Impact of different initial systemic staging imaging strategies on metastasis detection in uveal melanoma patients: The Melanoma of the Uvea Staging Imaging Consortium (MUSIC) Study

Anthony B. Daniels

Chief, Division of Ocular Oncology and Pathology
Department of Ophthalmology and Visual Sciences
Vanderbilt Eye Institute
Nashville, TN, USA
Co-Authors/Disclosures

Authors
• Anthony B. Daniels, MD, MSc
• Katherine S. Peters, MD
• Mark Breazzano, MD
• William Choi, MD
• Jeanette Du, MD
• Nathan Law, MD
• Audra Miller, MD
• Max Aveis, MD
• Suleyman Ciftci, MD
• Amy C. Schefler, MD
• Hakan Demirci, MD
• Alison Skalet, MD
• Yevgeniy Shildkrot, MD
• Stephen Deppen, PhD

Disclosures
• None relevant to the presented materials
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Summary

• Multi-institution study, including 1000 newly-diagnosed UM patients
• Evaluated modalities for initial staging imaging, fields imaged, findings
• Many more incidental findings than true metastases identified
  • Especially true in pelvis, where there were never any true mets found
  • Pulmonary metastases were almost always in conjunction with liver mets
  • Only a single patient (out of 1000) had pulmonary mets without liver mets
• CT had more false negative and false positive radiology reads in liver than MRI or PET
• Study suggests that the pelvis should not be included in initial systemic staging imaging, and it is unclear if there is utility to imaging the chest
• MRI (or PET, US) imaging of the abdomen should be considered over CT
UM Metastases

• ~50% of patients develop metastases
• Extremely high mortality
  • Nearly 100%
• Average survival ~6 months

From Andreoli MT, et al., 2015.
UM Metastases

- Rare to have radiographically-evident or clinically-evident metastases at time of Dx
  - ~3% of patients

- Systemic staging imaging
  - NCCN guidelines
Study Purpose

• To describe current practice patterns for staging
• To evaluate the impact of field of imaging
• To evaluate the impact of imaging modality
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• To evaluate the impact of imaging modality

• INITIAL STAGING IMAGING, not subsequent surveillance
Study Purpose

• MUSIC Study
  • Melanoma of the Uvea Staging Imaging Consortium
    • Vanderbilt
    • University of Michigan
    • Oregon Health Sciences University
    • Retina Consultants of Houston
    • University of Virginia
Methods

• Retrospective review
  • 5 sites
  • 5 years
  • No specific number of patients specified

• RedCap survey

“There’s a method to my madness, and a madness to my method.”
- Salvador Dali
Methods

• RedCap survey
  • Initial imaging modality and field
  • Imaging findings and radiologist’s diagnosis
    • By organ
  • Any subsequent imaging
    • Modalities and findings
  • Biopsy confirmation of mets?
  • Final diagnosis of biopsy
  • Incidental findings
Results

• 1000 total patients were included in the study

• Practice Patterns:
  • Variability in imaging modalities and fields
  • Varied within institutions
Results – Practice Patterns

• The liver was always evaluated
  • 94% with imaging
  • 6% with LFTs (without imaging)

• The chest was almost always evaluated
  • 91% with imaging
  • Pelvis was usually included (64%)
Results – Practice Patterns

• CT was the most common modality for all fields
• MRI, PET-CT, or US were sometimes used for the abdomen
• X-Ray or PET-CT were sometimes used for the chest
• Pelvis was always grouped in with the abdomen’s imaging modality
Results – Imaging Findings

- There were a lot more incidental findings than true metastases found
- Led to additional imaging performed
• **Pelvis:**
  - 640 patients imaged
  - 20 patients had a suspicious finding
  - 5 necessitated additional imaging
  - NO metastases in the pelvis
Imaging Findings - PELVIS

• Pelvis:
  • 640 patients imaged
  • 20 patients had a suspicious finding
  • 5 necessitated additional imaging
  • NO metastases in the pelvis
## Imaging Findings - CHEST

**Chest:**
- 908 patients imaged
- 346 patients had a suspicious finding
- 64 necessitated additional imaging
- 10 patients had confirmed mets in the chest

<table>
<thead>
<tr>
<th>Metastasis Found</th>
<th>Incidental Finding Noted, No Additional Imaging Done</th>
<th>Incidental Finding Noted, Additional Imaging Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest</td>
<td>Abdomen</td>
<td>Pelvis</td>
</tr>
<tr>
<td>37.3</td>
<td>2.7</td>
<td>41.9</td>
</tr>
<tr>
<td>Percent of Patients with Finding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Bar chart showing metastasis and incidental findings found in chest, abdomen, and pelvis sections.](attachment:bar_chart.png)
Imaging Findings - CHEST

Liver: 13
Brain: 1
Bone: 1
Lung: 5

Legend:
- Blue: Liver
- Orange: Lung
- Red: Bone
- Green: Brain

Numbers indicate the number of findings in each region.
Imaging Findings - CHEST

Liver: 13
Brain: 1
Bone: 4
Lung: 5

Total: 13
Imaging Findings - CHEST

- Liver: 13
- Lung: 5
- Bone: 4
- Brain: 1

Liver
15
10
1

Lung
Imaging Findings - CHEST

- Liver: 13
- Lung: 5
- Bone: 4
- Brain: 1

Small circle: Liver 15, Lung 10, Lung 1
Imaging Findings - CHEST

Liver: 13
Lung: 15
Bone: 5
Brain: 1

Abdomen: 79
Chest: 32
Lung: 28
Imaging Findings - CHEST
Imaging Findings - ABDOMEN

- Liver is the most common site (25/26)
Imaging Findings - ABDOMEN

• Liver had the greatest number of NON-UM metastasis / incidental findings
Imaging Findings - ABDOMEN

- Rates varied by imaging modality
  - Non-randomized
- CT had the highest number of additional studies required for “false positives”
- Overall numbers of US, MRI, and PET studies were much lower, so hard to assess that data in a granular fashion

Percent of patients who were recommended additional liver imaging, by initial imaging modality.

- CT (694): 18.7%
- MRI (75): 8.0%
- US (28): 10.7%
- PET-CT (138): 5.1%

Legend:
- Additional Imaging Recommended but not Performed
- Additional Imaging Performed, No Metastasis Found
- Metastasis Found
Imaging Modalities for the Liver

- 2.5% with CT or MRI had liver lesions initially called benign that were actually found to be malignant.
- 3 patients with presumed UM liver met on CT, actually had met from 2\textsuperscript{nd} primary.
- Radiologists were often incorrect in calling a met a met, or in calling a benign lesion benign.
- This was especially true for abdominal CT.
CONCLUSIONS

• Practice patterns varied between institutions, and within institutions

• FIELD:
  • PELVIS:
    • NO additional true mets, but additional testing for ultimately benign findings
  • CHEST:
    • Lung mets almost always accompanied by liver mets on abd. Imaging
    • Only 1/1000 patients found to have isolated lung mets
    • This approaches the additional risk of cancer from 1 additional CT scan (+ follow-up)

• MODALITY (for the abdomen):
  • Many “over-calls” and “under-calls” across all modalities
  • CT appears to pick up a very great number of benign findings relative to true findings, and these CT findings lead to a very large number of additional tests
Thank you!

Questions? Email: anthony.b.daniels@vumc.org
anthony.b.daniels@gmail.com