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^{68}Ga-DOTATOC PET/CT Effectiveness for Diagnosis and Staging in Neuroendocrine Tumors in Comparison with Octreoscan and High-Resolution, Contrast-Enhanced CT

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Background: Neuroendocrine tumors (NETs) affect children, adolescents, and adults. The incidence of NETs has been rising; surgery remains the only curative treatment. With great variability in primary tumor location and symptomatology, a sensitive and specific method for diagnosis and staging is a critical need. Positron emission tomography (PET) is more sensitive than single photon emission tomography (SPECT) and can be completed in one visit. Furthermore, Gallium-68 (68 min half-life) provides sensitive imaging with less radiation exposure than Indium-111 (2.8 day half-life). We *hypothesize* that ^{68}Ga-DOTA^{0}-Tyr^{3} octreotide (^{68}Ga-DOTATOC) PET/CT will be more sensitive, accurate, and convenient than OctreoScan (^{111}In-DTPA-Octreotide) SPECT/CT for diagnosis and staging of neuroendocrine tumors.

Methods: Volunteers (3 to 92 years old) have enrolled in this University of Iowa, IRB approved study. Subjects received a ^{68}Ga-DOTATOC PET/CT, and an ^{111}In-DTPA-Octreotide SPECT, high-resolution, contrast-enhanced CT or MRI within 120 days. Scans were read and compared by a board certified nuclear

medicine physician. Discordant and newly observed lesions detected on PET/CT but not on ^{111}In-DTPA-Octreotide SPECT/CT were confirmed by surgery or a second ^{68}Ga-DOTATOC PET/CT. Kidney and liver function were assessed pre- and post-scan. SSTR2 status of each subject's tumor was confirmed by immunohistochemistry with a specific anti-SSTR2 monoclonal antibody.

Results: ^{68}Ga-DOTATOC PET/CT detected at least one positive lesion not found on Octreoscan SPECT/CT in 18 of 52 subjects (34.6%); 13 were confirmed with a second PET/CT and 3 by surgical exploration. Two subjects declined. Grade I increases in kidney and liver function tests were seen in eight subjects. Reported side-effects included flushing, nausea, and pain/discomfort associated with lying still.

Enrolled Subjects	Discordant PET/SPECT	Confirmation Method			
		2nd PET/CT	Surgery	Declined	False Positives
52	18 (34.6%)	12 (23%)	3 (5.7%)	2 (3.8%)	1 (1.9%)

Conclusions: The ^{68}Ga-DOTATOC PET/CT is a safe, specific, and sensitive alternative to OctreoScan SPECT/CT. ^{68}Ga-DOTATOC PET/CT enables diagnosis and staging of NETs with a single exam that is more convenient for the patient and decreases radiation exposure compared to OctreoScan SPECT/CT.