Melanoma of the Skin

Protocol applies to melanoma of cutaneous surfaces only.

Protocol revision date: January 2005
Based on AJCC/UICC TNM, 6th edition

Procedures
• Biopsy (No Accompanying Checklist)
• Excision
• Re-excision

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The College of American Pathologists offers these protocols to assist pathologists in providing clinically useful and relevant information when reporting results of surgical specimen examinations of surgical specimens. The College regards the reporting elements in the “Surgical Pathology Cancer Case Summary (Checklist)” portion of the protocols as essential elements of the pathology report. However, the manner in which these elements are reported is at the discretion of each specific pathologist, taking into account clinician preferences, institutional policies, and individual practice.

The College developed these protocols as an educational tool to assist pathologists in the useful reporting of relevant information. It did not issue the protocols for use in litigation, reimbursement, or other contexts. Nevertheless, the College recognizes that the protocols might be used by hospitals, attorneys, payers, and others. Indeed, effective January 1, 2004, the Commission on Cancer of the American College of Surgeons mandated the use of the checklist elements of the protocols as part of its Cancer Program Standards for Approved Cancer Programs. Therefore, it becomes even more important for pathologists to familiarize themselves with the document. At the same time, the College cautions that use of the protocols other than for their intended educational purpose may involve additional considerations that are beyond the scope of this document.
Summary of Changes to Checklist(s)

Protocol revision date: January 2005

No changes have been made to the data elements of the checklist(s) since the January 2004 protocol revision.
Surgical Pathology Cancer Case Summary

Protocol revision date: January 2005
Applies to invasive melanoma only
Based on AJCC/UICC TNM, 6th edition

MELANOMA OF THE SKIN: Excision, Re-Excision

Patient name:
Surgical pathology number:

Note: Check 1 response unless otherwise indicated.

MACROSCOPIC

Specimen Type
___ Excision, ellipse
___ Excision, wide
___ Excision, other (specify): ____________________________
___ Re-excision, ellipse
___ Re-excision, wide
___ Re-excision, other (specify): ____________________________
___ Lymphadenectomy, sentinel node(s)
___ Lymphadenectomy, regional nodes (specify): ____________________________
___ Other (specify): ____________________________
___ Not specified

Macrosopic Tumor
___ Present
___ Absent
___ Indeterminate

Tumor Site
Specify (if known): ____________________________
___ Not specified

Lesion Size
Greatest dimension: ___ cm
*Additional dimensions: ___ x ___ cm
___ Cannot be determined (see Comment)
CAP Approved

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Satellite Nodule(s)
___ Absent
___ Present (specify): ____________________________
___ Cannot be determined

*Pigmentation
*___ Absent
*___ Present, diffuse
*___ Present, patchy/focal
*___ Indeterminate
*___ Cannot be determined

MICROSCOPIC

Histologic Type
___ Superficial spreading melanoma
___ Lentigo maligna melanoma
___ Nodular melanoma
___ Acral lentiginous melanoma
___ Mucosal-lentiginous melanoma
___ Desmoplastic (spindle desmoplastic; neuroid) melanoma
___ Neurotropic melanoma
___ Malignant blue nevus
___ Melanoma in congenital melanocytic nevi
___ Minimal deviation (nevoid) melanoma
___ Other (specify): ____________________________
___ Melanoma, type cannot be determined

Ulceration
___ Present
___ Absent

Depth of Invasion
Specify: ___ mm
___ Cannot be determined (see Comment)

* Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.
Pathologic Staging (pTNM)

**Primary Tumor (pT)**

___ pTX: Primary tumor cannot be assessed (see Comment)
___ pT0: No evidence of primary tumor
___ pTis: Melanoma in situ (i.e., not an invasive tumor: level I)

pT1: Melanoma 1.0 mm or less in thickness, with or without ulceration
   ___ pT1a: Melanoma 1.0 mm or less in thickness and level II or III, no ulceration
   ___ pT1b: Melanoma 1.0 mm or less in thickness and level IV or V or with ulceration

pT2: Melanoma 1.01 to 2 mm in thickness, with or without ulceration
   ___ pT2a: Melanoma 1.01 to 2.0 mm in thickness, no ulceration
   ___ pT2b: Melanoma 1.01 to 2.0 mm in thickness, with ulceration

pT3: Melanoma 2.01 to 4.0 mm in thickness, with or without ulceration
   ___ pT3a: Melanoma 2.01 to 4.0 mm in thickness, no ulceration
   ___ pT3b: Melanoma 2.01 to 4.0 mm in thickness, with ulceration

pT4: Melanoma greater than 4.0 mm in thickness, with or without ulceration
   ___ pT4a: Melanoma greater than 4.0 mm in thickness, no ulceration
   ___ pT4b: Melanoma greater than 4.0 mm in thickness, with ulceration

**Regional Lymph Nodes (pN)**

___ pNX: Regional lymph nodes cannot be assessed
___ pN0: No regional lymph node metastasis

pN1: Metastasis in 1 regional lymph node
   ___ pN1a: Clinically occult (microscopic) metastasis
   ___ pN1b: Clinically apparent (macroscopic) metastasis

pN2: Metastasis in 2 to 3 regional nodes or intra-lymphatic regional metastasis without nodal metastasis
   ___ pN2a: Clinically occult (microscopic) metastasis
   ___ pN2b: Clinically apparent (macroscopic) metastasis

pN3: Metastasis in 4 or more regional lymph nodes, or matted metastatic nodes, or in-transit metastasis or satellites(s) with metastasis in regional node(s)
   ___ pN3a: Clinically occult (microscopic) metastasis
   ___ pN3b: Clinically apparent (macroscopic) metastasis
   ___ pN3c: Satellite or in-transit metastasis without nodal metastasis
   ___ pN3d: Satellite or in-transit metastasis with nodal metastasis

Number identified: __________
Number containing metastases identified macroscopically: ______
Number containing metastases identified microscopically: ______

Matted nodes:
   ___ Present
   ___ Absent

**Distant Metastasis (pM)**

___ pMX: Presence of distant metastasis cannot be assessed
___ pM1: Distant metastasis (documented in this specimen)
   ___ pM1a: Metastasis in skin, subcutaneous tissues, or distant lymph nodes
   ___ pM1b: Metastasis to lung
   ___ pM1c: Metastasis to all other visceral sites or distant metastasis at any site associated with an elevated serum lactic dehydrogenase (LDH)
   *(Other site, specify: _________________________)*

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* Data elements with asterisks are *not required* for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.
Margins (check all that apply)

Lateral Margins

___ Cannot be assessed
___ Uninvolved by invasive melanoma
    Distance of invasive melanoma from closest lateral margin: ___ mm
    Specify location(s), if possible: ____________________________
___ Involved by invasive melanoma
    Specify location(s), if possible: ____________________________
___ Uninvolved by melanoma in situ
    Distance of melanoma in situ from closest margin: ___ mm
    Specify location(s), if possible: ____________________________
___ Involved by melanoma in situ
    Specify location(s), if possible: ____________________________

Deep Margin

___ Cannot be assessed
___ Uninvolved by invasive melanoma
    Distance of invasive melanoma from margin: ___ mm
    Specify location(s), if possible: ____________________________
___ Involved by invasive melanoma
    Specify location(s), if possible: ____________________________

*Venous (Large Vessel) Invasion (V)
* ___ Absent
* ___ Present
* ___ Indeterminate

*Perineural Invasion
* ___ Absent
* ___ Present
* ___ Indeterminate

*Tumor-Infiltrating Lymphocytes
* ___ Absent
* ___ Nonbrisk
* ___ Brisk

*Tumor Regression
* ___ Absent
* ___ Present involving less than 75%
* ___ Present involving 75% or more of lesion

* Data elements with asterisks are not required for accreditation purposes for the Commission on Cancer. These elements may be clinically important, but are not yet validated or regularly used in patient management. Alternatively, the necessary data may not be available to the pathologist at the time of pathologic assessment of this specimen.
**Mitotic Index**
* ___ Less than 1 mitotic figure per mm²
* ___ 1 or more mitotic figure per mm²

**Additional Pathologic Findings (check all that apply)**
* ___ Nevus remnant
* ___ Actinic keratosis
* ___ Other (specify): ____________________________

**Comment(s)**
Background Documentation

Protocol revision date: January 2005

I. Biopsy (Note A)
A. Clinical Information
   1. Patient identification
      a. Name
      b. Identification number
      c. Age (birth date) (birth date) (Note B)
      d. Sex (Note B)
   2. Responsible physician(s)
   3. Date of procedure
   4. Other clinical information
      a. Relevant history
         (1) duration of lesion
         (2) previous similar lesions
         (3) family history of similar lesions
      b. Relevant physical findings
         (1) anatomic site (Note C)
         (2) ulceration (Note D)
         (3) contour of advancing borders of lesion
         (4) pigmentation, if any
         (5) fixation to deeper tissues on palpation
      c. Relevant clinical findings (eg, serum lactate dehydrogenase) (Note E)
      d. Clinical diagnosis
      e. Procedure (eg, punch biopsy, incisional biopsy, excisional biopsy)

B. Macroscopic Examination
   1. Specimen
      a. Tissues received (specify nature and site)
      b. Unfixed/fixed (specify fixative)
      c. Number of pieces of tissue
      d. Dimensions
      e. Results of intraoperative consultation, if performed (Note F)
   2. Tumor, if discernible
      a. Location
      b. Configuration
      c. Pigmentation (color and intensity)
      d. Dimensions (3)
      e. Ulceration (Note D)
      f. Other descriptive characteristics (eg, consistency, hemorrhage)
   3. Tissue submitted for microscopic examination
      a. Submit all
      b. Frozen section tissue fragment(s) (Note F)
   4. Special studies (specify) (eg, histochemical stains, immunohistochemistry, electron microscopy, flow cytometry, cytogenetics)

C. Microscopic Evaluation
   1. Tumor
      a. Histologic type (Note G)
      b. Thickness in millimeters (Note H)
      c. Level of invasion (Note H)
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For Information Only

1. Growth pattern (Note G)
2. Ulceration (Notes D and H)
3. Perineural invasion (with extent) (Note I)
4. Venous/lymphatic vessel invasion (with extent) (Notes H and J)
5. Tumor-infiltrating lymphocytes (absent, nonbrisk, brisk) (Note K)
6. Presence and percentage extent of regression, if present (Note L)
7. Mitotic index (number of mitosis per square millimeter) (Note M)
8. Additional pathologic findings, if present
   a. Nevus remnant (absent or present; if present, specific type)
   b. Actinic keratosis
3. Results of special studies (specify)
4. Comments
   a. Correlation with intraoperative consultations, if any (Note F)
   b. Correlation with prior specimens, if any
   c. Correlation with clinical findings, as appropriate
   d. Margin status, if clinically relevant

II. Excision, Re-excision (Note A)
A. Clinical Information
1. Patient identification
   a. Name
   b. Identification number
   c. Age (birth date) (Note B)
   d. Sex (Note B)
2. Responsible physician(s)
3. Date of procedure
4. Other clinical information
   a. Relevant history
      (1) duration of lesion
      (2) previous similar lesions
      (3) family history of similar lesions
   b. Relevant physical findings
      (1) anatomic site (Note C)
      (2) ulceration (Note D)
      (3) contour of advancing borders of lesion
      (4) pigmentation, if any
      (5) fixation to deeper tissues on palpation
   c. Relevant clinical findings (eg, serum lactate dehydrogenase) (Note E)
   d. Clinical diagnosis
   e. Procedure (eg, punch biopsy, ellipse, wide excision)
B. Macroscopic Examination
1. Specimen
   a. Tissues received (specify nature and site)
   b. Unfixed/fixed (specify fixative)
   c. Orientation of specimen, if indicated by surgeon
   d. Number of pieces of tissue
   e. Dimensions
   f. Results of intraoperative consultation, if any (Note F)
2. Tumor
   a. Location
   b. Configuration
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c. Pigmentation (color and intensity)
d. Dimensions
e. Ulceration (Note D)
f. Other descriptive characteristics (eg, consistency, fixation to other tissues, necrosis, hemorrhage)
g. Estimated depth of invasion from skin surface (specify compartment, eg, deep dermis, subcutis)

3. Previous biopsy site, if re-excision
   a. Location
   b. Tumor, if present (describe as above)

4. Margins (specify distance from the closest margin)

5. Regional lymph nodes, if any
   a. Location (as specific as possible)
   b. Number identified
   c. Number with macroscopic metastasis
   d. Matted lymph nodes, if present

6. Additional pathologic findings, if present
   a. Actinic keratoses
   b. Melanocytic nevi
   c. Other

7. Tissue submitted for microscopic examination
   a. Specify location in specimen of each sample
   b. Margins submitted as radial, not en face, sections

8. Special studies (specify) (eg, histochemical stains, immunohistochemistry, electron microscopy, flow cytometry, cytogenetics)

C. Microscopic Evaluation

1. Tumor
   a. Histologic type (Note G)
   b. Thickness in millimeters (Note H)
   c. Level of invasion (Note H)
   d. Growth pattern (Note G)
   e. Ulceration (Notes D and H)
   f. Perineural invasion (with extent) (Note I)
   g. Venous/lymphatic vessel invasion (with extent) (Notes J and H)
   h. Tumor-infiltrating lymphocytes (absent, nonbrisk, brisk) (Note K)
   i. Presence and percentage extent of regression, if present (Note L)
   j. Mitotic index (number of mitosis per square millimeter) (Note M)

2. Margins (Note N)
   a. Closest approximation to margin (in millimeters)

3. Additional pathologic findings, if present
   a. Nevus remnant (absent or present)
   b. Actinic keratosis

4. Regional lymph nodes (pN) (Notes H and O)
   a. Number identified
   b. Number containing metastases identified macroscopically
   c. Number containing metastases identified microscopically
   d. Matted nodes, if present

5. Metastases to other organs (pM) (Note H)
   a. Location, if known
      (1) distant skin, subcutis, or extra-regional lymph nodes
      (2) lung, other
6. Results of special studies (specify)
7. Comments
   a. Correlation with intraoperative consultations, if any (Note F)
   b. Correlation with prior specimens, if any
   c. Correlation with clinical findings, as appropriate
   d. Comments on prognostic findings, as appropriate

Explanatory Notes

A. Procedure
Optimal evaluation of melanocytic lesions requires complete excision that incorporates the full thickness of the involved lesion removed intact. "Shave" procedures should be avoided.

B. Patient Age and Sex
Older patient age and male sex have been shown to be adverse prognostic factors in some studies, but the effect of these factors, independent of other strong adverse prognostic factors with which they correlate, is unclear.

Data from selected treatment centers indicate that the average patient age at diagnosis ranges from about 48 to 59 years. A correlation between advanced age (ie, age greater than the median at diagnosis) and decreased survival has been suggested by several studies. However, some multivariate analyses have failed to support an independent effect of age. In other studies, correlative trends have been noted between advanced age and increased melanoma thickness at diagnosis, which is a very strong adverse prognostic factor, suggesting that this interrelationship may account for the apparent prognostic effect of age. In more recent multivariate analyses of data from melanoma centers worldwide, a strong independent relationship between age and outcome was demonstrated.

Male sex also has proven to be an adverse prognostic factor in many studies, many using multivariate analysis of results. However, anatomic site of origin, tumor ulceration, and tumor stage (see Notes C, D, and H) are very strong prognostic factors in cutaneous melanoma, and all of these factors correlate with sex. That is, males are more likely than females to develop melanomas in unfavorable sites, to have ulcerated tumors, and to have a higher stage of disease presentation.

C. Anatomic Site
For cutaneous melanoma, location on the extremities is associated with a better survival compared with location on the trunk or head and neck. Sublocation analyses have indicated that location on the upper extremities is associated with a slightly better survival than location on the lower extremities. In the head and neck region, location on the face or neck is associated with a survival advantage compared to location on the scalp.

D. Ulceration
Ulceration is a dominant prognostic factor in cutaneous melanoma without metastasis. It is defined as the absence of an intact epidermis over any part of the primary tumor based on microscopic observation of histologic sections. The presence or absence of ulceration must be confirmed on microscopic examination. Ulcerated melanomas
typically show invasion through the epidermis, whereas nonulcerated melanomas tend to lift the overlying epidermis. Thus, ulceration is widely regarded as an indication of biological aggressiveness in cutaneous melanoma, and clinical data strongly support this interpretation.

Ulceration has been shown repeatedly to be among the most powerful adverse prognostic factors in stage I and II melanomas (see Note H below for stage definitions), and in several studies, it has proven to be the single most important feature predicting outcome. Overall, for patients with stage I and II melanomas, the 10-year survival rate is 50% if the tumor is ulcerated and 78% if the tumor is not ulcerated. In almost every Cox regression analysis of prognostic factors in cutaneous melanoma that includes ulceration, a significantly worse prognosis and a higher risk of metastatic disease have been demonstrated for ulcerated versus nonulcerated tumors of equivalent thickness.

There is a positive correlation between ulceration and thickness. For ulcerated tumors, the median thickness has been shown to be about 3 mm; for nonulcerated tumors, it is about 1.3 mm. Nevertheless, the adverse prognostic significance of melanoma ulceration has been shown to be independent of tumor thickness. For thin melanomas (1.0 mm or less in thickness), level of invasion is more predictive of survival outcome than ulceration. For all melanomas greater than 1.0 mm, ulceration is clearly more predictive than thickness.

E. Pretreatment Serum Lactate Dehydrogenase (LDH) and Serum Albumin
Data from numerous studies have suggested that an elevated serum level of LDH is a stage-independent prognostic factor for decreased survival in melanoma. In these studies, pretreatment LDH elevation has been variably defined as serum levels greater than 200 to 225 U/L or levels elevated above the normal levels of the reference laboratory. It is recommended that any elevation above normal should be checked by repeat LDH testing after at least 24 hours. For stage IV melanoma, a decreased serum albumin level (less than or equal to 3.5 to 4.0 g/dL) has also been shown to be an independent adverse prognostic factor.

F. Frozen Sections
The use of frozen sections in biopsies or excisions of pigmented lesions is discouraged. Optimal histologic evaluation of cutaneous melanoma requires formalin fixation.

G. Histologic Subtypes and Growth Patterns
The classification of variants of malignant melanocytic neoplasms of the skin includes the following:

- Superficial spreading melanoma
- Nodular melanoma
- Lentigo maligna melanoma
- Acral lentiginous melanoma
- Mucosal-lentiginous melanoma
- Desmoplastic (spindle desmoplastic; neuroid) melanoma
- Neurotropic melanoma
- Malignant blue nevus
- Melanoma in congenital melanocytic nevi
- Minimal deviation (nevoid) melanoma
Other terms for variants not included in the above-cited classification\textsuperscript{18} include:

- Micronodular melanoma
- Pleomorphic (sarcomatoid) melanoma
- Rhabdoid melanoma
- Myxoid melanoma
- Pseudopapillary (adenoid) melanoma
- Small cell melanoma
- Balloon cell melanoma
- Hemangiopericytoid melanoma
- Signet ring-cell melanoma
- Additional forms not otherwise specified

The prognostic significance of histologic type is less significant than the growth patterns and depth of infiltration displayed by those histologic types. For example, superficial spreading melanomas, by definition, demonstrate prominent radial growth and have a better prognosis than nodular melanomas, which predominantly demonstrate vertical growth.\textsuperscript{9}

Radial growth phase: tumor demonstrates a uniform cytological appearance and is generally wider than it is deep. The presence or absence of a radial growth phase should be noted because the information may be used clinically to plan the extent of the re-excision.

Vertical growth phase: tumor exhibits at least 2 cytologically distinct clones of tumor cells microscopically and shows an inconstant relationship between width and depth. Nodular melanomas are by definition vertical growth phase tumors. The presence or absence of a vertical growth phase should be noted. If a vertical growth phase is present, the character of the cells may also be noted as follows: epithelioid, spindled, or small. Vertical growth phase is an adverse prognostic factor for cutaneous melanoma.

H. TNM and Stage Groupings
The TNM Staging System of the American Joint Committee on Cancer (AJCC) and the International Union Against Cancer (UICC) recommended by this protocol is shown below.\textsuperscript{19,20} In the sixth editions of the AJCC and the UICC staging manuals, the staging system for melanoma of the skin has been completely changed, using different criteria for T, N, and M. Thus, the current staging system cannot be directly compared with previous TNM classifications.

Pathologic staging includes microstaging of the primary melanoma and pathologic information about the regional lymph nodes after partial or complete lymphadenectomy. Pathologic stage 0 or stage 1A patients are exceptions; they do not require pathologic evaluation of their lymph nodes.\textsuperscript{19}

In virtually all studies of cutaneous melanoma, tumor thickness has been shown to be a dominant prognostic factor\textsuperscript{15,16} and forms the basis for the stratification of pT. Clark levels are also commonly used to indicate depth of invasion of the primary tumor.\textsuperscript{19-22}

By AJCC/UICC convention, the designation “T” refers to a primary tumor that has not been previously treated. The symbol “p” refers to the pathologic classification of the TNM, as opposed to the clinical classification, and is based on gross and microscopic examination. pT entails a resection of the primary tumor or biopsy adequate to evaluate
the highest pT category, pN entails removal of nodes adequate to validate lymph node metastasis, and pM implies microscopic examination of distant lesions. Clinical classification (cTNM) is usually carried out by the referring physician before treatment during initial evaluation of the patient or when pathologic classification is not possible.

Pathologic staging is usually performed after surgical resection of the primary tumor. Pathologic staging depends on pathologic documentation of the anatomic extent of disease, regardless of whether the primary tumor has been completely removed. If a biopsied tumor is not resected for any reason (eg, when technically unfeasible) and if the highest T and N categories or the M1 category of the tumor can be confirmed microscopically, the criteria for pathologic classification and staging have been satisfied without total removal of the primary cancer.

**Primary Tumor (T)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed (eg, shave biopsy or regressed melanoma)</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
</tr>
<tr>
<td>Tis</td>
<td>Melanoma in situ (ie, not an invasive tumor: level I)</td>
</tr>
<tr>
<td>T1</td>
<td>Melanoma 1.0 mm or less in thickness, with or without ulceration</td>
</tr>
<tr>
<td>T1a</td>
<td>Melanoma 1.0 mm or less in thickness and level II or III, no ulceration</td>
</tr>
<tr>
<td>T1b</td>
<td>Melanoma 1.0 mm or less in thickness and level IV or V or with ulceration</td>
</tr>
<tr>
<td>T2</td>
<td>Melanoma 1.01 to 2.0 mm in thickness, with or without ulceration</td>
</tr>
<tr>
<td>T2a</td>
<td>Melanoma 1.01 to 2.0 mm in thickness, no ulceration</td>
</tr>
<tr>
<td>T2b</td>
<td>Melanoma 1.01 to 2.0 mm in thickness, with ulceration</td>
</tr>
<tr>
<td>T3</td>
<td>Melanoma 2.01 to 4.0 mm in thickness, with or without ulceration</td>
</tr>
<tr>
<td>T3a</td>
<td>Melanoma 2.01 to 4.0 mm in thickness, no ulceration</td>
</tr>
<tr>
<td>T3b</td>
<td>Melanoma 2.01 to 4.0 mm in thickness, with ulceration</td>
</tr>
<tr>
<td>T4</td>
<td>Melanoma greater than 4.0 mm in thickness, with or without ulceration</td>
</tr>
<tr>
<td>T4a</td>
<td>Melanoma greater than 4.0 mm in thickness, no ulceration</td>
</tr>
<tr>
<td>T4b</td>
<td>Melanoma greater than 4.0 mm in thickness, with ulceration</td>
</tr>
</tbody>
</table>

# Clinical T classification (cT) is usually not possible for melanoma, and pathologic (microscopic) assessment of the primary tumor is required for proper staging. Therefore, excision of the primary tumor, rather than punch or other incisional biopsy, is always advised. The T classification of melanoma is based on the thickness of the primary tumor, its anatomic level of invasion, and the presence or absence of ulceration. Maximal thickness is measured with an ocular micrometer at a right angle to the adjacent normal skin. The upper point of reference is the granular layer of the epidermis of the overlying skin or, if the lesion is ulcerated, the base of the lesion (ulcer). The lower reference point is the deepest point of tumor invasion (ie, the leading edge of a single mass or an isolated group of cells deep to the main mass). Ulceration is a strong adverse prognostic factor \(^1,16\) (see Note D).

## Clark levels are defined as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Intraepidermal tumor only</td>
</tr>
<tr>
<td>II</td>
<td>Tumor invades into papillary dermis</td>
</tr>
<tr>
<td>III</td>
<td>Tumor invades into papillary dermis and expands it</td>
</tr>
<tr>
<td>IV</td>
<td>Tumor invades into reticular dermis</td>
</tr>
<tr>
<td>V</td>
<td>Tumor invades subcutis</td>
</tr>
</tbody>
</table>
Regional Lymph Nodes (N)¹
NX  Regional lymph nodes cannot be assessed
N0  No regional lymph node metastasis²
N1  Metastasis in 1 lymph node²²
N1a Clinically occult (microscopic) metastasis
N1b Clinically apparent (macroscopic) metastasis
N2  Metastasis in 2 to 3 regional nodes or intralymphatic regional metastasis without nodal metastasis
N2a Clinically occult (microscopic) metastasis
N2b Clinically apparent (macroscopic) metastasis
N2c Satellite or in-transit metastasis without nodal metastasis³
N3  Metastasis in 4 or more regional lymph nodes, or matted metastatic nodes, or in-transit metastasis or satellites(s) with metastasis in regional node(s)⁴

¹ The regional lymph nodes are the most common sites of metastasis. The widespread use of cutaneous lymphoscintigraphy, lymphatic mapping, and sentinel lymph node biopsies has greatly enhanced the ability to identify the presence of lymph node metastasis. By convention, the term "regional lymph nodal metastasis" refers to disease confined to 1 nodal basin or 2 contiguous nodal basins, as in patients with nodal disease in combinations of femoral/iliac, axillary/supraclavicular, cervical/supraclavicular, axillary/femoral, or bilateral axillary or femoral metastases.

²² Isolated Tumor Cells, Micrometastasis, and Sentinel Lymph Nodes²⁰,²¹,²³
Use of published guidelines for definitions of nodal metastasis is recommended.²⁰,²¹,²³ Accordingly, any histologically identified focus of tumor (ie, seen on routine hematoxylin-eosin [H&E] stain), greater than 0.2 mm in size is classified as nodal involvement. However, tumor measuring 0.2 mm or less identified only by immunohistochemistry or nonhistologic methods should be classified as pN0, as described in the following list, with a comment on the finding in the pathology report.

The biologic significance of minute amounts of tumor (isolated tumor cells [ITCs]) in regional lymph nodes or distant metastatic sites is unproven at present. Isolated tumor cells are defined as single cells or small clusters of cells not more than 0.2 mm in greatest dimension.²⁰,²¹ They are always clinically occult, but when seen on routine histologic examination, are classified as pN0. Lymph nodes or distant sites that are histologically negative but contain ITCs found by either special morphologic (immunohistochemistry) or nonmorphologic techniques (eg, flow cytometry, DNA analysis, polymerase chain reaction [PCR] amplification of a specific tumor marker) should be classified as N0 or M0, respectively. Specific denotation of the assigned N category is suggested as follows for cases in which ITCs are the only evidence of possible metastatic disease.

pN0  No regional lymph node metastasis histologically, no examination for isolated tumor cells (ITCs)
pN0(i-) No regional lymph node metastasis histologically, negative morphologic (any morphologic technique, including hematoxylin-eosin and immunohistochemistry) findings for ITCs
pN0(i+) No regional lymph node metastasis histologically, positive morphologic (any morphologic technique, including hematoxylin-eosin and immunohistochemistry) findings for ITCs
Sentinel lymph node identification and evaluation may be included in the surgical approach to cutaneous melanoma. A sentinel lymph node is defined as the first node to receive lymphatic drainage from a primary tumor. There may be more than 1 sentinel node for some tumors. The clinical rationale for sentinel lymph node identification and separate evaluation is based on the assumption that metastatic involvement of a sentinel node increases the likelihood that other more distant nodes may also contain metastatic disease. Conversely, if sentinel nodes are negative, other regional nodes would be less likely to contain metastasis. Like other regional lymph nodes, sentinel lymph nodes that contain histologically identified tumor that is greater than 0.2 mm are classified as pN1. Sentinel lymph nodes that are histologically negative for true metastasis but have been examined for ITCs by any approach are denoted as follows.

pN0(i-)(sn) No sentinel lymph node metastasis histologically, negative morphologic findings for ITCs (i = “isolated”)
pN0(i+)(sn) No sentinel lymph node metastasis histologically, positive morphologic findings for ITCs (i = “isolated”)
pN0(mol-)(sn) No sentinel lymph node metastasis histologically, negative nonmorphologic findings for ITCs
pN0(mol+)(sn) No sentinel lymph node metastasis histologically, positive nonmorphologic findings for ITCs

### In almost all studies using Cox regression analysis, either the number of regional lymph nodes containing metastases or the percentage of regional nodes containing metastases more strongly predicted outcome than the size of metastasis.\(^1\),\(^4\),\(^15\),\(^16\) Patients with 1 involved lymph node have longer survivals compared to patients with any combination of 2 or more involved nodes, regardless of the size of the metastasis. In their review of reported studies, the AJCC Melanoma Staging Committee found no compelling evidence that the gross dimension of lymph nodes metastases was an independent predictor of outcome.\(^22\)

^ The presence of in-transit metastasis between the primary tumor and the regional lymph nodes portends a poor prognosis. In-transit metastasis is defined arbitrarily as intralymphatic tumor in skin or subcutaneous tissue more than 2 cm from the primary tumor but not beyond the nearest regional lymph node basin.

^^ The presence of clinical or microscopic satellite lesions around a primary melanoma and in-transit metastases both portend a poor prognosis, and an analysis of the available data by the AJCC Melanoma Staging Committee revealed no significant difference in survival for these 2 entities.\(^15\),\(^16\) They both are associated with a prognosis equivalent to multiple lymph node metastases.\(^15\),\(^16\)
Distant Metastasis (M)
MX Presence of distant metastasis cannot be assessed
M0 No distant metastasis
M1 Distant metastasis
M1a Metastasis in skin, subcutaneous tissues, or distant lymph nodes
M1b Metastasis to lung
M1c Metastasis to all other visceral sites or distant metastasis at any site associated with an elevated serum lactic dehydrogenase (LDH)

Pathologic Stage Groupings
Stage 0 Tis N0 M0
Stage IA T1a N0 M0
Stage IB T1b N0 M0
T2a N0 M0
Stage IIA T2b N0 M0
T3a N0 M0
Stage IIB T3b N0 M0
T4a N0 M0
Stage IIC T4b N0 M0
Stage IIIA T1-4a N1a M0
T1-4a N2a M0
Stage IIIB T1-4b N1a M0
T1-4b N2a M0
T1-4a N1b M0
T1-4a N2b M0
T1-4a/b N2c M0
Stage IIIC T1-4b N1b M0
T1-4b N2b M0
Any T N3 M0
Stage IV Any T Any N M1

Note that for cutaneous melanoma, clinical and pathologic stage groupings differ for stage III. The complete clinical stage groupings are shown below for comparison.

Clinical Stage Groupings
Stage 0 Tis N0 M0
Stage IA T1a N0 M0
Stage IB T1b N0 M0
T2a N0 M0
Stage IIA T2b N0 M0
T3a N0 M0
Stage IIB T3b N0 M0
T4a N0 M0
Stage IIC T4b N0 M0
Stage III Any T N1 M0
Any T N2 M0
Any T N3 M0
Stage IV Any T Any N M1
TNM Descriptors\textsuperscript{19,20}
For identification of special cases of TNM or pTNM classifications, the “m” suffix and “y,” “r,” and “a” prefixes are used. Although they do not affect the stage grouping, they indicate cases needing separate analysis.

The “m” suffix indicates the presence of multiple primary tumors in a single site and is recorded in parentheses: pT(m)NM.

The “y” prefix indicates those cases in which classification is performed during or following initial multimodality therapy (ie, neoadjuvant chemotherapy, radiation therapy, or both chemotherapy and radiation therapy). The cTNM or pTNM category is identified by a “y” prefix. The ycTNM or ypTNM categorizes the extent of tumor actually present at the time of that examination. The “y” categorization is not an estimate of tumor prior to multimodality therapy (ie, before initiation of neoadjuvant therapy).

The “r” prefix indicates a recurrent tumor when staged after a documented disease-free interval, and is identified by the “r” prefix: rTNM.

The “a” prefix designates the stage determined at autopsy: aTNM.

Additional Descriptors\textsuperscript{19,20}

Residual Tumor (R)
Tumor remaining in a patient after therapy with curative intent (eg, surgical resection for cure) is categorized by a system known as R classification, as follows.

RX Presence of residual tumor cannot be assessed
R0 No residual tumor
R1 Microscopic residual tumor
R2 Macroscopic residual tumor

For the surgeon, the R classification may be useful to indicate the known or assumed status of the completeness of a surgical excision. For the pathologist, the R classification is relevant to the status of the margins of a surgical resection specimen. That is, tumor involving the resection margin on pathologic examination may be assumed to correspond to residual tumor in the patient and may be classified as macroscopic or microscopic according to the findings at the specimen margin(s).

Vessel Invasion
By AJCC/UICC convention, vessel invasion (lymphatic or venous) does not affect the T category indicating local extent of tumor unless specifically included in the definition of a T category. In all other cases, lymphatic and venous invasion by tumor are coded separately as follows.

Lymphatic Vessel Invasion (L)
LX Lymphatic vessel invasion cannot be assessed
L0 No lymphatic vessel invasion
L1 Lymphatic vessel invasion
Venous Invasion (V)
VX Venous invasion cannot be assessed
V0 No venous invasion
V1 Microscopic venous invasion
V2 Macroscopic venous invasion

I. Perineural Invasion
Perineural invasion may be seen in melanomas, particularly desmoplastic-neuroid subtypes. Although still debated, this feature may correlate with an increased risk for local recurrence. It is suggested that the presence of perineural infiltration be noted in surgical pathology reports on melanomas.

J. Venous Vessel Invasion
At least 1 study has suggested that vascular invasion by melanomas correlates independently with worsened overall survival. It is suggested that this parameter be recorded if it is present.

K. Tumor-Infiltrating Lymphocytes (TILs)
A paucity of TILs is an adverse prognostic factor for cutaneous melanoma. Although a precise numerical characterization of that finding has not been made, a recent study has shown good to excellent overall interobserver agreement in the classification of TILs as brisk, nonbrisk, or absent according to Clark, using the guidelines that follow. To qualify as TILs, lymphocytes needed to surround and disrupt tumor cells of the vertical growth phase.

TILs absent: no lymphocytes present, or lymphocytes present but do not infiltrate tumor at all.

TILs nonbrisk: lymphocytes infiltrate melanoma only focally or not along the entire base of the vertical growth phase.

TILs brisk: lymphocytes diffusely infiltrate the entire invasive component of the melanoma or the entire base of the vertical growth phase.

L. Tumor Regression
Regression of 75% or more of the lesion (defined by replacement of tumor cells by lymphocytic inflammation, with or without dermal melanophages and fibrosis) carries adverse prognostic importance in invasive melanomas.

M. Mitotic Index
A mitotic rate of 1 or more mitotic figure per square millimeter is an adverse prognostic factor for cutaneous melanoma. For a X25 objective with a field diameter of 0.59 mm, the field area is 0.274 mm². For a X40 objective with a field diameter of 0.44 mm, the field area is 0.152 mm².

N. Margins
Microscopically measured distances between tumor and labeled lateral or deep margins are appropriately recorded for melanoma because these neoplasms may demonstrate clinical "satellitosis," as discussed in Note H. A comment on margins is necessary only for excisional biopsies or formal resections. If a lateral margin is involved by tumor, it should be stated whether the tumor is in situ or invasive.
O. Lymph Nodes
Pathologic examination of lymph nodes has become increasingly important in cutaneous melanoma.\textsuperscript{19,31} Therefore, a comment may be needed that documents the clinical nodal status (cN substage) versus pathologic (pN substage) status in assigning the stage grouping for the tumor. It is strongly recommended that patients with clinically negative nodes undergo pathologic staging using the sentinel lymph node technique or complete regional lymph node dissection. This is especially important for patients being considered for clinical trials.

Removal of sentinel lymph nodes may be performed for patients with primary localized vertical growth phase cutaneous melanomas with a thickness of 1 mm or greater, and recent data indicates that it also may be justified for lesions less than 1 mm thick (incidence of sentinel lymph node metastasis is about 6% in so-called “thin melanomas” versus about 15% for melanomas greater than or equal to 1 mm thick).\textsuperscript{32} Frozen section analysis of sentinel lymph nodes is not advised. Review of H&E-stained slides from multiple (6 to 10) levels through sentinel lymph nodes increases the sensitivity of detecting microscopic melanoma metastasis; routine analysis (H&E-stained sections of the cut surfaces of a simply bisected lymph node) may lead to a false-negative rate of 10% to 15%. The use of immunohistochemical stains (eg, for tyrosinase or MART-1) also increases the sensitivity of detection of microscopic melanoma metastases and may also be considered in the examination of sentinel lymph nodes. However, immunohistochemical staining should not be used in place of standard histologic examination.

For histologic examination, whether for sentinel node analysis or routine regional lymph node evaluation (see Note H), the entire node should be submitted. Large lymph nodes may be bisected or sliced at 2-mm intervals, whereas smaller nodes (less than 5 mm) may be submitted whole. On histologic examination, metastatic tumor measuring greater than 0.2 mm is classified as pN1.

References


**Bibliography**


