RSNA 2018 TOMORROW'S RADIOLOGY TODAY

Imaging of Merkel Cell Carcinoma

What imaging experts should know

TO BE FAMILIER WITH RATIONALE BEHIND THE ORDER AND
CREATE ACTIONABLE AND CLINICLLY RELEVENT REPORTS

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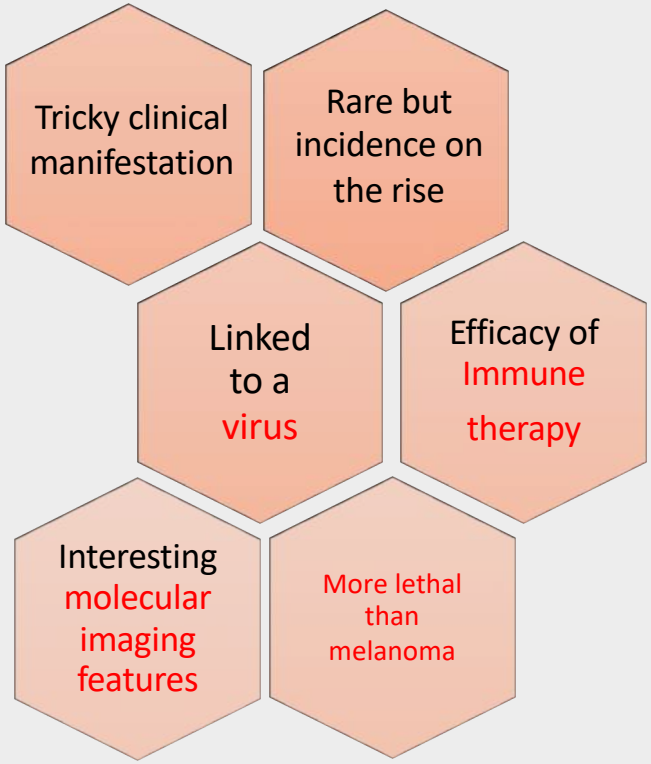
Introduction

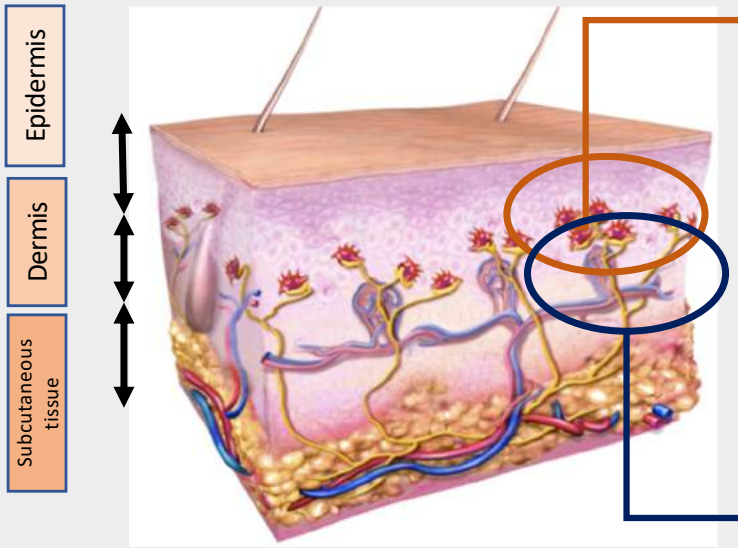
Merkel cell carcinoma (MCC) is gathering more and more attention…



The purpose of this exhibit is to understand/review…

1. Pathophysiology and clinical behavior of Merkel cell carcinoma (MCC).
2. MCC's aggressive features and the important role of imaging in the management.
3. The Merkel cell polyomavirus (MCPyV) as a cause of MCC.
4. Utility of a blood test that detects antibodies to the MCPyV.
5. Different clinical approaches in antibody producers and non-antibody producers.
6. Neuroendocrine features of MCC with somatostatin receptor (SSTR) expression which can be imaged by SSTR seeking nuclear medicine studies.
7. Various imaging manifestations of MCC on different modalities.

Where does MCC come from?



Merkel cells are found in the base of epidermis to dermis of the skin.

They function as “touch receptors”.

Normal Merkel cells (shown in red), are connected to nerves (shown in yellow), signaling touch sensation.

Figure Copyright by Paul Nghiem, MD, PhD & Quade Medical Group.

Merkel cells are ***not*** the origin of MCC.

MCC is named after ultrastructural and immunophenotypic resemblance to sensory Merkel cells in the skin[1].

MCCs are most frequently found in the dermis but **can arise from any layer of the skin** from intraepidermal to subcutaneous[2].

Fundamental evidence on the MCC cell of origin is yet to come into view.

1. *Harms PW, Clin Lab Med 37 (2017) 485–501*
2. *Harms PW, et. al. Nat Rev Clin Oncol 2018 Oct 4. [Epub ahead of print]*

MCC is unique and tricky cancer

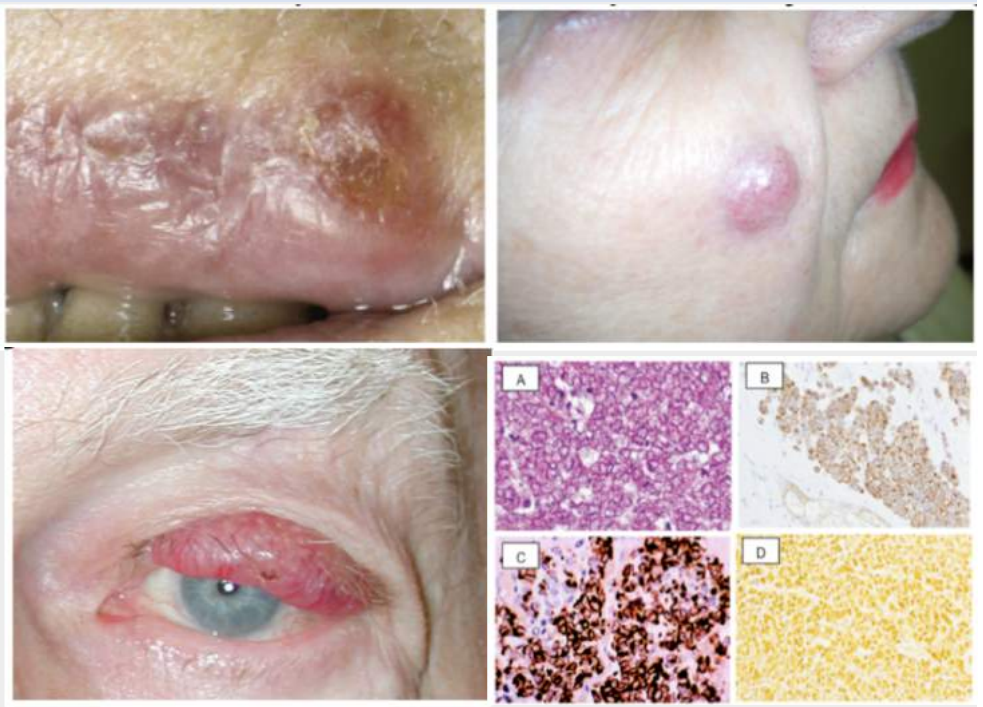
Tricky clinical features

MCC typically develops **rapidly** and manifests as firm, nontender, dome-shaped red, purple or violet nodule.

It has a predilection for the sun-exposed area, such as head, neck and extremities, however, it can occur anywhere in the body.

"*It can fool even the best clinicians*"
A majority of MCC lesions (56%) were **presumed to be benign** at biopsy.

Heath M et. al. J Am Acad Dermatol 2008;58:375-81.



MCC is more lethal than melanoma

Mortality rate
~40% for MCC *Becker JC et al., Ann Oncol, 2010*
~8% for melanoma *2007-2013 SEER Cancer Stat Facts.*

5-year survival rate from the 8th edition AJCC staging system	
Localized disease	51%
Nodal involvement	35%
Distant metastasis	14%

Increasing incidence

2500 cases/year in US in 2013. The incidence is expected to increase to 2835 in 2020 and to 3284 in 2025.

From 2000 to 2013, solid cancers increased by 15%, melanoma by 57%, and Merkel cell carcinoma by **95%.** *Harms et. al. Ann Surg Oncol (2016) 23:3564–3571*

Risk factors

Risk factors:

- -Age (> 65 years)
- -Fair skin
- -Sun exposure
- -Chronic immune suppression
- **Merkel cell polyomavirus in ~80% cases.**

Risk of developing MCC increases in patients with immunosuppression.

- HIV patient : 8 times greater *Engels et. al. Lancet 2002;*359:497-498
- Organ transplant patient: 25 times greater *Penn et. al. Transplantation.* 1999;68(11):1717-1721.
- Chronic Lymphocytic leukemia: 40 times greater *Heath et.al J Am Acad Dermatol 2008;58:375-81.*

*However, 90% of MCC patients are not immune suppressed.

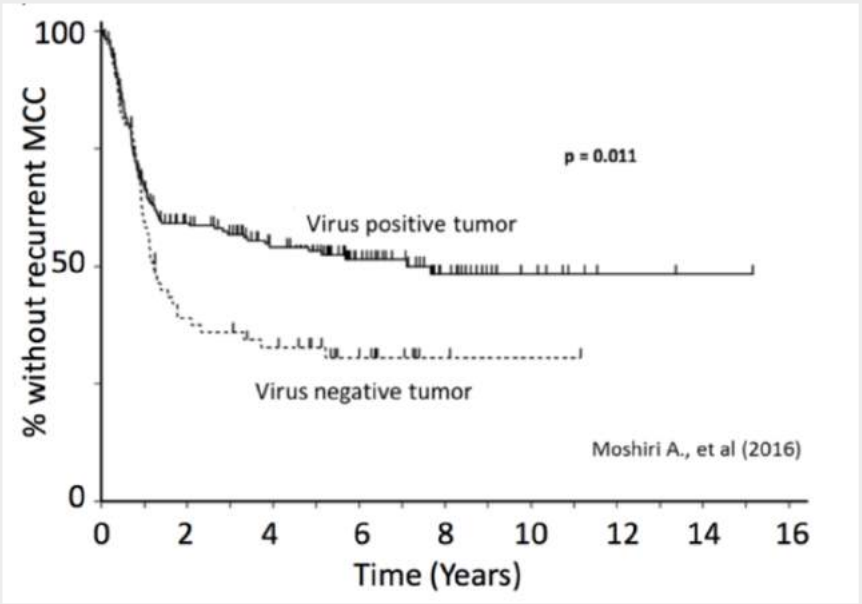
MCC's AEIOU

- **A** Asymptomatic
- **E** Expanding rapidly
- **I** Immunosuppression
- **O** Older Patients
- **U** UV exposure

Voelker JAMA 320 (1), 18-20, 2018

Merkel Cell Polyoma Virus (MCPyV)

- The Merkel cell polyomavirus (MCPyV) is causally linked to 80% of cases whereas 20% are caused by extensive UV mutations.
- MCPyV is the only known human onco-virus in the polyomavirus family
- Antibodies against MCPyV oncoprotein antigens are associated with tumor burden and serve as a "tumor marker".
- The test is much cheaper (~$300/test) than imaging studies (3,000-$100,000/scan)

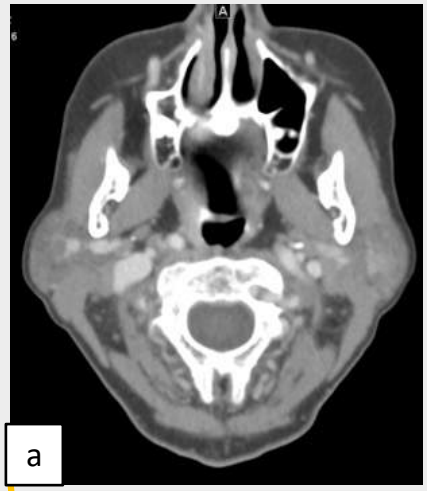


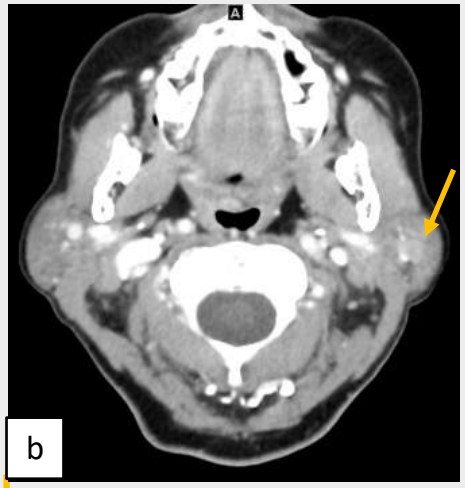
Different approach based on MCPyV oncoprotein antibody status.

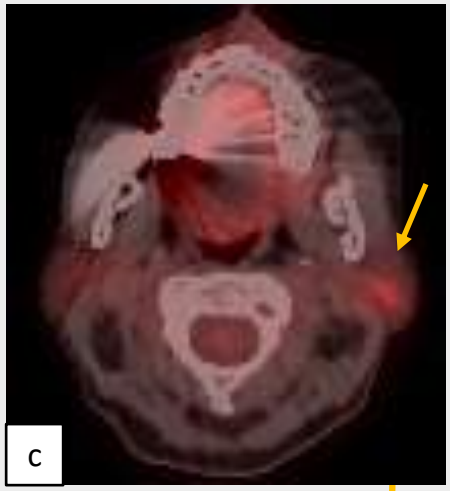
Antibody producers → **Routine radiologic scans can be reduced** as the antibody serves as "tumor marker".

Non-Antibody producers → Must be followed by **frequent imaging studies.**

MCPyV oncoprotein antibody producer







65-year-old woman with stage I MCC of the left cheek s/p wide local excision and negative SNLB on 02/2016.
(a) Post-operative oncoprotein titer was negative and contrast CT showed no evidence of disease.
Oncoprotein antibody titer had been continuously increased which prompted imaging evaluation.
(b) Contrast Neck CT shows a small enhancing nodule in the left parotid gland.
(c) F^{18} FDG PET/CT shows increased FDG uptake in the corresponding nodule.
US guided biopsy was performed and recurrent MCC was pathologically confirmed.

AJCC (American Joint Committee of Cancer) Staging 8th edition

Stage		Primary Tumor	Lymph Node	Metastasis
0		In situ (within epidermis only)	No regional lymph node metastasis	No distant metastasis
I	Clinical*	≤ 2 cm maximum tumor dimension	Nodes negative by clinical exam (no pathological exam performed)	No distant metastasis
I	Pathological**	≤ 2 cm maximum tumor dimension	Nodes negative by pathologic exam	No distant metastasis
IIA	Clinical	> 2 cm tumor dimension	Nodes negative by clinical exam (no pathological exam performed)	No distant metastasis
IIA	Pathological	> 2 cm tumor dimension	Nodes negative by pathological exam	No distant metastasis
IIB	Clinical	Primary tumor invades bone, muscle, fascia, or cartilage	Nodes negative by clinical exam (no pathological exam performed)	No distant metastasis
IIB	Pathological	Primary tumor invades bone, muscle, fascia, or cartilage	Nodes negative by pathologic exam	No distant metastasis
III	Clinical	Any size / depth tumor	Nodes positive by clinical exam (no pathological exam performed)	No distant metastasis
IIIA	Pathological	Any size / depth tumor	Nodes positive by pathological exam only (nodal disease not apparent on clinical exam)	No distant metastasis
		Not detected ("unknown primary")	Nodes positive by clinical exam, and confirmed via pathological exam	No distant metastasis
IIIB	Pathological	Any size / depth tumor	Nodes positive by clinical exam, and confirmed via pathological exam OR in-transit metastasis***	No distant metastasis
IV	Clinical	Any	+/- regional nodal involvement	Distant metastasis detected via clinical exam
IV	Pathological	Any	+/- regional nodal involvement	Distant metastasis confirmed via pathological exam

Clinical detection of nodal or metastatic disease may be via inspection, palpation, and/or imaging

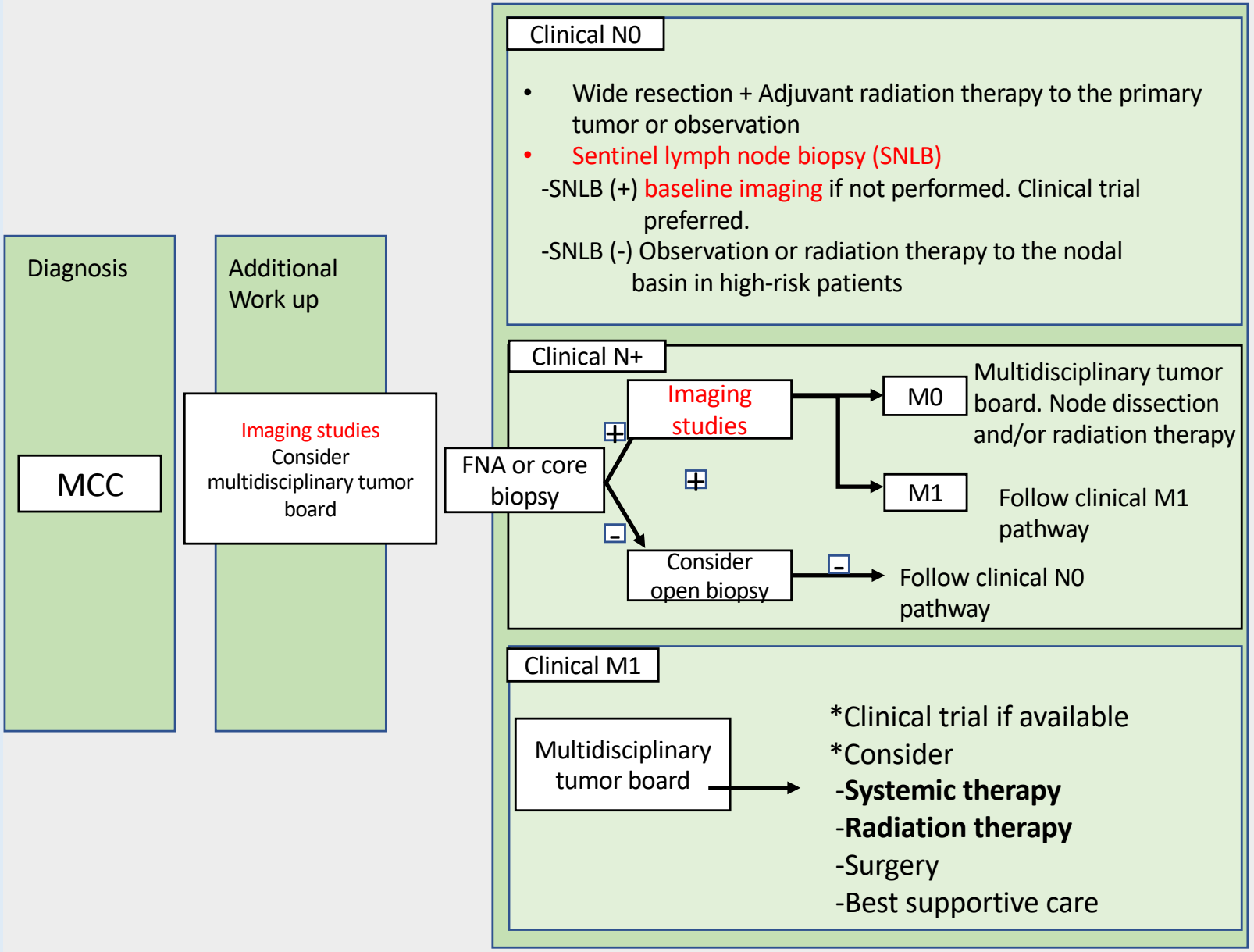
In transit metastasis

A tumor distinct from the primary lesion and located either

1) between the primary lesion and the draining regional lymph nodes
   or
2) distal to the primary lesion

https://www.merkelcell.org/news-and-publications/2016/8th-edition-mcc-staging-system-announced/

NCCN guidelines



Bichakjian et.al. J Natl Compr Canc Netw 2018;16(6):742–774

Immunotherapy has changed NCCN guidelines

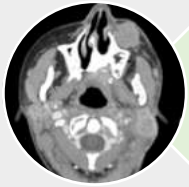
-2016	Chemotherapy only
2017	Immunotherapy (Pembrolizumab) was listed as one of the systemic therapy options
2018	Immunotherapies (avelumab, pembrolizumab, nivolumab) are **preferred as 1st line therapy**

Checkpoint inhibitors disable the **PD-L1 (programmed cell death-ligand 1)** protein on cancer cells, activating the immune system to attack the tumor cells.

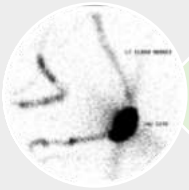
Cytotoxic chemotherapy is associated with a high initial objective response rate (ORR), however responses are **seldom durable** with the median progression-free survival (PFS) of about 94 days, and toxicity is considerable. *Iyer JG et.al. Cancer Med* 2016; 5(9):2294–2301

Food and drug administration (FDA)-recently approved immunotherapy with PD-1/PD-L1 antibody have demonstrated promising long-term benefit. *Nghiem et.al. N Engl J Med, 2016; 374: 2542–52*

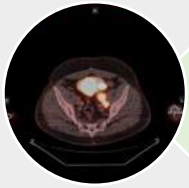
Role of Imaging



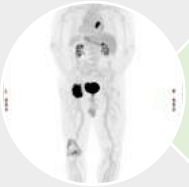
Local staging, surgical planning and radiation planning



Sentinel lymph node biopsy

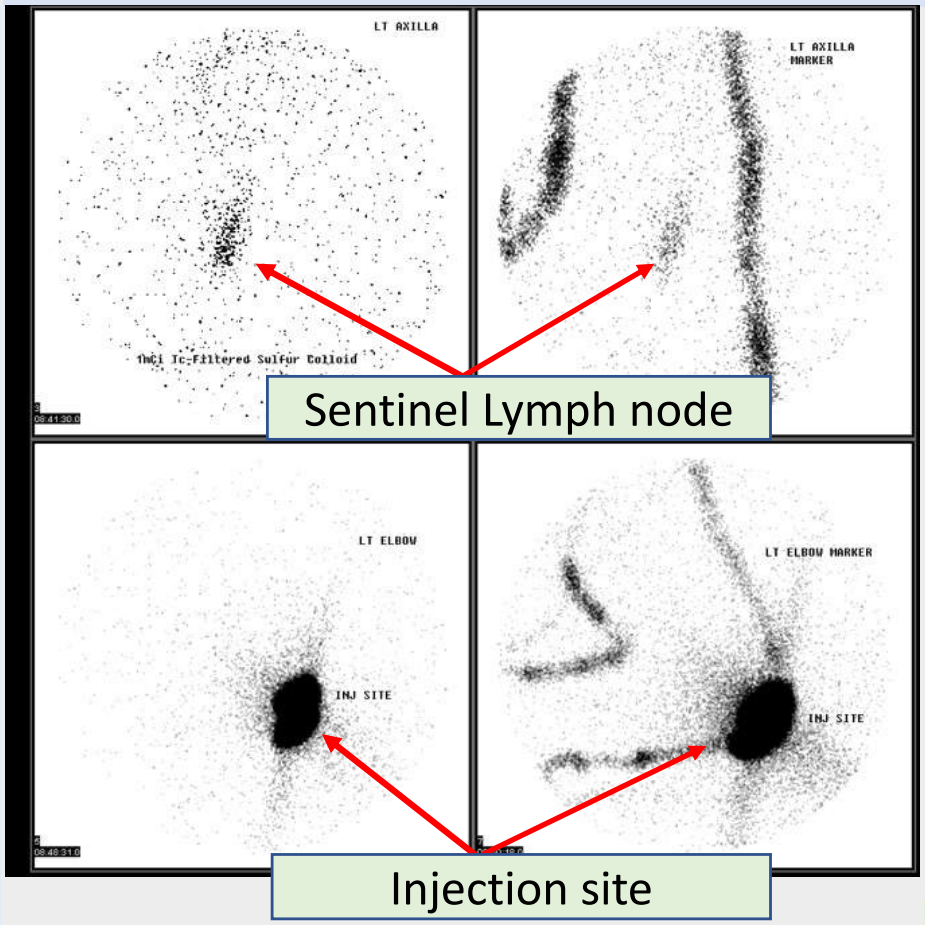


Systemic staging



Evaluation of treatment response and follow-up

Sentinel Lymph node biopsy (SNLB)



Procedure:
Tc99m Sulfur Colloid
1 mCi (0.2 micron Filtered) was injected intra-dermally at four locations around the primary tumor/tumor biopsy site.
Multiple static images of the expected lymph nodal basin to localize SNL.
Hand probe is used to confirm the node.

Occult nodal metastasis is common in MCC and SNLB should be recommended for aLL patients with primary MCC.

Patients with a positive SLN have a higher risk of in-transit recurrence and may benefit from adjuvant radiation with inclusion of the in-transit field in amenable cases.

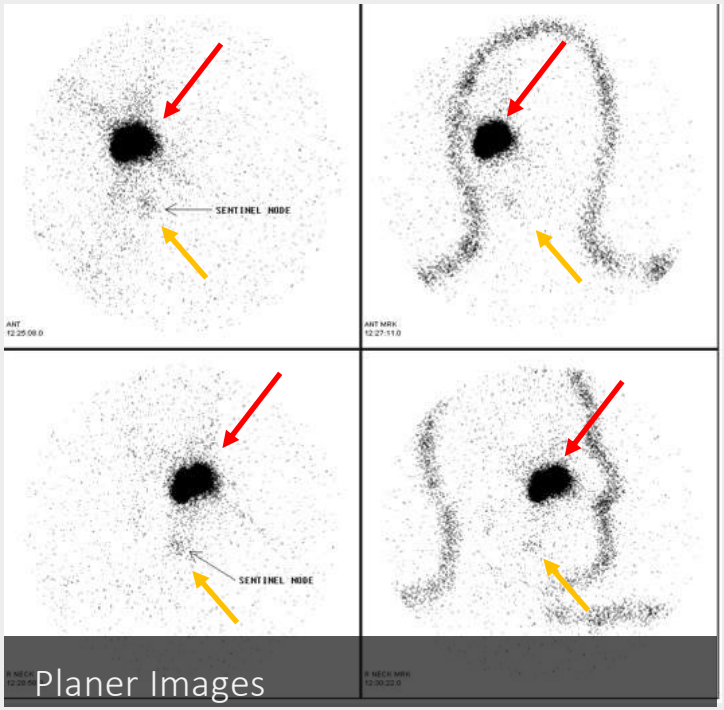
J.R. Sims et al. Sur Oncol 2018 27; 11-17

In patients with stage I and II MCC, SNLB is more sensitive than FDG PET/CT

Liu et.al. Australas J Dermatol 2017 58, 99–105

SLNB should be performed before wide local excision or Mohs micrographic surgery, because surgical excision before SLNB may alter the lymphatic drainage patterns.

Sentinel Lymph node biopsy (SNLB)



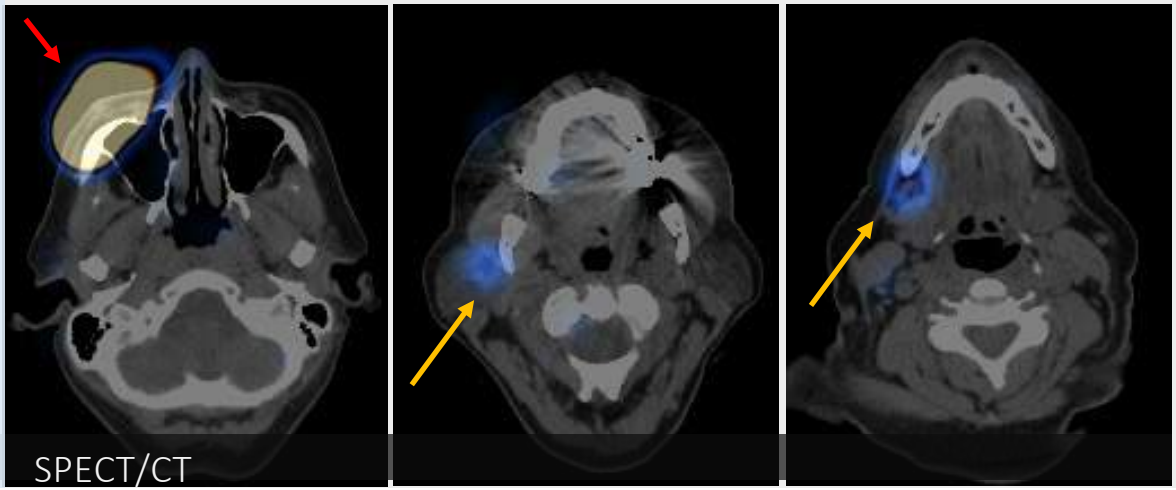
Planer Images

For anatomically complex areas, or when planar image are difficult to interpret, SPECT/CT can be performed to localize SNL. In addition, higher contrast resolution of SPECT allows visualization of foci undetected on planar images.

In our institution, SPECT/CT is routinely performed for MCC of the head and neck due to its anatomical complexity.

Planer images obtained after radiotracer injection around the primary lesion (red arrow) in the right cheek. There is a faint uptake below the injection site (yellow arrow).
However, **it is difficult to localize the focus** on planar images only.

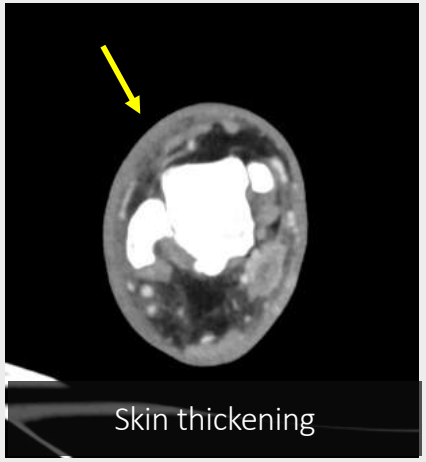
← Injection site ← Sentinel lymph node

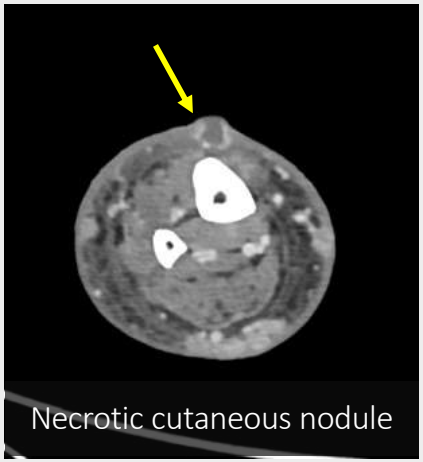


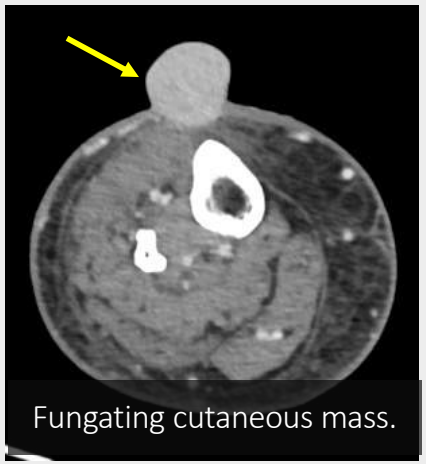
SPECT/CT

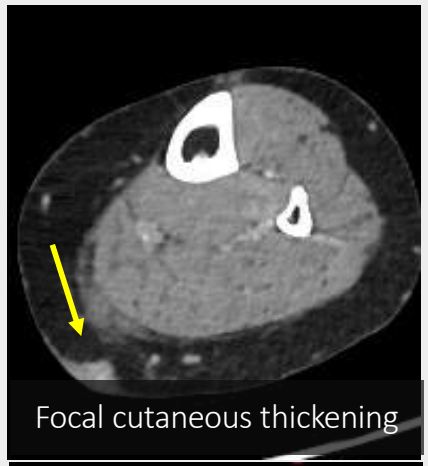
SPECT/CT demonstrates the focus in the right parotid gland.
There is **additional node** in the right submental region which was not visualized on planar images.

CT imaging patterns of primary/regional MCC lesions

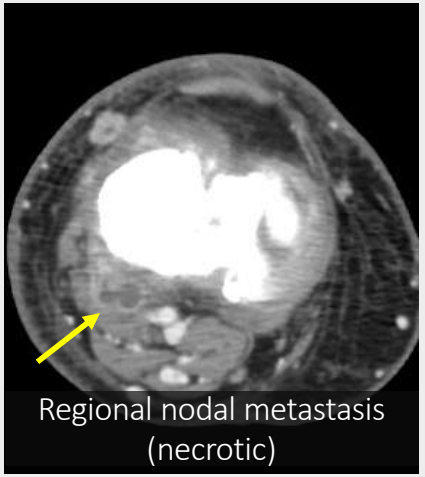

Skin thickening

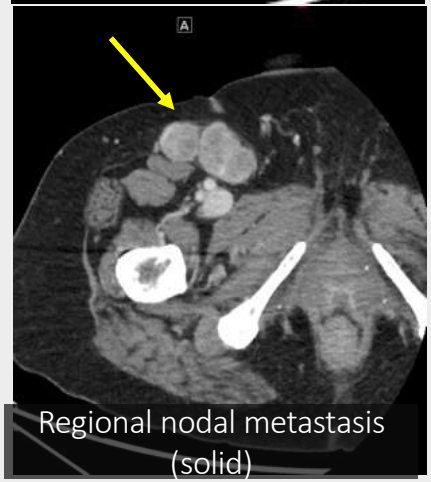

Necrotic cutaneous nodule


Fungating cutaneous mass.


Focal cutaneous thickening

- Primary lesion can manifest as cutaneous or subcutaneous mass/nodule or skin thickening.
- Many patients are referred for imaging after resection of the primary lesion.
- In-transit and satellite cutaneous metastases can occur. MCC have tendency to "skip"

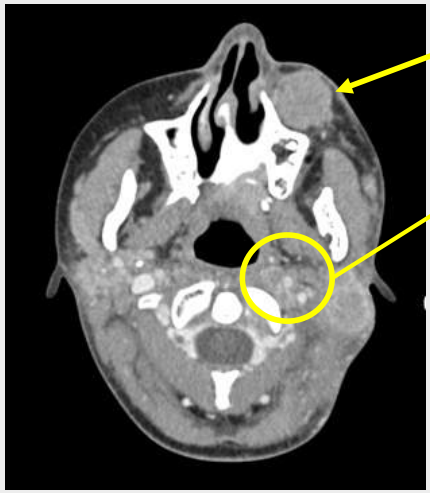

Regional nodal metastasis (necrotic)


Regional nodal metastasis (solid)

Patients with nodal or presumed metastatic MCC with **no identifiable primary skin lesions** can have **better prognosis**.
→ An antitumor immune response has been proposed to underlie both the primary tumor regression and improved patient outcomes in such patients.

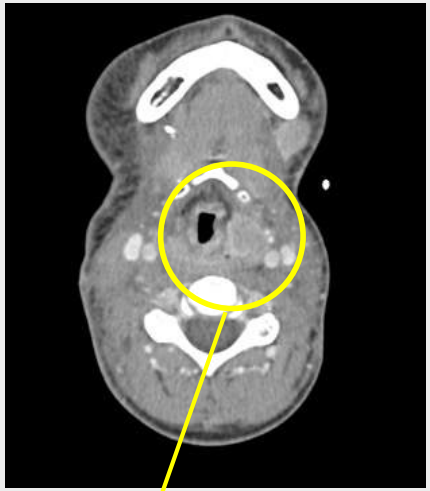
Vandeven et.al Clin Cancer Res 2018 15;24(4):963-971

Evaluation of local invasion

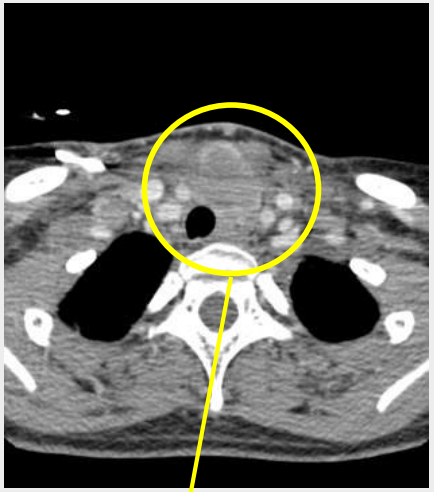


Subcutaneous mass is not invading bone

Necrotic nodal metastasis is abutting the left carotid artery



Necrotic tumor in the left pyriform sinus is abutting the airway



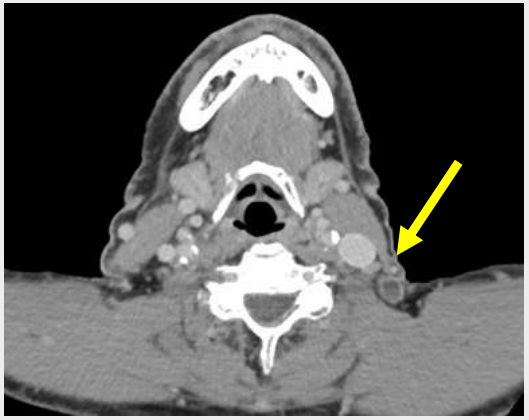
Necrotic tumor is abutting the trachea

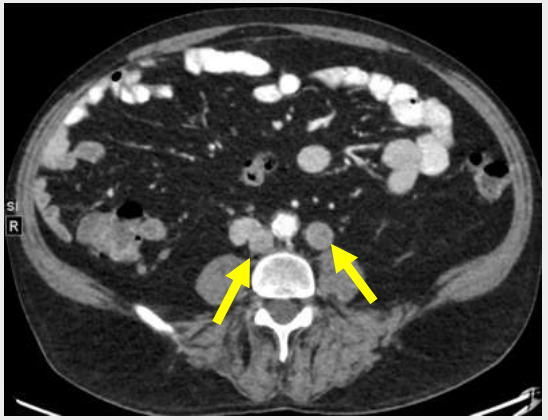
In locally advanced disease or advanced metastatic disease, imaging plays an important role determining the localization of the lesion and identifying loco-regional invasion to surrounding organs.

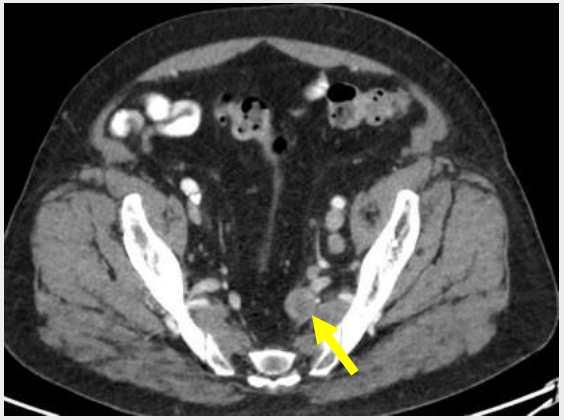
This is especially important in head and neck disease, due to its anatomical complexity.

Accurate evaluation is necessary for surgical and/or radiation therapy planning.

Detecting nodal/distant metastasis

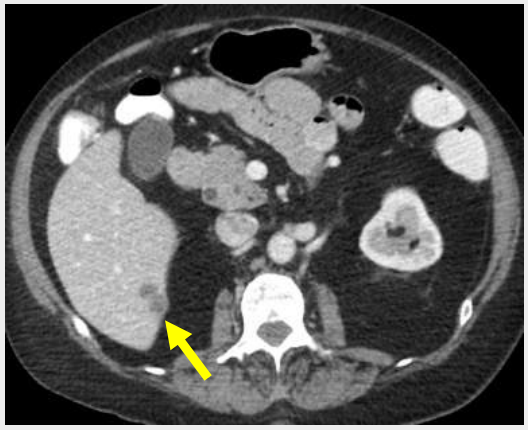


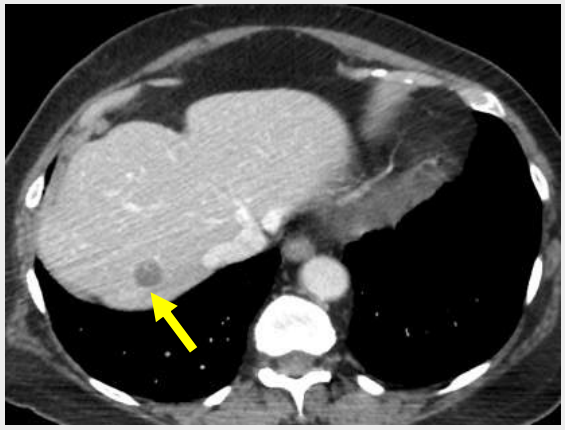


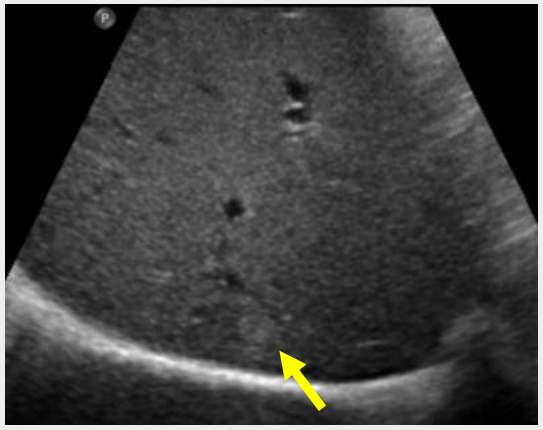


MCC has a **high propensity for nodal metastasis** with 27- 31% presenting with clinical nodal disease. In addition, another 16-38% have occult nodal metastasis determined by SNLB.

J.R. Sims et al. Surgical Oncology 2018 27; 11-17







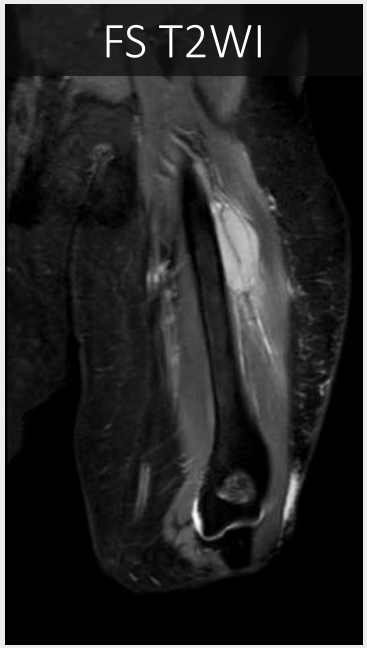
Liver Metastasis

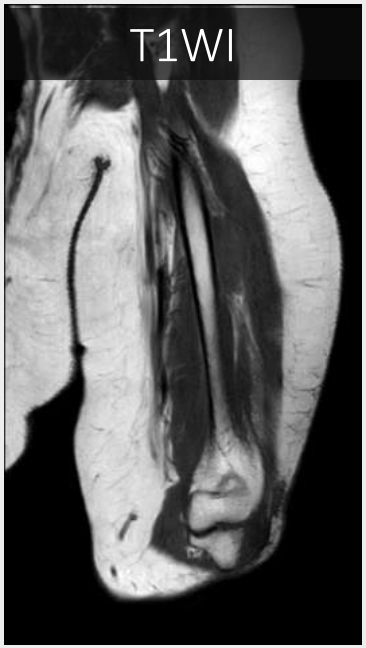
-Non-specific hypoattenuating lesion.

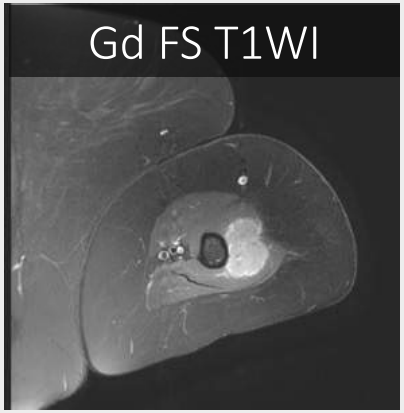
-Typically hypoenhancing compared with surrounding liver parenchyma.

-Hyperechoic on Ultrasound

MRI patterns of primary/regional MCC lesions







70-year-old female with MCC of the left upper extremity status post resection and radiation. Follow-up MRI of the left upper extremity demonstrates a lobulated T1 isointense, T2 hyperintense, enhancing mass within the lateral arm involving the lateral head of the triceps and brachialis muscles.

MRI characteristic of MCC

- Skin thickening
- Subcutaneous reticular stranding
- Subcutaneous soft tissue mass
- Perifascial muscular and intramuscular metastases.
- Adjacent large lymph node masses with retained, compressed internodal fat

MR signal

- Isointense on T1WI
- High intensity on T2WI, Fat saturated T2WI.
- Diffuse enhancement on Gadolinium administration
- Tumor necrosis.
- Large lesions can demonstrate inhomogeneous signal intensity on both T1WI and T2WI.
- Focal central increased signal on T2WI within large lesions has been described as being associated with histologically proven central necrosis and hemorrhage

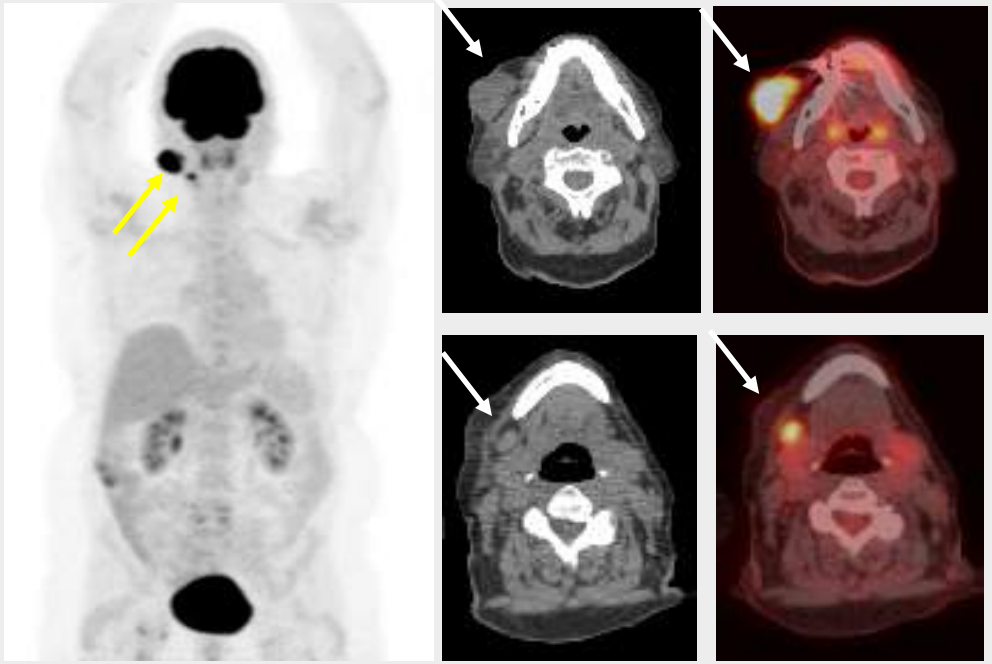
(Skeletal Radiol 1998; 27:396–399)

The skin, subcutaneous masses, and reticular stranding histologically were found to be caused by lymphangitis carcinomatosa and soft-tissue lymphatic metastases.

Anderson et. al. AJR 2005; 185:1441–1448

F^{18}-FDG PET/CT

F^{18}-FDG PET/CT is a good modality for staging and increasingly used



66-year-old female with MCC of the right cheek. Staging F18-FDG PET/CT demonstrates hypermetabolic primary mass in the right cheek and hypermetabolic right submandibular lymph node (arrows), suggesting metastatic nodal disease.

- PET-CT is useful for detection od nodal involvement and distant metastasis.
- Staging F^{18}-FDG-PET significantly influenced treatment decisions in approximately **one-third of cases** of MCC and should be considered in the routine pre-treatment work-up. Post-treatment PET was not found to be prognostic.

  Poulsen M. el. al. J Med Imaging Radiat Oncol. 2018 ;62(3):412-419
- FDG-PET/CT performed as part of the initial management strategy tended to upstage MCC patients with more advanced disease

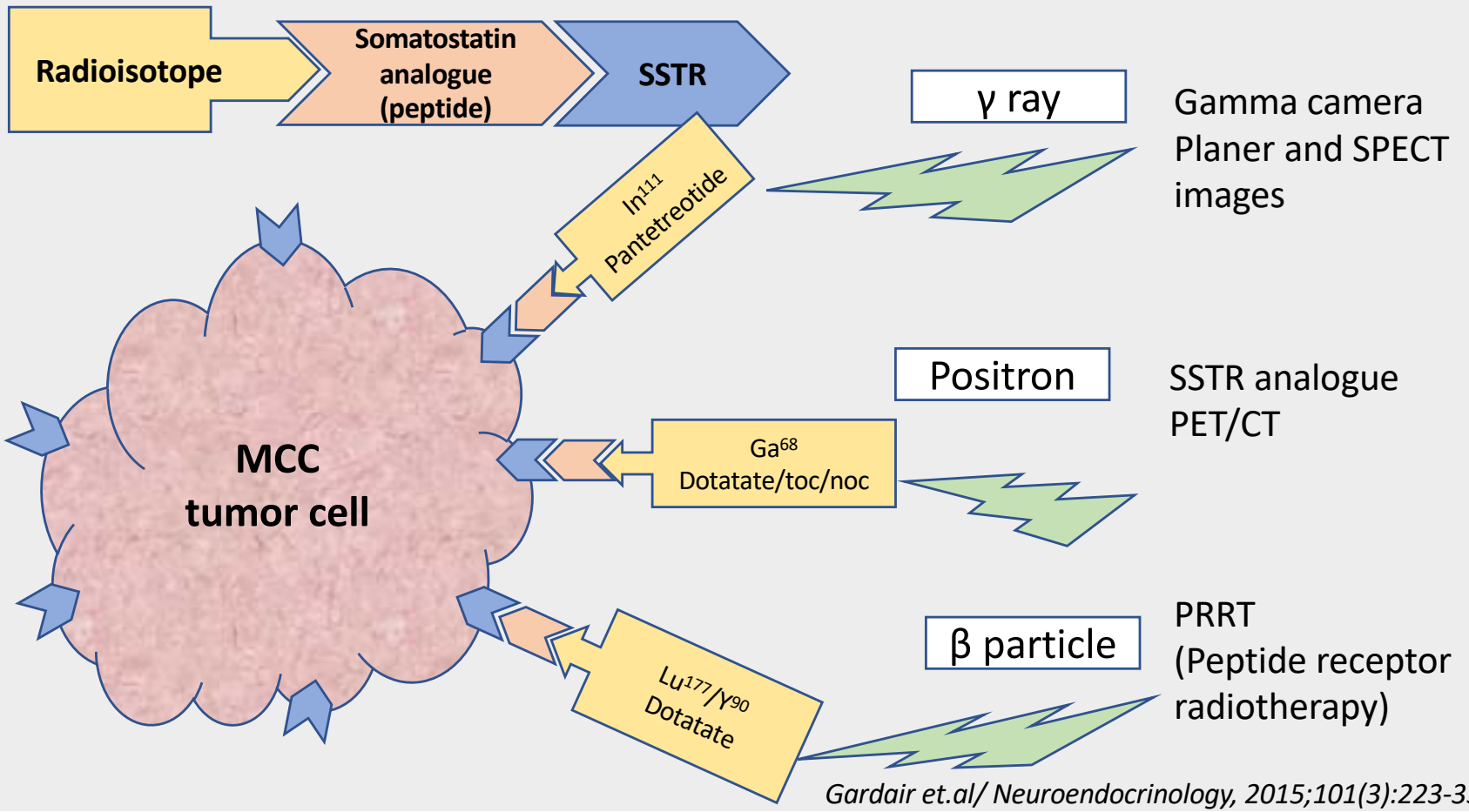
  Hawryluk et. al. J Am Acad Dermatol 2013;68:592-9

Somatostatin receptor seeking nuclear medicine

MCC is a unique cutaneous **neuroendocrine tumor (NET)** and exhibits **somatostatin receptor (SSTR)** on the tumor cell surface.

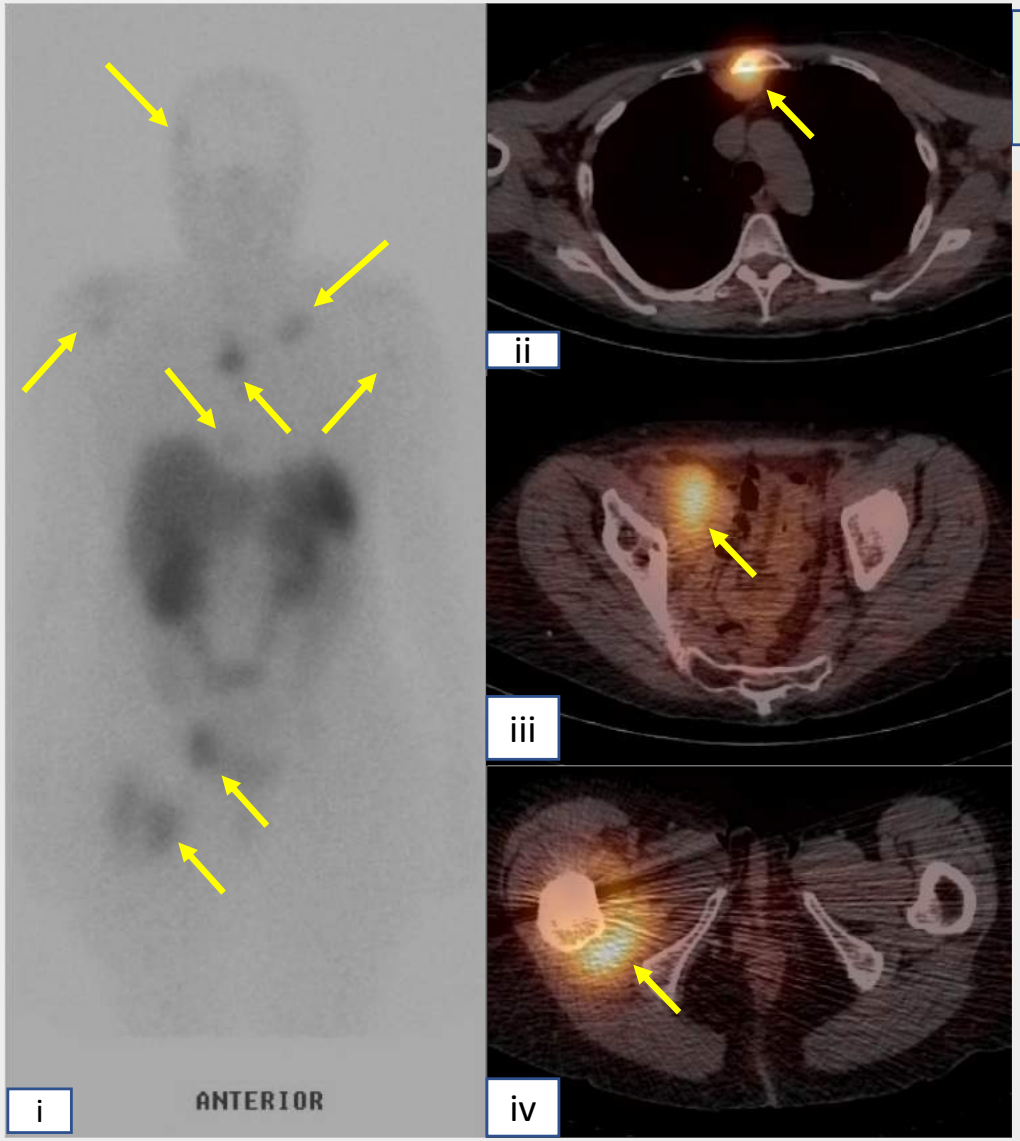
MCC has higher affinity to SSTR type 2A and 5, like other NETs

If tumor expresses SSTR, Somatostatin Analogue can be used for treatment in selective patients.



Gardair et.al/ Neuroendocrinology, 2015;101(3):223-35

In^{111}-Pantetreotide scintigraphy (OctreoScan™)



Radiolabeled Indium^{111}-Pantetreotide

Commercially available Somatostatin receptor binding radiotracer that can be used for scintigraphic imaging.

It has high affinity to **SSTR type 2** and **type 5 (remember MCC has high expression of SSTR type 2 and 5)**, to a lesser extent with subtype 3, and not at all with subtype 1 and 4.

(i)Whole body planar image demonstrates several foci of increased radiotracer uptake, some greater than liver. Fused SPECT/CT localized these foci in the Sternum (ii), right external iliac node (iii), soft tissue mass around the right proximal femur (iv), as well as in left subpectoral soft tissue, right calvarium, right scapula, left proximal humerus or cardiophrenic node (Images not shown)

Ga^{68} Somatostatin analogue PET/CT

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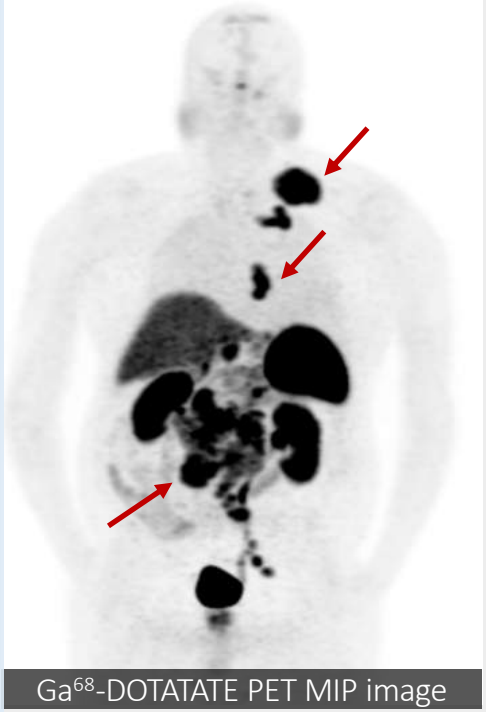
18. PRRT
19. Take home messages

Gallium ^{68} (Ga^{68}) DOTA–Tyr^3 - Octreotate (DOTATATE), G^{68}-DOTA-NAI^3-octreotide (DOTANOC) or Ga^{68}-DOTA-TyI^3- Octreotide (DOTATOC) are PET tracers with high affinity to SSTRs and can be used for neuroendocrine tumors

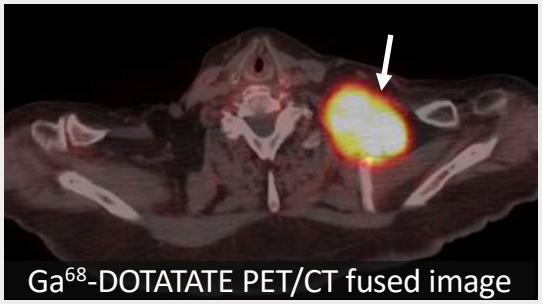
Much higher special resolution

Shorter scanning time
Patient can be scanned after **45-60 min** after radiotracer administration vs **24-72 hours** for Octeoscan

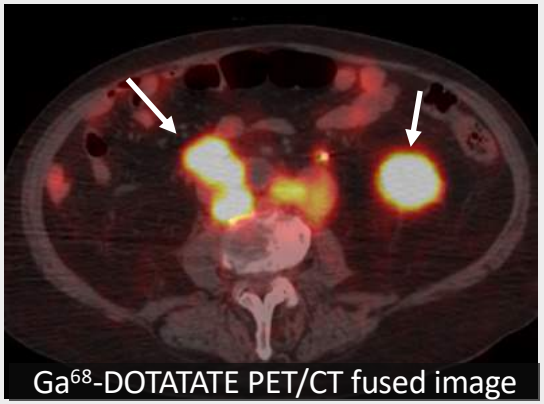
Quantification
Since it is PET/CT, quantification of several parameters (such as SUV) is possible.



Ga^{68}-DOTATATE PET MIP image



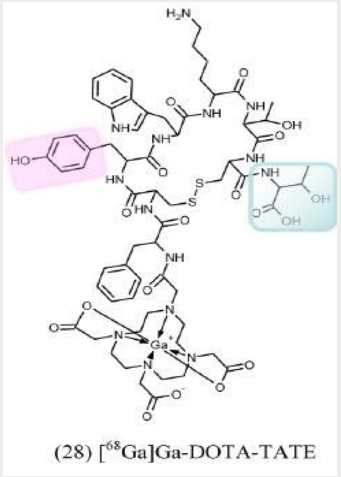
Ga^{68}-DOTATATE PET/CT fused image



Ga^{68}-DOTATATE PET/CT fused image

70-year-old male with MCC of the left posterior knee s/p wide resection. Ga68 Dotatate PET/CT demonstrates intense radiotracer uptake in the left supraclavicular, mediastinal, retroperitoneal and pelvic regions (arrows), suggesting metastatic disease with somatostatin receptor expression.

Ga **68**: T ½ is **68** min



(28) [^{68}Ga]Ga-DOTA-TATE

Velikyan I. Theranostics 2014;4(1):47-80.

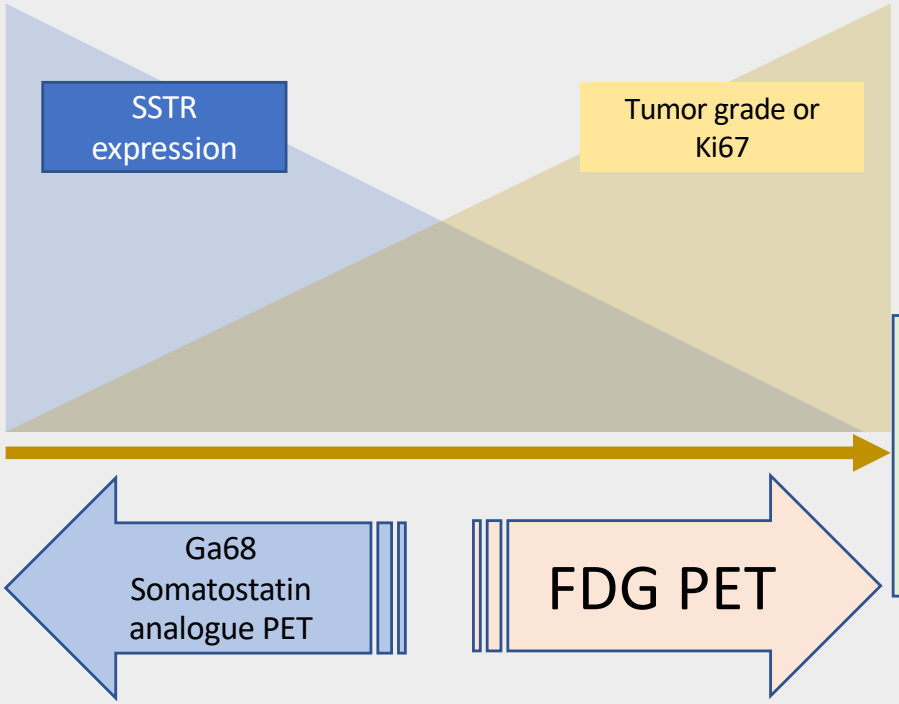
SSTR analogue PET has higher sensitivity for **bone, soft tissue and brain** disease but lower sensitivity for liver and lung disease compared to CT. Combined PET/CT has a significant impact on patient management.

Buder et al. BMC Cancer 2014, 14:268

Radiotracers clinically available (FDA-approved) in the USA (as of 2018)

	In^{111} Pentetreotide (OctreoScan™)	**Ga^{68} Dotatate (NETSPOT™)**	**F^{18}-FDG**
Biomechanism	SSTR binding (mainly SSTR type 2 and 5)	SSTR binding (mainly SSTR type 2)	Glucose metabolism
Physical half life	2.8 days	68 minutes	110 minutes
Camera	Gamma camera/SPECT	PET	PET
Principle mode of decay	Electron Capture	Positron decay	Positron decay
Production	Cyclotron	Generator	Cyclotron
Timing of scan after tracer injection	24 hours (4 hour, 48 hour, 72 hour scan can be considered)	45-60 minutes	60 minutes
Spatial resolution	Low	High	High
Quantification of lesion activity	No	Yes (SUV)	Yes (SUV)
Patient preparation (may vary depending on institution)	No dedicated fasting is needed	No dedicated fasting is needed	At least 6 hours of fasting is need. Strict glucose control is needed for diabetic patients

Which PET scan to be used for MCC?
F18-FDG vs **Ga^{68} - Somatostatin analogue**



In Gastrointestinal NET, there is an **inverse relationship** between World Health Organization (WHO) or The European Neuroendocrine Tumor Society (ENETS) tumor grade based on Ki-67 and SSTR expression rate.

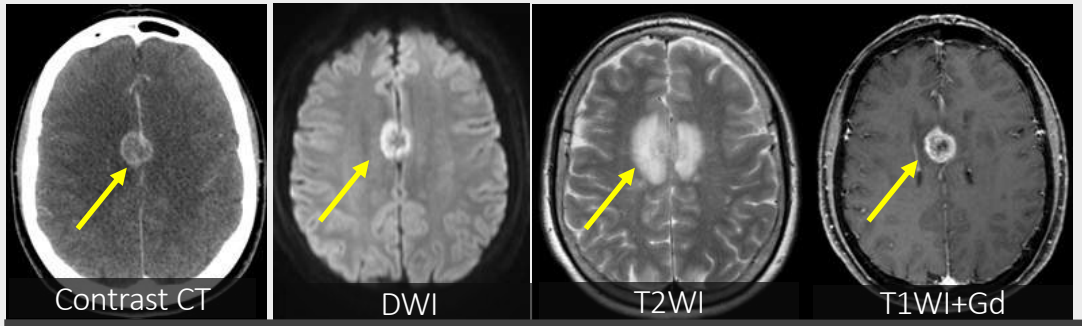
In non-MCC NETs, Ga^{68}-somatostatin analogue PET/CT is recommended for lower grade tumor with low Ki 67 expression **(<20%).** FDG PET is recommended for higher grade, more aggressive tumor.

Little is known regarding association between SSTR expression, tumor grade and Ki 67 in MCC.

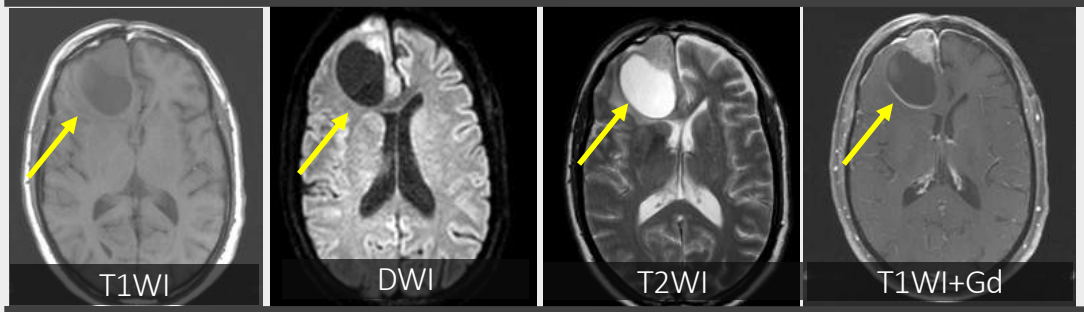
Preliminary study showed that **Ga68-somatostatin analog PET/CT provides good and equally diagnostic performance as F18-FDG PET**. These results do not suggest that 18F-FDG PET/CT should be replaced by 68Ga-somatostatin receptor imaging. It could, however, be considered in selected cases of SSR positive MCC , i.e., “personalized medicine.”

Taralli et al. EJNMMI Research 2018 8:64

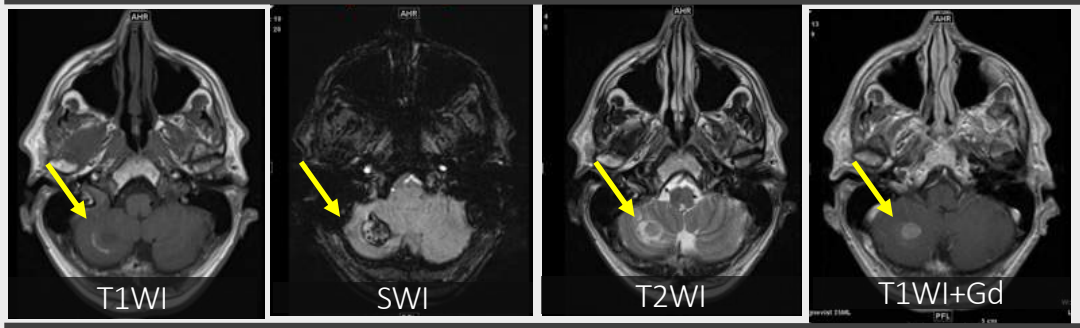
Imaging patterns of MCC Central nervous system metastasis



Solid enhancing nodule/mass with vasogenic edema

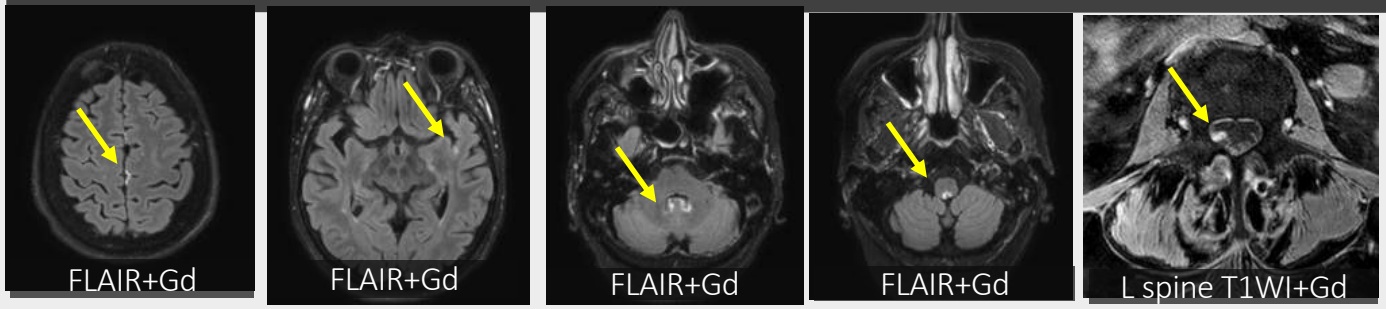


Cystic mass with enhancing solid component



Enhancing mass with hemorrhage

*Note linear hyperintensity along the right cerebellar mass on T1WI and with blooming on susceptibility weighted image (SWI)



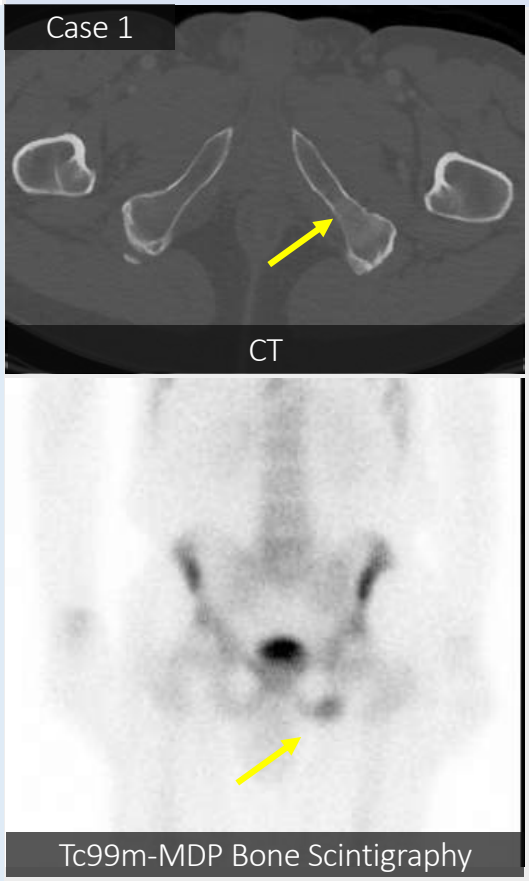
Leptomeningeal metastasis

MCC metastasis to the brain

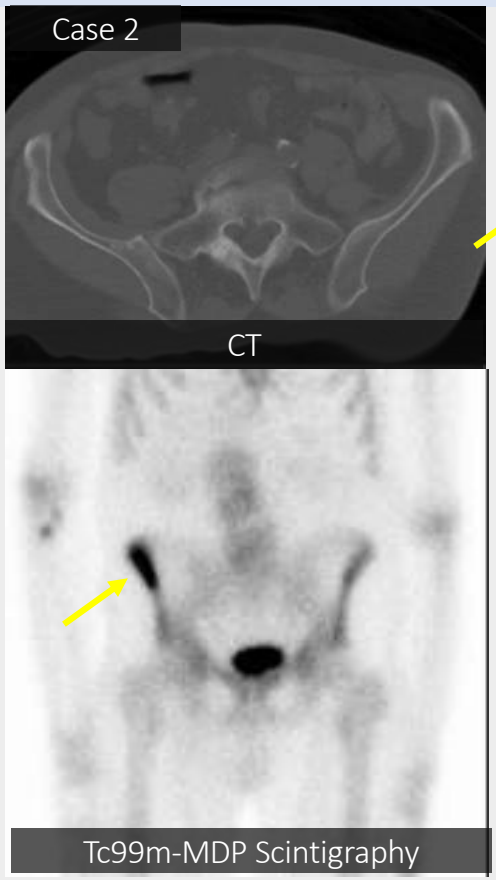
Rare. Previously reported Brain metastasis site include

Lead author		Site of brain metastasis	Primary site	Modality	Findings
Jacob AT	61 M	R thalamus	R parotid gland.	MRI	Cystic mass with enhancing nodule.
Honeybul	65 M	Left temporal lobe	No primary lesion found. Dx'd by R axillary nodal metastasis.	MRI	Enhancing parenchymal nodule.
Feletti	65 M	Pituitary	R groin	MRI	Heterogeneous enhancing mass.
Abul-Kasim	65 M	Leptomeninges	Unknown	MRI	Enhancing meningeal nodule with surrounding vasogenic edema. Leptomeningeal thickening.
Seaman	78 M	L cerebellopontine angle	Right groin	CT, MRI	Heterogeneously enhancing in the intracranial extraaxial mass with vasogenic edema.
Barkdull	55 M	R cerebrum	scalp	CT, MRI	Direct intracranial invasion from bone metastasis to the calvarium.

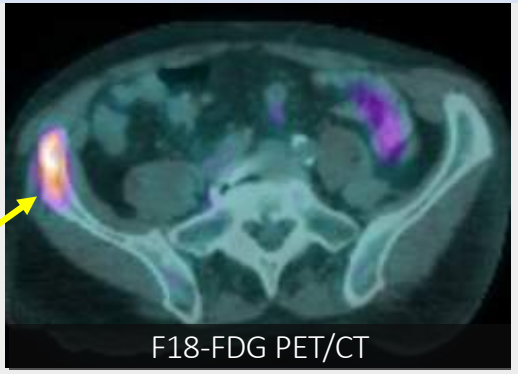
Bone metastasis



Case 1: CT demonstrates sclerotic lesion in the left ischium (yellow arrow). Tc99m-MDP bone scintigraphy demonstrates focal radiotracer activity (black arrow)



Case:2
No suspicious bone lesion is identified on CT.
Both Tc99m-MDP bone scintigraphy and F18-FDG PET/CT demonstrate
increased radiotracer activity in the right iliac crest (arrow). The lesion was biopsied and confirmed as metastatic MCC.



FDG PET or Bone scintigraphy has higher sensitivity for osseous metastasis than CT

Hawryluk et. al. J Am Acad Dermatol2013;68:592-9

SSTR analogue PET has higher sensitivity for bone metastasis than CT

Buder et al. BMC Cancer 2014, 14:268

Osseous involvement of MCC, although rare, has been described in facial bones, cranium, tibia and spine.

MCC can metastasize to weird places…

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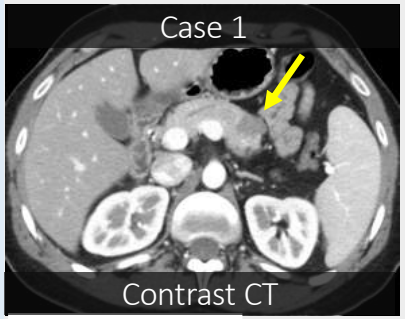
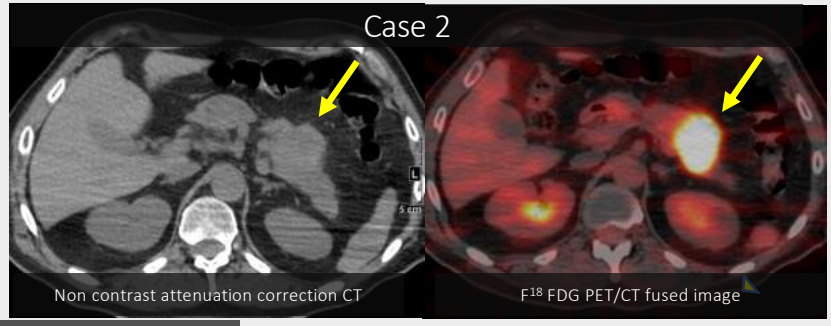
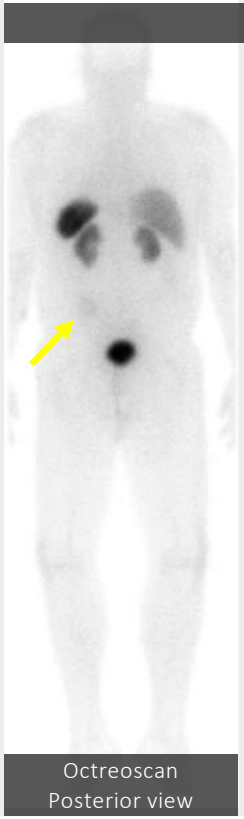
In advanced malignancy with widespread disease, metastasis can occur in uncommon organs.
In our experience at one of the largest MCC centers in the world, it is felt that **MCC metastases to these organs might occur earlier than previously anticipated.**

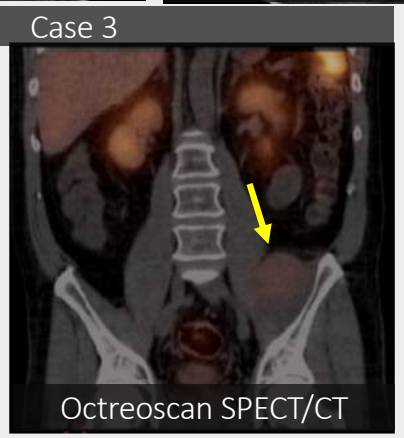




Pancreas (case 1, 2)

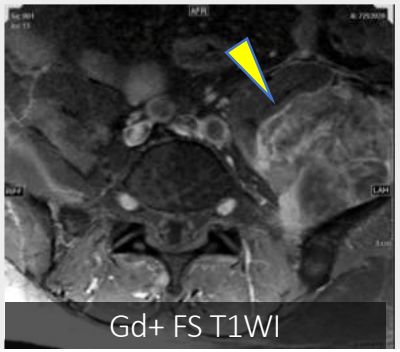
Metastasis to the pancreas is rare in general. However, our preliminary data (unpublished) shows MCC has higher rate of pancreas metastasis than melanoma (5% vs < 1%)





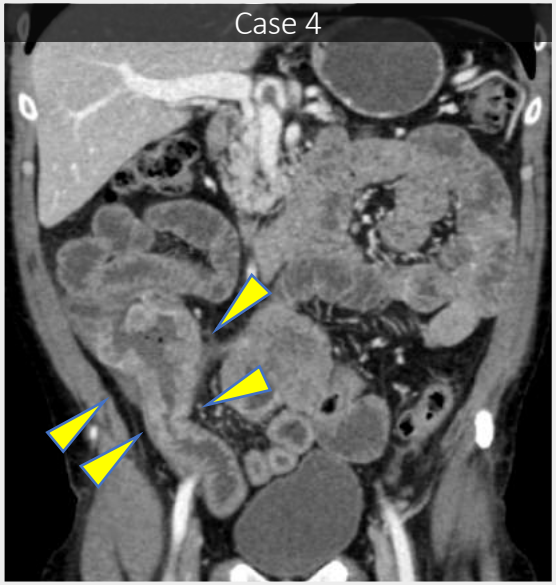
Muscle (case 3)

Posterior planar image and SPECT/CT of In-111 Pentetreotide scintigraphy show faint radiotracer uptake in the left psoas muscle (arrows). Post-Gadolinium fat suppressed MRI shows irregular enhancing mass in the left psoas muscle (arrow head)



Colon (case 4)

Coronal contrast CT shows wall thickening in the distal ilium with aneurysmal dilatation and partial small bowel obstruction.



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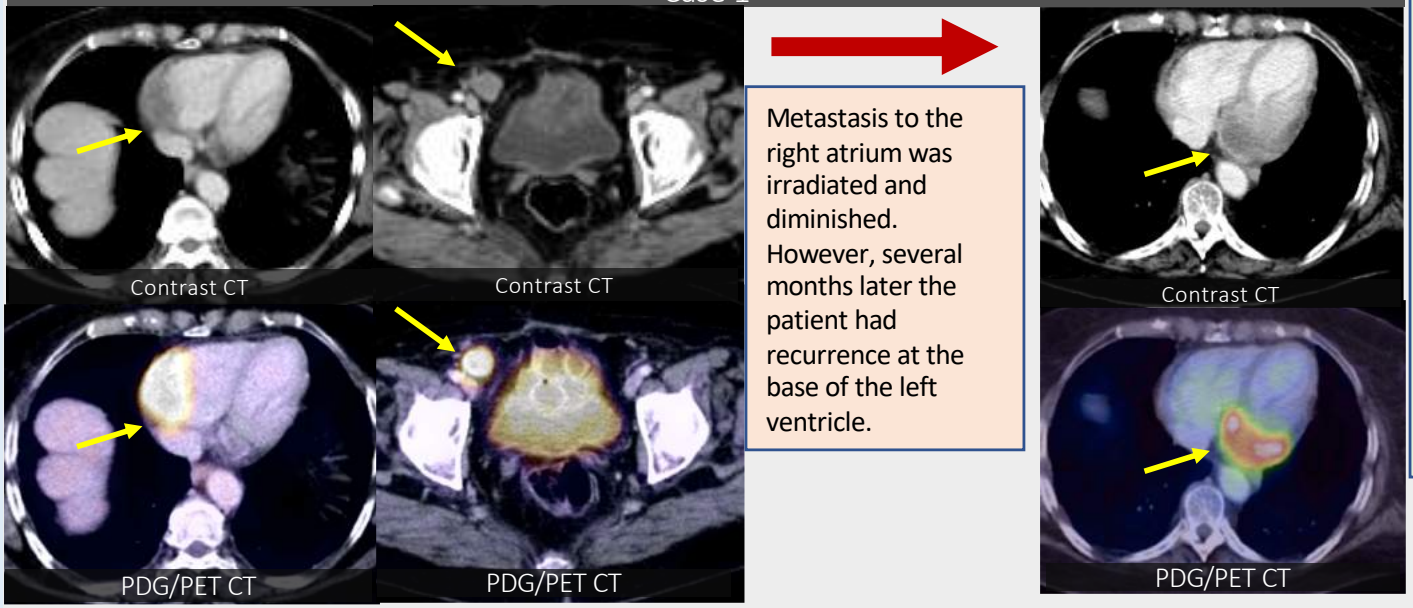
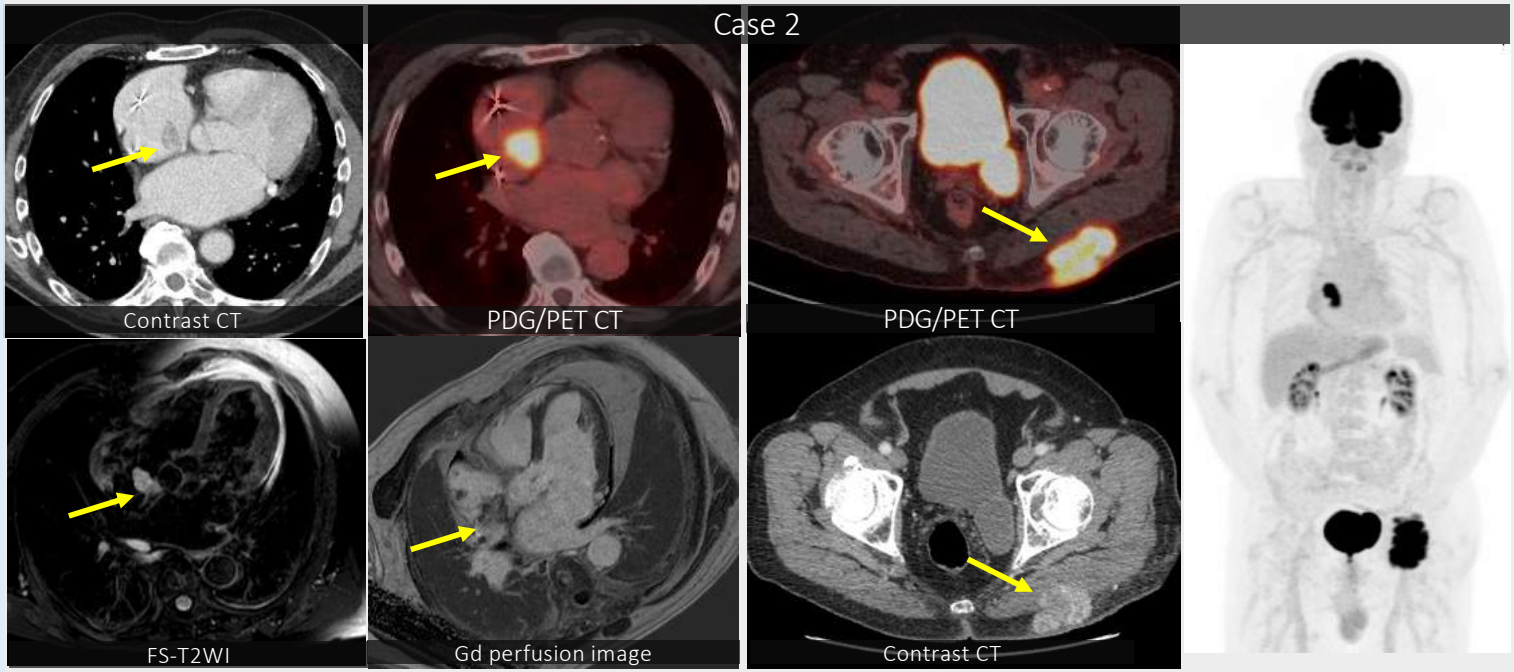
Case 1



Metastasis to the right atrium was irradiated and diminished. However, several months later the patient had recurrence at the base of the left ventricle.

Case 2

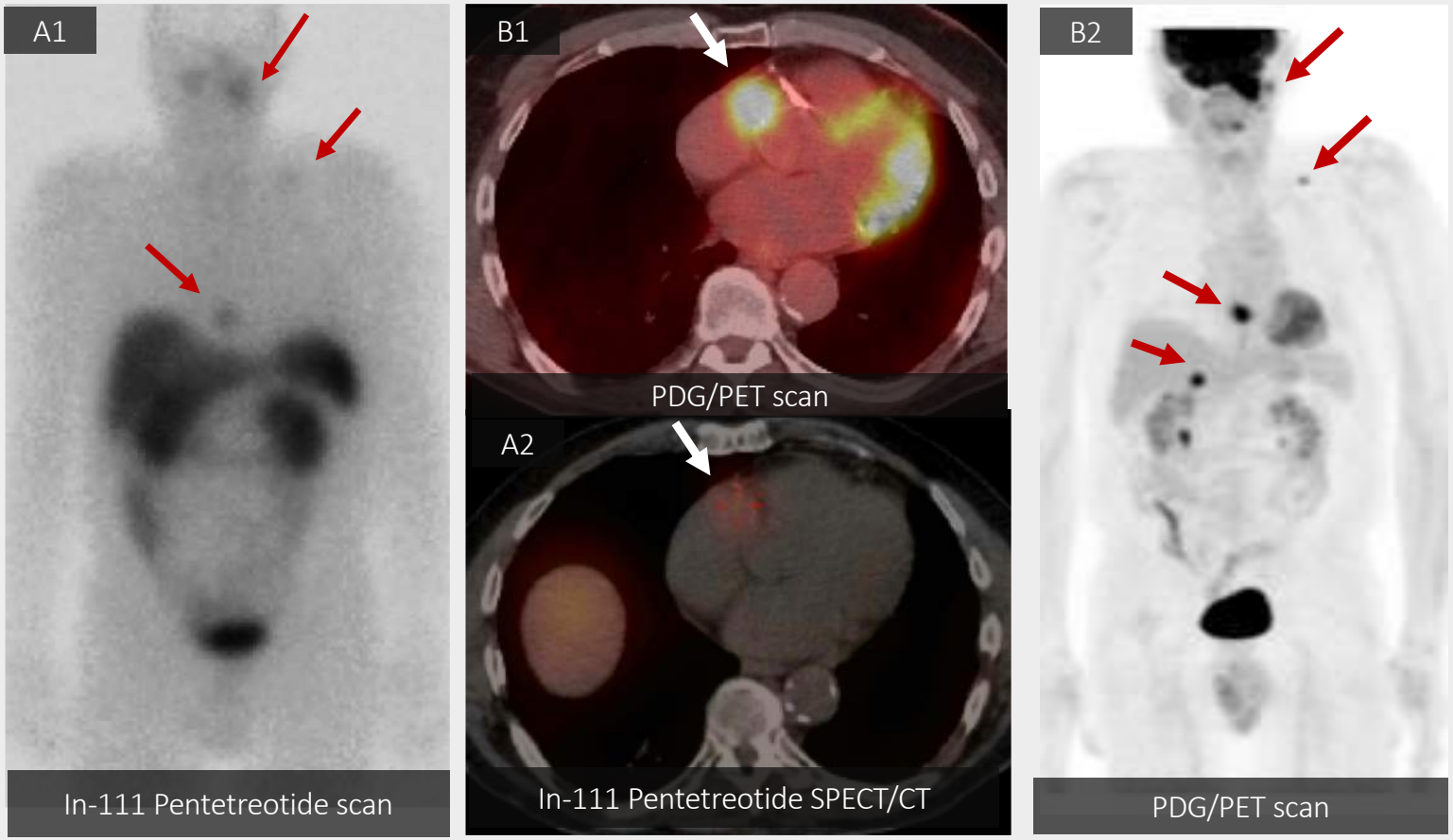


Heart

Cardiac metastasis is rare. Due to its invasiveness, it is difficult to obtain pathologic confirmation. Thus, imaging is important to establish diagnosis of this rare manifestation.

MCC can metastasize to weird places…

Cardiac metastasis diagnosed by both **In^{111}-Pentetreotide** scintigraphy and **F^{18} FDG PET/CT**



73-year-old man with recurrent MCC. In^{111}-Pentetreotide scintigraphy (A1,2) show increased radiotracer uptake within the bilateral maxillary sinuses, left supraclavicular lymph node, right adrenal gland (not shown) and right atrium (arrows), indicating somatostatin receptor expression within these known sites of MCC recurrence.

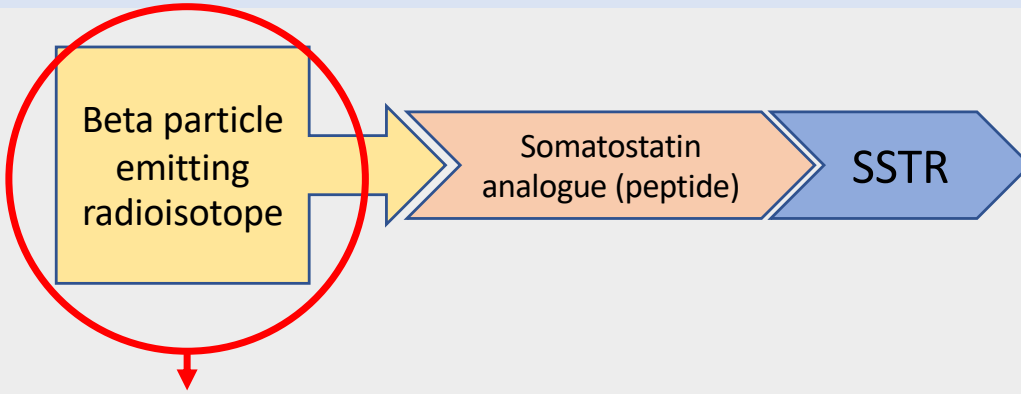
F^{18}-FDG PET/CT (B1,2) shows increased FDG uptake in the same areas (arrows).

Peptide Receptor Radionuclide therapy (PRRT)

[^{90}Y-DOTA^{0},Tyr^{3}] Octreotide

[^{177}Lu-DOTA0,Tyr^{3}] Octreotide

[^{177}Lu-DOTA0,Tyr^{3}] Octreotate



The SSTR binding peptide is paired with a **beta particle emitting radioisotope** using a chelator (bonding agent). The beta particle irradiate tumor cells.

- Delivers radionuclides directly to tumor cells via SSTR.
- Used for SSTR-positive metastatic well-differentiated GI NETs in Europe since 1990s.
- Retrospective analysis showed promising results for GI NETs.

FDA recently approved Lutetium ^{177}-Dotatate for GI NETs in Jan 2018.

Currently, there are a few case reports that demonstrated favorable result on MCC.

Basu et.al. J Nucl Med Technol. 2016 Jun;44(2):85-7
Salavati et.al. Ann Nucl Med. 2012 May;26(4):365-9

However, MCC is very radiosensitive tumor and further investigation is warranted to evaluate efficacy of PRRT on MCC as it might have potential benefit.

Kunz PL. J Clin Oncol 2015;33:1855.

Take home messages

MCC is an aggressive cutaneous cancer with tricky clinical manifestation

Merkel Cell Polyoma Virus (MCPyV) is causally linked to its development

Antibody to the MCPyV oncoprotein can be used as a “tumor marker ” in antibody producers

Immunotherapy is now a first line systemic therapy

MCC has unique neuroendocrine features with somatostatin receptor expression which can be used for molecular imaging such as In^{111} based scintigraphy (SPECT/CT), Ga^{68} based PET/CT, or potentially Peptide Receptor Radionuclide Therapy (PRRT)

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Thank you for your attention!