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Improved Tumor Dosimetry by Combining ^{131}I-MIBG and ^{90}Y-DOTATOC in Patients with Carcinoid Tumors

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Background: ^{131}I-MIBG and ^{90}Y-DOTATOC are used as radiotherapeutic agents for neuroendocrine tumors. The tumor dose delivered by either of these agents individually is often insufficient to cure disease. Since the activity limiting tissues are different for each (kidney for ^{90}Y-DOTATOC and marrow for ^{131}I-MIBG) we have previously demonstrated that combining them may lead to increased tumor dose without exceeding critical organ limits.The goal of this work is to establish whether patients with advanced stage carcinoid tumors could benefit dosimetrically from combining ^{131}I-MIBG and ^{90}Y-DOTATOC.

Methods: In patients with advanced stage midgut carcinoid tumors, Individual patient tracer kinetics and uptake measurements were used to calculate radiation dose values per unit of administered activity for both ^{131}I-MIBG and ^{90}Y-DOTATOC for the kidneys, bone marrow, and tumor sites. These results were then used with previously derived equations to calculate the optimal/safe administered activity levels for each drug, individually and in combination, to achieve maximum tumor dose in each subject.

Results: We have completed the data analysis for 3 patients to date. We have 5 additional patients in this study. In 1 of these 3 patients, the radiation dose (to a carcinoid tumor site) that would be delivered using an optimized combination of ^{131}I-MIBG and ^{90}Y-DOTATOC was

found to be higher by 24% than the achievable tumor dose with either ^{131}I-MIBG or ^{90}Y-DOTATOC alone without exceeding dose limits to kidneys or marrow. The optimized combination of administered activities for this subject was found to be 20 GBq ^{131}I-MIBG plus 11 GBq ^{90}Y-DOTATOC. In practice these levels of activity would be delivered over multiple cycles.

Conclusion: These findings support the premise that combining ^{131}I-MIBG and ^{90}Y-DOTATOC can increase the delivered tumor radiation dose in some patients with metastatic midgut carcinoid above that achievable with either agent alone.