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Clinical Utility of Qualitative Post-treatment SPECT After Peptide Receptor Radionuclide Therapy

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BACKGROUND: Peptide receptor radionuclide therapy (PRRT) is an established treatment modality for NETs, usually using ^{177}Lu-DOTATATE. Although ^{177}Lu primarily emits beta particles, ^{177}Lu also emits gamma photons which can be imaged with SPECT. Most US centers do not currently perform post-PRRT scintigraphy. However, qualitative information on post-PRRT scintigraphy has the potential to impact clinical management.

METHODS: 24 hours after each administration of ^{177}Lu-DOTATATE, patients with metastatic well-differentiated NET underwent planar and SPECT/CT imaging from vertex to thighs. Images were evaluated by a board-certified nuclear medicine physician and compared to prior imaging (CT, MRI, SSTR PET, and prior post-PRRT scintigraphy). Cases in which post-PRRT scintigraphy findings contributed to a change in management were retrospectively recorded, including the nature of the findings (improvement, new lesions, etc.) and associated changes in management. Common themes in imaging findings and management changes were identified.

RESULTS: 13 cases were found in which post-PRRT imaging impacted management (patient characteristics in Table 1). Findings fell into the following 4 categories: new/growing lesion (n=4); marked response (n=4); mild to moderate response in the setting of toxicities and/or prior radionuclide therapy (n=3); and pseudoprogression (n=2). Management changes based on these findings fell into the following 4 categories: targeted treatment of new/growing lesion before resuming PRRT (n=4); deferring further PRRT for later progression (n=6); delaying next PRRT cycle (n=1); and continuing treatment in the setting of confirmed pseudoprogression (n=2). Case examples of each type of imaging finding with

corresponding management change will be shown.

CONCLUSION: Qualitative findings on post-PRRT imaging can have a meaningful impact on the clinical management of NET patients. Routine next-day imaging of PRRT patients should be considered to help guide management.

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Table 1. Patient characteristics.

Characteristic	Parameter	Data
Sex	Female / Male	8 (61.5%) / 5 (38.5%)
Median age at first PRRT(years) (range)		67.5 (34-78)
Primary location	Small bowel / Pancreas / Bronchial / Rectal	5 (38.5%) / 5 (38.5%) / 2 (15.3%) / 1 (7.7%)
Tumor grade	G1 / G2 / G3	3 (23.1%) / 9 (69.2%) / 1 (7.7%)
Previous treatments	SSA / Liver-directed therapy / Surgery	12 (84.6%) / 9 (69.2%) / 5 (38.5%)
	Chemotherapy / Everolimus / External beam radiation	5 (38.5%) / 2 (15.4%) / 1 (7.7%)
	PRRT: Intravenous (4 cycles) / Intra-arterial to liver (1 cycle)	1 (7.7%) / 1 (7.3%)
Median dose of PRRT(mCi/Gbq) (range)		202.0 (187.4-205.3)/7.5 (6.9-7.6)
Median cycles of PRRT(range)		3 (2-4)