PET may be useful for distinguishing thymic carcinoma from invasive thymoma. One study’s results suggest a standard uptake value of 5.0 to distinguish thymic carcinoma from thymoma.

**Objective:** To present the imaging findings for CT and PET of the normal and abnormal thymus, with the primary focus being on CT. **Thymic Hyperplasia:** A normal thymus is often seen on CT in children and young adults. Rebound hyperplasia following chemotherapy can cause a change in the normal bilobed anatomical appearance of the thymus to something more oval in nature. Thymic rebound hyperplasia is very common in children, but it may be seen in young adulthood and may be present for many months following chemotherapy. One report found this phenomenon on CT anywhere from 3 to 14 months following chemotherapy. Thymic hyperplasia is also seen in diseases such as myasthenia gravis, connective tissue disorders, and thyrotoxicosis. **Thymic Tumors:** Thymoma is the most common tumor of the thymus and is classified as invasive or noninvasive based on CT/MR imaging and gross pathologic findings. Histologically invasive and noninvasive thymomas have a generally benign appearance. These tumors are seen most often in the fifth and sixth decades of life. Thymic lymphoma is the second most common type of thymic tumor but is only rarely the sole site of lymphomatous involvement. Thymic carcinomas are rare thymic tumors which are difficult to distinguish from invasive thymoma on CT. The authors of this article also discuss the CT appearance of other less common tumors of the thymus. **Reviewer’s Comments:** While low-grade FDG uptake is typically seen in the normal thymus of virtually all children, at least 1 large study has demonstrated that normal physiologic thymic uptake is seen in up to one-third of adults aged in their 20s. The appearance of the normal thymus with FDG is 1 of an inverted V on coronal images or arrowhead shape on axial images as with CT. FDG uptake in the thymus is known to increase in children following chemotherapy, but this phenomenon of rebound hyperplasia also may be seen in young adults following chemotherapy. One study demonstrated that a normal thymus has an SUV of around 1.8 whereas, in another study, rebound hyperplasia was found to be associated with a mean SUV of 2.7. Yet another study found a mean SUV of 7.2 associated with thymic carcinoma compared to 3.8 for invasive thymoma and 3.0 for noninvasive thymoma. The authors of this final study suggested an SUV of 5.0 to distinguish thymic carcinoma from thymoma. (Reviewer-David Bushnell, MD).
F-18 Dopamine PET/CT Superior for Assessing PGLs

Comparison of 18F-Fluoro-L-DOPA, 18F-Fluoro-Deoxyglucose, and 18F-Fluorodopamine PET and 123I-MIBG Scintigraphy in the Localization of Pheochromocytoma and Paraganglioma.

Timmers HJ, Chen CC, et al:

J Clin Endocrinol Metab 2009; 94 (December): 4757-4767

F-18 dopamine PET/CT may be the single best molecular imaging technique for assessment of pheochromocytomas and paragangliomas.

**Background:** Standard scintigraphic imaging methods for detecting neuroendocrine tumors (NETs) utilize radiopharmaceuticals such as In-111 pentetreotide (Octreoscan™) and I-123 MIBG. PET imaging with F-18 FDG is also useful in specific patients. Newer PET radiopharmaceuticals, including F-18 DOPA and F-18 dopamine, have shown substantial promise for identifying primary NETs and metastatic disease.

**Objective:** To compare the accuracy of several of these agents in the evaluation of patients with pheochromocytoma and paraganglioma (PGL).

**Design:** Prospective study.

**Participants:** 52 patients with either pheochromocytoma or PGL. The series included 22 individuals whose tumor displayed an underlying mutation of the succinate dehydrogenase subunit B (SDHB) gene.

**Methods:** All patients underwent CT imaging, and all but 8 also had MRI. Imaging was performed with F-18 DOPA, F-18 FDG, F-18 fluorodopamine, and I-123 MIBG in all subjects, except 3 who did not have an MIBG exam. FDG and dopamine were imaged with PET/CT, whereas DOPA was imaged with PET. It was not clear from the methods whether MIBG imaging included SPECT.

**Results:** The overall sensitivities for detecting metastatic sites were 45% for F-18 DOPA, 74% for F-18 FDG, 76% for F-18 dopamine, and 57% for I-123 MIBG. For the subgroup with SDHB-positive associated metastatic tumors, F-18 dopamine and FDG demonstrated significantly higher sensitivities (82% and 83%, respectively) compared to I-123 MIBG (57%) and F-18 DOPA (20%).

**Conclusions:** The authors recommend that F-18 dopamine PET/CT be used to evaluate pheochromocytomas and PGLs. However, they note that FDG is an excellent alternative in SDHB-positive tumors, and MIBG and DOPA can be used for imaging in SDHB-negative patients.

**Reviewer's Comments:** One of the limitations of this study was the use of CT/MRI as the gold standard for metastatic disease since it is known that neither CT nor MRI is optimal for this purpose. Nonetheless, while this design limitation makes it difficult to draw any conclusions regarding the absolute sensitivity of the molecular imaging exams under investigation, it is possible to draw firm conclusions from the authors’ findings regarding the relative accuracy of these exams to each other in this patient population. It also is a little unfortunate that DOPA imaging was performed with PET as opposed to PET/CT, which could potentially bias the results against this agent. Perhaps the most interesting findings from this work are those from the SDHB subgroup where this genetic mutation appears associated with strong FDG and dopamine uptake but not necessarily with DOPA or MIBG uptake. This could turn out to be useful for deciding with which agent to image when evaluating these tumors. (Reviewer-David Bushnell, MD).

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Keywords: Neuroendocrine Tumors, Paraganglioma, Pheochromocytoma

Print Tag: Refer to original journal article
Global improvement of left ventricular function in patients with idiopathic dilated cardiomyopathy is accompanied by an improvement in myocardial perfusion reserve.

**Background:** Patients with idiopathic dilated cardiomyopathy (IDC) frequently respond to β-blocker therapy. IDC is postulated to be due to an imbalance between myocardial oxygen consumption and supply.

**Objective:** To determine whether differences between β-blocker responders and nonresponders can be identified through the use of regional myocardial perfusion reserve (MPR) and contractile performance.

**Participants:** 12 men and 4 women (median patient age, 48 years) with newly diagnosed IDC, mild chronic heart failure, and normal epicardial coronary arteries on angiography.

**Methods:** All patients underwent PET scanning using N-13 ammonia for stress-rest perfusion imaging and F-18 FDG for metabolism imaging. In addition, all patients underwent a dobutamine stress MRI. The MRI and PET scans were repeated 6 months after maximal β-blocker therapy. The myocardial perfusion reserve (MPR; assessed by PET) and the wall motion score (WMS; assessed by MRI) were evaluated. Functional response to β-blocker therapy was defined as a stable or improved left ventricular ejection fraction (LVEF) for responders versus a decreased LVEF in nonresponders.

**Results:** Baseline LVEF was 28.6% ±8.4%. At 6 months after initiation of β-blocker therapy, 7 patients showed an improved LVEF (9.7% ±3.1%) and 9 patients did not show improved LVEF (-3.4% ±3.9%). MPR improved in responders from a baseline of 1.56 up to 1.93 at 6 months ($P=0.049$). In nonresponders, the MPR decreased from 1.98 at baseline to 1.61 at 6 months, although this change was not statistically significant ($P=0.064$). The change in MPR was significantly different when comparing responders to nonresponders ($P=0.017$). There was a statistically significant positive correlation between change in MPR and change in LVEF. The summed rest WMS improved from 26 to 21 in responders ($P=0.022$), but no significant change was seen in nonresponders. The summed stress WMS in responders showed a significant improvement from 23 to 21, but no significant change was observed in nonresponders.

**Conclusions:** In IDC patients, left ventricular function and regional wall motion improvement after initiation of β-blocker treatment is accompanied by an improvement in regional myocardial perfusion. IDC patients who experience deterioration in left ventricular function after initiation of β-blocker therapy were also found to have a decrease in perfusion reserve.

**Reviewer's Comments:** It has yet to be determined whether a change in MPR occurs earlier than a decline in left ventricular function. The clinical implications of this research are not fully known, but this research raises the possibility that a change in MPR can help optimize the medical therapy for patients with IDC. (Reviewer-Thomas F. Heston, MD).

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Keywords: Idiopathic Dilated Cardiomyopathy,

Print Tag: Refer to original journal article
F-18 FDG-assisted management of patients with ischemic cardiomyopathy appears to help reduce cardiac events.

**Background:** F-18 FDG PET myocardial viability scanning may be helpful in the management of patients with ischemic cardiomyopathy. A previous study, the PET and Recovery Following Revascularization (PARR 2) trial, identified a trend toward beneficial outcomes with PET-assisted management.

**Objective:** To examine a subset of the PARR 2 data consisting of the experience in a single center with extensive expertise with and ready access to F-18 FDG and full integration with clinical teams.

**Design:** Post hoc substudy. **Setting:** University of Ottawa Heart Institute.

**Participants:** 109 patients with left ventricular dysfunction and suspected coronary artery disease who were being considered for revascularization.

**Methods:** Patients were randomly assigned to receive PET-assisted management (group 1) or standard care (group 2). The primary outcome measure was the composite end point of cardiac death, myocardial infarction, or cardiac rehospitalization within 1 year.

**Results:** The cumulative proportion of patients experiencing the composite event was 19% in the PET-assisted group versus 41% in the group receiving standard care. A multivariable Cox proportional hazards regression analysis showed that the PET-assisted strategy was beneficial, with a hazard ratio of 0.34. A comparison with the other patients in the larger PARR 2 trial found that the Ottawa Heart Institute patients had a slightly lower ejection fraction (25% vs 27%), were more often female (24% vs 13%), tended to be older (64 years vs 62 years), and had less previous coronary artery bypass grafting (13% vs 21%).

**Conclusions:** The Ottawa Heart Institute patient subset had a significant reduction in cardiac events with F-18 FDG PET-assisted management compared with patients who received standard care.

**Reviewer's Comments:** The authors suggest that a possible reason that their patients benefited from PET-assisted management was because the PET center was located in the institution enrolling the patients, resulting in a lower enrollment bias. In addition, the center had a tight integration of the imaging team with the clinical team, undoubtedly increasing the value of the imaging studies. (Reviewer-Thomas F. Heston, MD).
In patients with neuroendocrine tumors, PET imaging with Ga-68 DOTANOC allows more accurate and reliable quantification of tracer uptake than is possible with In-111 pentetreotide SPECT.

**Background:** Ga-68 DOTANOC is a recently introduced PET neuroendocrine tumor (NET) imaging agent. Do standardized uptake values (SUVs) from these studies have prognostic value?

**Objective:** To investigate the efficacy of SUVs from Ga-68 DOTANOC PET studies as indicators of disease prognosis in NETs.

**Methods:** 47 patients with a NET underwent Ga-68 DOTANOC whole-body PET scans during a 2-year study interval. The PET images were evaluated by 2 nuclear medicine specialists blinded to the results of other diagnostic imaging tests. SUVs were calculated based on the maximum pixel value in the lesion region. When available, tissue measurements were made of Ki-67 (n=33) and the expression of type 2A somatostatin receptors (SSTR2A; n=14). These were compared with the associated tumor SUVs. The progression of disease was monitored with CT scans performed every 3 to 6 months. The CT information was used to classify the patients into 3 categories: stable disease, partial response, and progressive disease. A 1-way ANOVA was used to analyze the results.

**Results:** The SUVs of patients with pancreatic cancer were significantly higher than those with either GI NETs or lung tumors. The difference between the GI and lung tumors was not statistically significant. The mean SUVs of functioning and nonfunctioning tumors were not significantly different and did not correlate with the disease stage. Well-differentiated NETs had significantly higher SUVs than the poorly differentiated cancers. No correlation was found between SUV and Ki-67, but the SUV was higher in patients with increased SSTR2A expression compared to those with low expression of SSTR2A. The follow-up scans showed that stable disease or partial response was associated with increased SUVs compared to the SUVs seen with disease progression. Using SUV as a predictor of progressive disease yielded a sensitivity of 52.6% and a specificity of 92%.

**Conclusions:** The SUV determined from Ga-68 DOTANOC PET scans yields useful prognostic information about the progression of NETs.

**Reviewer’s Comments:** Although NETs are relatively uncommon, there are effective treatments for stabilizing disease progression. The use of imaging studies to evaluate treatment efficacy is becoming a larger component of molecular imaging because a number of studies have shown that PET agents such as F-18 FDG or F-18 FLT have prognostic value in some cancers, though they do not work well in NETs. The development of Ga-68 DOTANOC to take advantage of the superior resolution and quantitative capability associated with PET is welcome. These initial results have a relatively low sensitivity, but even that represents a substantial improvement over conventional alternatives. (Reviewer-Mark T. Madsen, MD).

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**Keywords:** Neuroendocrine Tumors, PET, Ga-68 DOTANOC

**Print Tag:** Refer to original journal article
Tc-99m MIBI Predicts Malignant Behavior of Thyroid Nodules

99mTc-MIBI Imaging in the Presurgical Characterization of Thyroid Follicular Neoplasms: Relationship to Multidrug Resistance Protein Expression.

Saggiorato E, Angusti T, et al:


Tc-99m MIBI scintigraphy seems suited to diagnosing malignancy of nononcocytic follicular thyroid nodules that are indeterminate at fine-needle aspiration biopsy.

**Background:** In the evaluation of thyroid nodules, fine-needle aspiration biopsy (FNAB) lacks the ability to detect capsular invasion and vessel infiltration. As a result, FNAB cannot accurately characterize follicular neoplasms as benign or malignant. Discrepant findings have been reported regarding the accuracy of Tc-99m MIBI to distinguish thyroid carcinoma from benign nodules, especially in mitochondria-rich oncocytic lesions. Tc-99m MIBI is a substrate for the MDR1 gene coded P-glycoprotein (P-gp) and multigrade resistance-associated protein-1 (MRP1) efflux pumps. Therefore, rapid Tc-99m MIBI washout is displayed by cells with undetectable levels or altered P-gp or MRP1.

**Objective:** To assess qualitative and semiquantitative analyses of dual-phase Tc-99m MIBI thyroid scintigraphy for differentiating benign from malignant thyroid nodules, and to analyze the relationship between scintigraphic Tc-99m MIBI findings and the expression of P-gp and MRP1 in thyroid nodules.

**Design:** Prospective study.

**Participants:** 11 men and 40 women with Tc-99m pertechnetate-cold thyroid nodules at least 1 cm in diameter, cytologically diagnosed as nononcocytic or oncocytic follicular neoplasms. Patient ages ranged from 28 to 72 years (mean, 55 years).

**Methods:** Images were obtained at 10 minutes (early) and 2 hours after IV injection of 400 MBq of Tc-99m MIBI. Visual and quantitative assessments classified lesions according to increased uptake of the nodule in early and/or delayed images. Increased uptake of the nodule in both early and delayed images and increased uptake of the nodule only in delayed images were considered positive for malignancy.

**Results:** Tc-99m MIBI showed little utility in differentiating benign from malignant oncocytic neoplasms. In nononcocytic nodules, the semiquantitative method had 95% specificity compared to 78% specificity for the visual method.

**Conclusions:** Semiquantitative Tc-99m MIBI scintigraphy seems suited to diagnosing malignancy of nononcocytic follicular thyroid nodules that are indeterminate at FNAB. The good correlation between immunohistochemical apical expression of MRP1 and MIBI uptake supports the Tc-99m MIBI results.

**Reviewer’s Comments:** Follicular neoplasm is probably the most common equivocal FNAB result in our institution. Excluding oncocytic lesions was a clever strategy that could establish a new key role for Tc-sestamibi in reducing the frequency of equivocal FNAB results. (Reviewer-C. Richard Goldfarb, MD).

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Keywords: Thyroid Follicular Neoplasms, Benign vs Malignant, Tc-99m MIBI Scintigraphy

Print Tag: Refer to original journal article
ATA Does Not Recommend Thyrogen-Mediated I-131 Ablation

Revised American Thyroid Association Management Guidelines for Patients With Thyroid Nodules and Differentiated Thyroid Cancer.

Cooper DS, Doherty GM, et al:

Thyroid 2009; 19 (November): 1153-1158

The American Thyroid Association believes that there is insufficient data to recommend Thyrogen-mediated I-131 for the treatment of metastatic thyroid disease, except in selected patients.

No randomized trial compares thyroid hormone withdrawal therapy to Thyrogen®-stimulated I-131 treatment of metastatic thyroid cancer. However, nonrandomized studies report disease stabilization or improvement in some patients following Thyrogen-mediated I-131 therapy. The American Thyroid Association (ATA) believes that there is insufficient data to recommend rhTSH-mediated I-131 for metastatic disease, except in patients for whom iatrogenic hypothyroidism is dangerous, those with pituitary disease who are unable to raise their serum TSH, or those for whom a delay in therapy is risky. Lithium: Another proposed method of increasing I-131 efficacy is lithium pretreatment, which blocks iodine release from the thyroid, thus enhancing I-131 retention. Lithium increases I-131 dose to tumors more than twofold. However, the ATA is not ready to recommend lithium because a recent study showed no advantage of lithium pretreatment on outcome despite an increase in radioactive iodine (RAI) uptake in tumor deposits. RAI Treatment: For treating iodine-avid pulmonary metastases, the I-131 dose can be empiric (100-200 mCi) or estimated by dosimetry to limit whole-body retention to 80 mCi at 48 hours and 200 cGy to the red bone marrow. I-131 macronodular lung metastases should have RAI treatment repeated only if it is shown to help (decrease lesion size, decrease thyroglobulin), but complete remission is unusual and survival is poor. A study of 400 thyroid cancer patients with distant metastases found age, initial tumor stage, histology, thyroglobulin level, RAI uptake, and PET all correlated with survival. By univariate analysis, only age and PET results were strong predictors. Chemotherapy: Traditional cytotoxic chemotherapeutic agents have 25% partial response rates, at best, and toxicities are considerable. Doxorubicin remains the only FDA-approved chemotherapeutic agent for metastatic thyroid carcinoma. Recent phase II trials suggest anti-angiogenic therapies stabilize 50% of patients with metastatic disease. Orally available anti-angiogenic tyrosine kinase inhibitors (axitinib, motesanib, and sorafenib) have numerous common side effects. Treatment with these agents should be limited to specialists experienced in their use. Similar results are also being reported with sunitinib. Other Treatments: Surgical resection of isolated symptomatic metastases improves survival, especially in patients aged <45 years with slowly progressive disease. RAI therapy of bone metastases improves survival but is rarely curative. Brain metastases occur in older patients, and RAI usually is not effective. Complete surgical resection of central nervous system metastases should be considered.

Reviewer’s Comments: The authors of a newly published paper (Thyroid. 2010; 20 [March]: 257-263) present strong data supporting the use of Thyrogen preparation in eradicating small-volume metastases with I-131, including those in the lung. My guess is that the ATA will approve Thyrogen preparation for therapy of iodine-avid metastases in its next update of the guidelines. Meanwhile, most of our referrers already prefer Thyrogen over hormone withdrawal with its attendant long-term stimulation of TSH-dependent tumor. (Reviewer-C. Richard Goldfarb, MD).

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Keywords: Thyroid Cancer, Guidelines

Print Tag: Refer to original journal article
FDG tumor uptake can be used as an independent predictor of survival in patients with neuroendocrine tumors. For this reason, FDG-PET may find its way into the algorithm for assessment of NETs.

**Background:** High tumor proliferation rate (based on Ki67 from immunohistochemical staining of tumor tissue samples) is used for assessment of tumor aggressiveness and prognosis in patients with neuroendocrine tumors (NETs). FDG imaging with PET may represent a noninvasive technique capable of providing similar information without the need for tumor resection or biopsy in patients with known metastatic disease.  

**Objective:** To evaluate the utility of FDG-PET/CT for predicting outcome in patients with NETs.  

**Methods:** All patients underwent FDG-PET/CT imaging, Ki67 staining, and chromogranin A (CgA) measures. The mean follow-up was 1 year. All deaths were related to progressive NETs.  

**Results:** Of the 98 subjects evaluated, 45 had intestinal carcinoids and 30 had pancreatic NETs. Thirteen of 57 FDG-positive patients died during follow-up, compared with 1 of 41 patients with FDG-negative tumors. SUV\(_{\text{max}}>9\) and high Ki67 values were independent predictors of overall mortality. SUV\(_{\text{max}}>3.0\) was a strong predictor of lower progression-free survival. The NETs were FDG-positive in 19 of 47 cases (40%) with Ki67 \(\leq 2\)%, in 19 of 27 cases (70%) with Ki67 ranging from 2% to 15%, and in 13 of 14 cases (93%) with Ki67 \(>15\)%. In the Ki67 group with Ki67 \(\leq 2\)%, 5 patients died, and the tumors were FDG-positive in 4 of these cases. CgA levels were not independently predictive of outcome.  

**Conclusions:** FDG-PET is an independent predictor of survival in patients with NETs. The prognostic value of FDG-PET appears to exceed that of Ki67 and CgA levels.  

**Reviewer's Comments:** These data are compelling, showing that FDG tumor uptake can be used as an independent predictor of tumor-related mortality. For this reason, FDG-PET may find its way into the algorithm for assessment of NETs. (Reviewer-David Bushnell, MD).

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Keywords: Neuroendocrine Tumors, FDG-PET

Print Tag: Refer to original journal article
Dosimetry Enhances Success of Thyroid Ablation

_A Dose-Effect Correlation for Radioiodine Ablation in Differentiated Thyroid Cancer._

Flux GD, Haq M, et al:


The absorbed dose of radioiodine delivered to thyroid remnants varies greatly if a fixed I-131 activity is given. Dosimetry can enhance the success of ablation.

**Background:** After thyroidectomy, a widely practiced ablation strategy is to administer a fixed activity of 30 to 100 mCi I-131. However, recurrence rates can be as high as 25%, and recurrences potentially can be fatal in high-risk groups. Successful ablation depends on the absorbed dose delivered to thyroid remnants rather than on the administered activity.

**Objective:** To use widely available facilities in standard nuclear medicine departments to determine whether calculating absorbed doses of I-131 results in improved ablation.

**Participants/Methods:** 15 women and 8 men with differentiated thyroid cancer (DTC) received 100 mCi I-131 following thyroidectomy. The median patient age was 41 years, and patients with Hürthle cell carcinoma and other aggressive variants were excluded. Thyroid hormone replacement was discontinued in most patients between surgery and ablation. The remaining patients commenced treatment with liothyronine (T3), which was discontinued 14 days before admission. None received recombinant thyroid-stimulating hormone (rhTSH). Following I-131 administration, patients were hospitalized for 3 days. SPECT scans were acquired at 24, 48, and 72 hours. A fourth scan was acquired at 96 hours when possible. Blood samples were collected at 24, 48, 72, and 144 hours to calculate absorbed doses to the blood and red marrow. Whole-body retention was measured using a ceiling-mounted Geiger counter.

**Results:** 18 of 23 patients had a successful ablation. The maximum absorbed dose to thyroid remnants was 99 ±128 Gy for patients who had a complete ablation and was 25 ±17 Gy for patients with persistent uptake (_P_=0.030). Ablation was successful for all patients who received an absorbed dose >49 Gy to the thyroid remnant. Persistent uptake was seen in 5 of 13 patients (38%) receiving <49 Gy. No significant difference was seen between the mean absorbed doses delivered to the 2 groups. The self-absorbed doses to both blood and red marrow were significantly lower for those successfully ablated.

**Conclusions:** The success of ablation strongly depends on the absorbed dose delivered to the thyroid remnant, which varies greatly if a fixed administered activity is given.

**Reviewer's Comments:** Most observers agree that dosimetry improves ablation results. For that reason, whole-body diagnostic imaging is gaining more popularity after surgery and prior to ablation. The time, effort, and expense of obtaining several blood samples and images for several days seem to be more than most departments can afford. The multiple visits, images, and sticks are also more than most patients are willing to tolerate, especially if they are undergoing thyroid hormone withdrawal. We take an intermediate approach of obtaining camera-based 24-hour neck uptake and 48-hour body retention. (Reviewer-C. Richard Goldfarb, MD).

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Keywords: Thyroid Cancer, Radioiodine Ablation

Print Tag: Refer to original journal article
Simulations provide insights into difficult-to-acquire imaging situations and other situations requiring the control of many parameters. However, the conclusions drawn from simulations are limited.

**Background:** Optimized cardiac SPECT systems often have a restricted field-of-view (FOV) that may cause significant artifacts in tomographic images.

**Objective:** To evaluate how attenuation and scatter corrections are affected by the truncated projections associated with small FOV cardiac SPECT (SF-SPECT) systems. A simple truncation correction technique was also investigated.

**Methods:** The NURBS-based cardiac-torso (NCAT) phantom was used to model the thorax and heart. A large (42 cm) and small (36 cm) thorax phantom was generated along with a large (10.7 cm) and small heart (9.1 cm), giving a total of 4 configurations. The heart distribution had a perfusion defect in the basal portion of the inferior and septal wall. Activity levels in body compartments were adjusted to match clinical studies. The projection data for each configuration were obtained from a Monte Carlo simulator that included attenuation, spatial resolution, and scattered radiation for Tc-99m, Tl-201 and a Tc-99m/Tl-201 dual isotope study. The reconstructions either included compensation for attenuation and spatial resolution (OS-AD) or those with a model-based scatter correction (OS-ADS). A replication routine was used to estimate truncated activity in the liver. The resulting bull’s-eye displays from the short axis views were divided into 9 segments, and the small FOV results were compared to large FOV results.

**Results:** The simulations for a single isotope showed essentially no dependence on the detector FOV. The largest deviation for the OS-AD was <1.5%. The deviations were somewhat higher when scatter correction was also included, but the largest deviation was still only 3.5%. From this, the authors concluded that liver truncation is not an important factor for either Tl-201 or Tc-99m. The largest deviation for the dual isotope studies was almost 50% when only the truncated projections were used for the OS-ADS reconstruction. When the projections were modified using the replication technique, the maximum deviation dropped to 2.6%.

**Conclusions:** Projection truncation had no clinical impact for cardiac studies with either Tc-99m or Tl-201. The authors also concluded that their count replication approach would allow dual isotope SPECT imaging on small FOV systems.

**Reviewer’s Comments:** This investigation was performed by a very well-respected group that has made significant contributions to SPECT imaging. The conclusions about the single isotope simulations appear to be justified since they do not depend much on the liver truncation. The dual isotope results were compromised by liver truncation and, even though their count replication solution seemed to improve the results, there is reason for skepticism. Count replication is only reasonable if the truncated distribution is similar to what is left in the image, as in this simulation. However, there will be cases in which this is not an appropriate estimate, and therefore, substantial errors can be expected. (Reviewer-Mark T. Madsen, MD).
A lung-heart uptake ratio >0.5 on Tc-99m tetrofosmin cardiac perfusion studies is a predictor of adverse cardiac outcomes.

**Background:** Several studies have shown that increased lung-to-heart ratios during early poststress TI myocardial perfusion imaging (MPI) are associated with adverse outcomes. However, data are scarce regarding the prognostic value of increased lung uptake on early poststress images with the technetium (Tc)-based agents. Because Tc-based agents are used more frequently due to the favorable imaging characteristics, we need to know the long-term prognostic implications of this finding.

**Objective:** To determine the prognostic value of an increased lung-to-heart ratio obtained immediately poststress (eLHR) during Tc-tetrofosmin exercise myocardial SPECT imaging.

**Methods:** 276 patients with suspected or known coronary artery disease were evaluated with exercise Tc-tetrofosmin perfusion imaging. All patients underwent coronary catheterization at either 3 months before or 3 months after perfusion imaging. Patients were excluded if unable to exercise or if receiving any medication or had any condition that could possibly affect tetrofosmin pulmonary uptake. To achieve a target heart rate reflective of an adequate stress, β-blockers, calcium channel blockers, and nitrates were held in patients who could tolerate it. ROIs were drawn around the mid-left lung 3 pixels above the anterior myocardial wall, and around the entire left ventricle on early poststress images to calculate the eLHR. Patients were followed up for a mean duration of 32 months, with soft and hard cardiac events as outcomes (soft: revascularization procedures; hard: myocardial infarction, cardiac death). Cox regression analysis was used to determine the prognostic value of several variables, including the eLHR. Kaplan-Meier curves were used to estimate the survival of patients with soft and hard cardiac events with eLHR >0.5 and <0.5 (0.5=upper limit of normal for eLHR).

**Results:** Of 135 patients with eLHR >0.5, 60 had cardiac events (hard n=28; soft, n=32). In this subgroup of 60 patients, the eLHRs were higher, and 56% of this subgroup exhibited at least 2-vessel disease on catheterization. Cox regression analysis revealed that eLHR was an independent predictor for both soft and hard cardiac events. Other variables (summed stress score, shorter exercise duration, and use of nitrates or β-blockers) were also independent predictors of soft and hard cardiac events. Event-free survival rates were also lower among patients with higher eLHRs.

**Conclusions:** An eLHR >0.5 on early poststress Tc-tetrofosmin imaging is predictive of cardiac events.

**Reviewer's Comments:** This interesting study examines the utility of pulmonary uptake on early poststress tetrofosmin MPI. One implication of this study is that the clinical management of patients can be modified based on this finding, even in the absence of significant disease at catheterization, because an elevated eLHR was seen in the 16% of patients with normal catheterization findings who eventually had cardiac events. It would also be interesting to know if this finding rings true in pharmacologic stress testing. (Reviewer-Damita Thomas, MD).

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Keywords: SPECT Myocardial Perfusion Imaging, Poststress Lung-to-Heart Ratio, Prognostic Value

Print Tag: Refer to original journal article
F-18 FLT-PET/CT is more specific than FDG-PET/CT in the detection of the primary lesion as well as regional nodal metastases in patients with non-small cell lung cancer.

**Background:** FDG-PET/CT is widely used in the diagnosis of non-small cell lung cancer (NSCLC). However, its main disadvantage is its low specificity because FDG uptake parallels increased glucose metabolism, which also occurs in benign inflammatory processes. F-18 FLT has been studied as an oncologic imaging agent because it serves as an index of tumor proliferation. FLT is thought to be more tumor-specific than FDG, and it likely is an alternative imaging agent for the diagnosis of NSCLC.

**Objective:** To compare the diagnostic efficacies of FDG-PET and FLT-PET in patients with NSCLC, and to correlate each to the cyclin D1 index.

**Design:** Prospective study.

**Methods:** 31 patients with NSCLC underwent conventional staging, consecutive imaging with both FDG and FLT, and surgical resection within 2 weeks of imaging. Histopathological analysis of the specimens served as the gold standard. Pathology specimens were also immunostained for cyclin D1 for correlation to FDG and FLT uptake values. Two nuclear medicine specialists jointly reviewed the studies, arriving at a consensus decision for each scan.

**Results:** For detection of the primary lesion, the sensitivities of FDG and FLT were 94% and 74%, respectively. For nodal detection, FDG was associated with a sensitivity of 85%, a specificity of 84%, an accuracy of 84%, and a positive predictive value of 52%. For nodal detection, FLT was associated with a sensitivity of 65%, a specificity of 98%, an accuracy of 93%, and a positive predictive value of 89%. FDG and FLT detected both detected 77% of metastatic nodes, with FDG overstaging (false positives) 16% and FLT understaging (false negatives) 16%. SUVmax values were significantly different for both FLT and FDG among the different stages of disease, but not among stage subtype or level of differentiation. As for correlation with the cyclin D1 index, higher FLT uptake showed a significant correlation with greater indices, whereas FDG uptake did not.

**Conclusions:** FLT is more specific and accurate than FDG in the detection of primary lesions and metastatic lymph nodes in patients with NSCLC. FLT also correlated with the cyclin 1 index of cell proliferation.

**Reviewer's Comments:** This intriguing head-to-head comparison evaluates the diagnostic efficacy of FDG with FLT in the same study population. As the results suggest, FLT clearly will not supplant FDG as an oncologic imaging agent in NSCLC patients because 16% is not insignificant in terms of missing disease, but it could perhaps be used in conjunction with FLT to better characterize questionable lesions. Another interesting component of this study is the analysis of correlation between the cyclin D1 cell proliferation index and FDG/FLT uptake. Studies have shown that a higher cyclin D1 index is associated with a poorer prognosis. The authors raise the possibility that FLT imaging might identify high-risk patients. (Reviewer-Damita Thomas, MD).

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**Keywords:** Non-Small Cell Lung Cancer, Diagnosis, PET

**Print Tag:** Refer to original journal article
C-11 MET PET Impacts Management of Brain Tumors

Clinical Impact of 11C-Methionine PET on Expected Management of Patients With Brain Neoplasm.
Yamane T, Sakamoto S, Senda M:


C-11 MET PET could potentially impact clinical management of brain tumor patients by altering therapy decisions.

Background: C-11 methionine (MET) is an emerging imaging agent in the diagnostic workup of brain tumors. Paralleling the enhanced amino acid transport of tumor cells, C-11 has a major advantage of decreased uptake in normal brain parenchyma when compared to FDG. Several studies have reported on diagnostic efficacy of C-11.

Objective: To examine the diagnostic efficacy of C-11 PET and its impact on the clinical management of patients with brain neoplasms.

Methods: 89 scans done on 80 patients with various brain tumors were retrospectively reviewed. Patient scans were subdivided into 2 groups: those undergoing initial diagnosis (n=20) and those undergoing evaluation for tumor recurrence versus radiation necrosis (n=69). All underwent C-11 MET-PET, with 2 nuclear medicine specialists visually interpreting the images as being positive, negative, or equivocal for disease. The impact of C-11 PET on clinical management was assessed using a questionnaire given to the referring clinician that addressed the ultimate diagnosis and whether C-11 MET PET impacted the decision that was derived. An impact in management decision was defined as whether the PET scan inclined the referring clinician to change watchful waiting to treatment, to change treatment to watchful waiting, to include major or minor changes to management strategy, or to make no change in strategy.

Results: Only 47 patients had available data regarding the final diagnostic decision, as well as data regarding whether C-11 PET had an impact on clinical management. Using the final decision deemed by the referring physician as the gold standard, C-11 PET had a sensitivity of 88%, a specificity of 80%, and an accuracy of 86%. C-11 PET had a beneficial diagnostic impact on 36% of cases, and it had a detrimental diagnostic impact on 4%.

Conclusions: C-11 PET can provide useful information in the initial evaluation and subsequent workup of patients with brain tumors.

Reviewer's Comments: This study attempts to show the benefit and possible detriment that the incorporation of C-11 MET-PET adds in the clinical management of patients with brain tumors. However, several aspects of the study make its conclusions equivocal for the true benefit of C-11 MET-PET. These include a study population of various brain tumors. It may be possible that different neoplasms take up C-11 MET to varying degrees, either based on histology or grade. Also, the diagnostic efficacy measures (sensitivity/specificity/accuracy) are suspect because they are based on the referring clinician’s final opinion and not histological proof of presence or absence of disease. It is interesting to note that C-11 PET had a beneficial impact on clinical management in 36% of patients. However, it is difficult to assess exactly what this means in terms of patient outcome because outcome data were not reported. (Reviewer-Damita Thomas, MD).

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Keywords: Brain Tumor, C-11 PET, Diagnosis, Management

Print Tag: Refer to original journal article
PET myocardial perfusion imaging may become commonplace with the development of an F-18 labeled perfusion agent. F-18 BMS747158 was effective at detecting chronic myocardial infarction in animal models.

**Background:** F-18–labeled BMS747158 is a new myocardial perfusion agent being developed for PET imaging and currently in phase II development. It is taken up across a large range of flow rates, and it targets the mitochondria. Compared with Ti-201 and Tc-99m sestamibi, F-18 BMS747158 uptake correlates better with myocardial blood flow. Uptake of the tracer requires blood flow and functioning mitochondria. Previous safety studies have been in normal species or after acute injury. It has not been studied in a chronic cardiac-compromised model.

**Objective:** To test the safety of F-18 BMS747158 in a chronic cardiac-compromised rabbit model.

**Design:** Prospective case-control study.

**Participants:** 7 male New Zealand rabbits.

**Methods:** The left coronary artery was surgically ligated in 4 rabbits, and 3 different rabbits served as controls. The surgically induced cardiac-compromised rabbits were allowed 4 weeks to heal. MicroPET imaging was performed after infusion of F-18 BMS747158. Blood pressure, ECG, heart rate, and QT intervals were monitored 5 minutes before and 20 minutes after tracer injection. Images were processed and reconstructed into short axis, vertical long axis, and horizontal long axis displays. Polar maps were constructed.

**Results:** Images clearly identified normal myocardial uptake in the normal rabbits and uptake in normal versus infarcted myocardial tissue in the cardiac-compromised rabbits. There were no significant changes in the ECG, heart rate, blood pressures, or QT intervals with tracer injection in either the cardiac-compromised or control rabbits.

**Conclusions:** This small study in cardiac-compromised rabbits found that F-18 BMS747158 clearly detected chronic myocardial infarction without producing cardiovascular alterations.

**Reviewer's Comments:** Cardiac PET/CT likely will make significant breakthroughs once an F-18–labeled perfusion agent becomes available. The F-18 BMS747158 agent is a promising candidate. (Reviewer-Thomas F. Heston, MD).
Detection of coronary artery disease by myocardial perfusion imaging is as effective in diabetic patients as it is in nondiabetic patients.

**Background:** Diabetes mellitus is a common condition that is increasing in prevalence. Diabetes increases the risk of coronary artery disease (CAD) by 2 to 3 times in men and by 3 to 5 times in women.

**Objective:** To determine the utility of various tests for diagnosing CAD in patients with diabetes.

**Design:** Literature review. **Resting ECG:** A resting ECG should be obtained in all patients with diabetes, but its value is limited. The resting ECG is normal in 50% of patients with both diabetes and CAD. **High Sensitivity C-Reactive Protein:** Increased levels of high sensitivity C-reactive protein are correlated with increased risk of CAD in diabetic patients. However, more research is needed. **Intima-Media Thickness (IMT):** An increased IMT is associated with an increased risk, but the differences are small. The mean IMT is 0.83 in diabetic patients with a prior myocardial infarction (MI) and is 0.78 in diabetic patients without a prior MI. **Stress ECG:** The accuracy of stress ECG is similar in diabetic versus nondiabetic patients. **Nuclear SPECT:** A normal SPECT scan has a slightly higher annual event rate in diabetic (1.2%) than in nondiabetic patients (0.7%). An abnormal scan carries a much worse prognosis in diabetic versus nondiabetic patients. Retesting should occur earlier in diabetic patients compared to nondiabetic patients. **Stress ECHO:** The value of stress echocardiography (echo) is similar in diabetic and nondiabetic patients. The positive predictive value of stress echo is slightly lower than that of a positive nuclear SPECT (69% vs 75%, respectively). **Coronary Calcium:** Adding a coronary calcium score to a population already known to be at high risk (diabetics) is unknown. **Multi-Slice CT:** Diabetic patients are found to have more extensive, diffuse disease. **Screening in Asymptomatic Diabetics:** It remains unresolved whether screening tests for CAD are useful in diabetic patients.

**Reviewer’s Comments:** This review only touches on cardiac PET/CT, and the authors suggest that a stepwise approach (either perfusion first followed by CT or vice versa) would probably be best. This is a debatable position, and more investigation needs to be made into the benefits versus risks of routine SPECT/CT or PET/CT. (Reviewer-Thomas F. Heston, MD).

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**Keywords:** Diabetes & Coronary Artery Disease, Noninvasive Imaging

**Print Tag:** Refer to original journal article
Coronary CT angiography followed by direct angiography for equivocal/positive findings is the most cost-effective long-term strategy for patients with stable chest pain and intermediate pretest probability of CAD.

**Background:** Coronary CT angiography (CCTA) has been demonstrated to have high sensitivity and high negative predictive value for the detection of coronary artery disease (CAD). Clinicians can choose between CCTA and SPECT myocardial perfusion imaging (MPI) for the evaluation of patients without known CAD who present with stable chest pain.

**Objective:** To determine the incremental cost per correct diagnosis and quality-adjusted life-year (QALY) for various diagnostic strategies that included SPECT MPI or CCTA.

**Methods:** The cost-effectiveness of 5 different diagnostic strategies was assessed. These strategies included CCTA followed by invasive angiography for positive or equivocal studies (strategy 1), CCTA followed by SPECT MPI for equivocal findings and invasive angiography for positive findings (strategy 2), SPECT MPI followed by invasive angiography for positive or equivocal findings (strategy 3), SPECT MPI followed by invasive angiography for positive findings and CCTA for equivocal findings (strategy 4), and direct invasive coronary angiography (strategy 5). Obstructive CAD was defined as ≥50% luminal narrowing of the left main artery or ≥70% narrowing of any of the other major epicardial arteries. In all cases, the test patient was assumed to have intermediate pretest probability of CAD (30% pretest probability of obstructive CAD). This assumption was made so that data could be used from the ACCURACY trial, which evaluated the diagnostic accuracy of CCTA in multiple centers.

**Results:** Regarding near-term costs, strategy 2 (CCTA first) was the least costly strategy, yielding an expected 982.1 correct diagnoses per 1000 patients at an average cost of $1770/patient, including incidental findings. Strategy 1 (CCTA only) was more effective, with 986.3 correct diagnoses at an average cost of $1842/patient. Strategies 3 and 4 (SPECT only and SPECT first) were ruled out by simple dominance on the basis of less effectiveness and higher costs. Strategy 5 (direct angiography) was the most effective and most costly. Strategy 2 (CCTA first) was the least costly long-term strategy, while strategy 1 (CCTA only) was the most long-term cost-effective strategy of the 5 strategies.

**Conclusions:** Patients with intermediate probability of CAD incur lower near-term costs per correct diagnosis and lower long-term costs per QALY by using CCTA-based strategies.

**Reviewer's Comments:** I question whether the investigators underestimated the cost of incidental findings on CCTA. They assumed that incidental findings would lead to 1 additional noncontrast CT for a cost of $299. (Reviewer-Shayne Squires, MD).

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Keywords: Angina, Coronary Artery Disease, Imaging

Print Tag: Refer to original journal article
Fallopian radiotracer uptake is usually bilateral, linear in appearance, and seen adjacent to ovaries.

**Background:** Radiotracer uptake in ovaries of premenopausal female patients can occur on FDG PET/CT as a benign incidental finding associated with ovulation. Radiotracer uptake in fallopian tubes (uterine tubes) has a distinct appearance from that of ovarian uptake and is seen in premenopausal or perimenopausal patients. **Objective:** To assess the frequency of occurrence, anatomic localization, and possible clinical significance of bilateral linear foci of pelvic radiotracer uptake which is observed as an incidental finding, usually adjacent to ovaries, on FDG PET/CT. **Methods:** This retrospective investigation included PET/CT studies using FDG for 159 consecutive female patients, 9 of whom were referred for cancer screening and the remainder for evaluation of known cancer. CT images were enhanced with IV contrast. Regions of interest were drawn to determine maximum standardized uptake values \( (SUV_{\text{max}}) \) for the incidental findings. Findings were correlated with menstrual status. Images were interpreted by 2 experienced readers. **Results:** The mean patient age was 52.3 years (range, 16-81 years). Forty-eight patients had gynecologic malignancy, and 102 had non-gynecologic malignancy. Bilateral pelvic focal uptake, determined to be in fallopian tubes by comparison with CT images, was observed in 8.8% of study subjects. This finding was seen in 1 of 2 teenage patients, 2 of 6 patients in their 20s, 4 of 14 patients in their 30s, 5 of 39 patients in their 40s, 2 of 55 patients in their 50s, and in no patients aged >60 years. Mean \( SUV_{\text{max}} \) was 3.7 (2.6-5.3) on the right and 3.5 (2.5-4.9) on the left. Of the 14 patients with fallopian uptake, 9 were regularly menstruating and in the ovulatory or periovulatory phase. Three of the 14 cases presented with abnormal uterine bleeding, 1 patient was perimenopausal, and 1 patient did not menstruate due to prior hysterectomy. **Conclusions:** Fallopian tube uptake of FDG can occur as a benign finding on PET/CT and is most commonly seen in premenopausal women who are mid-cycle. **Reviewer’s Comments:** Fallopian tube uptake is often mistaken for bowel. It can be distinguished from nodal disease by its characteristic linear or tubular appearance and its proximity to the ovaries. (Reviewer-Shayne Squires, MD). © 2010, Oakstone Medical Publishing

**Keywords:** Fallopian Tubes, Uterine Tubes, FDG Uptake

**Print Tag:** Refer to original journal article
Aortic involvement develops in an estimated 18% of patients with giant cell arteritis. It may appear many years after the diagnosis and completed treatment.

**Background:** Giant cell arteritis (GCA) is a primary large-vessel vasculitis that generally occurs in elderly patients and affects the external carotid artery and its branches. In a subset of patients, the aorta and its branches are also affected. GCA-associated aortitis can be asymptomatic and can occur years after the initial diagnosis of GCA, so its occurrence may be underestimated.

**Objective:** To review the occurrence of aortitis in GCA and the diagnostic utility of MRI and FDG-PET for detecting it.

**Methods:** The authors reviewed the literature and report on the epidemiology, pathogenesis, clinical features, and diagnostic strategies for GCA-associated aortitis.

**Results:** Aortic involvement in GCA can occur in up to 18% of patients, but it is likely underestimated due to its late presentation and silent clinical features. Patients with GCA are 17.3 times more likely than the background population to develop thoracic aortic aneurysm and 2.4 times more likely than the background population to develop isolated abdominal aortic aneurysm. GCA is thought to be antigen driven and only affects large- and mid-sized vessels known to have vasa vasorum. Thoracic involvement of the aorta is more likely than abdominal involvement, probably because of the increased presence of vasa vasorum proximally as well as changes in the content of collagen and elastin fibers in the vessel wall. Sixty percent of GCA patients present with headache. Patients with large-vessel arteritis may present with claudication of the extremities. GCA can affect the entire aorta, resulting in dilatation or aneurysm with complications occurring years after the initial diagnosis and treatment. MRI can be used to detect structural abnormalities in the aorta as well as features consistent with inflammation, such as vessel wall thickness, edema, and contrast enhancement. FDG-PET can detect aortitis in the initial phase of GCA in most patients with aortic involvement. Another advantage of PET is its ability to detect involvement of aortic branches. PET can be used to assess response to therapy. PET generally is insensitive to involvement of smaller, intracranial vessels.

**Conclusions:** Aortitis is a significant complication of GCA that is often diagnosed late. FDG-PET can be used to detect aortitis at an earlier stage in the disease and to follow response to therapy.

**Reviewer's Comments:** Recently at our institution, we detected aortitis by FDG-PET in a patient being evaluated for fever of unknown origin. The pattern on PET showed concentric uptake in the aortic wall, sparing the lumen. Both the ascending and proximal descending segments of the aorta were involved. This finding preceded the diagnosis of GCA but helped guide the clinicians to perform a temporal artery biopsy, which confirmed the presence of GCA. The patient was also evaluated by transesophageal echocardiography, which failed to show any abnormality in the aortic wall. (Reviewer-Shayne Squires, MD).
Luminal Stenosis on CCTA Predicts Ischemia on SPECT-MPI

Assessment of the Relationship Between Stenosis Severity and Distribution of Coronary Artery Stenoses on Multislice Computed Tomographic Angiography and Myocardial Ischemia Detected by Single Photon Emission Computed Tomography.

Tamarappoo BK, Gutstein A, et al:

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Patients with coronary artery luminal stenoses of <50% by coronary CT angiography are unlikely to benefit from additional imaging with SPECT myocardial perfusion imaging.

**Background:** A few studies with heterogenous, modest-sized patient populations compare the results of coronary CT angiography (CCTA) with SPECT myocardial perfusion imaging (SPECT-MPI) for the detection of coronary artery disease (CAD).

**Objective:** To determine whether the severity of coronary artery stenosis detected by CCTA could be used to predict the detection of myocardial ischemia by SPECT-MPI.

**Design:** Retrospective study.

**Participants:** 292 consecutive patients without known CAD.

**Methods:** All patients underwent CCTA and SPECT-MPI within 6 months. Patients were classified as having low (<15%), intermediate (15%-85%), or high (>85%) pretest probability of CAD using the method of Diamond and Forrester, which is based on the characterization of chest pain. CCTA images were interpreted by 2 observers who graded stenoses on a scale of 0 to 6 (0=0%, 1=1%-24%, 2=25%-49%, 3=50%-69%, 4=70%-89%, 5=90%-99%, and 6=100%). Patients underwent stress MPI using either adenosine or treadmill exercise. The radiotracer was Tc-99m sestamibi.

**Results:** With increasing stenosis grade, there was an increase in proportion of patients with abnormal SPECT-MPI. A small proportion of patients with <50% stenosis on CCTA had stress MPI abnormalities (approximately 3%-5%). The proportion of patients with abnormal SPECT-MPI and 25% to 49% stenosis was 0. For luminal stenosis of 50% to 70%, 70% to 89%, or 90% to 100%, the proportion of patients with abnormal SPECT-MPI was 17%, 42%, and 74%, respectively. ROC analysis of SPECT-MPI was performed. For the detection of ≥70% stenosis, the area under the curve (AUC) was 0.82. This was not significantly different from the AUC for the detection of ≥50% stenosis (0.83). For the detection of ≥90%, the AUC was 0.73.

**Conclusions:** The presence of ischemia by SPECT-MPI increases in proportion to the severity of luminal stenosis. Individuals with luminal stenosis <50% are so unlikely to have myocardial ischemia that further testing with SPECT-MPI is not warranted.

**Reviewer’s Comments:** Interestingly, abnormal SPECT-MPI was more likely when plaques were noncalcified or partially calcified than when they were calcified. The most significant predictor of ischemia remained stenosis severity. (Reviewer-Shayne Squires, MD).

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Keywords: Coronary Artery Stenosis, Predicting Ischemia, CCTA

Print Tag: Refer to original journal article
I-123 MIBG is unlikely to play an important role in the future of neuroendocrine tumor imaging. Somatostatin receptor imaging performs better overall, while PET may provide complementary information.

**Background:** Neuroendocrine tumors (NETs) can be imaged using In-111–labeled octreotide (somatostatin receptor imaging; SRI), I-123 MIBG (based on monoamine metabolism), or FDG-PET. Selection criteria for choosing an imaging method remain unsettled.

**Objective:** To prospectively compare the sensitivity of SRI, I-123 MIBG, and FDG-PET for imaging NETs.

**Participants:** 96 consecutive patients referred for further evaluation and treatment of histologically verified NETs. Patients had either gastrointestinal or bronchopulmonary tumors and primary, residual, or recurrent disease.

**Methods:** For SRI, patients underwent planar and SPECT/CT imaging 24 hours after the IV administration of In-111 DTPA octreotide (Octreoscan™). Similarly, patients underwent planar and SPECT/CT imaging 24 hours after the IV administration of I-123 MIBG. PET/CT imaging was performed following the administration of F-18 FDG. Tumor proliferation was assessed by staining biopsy specimens for Ki67.

**Results:** In a patient-based analysis, the sensitivities of SRI, I-123 MIBG, and FDG-PET for the detection of metastasis or primary tumor were 89%, 52%, and 58%, respectively. In none of the patients was I-123 MIBG the only positive test. In a lesion-based analysis, SRI performed significantly better than PET and I-123 MIBG for the detection of liver metastases. There was no significant difference between SRI and PET for the detection of lymph node metastases, but both performed better than I-123 MIBG. SRI performed better than PET and MIBG for the detection of bone metastases. SRI was more sensitive for tumors with a proliferation index <15%, while PET was more sensitive for tumors with a proliferation index >15%. No such dependence was found for MIBG.

**Conclusions:** SRI performed better overall than FDG-PET and I-123 MIBG for the detection of neuroendocrine tumors. PET may provide complementary information, particularly when the proliferation index is high. The role for I-123 MIBG appears limited.

**Reviewer's Comments:** PET was more likely to be positive in patients with a higher metastatic burden. It may play a role in more aggressive disease and indicate worse prognosis. (Reviewer-Shayne Squires, MD).

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Keywords: Neuroendocrine Tumors, Somatostatin Receptor Imaging, PET, MIBG

Print Tag: Refer to original journal article