The TNM staging for lung cancer

Kwun M FONG
The Prince Charles Hospital
University of Queensland Thoracic Research Center
AUSTRALIA
Disclosures

• Contributed to IASLC TNM database
• The anatomical extent of disease, as expressed by the TNM classification, predicts prognosis and all patients wish to have some idea of their expected survival.

• Stage changes are clinically important as they may influence patient treatment.

• Approximately 1 in 6 patients will be classified into a different stage category due to the changes implemented in the 7th edition of TNM.

• The IASLC Staging Handbook and Manual in Thoracic Oncology were published in August 2009, and the 7th edition of TNM was implemented in January 2010.
Clinical T-Descriptors – Size of Primary Tumor

Size of Primary Tumor, cT1-3, N0 NSCLC

Superficial spreading tumour of any size with its invasive component limited to the bronchial wall, which may extend proximal to the main bronchus.

Tumour ≤2cm; any associated bronchoscopic invasion should not extend proximal to the lobar bronchus.

Tumour >2cm, ≤3cm; any associated bronchoscopic invasion should not extend proximal to the lobar bronchus.

**T2a**

Tumour: 
> 3cm, ≤ 5cm

Tumour ≤ 5cm, invasion of the visceral pleura

Tumour involves main bronchus, 2cm or more distal to carina

Associated atelectasis or obstructive pneumonitis that extends to the hilar region but does not involve the entire lung

**T2b**

Tumour: 
> 5cm, ≤ 7cm (with or without other T2 descriptors)

Note: any associated pleural effusion should be shown on multiple microscopical examinations to be negative for tumour; it should be non-bloody and not an exudate, and clinical judgement should dictate that the effusion is not related to the tumour.
Chest wall invasion, including Pancoast tumours without invasion of vertebral body or spinal canal, encasement of the subclavian vessels, or unequivocal involvement of the superior branches of the brachial plexus (C8 or above)

Tumour > 7cm

Invasion of parietal pleura over the mediastinum

Tumour in the main bronchus less than 2 cm from the carina (without involvement of the carina and/or associated atelectasis or obstructive pneumonitis of the entire lung)

Note: any associated pleural effusion should be shown on multiple microscopical examinations to be negative for tumour; it should be non-bloody and not an exudate, and clinical judgement should dictate that the effusion is not related to the tumour.
Tumors previously designated as M1 by additional nodule(s) in other ipsilateral lobe(s) now qualify as T4

- Tumour invades trachea and/or SVC or other great vessel
- Tumour involves carina
- Tumour invades adjacent vertebral body
- Tumour invades aorta and/or recurrent laryngeal nerve
- Tumour invades esophagus, mediastinum and/or heart
- Pancoast tumours with invasion of one or more of the following structures:
  - vertebral body or spinal canal
  - brachial plexus (C8 or above)
  - subclavian vessels
- Tumour accompanied by ipsilateral nodules, different lobe
Survival by Clinical N-Descriptors
Clinical N-stage, cN0-cN3

No regional lymph node metastases

Metastasis in ipsilateral intrapulmonary/peribronchial/hilar lymph node(s), including nodal involvement by direct extension
Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s), including “skip” metastasis without N1 involvement

Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s) associated with N1 disease
Survival by Clinical M-Descriptors
Clinically Staged T4 and M1 Descriptors

- **T4 M0 Any N**: 332 / 399, MST 13, 5 Year 15%
- **Pleural Dissemination**: 462 / 488, MST 8, 5 Year 2%
- **Contralat. Lung Nodules**: 350 / 362, MST 10, 5 Year 3%
- **M1 Distant Mets**: 4149 / 4343, MST 6, 5 Year 1%

Primary tumour

Contralateral pulmonary nodule(s)

Malignant pericardial effusion/nodule(s)

Malignant pleural effusion/nodule(s)
Distant metastases:

Brain

Distant nodal metastases (those beyond the regional nodes)

Bone

Liver

Adrenal
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>TX</td>
<td>Positive cytology only</td>
</tr>
<tr>
<td>T1</td>
<td>≤3 cm</td>
</tr>
<tr>
<td>T1a</td>
<td>≤2 cm</td>
</tr>
<tr>
<td>T1b</td>
<td>&gt;2-3 cm</td>
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<tr>
<td>T2</td>
<td>Main bronchus ≥2 cm from carina, invades visceral pleura, partial atelectasis</td>
</tr>
<tr>
<td>T2a</td>
<td>&gt;3-5 cm</td>
</tr>
<tr>
<td>T2b</td>
<td>&gt;5-7 cm</td>
</tr>
<tr>
<td>T3</td>
<td>&gt;7 cm; chest wall, diaphragm, pericardium, mediastinal pleura, main bronchus &lt;2 cm from carina, total atelectasis, separate nodule(s) in same lobe</td>
</tr>
<tr>
<td>T4</td>
<td>Mediastinum, heart, great vessels, carina, trachea, esophagus, vertebra; separate tumor nodule(s) in a different ipsilateral lobe</td>
</tr>
<tr>
<td>N1</td>
<td>Ipsilateral peribronchial, ipsilateral hilar</td>
</tr>
<tr>
<td>N2</td>
<td>Subcarinal, ipsilateral mediastinal</td>
</tr>
<tr>
<td>N3</td>
<td>Contralateral mediastinal or hilar, scalene or supraclavicular</td>
</tr>
<tr>
<td>M1</td>
<td>Distant metastasis</td>
</tr>
<tr>
<td>M1a</td>
<td>Separate tumor nodule(s) in a contralateral lobe; pleural nodules or malignant pleural or pericardial effusion</td>
</tr>
<tr>
<td>M1b</td>
<td>Distant metastasis</td>
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<table>
<thead>
<tr>
<th>Occult Carcinoma</th>
<th>TX</th>
<th>N0</th>
<th>M0</th>
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<tr>
<td>Stage 0</td>
<td>Tis</td>
<td>N0</td>
<td>M0</td>
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<tr>
<td>Stage IA</td>
<td>T1a, b</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IB</td>
<td>T2a</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T2b</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIA</td>
<td>T1a, b</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T2a</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIB</td>
<td>T2b</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T3</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>T1a, b; T2a, b</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T3</td>
<td>N1, N2</td>
<td>M0</td>
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<tr>
<td></td>
<td>T4</td>
<td>N0, N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>T4</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td></td>
<td>Any T</td>
<td>N3</td>
<td>M0</td>
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<tr>
<td>Stage IV</td>
<td>Any T</td>
<td>Any N</td>
<td>M1</td>
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<table>
<thead>
<tr>
<th>T and M Descriptors</th>
<th>6th Edition TNM</th>
<th>7th Edition TNM</th>
<th>N0 Stage</th>
<th>N1 Stage</th>
<th>N2 Stage</th>
<th>N3 Stage</th>
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</thead>
<tbody>
<tr>
<td>T1 (≤3 cm)</td>
<td>T1a (≤2 cm)</td>
<td>IA</td>
<td>IIA</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td></td>
<td>T1b (&gt;2-3 cm)</td>
<td>IA</td>
<td>IIA</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td>T2 (&gt;3 cm)</td>
<td>T2a (&gt;3-5 cm)</td>
<td>IB</td>
<td>IIA (IB)</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td></td>
<td>T2b (&gt;5-7 cm)</td>
<td>IIA (IB)</td>
<td>IIIB</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td></td>
<td>T3 (&gt;7 cm)</td>
<td>IIB (IB)</td>
<td>IIIA</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td>T3 invasion</td>
<td>T3</td>
<td>IIB</td>
<td>IIIA</td>
<td>IIIA</td>
<td>IIIB</td>
<td>IIIIB</td>
</tr>
<tr>
<td>T4 (same lobe nodules)</td>
<td>T3</td>
<td>IIB (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIB (IIIIB)</td>
</tr>
<tr>
<td>T4 (extension)</td>
<td>T4</td>
<td>IIIA (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIA (IIIIB)</td>
<td>IIIB (IIIIB)</td>
</tr>
<tr>
<td>M1 (ipsilateral lung)</td>
<td>T4</td>
<td>IIIA (IV)</td>
<td>IIIA (IV)</td>
<td>IIIB (IV)</td>
<td>IIIB (IV)</td>
<td></td>
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<tr>
<td>T4 (pleural effusion)</td>
<td>M1a</td>
<td>IV (IIIIB)</td>
<td>IV (IIIIB)</td>
<td>IV (IIIIB)</td>
<td>IV (IIIIB)</td>
<td>IV (IIIIB)</td>
</tr>
<tr>
<td>M1 (contralateral lung)</td>
<td>M1a</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td>M1 (distant)</td>
<td>M1b</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
</tr>
</tbody>
</table>

Changes from 6th Ed
Supplementary Recommendations:

- Role of TNM in SCLC confirmed, and its use in SCLC re-emphasized.
- Carcinoid Tumours included.
- A uniform definition of “Visceral Pleural Invasion” has been provided.
- A New International Nodal Chart agreed.
- Minimum number of nodes reinstated for surgical/pathological classification.
- Additional Guidance on Distinction in Synchronous Primary vs Metastases.
Definitions of Visceral Pleural Invasion

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

PL2  tumor invades to the pleural surface

PL3  tumor invades into any component of the parietal pleura

PL0:  
PL1 & PL2:  T2
PL3:  T3

In case of doubt about the visceral pleura involvement, the use of elastic stains is recommended

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Supraclavicular zone
1. Low cervical, supraclavicular, and sternal notch nodes

Superior Mediastinal Nodes
Upper zone
- 2R Upper Paratracheal (right)
- 2L Upper Paratracheal (left)
- 3a Pre-vascular
- 3p Retrotracheal
- 4R Lower Paratracheal (right)
- 4L Lower Paratracheal (left)

Aortic Nodes
AP zone
- 5 Subaortic
- 6 Para-aortic (ascending aorta or phrenic)

Inferior Mediastinal Nodes
Subcarinal zone
- 7 Subcarinal
Lower zone
- 8 Paraesophageal (below carina)
- 9 Pulmonary ligament

N₁ Nodes
Hilar zone
- 10 Hilar
- 11 Interlobar
Peripheral zone
- 12 Lobar
- 13 Segmental
- 14 Subsegmental
**Supraclavicular zone**
- 1 Low cervical, supraclavicular, and sternal notch nodes

**SUPERIOR MEDIASTINAL NODES**
- Upper zone
  - 2R Upper Paratracheal (right)
  - 2L Upper Paratracheal (left)
  - 3a Prevascular
  - 3p Retrotracheal
  - 4R Lower Paratracheal (right)
  - 4L Lower Paratracheal (left)

**AORTIC NODES**
- AP zone
  - 5 Subaortic
  - 6 Para-aortic (ascending aorta or phrenic)

**INFERIOR MEDIASTINAL NODES**
- Subcarinal zone
  - 7 Subcarinal
- Lower zone
  - 8 Paraesophageal (below carina)
  - 9 Pulmonary ligament

**N1 NODES**
- Hilar/Interlobar zone
  - 10 Hilar
  - 11 Interlobar
- Peripheral zone
  - 12 Lobar
  - 13 Segmental
  - 14 Subsegmental
New supraclavicular zone

Upper border: lower margin of cricoid cartilage

Lower border: clavicles bilaterally and, in the midline, the upper border of manubrium #L1 and #R1 limited by the midline of the trachea.

All these nodes are N3 if involved, regardless of the side of the tumour
Shift of the anatomic midline to the left paratracheal border
Enlargement of the subcarinal station

Upper border: the carina of the trachea
Lower border: the upper border of the lower lobe bronchus on the left; the lower border of the bronchus intermedius on the right

All these nodes are N2 if involved, regardless of the side of the tumour
Completeness of Resection

R0: Complete Resection.

All of the following are satisfied:

a) Resection margins confirmed to be clear on microscopy.

b) Six nodes/nodal stations removed/sampled for histological examination. These should include 3 nodes/stations from the mediastinum, one of which should be sub-carinal node #7 and 3 nodes/stations from the hilum or other N1 locations*.

*If all resected/sampled lymph nodes are negative, but the number recommended is not met, classify as pN0. If resection has been performed, and otherwise fulfills the requirements for complete resection, it should be classified as R0.
Additional Tumour Nodules

- In most situations in which additional tumour nodules are found in association with a lung primary these are metastatic nodules, with identical histological appearances to that of the primary tumour. If limited to the lobe of the primary tumour such tumours are classified as T3, when found in other ipsilateral lobes are designated as T4 and if found in the contralateral lung are designated M1a.
Multiple Primary Tumours

- Multiple tumours may be considered to be synchronous primaries if they are of different histological cell types. Multiple tumours of similar histological appearance should only be considered to be synchronous primary tumours if *in the opinion of the pathologist*, based on features such as differences in morphology, immunohistochemistry and/or molecular studies, or, in the case of squamous cancers, are associated with carcinoma in situ, they represent differing sub-types of the same histopathological cell type. Such cases should also have no evidence of mediastinal nodal metastases or of nodal metastases within a common nodal drainage.
Updates on Lung Cancer Classification and Staging

Peter Goldstraw,
Honorary Consultant Thoracic Surgeon, Royal Brompton Hospital,
Emeritus Professor of Thoracic Surgery, Imperial College, London, UK.
Past President, International Association for the Study of Lung Cancer.
Lung Cancer

- A new data base was created following the successful conclusion of the previous revision.
- 94,708 cases collected from 35 centres in 16 countries recruited between 1999-2010.
- New data base published:
- Proposals on T, N, M categories and SCLC analyzed and papers in preparation for JTO, submission late 2014.
- Stage Groupings and Validation being analyzed, publication anticipated early 2015.
Health Warning!

The following slides show preliminary analyses which might form the basis of proposals for the 8th Edition of TNM for Lung Cancer.
- **T category possible Proposals (1).**

- Retain 7 size cut points
- Create new cut points at 1cm and 4 cm
- Subdivide T1:
  - T1a: ≤ 1 cm; T1b: >1 & ≤ 2 cm; T1c: < 2cm & ≤ 3 cm
- Redefine T2a as >3- ≤ 4 cm
- Redefine T2b as >4- ≤ 5 cm
- Reclassify tumours >5 cms but =/< 7cms as T3
- Reclassify tumours > 7cms as T4
- Reclassify tumours invading diaphragm as T4.
- Evaluate interaction of T size and PL category.
- Remove rarely used descriptors, e.g. extent of atelectasis, bronchial involvement, etc.
- Propose that T size is based on solid/invasive element in mixed attenuation lesions.
- **Proposals**

- Retain 7\textsuperscript{th} edition N categories.

- Some interesting pN data showing the number of stations/nodes/zones may be more important than anatomical location did not conform to validation process but may be a “Proposal for Testing”.

- pN1a single N1 station involvement.

- pN1b multiple N1 station involvement.

- pN2a1 single “skip” N2 station involvement.

- pN2a2 single N2 station with N1 positive station(s).

- pN2b multiple N2 station involvement.
- **M category possible Proposals**

- Retain M1a category for intrathoracic metastases.
- Reclassify M1b as single distant metastasis in one organ.
- Create M1c for multiple metastases in a single or multiple organs.
- Consequent changes for Stage IVA and B
# Proposal 6 Stage Groupings (Stage IA-IIIIIB)

<table>
<thead>
<tr>
<th></th>
<th>N0</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>v7</td>
<td>New</td>
<td>v7</td>
<td>New</td>
</tr>
<tr>
<td><strong>T1a</strong></td>
<td>IA</td>
<td>IA1</td>
<td>IIA</td>
<td>IIB</td>
</tr>
<tr>
<td><strong>T1b</strong></td>
<td>IA</td>
<td>IA2</td>
<td>IIA</td>
<td>IIB</td>
</tr>
<tr>
<td><strong>T1c</strong></td>
<td>IA</td>
<td>IA3</td>
<td>IIA</td>
<td>IIB</td>
</tr>
<tr>
<td><strong>T2a</strong></td>
<td>1B</td>
<td>IB</td>
<td>IIA</td>
<td>IIB</td>
</tr>
<tr>
<td><strong>T2b</strong></td>
<td>IIA</td>
<td>IIA</td>
<td>IIIB</td>
<td>IIIB</td>
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<tr>
<td><strong>T3</strong></td>
<td>IIIB</td>
<td>IIIB</td>
<td>IIIA</td>
<td>IIIA</td>
</tr>
<tr>
<td><strong>T4</strong></td>
<td>IIIA</td>
<td>IIIA</td>
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</tbody>
</table>
8th Edition of TNM

- All proposals will be first published in JTO 2014-15, free to members of IASLC.
- IASLC will submit proposals to UICC/AJCC early 2015.
- Publication presently scheduled for late 2016 (WCLC 2016 in Vienna).
- IASLC educational products available at WCLC Vienna, free/discounted for members.
- To be enacted January 2017.
Thank you