Clinical characteristics, echocardiographic features, and outcomes of patients with neuroendocrine tumours and carcinoid heart disease in a contemporary Canadian cohort

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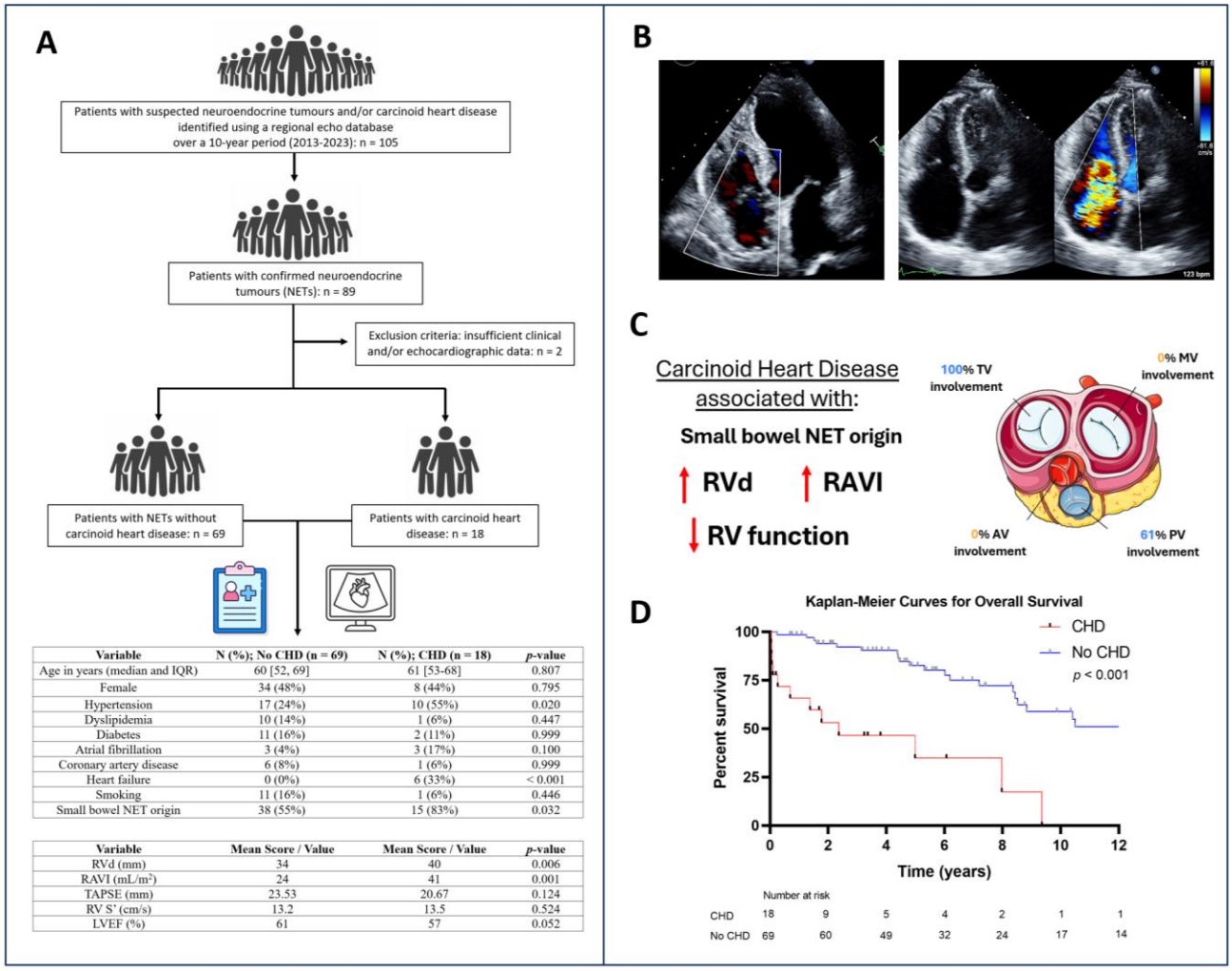
Background: Neuroendocrine tumours (NETs) are uncommon cancers that can secrete vasoactive hormones, causing a range of symptoms. Approximately 50% of metastatic small bowel NETs develop carcinoid syndrome, with 20-50% historically developing carcinoid heart disease (CHD). With more effective medical therapy and increased recognition of CHD, the contemporary characteristics and prognosis of CHD are unclear. We performed a contemporary evaluation of clinical characteristics, echocardiographic features, and outcomes of patients with NETs and CHD in a Canadian cohort.

Methods: Patients who underwent echocardiograms at a tertiary cancer agency-affiliated echocardiography laboratory between 2013-2023 and had NETs or CHD referenced on their echo reports were identified. Medical records were reviewed for baseline clinical characteristics, treatments, and outcomes of patients. Echo reports and raw images were reviewed to characterize features associated with CHD development.

Results: In this 10-year period, 87 patients with NETs were identified [42 (48%) female; median age 61 (IQR 53-69)] years. 18 (21%) developed CHD [8 (44%) female; median age 66 (IQR 59-71) years]. Primary NETs of small bowel origin were more common in patients with CHD compared to those without CHD (83% vs. 55%, p=0.032). CHD patients showed the following distribution of valve involvement: 100% tricuspid; 61% pulmonary; and 0% mitral/aortic; only 2 (11%) patients had a documented patent foramen ovale. At baseline echo (i.e. within 6 months of NET diagnosis), CHD patients demonstrated higher mean right atrial volume index (41mL/m^2 vs 24mL/m^2, p=0.001), higher mean right ventricular (RV) basal diameter (40mm vs. 34mm, p=0.006), and more frequent RV dysfunction (22% vs. 0%, p<0.001). Surgical valve replacement was performed in 9 (50%) patients and was indicated but deferred in 6 (33%) due to competing comorbidities. The median survival of CHD patients was 2.4 years (vs. 13.4 years without CHD, p<0.001), and NET progression and refractory heart failure were predominant reasons for mortality.

Conclusions: In our cohort of patients with NETs, CHD prevalence was lower than previously reported and patients exhibited only right-sided valve involvement, with over half developing an indication for valve replacement. Further studies are needed to determine reasons behind differences in CHD prevalence, valvular involvement, and outcomes in the contemporary era.

Central Illustration. A) Study pathway outlining cohort construction along with baseline clinical and echocardiographic characteristics of patients with neuroendocrine tumours (NET) and carcinoid heart disease (CHD). **B**) Echocardiography images of patients with (left) and without CHD (right). **C**) Characteristics associated with CHD development. **D**) Kaplan-Meier survival analyses of NET patients with (red) and without CHD (blue).



Variable	N (%); No CHD (n = 69)	N (%); CHD (n = 18)	*p*-value
Age in years (median and IQR)	60 [52, 69]	61 [53-68]	0.807
Female	34 (48%)	8 (44%)	0.795
Hypertension	17 (24%)	10 (55%)	0.020
Dyslipidemia	10 (14%)	1 (6%)	0.447
Diabetes	11 (16%)	2 (11%)	0.999
Atrial fibrillation	3 (4%)	3 (17%)	0.100
Coronary artery disease	6 (8%)	1 (6%)	0.999
Heart failure	0 (0%)	6 (33%)	< 0.001
Smoking	11 (16%)	1 (6%)	0.446
Small bowel NET origin	38 (55%)	15 (83%)	0.032

Variable	Mean Score / Value	Mean Score / Value	*p*-value
RVd (mm)	34	40	0.006
RAVI (mL/m^2)	24	41	0.001
TAPSE (mm)	23.53	20.67	0.124
RV S' (cm/s)	13.2	13.5	0.524
LVEF (%)	61	57	0.052