Clinical value of 18-fluorine-fluorodihydroxyphenylalanine positron emission tomography/computed tomography in the follow-up of medullary thyroid carcinoma.

Abstract:
18-Fluorine-fluorodihydroxyphenylalanine positron emission tomography (\(^{18}\)F-DOPA PET) is a sensitive method for detecting medullary thyroid carcinoma (MTC). The advent of PET/computed tomography (CT) has enabled more sensitive and specific lesion identification using various tracers in many other tumors. The aim of this study was therefore to test the hypothesis that combined \(^{18}\)F-DOPA PET/CT more accurately detects MTC lesions than each modality does alone. Twenty-eight consecutive \(^{18}\)F-DOPA PET, CT, and \(^{18}\)F-DOPA PET/CT scans of patients followed up for sporadic MTC or multiple endocrine neoplasia 2 syndrome-associated MTC were reviewed retrospectively in randomized sequence by two blinded readers, one a nuclear medicine physician and the other a radiologist, with extensive experience interpreting such images. Of 18 lesions detected concurrently by the three modalities, PET identified all as positive for MTC, but was unable to definitively localize 4 (22%) lesions. CT could definitively localize all 18 lesions, but could not definitively diagnose or exclude MTC in 6 (33%) lesions. Further, CT falsely identified as MTC-negative one lesion that was judged to be MTC-positive by both PET and PET/CT. Only PET/CT scans accurately characterized and localized all 18 lesions.
patient basis, the sensitivity of (18)F-DOPA PET/CT for MTC was 74% and the specificity, 100%. In
the present series, no truly MTC-positive (18)F-DOPA PET/CT case was found in patients with basal
human calcitonin (hCt) levels under 60 pg/mL, and conversely, no truly MTC-negative PET/CT case
was found in patients with basal hCt over 120 pg/mL. Between hCt concentrations of 60 and 150
pg/mL true-negative, false-negative, and true-positive scans all were obtained. (18)F-DOPA PET/CT
had 100% sensitivity and specificity when hCt at the time of scanning was over 150 pg/mL, the
threshold at which the 2009 American Thyroid Association guidelines recommend performing
additional imaging including (18)F-DOPA PET/CT. (18)F-DOPA PET/CT allows for a more accurate
diagnosis and localization of MTC lesions than do (18)F-DOPA PET or CT alone. Supporting the
recent American Thyroid Association recommendations on additional imaging in MTC, (18)F-DOPA
PET/CT appears to have 100% sensitivity in patients with hCt over 150 pg/mL.