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Comparison of ^{68}Ga-somatostatin Analogues, ^{18}F-DOPA and ^{18}F-FDG PET/CT in Patients with Recurrent Medullary Thyroid Carcinoma

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Background: Early detection of recurrences is a crucial step in the management of patients with medullary thyroid carcinoma (MTC). Currently, there is growing interest for PET tracers in MTC such as: ^{18}F-FDG (reflecting glucose metabolism), ^{18}F-DOPA (reflecting amine decarboxylation), ^{68}Ga-somatostatin analogues (reflecting somatostatin receptors expression).

Aim of our study was to compare PET/CT with ^{68}Ga-somatostatin analogues, ^{18}F-DOPA and ^{18}F-FDG in a series of patients with suspected recurrent MTC on the basis of increased calcitonin levels during follow-up, but with conventional imaging inconclusive for loco-regional and/or metastatic spread.

Methods: Eighteen patients (6 male/12 female; mean age: 53.5 years) who had performed PET/CT with ^{68}Ga-somatostatin analogues, ^{18}F-DOPA and ^{18}F-FDG within 3 months were selected. Comparison of the results was done on a per-patient and on a per-lesion basis. Verification of PET/CT findings was achieved by histopathology (13 cases) or imaging follow-up (5 cases).

Results: Foci of abnormal uptake were observed in 13/18 patients at ^{18}F-DOPA PET/CT (sensitivity: 72%), 6/18 patients at ^{68}Ga-somatostatin analogues PET/CT (sensitivity: 33%), in 3/18 patients at ^{18}F-FDG PET/CT (sensitivity: 17%); 5/18 patients (28%) were negative with all procedures. ^{18}F-DOPA PET/CT detected more lesions than ^{18}F-FDG and ^{68}Ga-somatostatin analogues PET/CT (61 *vs* 20 *vs* 14, respectively; $p<0.05$).

Conclusion: ^{18}F-DOPA PET/CT seems to be the most sensitive imaging method to detect recurrences in patients with MTC. Studies investigating larger patient population are needed to confirm these results and to explain the lack of abnormal uptake of all tracers in some cases. In any case, the different uptake patterns observed with the various PET tracers reflect different metabolic pathways (uptake of hormone precursors, receptor expression, glucose metabolism); this information may help to broaden knowledge of MTC and potentially to select the most appropriate treatment.