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Prevalence of Bone Metastases in Neuroendocrine Neoplasms by 68Ga Dotatate PET Scan

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BACKGROUND: Neuroendocrine neoplasms (NEN) are rare tumors, accounting for only 0.5% of all tumors. These tumors are heterogeneous and their prognosis and long-term survival are not well known. NENs have the propensity to metastasize to liver, bone, lymph nodes and lung. Bone metastasis initially thought to be a rare feature of NEN, are now a well-recognized clinical complication causing significant morbidity and mortality. Bone metastasis portends poor prognosis with poor outcomes. Prevalence of bone metastasis in NEN varies considerably, with most studies reporting a 12-15% range. With the advent of more sensitive imaging modalities such as 68Ga Dotatate PET, we hypothesize that the prevalence of bone metastases is higher than previously reported.

METHODS: Data for sex, age, tumor, and metastasis diagnosis dates, primary tumor site, WHO grade, and metastasis site were extracted from the Stanford Neuroendocrine tumor database. We included patients who had 68Ga Dotatate PET and metastatic disease; patients with second malignancies were excluded. We classified patients with bone metastasis (BM) or not (non-BM) based on results from 68Ga Dotatate PET. Patient characteristics reference (Table 1) were compared using chi-square and t-tests.

RESULTS: Of the 2175 NEN patients, we included 131 patients: 50 (38%) with bone metastasis and 81 (62%) with non-bone metastasis. Primary tumor site and grade were not statistically significantly different between BM and non-BM patients (p-value = 0.271). However, lung metastasis and metastasis at other sites were higher in BM patients (p-values = <0.001, 0.021 respectively). There were 10 deaths in the BM cohort and two in the non-BM cohort.

CONCLUSION: Prevalence of bone metastasis in our study was 38.2% which is higher than reported in most other studies. Further studies are needed to characterize and evaluate therapeutic options for bone metastasis.

Table 1. Baseline Demographic and Disease Characteristic of NEN patients who had a 68Ga Dotatate PET and metastases

Characteristics	Patients with bone metastasis on 68Ga Dotatate PET (N=50)	Patients without bone metastasis on 68Ga Dotatate PET (N=81)	P-value
Sex: N (%) Male Female	 25 (50.0) 25 (50.0)	 41 (50.6) 40 (49.4)	1.0
Age at diagnosis: Mean (SD)	57.42 (11.00)	54.91 (11.34)	0.22
Primary tumor site, N (%) Lung Pancreas Small intestine (duodenum, Jejunum, ileum, appendix) Other (rectum, colon, ovaries) Unknown primary	 2 (4.0) 17 (34.0) 21 (42.0) 0 (0.0) 10 (20.0)	 2 (4.0) 35 (43.2) 31 (38.3) 4 (4.9) 9 (11.1)	0.27
WHO tumor grade, N (%) Grade 1 Grade 2 Grade 3	 21 (42.0) 24 (48.0) 4 (8.0)	 36 (45.0) 36 (45.0) 7 (8.8)	0.97
Site of metastasis, N (%) Bone Liver Lymph nodes Lung Others	 50 (100.0) 45 (90.0) 34 (68.0) 14 (28.0) 25 (50.0)	 0 (0.0) 64 (79.0) 49 (60.5) 2 (2.5) 23 (28.4)	Not applicable 0.16 0.50 <0.001 0.02