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Diagnostic Performance of PET or PET/CT Utilizing 18F-DOPA, 68Ga-DOTATATE, 18F-FDG, 18F-FDA, and CT and MRI in the Detection of MEN2A-related-pheochromocytoma

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BACKGROUND

Pheochromocytoma (PHEO) is a rare neuroendocrine tumor arising from chromaffin cells of adrenal gland that can cause life-threatening complications due to overproduction of catecholamines. Per EANM/SNMMI 2019 guidelines for radionuclide imaging of PHEO and paraganglioma, ^{18}F-fluoro-L-dihydroxyphenylalanine ^{18}F-FDOPA) is recommended as a positron emission tomography (PET) radiotracer of choice followed by ^{68}Ga-DOTA(0)-Tyr(3)-octreotate (68Ga-DOTATATE) and ^{18}F-fluoro-2-deoxy-D-glucose (^{18}F-FDG), respectively in the detection of PHEO associated with multiple endocrine neoplasia 2A (MEN2A), caused by germline mutation in *rearranged during transfection* (*RET*) gene. No study has compared the diagnostic performance of these radiotracers in patients with MEN2A-related PHEO. The purpose of this prospective study was to evaluate and compare the detection rates of ^{18}F-FDOPA, ^{68}Ga-DOTATATE, ^{18}F-FDG, and ^{18}F-fluorodopamine (^{18}F-FDA) PET or positron emission tomography/computed tomography (PET/CT), contrast-enhanced computed tomography (CT), and contrast-enhanced magnetic resonance imaging (MRI) in the detection of MEN2A-related PHEO.

METHODS

Between 2008 and 2021, 19 patients (females:males, 10:9; mean age, 36.3±9.9 years) prospectively underwent ^{18}F-FDOPA PET (N=3) or PET/CT (N=11), ^{68}Ga-DOTATATE PET/CT (N=12), ^{18}F-FDG PET/CT (N=18), and ^{18}F-FDA PET (N=4) or PET/CT (N=4), CT (N=20) and MRI (N=18). The mean duration between scans was less than a month. The scans were evaluated by a nuclear medicine physician or radiologist.

The histopathologic diagnosis served as the reference standard. The McNemar test was used to compare PHEO detection rates between the imaging modalities. Two-sided p values <0.05 were considered significant.

RESULTS

Nineteen patients had 26 PHEOs [12 unilateral (7 right, 5 left) and 7 bilateral] on histopathology. ^{18}F-FDOPA PET or PET/CT demonstrated a PHEO detection rate of 15/18 [83.3%, 95% confidence interval (CI): 58.6-96.4%]. ^{68}Ga-DOTATATE PET/CT, ^{18}F-FDG PET/CT, ^{18}F-FDA PET or PET/CT, CT, and MRI showed PHEO detection rates of 12/15 (80.0%, 95% CI: 51.9-95.7%), 7/23 (30.4%, 95% CI: 13.2-52.9%), 6/12 (50.0%, 95% CI: 21.1-78.9%), 24/26 (92.3%, 95% CI: 74.9-99.1%), and 22/24 (91.7%, 95% CI: 73.0-99.0%), respectively. The difference in detection rates between ^{18}F-FDG and other scans was significant ($p<0.05$).

CONCLUSIONS

The study was performed in a small cohort of MEN2A-related PHEO patients demonstrating CT, an anatomic imaging modality with the highest detection rate whereas in functional imaging, ^{18}F-FDOPA PET/CT showed the highest detection rate followed by ^{68}Ga-DOTATATE, ^{18}F-FDA, and ^{18}F-FDG in supporting the 2019 EANM/SNMMI guidelines. A difference in detection rates between various imaging modalities and ^{18}F-FDG was found.

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