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Unintentional Intra-arterial Injection of ^{177}Lu -PSMA-1 in a Patient With a Peritoneal Carcinosis Secondary to a Metastatic Prostate Cancer

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Abstract: We report the case of an 81-year-old man presenting with peritoneal carcinosis secondary to a metastatic castrate-resistant prostate cancer addressed for ^{177}Lu -PSMA-1 therapy. During the second cycle, a diffuse uptake in his left forearm was observed on the 1-hour postinjection scintigraphy, typical for an accidental intra-arterial injection. Less than 24 hours postinjection, a full removal of the intra-arterial injection was observed in the man, without any pain or symptoms. Moreover, the man demonstrated an 85% PSA reduction and a CT OR following the RECIST 1.1 criteria after 3 cycles.

Key Words: intra-arterial injection, planar scintigraphy, ^{177}Lu -PSMA, prostate cancer

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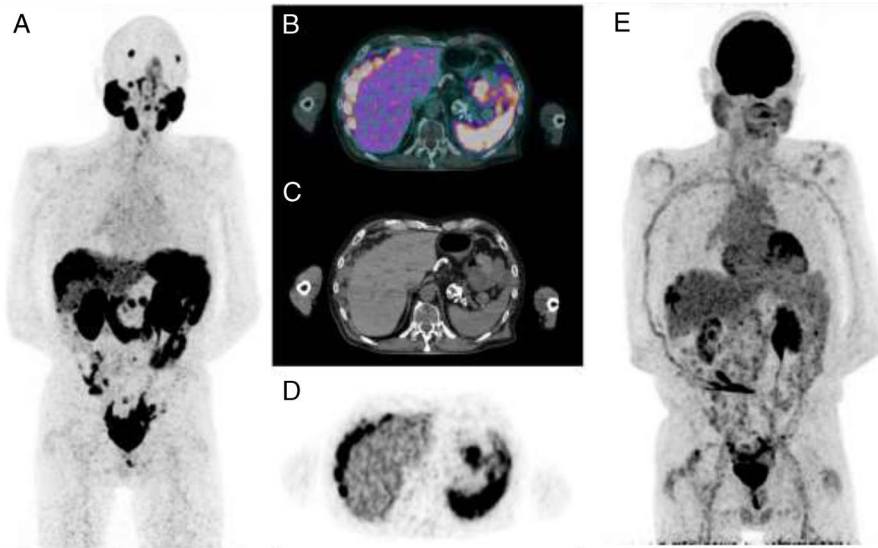


FIGURE 1. A 81-year-old man with metastatic castrate-resistant prostate cancer underwent a ^{68}Ga -PSMA-11 as a screening examination before ^{177}Lu -PSMA-1 therapy. Indeed his disease was getting worse despite 2 androgen receptor-directed hormonal therapies lines and 2 chemotherapy lines. The ^{68}Ga -PSMA-11 PET/CT performed for patient's screening therapy demonstrated an intense uptake of the known secondary peritoneal carcinomatosis (SUV_{max} , 12.7), notably in liver scalloping lesions (A, MIP; B, axial fusion; C, axial CT; D, axial PET). It showed no other uptake, especially in bone or lymph nodes. The man also underwent an ^{18}F -FDG PET/CT as screening examination, which displayed a moderate uptake in the peritoneal lesions, without any mismatch (E, MIP).

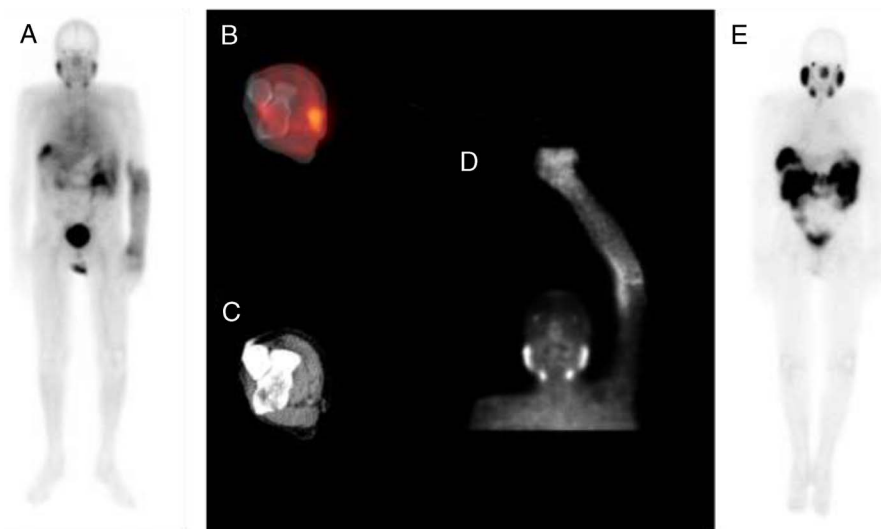


FIGURE 2. During the second cycle of radionuclide therapy, ^{177}Lu -PSMA-1 injection in the supposed left antecubital vein was difficult, and the man had a radiating pain in the hand during the first seconds of injection leading the technologists to reduce the injection rate. The 1-hour postinjection scintigraphy control of ^{177}Lu -PSMA-1 showed an intense and diffuse uptake in the left forearm with a “hot forearm” or “glove phenomenon” aspect (A, whole-body planar scintigraphy; D, static arm scintigraphy). Brachial artery’s pathway was visualized (B, axial SPECT/CT fusion; C, axial CT). It was consistent with an inadvertent intra-arterial injection, without any extravascular leakage. Peritoneal lesions were already visualized despite the early acquisition and the mistaken injection (A, whole-body planar scintigraphy). The arm was elevated and massaged. The 24-hour postinjection scintigraphy demonstrated a very intense ^{177}Lu -PSMA-1 uptake by the peritoneal lesions, and a full removal of the intra-arterial injection (E, whole-body planar scintigraphy). The man did not experience any pain or redness in the forearm afterward. The left hand arm estimated that the absorbed dose obtained by Monte Carlo calculation¹ was 0.09 mGy/MBq, 20% higher than the controlateral arm. Inadvertent intra-arterial injection has already been described with different diagnostic radiopharmaceuticals, such as $^{99\text{m}}\text{Tc}$ -MDP,^{2,3} $^{99\text{m}}\text{Tc}$ -MIBI,⁴ ^{123}I -MIBG,⁵ or ^{18}F -FDG,^{6,7} without any serious interferences or adverse events. To our knowledge, radionuclide therapy (ie, ^{177}Lu -PSMA-1) intra-arterial injection has never been described yet. Venipuncture can be challenging in patients followed up for cancers because of fragile venous network caused by multiple venous access, especially in elderly patients. Injection requires careful attention to the color and blood return movement, notably catheter’s pulsation. Correct catheter placement and insertion practices were highlighted. At cycle 3, man demonstrated an excellent biological response with an 85% decrease PSMA rate (PSMA rate dropping from 608 to 89 ng/mL), a decrease in lesions uptake on scintigraphy, and an OR on the CT component of the control SPECT/CT. This case demonstrated the lack of repercussion of inadvertent intra-arterial ^{177}Lu -PSMA-1 injection on patient’s response to therapy, but the person in charge of the radionuclide therapy injection should be aware of this potential risk.