



# The Utility of <sup>111</sup>In-Pentetreotide Imaging in Staging Neuroendocrine Tumors

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## Abstract

**Background:** <sup>111</sup>In-Pentetreotide imaging or somatostatin receptor scintigraphy, herein "octreotide scan," detects somatostatin receptors and can detect disease in patients with neuroendocrine tumors (NETs). We sought to evaluate the utility of octreotide scan when used in conjunction with CT or MRI and to determine if it added additional information to the CT or MRI.

**Methods:** We used computerized medical records to identify all patients who underwent either a CT or MRI in addition to an octreotide scan within a 30-day time period at Memorial Sloan Kettering Cancer Center (1/1/2003 - 12/1/2009). Reports of the octreotide scan and CT/MRI were reviewed by a medical oncologist and radiologist.

**Results:** 121 patients were identified. Thirty patients had functional tumors (25%) and 107 had metastatic disease. Twenty-one were high grade, 13 intermediate grade, 78 low grade and 9 had no grade classification. There were 6 patients that had serial octreotide scan plus either CT or MRI within a 30 day window.

Twenty-two patients had a negative octreotide scan in the setting of metastatic disease documented on CT or MRI. Of those, 14 were high grade, 3 intermediate grade, 3 low grade and 2 unspecified grade. An additional 20 low grade patients had findings on CT or MRI not seen on octreotide scan and a review of those scans suggested that 9 of those patients were thought to have NET disease not seen on octreotide scan. Six patients had positive findings on octreotide scan that were not seen on CT or MRI imaging; all of these findings were bone lesions. A review of the medical records found that all were in the setting of metastatic disease. Of the 6 patients who underwent serial octreotide scan and CT or MRI, octreotide scan did not detect any additional metastatic disease.

**Conclusion:** Modern CT and MRI were able to identify soft tissue lesions with greater sensitivity than octreotide scan. 9% of patients had octreotide scan avid bone metastases not seen on CT or MR. These data suggest that octreotide scan is not a useful adjunct to defining extent of soft tissue disease in NET tumors, and should not be used routinely for this purpose.

## Background

•Approximately 90% of well differentiated NETs typically express somatostatin receptors.

•Octreotide is an eight amino acid long acting analogue of the 14-amino acid regulatory hormone somatostatin (sms). Binds predominantly to type II somatostatin receptor (sms-r)

•Early trials suggested that octreotide scanning was more sensitive than the conventional CT/MRI.

•In past two decades, CT and MRI resolution has substantially improved. <sup>111</sup>In pentetreotide has also improved using SPECT and SPECT-CT fusion.

•We sought to understand the relative utility of CT, MRI and octreotide scan imaging to detect disease in patients with neuroendocrine tumors

•Radiation exposure of an octreotide scan is similar to that of a CT scan (approximately 10 mSv)

## Methods

Electronic medical records at our institution from January 1, 2003 through December 1, 2009 were searched to identify all patients who underwent both octreotide imaging and either a CT or MRI within a 30 days of each other.

Reports of the octreotide scan imaging and CT or MRI were reviewed.

Positive octreoscan findings were noted by organ not by number of lesions

CT/MRI findings were considered positive if the report commented on "increase in size," "enlarged", "masses consistent with tumor," or "hypervascular" If "suspicious," the lesion had to change on subsequent scans to be considered positive.

## Patient Characteristics

Neuroendocrine Tumor Patients Histology (N=121)	
High Grade (≥50 mitoses /50 HPF)	21
Intermediate Grade (2-50 HPF)	13
Low Grade (0-1 HPF)	78
Pancreatic NETs	60
Functional Tumors	30
Carcinoid	15
Insulinoma	3
Gastrinoma	6
VIPoma	3
Glucagonoma	2
ACTHoma	1

## Results

70% CT scans were triphasic; all MRI's were performed with and without gadolinium, and all CT scans were performed with oral and intravenous contrast.

All octreotide scans were done with SPECT, SPECT-CT fusion was used after April, 2006 (n=40)

16 patients had local or local regional disease only  
7 pre-operative scans (pancreatic lesions); all 7 had +CT  
6/7 +octreotide scans (pancreas only)  
9 post-op scans- CT and Octreotide were both negative

22/105 (21%) patients with metastases on CT/MRI had negative octreotide scan  
14 high grade, 3 intermediate, 3 low grade, 2 unspecified

67/71 (94%) low grade NETs had (+) imaging on octreotide scan

7/21 (33%) high grade NETs had (+) imaging on octreotide scan

## Results

20/83 low grade NETs with mets seen on CT/MRI had one or more lesions suspicious for metastases NOT reported on octreotide scan; review of these scans confirmed 9 of those patient's lesions were consistent with NETs

CT/MRI Finding	Octreotide Finding	Consistent Finding
Liver, Pancreas	Liver	Pancreas
Liver, Pancreas	Liver	Pancreas
Pelvic Mass, LN, Mesentery	Pelvic Mass	Small Bowel
Mesenteric Mass, Liver	Mesenteric Mass	Small Bowel
Liver, Bone, Pancreas	Liver, Bone	Pancreas
Mesenteric Mass, ileal Primary	Mesenteric mass	Ileum
Liver, Pancreas	Pancreas	Pancreas
Mesenteric Mass, ileal Primary	Mesenteric Mass	Ileum
Liver, Peritoneal Disease	Liver	Presumed Small Bowel

## Conclusions

• Modern CT and MRI were able to identify soft tissue lesions with greater sensitivity than octreotide scanning.

• 9% of patients had octreotide-avid bone metastases not seen on CT or MRI. All of these patients already had extensive soft tissue metastatic disease identified on CT/MRI.

• These data suggest that octreotide scanning is not a useful adjunct to defining extent of soft tissue disease in patients with metastatic NET tumors, and should not be used routinely for this purpose.

• Prospective trials comparing contemporary CT/MRI and octreotide scanning with investigational imaging agents, such as 68-Ga-Tyr<sup>3</sup>-Octreotide-PET, are warranted.