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

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BACKGROUND

The purpose of this prospective study was to evaluate and compare the detection rates of ¹⁸F-L-dihydroxyphenylalanine (¹⁸F-FDOPA), ⁶⁸Ga-DOTATATE, ¹⁸F-FDG, and ¹⁸F-fluorodopamine (18F-FDA) PET or positron emission tomography/computed tomography (PET/CT), computed tomography (CT), and magnetic resonance imaging (MRI) in the detection of VHL-related pheochromocytoma (PHEO).

METHODS

Between October 2007 and October 2021, twelve patients (females: males, 5:7; mean age, 27.9±13.6 years) prospectively underwent ¹⁸F-DOPA PET (N=2) or PET/CT (N=7), ⁶⁸Ga-DOTATATE PET/CT (N=6), ¹⁸F-FDG PET/CT (N= 11), and ¹⁸F-FDA PET (N=2) or PET/CT (N=2) with VHL-related PHEOs. Additionally, these patients also underwent CT (N=12) and MRI (N=11). The mean duration between CT and ¹⁸F-FDOPA was 10±15 days, between CT and ⁶⁸Ga-DOTATATE 7±10 days, between CT and ¹⁸F-FDG 5±10 days, between CT and ¹⁸F-FDA 3±2 days, and between CT and MRI 2±4 days. The PET or PET/CT and CT and MRI scans were evaluated by a nuclear medicine physician and body radiologist. All but one patient underwent surgical resection of PHEOs, and the histopathologic diagnosis served as a reference standard. PHEO detection rates were compared for all of the imaging modalities. For statistical analysis, the McNemar test was used to compare detection rates between the imaging modalities. Two-sided p values <0.05 were considered significant.

RESULTS

Twelve patients had 19 PHEOs [3 unilateral (2, right) and 6 bilateral]. 18/19 tumors underwent surgical resections and were proved to be PHEOs on histopathologic examination and 1 PHEO is awaiting surgery in whom a clinical diagnosis of PHEO was made. ^{18}F -FDOPA PET or PET/CT demonstrated a PHEO detection rate of 12/14 [85.7%, 95% confidence interval (CI): 57.2-98.2%]. ^{18}F -FDG PET/CT, ^{68}Ga -DOTATATE PET/CT, ^{18}F -FDA PET or PET/CT, and CT, and MRI showed PHEO detection rates of 16/17 (94.1%, 95% CI: 71.3-99.6%), 5/9 (55.6%, 95% CI: 21.2-86.3%), 4/6 (66.7%, 95% CI: 22.3-95.7%), 17/19 (89.5%, 95% CI: 66.9-98.7%), and 17/17 (100%, 95% CI: 80.5-100%), respectively. The difference in detection rates between none of the imaging modalities achieved a statistical significance ($p < 0.05$).

CONCLUSIONS

The study was performed in a small cohort of in *VHL*-related PHEO demonstrating MRI, an anatomic imaging modality with the highest detection rate whereas amongst functional PET or PET/CT imaging, ^{18}F -FDG showed the highest detection rate followed by ^{18}F -FDOPA, ^{18}F -FDA, and ^{68}Ga -DOTATATE. However, no difference in detection rates by various imaging modalities was found and hence, multicentric clinical trials needs to be conducted to support the statistical relevance as it was not seen in this study.

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