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[68Ga] DOTA-TATE (NETSpot) PET/CT Imaging of Pulmonary Neuroendocrine Tumors

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BACKGROUND

Neuroendocrine tumors (NETs), also known as carcinoid, comprise a heterogeneous group of malignancies that arise from neuroendocrine cells throughout the body, most commonly originating from the gastrointestinal tract and lungs. Lung NETs originate from pulmonary neuroendocrine cells (PNECs) that occur as individual cells or small clusters, accounting for approximately 25% of primary lung neoplasms. Lungs NETs can be classified into four subtypes: well-differentiated, low-grade typical carcinoids (TCs); well-differentiated, intermediate-grade atypical carcinoids (ACs); poorly differentiated, high-grade large cell neuroendocrine carcinomas (LCNECs); and poorly differentiated, high grade small cell lung carcinomas (SCLCs). Lung NETs are considered a distinct family of tumors with shared morphologic characteristics. There is evidence to suggest that TCs and ACs are morphologically distinct from LCNECs and SCLCs. Some TCs and ACs develop in patients with diffuse idiopathic pulmonary neuroendocrine cell hyperplasia (DIPNECH), a rare pre-neoplastic lesion characterized by the associated of pre-invasion hyperplasia of PNECs and neuroepithelial bodies in the respiratory epithelium. Carcinoid tumors express somatostatin receptors, which allows for imaging with the use of [68Ga] DOTA-TATE (NETSpot) PET/CT and FDG PET/CT. These studies image the uptake of somatostatin by the tumor rather than the actual tumor and acquire a maximum standardized uptake value (max SUV).

METHODS

We obtained permission from the Institutional Review Board for this retrospective review. The Mayo Florida registry was searched with chart review that looked at the max SUV of patients with pulmonary NETs who received [68Ga] DOTA-TATE (NETSpot) PET/CT imaging. We identified multiple patients with biopsy proven pulmonary NETs. Tumor imaging characteristics, pathology, and associated findings were reviewed, analyzed, and recorded.

RESULTS

Patient Characteristics: Seventeen patients had biopsy proven lung NET, 12 cases of typical and 5 cases of atypical carcinoid. The demographics are summarized in Table 1. Most lesions where found in the lung parenchyma with a couple in the hilum.

Radiologic Data: CT, [^{68}Ga] DOTA-TATE (NETSpot) PET/CT, and FDG PET/CT imaging were reviewed with max SUV measurement included in Table 1. Max SUV of all lesions ranged from 1.2 – 57.5. Representative images are included on Figure 1a, 1b, and 2. Twelve patients were diagnosed with typical carcinoid with the highest uptake of 57.5, range of max SUV of 3.6-57.5.

Five patients were diagnosed with atypical carcinoid, range of max SUV of 1.2–6.2. Of the 3 patients with DIPNECH, one had pathology of atypical carcinoid and 2 were found to be typical carcinoid. The patients with typical carcinoid were found to have a higher max SUV than atypical carcinoid.

Pathological Data: Typical carcinoid lesions had a lower Ki-67 than atypical carcinoid.

CONCLUSIONS

[68Ga] DOTA-TATE (NETSpot) PET/CT can identify patients with pulmonary neuroendocrine tumors with high specificity and sensitivity. The maximum SUV seems to decrease as the disease progresses, which is in line with common knowledge. Maximum SUV is not necessarily involved in the grading of these tumors; however it may give a marker about the extent of disease and whether there is a recurrence. The results need to be further verified in a larger sample size and with clinical follow up to correlate PET characteristics and outcomes.

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