

Definition of a standard lymphadenectomy in surgery for pancreatic ductal adenocarcinoma: A consensus statement by the International Study Group on Pancreatic Surgery (ISGPS)

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Background. The lymph node (Ln) status of patients with resectable pancreatic ductal adenocarcinoma is an important predictor of survival. The survival benefit of extended lymphadenectomy during pancreatotomy is, however, disputed, and there is no true definition of the optimal extent of the lymphadenectomy. The aim of this study was to formulate a definition for standard lymphadenectomy during pancreatotomy.

Methods. During a consensus meeting of the International Study Group on Pancreatic Surgery, pancreatic surgeons formulated a consensus statement based on available literature and their experience.

Results. The nomenclature of the Japanese Pancreas Society was accepted by all participants. Extended lymphadenectomy during pancreatoduodenectomy with resection of Ln's along the left side of the superior mesenteric artery (SMA) and around the celiac trunk, splenic artery, or left gastric artery showed no survival benefit compared with a standard lymphadenectomy. No level I evidence was available on prognostic impact of positive para-aortic Ln's. Consensus was reached on selectively removing suspected Ln's outside the resection area for frozen section. No consensus was reached on continuing or terminating resection in cases where these nodes were positive.

Conclusion. Extended lymphadenectomy cannot be recommended. Standard lymphadenectomy for pancreatoduodenectomy should strive to resect Ln stations no. 5, 6, 8a, 12b1, 12b2, 12c, 13a, 13b, 14a, 14b, 17a, and 17b. For cancers of the body and tail of the pancreas, removal of stations 10, 11, and 18 is standard. Furthermore, lymphadenectomy is important for adequate nodal staging. Both pancreatic resection in relatively fit patients or nonresectional palliative treatment were accepted as

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acceptable treatment in cases of positive Ln's outside the resection plane. This consensus statement could serve as a guide for surgeons and researchers in future directives and new clinical studies. (Surgery 2014;156:591-600.)

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THE OPTIMAL LYMPHADENECTOMY during pancreatectomy for pancreatic adenocarcinoma is disputed. Although the lymph node (Ln) status of patients with resectable pancreatic ductal adenocarcinoma is an important predictor of survival, the actual survival benefit of an extended lymphadenectomy compared with a standard lymphadenectomy is limited. Four randomized, controlled trials (RCT) analyzed extended versus standard lymphadenectomy during pancreatoduodenectomy and failed to find better outcomes in patients undergoing an extended Ln dissection.¹⁻⁶ Complicating this topic is that the nomenclature, definitions, and classifications of Ln stations and standard or extended lymphadenectomy vary widely in the 4 RCTs, which makes it difficult to compare the results between studies and to analyses which lymphadenectomy is preferred. During a consensus conference in 1999, an agreement was reached on which Ln nomenclature should be used, and definitions for standard and extended lymphadenectomy were formulated.⁷ Notwithstanding, there remains ongoing discussion regarding the extent of lymphadenectomy and what consequences positive Ln's in specific stations have when discovered during an operation. Owing to the persistent controversy on this topic and absence of level I evidence on the optimal lymphadenectomy, an expert panel prepared and participated in a consensus conference of the International Study Group on Pancreatic Surgery (ISGPS) in April 2013 to evaluate the current literature on the definitions and to discuss the extent of a standard lymphadenectomy and

related issues. In this consensus document, the term "standard lymphadenectomy" is used to define the extent of the lymphadenectomy and the nodal stations that should be removed in patients undergoing resection for suspected or confirmed pancreatic ductal adenocarcinoma. This type of lymphadenectomy might also be appropriate in patients with periampullary cancers and cystic neoplasms with malignant potential. To determine this, studies first need to present data using the same definition for lymphadenectomy to enable an accurate comparison and to start or design new clinical trials.

The aim of this consensus statement was to guide surgeons in their decision making and prevent unnecessary extended procedures from being performed. Furthermore, this consensus statement can prevent the disparity in classification of lymphadenectomy that is found today.

METHODS

A computerized search of the PubMed and Embase database was made using the following terms: "pancreatic cancer," "pancreatic adenocarcinoma," "surgery," "radical lymphadenectomy," "extended lymphadenectomy," "complications," "para-aortic," "lymph nodes," and "nodal staging." Publications of rated in descending order of level of evidence: Systematic reviews and meta-analyses, prospective (randomized) studies, major publications from high-volume centers, and existing consensus reports; case studies were excluded. Only studies published in English were included.

References of the included articles were hand checked to ensure no relevant studies were missed. The search was performed in February 2013.

All relevant literature and a summary of the extracted data were reviewed by the study group (DJG, CB, CD, MM, RMC) of the International Study Group Pancreatic Surgery (ISGPS), which resulted in a first draft of the consensus definition and preparation of the statement. During the international consensus meeting attended by members of the ISGPS, the first draft was discussed. A final consensus statement on the definition of standard lymphadenectomy in pancreatic surgery was formulated and agreed by all cosignatories using the Grading of Recommendations Assessment, Development, and Evaluation guidelines.⁸

RESULTS AND CONSENSUS STATEMENTS

Nomenclature for nodal stations in pancreatic surgery. Both the Union International Contre le Cancer criteria and the Japanese Pancreas Society rules have been described in all level I RCTs.¹⁻⁶ During the European consensus meeting in 1999, the nomenclature of the Japanese Pancreas Society was selected and specification of the lymphadenectomy during pancreatoduodenectomy was described thereafter.⁹ There now seems to be general acceptance to use the “classification of pancreatic carcinoma” proposed by the Japanese Society (Fig 1).

Consensus statement. Based on these RCTs and the detailed nature of the classification, the use of the nomenclature for nodal stations based on the classification of the Japanese Pancreas Society (Japan Pancreas Society. Classification of pancreatic carcinoma. 2nd English ed. Tokyo: Kanehara & Co. Ltd; 2003¹⁰) was agreed on by all conference members and was recommended strongly.

Pancreatoduodenectomy: Extended or standard lymphadenectomy? The extent of lymphadenectomy in patients with pancreatic adenocarcinoma during pancreatoduodenectomy as well as for left-sided pancreatectomy is discussed separately.

Lymphadenectomy during pancreatoduodenectomy was described in 2 older cohort studies showing improved 5-year survival rates in patients who underwent standard lymphadenectomy compared with nonradical lymphadenectomy.^{11,12} Three RCTs published afterward reported no survival benefit, and no arguments could be presented based on the evidence of these studies to support the role of extended lymphadenectomy during pancreatoduodenectomy. A similar conclusion was underlined again in 2 meta-analyses, the first from Michalski et al,¹³ in which 3 RCTs were analyzed and the second from Iqbal et al,¹⁴ in

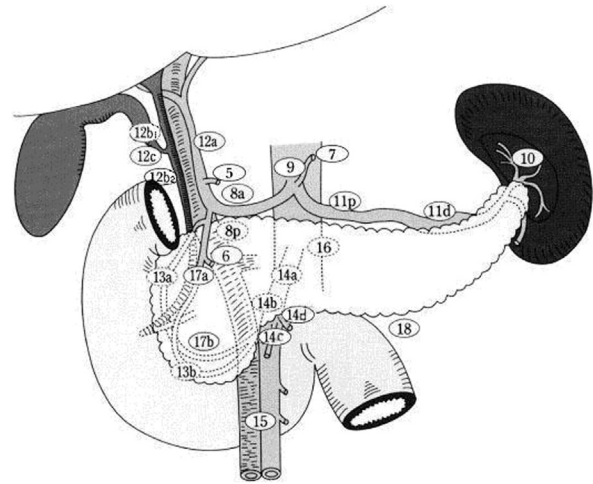


Fig 1. Japan Pancreas Society nomenclature of peri-pancreatic lymph nodes. (Adapted from Japan Pancreas Society. Classification of pancreatic carcinoma. 2nd English edition. Tokyo: Kanehara & Co. Ltd; 2003.) Lymph node stations: No. 5, Suprapyloric lymph nodes; No. 6, infrapyloric lymph nodes; No. 7, lymph nodes along the left gastric artery; No. 8a, lymph nodes in the anterosuperior group along the common hepatic artery; No. 8p, lymph nodes in the posterior group along the common hepatic artery; No. 9, lymph nodes around the celiac artery; No. 10, lymph nodes at the splenic hilum; No. 11p, lymph nodes along the proximal splenic artery; No. 11d, lymph nodes along the distal splenic artery; No. 12a, lymph nodes along the hepatic artery; No. 12b, lymph nodes along the portal vein; No. 12c (located next to 12b), lymph nodes around the cystic duct; No. 13a, lymph nodes on the posterior aspect of the superior portion of the head of the pancreas; No. 13b, lymph nodes on the posterior aspect of the inferior portion of the head of the pancreas; No. 14p, lymph nodes along the proximal superior mesenteric artery; No. 14d, lymph nodes along the distal superior mesenteric artery; No. 15, lymph nodes along the middle colic artery; No. 16, lymph nodes around the abdominal aorta; No. 17a, lymph nodes on the anterior surface of the superior portion of the head of the pancreas; No. 17b, lymph nodes on the anterior surface of the inferior portion of the head of the pancreas.

which both RCTs and cohort studies were included (Fig 2), both of which showed no benefit of extended lymphadenectomy. These conclusions are in accordance with the fourth RCT from Japan showing no benefit in long-term survival after extended lymphadenectomy in patients with resectable pancreatic head adenocarcinoma.⁶ The definition of lymphadenectomy, however, varied considerably between the RCTs. The pancreatic cancer registry of the Japan Pancreas Society analyzed 32,619 records and showed a significantly poorer survival in patients who underwent

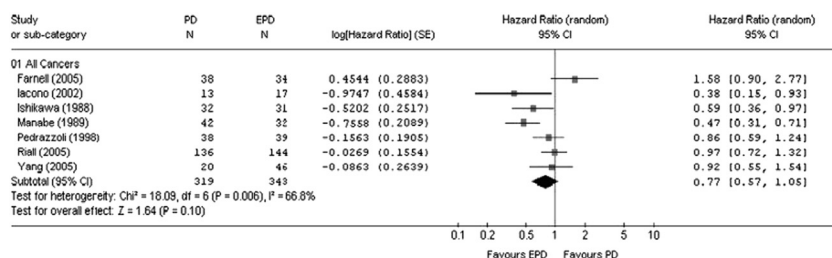


Fig 2. Meta-analysis on survival data of randomized controlled trials and cohort studies including patients with pancreatic cancer undergoing an extended versus standard lymphadenectomy. (Adapted from Iqbal et al. A comparison of pancreaticoduodenectomy with extended pancreaticoduodenectomy: a meta-analysis of 1909 patients. *EJSO* 2009;35:79–86.)

resection with a D1 lymphadenectomy compared with D2 and D3 lymphadenectomy; however, no survival advantages were seen between D2 versus the more extended D3 resections.¹⁵

Consensus statement. The performance of an extended lymphadenectomy during pancreatoduodenectomy as described in the 4 RCTs was not of any proven benefit and should not be performed. Although the definition of extended lymphadenectomy varied between the RCTs, none of the trials reported a survival benefit in patients undergoing the more extended lymphadenectomy. Moreover, an extended lymphadenectomy might be associated with undesirable consequences, such as chronic diarrhea and associated weight loss.^{6,13,16}

Which local Ln's should be included in standard lymphadenectomy during pancreatoduodenectomy in patients with pancreatic ductal adenocarcinoma? The [Table](#) depicts the differences found in the literature when comparing the different RCTs accompanied with the outcomes after lymphadenectomy. During the consensus conference, all Ln's were discussed, and no consensus could be reached by reviewing the available literature. Consensus on including Ln stations 13 and 17 in the standard lymphadenectomy was reached beforehand, because these nodes are embedded within the pancreaticoduodenal groove, and therefore are always resected with the specimen. Ln's around the SMA, celiac trunk, hepatoduodenal ligament, splenic artery, left gastric artery, and interaorto-caval region are discussed below.

Should Ln's of the complete SMA (Ln 14) or only right lateral SMA be included? Should the Ln's around the celiac trunk (Ln 9) be included? According to the 4 RCTs, only Ln along the right lateral side of the SMA should be resected during standard lymphadenectomy. This is the area in which recurrence is most common, and positive Ln's are most likely to be detected.^{17,18} A complete resection of the Ln around the SMA as part of an extended lymphadenectomy

has not been shown to be beneficial for the patient and leads to more morbidity, in particular postoperative diarrhea, and is not indicated.^{6,13,16} Generally, clearance of the Ln and tissue at the right site of the SMA (dissection plane) is helpful to allow complete resection of the uncinate process of the pancreas. Similarly, no data show a survival benefit when Ln's around the celiac trunk are removed, and therefore, extending the lymphadenectomy to include station 9 is not indicated ([Table](#)).

Consensus statement. Only Ln stations along the right side of the SMA (Ln 14a and 14b) should be resected in a standard lymphadenectomy during pancreatoduodenectomy. Complete resection around the SMA is not indicated. Nodes around the celiac trunk should not be resected.

How high should the resection go into the hepatoduodenal ligament (Ln 5, 6, 8, and 12)? The hepatoduodenal ligament includes Ln stations from a more proximal location, No. 12, to a more distal location, No. 8, and No. 6 toward the duodenum. When reviewing the Ln stations resected in the 4 RCTs, a standard lymphadenectomy should include: 5, 6, 8a, and 12b and 12c ([Table](#)). Whether to resect Ln 8p was discussed extensively during the consensus conference.

Consensus statement. All conference members agreed on dissecting Ln stations 5, 6, 8a, 12b, and 12c found in the hepatoduodenal ligament. Considering the results of the RCTs and the extensive discussion during the conference meeting, no strong recommendation could be formulated on routine resection of Ln 8p; however, some members resect this node as part of the resection plane. Lymphadenectomy should extend up to the level of the right hepatic artery (classic anatomy) as it crosses over to the right liver to adequately clear the hepatoduodenal ligament.

Should Ln's around the splenic (Ln 11) and left gastric (Ln 7) artery be included? Reviewing the Ln dissection during pancreatoduodenectomy in the

Table. Differences in lymph node and nerve plexus dissection, median number of resected lymph nodes, margin-free resection, morbidity, and mortality in 4 randomized, controlled trials assessing the value of extended lymphadenectomy during pancreatoduodenectomy for pancreatic adenocarcinoma

Location	Pedrazzoli et al 1998 (n = 81)		Yeo et al 1999 (n = 114)		Farnell et al 2005 (n = 79)		Nimura et al 2012 (n = 101)	
	Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended
Lymph node station								
5	*	*	—	*	*	*	—	—
6	*	*	—	—	*	—	—	—
7	NA	NA	NA	NA	NA	NA	NA	NA
8a	*	*	—	—	*	*	—	*
8p, posterior node	*	*	—	—	—	*	—	*
9	—	*	—	*	—	*	—	*
11	NA	NA	NA	NA	NA	NA	NA	NA
12a	—	*	—	—	—	*	—	*
12b	*	*	*	*	*	*	—	*
12c	—	*	*	*	*	*	—	*
12p, posterior node	—	*	—	—	—	*	—	*
13, posterior node	*	*	*	*	*	*	*	*
14a	—	*	—	—	*	*	—	*
14b	—	*	*	*	*	*	—	*
14c	—	*	—	—	—	*	—	*
14d, posterior node	—	*	—	—	—	*	—	*
14p, posterior node	—	*	*	*	—	*	—	*
16a1	—	*	—	—	—	—	—	—
16a2	—	*	—	*	—	*	—	*
16b1, posterior node	—	*	—	*	—	*	—	*
17	*	*	*	*	*	*	*	*
18	*	*	—	—	—	—	—	—
Celiac trunk	—	*	—	—	—	*	—	†
SMA	—	*	†	†	†	*	—	*
Lymph nodes resected, n (mean)	13	20	15	27	15	36	13	40
Margin-free resection (R0), %	73	78	88	95	76	82	94	45
Morbidity, %			34	40			20	22‡
Mortality, %	5	5	5.4	3.4	0	3	0	2

*Resection of that particular lymph node station.
†Resection of the right lateral side of that particular lymph node.
‡Excluding severe diarrhea.

4 RCTs, dissection of Ln around the splenic and left gastric artery (stations 11 and 7) was not performed in the standard procedure during pancreatoduodenectomy (Table).

Consensus statement. Resection of Ln stations of the splenic and left gastric artery is not recommended during pancreatoduodenectomy. These nodal stations should not be part of a standard lymphadenectomy.

Should para-aortic Ln's (Ln 16) be included, in particular the Ln's along the posterior side of the pancreas between the aorta and inferior vena cava (16b1)? Several studies reported the prognostic impact of positive para-aortic Ln's on survival in patients with pancreatic ductal adenocarcinoma after pancreatoduodenectomy.¹⁸⁻²² Some studies showed no difference in survival between patients

with or without positive para-aortic Ln's undergoing resection.^{19,21} Other studies reported poorer survival rates in patients with positive para-aortic Ln's and summarized the outcomes found in several studies leading to the conclusion that the prognosis of patients with positive para-aortic Ln's was extremely poor (Fig 3).^{18,20}

There was an extensive discussion about Ln 16b1; some members include this Ln routinely within the resection plane. Data on lymphatic drainage pathways has shown that Ln 16b1 is an important node in the major lymphatic drainage route,^{23,24} but a study of positive Ln's in stations 8a and 16b1 found that positive 16b1 Ln's did not have an effect on survival ($P = .185$).²² Nevertheless there is no level I evidence available concerning the impact on survival. It should also be noted

Table 4 Reports on survival of patients with para-aortic lymph node metastasis in pancreatic ductal adenocarcinoma

Author	Year	No. of patients	No. of patients with PALN metastasis (%)	Survival of patients with PALN metastasis			
				1 Year (%)	2 Year (%)	3 Year (%)	MST (months)
Our series	2009	103	18 (17)	53	12	0	12.4
Doi et al.	2007	133	19 (14)	16	NR	NR	5.1
Shimada et al.	2006	133	26 (20)	65	5	0	13.0
Sakai et al.	2005	178	34 (19)	30	7	3	NR
Yoshida et al.	2004	34	9 (26)	22	0	0	NR
Kayahara et al.	1999	99	18 (18)	38	18	11	NR

PALN para-aortic lymph node, MST median survival time, NR not reported

Fig 3. Survival of patients with pancreatic cancer and positive para-aortic lymph nodes. (Adapted from Murakami et al. Prognostic impact of para-aortic lymph node metastasis in pancreatic ductal adenocarcinoma. *World J Surg* 2010;34:1900–7.)

that almost all of the available studies emanated from Asian centers.

Consensus statement. Based on the poor prognosis of patients with positive para-aortic Ln's routine resection of Ln station 16 was not recommended. No consensus, however, was reached on Ln 16b1 owing to variation in the literature and different expert opinions during the consensus conference. Some members resect this node, because they include it in the resection plane; however, no strong recommendation could be formulated on dissecting Ln 16b1 routinely.

Final definition of a standard lymphadenectomy during pancreatoduodenectomy in patients with pancreatic ductal adenocarcinoma. After evaluating all the available literature and the expert opinions during the consensus meeting, a clear definition of a standard lymphadenectomy was reached, although no strong recommendation could be given on resecting Ln 8p and 16b1 routinely: A standard lymphadenectomy should include Ln stations 5, 6, 8a, 12b1, 12b2, 12c, 13a, 13b, 14a right lateral side, 14b right lateral side, 17a, and 17b (Fig 4).

LEFT-SIDED (DISTAL) PANCREATECTOMY

Definition of standard lymphadenectomy during left-sided pancreatectomy in patients with pancreatic ductal adenocarcinoma in the body or tail area. Studies on lymphadenectomy during left-sided pancreatectomy for body and tail tumors are scarce. A study from 1997 described Ln involvement in 30 specimens. The greatest incidence of Ln involvement was around the splenic artery (Ln station 11), aorta (Ln station 16), SMA (Ln station 14), and celiac trunk (Ln station 9).²⁵ Another study reported similar findings with the greatest incidence of involvement seen in nodes around the splenic artery, along the inferior border of the body and tail of the pancreas, and along the common hepatic artery. The authors suggested that extended lymphadenectomy, including the para-aortic, celiac, and superior mesenteric Ln's

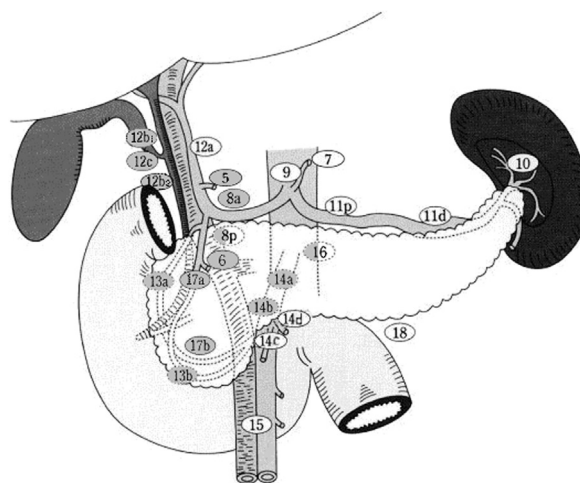


Fig 4. Standard lymphadenectomy during pancreatoduodenectomy in patients with pancreatic ductal adenocarcinoma includes: Lymph node stations—No. 5, Suprapyloric lymph nodes; No. 6, infrapyloric lymph nodes; No. 8a, lymph nodes in the anterosuperior group along the common hepatic artery; No. 12b and 12c, lymph nodes along the bile duct and around the cystic duct; No. 13a, lymph nodes on the posterior aspect of the superior portion of the head of the pancreas; No. 13b, lymph nodes on the posterior aspect of the inferior portion of the head of the pancreas; No. 14, lymph nodes along the right lateral superior mesenteric artery; No. 17a, lymph nodes on the anterior surface of the superior portion of the head of the pancreas; No. 17b, lymph nodes on the anterior surface of the inferior portion of the head of the pancreas.

might improve prognosis.²⁶ The most recent study on distribution of metastatic Ln's reporting the greatest incidence of nodal involvement included stations 8, 11, 14, and 16,¹⁸ but no study could provide evidence on a survival benefit related to extended lymphadenectomy. Therefore, there is no current evidence to support an extended lymphadenectomy of stations 8, 14, and 16 during left-sided pancreatectomy. The consensus meeting in 1999 included Ln stations 9, 10, 11,

and 18 in a standard lymphadenectomy.⁷ During the consensus conference in 2013, discussion among the experts on Ln station 9 revealed that some members of the consensus conference resect this Ln station, particularly when the tumor is close to the celiac axis in the body of the pancreas, while others do not. No consensus could be reached.

Another technical approach designed to dissect more Ln's is to extend the resection by performing a left-sided pancreatectomy with en bloc resection of the celiac axis. Preoperative coil embolization of the common hepatic artery to develop collateral pathways and performing a left-sided pancreatectomy with en bloc resection of the celiac axis, together with the surrounding Ln's has been described in several studies.^{27,28} This procedure has also been described without preoperative coil embolization of the common hepatic artery and was compared with a standard left-sided pancreatectomy, but no survival benefit was reported.²⁹

To improve the visibility of the posterior extent of the resection, a different operative approach to tumors of the body and tail of the pancreas by means of an antegrade procedure was described in 2003.³⁰ Long-term results were promising, but no formal trial has been conducted with standard left-sided pancreatectomy.³¹

Consensus statement. Standard lymphadenectomy during pancreatectomy for patients with pancreatic ductal adenocarcinoma in the body or tail includes Ln's in stations 10 in the hilum of the spleen, 11 along the splenic artery, and 18 along the inferior border of the body and tail of the pancreas. Ln station 9 is only suggested to be included in the resection when tumors are confined to the area of the body of the pancreas (Fig 5).

Members of the consensus conference also agreed that in patients undergoing left-sided pancreatectomy for malignant neoplasms, splenectomy is indicated to ensure adequate excision of the primary tumor and Ln's. The lack of consensus and no available level I evidence on the benefit of extending the resection weakens this consensus statement.

Which nodal stations should undergo frozen section during pancreatoduodenectomy and left-sided pancreatectomy? Whether a lymphadenectomy could be extended by selectively removing suspected Ln's beyond the resection area for frozen section was discussed during the consensus conference. This procedure should provide more information on the nodal status of the patient. Furthermore, positive Ln's can influence subsequently the ultimate management during the pancreatectomy, as well as the potential for adjuvant or palliative treatment. What consequences will these positive Ln's have? Should

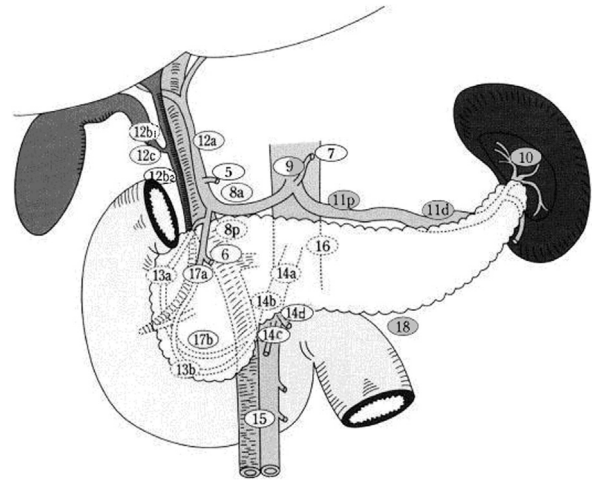


Fig 5. Standard lymphadenectomy during left-sided pancreatectomy in patients with pancreatic ductal adenocarcinoma includes: Lymph node stations—No. 9, Lymph nodes around the celiac artery (suggested only in tumors in the area of the body of the pancreas); No. 10, lymph nodes at the splenic hilum; No. 11, lymph nodes along the proximal and distal splenic artery; No. 18, lymph nodes along the inferior margin of the pancreas.

positive Ln's be considered as metastatic disease or should the surgeon continue with the resection if possible to attempt to achieve an R0 resection?

Consensus statement. If, during operation, a suspicious Ln is discovered beyond the standard lymphadenectomy resection area, it should be removed and sent for frozen pathologic examination. Ideally, however, any suspicious distant Ln's outside the planned resection should be detected on preoperative imaging and biopsied before operation. Operative exploration is not normally recommended in patients with proven positive Ln's outside the standard resection field. In contrast, if positive nodes are discovered outside the boundary of a standard resection during operation for a tumor confined to the head of the pancreas, there was still a consensus to consider nodes along the left side of the SMA in particular caudal to the mesocolon or around the celiac axis, to be beyond the classic resection margin and thus to be metastatic Ln's. When Ln station 16 is found to be positive during operation, most members of the consensus conference would continue with resection to achieve optimal treatment. Deciding to abandon resection or to continue the procedure should also depend on other variables, such as comorbidity and age of the patient, local ingrowth of tumor into the main vessels, or a markedly increased level of CA 19-9 preoperatively, which is considered a relevant

prognostic parameter.³² These combined factors might lead to a change in strategy concerning resection or a palliative bypass procedure. Both strategies were considered to be appropriate in selected situations. Similar arguments can be made from distant nodes during a left-sided pancreatectomy.

Lymphadenectomy for nodal staging and minimal number of Ln's retrieved during pancreatoduodenectomy. Ln status is an important prognostic factor and is crucial in the pathologic examination of the resected specimen. A standard lymphadenectomy is also important for staging the patient's disease, and, therefore, as a part of multimodal therapy for pancreatic adenocarcinoma. Several articles have discussed the prognostic value of the number of harvested Ln's and the ratio of positive to total examined Ln's that is, the Ln ratio (LNR). Increased survival has been reported in patients in whom a greater number of Ln's were harvested. Some studies reported this survival benefit in N0 patients, probably owing to a more accurate classification of the N0 group; others only reported benefit in N1 patients. Other studies, however, were contradictory and did not find the number of Ln to be a predictor of survival.³³⁻³⁹ During the consensus meeting, the importance of a minimum number of harvested Ln's was stressed such that the pathologic N status would be accurate; a minimum of 12 or 15 Ln's was believed to be important. The LNR was considered an important predictor for poor survival. The greater the LNR, the worse the prognosis for the patients. A LNR of >0.2 was an negative independent predictor of survival.³⁵⁻⁴⁴

The more Ln's examined, the less chance of underestimating the N stage.³⁹ The number of Ln harvested and examined pathologically and the LNR is, therefore, dependent on both the surgeon performing the lymphadenectomy and the pathologist examining the specimen. Furthermore, the body mass index of the patient influences the Ln yield, although another study did not find a correlation between body mass index and Ln yield.^{45,46}

Consensus statement. The description of standard lymphadenectomy, as described herein, should regularly provide ≥ 15 Ln's to ensure adequate pathologic staging of the disease. Furthermore, to be able to stage the patient adequately, the total number of Ln and the LNR are important, and should be reported in the pathologic analysis. In addition, the presence of neoadjuvant therapy should be mentioned to the pathologist during examination of the specimen.

After preoperative chemotherapy or chemoradiotherapy, pathologists may find fewer Ln; in this case, a total of <15 Ln should be accepted.

GENERAL DISCUSSION

The standard lymphadenectomy formulated by the ISGPS members based on the literature and expert opinions is a guide for surgeons when operating on patients with resectable pancreatic ductal adenocarcinoma. The diversity of extent and site of lymphadenectomy described in the literature makes it difficult to compare results across studies, institutions, and countries, and to determine the optimal procedure. There are many potential advantages in adopting this consensus statement, including new clinical trials to generate evidence for the appropriate treatment in the case of positive distant Ln's.

Compelling evidence-based reports, both RCTs and metaanalyses, show no benefit to performing an extended lymphadenectomy. Despite the variation in definition of lymphadenectomy, this consensus states that extended lymphadenectomy should not be performed. What consists of a standard lymphadenectomy was explained in this consensus proposal, although there was no general agreement on the exclusion of Ln stations 16b1, the posterior para-aortic Ln and Ln station 8p. Final consensus was reached on Ln's that were not included in the standard lymphadenectomy but situated nearby the resection plane; when Ln's could be incorporated easily into the resection plane, dissection was justified.

Selective removal of suspected Ln's has not been reported to influence survival. The potential advantage or importance of this practice and the consequences of tumor-positive nodes beyond the resection area remains unknown. Consensus was reached on positive nodes along the left side of the SMA or around the celiac axis positioned beyond the resection area or a pancreatoduodenectomy and are considered to be metastatic Ln's. Some conference members, however, resect positive para-aortic nodes found at the time of resection in selected patients. Deciding to continue or cease the operation should depend on other characteristics, such as comorbidity and age of the patients, local ingrowth of tumor into the main vessels, and the presence of markedly increased serum tumor markers such as CA 19-9. Both resection and bypass were accepted as plausible treatments for patients with these areas of metastatic Ln's.

Although an R0 resection is always reported to be the only chance of long-term survival in patients with pancreatic ductal adenocarcinoma, this

treatment modality alone is not sufficient and should be combined with some form of adjuvant chemotherapy with or without radiotherapy. Although the appropriate lymphadenectomy is an important therapeutic maneuver, it is only a part of the multimodal treatment of these patients.

The ISGS hope that this consensus statement will serve as a guide, although it is clear that patient characteristics and other factors that influence the postoperative course and long term results will influence the surgeon's decision making. Adoption of this statement will provide the most optimal lymphadenectomy and should ensure accurate reporting of techniques and outcomes of pancreatectomy for ductal adenocarcinoma of the pancreas. It will enable accurate comparisons of studies using the same definition for lymphadenectomy and the start of new clinical trials.

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