vs* 83 %, *P* = 0.015), and for patients with pT2-4 status and positive lymph nodes in the D2 as compared to D1 (59% *vs* 38%, *P* = 0.055). The authors concluded that D2 lymphadenectomy might be a better choice in patients with advanced disease (pT2-4) and lymph node metastases. Though the overall 5-year survival rate of approximately 65% in the whole patient cohort is impressive, it seems to be related to the unexpectedly high proportion (33%) of patients with pT category 1 tumors, who have a good prognosis and probably would not benefit from a D2 procedure[18]. The Italian study contributes to the view that D2 lymphadenectomy can be performed safely and adequately, producing 5-year survival results that help to close the gap between survival results reported from Asia and those from Europe.

D1 vs D3 lymphadenectomy

Wu *et al*[19] reported a randomized controlled trial of nodal dissection for patients with the gastric cancer from Taiwan; they randomly allocated 221 patients with the advanced gastric cancer at the Taipei Veterans General Hospital, Taiwan, to either D1 lymphadenectomy or D3 lymphadenectomy during the study period 1993-1999. At a median follow-up of 94.5 mo, the authors reported that the 5-year overall survival was 59.5% (95%CI: 50.3-68.7) for the D3 group and 53.6% (95%CI: 44.2-63.0) for the D1 group (difference between groups 5.9%, 95%CI: -7.3 to 19.1, log-rank *P* = 0.041) as per the intention to treat analysis. Among patients who had R0 resection, D3 dissection group had fewer disease recurrences than D1 (42% *vs* 52%), though it did not attain statistical significance (*P* value = 0.117, χ^2 test). However, among this R0 resection group, D3 group had significantly higher 5-year overall survival than D1 group (61.1%, 95%CI: 51.9-70.3 *vs* 54.2%, 95%CI: 44.8-63.6; difference between groups 6.9%, 95%CI: -6.3-20.7, log-rank *P* = 0.026). The authors concluded that D3 nodal dissection performed by well trained and experienced surgeons offers survival advantage compared with D1 in gastric cancer. This trial had its own limitations. The preoperative work up of the patients was not stringent as sizeable number of patients (*n* = 114, 34%) met exclusion criteria. More troublesome is those 64 patients who were found to have not met the protocol after randomization in view of early cancer, oesophageal invasion, or positive resection margin following histopathological examination. This highlights the growing role of high resolution computed tomography and endoscopic ultrasonography for accurate disease staging. The authors did not mention anatomical mapping of late nodal recurrences; this detailed anatomic information would have highlighted whether extensive lymphadenectomy helped avoiding the nodal recurrence in the dissected lymph node basins.

D2 vs extended D2 lymphadenectomy

Three published RCTs have addressed this issue of D2 *vs* extended D2 (including Paraaortic lymph node dissection). Significant postoperative morbidity and mortality following extensive lymphadenectomy has always been a matter of grave concern especially among the western surgeons. In order to address the safety concerns of extensive D2 dissection, Polish Gastric Cancer Study Group published the interim analysis of their multicentre, randomized clinical trial which was

initiated to evaluate the possible benefits of extended D2 (D2+) lymphadenectomy after potentially curative resection of gastric cancer[20]. They defined standard D2 lymphadenectomy according to the JGCA classification; D2+ lymphadenectomy included additional removal of para-aortic nodes. They randomized 275 patients into two groups: 141 to standard D2 and 134 to D2+ lymphadenectomy. The overall morbidity rates were comparable in two groups: D2 and D2+ (27.7%, 95%CI 20.3-35.1 *vs* 21.6%, 95%CI: 13.7-29.5, *P* value = 0.248). The postoperative mortality rates were also similar in two groups (D2 *vs* D2+, 4.9% *vs* 2.2%, *P* value = 0.376). They concluded that the interim safety analysis suggested similar surgical outcome in two groups. Long term survival data from the POLAND trial is still awaited.

Though the POLAND trial established the safety of extended D2 dissection, the JCOG 9501 trial failed to establish oncological benefit of D2 extended dissection[21]. The JCOG 9501 trial addressed the surgical issue if addition of para-aortic nodal dissection (PAND) to D2 lymphadenectomy for stage T2, T3, or T4 tumors improves survival. They conducted a multi-centric (24 hospitals in Japan) randomized controlled trial to compare D2 lymphadenectomy alone with D2 lymphadenectomy plus PAND in patients undergoing gastrectomy for curable gastric cancer. They randomized 523 patients with curable stage T2b, T3, or T4 gastric cancer to D2 lymphadenectomy alone (*n* = 263 patients) or to D2 lymphadenectomy plus PAND (*n* = 260 patients). No adjuvant treatment was prescribed to any patient following surgery. The rates of surgery-related complications (anastomotic leakage, pancreatic fistula, abdominal abscess, pneumonia) in two groups were similar (D2 *vs* D2+, 20.9% *vs* 28.1%, *P* value = 0.07), Death rates from any cause within 30 d after surgery in two groups were also similar. There was also no difference in 5-year overall survival rate in two groups (D2 *vs* D2+, 69.2% *vs* 70.3%, HR = 1.03, *P* = 0.85). There were no significant differences in recurrence-free survival between the two groups (HR for recurrence 1.08, *P* = 0.56). The authors concluded that D2 lymphadenectomy plus PAND does not improve the survival rate in curable gastric cancer in comparison to D2 lymphadenectomy alone.

The third RCT was conducted by the East Asia Surgical Oncology (EASO) group to evaluate the survival benefit of para-aortic dissection in addition to the D2 lymphadenectomy in potentially curable gastric adenocarcinoma[22]. They randomized 269 patients into two groups 135 patients were allocated to the D2 group and 134 to the D2 + para-aortic lymphadenectomy (D2+, also designated as D4 by the authors) group. There was no statistically significant difference in survival between the two groups (52.6% for D2 *vs* 55.0% for D2+, χ^2 = 0.064; *P* = 0.80). The authors concluded that prophylactic para-aortic dissection is not recommended for patients with potentially curable advanced gastric cancer. It is worth mentioning here that out of 12 patients who had pathologically positive station 16 nodes, three of them survived for more than 5 years (median survival 2.8 years).

What do we learn from these trials?

Though the MRC[15] and Dutch trial[11] suggested that D2 dissection is associated with significantly higher postoperative morbidity in terms of anastomotic leakage, pancreatic leakage, reoperation rates, wound infection and pulmonary complications, it seems that higher postoperative risk reported with D2 dissection in these trials can be contributed largely to splenectomy and pancreatectomy and not to D2 itself. Secondly, inadequate surgical training in the D2 dissection and sub-optimal quality control would further explain the higher postoperative morbidity and mortality in earlier trials. IGCSG trial showed that D2 dissection could be performed safely without splenectomy and distal pancreatectomy, with comparable mortality and morbidity to those for D1 dissection[17]. Splenectomy or distal pancreatectomy might be considered beneficial only when the primary tumour or metastatic lymph nodes directly invade these organs. Routine resection of spleen and pancreatic tail is no longer recommended as a necessary component of modern D2 dissection[23].

Though the initial results of the Dutch trial and the MRC trial did not show survival benefit of D2 lymphadenectomy, 15-year follow-up data of Dutch trial clearly swayed the evidence in favour of spleen preserving D2 lymphadenectomy. This was despite the significant problem of contamination and non-compliance. This further reiterated the notion that long term follow-up is needed to document the survival benefit of good loco-regional control. It must be remembered that adjuvant treatment is not the replacement of inadequate surgery; subgroup analysis of Intergroup 116 trial showed that while adjuvant chemoradiotherapy is required after D0/1 dissection, it had no added value after D2 dissection[24-26].

Prophylactic dissection of station 16 does not provide any significant benefit over standard D2 lymphadenectomy, though 25% 5-year survival among patients with pathologically positive para-aortic nodes in EASO group trial[22] gives a hope for this patient cohort.

When will there be reconciliation in Eastern and Western surgeons is not the issue; the basic question remains what is the optimum lymphadenectomy for a given patient to improve survival without adding significant postoperative complications. A personalized surgical approach may be beneficial in a given patient to select D1 or D2 lymphadenectomy - a D2 lymphadenectomy may not benefit a patient with early gastric cancer and may indeed lead to increased complications; on the contrary, patients with more advanced disease may benefit from an extensive lymphadenectomy[27].

CONCLUSION

Presently, the D2 lymphadenectomy is the standard of

care in an operable gastric cancer. Routine excision of spleen and pancreatic tail should not be undertaken as it increases the postoperative complications without adding significantly to overall survival.

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