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Brief Communications

The Eighth Edition of TNM Staging of Lung Cancer: Reference Chart and Diagrams

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Disclosures of potential conflicts of interest may be found at the end of this article.

Abstract

Lung cancer is the leading cause of cancer-related mortality in the U.S. TNM staging of lung cancer is implemented to define the extent of disease and consequently assign prognosis and guide treatment. The newest edition of TNM staging of lung cancer has been released recently. In this article, we present the TNM staging of lung cancer in a concise, yet comprehensive, visual format. ***The Oncologist*** 2018;23:844–848

Lung cancer is still estimated to be the most frequent cause of cancer-related death in both men and women in the U.S. [1]. The anatomic extent of cancer is described by the TNM staging system. Such consistent reproducible classification is essential for predicting prognosis, selecting and optimizing treatment, and assessing response to treatment. Communication and clinical research are facilitated by using this uniform system. TNM staging has three components: the features/extent of the primary tumor (T), regional lymph node(s) involvement (N), and distant metastases (M). The eighth edition of TNM classification/staging for lung cancers has been recently introduced. The revisions in this edition were based on recommendation from analyses of databases of the International Association for the Study of Lung Cancer and were adopted by the American Joint Committee on Cancer and the Union for International Cancer Control [2–4].

The new TNM classification is summarized in Tables 1 and 2. The revisions in the eighth edition of the TNM staging include several changes in the T and M categories as well as in the stage grouping. These can be summarized as follows:

Modifications of the primary tumor classification

- Redefinition of T based on size by adding a new category (T1c) and subdividing T1 and T2 into T1a, T1b, T1c, T2a, and T2b (using 1 cm intervals from $\leq$1 cm to $\leq$5 cm. Additionally, the size definition for T3 is changed to $>$5 and $\leq$7 (from $>$7 cm previously). Tumors larger than 7 cm are now reclassified as T4.
- Removal of the 2-cm distance from the carina as a limit to separate T2 and T3 tumors with endobronchial extension into the main bronchus. Currently, these tumors are considered T2 (as long as the carina is not involved). Similarly, tumors with complete lung atelectasis or obstructive pneumonitis are considered as T2 rather than T3.
- Elimination of the mediastinal pleura invasion from the criteria of T3 definition. Invasion of the diaphragm is currently a descriptor of T4 rather than T3.
- Subdivision of carcinoma in situ into squamous cell carcinoma in situ and adenocarcinoma in situ.
- Adding T1 mi (minimally invasive carcinoma) as a new T category.

Redefinition of metastases (M)

- Revision of cases with distant metastasis (the previous M1b category) into M1b and M1c based on the number of the metastatic foci (single [M1b] versus multiple [M1c]).

Changes to stage groupings

- Subdivision of stage IA into stages IA1, IA2, and IA3, which correspond to T1aN0M0, T1bN0M0, and T1cN0M0, respectively.
- Reassignment of T1 and T2a nonmetastatic tumors with N1 lymph node involvement (T1[a–c]N1M0 and T2aN1M0) as stage IIB (from stage IIA in the previous seventh edition).
- Reassignment of T3 nonmetastatic tumors with N2 lymph node involvement (T3N2M0) from stage IIIA to stage IIIB.
- The newly defined stage IIIC includes nonmetastatic T3 and T4 tumors with N3 lymph node involvement (T3N3M0 and T4N3M0)
- Tumors with M1a or M1b disease are currently grouped as stage IVA, and tumors with M1c disease are grouped as stage IVB (regardless of the T or N status).

In the new eighth edition of TNM staging, the regional lymph node (N) classifications and the unified map of lymph node stations remain unchanged from the prior edition.

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Table 1. Eighth edition of TNM staging of lung cancer: Definition of T, N and M

Primary tumor (T)	
T category	**Definition**
Tx	Tumor that is proven histopathologically (malignant cells in bronchopulmonary secretions/washings) but cannot be assessed or is not demonstrable radiologically or bronchoscopically.
T0	No evidence of primary tumor.
Tis	Carcinoma in situ: Squamous cell carcinoma in situ. Adenocarcinoma in situ (pure lepidic pattern and $\leq$3 cm in greatest dimension).
T1	Size: $\leq$3 cm. Airway location: in or distal to the lobar bronchus. Local invasion: none (surrounded by lung or visceral pleura). Subdivisions: T1mi: Minimally invasive adenocarcinoma (pure lepidic pattern, $\leq$3 cm in greatest dimension and $\leq$5 mm invasion)—T1a (size $\leq$1 cm)[a]—T1b (1 cm $<$ size $\leq$ 2 cm)—T1c (2 cm $<$ size $\leq$ 3 cm).
T2	Any of the following characteristics: Size: $>$3 cm but $\leq$5 cm. Airway location: invasion of the main bronchus (regardless the distance to the carina) or presence of atelectasis or obstructive. Pneumonitis that extends to hilar region (whether it is involving part or the entire lung). Local invasion: visceral pleura (PL1 or PL2). Subdivisions: T2a (3 cm $<$ size $\leq$ 4 cm or cannot be determined) and T2b (4 cm $<$ size $\leq$ 5 cm).
T3	Any of the following characteristics: Size: $>$5 cm but $\leq$7 cm. Local invasion: direct invasion of chest wall (including superior sulcus tumors), parietal pleura (PL3), phrenic nerve, or parietal pericardium. Separate tumor nodule(s) in the same lobe of the primary tumor.
T4	Any of the following characteristics: Size $>$7 cm. Airway location: invasion of the carina or trachea. Local invasion: diaphragm, mediastinum, heart, great vessels, recurrent laryngeal nerve, esophagus or vertebral body. Separate tumor nodule(s) in an ipsilateral different lobe of the primary tumor.
Lymph nodes (N)	
Descriptor	**Definition**
Nx	Regional lymph nodes cannot be evaluated.
N0	No regional lymph nodes involvement.
N1	Involvement of ipsilateral peribronchial and/or ipsilateral hilar lymph nodes (includes direct extension to intrapulmonary nodes).
N2	Involvement of the ipsilateral mediastinal and/or subcarinal lymph nodes.
N3	Involvement of any of the following lymph node groups: contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene, or supraclavicular nodes.
Distant metastasis (M)	
Descriptor	**Definition**
M0	No distant metastasis.
M1	Presence of distant metastasis. Subdivisions: M1a (separate tumor nodule(s) in a contralateral lobe to that of the primary tumor or tumors with pleural or pericardial nodules or malignant effusion); M1b (single extrathoracic metastasis); M1c (multiple extrathoracic metastases to one or more organs).

Note: Tumor's size is determined by the greatest dimension of the lesion.
[a]The uncommon superficial spreading tumor with invasive component limited to bronchial wall is classified as T1a regardless of size or extent to main bronchus.

We present a reference chart and diagrams that consolidate the eighth edition of the TNM staging system of lung cancer. The chart (Fig. 1) is separated into two frames based on the status of the distant metastatic involvement (M). The upper frame details the classification in the presence of metastases. In the lower frame, which is dedicated to tumors without distant metastases, comparative features of the primary tumor (T) are described in the vertical columns, and the regional lymph node involvement (N) is detailed in the horizontal columns. The (T) definition includes the tumor size and other criteria of extent, such as endobronchial location, local invasion, and separate tumor nodule(s). The intersection of the horizontal and vertical columns will define the corresponding stage group. Color coding is used to facilitate the visualization of the different stage groups. Stages with unique characteristics are defined separately. The diagrams (Fig. 2)

Table 2. Eighth edition of TNM staging of lung cancer: Stage grouping

Stage group	
Occult carcinoma	(TxN0M0)
Stage 0	(TisN0M0)
Stage IA1	(T1aN0M0) (T1(mi)N0M0)
Stage IA2	(T1bN0M0)
Stage IA3	(T1cN0M0)
Stage IB	(T2aN0M0)
Stage IIA	(T2bN0M0)
Stage IIB	(T (1–2)N1M0) (T3N0M0)
Stage IIIA	(T(1–2)N2M0) (T3N1M0) (T4N(0–1)M0)
Stage IIIB	(T(1–2)N3M0) (T(3–4)N2M0)
Stage IIIC	(T(3–4)N3M0)
Stage IVA	(Any T, Any N, M1a,b)
Stage IVB	(Any T, Any N, M1c)

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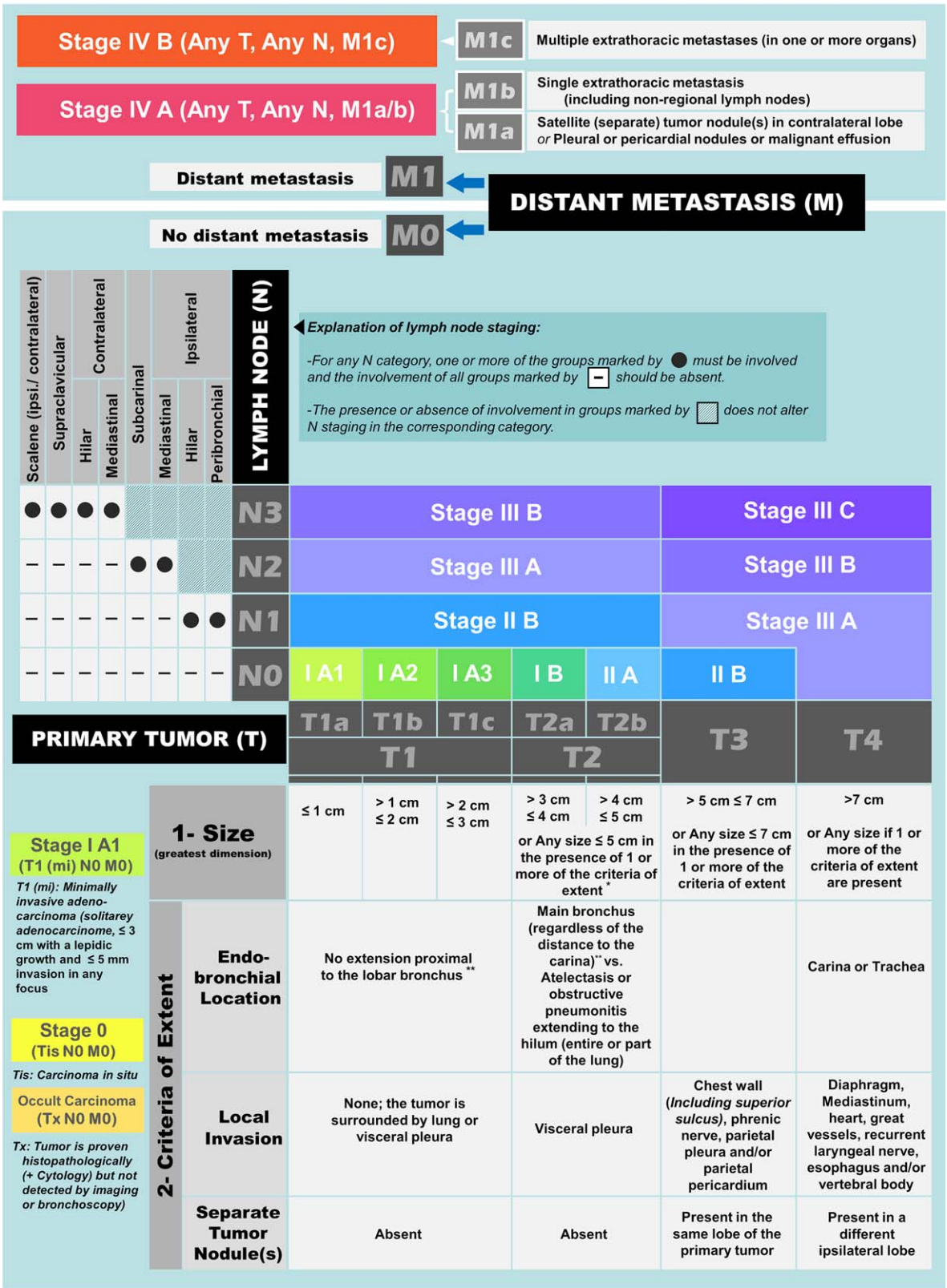

Figure 1. Reference chart summarizing the eighth edition of TNM staging classification of lung cancer.

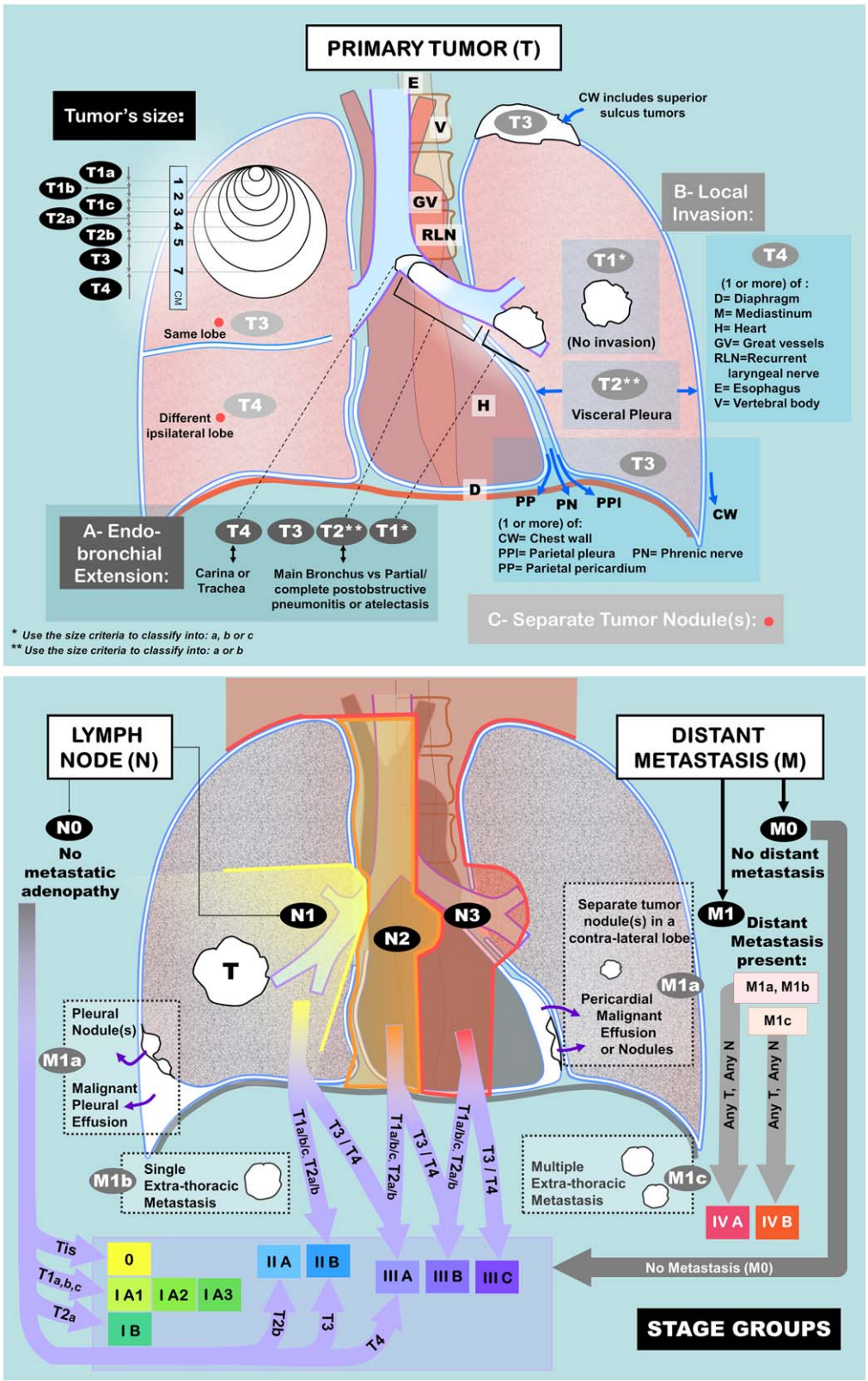

Figure 2. Reference diagrams depicting the eighth edition of TNM staging classification of lung cancer. First, define T category by matching the greatest dimension and the appropriate T category. Second, upgrade the classification based on the other criteria of primary tumor invasion/extent if applicable (use the criteria of invasion/extent [endobronchial extension (A), local invasion (B), and separate tumor nodule(s)(C)] only to assign a higher, not lesser, T classification). Finally, use the lower diagram to assign N and M classifications then combine that with the T category to define the corresponding stage. In the lower illustration, N1, N2, N3, and the separate tumor nodule(s) of M1a were described based on right-sided primary neoplasm (marked with letter T). Use a mirror image in the case of left-sided lung neoplasm.

demonstrate the TNM staging classification using more consolidated pictorial format (Fig. 2). The general design of the chart and the diagrams is based on our previously published work about the seventh edition of the TNM staging system [5]. The simplified, yet comprehensive, visual format can serve as an effective quick reference, given the increasing complexity of the TNM classification. Additionally, using such a format may facilitate learning, understanding, and memorizing of the staging system.

Disclosures
The authors indicated no financial relationships.

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For Further Reading:
Mariana Chavez-MacGregor, Elizabeth A. Mittendorf, Christina A. Clarke et al. Incorporating Tumor Characteristics to the American Joint Committee on Cancer Breast Cancer Staging System. ***The Oncologist*** 2017;22:1292–1300; first published on June 7, 2017.

Implications for Practice:
This study demonstrates that stage, but also breast cancer subtype and grade, define prognosis in a large population of breast cancer patients. It shows that a point-based risk score system that incorporates these biological factors provides refined stratification and information on prognosis, improving the anatomic American Joint Committee on Cancer (AJCC) staging system. In addition, the overall mortality and breast cancer specific mortality rates detailed here provide much-needed information about prognosis in the current era, refining the current AJCC staging.