



First-in-human SPECT/CT imaging of [^{212}Pb]Pb-VMT- α -NET in a patient with metastatic neuroendocrine tumor

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^{212}Pb is a promising radionuclide for targeted alpha particle therapy for cancer. Ongoing preclinical and clinical studies are investigating the potential of ^{212}Pb -labeled peptides and antibodies [1–5]. PSC-PEG₂-TOC (VMT- α -NET) is a novel somatostatin receptor subtype 2 (SSTR2) targeting peptide for the treatment of neuroendocrine tumors (NET) that shows rapid tumor accumulation, high tumor retention, and fast renal excretion with the potential for low nephrotoxicity [6, 7].

Here, we present the case of a 75-year-old woman with an advanced G2 NET of unknown primary with liver metastases who was heavily pretreated with somatostatin analogs, various chemotherapies, multiple cycles of [^{177}Lu]Lu-DOTA-TATE and [^{225}Ac]Ac-DOTA-TATE, and radioembolization over 7 years. The patient received 90 MBq of [^{212}Pb]Pb-VMT- α -NET intravenously. Whole-body scintigraphy and SPECT/CT acquisitions were

performed 2, 5, and 19 h after injection on a Symbia Intevo 6 (Siemens Healthineers) using high-energy collimators. Images were obtained by detection of the characteristic X-ray emissions of ^{212}Pb using an energy window at 79 keV (40% width). The whole-body scan speed was 8 cm/min, and SPECT/CT scans were acquired with 120 projections (60 per detector, 30 s per projection) over a non-circular 360° orbit. The SPECT/CT images showed a high accumulation of [^{212}Pb]Pb-VMT- α -NET in liver metastases in segments III and IV, consistent with the previously acquired [^{68}Ga]Ga-DOTA-TATE PET/CT. High tumor retention can be observed in the planar and SPECT/CT images over time. The planar images showed a high level of background noise due to down-scatter and septal penetration of high-energy photon emissions from ^{212}Pb daughter nuclides (e.g., 2.6 MeV from ^{208}Tl). Due to the short half-life of ^{212}Pb (10.6 h), the images acquired after

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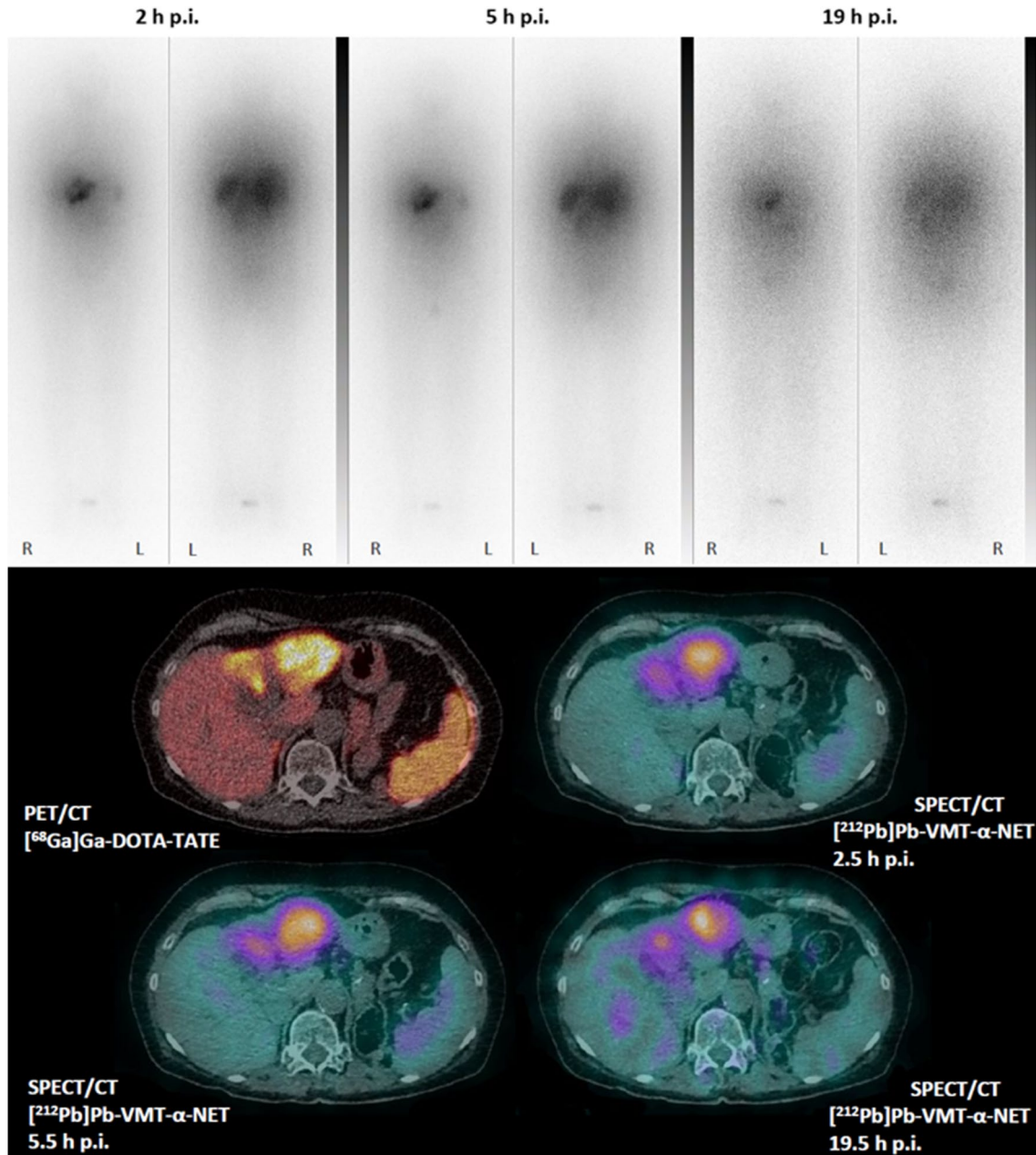
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19 h showed a relatively high level of image noise due to the low count statistics. The patient showed no early or acute adverse events.

These are the first clinical post-treatment scintigraphic images of $[^{212}\text{Pb}]\text{Pb-VMT-}\alpha\text{-NET}$ and additionally the first-in-human SPECT/CT images of ^{212}Pb .



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Data availability The data of this study are available on reasonable request.

Declarations

Ethics approval and consent to participate Written informed consent was obtained from the patient for the treatment procedure and for data publication.

Conflict of interest The author Michael K. Schultz is the CSO (Chief Science Officer) of Perspective Therapeutics, Inc. The other authors declare no other competing interests.

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