

Dosimetry

2D dosimetry was performed for the bladder (all patients) and large intestine, if visible at more than one time point on images, which was the case in one patient. For all imaging time points, regions of interest were manually drawn around the whole body, bladder and, if applicable, large intestine, on both the anterior and the posterior scans. Background regions were placed close to the regions of interest for background correction. The geometric mean value, between anterior and posterior, was taken and corrected for attenuation using the conjugate-view method. Whole-body activity acquired at 1 hour after injection of ^{177}Lu -PP-F11N was set as 100 percentage injected activity. Time-activity curves derived from the whole-body studies were analyzed with the OLINDA/EXAM 1.0 (Vanderbilt University, TN, USA) software. Organ doses were calculated with the OLINDA/EXAM 1.0 whole-body female and male phantom. For this calculation stomach and kidney numbers of disintegrations for the source organs were obtained from 3D dosimetry data. In doing so the gamma radiation cross-fire effect from stomach and kidneys to the other organs is considered. Blood marrow doses were determined by the blood-based red marrow dose methodology, which assumes a linear relation between the blood residence time and the red marrow residence time. For dosimetry calculations with OLINDA/EXAM 1.0 a blood-to-red-marrow activity concentration ratio of 1 was used as recommended by the European Association of Nuclear Medicine. Final organ dosimetry results which are presented in Supplemental Table 2 are based on OLINDA/EXAM 1.0 calculations except stomach and kidneys which were done with 3D volume-based MIRD dosimetry as described in the Method part of the manuscript.

Supplemental Table 1. Patients' demography and MTC characteristics

Patient no.	Age (y)	Sex	TNM	Time after first diagnosis (months)	Ct* before study enrollment (pg/ml)	CEA* before study enrollment ($\mu\text{g/l}$)
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1	60	F	pT4 N1 Mx	129	3150	15.5
2	40	M	pT3 N1b M1	7	5900	64.8
3	54	F	pT4 N1 M0	186	1272	24.5
4	32	F	Tx N1 M1	125	53694	1436
5	67	M	Tx N1 Mx	230	226	3.3
6	46	M	pT3 N1b	8	134	2.7

*Abbreviations and normal laboratory values: Ct = calcitonin, normal value Ct < 8.6 pg/ml,

CEA = carcinoembryonic antigen, normal value CEA < 3.4 µg/l

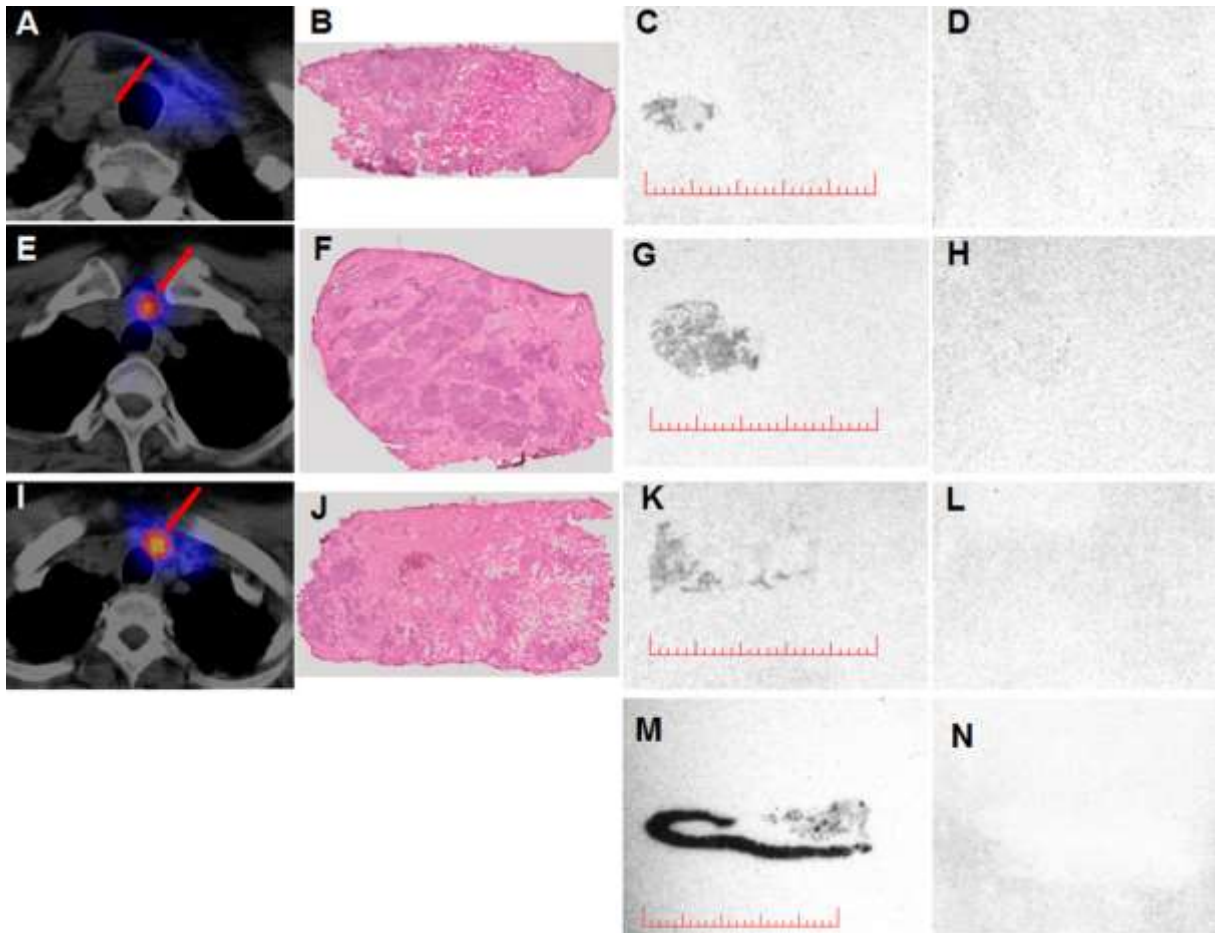
Supplemental Table 2. Absorbed organ and effective doses of ¹⁷⁷Lu-PP-F11N without and

Organ/tissue	Median absorbed radiation dose in Gy/GBq (IQR)		Test for superiority* <i>P</i> =
	Without SG	With SG	
Adrenals	0.0012 (0.0008-0.0021)	0.0011 (0.0008-0.0024)	1.00
Brain	0.0000	0.0000	1.00
Breasts	0.0002 (0.0001-0.0004)	0.0002 (0.0001-0.0005)	0.22
Gallbladder wall	0.0011 (0.0008-0.0021)	0.0012 (0.0007-0.0029)	1.00
LLI wall	0.0017 (0.0009-0.0025)	0.0011 (0.0010-0.0016)	0.38
Small intestine	0.0013 (0.0009-0.0016)	0.0010 (0.0007-0.0021)	0.69
Stomach wall	0.42 (0.25-1.01)	0.49 (0.31-1.22)	0.69
ULI wall	0.0012 (0.0010-0.0019)	0.0011 (0.0008-0.0025)	1
Heart wall	0.0007 (0.0005-0.0015)	0.0080 (0.0005-0.0021)	0.69
Kidneys	0.11 (0.067-0.13)	0.062 (0.053-0.093)	0.38
Liver	0.0006 (0.0004-0.0011)	0.0006 (0.0004-0.0015)	0.69
Lungs	0.0004 (0.0003-0.0007)	0.0004 (0.0003-0.0011)	0.03
Muscle	0.0007 (0.0005-0.0009)	0.0005 (0.0004-0.0011)	0.69

with co-administration of succinylated gelatin.

Ovaries	0.0012	(0.0008-0.0017)	0.0010	(0.0009-0.0013)	0.69
Pancreas	0.0035	(0.0022-0.0079)	0.0039	(0.0025-0.0010)	0.69
Red marrow	0.0280	(0.026-0.034)	0.0320	(0.025-0.0375)	0.22
Osteogenic cells	0.0066	(0.0053-0.0082)	0.0074	(0.0062-0.0088)	0.22
Skin	0.0002	(0.0002-0.0003)	0.0002	(0.0001-0.0004)	0.13
Spleen	0.0023	(0.0014-0.0051)	0.0025	(0.0016-0.0058)	0.69
Testes	0.0002	(0.0-0.0004)	0.0002	(0.0-0.0004)	0.25
Thymus	0.0001	(0.0001-0.0003)	0.0001	(0.0001-0.0004)	0.30
Thyroid	Not applicable †		Not applicable †		
Urinary bladder wall	0.27	(0.22-0.37)	0.26	(0.23-0.32)	0.69
Uterus	0.0018	(0.0015-0.0027)	0.0018	(0.0017-0.0020)	0.69
Total body	0.0030	(0.0023-0.0041)	0.0025	(0.0021-0.0050)	0.69
Effective dose (Sv/GBq)	0.077	(0.062-0.138)	0.075	(0.051-0.167)	0.69

*Test for superiority: two-sample paired sign test with a significance level, α , of 0.05. † Not applicable as all patients had previous thyroidectomy. Abbreviation: SG = succinylated gelatin, LLI = lower large intestine; ULI = upper large intestine



Supplemental Figure 1. Images from patient 3 showing axial ^{177}Lu -PP-F11N SPECT/CT scans (A,E,I) of suspicious lymph nodes (red arrows), with corresponding histology and *in vitro* autoradiography results in the same row: fraction of hematoxylin-eosin-stained sections (B,F,J) together with autoradiograms indicating total binding of ^{111}In -PP-F11N (C,G,K) and non-specific binding (D,H,L). M and N show dog stomach tissue as a positive control. First row: 8 x 8 mm lesion without uptake in SPECT/CT (A, red arrow) corresponds to a lymph node metastasis with 40% tumor cells (B) with specific ^{111}In -PP-F11N binding (C and D). Second row: 9 x 9 mm lesion with uptake in SPECT/CT (E, red arrow) corresponds to a lymph node metastasis with 60% tumor cells (F) with specific ^{111}In -PP-F11N binding (G and H). Third row: 16 x 18 mm lesion with uptake in SPECT/CT (I, red arrow) corresponds to a lymph node metastasis with 40% tumor cells (J) with specific ^{111}In -PP-F11N binding (K and L). Red bars: 10 mm.