Sinus Tachycardia as a Predictor of All-Cause Mortality in Cancer Patients

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Introduction

- Tachycardia in cancer patients is a reflection of significant multi-system organ stressor/disease; with sparse literature describing its clinical significance
- Recently, research revealed correlations between tachycardia (heart rate ≥ 100 bpm) and increased risk of mortality in patients with cancer
- None to our knowledge have investigated the prognostic value of sinus tachycardia, separate from other forms of tachycardia
- The purpose of this study to determine whether baseline sinus tachycardia at the time of cancer diagnosis predicted overall mortality in patients with cancer

Methods

- We conducted a retrospective case-control study in 622 cancer patients (lung cancer, leukemia, lymphoma or multiple myeloma) at Rush University Medical Center, 2008-2016
- Cases had sinus tachycardia (heart rate ≥ 100 bpm) in ≥ 3 different clinic visits within 1 year of cancer diagnosis, confirmed on ECG; excluding history of pulmonary embolism, thyroid dysfunction, ejection fraction < 50%, atrial fibrillation/flutter, HR > 180 bpm
- Comparison between groups was achieved using unpaired Student's t-test for continuous variables while $\chi 2$ was used to evaluate dichotomous variables
- Cox proportional hazards model assessed mortality associated with tachycardia. Model 1 adjusted for age plus covariates that were significantly different between HR ≥ 100 and < 100 (Figure 1); while model 2 adjusted for age and other clinically relevant characteristics (Figure 2)
- Mortality was assessed up to 10 years (120 months) after cancer diagnosis

Table 1. Baseline Characteristics

	All Patients	HR < 100	HR ≥ 100	P-value
N (%)	622	527	55	-
Age	70±10	71±9	67±13	0.002
Gender (Female %)	376 (60.5)	348 (60.8)	28 (56)	0.502
Race (white %)	475 (76.4)	445 (77.8)	30 (60)	0.005
BMI	27.7±7.1	27.7 ± 7	27.4 ± 7.4	0.963
AJCC (Stage 4)	297 (69.4)	279 (69.9)	18 (62.1)	0.375
Albumin	3.44±1.47	3.5 ± 1.5	3 ± 0.89	0.043
Hemoglobin	11.6 ±2.4	11.7 ±2.2	10.5 ±2.8	0.001
N/L	5.3 ± 7.43	5.21 ± 7.5	5.7 ±7.44	0.094
Diabetes	124 (19.9)	109 (19.1)	15 (30)	0.063
Hypertension	418 (67.2)	386 (67.5)	32 (64)	0.615
Hyperlipidemia	230 (37)	210 (36.8)	20 (40)	0.651
Coronary artery disease	91 (14.6)	83 (14.5)	8 (16)	0.775
Stroke/TIA	57 (9.2)	54 (9.4)	3 (6)	0.419
Renal disease	121 (19.5)	98 (17.1)	23 (46)	.000
Leukocytosis	157 (25.2)	141 (24.7)	16 (32)	0.251
Smoking	298 (47.9)	273 (47.7)	25 (50)	0.758
Beta-blockers	204 (32.8)	180 (31.5)	24 (48)	0.017
Calcium channel blockers	124 (20)	115 (20.2)	9 (18)	0.712
ACE/ARB	197 (31.8)	184 (32.3)	13 (26)	0.356
Hydralazine	10 (1.6)	8 (1.4)	2 (4)	0.161
Aspirin	167 (26.8)	158 (27.6)	9 (18)	0.141
Anticoagulation	45 (7.2)	34 (5.9)	11 (22)	0.000
Spironolactone	8 (1.3)	7 (1.2)	1 (2)	0.640
Type of Malignancy	Primary Lung	255 (44.6)	14 (28)	0.001
Chemotherapy at time of visit	341 (56.4)	314 (56.6)	27 (54)	0.725
Anthracyclines	118 (19)	107 (18.7)	11 (22)	0.573
Radiation	267 (43)	249 (43.6)	18 (36)	0.297

Results

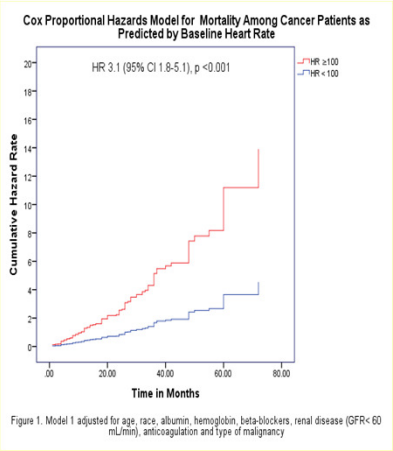

Figure 1. Model 1 adjusted for age, race, albumin, hemoglobin, beta-blockers, renal disease (GFR< 60 mL/min), anticoagulation and type of malignancy

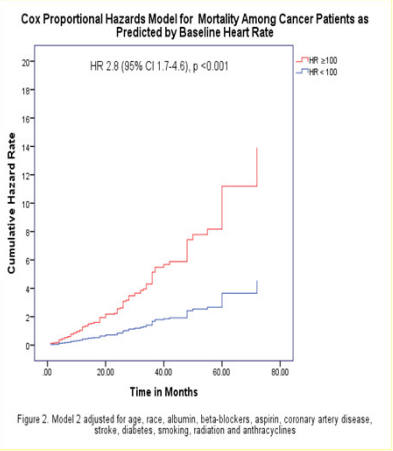

Figure 2. Model 2 adjusted for age, race, albumin, beta-blockers, aspirin, coronary artery disease, stroke, diabetes, smoking, radiation and anthracyclines

- We included 51 patients and 591 controls (mean age 70 years, 60.5% women, 76.4% white); 69.4% were classified as AJCC (American Joint Committee on Cancer) stage 4 and 43% had lung cancer (Table 1).
- Baseline sinus tachycardia was a significant predictor of overall mortality in both models [HR 3.1 (95% CI 1.8 – 5.1); HR 2.8 (95% CI 1.7 – 4.6); respectively], up to 10 years after cancer diagnosis.

Conclusion

- Our study demonstrates that baseline sinus tachycardia is a strong and independent predictor of mortality in patients with lung cancer, leukemia, lymphoma and multiple myeloma.
- This study suggests that sinus tachycardia could be used as a clinically significant predictor of poor outcomes in this patient population
- Further studies are needed to determine whether therapeutic interventions that lower resting heart rate would result in positive clinical outcomes