Whole Body Imaging in Melanoma Staging

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Year III
Gillian Lieberman, MD
Outline

- Patient Introduction
- Overview of Melanoma
- Imaging Modalities Used
- Revisit our Patient
Patient MW

- 54 yo F who has otherwise been healthy p/w large, malodorours **left facial mass**
- Started 4 yrs ago → crusted → fell off
- Recurred a yr ago → increase in size → w/ brownish discharge, occasional bleeding, and pain
- PMH: Several benign moles removed from back in 1975
Patient MW 2

- FH: Grandmother w/ skin CA but not melanoma
- PE: Unremarkable except for 9 x 12cm fungating, malodorous, left facial mass (in area of Parotid gland) with brownish discharge
Ddx for Facial Mass

- Facial Nerve Schwannoma
- Hemangioma
- Lipoma
- Parotid gland tumor
- **Melanoma**
- Squamous Cell CA
- Metastases
- Lymph Edema
- Other Non-malignant Processes
Malignant melanoma

- Arises from melanocytes
- Can involve any organ system

http://www.the-reference-desk.com/images/skin.jpg
Epidemiology 1

10 Most Frequent Cancers in US Men and Women from 1995-1999

<table>
<thead>
<tr>
<th>20 AND YOUNGER</th>
<th>20 - 49</th>
<th>50 - 64</th>
<th>65 - 74</th>
<th>75 AND OLDER</th>
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<tbody>
<tr>
<td>Leukemias</td>
<td>Breast</td>
<td>Breast</td>
<td>Prostate</td>
<td>Colon and rectum</td>
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<td>Brain and other</td>
<td>Melanomas of the skin</td>
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<td>Lung and bronchus</td>
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<td>Thyroid</td>
<td>Non-Hodgkin's lymphoma</td>
<td>Corpus and uterus</td>
<td>Urinary bladder</td>
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<td>Pancreas</td>
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<td>Other endocrine</td>
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<td>including thymus</td>
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http://www.cnn.com/interactive/health/0205/cancer.statistics/content.2.html
# Epidemiology 2

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<td>Pancreas</td>
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<td>Breast</td>
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<tr>
<td>Kidney and renal pelvis</td>
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<td>Ovary</td>
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<td>Ovary</td>
<td>Ovary</td>
<td>Liver and intrahepatic bile duct</td>
<td>Ovary</td>
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Types of Melanoma

- Superficial Spreading
- Acral lentiginous
- Nodular
- Lentigo Maligna
- Other
Diagnosis

Pathological
A Word on Lymphoscintigraphy

• ? Nodal Involvement

• Uses a radionuclide tracer +/- isosulfan blue to identify lymph drainage for the lesion in question

• Works great for lesions of the extremity

• Not as good for axial & head and neck lesions

Clean SLN is not equivalent to no Mets especially for thicker lesions and lesions of the head, neck, and trunk

http://www.melanomahopenetwork.org/images/Lymphoscintigramweb.jpg
Lymphoscintigraphy 2


http://www.rcsed.ac.uk/journal/vol45_6/4560012.jpg

http://bidmc.harvard.edu/content/bidmc/Departments/Radiology/images/sentinel_node_labelled.gif

http://www.jwci.org/Graphics/Lymphoscintigraphy.jpg
### Revised AJCC TNM Classification

#### T Classification

<table>
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<tr>
<th>T</th>
<th>Classification</th>
<th>Notes</th>
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<tr>
<td>T1</td>
<td>≤1.0 mm</td>
<td>a: without ulceration</td>
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<tr>
<td></td>
<td></td>
<td>b: with ulceration or level IV or V</td>
</tr>
<tr>
<td>T2</td>
<td>1.01–2.0 mm</td>
<td>a: without ulceration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b: with ulceration</td>
</tr>
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<td>T3</td>
<td>2.01–4.0 mm</td>
<td>a: without ulceration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b: with ulceration</td>
</tr>
<tr>
<td>T4</td>
<td>&gt;4.0 mm</td>
<td>a: without ulceration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b: with ulceration</td>
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</tbody>
</table>

#### N Classification

<table>
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<th>N</th>
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<tr>
<td>N1</td>
<td>One lymph node</td>
<td>a: micrometastasis¹</td>
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<td></td>
<td></td>
<td>b: macrometastasis²</td>
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<tr>
<td>N2</td>
<td>2–3 lymph nodes</td>
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<td></td>
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<tr>
<td>N3</td>
<td>4 or &gt; metastatic lymph nodes, matted lymph nodes, or combinations of in-transit met(s)/satellite(s) and metastatic lymph node(s)</td>
<td>c: in-transit met(s)/satellite(s) without metastatic lymph nodes</td>
</tr>
</tbody>
</table>

#### M Classification

<table>
<thead>
<tr>
<th>M</th>
<th>Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Distant skin, subcutaneous, or lymph node mets</td>
<td>Normal LDH</td>
</tr>
<tr>
<td>M2</td>
<td>Lung mets</td>
<td>Normal LDH</td>
</tr>
<tr>
<td>M3</td>
<td>All other visceral or any distant mets</td>
<td>Elevated LDH</td>
</tr>
</tbody>
</table>

mets = metastases

¹ Micrometastases are diagnosed after sentinel or elective lymphadenectomy.

² Macrometastases are defined as clinically detectable lymph node metastases confirmed by therapeutic lymphadenectomy or when any lymph node metastasis exhibits gross extracapsular extension.

### New Stage Groupings for Cutaneous Melanoma

<table>
<thead>
<tr>
<th>Clinical Staging</th>
<th>Pathologic Staging</th>
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<tr>
<td><strong>0</strong> Tis N0 M0</td>
<td>Tis N0 M0</td>
</tr>
<tr>
<td><strong>Ia</strong> T1a N0 M0</td>
<td>T1a N0 M0</td>
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<tr>
<td><strong>Ib</strong> T1b N0 M0</td>
<td>T1b N0 M0</td>
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<tr>
<td><strong>Iia</strong> T2a N0 M0</td>
<td>T2a N0 M0</td>
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<tr>
<td><strong>Iib</strong> T2b N0 M0</td>
<td>T2b N0 M0</td>
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<td><strong>Iic</strong> T3a N0 M0</td>
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<td><strong>Iiic</strong> Any T N1</td>
<td>T4a N0 M0</td>
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<td>T4b N0 M0</td>
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<td><strong>Iib</strong> T4b N0 M0</td>
<td>T4b N0 M0</td>
</tr>
<tr>
<td><strong>Iic</strong> Any T N1</td>
<td>T4b N0 M0</td>
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<td><strong>IiiA</strong> T1-4a N1a M0</td>
<td>T1-4a N1a M0</td>
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<td><strong>IiiB</strong> T1-4a N1a M0</td>
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<td><strong>IiiiC</strong> T1-4a N1b M0</td>
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</tr>
<tr>
<td><strong>Iv</strong> Any T Any N Any M1</td>
<td>Any T Any N Any M1</td>
</tr>
</tbody>
</table>

- Clinical staging includes microstaging of the primary melanoma and clinical/radiologic evaluation for metastases. By convention, it should be used after complete excision of the primary melanoma with clinical assessment for regional and distant metastases.
- Pathologic staging includes microstaging of the primary melanoma and pathologic information about the regional lymph nodes after partial or complete lymphadenectomy, except for pathologic stage 0 or stage T4A patients, who do not need pathologic evaluation of their lymph nodes.
- There are no stage III subgroups for clinical staging.

From the American Joint Committee on Cancer Staging System for Cutaneous Melanoma.

Cancer. Vol 88; 1484-1491
Staging of Melanoma 3

Stage I & II → No Nodal Involvement
- 100% Cure w/ resection
- Thicker Lesions → Higher recurrence Rate

Stage III → Nodal Involvement
- Sometimes cure w/ resection
- Depends on no. of Nodes involved

Stage IV → Distant Mets
- Case reports of cure from resection of localized, limited Dz

CT
PET
MRI
Plain Film
US
Bone Scan
Lymphoscintigraphy
Prognosis

[Graph showing survival rates for different stages of disease]

medstat.med.utah.edu/kw/derm/pages/metr_5.htm
Why CT For Staging

- 30% of pts presenting already have mets
- Large # of these pts have distant metastasis
- Presence of Distant Mets changes prognosis and influences management
- CT Surveys multiple organs
- Relatively Quick
Common Sites of Metastatic Dz

Contrast enhanced CT showing liver and in 51 yo M w/ widely metastaticDz. Splenic mets, though not common, are also shown

Contrast enhanced CT showing metastatic dz in 50 yo M p/w vomiting
- Enhancing masses in small bowel mesentery
- Melanoma inplants in dilated loops of small bowel
- Ileoileal intussusception

Radiology. 1999;213:92-96

Radiographics. 2003;23:457-473
Not So Common Sites…

- Contrast enhanced axial CT
- Metastatic Melanoma in 30 yo F
- Large Filling defect in right atrium
- Mass in lower lobe of left lung more characteristic of melanoma


- Contrast enhanced axial CT
- Large polylobulated mass in body and tail of pancreas
- Evidence of necrosis in tumor

www.unipa.it/~radpa/eido/e2/e2.html
Limitations of CT in the Staging of Melanoma

- No functional Data
- Lesions have to be large enough to be detected
- Not as good for Imaging the Brain and brain mets common with melanoma
Advantages of Using PET for Melanoma Staging

• Functional data

• Able to detect smaller lesions than CT
PET Detects Mets Missed by CT

- 71 yo M w/ metastatic melanoma of R shoulder
- CT 7mths later showed tumor in lower L Femur with no abdominal findings
- Patient scheduled for resection w/ total knee replacement
- PET scan done later showed widespread metastatic disease

http://www.petscaninfo.com/zportal/portals/phys/clinical/pet_case_studies/melanoma
Limitations of PET in Staging Melanoma

- Lacks Anatomic Detail
- Hypermetabolic suggestive of but ≠ malignancy
PET-CT

http://www.kumed.com/images/PETCT_Melanoma_Image.gif
Use of PET-CT in Staging Melanoma

- Examples of Bone mets identified by PET-CT
- (E) – 45 yo w/ h/o bone mets from melanoma
- No definite morphologic abnormality on CT but hypermetabolic focus on PET

*Radiology* 2005;237:627-634
MRI

- Particularly helpful with identifying brain mets
- Lesions show up well on T1 images because of melanin
- Ability to detect smaller tumors of the brain
- Option if exam/PET suggests brain mets particularly in high risk patients
- Limited in ability to image lung and bone
Melanotic pattern on Brain MRI

Non-enhanced axial T1-weighted

Axial T2-weighted

54 yo M with brain mets ~ 9yrs after resection of acral lentiginous melanoma of the distal thumb

Radiographics:2001;21:625-639
Amelanotic Pattern on MRI

- 40 yo with brain mets
- ? Mets elsewhere
- ? Benefit from surgery

Radiographics: 2001; 21: 625-639
Summary

• Staging of Melanoma is important in determining prognosis and guiding management

• Imaging is critical to staging

• Different modalities w/ different strengths

• Combinations sometimes better

• Approach should be tailored to the individual patient
Patient MW 3

- PET/CT Scan showed possible nodal involvement
- Resection with parotidectomy
- Nodal dissection and path showed no nodal involvement
- Given size and depth of lesion pt should be monitored for recurrence → Labs, CXR, etc.
- This means CT/PET/MRI if Sx arise
MW 4: PET-CT Results
MW 5: PET-CT Results Cont’d

Exophytic mass

Nodal enlargement on CT but not hypermetabolic on PET
References

- Nakamoto, Yuji et al. CT Appearances of Bone Metastases Detected with FDG PET as Part of the same examination. Radiology 2005;237:627-634.
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