The IASLC Lung Cancer Staging Project

Proposals for the Revisions of the T Descriptors in the Forthcoming Eighth Edition of the TNM Classification for Lung Cancer

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Introduction: An international database was collected to inform the 8th edition of the anatomic classification of lung cancer. The present analyses concern its primary tumor (T) component.

Methods: From 1999 to 2010, 77,156 evaluable patients, 70,967 with non–small-cell lung cancer, were collected; and 33,115 had either a clinical or a pathological classification, known tumor size, sufficient T information, and no metastases. Survival was measured from date of diagnosis or surgery for clinically and pathologically staged tumors. Tumor-size cutpoints were evaluated by the running log-rank statistics. T descriptors were evaluated in a multivariate Cox regression analysis adjusted for age, gender, histological type, and geographic region.

Results: The 3-cm cutpoint significantly separates T1 from T2. From 1 to 5 cm, each centimeter separates tumors of significantly different prognosis. Prognosis of tumors greater than 5 cm but less than or equal to 7 cm is equivalent to T3, and that of those greater than 7 cm to T4. Bronchial involvement less than 2 cm from carina, but without involving it, and total atelectasis/pneumonitis have a T2 prognosis. Involvement of the diaphragm has a T4 prognosis. Invasion of the mediastinal pleura is a descriptor seldom used.

Conclusions: Recommended changes are as follows: to subclassify T1 into T1a (≤1 cm), T1b (>1 to ≤2 cm), and T1c (>2 to ≤3 cm); to subclassify T2 into T2a (>3 to ≤4 cm) and T2b (>4 to ≤5 cm); to reclassify tumors greater than 5 to less than or equal to 7 cm as T3; to reclassify tumors greater than 7 cm as T4; to group involvement of main bronchus as T2 regardless of distance from carina; to group partial and total atelectasis/pneumonitis as T2; to reclassify diaphragm invasion as T4; and to delete mediastinal pleura invasion as a T descriptor.

Key Words: Lung cancer, Lung cancer staging, T component, T descriptors, TNM classification, Tumor size.

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The 7th edition of the tumor, node, and metastasis (TNM) classification of lung cancer published in 2009 was based on the most thorough data-based revision ever done to date.[1–3] A retrospective international database including 81,495 evaluable patients collected from 1990 to 2000 by the International Association for the Study of Lung Cancer (IASLC) and analyzed by Cancer Research And Biostatistics (CRAB) was used for the revision.[4] The revision consisted of changes in the T descriptors that emphasized the prognostic impact of tumor size and redefined the classification of additional tumor nodules and malignant pleural effusion, the subclassification of M1, the validation of the classification for bronchopulmonary carcinoid tumors, and the rearrangement of stage grouping, whereas the N descriptors remained the same. Despite the magnitude of the database not all descriptors could be validated.[5] The limitations of the retrospective database prompted

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the IASLC to launch a call for the collection of new data.[6] The call resulted in a new database of 77,156 evaluable patients diagnosed with lung cancer from 1999 to 2010.[7] This new database is being used now to inform the 8th edition of the TNM classification of lung cancer due to be published in 2016.

This article presents the results of the analyses of the new IASLC database performed by the members of the Primary Tumor (T) Subcommittee of the IASLC Staging and Prognostic Factors Committee and the statisticians of CRAB concerning the T component of the TNM classification and its descriptors. The analyses were conducted to achieve predefined objectives: to further assess the prognostic impact of tumor size; to assess the prognostic power of each descriptor defining the different T categories; and to study new conditions not included in the present T descriptors, such as differences between parietal pleura and rib invasion.[6]

PATIENTS AND METHODS

Population

The total number of patients diagnosed with lung cancer between 1999 and 2010 submitted to CRAB was 94,708. After exclusions, 77,156 (70,967 with non–small-cell lung cancer [NSCLC] and 6189 with small-cell lung cancer) remained for analysis.[7] In the NSCLC group, 33,115 patients met the T descriptors subcommittee's initial analytic requirements of M0 NSCLC, a complete set of either clinical (c) TNM or pathological (p) TNM, known tumor size, and sufficiently detailed T descriptors to support the assigned T category. There was sufficient clinical T descriptor information for 13,012 patients, including 12,449 who were eventually operated, distributed as follows: 10,084 (81.0%) cN0, 907 (7.3%) cN1, 1327 (10.7%) cN2, and 131 (1.1%) cN3. As for the analysis of the pathologic T, the population excluded those who had induction treatment and consisted of 30,018 patients with complete pTN and M0 tumors (9915 of these also provided complete cTN categories; Table 1). Their distribution according to the pN component is 22,257 (74.2%) pN0, 3465 (11.5%) pN1, 4157 (13.9%) pN2, and 139 (0.5%) pN3. Asia was the geographic region that contributed most to the IASLC database: 10,294 (79%) patients with clinically staged tumors and 23,838 (79%) with pathologically staged ones came from Japan, South Korea, and People's Republic of China (Supplementary Table 1, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). Adenocarcinoma was the most common cell type, with 64% of tumors both clinically and pathologically staged. Squamous cell carcinoma followed with 25% of clinically staged tumors and 27% of pathologically staged tumors (Supplementary Table 2, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). From the 30,018 patients with surgically resected and pathologically staged tumors, 28,150 (94%) were completely resected (Supplementary Table 3, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). To assess the completeness of resection, the information given by the data providers was considered. When the specific residual tumor (R) status was unknown, the case was grouped in the "any R" category.

Statistical Analysis

Survival was measured from the date of diagnosis for clinically staged patients and date of surgery for pathologically staged patients. Overall survival was assessed using the Kaplan–Meier method. Prognostic groups were assessed using Cox proportional hazards regression analysis.[8] All survival and regression analyses were performed using SAS version 9.2.

Tumor-size cutpoints were evaluated using a running log-rank statistics produced by each hypothetical cutpoint in the pN0M0R0 data set graphed against tumor size.[9] This was performed both to confirm the 7th edition T category cutpoints defined by size (T1a, b; T2a, b; and T3) and to identify possible additional size increments that could be useful. For evaluating possible new size cutpoints, the tumor size that coincided with the highest log-rank statistics, rounded to the nearest 1 cm, was chosen as the optimal cutpoint. The chosen cutpoint was then tested in the context of the 7th edition

TABLE 1. Number of M0 Non–Small-Cell Lung Cancer Cases Passing Initial Screening[a]

	N0					Any N				
	Total	T1	T2	T3	T4	Total	T1	T2	T3	T4
Clinically staged										
Total	30,102	17,430	9498	2357	817	40,263	19,182	14,394	4380	2307
Analyzed	10,230	6436	2926	719	149	13,012	7100	4239	1305	368
Clinically staged, surgically managed										
Total	29,153	17,248	9200	2178	527	36,697	18,807	13,253	3664	973
Analyzed	10,084	6416	2873	682	113	12,449	7022	4049	1167	113
Clinically staged, nonsurgically managed										
Total	949	182	298	179	290	3566	375	1141	716	1334
Analyzed	146	20	53	37	36	563	78	190	138	157
Pathologically staged										
Total	26,722	12,857	10,510	2780	575	36,830	14,954	15,973	4756	1147
Analyzed	22,257	11,559	8411	2108	179	30,018	13,368	12,628	3620	402

[a]Criteria for T descriptor analysis: cases must have known tumor size, at least one T descriptor supporting the assigned T category, and no T descriptors suggesting a higher T category.

cutpoints in a multivariate Cox regression to assess their additional prognostic significance. In addition, the cutpoints were assessed in the N0M0 population regardless of resection completeness, in the M0R0 population regardless of nodal status, and in the clinically staged N0M0 population. R software was used to generate the log-rank statistics.[10]

T descriptors were evaluated individually among the population of cases where the given descriptor was evaluated along with at least one other descriptor within the given T category. To isolate the effects of each descriptor individually, cases with more than one positive descriptor within a T category were considered separately from those with only one positive descriptor. Descriptors identified for potential reclassification, on the basis of their respective survival outcome compared with other descriptors in the same or adjacent category, were then evaluated in a multivariate Cox regression analysis that adjusted for age, gender, histology, and geographic region. Specific comparisons were made to compare the survival of patients with a given descriptor against other cases within its category as defined by the 7th edition and against those in the proposed category. If a given descriptor was significantly different from others in the same 7th edition category, and similar to those in an adjacent category, it was considered to be evidence in support of the proposed change.

Decisions on Recommendations

The objective-based preliminary analyses of the new IASLC database were presented at the IASLC Staging and Prognostic Factors Committee General Meeting that took place in Sydney, Australia, on October 25 and 26, 2013. Most committee members attended this meeting. Further analyses on certain descriptors, such as visceral pleural invasion, and univariate and multivariate analyses, were suggested. Once these were completed, a core group of the committee membership directly involved with data analyses met with the IASLC statisticians at CRAB in Seattle on October 31, 2014. During this meeting the final recommendations were agreed upon discussion of the new results.

RESULTS

Tumor Size

The running log-rank statistics showed that the 3-cm cutpoint is still valid to separate T1 from T2 tumors so classified exclusively according to tumor size, both in the pathological and clinical staging settings, but also when the population of patients with T2 tumors includes tumors classified by othet T2 descriptors other than size (Supplementary Fig. 1*A* and *B*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835). These supplementary figures just show the 3-cm cutpoint, the best cutpoint for all sizes over all T categories.

When survival was analyzed by 1-cm increments in tumor size (≤1 cm, >1 to 2 cm, >2 to 3 cm, >3 to 4 cm, >4 to 5 cm, >5 to 6 cm, >6 to 7 cm, and >7 cm), a progressive degradation of survival was observed for each 1-cm cutpoint. This was found not only in the population of patients with pT1-2 N0M0 and R0 tumors (Fig. 1*A*) but also in those with nodal involvement (Supplementary Fig. 2*A*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835) and incomplete resections (Supplementary Fig. 2*B*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835) and in those with clinically staged tumors with and without nodal involvement (Fig. 1*B* and Supplementary Fig. 2*C*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835).

Univariate and multivariate analyses to further study the significance of pathological tumor size controlled for age, gender, cell type, and geographical region showed that survival was statistically significant for all tumor-size cutpoints. The 6-cm cutpoint did not add additional prognostic information after the other cutpoints were considered in a stepwise selection process (Table 2 and Supplementary Table 4, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). The same result was found in the univariate and multivariate analyses of clinical tumor size (Supplementary Tables 5 and 6, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). Further analyses to evaluate the new 1-cm cutpoints for pT1 tumors showed that they distinguish between risk groups (Table 3 and Supplementary Table 7, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

A comparison of T2a less than 3 cm (T2a by descriptor other than size, i.e., visceral pleura invasion) versus cases of similar size (T1b 2–3 cm) indicated that T2a cases are appropriately in a higher risk category ($p < 0.001$; Table 3). The same is true for clinically staged T1 tumors (Supplementary Table 7, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). However, pathologically and clinically staged tumors greater than 5 cm but equal to or less than 7 cm aligned better with a T3 prognosis than with a T2b (Table 4 and Supplementary Table 8, Supplemental Digital Content 1), and tumors classified as T3 by size greater than 7 cm had a survival similar to that of T4 tumors (Supplementary Tables 9–12, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

Involvement of the Main Bronchus

Involvement of the main bronchus 2 cm or more from the carina is well aligned as a T2 descriptor in all studied populations with pathologically staged tumors (N0M0R0, any N and any R) and in the populations with clinically staged tumors (N0 and any N). There are no statistically significant differences among survival of this T2 descriptor when it is compared with that of other T2 descriptors (Supplementary Fig. 3*A–E*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835). On the other hand, involvement of the main bronchus less than 2 cm from the carina, without invasion of the carina, a present T3 descriptor, has better prognosis than other T3 descriptors in all studied populations (Supplementary Fig. 4*A–E*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835). When the prognosis of T2 and T3 so defined by involvement of the main bronchus are compared, their prognosis is similar, and that of T3 main bronchus is better than prognosis of other T3 descriptors (Supplementary Fig. 5*A–E*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835). Multivariate analyses

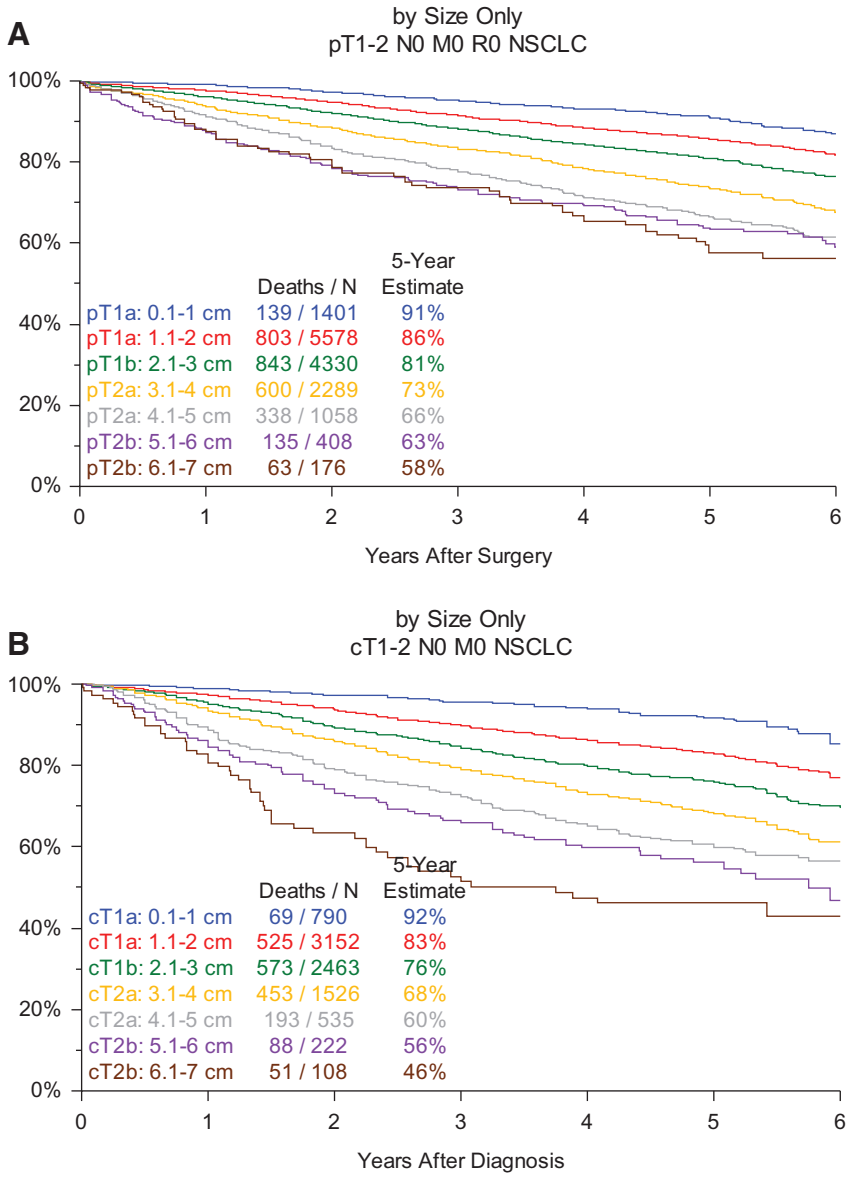

FIGURE 1. *A,* Survival of pathologically staged T1–T2 N0R0 tumors according to size only, at 1-cm intervals. *B,* Survival of clinically staged T1–T2 N0 tumors according to size only, at 1-cm intervals.

showed that, in pathologically and clinically staged tumors, involvement of main bronchus, regardless of distance to carina, does not seem to increase risk after adjusting for tumor size. This result supports the idea that T2 main bronchus is similar to other T2 cases, and that T3 main bronchus does not show significant increased risk over T2 (Table 5 and Supplementary Table 13, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

Atelectasis/Pneumonitis

Partial atelectasis/pneumonitis is well aligned with other T2 descriptors both in the pathological and in the clinical settings. Five-year survival for those patients with T2 tumors so defined by partial atelectasis/pneumonitis, only, and N0M0R0, for those with other T2 descriptors, and for those with T2 tumors by size only were 72%, 70%, and 70%, respectively. Similar survival rates for the three groups of T2 tumors were found in patients with any N and any R tumors and in the population of patients with cT2 N0 and any N tumors. Total atelectasis/pneumonitis, a T3 descriptor, showed better prognosis than other T3 tumors with different descriptors, but there were seven cases only in the pathological setting, which precluded further analyses (Supplementary Table 14, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

Visceral Pleural Invasion

Visceral pleural invasion is well positioned as a T2 descriptor and confers a worse prognosis even after adjusting for the current tumor size cutpoints (Supplementary Table 15, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). The extent of the visceral pleura invasion

TABLE 2. Results of Univariate Analyses of Survival of Pathologically Staged T1–T3 N0M0R0 Cases According to Tumor Size and T2 and T3 Descriptors

		Survival from Surgery	
Variable	**n/N (%)**	**HR (95% CI)**	***P* value**
Other histology vs. adeno	7064/21,122 (33)	2.19 (2.07, 2.32)	<0.001
Squamous vs. other	5237/21,122 (25)	1.96 (1.85, 2.07)	<0.001
Age ≥ 60 vs. <60	16,070/21,014 (76)	2.29 (2.11, 2.49)	<0.001
Male vs. female	12,457/20,995 (59)	1.86 (1.75, 1.98)	<0.001
Americas vs. Asia	1873/21,123 (9)	1.79 (1.64,1.97)	<0.001
Europe/Australia vs. Asia	2361/21,123 (11)	2.61 (2.43,2.80)	<0.001
Size >2 vs. ≤2 cm	12,970/21,123 (61)	1.50 (1.39,1.62)	<0.001
Size >3 vs. >2–3 cm	7163/21,123 (34)	1.59 (1.47,1.70)	<0.001
Size >5 vs. >3–5 cm	1925/21,123 (9)	1.45 (1.31,1.59)	<0.001
Size >7 vs. >5–7 cm	606/21,123 (3)	1.45 (1.26,1.67)	<0.001
Size >1 vs. ≤1 cm	19,623/21,122 (93)	2.68 (2.28, 3.14)	<0.001
Size >4 vs. ≤4 cm	3669/21,122 (17)	2.43 (2.28, 2.58)	<0.001
Size >6 vs. ≤6 cm	1041/21,122 (5)	2.79 (2.55, 3.06)	<0.001
Multiple pT2 descriptors vs. other pT2, pT3	1817/9952 (18)	1.17 (1.07, 1.27)	<0.001
pT3 vs. pT1-2	1882/21,122 (9)	2.63 (2.44, 2.83)	<0.001
pT2 main bronchus >2 cm vs. all others	67/19,013 (0)	1.53 (0.98, 2.37)	0.059
pT3 main bronchus <2 cm vs. all others	24/19,013 (0)	1.82 (0.91, 3.64)	0.091
pT2 atelectasis vs. all others	161/11,869 (1)	1.98 (1.51, 2.61)	<0.001
pT3 atelectasis vs. all others	8/11,869 (0)	3.06 (0.76, 12.24)	0.114
pT2 visceral pleura PL1 vs. PL0	2690/15,685 (17)	1.74 (1.60,1.89)	<0.001
pT2 visceral pleura PL2 vs. PL0	813/15,685 (5)	2.23 (1.97,2.54)	<0.001
pT2 3–5 cm size only vs. pT1, pT2 ≤ 3 cm	3320/21,123 (16)	1.79 (1.66,1.93)	<0.001
pT2 3–5 cm plus other descriptor vs. pT1, pT2 ≤ 3 cm	1362/21,123 (6)	2.22 (2.01,2.46)	<0.001
pT2 5–7 cm size only vs. pT1, pT2 ≤ 3 cm	586/21,123 (3)	2.59 (2.25,2.99)	<0.001
pT2 5–7 cm plus other descriptor vs. pT1, pT2 ≤3 cm	450/21,123 (2)	2.85 (2.46,3.31)	<0.001
pT3 Single descriptor vs. pT1, pT2 ≤ 3 cm	1556/21,123 (7)	3.20 (2.94,3.49)	<0.001
pT3 Multiple pT3 descriptors vs. pT1, pT2 ≤ 3 cm	326/21,123 (2)	4.27 (3.66,4.99)	<0.001

The *p* value from Wald χ^2 test in Cox Regression.
HR, hazard ratio; 95% CI, 95% confidence interval; n, number with descriptor; N, number evaluated; %, percent with descriptor.

as currently defined (PL0, tumor within the subpleural lung parenchyma or invades superficially into the pleural connective tissue beneath the elastic layer; PL1, tumor invades beyond the elastic layer of the visceral pleura; and PL2, tumor invades to the visceral pleura surface)[11] appropriately distinguishes between risk groups, and although the prognosis of PL1 and PL2 is worse than that of PL0, there are also significant differences between PL1 and PL2, the latter having a worse prognosis (Supplementary Table 16, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). The increased risk associated with visceral pleura invasion is also found in the clinical staging setting (Supplementary Table 17, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). Further analyses in pathologically and clinically staged tumors show that pathologically staged tumor of greater than 3–4 cm with visceral pleura invasion has similar prognosis to that of those greater than 4–5 cm; and that tumors of greater than 4–5 cm with visceral pleura invasion have similar prognosis to that of those greater than 5–7 cm (Table 6). However, these differences are not so clear in the clinically staged patients (Supplementary Table 18, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

Diaphragm

When survival of patients with tumors involving the diaphragm, a present T3 descriptor, is compared with survival of patients with other T3 tumors defined by other descriptors, it has worse prognosis, both in the pathological and clinical settings. This is confirmed by the multivariate analyses. Patients with pT3 tumors by diaphragm involvement have worse prognosis than those with pT3 tumors by other descriptors ($p = 0.004$) and even those with pT4 tumors ($p = 0.02$; Supplementary Table 19, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). Clinically staged tumors with diaphragm involvement have similar prognosis to those clinically classified as T4 ($p = 0.09$) and to those clinically classified as T3 ($p = 0.121$). (Supplementary Table 20, Supplemental Digital Content 1, http://links.lww.com/JTO/A834) The hazard ratio, however, is in the same direction as the pathological analyses.

TABLE 3. Multivariate Survival Analyses of Proposed 1-cm Cutpoints in Pathologically Staged T1 Tumors

		Survival from Surgery	
Variable	**n/N (%)**	**HR (95% CI)**	***P* Value**
Age ≥60 vs. <60	12,554/16,644 (75)	2.06 (1.87,2.28)	<0.001
Americas vs. Asia	1559/16,644 (9)	2.24 (2.01,2.50)	<0.001
Europe/Australia vs. Asia	1647/16,644 (10)	2.58 (2.36,2.83)	<0.001
Male vs. female	9371/16,644 (56)	1.70 (1.57,1.83)	<0.001
Other histology vs. adeno	4759/16,644 (29)	1.47 (1.31,1.65)	<0.001
Squamous vs. other	3473/16,644 (21)	0.98 (0.87,1.10)	0.685
T1a >1–2 vs.<1 cm	5462/16,644 (33)	1.45 (1.21,1.74)	<0.001
T1b >2–3 vs.<1 cm	4230/16,644 (25)	1.82 (1.52,2.18)	<0.001
T2a <3 vs. <1 cm	5611/16,644 (34)	2.43 (2.04,2.90)	<0.001

Each size increment distinguishes between risk groups. A comparison of T2a less than 3 cm (T2a by descriptors other than size) versus larger T1 cases (T1b > 2–3 cm, not shown in table) indicates that T2a cases are appropriately in a higher risk category ($p < 0.001$). p value from Wald χ^2 test in Cox regression.

HR, hazard ratio; 95% CI, 95% confidence interval; n, number with descriptor; N, number evaluated, %=percent with descriptor.

Other T3 and T4 Descriptors

T3 descriptors parietal pericardium, mediastinal pleura, chest wall invasion, including Pancoast tumors and parietal pleural invasion, and additional tumor nodules in the same lobe of the primary tumor did not differ in prognosis compared with other T3 tumors. In the subgroup of patients with tumors invading the chest wall, there were no differences in survival between those with parietal pleural invasion (163 patients with tumors classified as pT3 by parietal pleura invasion N0M0R0, with a 56% 5-year survival rate) and those with more extensive chest wall involvement (405 patients with tumor classified as pT3 by chest wall invasion N0M0R0, with a 52% 5-year survival rate). Similar survivals were found for the pathologically staged tumors with any N and any R and in the clinically staged tumors with N0 and any N. Tumors clinically staged T3 by mediastinal pleura involvement tended to have better prognosis than other T3 tumors, but there were only 20 tumors so classified in the present database (data not

TABLE 4. Survival Comparisons of Pathologically Staged T2–T4 Tumors >4–5 cm, >5–7 cm, and >7 cm in Greatest Dimension

			Survival from Surgery	
	Variable	**n/N (%)**	**HR (95% CI)**	***P* Value**
Univariate	Other histology vs. adeno	4357/10,028 (43)	1.61 (1.50, 1.73)	<0.001
	Squamous vs. other	3318/10,028 (33)	1.45 (1.35, 1.56)	<0.001
	Age ≥60 vs. <60	7934/9987 (79)	1.94 (1.76, 2.15)	<0.001
	Male vs. female	6599/9967 (66)	1.53 (1.41, 1.65)	<0.001
	Americas vs. Asia	762/10,028 (8)	1.24 (1.09, 1.42)	0.001
	Europe/Australia vs. Asia	1439/10,028 (14)	1.90 (1.74, 2.07)	<0.001
	Proposed T2b 4–5 cm vs. all others	1480/10,028 (15)	1.10 (1.00, 1.21)	0.046
	Proposed T3 5–7 cm vs. all others	1417/10,028 (14)	1.48 (1.35, 1.62)	<0.001
	Other T3 (excluding >7 cm) vs. all others	828/10,028 (8)	1.30 (1.16, 1.46)	<0.001
	Proposed T4 (including T3 > 7 cm) vs. all others	761/10,028 (8)	2.14 (1.92, 2.38)	<0.001
Multivariate	Other histology vs. adeno	4312/9940 (43)	1.28 (1.14, 1.43)	<0.001
	Squamous vs. other	3281/9940 (33)	0.92 (0.82, 1.03)	0.165
	Age ≥60 vs. <60	7891/9940 (79)	1.95 (1.76, 2.16)	<0.001
	Male vs. female	6581/9940 (66)	1.46 (1.35, 1.59)	<0.001
	Americas vs. Asia	761/9940 (8)	1.45 (1.27, 1.66)	<0.001
	Europe/Australia vs. Asia	1428/9940 (14)	1.82 (1.66, 1.99)	<0.001
	Proposed T2b 4–5 cm vs. T2 3–4 cm	1467/9940 (15)	1.27 (1.15, 1.41)	<0.001
	Proposed T3 5–7 cm vs. T2 3–4 cm	1409/9940 (14)	1.59 (1.44, 1.76)	<0.001
	Other T3 (excluding >7 cm) vs. T2 3–4 cm	821/9940 (8)	1.62 (1.43, 1.83)	<0.001
	Proposed T4 (Including T3>7 cm) vs. T2 3–4 cm	757/9940 (8)	2.24 (2.00, 2.52)	<0.001

Specific comparisons not shown in table: when survival of tumors greater than 5 to 7 cm is compared with that of tumors greater than 4 to 5 cm, the p value is 0.0002, indicating survival is significantly different for these groups. When survival of T3 tumors (excluding those >7 cm) is compared with that of tumors greater than 5 to 7 cm, the p value is 0.821, indicating survival is similar between these groups; p value from Wald χ^2 test in Cox regression.

HR, hazard ratio; 95% CI, 95% confidence interval; n, number with descriptor; N, number evaluated; %, percent with descriptor.

TABLE 5. Multivariate Survival Analyses of Pathologically Staged pT2-3 Tumors Based on Their Endobronchial Location

Multivariate Results Variable	n/N (%)	Survival from Surgery HR (95% CI)	*P* Value
Other histology vs. adenocarcinoma	3725/8807 (42)	1.42 (1.26, 1.60)	<0.001
Squamous vs. other	2868/8807 (33)	0.88 (0.78, 1.00)	0.045
Age ≥ 60 vs. <60	7031/8807 (80)	1.96 (1.76, 2.20)	<0.001
Male vs. female	5807/8807 (66)	1.45 (1.33, 1.58)	<0.001
Americas vs. Asia	234/8807 (3)	1.74 (1.39, 2.18)	<0.001
Europe vs. Asia	1031/8807 (12)	1.98 (1.78, 2.21)	<0.001
Size >2 vs. ≤ 2 cm	7640/8807 (87)	1.28 (1.09, 1.50)	0.002
Size >3 vs. 2 to ≤3 cm	6230/8807 (71)	1.09 (0.97, 1.22)	0.133
Size >5 vs. 3 to ≤5 cm	1571/8807 (18)	1.33 (1.20, 1.48)	<0.001
Size >7 vs. 5 to ≤7 cm	467/8807 (5)	0.99 (0.83, 1.19)	0.953
pT2 main bronchus >2 cm from carina vs. pT2 without invasion	67/8807 (1)	1.08 (0.69, 1.69)	0.725
pT3 main bronchus <2 cm from carina vs. pT2 without invasion	24/8807 (0)	1.03 (0.51, 2.06)	0.937
pT3 other than main bronchus vs. pT2, pT3 with invasion of main bronchus	1304/8807 (15)	1.56 (1.39, 1.76)	<0.001

p value from Wald χ^2 test in Cox regression.
HR, hazard ratio; 95% CI, 95% confidence interval; n, number with descriptor; N, number evaluated; %, percent with descriptor.

shown). However, at pathological staging, mediastinal pleura invasion seems to have worse prognosis than other pT3 tumors (Supplementary Table 9, Supplemental Digital Content 1, http://links.lww.com/JTO/A834).

A thorough analysis of the individual T4 descriptors was not possible because of the small number of patients in each group. However, from the survival graphs that could be developed, involvement of the mediastinum and of the vertebral body seems to be well aligned within the T4 descriptors; invasion of great vessels tended to have a slightly better prognosis than the other T4 tumors; and invasion of the heart tended to have the worst (data not shown). In the selected population of patients with completely resected T4 tumors with no nodal metastases, survival is very similar to that of patients with completely resected T3N0 tumors.

Additional tumor nodules in a different ipsilateral lobe seem to have a slightly worse prognosis than other T4 descriptors, but the limited number of patients precludes meaningful analyses. Although having more than one additional tumor nodule in the same side seems to have worse prognosis than having only one, there are too few patients in each group to draw solid conclusions (data not shown).

Single versus Multiple Descriptors for a T Category

Multiple analyses were conducted to compare tumors in a given T category defined by either single or multiple T descriptors. Results were inconclusive, and sometimes they differed in the clinical and pathological settings. As an example, Supplementary Tables 21 and 22 (Supplemental Digital Content 1, http://links.lww.com/JTO/A834) show that, although in the pathological setting current pT2a tumors (>3 to 5 cm) with multiple T2 descriptors might be upstaged to pT2b, this could not be reproduced in the clinical setting. Therefore, no meaningful conclusions could be drawn from these analyses.

Rearrangement of Descriptors

On the basis of the results described above, the following rearrangement of descriptors was done for exploratory analyses: T1 tumors were subdivided into three groups at 1 cm cutpoints (≤1 cm; >1 and ≤2 cm; and >2 and ≤3 cm); T2 tumors were subdivided into two subgroups (>3 and ≤4 cm; >4 and ≤5 cm); T2 tumors greater than 5 and less than or equal to 7 cm were reclassified as T3; T3 tumors greater than 7 cm were reclassified as T4; T2 and T3 tumors so classified by endobronchial location were combined as T2; and invasion of the diaphragm was reclassified as T4. When the survival of patients with tumors classified with the new descriptors was studied, survival curves separated nicely with no crossing over or superposition. This occurred in the three populations with pathologically staged tumors (N0M0R0, any N, and any R) and in those with clinically staged tumors (N0M0 and any NM0). (Fig. 2*A* and *B* and Supplementary Fig. 6*A–C*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835.) In addition, all survival comparisons were statistically significant, including the differences between T3 and T4, which are not significant in the current TNM classification (Tables 7 and 8).

DISCUSSION

The analyses of tumor size in the new IASLC database provided solid ground not only to further subclassify tumors 3 cm or less in size (present T1 category) and those greater than 3 cm (present T2 category), but also to distribute tumor size as a descriptor of all T categories. The survival analyses according to 1-cm cutpoints showed that from 1 to 5 cm every centimeter counts, and that larger tumors are best aligned with

TABLE 6. Univariate and Multivariate Survival Analyses for Pathologically Staged T1, T2, and T3 Tumors Based on the Status of the Visceral Pleura for the Purpose of Assessing Upstaging Based on Visceral Pleura Invasion (Proposed Size Cutpoints for the 8th Edition)

			Survival from Surgery	
	Variable	**n/N (%)**	**HR (95% CI)**	***P* value**
Univariate	Other histology vs. adeno	7020/21,007 (33)	2.20 (2.08, 2.33)	<0.001
	Age ≥ 60	15,970/20,899 (76)	2.28 (2.10, 2.47)	<0.001
	Male	12,380/20,880 (59)	1.87 (1.76, 1.99)	<0.001
	Americas	1871/21,007 (9)	1.55 (1.41, 1.69)	<0.001
	Europe/Australia	2358/21,007 (11)	2.47 (2.30, 2.65)	<0.001
	T1b vs. T1a	4652/20,372 (23)	0.47 (0.44, 0.51)	<0.001
	T1c vs. T1a	4247/20,372 (21)	0.81 (0.75, 0.87)	<0.001
	T2a VPI, 0.1–1 cm vs. T1a	25/20,372 (0)	0.17 (0.02, 1.20)	0.075
	T2a VPI, 1–2 cm vs. T1a	692/20,372 (3)	0.81 (0.68, 0.96)	0.016
	T2a VPI, 2–3 cm vs. T1a	1273/20,372 (6)	1.07 (0.96, 1.20)	0.218
	T2a size only vs. T1a	2405/20,372 (12)	1.22 (1.12, 1.33)	<0.001
	T2a VPI, 3–4 cm vs. T1a	1147/20,372 (6)	1.58 (1.42, 1.76)	<0.001
	T2b size only vs. T1a	1047/20,372 (5)	1.65 (1.48, 1.84)	<0.001
	T2b VPI, 4–5 cm vs. T1a	433/20,372 (2)	1.93 (1.64, 2.25)	<0.001
	T3 vs. T1a	2245/20,372 (11)	2.36 (2.19, 2.54)	<0.001
Multivariate	Other histology vs. adeno	6558/20,163 (33)	1.36 (1.28, 1.45)	<0.001
	Age ≥ 60	15,395/20,163 (76)	2.03 (1.87, 2.22)	<0.001
	Male	11,862/20,163 (59)	1.64 (1.54, 1.76)	<0.001
	Americas	1806/20,163 (9)	2.03 (1.85, 2.24)	<0.001
	Europe/Australia	2174/20,163 (11)	2.25 (2.09, 2.44)	<0.001
	T1b vs. T1a	4603/20,163 (23)	0.91 (0.80, 1.04)	0.173
	T1c vs. T1a	4213/20,163 (21)	1.28 (1.12, 1.45)	<0.001
	T2a VPI, 0.1–1 cm vs. T1a	25/20,163 (0)	0.26 (0.04, 1.87)	0.182
	T2a VPI, 1–2 cm vs. T1a	690/20,163 (3)	1.42 (1.16, 1.73)	<0.001
	T2a VPI, 2–3 cm vs. T1a	1262/20,163 (6)	1.80 (1.54, 2.10)	<0.001
	T2a size only vs. T1a	2378/20,163 (12)	1.58 (1.38, 1.81)	<0.001
	T2a VPI, 3–4 cm vs. T1a	1131/20,163 (6)	2.18 (1.88, 2.53)	<0.001
	T2b size only vs. T1a	1035/20,163 (5)	1.92 (1.65, 2.24)	<0.001
	T2b VPI, 4–5 cm vs. T1a	432/20,163 (2)	2.54 (2.10, 3.07)	<0.001
	T3 vs. T1a	2230/20,163 (11)	2.66 (2.34, 3.03)	<0.001

Specific comparisons not shown in table: T2a greater than 2 to 3 cm VPI versus T2a size only, $p = 0.0661$; T2a appropriate as proposed. T2a greater than 3 to 4 cm VPI versus T2a size only, $p < 0.0001$; support for upstaging to T2b. T2a greater than 3 to 4 cm VPI versus T2b size only, $p = 0.0945$; support for upstaging to T2b. T2b greater than 4 to 5 cm VPI versus T2b size only, $p = 0.0036$; support for upstaging to T3. T2b greater than 4 to 5 cm VPI versus T3, $p = 0.5761$; support for upstaging to T3. T2a 1 to 2 cm VPI versus T2a size only, $p = 0.2399$; T2a appropriate as proposed. p value from Wald χ^2 test in Cox regression.

HR, hazard ratio, 95% CI, 95% confidence interval.

either T3 (tumor size of more than 5 to 7 cm) or T4 (tumor size of more than 7 cm). This finding further confirms the common intuition that the larger the tumor, the worse the prognosis. This study confirms that, although the 3-cm cutpoint still remains a landmark to separate T1 from T2 tumors, there can be tumors less than 2 cm in greatest dimension with significantly different prognosis, and that the 5-cm cutpoint remains a useful one to separate tumors of different prognosis. The fact that tumors of 1 cm or less in greatest dimension are significantly different from larger ones is important in the light of the results of screening programs. In screening programs, 60% to 70% of detected lung cancers are in stage I,[12,13] and 56% are 1 cm or less in size.[14] These small tumors could constitute a particular group worthy of further studies regarding growth rate, tumor density (solid, part-solid, or pure ground glass opacity), intensity of uptake in positron emission tomography, type of resection, alternative nonsurgical therapies, molecular characterization, and genetic signatures. The cutpoints found in this study work well in each studied population in the clinical and pathological staging settings, represent a logical degradation of survival as tumor size increases, will be relevant for tumor stratification in future clinical trials, will allow the refinement of prognosis, and can be easily applied in clinical practice, while keeping compatibility with the size descriptors of the 7th edition.

The analyses of this database could not address how to measure the size of part-solid adenocarcinomas with a lepidic component. A Subcommittee within the IASLC Staging

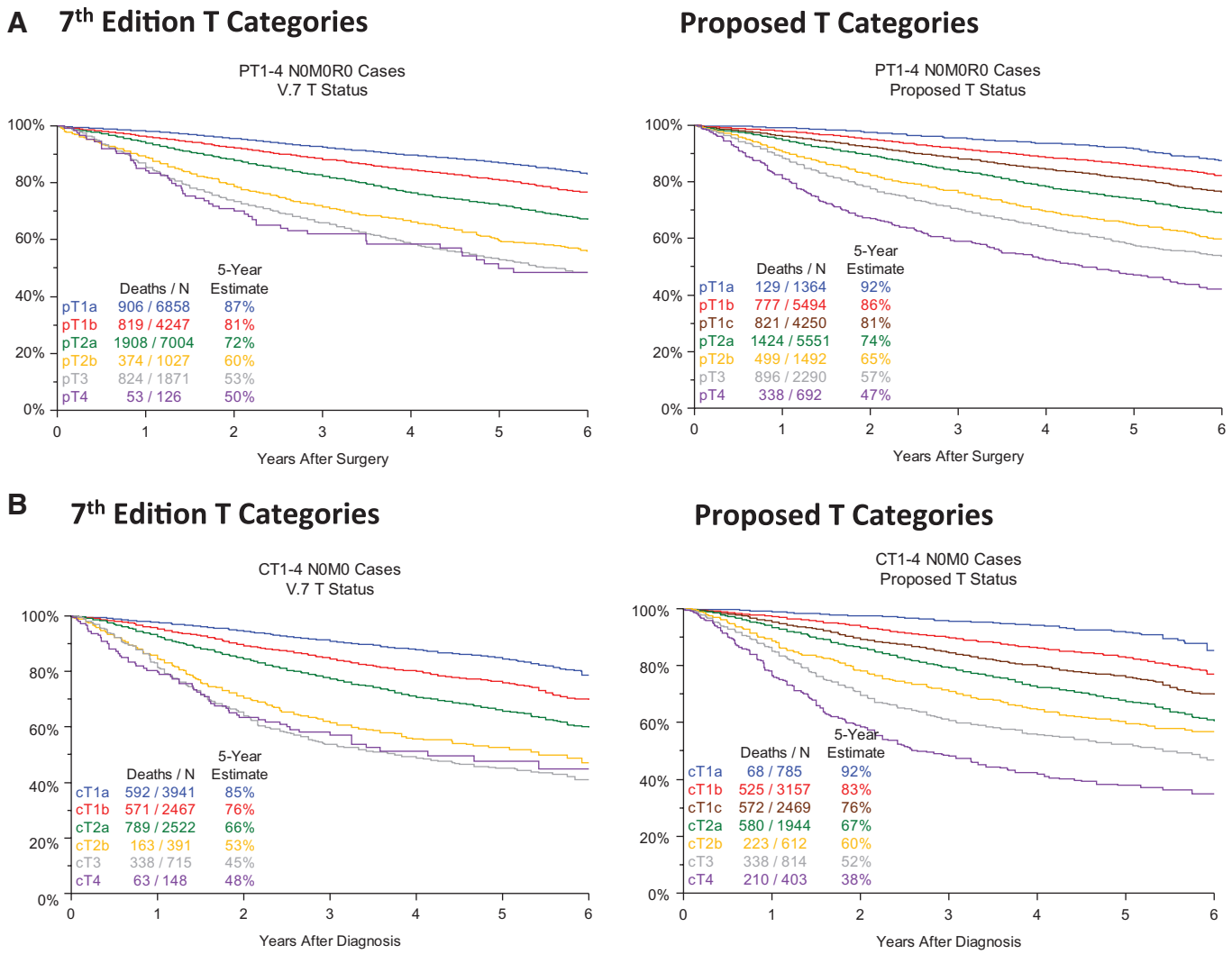

FIGURE 2. *A,* Survival according to 7th edition and proposed T categories for pathologically staged T1–T4 N0M0R0 tumors. *B,* Survival according to 7th edition and proposed T categories for clinically staged T1–T4 N0M0 tumors.

and Prognostic Factors Committee was created to address this issue and give recommendations in a white paper that is being prepared at the time of this writing. In the meantime, the Union for International Cancer Control recommendation is to measure the invasive component of the tumor to define its T category.[15] There is evidence that this measurement better predicts prognosis than the overall tumor size in lepidic predominant tumors.[16–18]

In the 7th edition of the TNM classification, involvement of the main bronchus is classified as T2 if it is located 2 cm or more from the carina and as T3 if it is less than 2 cm from the carina but without its invasion. This descriptor could

TABLE 7. Survival Comparisons of Pathologically Staged Tumors According to the T Categories of the 7th Edition and to the Proposed T Categories for the 8th Edition

7th Edition Categories					Proposed Categories				
Contrast	**Estimate**	**Lower Limit**	**Upper Limit**	***P* Value**	**Contrast**	**Estimate**	**Lower Limit**	**Upper Limit**	***P* Value**
T1a vs. T1b	1.3585	1.2353	1.4940	<0.0001	T1a vs. T1b	1.4899	1.2340	1.7988	<0.0001
T1b vs. T2a	1.4292	1.3162	1.5520	<0.0001	T1b vs. T1c	1.2767	1.1568	1.4090	<0.0001
T2a vs. T2b	1.2520	1.1191	1.4007	<0.0001	T1c vs. T2a	1.3647	1.2519	1.4878	<0.0001
T2b vs. T3	1.4486	1.2807	1.6384	<0.0001	T2a vs. T2b	1.2218	1.1022	1.3543	0.0001
T3 vs. T4	1.0045	0.7607	1.3264	0.9747	T2b vs. T3	1.2895	1.1553	1.4392	<0.0001
					T3 vs. T4	1.2997	1.1458	1.4742	<0.0001

TABLE 8. Survival Comparisons of Clinically Staged Tumors According to the T Categories of the 7th Edition and to the Proposed T Categories for the 8th Edition

7th Edition Categories					Proposed Categories				
Contrast	**Estimate**	**Lower Limit**	**Upper Limit**	***P* value**	**Contrast**	**Estimate**	**Lower Limit**	**Upper Limit**	***P* value**
T1a vs. T1b	1.5534	1.3844	1.7430	<0.0001	T1a vs. T1b	1.8380	1.4274	2.3668	<0.0001
T1b vs. T2a	1.3518	1.2126	1.5070	<0.0001	T1b vs. T1c	1.4165	1.2580	1.5949	<0.0001
T2a vs. T2b	1.4465	1.2202	1.7149	<0.0001	T1c vs. T2a	1.2967	1.1543	1.4567	<0.0001
T2b vs. T3	1.2804	1.0613	1.5449	0.0098	T2a vs. T2b	1.2038	1.0309	1.4056	0.0190
T3 vs. T4	0.8851	0.6726	1.1648	0.3836	T2b vs. T3	1.3031	1.0996	1.5443	0.0022
					T3 vs. T4	1.4542	1.2221	1.7305	<0.0001

not be studied reliably for the 7th edition of the TNM classification, but data from the new IASLC database revealed that endobronchial tumors either less than 2 or greater than 2 cm from the carina have the same prognosis in the clinical and pathological staging. This simplifies classification as this T3 descriptor can be merged with the T2 descriptor to form a single T2 descriptor in the 8th edition of the classification.

One of the consequences of endobronchial tumor involvement is atelectasis and pneumonitis. In the 7th edition of the TNM classification, atelectasis/pneumonitis is a T2 descriptor, if it does not involve the whole lung, and a T3 descriptor, if it involves the whole lung. The present analysis has found that partial atelectasis/pneumonitis is well aligned with other T2 descriptors, but that total atelectasis/pneumonitis has better survival than other T3 descriptors. Although the patients with total atelectasis/pneumonitis are few and it is difficult to draw data-based conclusion, it seems logical to group total atelectasis/pneumonitis in the T2 category as it surely follows the same prognostic pattern seen for endobronchial location. Atelectasis/pneumonitis by itself has no prognostic value; it is what it represents, i.e., endobronchial growth, what is prognostic. While discussing this issue at the Staging and Prognostic Factors Committee meeting, the question of eliminating partial and total atelectasis/pneumonitis from the list of T descriptors arose. Reasons for the elimination were that there are few tumors classified with this descriptor and that the pathologists examining the resected specimen do not see the atelectasis because the lungs are deflated, and then, this descriptor cannot be used in pathological staging. It is true that there are few patients with completely resected tumors and no nodal involvement classified as T2-partial atelectasis/pneumonitis (95 patients) or T3-total atelectasis/pneumonitis (5 patients). However, the numbers rise when we consider tumors with nodal involvement (156 patients with pT2 any N, 100 with pT2N0 any R, and 25 with cT3 any N). For patients with no surgical option who will not need any further explorations, atelectasis/pneumonitis seen on chest radiography or computed tomography may be the only way to assign a T category to the tumor, avoiding the need of positron emission tomography or bronchoscopy, if these are not essential for treatment. It is also important to have in mind that pathological classification does not only derive from the pathological study performed by the pathologist, but from the information collected before resection. The letter of the second general rule of the TNM classification explicitly states that pathological classification "is based on evidence acquired before treatment, supplemented or modified by additional evidence acquired from surgery and from pathological examination."[3,19,20] Therefore, a pT category based on the partial or total atelectasis/pneumonitis observed at clinical staging can be assigned to a tumor even if the pathologist cannot recognize it.

Because the publication of the recommended definition of visceral pleura invasion in 2008,[11] many groups have reviewed their experiences and published their results. Yoshida et al.,[21] reporting on an experience of 9758 patients who had undergone anatomical resection and of whom 2350 had visceral pleural invasion, concluded that, for tumors 7 cm or less in greatest dimension, the T category should be upstaged to the next T category if visceral pleura invasion (VPI) was present. Analyzing smaller series, others have found that T2a tumors with VPI had worse prognosis than other T2a tumors so classified by tumor size only and recommended to upstage them to the T2b category.[22–24] Shim et al.[25] found that pathological T2b tumors by tumor size greater than 5 cm but not greater than 7 cm with VPI should be upstaged to T3. Maeda et al.[26] identified VPI as a risk factor for recurrence in completely resected stage I and II tumors, whereas Nitadori et al.[27] did not find VPI to be a risk factor for increased recurrence or reduced overall survival in adenocarcinomas 2 cm or less in greatest dimension and proposed to combine tumors of 2 cm or less with or without VPI with those of more than 2 but 3 cm or less without VPI into a new stage IA. The present analyses have shown that the presence of VPI confers worse prognosis even when adjusting by tumor size, and that there is no need to modify the present definition of visceral pleura invasion and its different categories (PL0, PL1, and PL2) as this study confirms that visceral pleura involvement is well positioned in the T2 category. The two categories of visceral pleura invasion (PL1 and PL2) are justified as there are statistically significant differences between them. Detailed analyses of VPI in the pathological staging setting show that tumors greater than 3 to 4 cm with VPI have a similar prognosis to those greater than 4 to 5 cm; and that those greater than 4 to 5 cm with VPI had a similar prognosis to those greater than 5 to 7 cm. These findings could be used to upstage tumors with VPI to the next tumor size category, but they could not be replicated clearly in the clinical staging setting, indicating that the clinical assessment of VPI is unreliable. VPI mainly is a pathological descriptor. At clinical staging, it can be assumed by the proximity of the tumor to the lung surface and by its

retraction, and although it could be pathologically confirmed (by tru-cut biopsy, by thoracoscopic biopsy, or by wedge resection of the tumor mass), this confirmation is not often done, as it is unnecessary to plan therapy. The same is true for the distinction of PL1 and PL2. Even if this differentiation could be used to upstage tumors in case of PL2, this is a pathological finding that can be known at clinical staging only in exceptional cases. Therefore, the IASLC Staging and Prognostic Factors Committee members, although recognizing the prognostic value of VPI and of its different categories, decided not to modify its present position as a T2 descriptor, and not to use it to upstage tumors. However, they do recognize its value in the construction of postoperative prognostic groups, a new project of the IASLC Staging and Prognostic Factors Committee. VPI is an important prognostic factor that has been consolidated in the analyses of the present database. Therefore, the recommendation to search it with elastic stains when it is not evident or is inconclusive with hematoxylin and eosin stains is valid and should be emphasized.[11]

Invasion of the diaphragm is a different issue. Reported series, usually with small number of patients, have shown that invasion of the diaphragm has a bad prognosis. Five-year survival for completely resected tumors ranges from 0% to 30%.[28–31] Nodal involvement, full-depth invasion, and primary repair, when compared with prosthetic repair, have been found to adversely affect prognosis.[29–31] In this study, it has been confirmed that invasion of the diaphragm has a worse prognosis than that assigned to other T3 descriptors, but that prognosis is similar to that of T4 and even worse for those clinically staged. Present data thus support the upstaging of this descriptor to the T4 category.

Mediastinal pleura invasion is seldom used as a descriptor. It is difficult to determine clinically, and this may account for its tendency to have a better prognosis than other T3 descriptors at clinical staging. Contrary to parietal pleura invasion, mediastinal pleural invasion is not associated with pain by itself. It can be assumed if the tumor is in contact with the mediastinum, but when there are more signs of mediastinal invasion, the tumor has already gone beyond the mediastinal pleura and invaded mediastinal tissue, a T4 descriptor. This may explain its worse prognosis when compared with other pT3 descriptors. (Supplementary Table 9, Supplemental Digital Content 1, http://links.lww.com/JTO/A834). At pathological staging, it is exceptional to find mediastinal pleura invasion with no more invasion into the mediastinal tissue. Therefore, the IASLC Staging and Prognostic Factors Committee members favor the elimination of mediastinal pleura invasion as a T descriptor.

The analyses of the new IASLC database share some of the limitations of the first retrospective database used for the 7th edition of the TNM classification. The most important limitation is that many contributing databases were not designed to study the TNM classification and therefore lacked the detailed information needed for the specific study of each descriptor. Although tumor size was regularly recorded in all databases, the other specific descriptors to define the T categories were not recorded, and this lack of information prevented the validation of many T3 and T4 descriptors. This is probably the reason why the analyses on the impact on prognosis of tumors classified by multiple descriptors, when compared with those classified by one descriptor, only, could not lead to solid conclusions. However, there was enough information to study endobronchial location, atelectasis/pneumonitis, visceral pleura invasion, and diaphragm invasion to the extent of allowing recommendations for changes in the 8th edition and improving the capacity to separate groups of tumors with significantly different prognosis based on their anatomical extent. When these changes are incorporated as new descriptors and tested for survival, the resulting survival graphs are better separated, and the differences in prognosis are more significant than those observed in the 7th edition of the TNM classification. An important result of this rearrangement is that survival for T3 and T4 tumors is now different, whereas it was not in the 7th edition. (Fig. 2*A* and *B*; Supplementary Fig. 6*A–C*, Supplemental Digital Content 2, http://links.lww.com/JTO/A835; and Tables 7 and 8). It is important to note that there were insufficient patients treated by radiotherapy and chemotherapy alone in the database to determine the generalizability of the new recommendations across nonsurgical treatment modalities, as the prognostic impact of the T descriptors may differ depending on the therapy applied.[32] In addition, this database had a predominance of Asian patients, as opposed to the previous database used to inform the 7th edition that had a predominance of European cases. However, the multivariate analysis performed in this occasion was adjusted for geographical region to compensate for this geographical unbalance. The present database has no information on the epidermal growth factor receptor mutation status of the registered patients with adenocarcinoma. Therefore, its prognostic impact could not be assessed in the present analyses.

As it was the case after the 7th edition was published, many specialists managing lung cancer patients used the changes in the classification to modify therapy. If the proposed IASLC recommendations are eventually introduced in the 8th edition of the TNM classification, they should not be interpreted as basis for changing treatment. They imply a taxonomic refinement and not new indications of already established treatment protocols that should ideally be derived from clinical trials.[33,34] So, for the T component, upstaging invasion of the diaphragm or tumors greater than 7 cm from T3 to T4 does not imply that these tumors should not be resected if they are amenable to complete resection.

In conclusion, based on the results of the analyses of the new IASLC database, the IASLC Staging and Prognostic Factors Committee recommends the following changes in the T component for the 8th edition of the TNM classification of lung cancer:

1. The subclassification of T1 into
   T1a: tumor 1 cm or less in greatest dimension,
   T1b: tumor more than 1 cm but not more than 2 cm in greatest dimension, and
   T1c: tumor more than 2 cm but not more than 3 cm in greatest dimension;
2. The subclassification of T2 into
   T2a: tumor more than 3 cm but not more than 4 cm in greatest dimension and
   T2b: tumor more than 4 cm but not more than 5 cm in greatest dimension;
3. The reclassification of tumors more than 5 cm but not more than 7 cm in greatest dimension as T3;

4. The reclassification of tumors more than 7 cm in greatest dimension as T4;
5. The grouping of the involvement of the main bronchus as a T2 descriptor, regardless of distance from the carina, but without invasion of the carina;
6. The grouping of partial and total atelectasis or pneumonitis as a T2 descriptor;
7. The reclassification of diaphragm invasion as T4;
8. To delete mediastinal pleura invasion as a T descriptor.

The proposed changes to the T component reduce in part the arbitrary nature with which some descriptors had been assigned in the past to a certain T category, maintain the compatibility with previous classifications, and improve the prognostic discrimination of the different T categories. Therefore, they should be implemented in the new edition of the TNM classification of lung cancer.

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APPENDIX

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