Paralytic Subileus as an Adverse Effect of Amino Acid–Based Nephroprotection in a Patient Undergoing Peptide Receptor Radionuclide Therapy

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Abstract: Peptide receptor radionuclide therapy is routinely used for neuroendocrine tumors. To prevent radiopeptide retention at the proximal tubule of the kidney, positively charged amino are coinfused. However, hyperkalemia (>5.0 mmol/L) in more than three fourth of patients has been reported. In our case, the patient experienced acute hyperkalemia with blood values greater than 7.0 mmol/L with gastroparesis and subileus.

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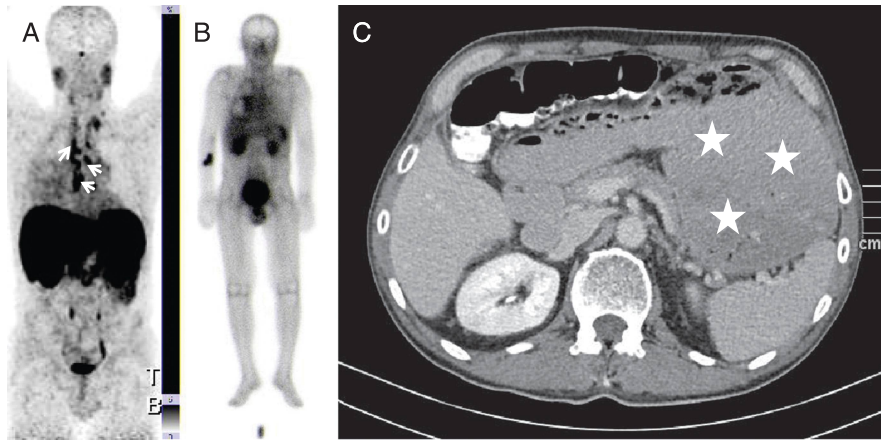

^{68}Ga-DOTATOC-SSTR-PET/CT Whole body view

PRRT with ^{177}Lu-DOTATOC Whole body view

Contrast-enhanced CT axial view

FIGURE 1. A 49-year-old patient with a history of neuroendocrine lung cancer was referred for peptide receptor radionuclide therapy (PRRT). After completion of first- and second-line chemotherapy including cisplatin, etoposide, and topotecan as well as radiation therapy, progressive disease was diagnosed. ^{68}Ga-DOTATOC-PET/CT demonstrated sufficient somatostatin receptor expression of both primary cancer and mediastinal lymph nodes metastases (**A**, arrows). A first course of PRRT with ^{177}Lu-DOTATOC was administered according to European Association of Nuclear Medicine guidelines (including infusion of nephroprotective amino acid solutions) and was well tolerated (**B**). Eight hours after completion of therapy, the patient complained about epigastric pain. Blood samples were drawn, and an ECG was performed to rule out myocardial infarction. Serum analysis revealed acute hyperkalemia with an elevation of K^+ levels to 7.2 mmol/L; the ECG demonstrated concordant changes with peaked T waves. Insulin 20 IU with 20% glucose in 500-mL saline was infused. However, pain did not resolve and then projected to the whole abdominal region. On physical examination, bowel sounds were absent in a—on palpation—tender abdomen. Imaging using contrast-enhanced CT was performed and depicted a distended stomach (**C**, stars). Furthermore, distended small bowel loops were present (**C**,) without evidence of mechanical obstruction, leading to the diagnosis of hyperkalemia-induced gastroparesis and paralytic subileus. A gastric tube was placed, which led to the immediate relief of symptoms. Electrolytes were closely monitored and normalized after infusion of insulin/glucose. In parallel, bowel function returned, and symptoms rapidly resolved. Peptide receptor radionuclide therapy is nowadays routinely used for advanced and/or metastasized neuroendocrine tumors or other entities that overexpress somatostatin receptor subtype.[1] Since the first attempts using ^{111}In-pentetreotide, radiolabeled somatostatin agonists such as ^{90}Y- or ^{177}Lu-DOTATOC/-TATE have been moved into focus.[2] Because the radiopeptide is reabsorbed at the proximal tubule of the kidney, subsequent retention may lead to excessive radiation doses and renal failure. To prevent significant renal radiopeptide retention, positively charged amino acids like L-arginine and L-lysine have been introduced and are used in different protocols over 1 or 2 days.[3] The coadministration of amino acids leads to a significant reduction in the renal absorbed dose. However, adverse effects such as nausea, vomiting, and hyperkalemia have been described.[4–7] In a recent study including patients with NET undergoing PRRT with ^{90}Y-DOTATOC, Giovacchini et al[8] reported on hyperkalemia (>5.0 mmol/L) in more than three fourth of patients. Blood values reached their maximum 4 hours after therapy and returned to baseline after 24 hours without intervention; the highest potassium level measured was as high as 6.7 mmol/L. In our case, the patient experienced acute hyperkalemia with blood values greater than 7.0 mmol/L. In the absence of other causes, gastroparesis and subileus might have been caused by hyperkalemia-induced muscle paralysis. Therefore, in patients undergoing PRRT who report abdominal discomfort shortly after completion of therapy, special attention should be paid to this potentially life-threatening adverse effect of protective amino acid infusion.