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Case Study

Robust quantification of neuroendocrine tumor imaging: xSPECT Quant with ^{111}In tracers enables new possibilities in SPECT/CT imaging

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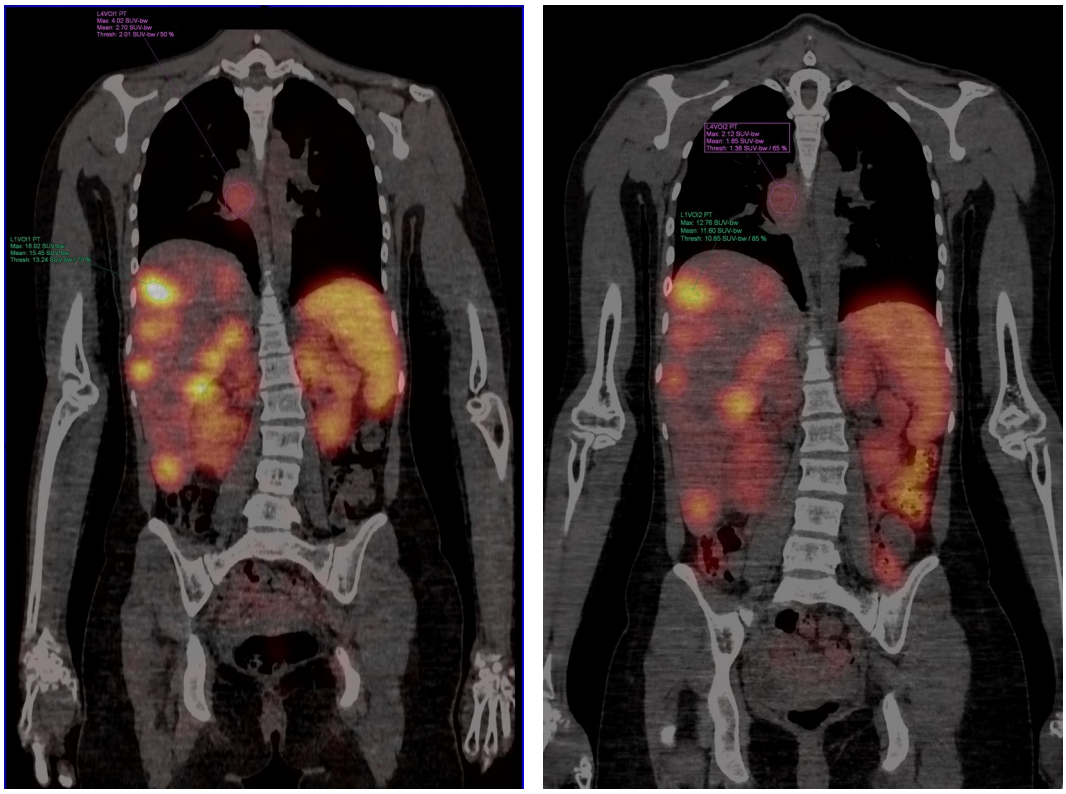
History
A patient with a well-differentiated neuroendocrine tumor stage IV [HEP, LYM] of the pancreas G2, MIB1 ~5% in March 2014, was treated with different chemotherapy regimens with progressive disease until January 2016. After two peptide receptor radionuclide therapy (PRRT) cycles, the patient was referred for restaging in August 2016.

Two- and 24-hour post-injection scans were performed after ^{111}In-octreotide using a Symbia Intevo™[1] 16 SPECT/CT scanner with xSPECT Quant™[1] technology.

Diagnosis
This scan demonstrated the metastatic disease with focal mass uptake in the pancreatic region as well as the disseminated spread, as shown in figures 1 and 2. Compared to a prior examination (not shown), the final results were concluded as stable disease after PRRT.

Comments
^{111}In-octreotide scans enable detection of several different diseases, but are mostly used in the early detection, staging and potential treatment of neuroendocrine tumors of the upper and mid-gut. With the advent of new therapy approaches in neuroendocrine tumors such as PRRT, the necessity for accurate uptake measurements has emerged. Quantitative response evaluation in neuroendocrine tumors is primarily in the domain of PET imaging, but ^{111}In-labelled octreotide is still one of the most commonly used agents for imaging of neuroendocrine tumors in diagnosis and staging, in particular, where PET tracers are not available.[2] Although it is known that there is a correlation of somatostatin receptor expression and the visibility in somatostatin receptor imaging, due to the lack of robust and repeatable quantification, visual scores were recommended.[3] The feasibility of ^{99m}Tc-MDP quantification and its potential clinical impact was already demonstrated.[4] Now, with the expansion of accurate and robust quantification using xSPECT Quant™[1] for additional tracers, clinicians have started to define the meaning of these uptake values.

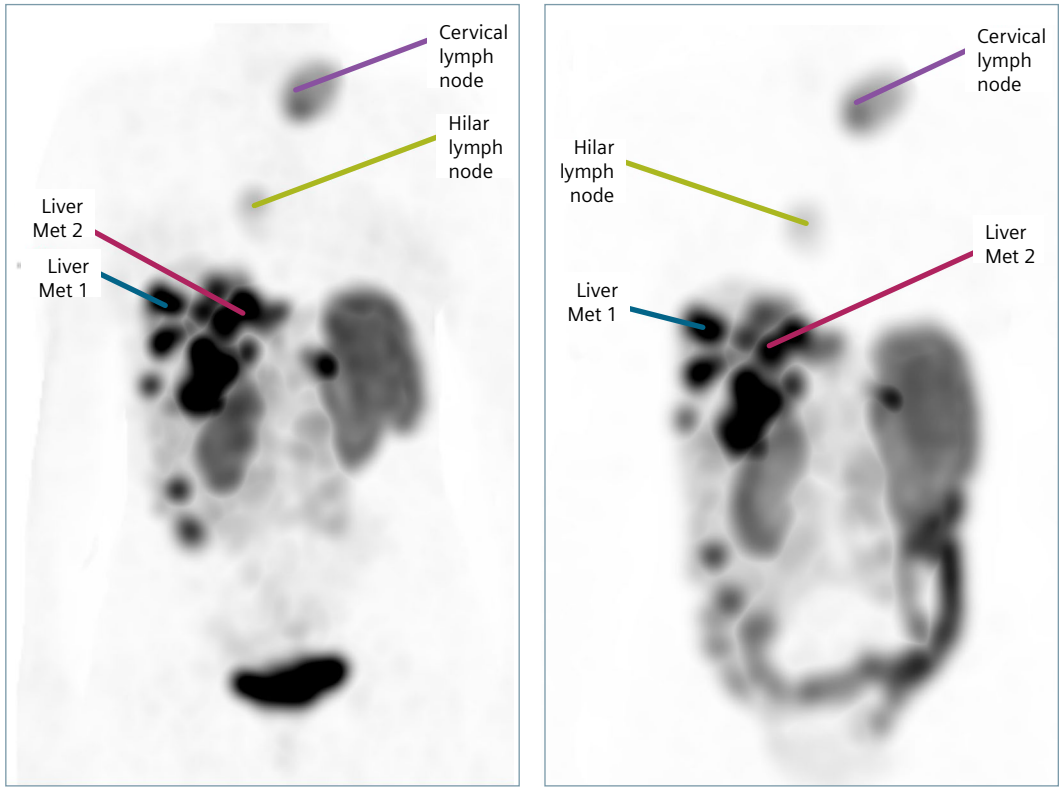
For this case, considering the tracers' distribution and uptake after 2 hours and 24 hours and, in particular, the uptake values calculated by SUV, one



2-hour post-injection | 24-hour post-injection

Figure 1: Coronal view of a fused xSPECT/CT image with measurements of one of the liver lesions as well as the hilar lymph node metastasis. Note the automated SUV measurements using *syngo*®.via. The tracer distribution, retention and elimination can be identified by comparing the two time points.

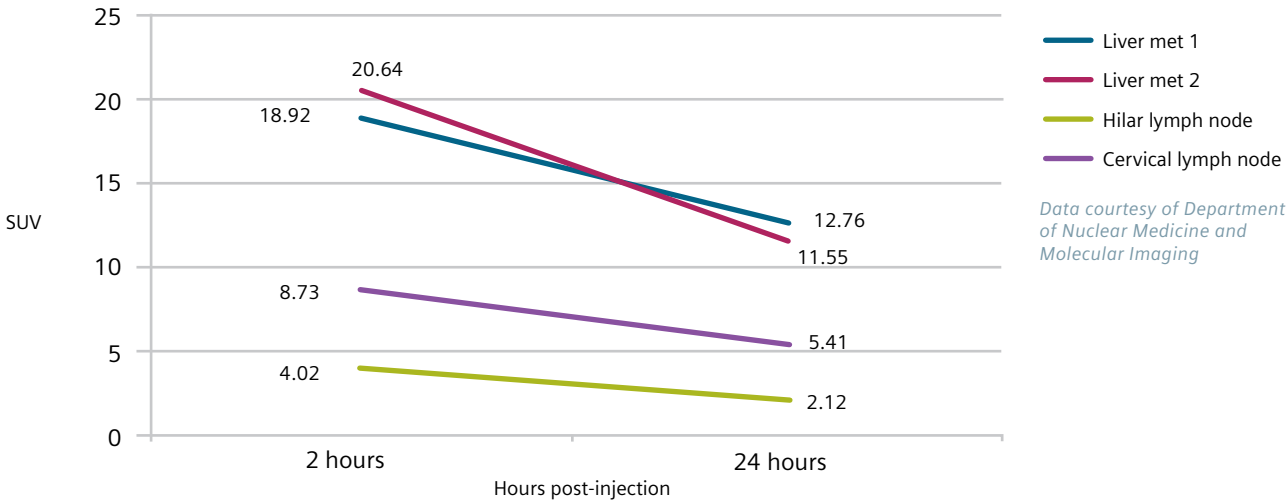
Data courtesy of Department of Nuclear Medicine and Molecular Imaging



2-hour post-injection | 24-hour post-injection

Figure 2: Coronal view of the maximum intensity projection (MIP) of the xSPECT data from both time points, showing four different lesions. Selection of the lesions is for demonstration purposes only.

Data courtesy of Department of Nuclear Medicine and Molecular Imaging



Data courtesy of Department of Nuclear Medicine and Molecular Imaging

Figure 3: Plotted SUV from the four selected lesions over time [2-hr., 24-hr.], demonstrate the quantified changes of the lesions.

can identify and quantify the biology of the tumor's behavior in terms of octreotide receptor binding, tracer target density, as well as the accumulation in potential organs at risk. As an example, Figure 3 illustrates the changes of the SUV between time point 1 at 2 hours, and time point 2 at 24 hours post-injection of all lesions measured in the overview in Figure 2. Using ^{111}In, as presented here, physicians worldwide can overcome the initial and inherent limitations of regular SPECT/CT and use accurate and reproducible quantification for uptake calculations and precise follow-up evaluation.

Conclusion

xSPECT Quant-enabled quantification for ^{111}In helps to measure precisely the initial uptake and changes over time in primary diagnosis, treatment follow-up and treatment planning. ■

[1] Symbia Intevo and xSPECT Quant are not commercially available in all countries. Due to regulatory reasons, their future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

References:

[2] Kwekkeboom D, Kam B, van Essen M, et al. Somatostatin receptor-based imaging and therapy of gastroenteropancreatic neuroendocrine tumors. Endocrine-Related Cancer 2010;17(1):R53–73.

[3] Diakatou E, Alexandraki K, Tsolakis A, et al. Somatostatin and dopamine receptor expression in neuroendocrine neoplasms: correlation of immunohistochemical findings with somatostatin receptor scintigraphy visual scores. Clin Endocrinol 2015;83(3):420–8.

[4] Salaun P-Y, Abgral R, Laroche RD. xSPECT Quant in Treatment Monitoring. 2017. siemens.com/mi | xSPECT Case Study.

Examination Protocol

Scanner: Symbia Intevo 16

SPECT	
Injected dose (representative scan)	180 MBq (4.9 mCi) ^{111}In-octreotide
Scan delay	2-hour, 24-hour
Acquisition	xSPECT Quant

CT	*2-hour*	*24-hour*
KVP	130 kV	130 kV
Current	28 mAs	24 mAs
CTDIvol	1.8816	1.6128

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