Whole Body Imaging in Melanoma Staging

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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

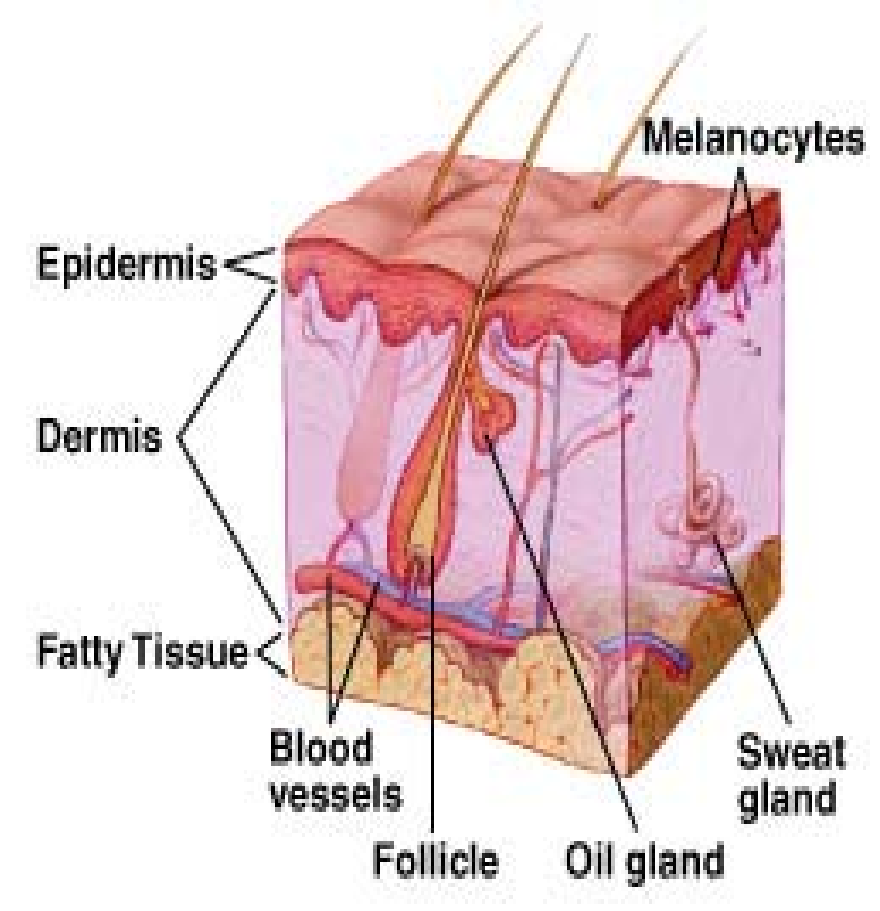
Patient MW 2

- 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 Schannoma
- Hemangioma
- Lipoma
- Parotid gland tumor
- Melanoma
- Squamous Cell CA
- Metastases
- Lymph Edema
- Other Non-malignant Processes

Malignant melanoma



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

- Arises from melanocytes
- Can involve any organ system

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Epidemiology 1

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

20 AND YOUNGER	20 - 49	50 - 64	65 - 74	75 AND OLDER
• Leukemias	• Breast	• Breast	• Prostate	• Colon and rectum
• Brain and other nervous system	• Melanomas of the skin	• Prostate	• Lung and bronchus	• Lung and bronchus
• Hodgkin's lymphoma	• Colon and rectum	• Lung and bronchus	• Breast	• Prostate
• Non-Hodgkin's lymphoma	• Lung and bronchus	• Colon and rectum	• Colon and rectum	• Breast
• Soft tissue including heart	• Non-Hodgkin's lymphoma	• Corpus and uterus	• Urinary bladder	• Urinary bladder
• Bones and joints	• Thyroid	• Urinary bladder	• Non-Hodgkin's lymphoma	• Non-Hodgkin's lymphoma
• Kidney and renal pelvis	• Cervix	• Non-Hodgkin's lymphoma	• Corpus and uterus	• Pancreas
• Other endocrine including thymus	• Testis	• Melanomas of the skin	• Kidney and renal pelvis	• Leukemias
• Thyroid	• Ovary	• Oral cavity and pharynx	• Pancreas	• Stomach
• Testis	• Oral cavity and pharynx	• Kidney and renal pelvis	• Melanomas of the skin	• Corpus and uterus

ource: Annual Report to the Nation on the Status of Cancer, 1973-1999, Featuring Implications of Age and Aging on U.S. Cancer Burden

http://www.cnn.com/interactive/health/0205/cancer.statistics/content.2.html

Epidemiology 2

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

20 AND YOUNGER	20 - 49	50 - 64	65 - 74	75 AND OLDER
• Leukemias	• Lung and bronchus	• Lung and bronchus	• Lung and bronchus	• Lung and bronchus
• Brain and other nervous system	• Breast	• Breast	• Colon and rectum	• Colon and rectum
• Other endocrine	• Colon and rectum	• Colon and rectum	• Breast	• Prostate
• Bones and joints	• Brain and other nervous system	• Pancreas	• Pancreas	• Breast
• Soft tissue including heart	• Non-Hodgkin's lymphoma	• Non-Hodgkin's lymphoma	• Prostate	• Pancreas
• Non-Hodgkin's lymphoma	• Leukemias	• Brain and other nervous system	• Non-Hodgkin's lymphoma	• Non-Hodgkin's lymphoma
• Kidney and renal pelvis	• Cervix	• Leukemias	• Leukemias	• Leukemias
• Liver and intrahepatic bile duct	• Melanoma of the skin	• Ovary	• Ovary	• Urinary bladder
• Hodgkin's disease	• Pancreas	• Esophagus	• Esophagus	• Stomach
• Colon and rectum	• Ovary	• Kidney and renal pelvis	• Liver and intrahepatic bile duct	• Ovary

Source: Annual Report to the Nation on the Status of Cancer, 1973-1999, Featuring Implications of Age and Aging on U.S. Cancer Burden

http://www.cnn.com/interactive/health/0205/cancer.statistics/content.2.html

Types of Melanoma

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

Diagnosis

Pathological

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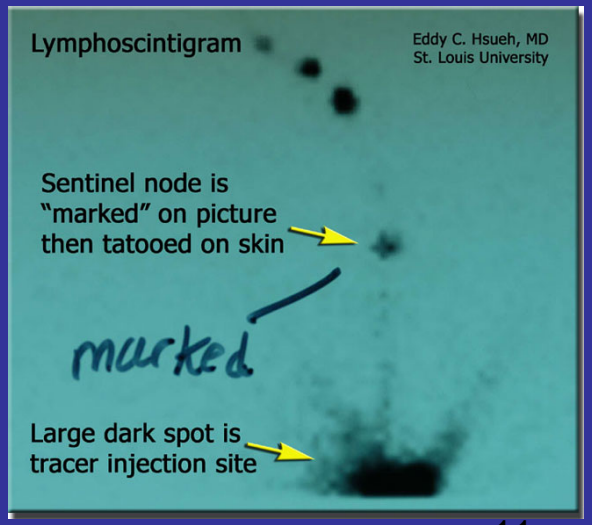
A Word on Lymphoscintigraphy

- ? 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

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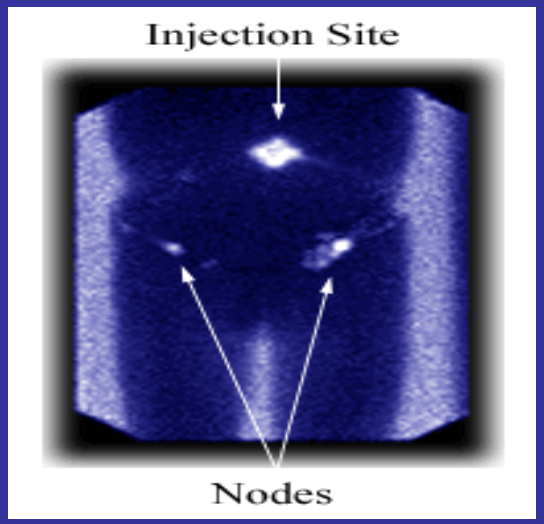
Lymphoscintigraphy 2

http://www.breastlink.com/images/ArticleImages/img-lymphatic_staining.jpg

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

http://www.jwci.org/Graphics/Lymphoscintigraphy.jpg



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

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STAGING 1

Revised AJCC TNM Classification

T Classification

T1	≤1.0 mm	a: without ulceration
		b: with ulceration or level IV or V
T2	1.01–2.0 mm	a: without ulceration
		b: with ulceration
T3	2.01–4.0 mm	a: without ulceration
		b: with ulceration
T4	>4.0 mm	a: without ulceration
		b: with ulceration

N Classification

N1	One lymph node	a: micrometastasis[a]
		b: macrometastasis[b]
N2	2–3 lymph nodes	a: micrometastasis[a]
		b: macrometastasis[b]
		c: in-transit met(s)/satellite(s)*without* metastatic lymph nodes
N3	4 or > metastatic lymph nodes, matted lymph nodes, or combinations of in-transit met(s)/satellite(s) and metastatic lymph node(s)	

M Classification

M1	Distant skin, subcutaneous, or lymph node mets	Normal LDH
M2	Lung mets	Normal LDH
M3	All other visceral or any distant mets	Normal LDH
		Elevated LDH

mets = metastases

[a] Micrometastases are diagnosed after sentinel or elective lymphadenectomy.

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

Cancer. Vol 88; 1484-1491

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STAGING 2

New Stage Groupings for Cutaneous Melanoma

	Clinical Staging[a]			Pathologic Staging[b]		
0	Tis	N0	M0	Tis	N0	M0
IA	T1a	N0	M0	T1a	N0	M0
IB	T1b	N0	M0	T1b	N0	M0
	T2a	N0	M0	T2a	N0	M0
IIA	T2b	N0	M0	T2b	N0	M0
	T3a	N0	M0	T3a	N0	M0
IIB	T3b	N0	M0	T3b	N0	M0
	T4a	N0	M0	T4a	N0	M0
IIC	T4b	N0	M0	T4b	N0	M0
III[c]	Any T	N1	M0			
		N2				
		N3				
IIIA				T1-4a	N1a	M0
				T1-4a	N2a	M0
IIIB				T1-4b	N1a	M0
				T1-4b	N2a	M0
				T1-4a	N1b	M0
				T1-4a	N2b	M0
				T1-4a/b	N2c	M0
IIIC				T1-4b	N1b	M0
				T1-4b	N2b	M0
				Any T	N3	M0
IV	Any T	Any N	Any M1	Any T	Any N	Any M1

[a] 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.

[b] 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 1A patients, who do not need pathologic evaluation of their lymph nodes.*

[c] 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

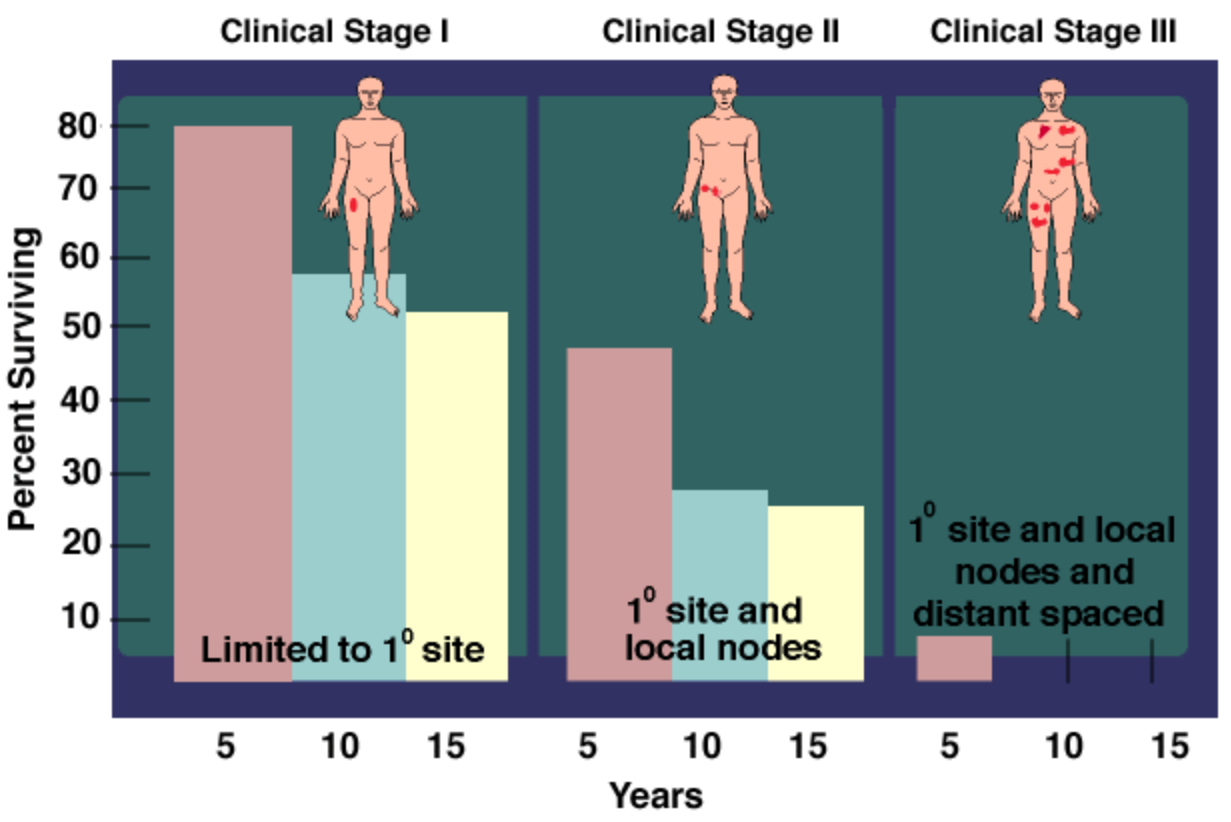
Stage I & II → No Nodal Involvement
- 100% Cure w/ resection
- Thicker Lesions → Higher recurrence Rate

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



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

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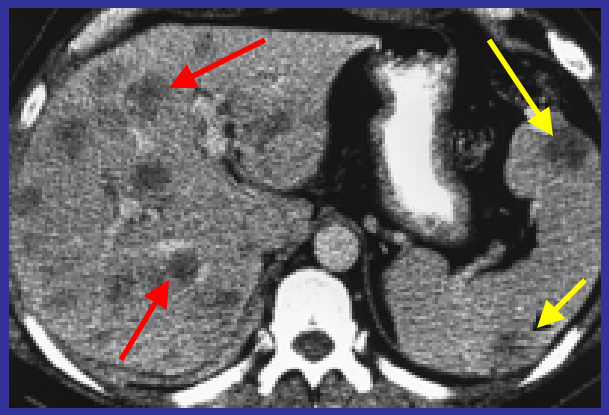
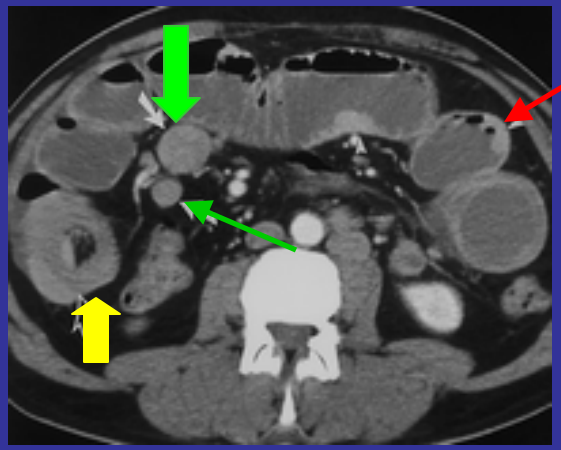
Common Sites of Metastatic Dz



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

Radiology. 1999;213:92-96



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

Radiographics. 2003;23:457-473

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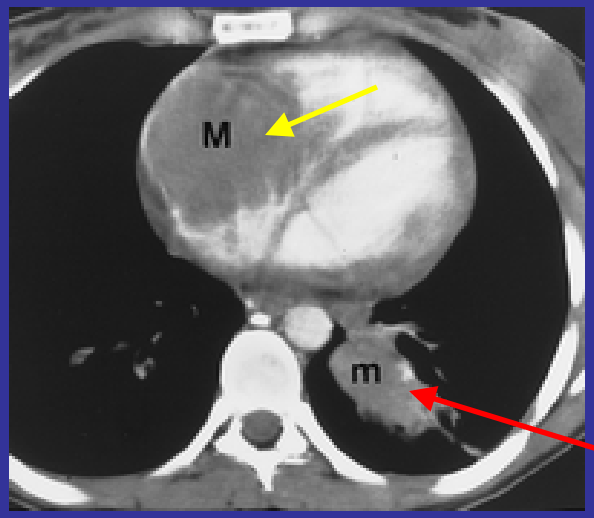
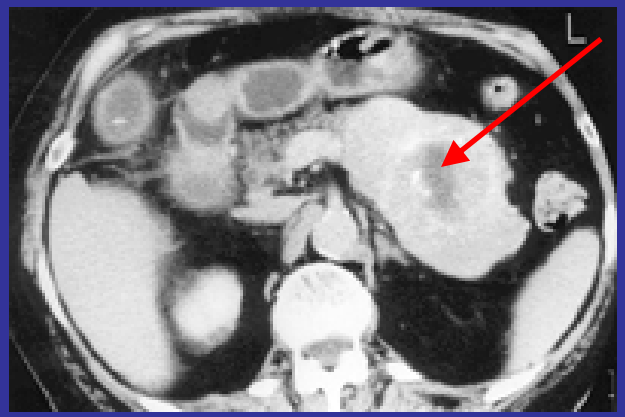
Not So Common Sites…



Radiographics. 2001;21:439-449.)

- 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

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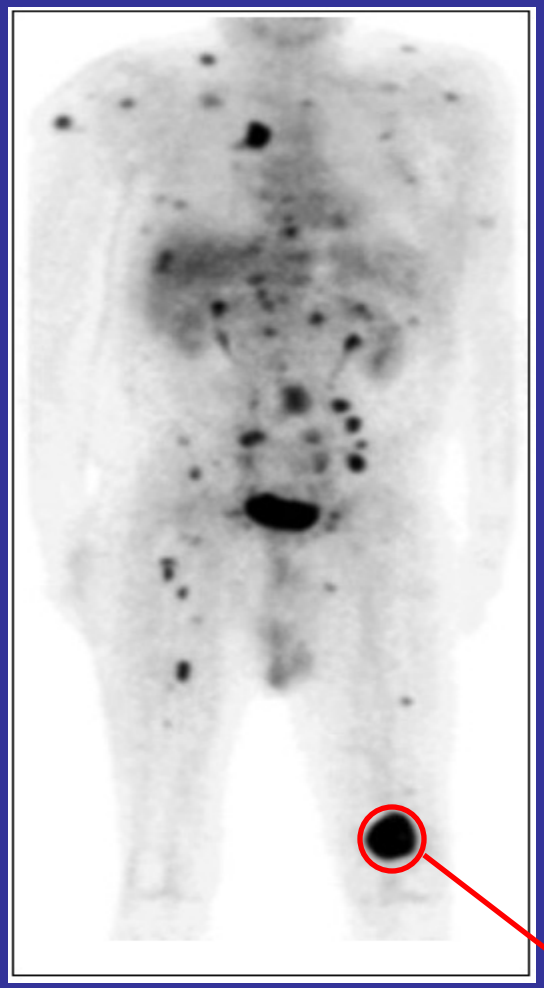
PET Detects Mets Missed by CT



- 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

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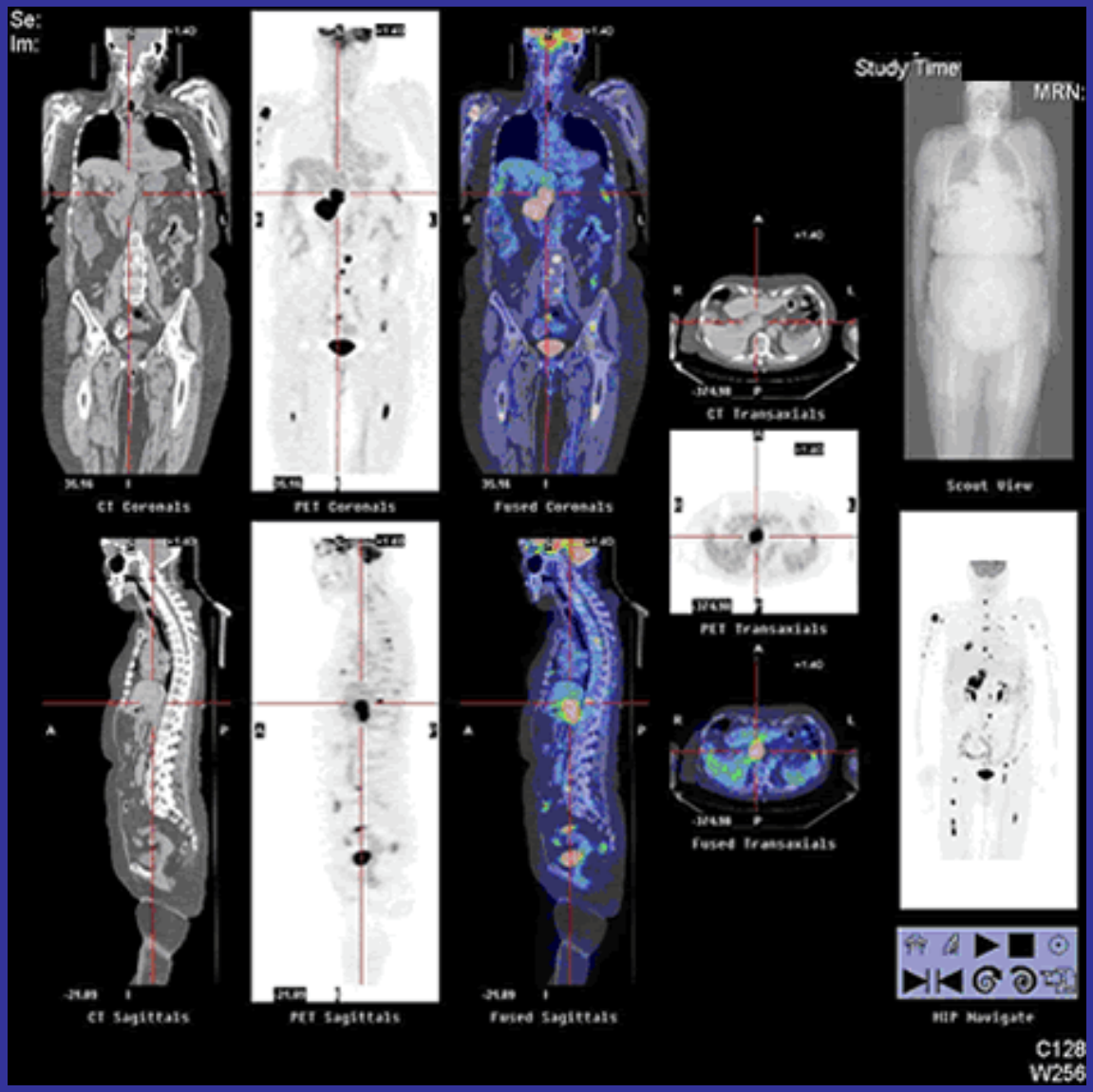
PET-CT



http://www.kumed.com/images/PETCT_Melanoma_Image.gif

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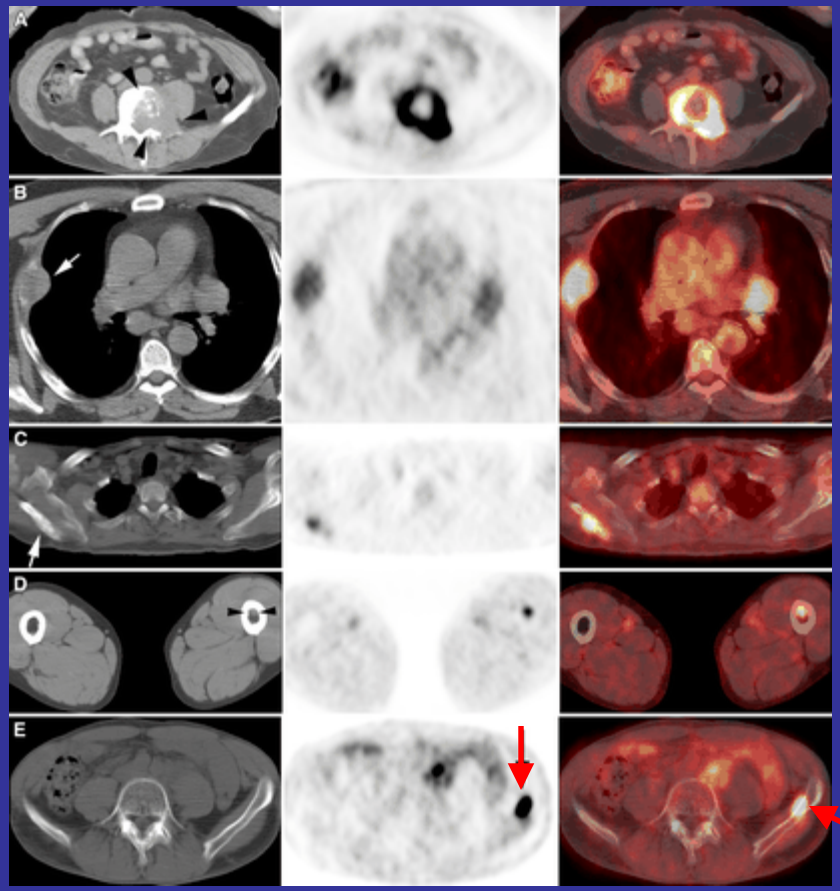
Use of PET-CT in Staging Melanoma



- 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

FDG avid area localized to left ilium w/ PET-CT

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

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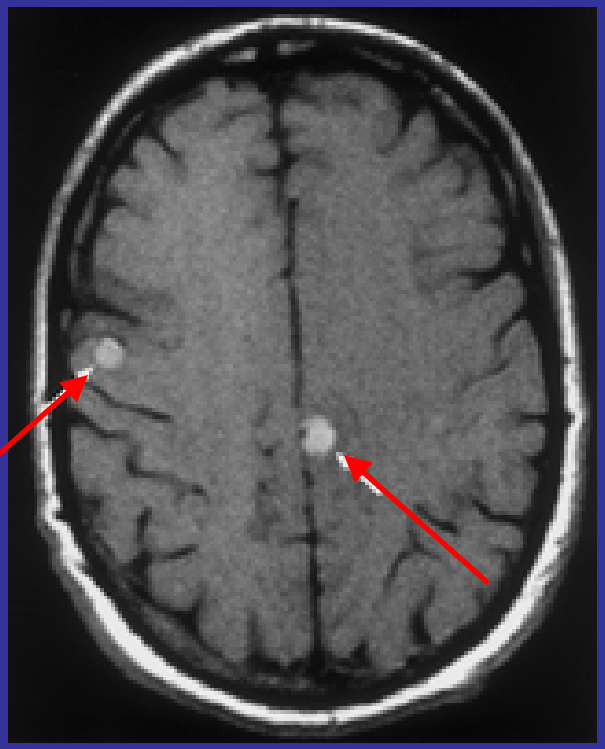
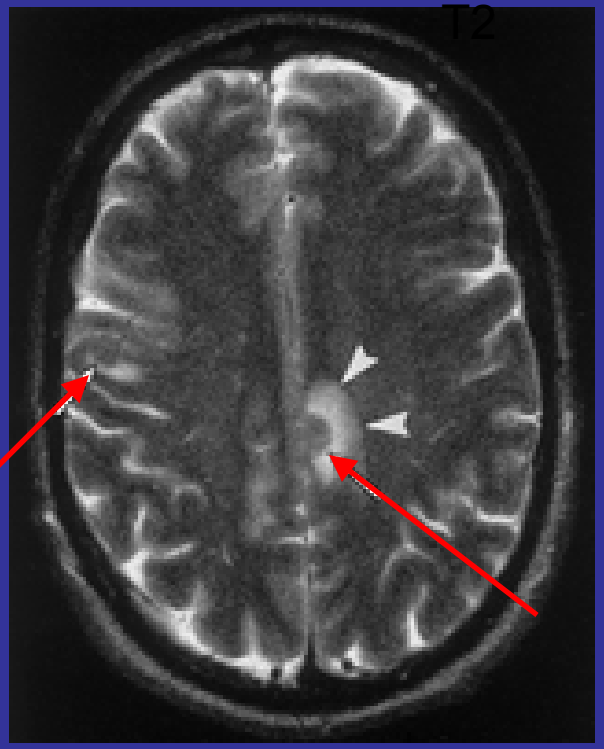
Melanotic pattern on Brain MRI

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

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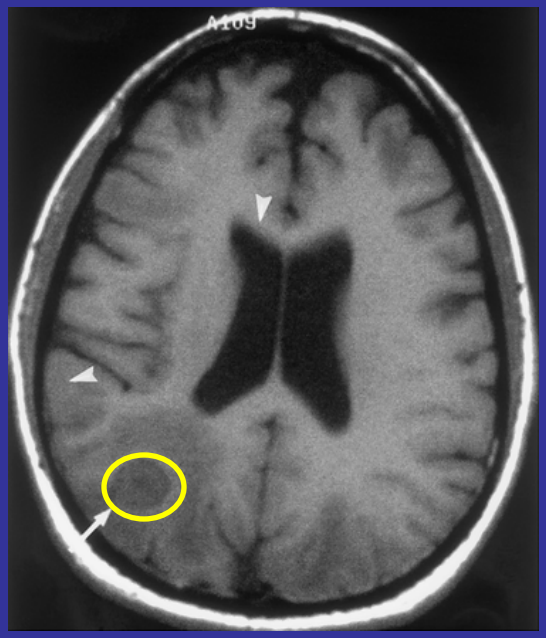
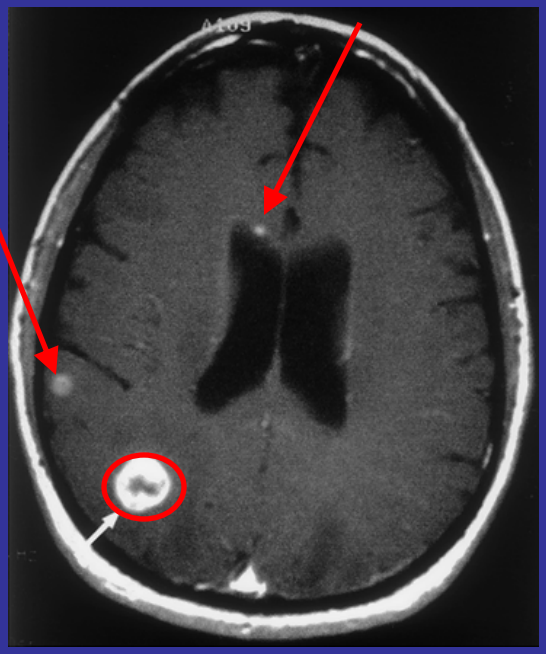
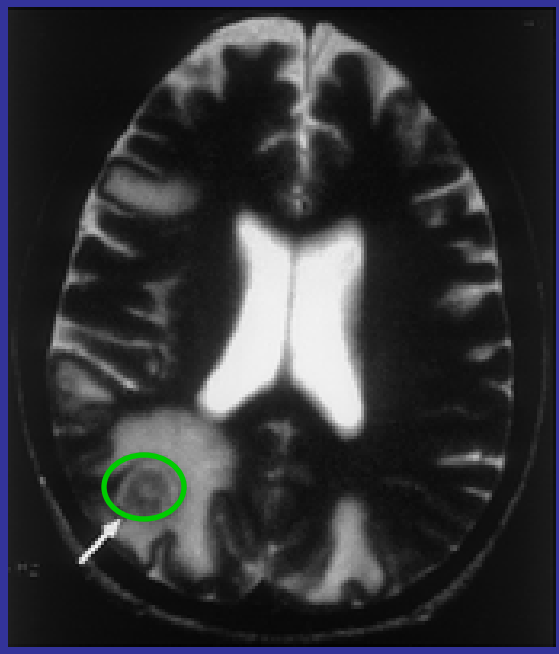
Amelanotic Pattern on MRI



Nonenhanced axial T1-weighted



Contrast enhanced axial T1-weighted



Axial T2-weighted

- 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

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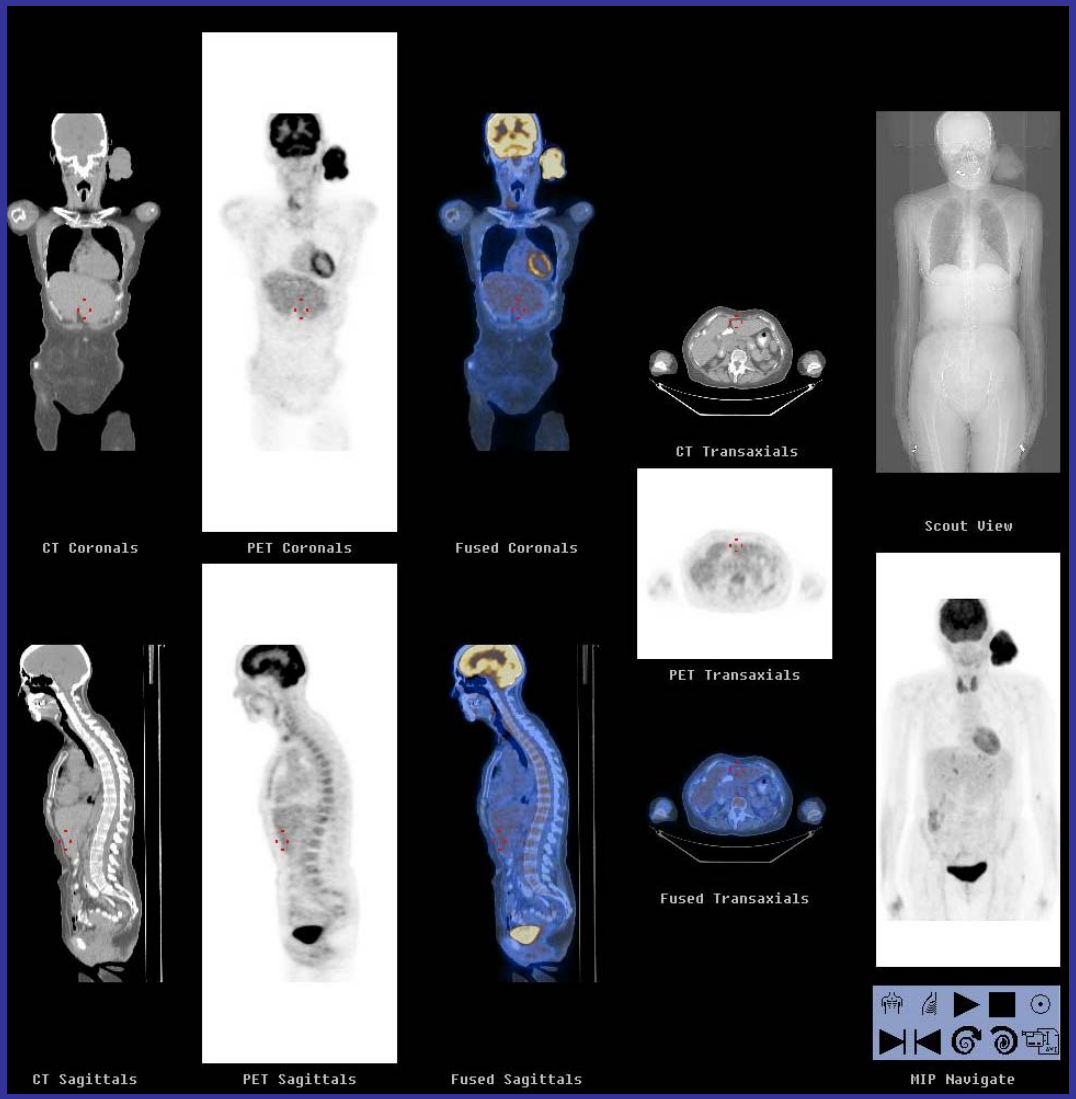
MW 4: PET-CT Results



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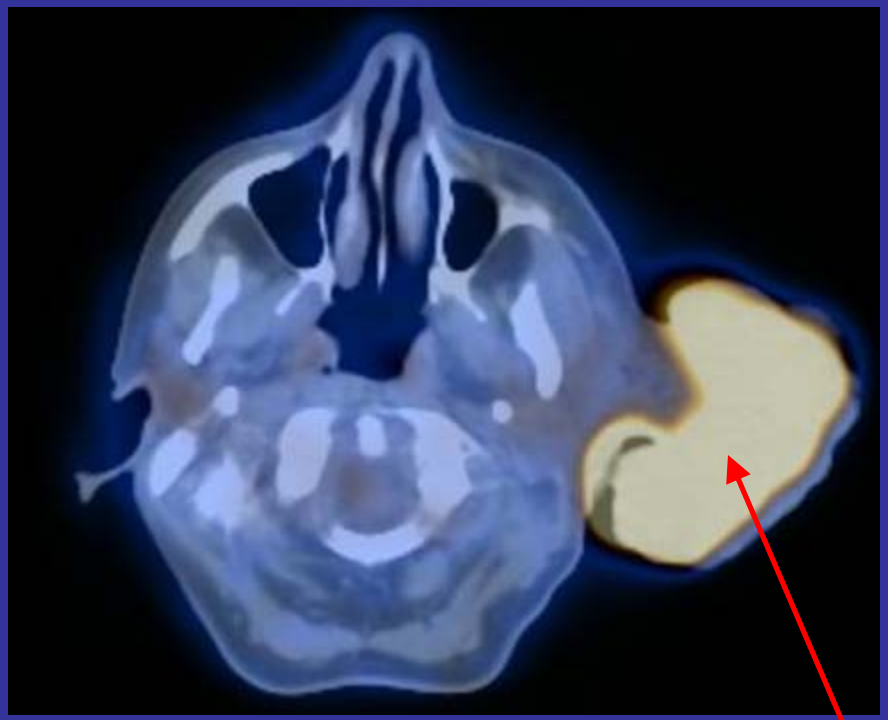
MW 5: PET-CT Results Cont'd



Exophytic mass

Nodal enlargement on CT but not hypermetabolic on PET

References

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