Response of calcitonin levels due to positron emission tomography with ^{18}F-FDG

To the Editor: The effect of small radiation doses on malignant tissue is still open. Fluorine 18-deoxyglucose (^{18}F-FDG) is a very common tracer used with PET in oncological patients. Until now, reports are available about an interaction of diagnostic doses of ^{18}F-FDG and a malignant tumor. However, we noted in a patient with a medullary thyroid carcinoma a response to calcitonin levels after the diagnostic ^{18}F-FDG PET/CT examinations.

A 43 years old female patient with medullary thyroid cancer had received total thyroidectomy and left cervical lymph node dissection and radioisotope treatment in November 2002. Calcitonin elevation was noted since 2007. No further therapy was initiated.

Follow-up PET, ^{18}F-FDG scans were performed from 2007 to 2011 due to abnormal calcitonin levels. These scans demonstrated small lymph node lesions, primarily in the submandibular region (Fig. 1). There were no major abnormal findings on these PET studies.

Calcitonin levels were varying over time and we noted a decrease always following each PET study (Fig. 2). This decrease was surprisingly high. For example, the calcitonin level prior to the third PET was 1865pg/mL and decreased after the PET examination down to 498pg/mL. No treatment was performed during the follow-up period.

It is not clear, how ^{18}F-FDG has an impact on calcitonin levels. Experimental studies in breast cancer and colorectal cancer have shown a tumoricidal effect on the cancer cells [1, 2]. Others used a breast cancer model in mice and performed treatment with 74-148MBq ^{18}F-FDG [1]. The authors observed apoptosis in 4% of the small tumors, about 0.15-0.17cm in diameter, while in tumors with a diameter of about 1cm necrosis was primarily noted in 14% of the total tumor volume. In the control group, with small tumors without treatment, only less than 1% apoptosis was observed.

Others used a colorectal cancer mouse model to assess the effect of ^{18}F-FDG [2]. The authors used a control group and three treatment groups, using 1.5, 3.0, 222MBq ^{18}F-FDG. The growth rate of the tumors was significantly lower for all the three treatment groups as compared to the control group. A higher dose had a better treatment response.

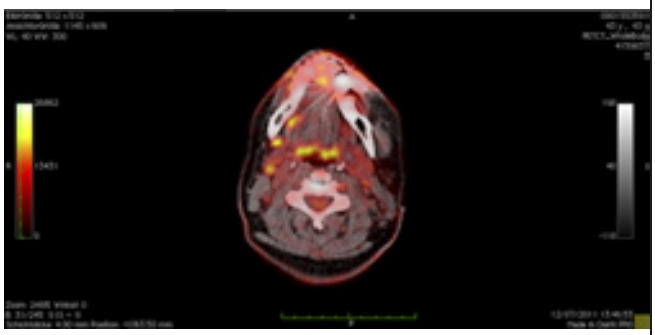

Figure 1. ^{18}F-FDG PET/CT from July 2011. Small lymph nodes on the right side, no other findings were present.

While in these experimental studies high doses of ^{18}F-FDG were used to achieve a therapeutic effect, substantial information is missing about low doses of ^{18}F-FDG and their impact. It may be discussed, whether^{18}F-FDG may have a trigger function on the immunological response to the tumor.

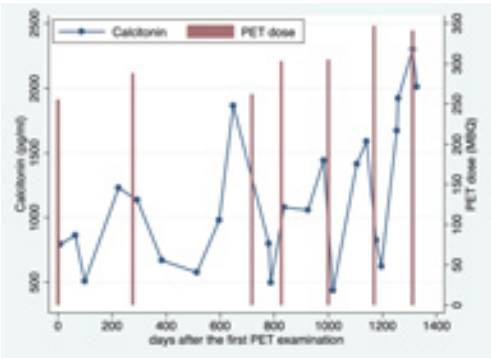

Figure 2. Calcitonin levels (connected points) and PET/CT examinations (injected dose as bars) in a patient with medullary thyroid cancer. Decrease of calcitonin levels following each PET study. The time scale is normalized according to the initial PET/CT scan.

The authors declare that they have no conflicts of interest.

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Hell J Nucl Med 2012; 15(3): 251 *Published on line: 2 December 2012*