Evaluation of nocturnal blood pressure phenotype and severity of cardiovascular disease in acute coronary syndrome

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Background

Hypertension is associated with increased risk of adverse cardiovascular events, including acute coronary syndrome (ACS) and death.[1]

24-hour ambulatory blood pressure (ABP) measurements have revealed phenotypes of nocturnal blood pressure patterns, with normal circadian rhythms, decreasing during sleep and surging in the morning.[2] Dippers have ≥10% decrease in nocturnal blood pressure (NBP) measurements; non-dippers show <10% decrease.[3] While ABP is preferred for identifying nocturnal phenotype, inpatient measurements correlate well with 24-hr ABP, and may be acceptable to identify dippers and non-dippers. The Hygia Chronotherapy Trial suggests that bedtime administration of ≥1 antihypertensives may decrease cardiovascular events by promoting "normal" dipper patterns in non-dippers.[4] It is unclear if NBP phenotype is associated with severity of ACS upon presentation.

Objectives

Study objective:
Examine inpatient BP measurements to determine if nocturnal blood pressure phenotypes are associated with severity of coronary stenosis in patients with ACS, which may influence treatment optimization.

Primary outcome:
To determine the severity of ACS in dipper and non-dippers by using cardiac biomarkers such as cardiac troponin T and Pro-BNP, relevant clinical findings, and the TIMI risk score.

Secondary outcome:
To examine a composite endpoint of cardiovascular disease death, myocardial infarction, coronary revascularization, heart failure, and stroke.

Methods

Study design: cross-sectional cohort study
Exposure: Nocturnal blood pressure phenotype
Inclusion criteria - ACS patients with NSTEMI, STEMI, unstable angina, age ≥ 18yrs, scheduled for or completed left heart catheterization or PCI
Exclusion criteria - ACS patients with less than 2 blood pressure measurements during both waking and sleeping hours, both after PCI and before hospital discharge.

The following will be collected from the EMR: patient demographics, BMP, CBC, lipid panel, home medications, discharge medications, cardiac catheterization procedure reports, nocturnal blood pressure phenotype, troponin-T and Pro-BNP levels, and TIMI risk score. Our study plans to examine the severity of ACS using cardiac biomarkers, EKG readings, PCI summary reports, and clinical diagnoses from LAC+USC Medical Center EHR to determine the thrombolysis in myocardial infarction (TIMI) risk score. Data collected from the EHR will be logged onto REDCap, a HIPAA compliant application used to manage survey results for clinical research.

Patients will be categorized as dippers or non-dippers using blood pressure readings 24 hours prior to discharge. ACS severity will be examined by nocturnal blood pressure phenotype groups.

Data Analysis

This is currently an ongoing study.

A Chi-squared test will later be conducted on the final sample size to determine if there is an association between nocturnal blood pressure phenotype and severity of CVD in ACS patients.

Currently, fifteen patients have been reviewed in the EMR and analysis of their baseline characteristics is as shown in Table 1. Twelve patients have been identified as non-dippers based on their 24 hour blood pressure measurements prior to discharge while three patients have been characterized as dippers. Present data suggests that non-dippers experience more STEMI events than NSTEMI events, compared to dippers.

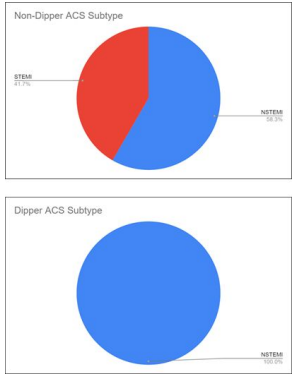

Figure 1. Nocturnal Blood Pressure Phenotypes in relation to ACS subtype (n = 15)

Table 1. Current Characteristics of the Patients at Baseline

Characteristics	Non-dippers (N = 12)	Dippers (N = 3)
Age — Median (yr)	58	59
Female — no. (%)	25%	0.0%
Body-mass Index — Median	30.1	31.6
Ethnicity — no. (%)		
Hispanic	58.3%	66.7%
African American	0.0%	33.3%
Caucasian	0.0%	0.0%
Asians	15.4%	0.0%
Others (Not Reported, etc)	23.1%	0.0%
ACS Subtype at time of Hospitalization — no. (%)		
UA	0.0%	0.0%
NSTEMI	58.3%	100%
STEMI	41.7%	0.0%
Patient History — no. (%)		
MI	16.7%	0.0%
CAD	33.3%	66.7%
HF	16.7%	33.3%
TIA/CVA	0.0%	0.0%
Use of ASA/anti-platelets	41.7%	33.3%
Use of Statins	33.3%	33.3%
Co-Morbid Conditions — no. (%)		
Hypertension	67.7%	100%
Hyperlipidemia	58.3%	66.7%
Diabetes	50.0%	66.7%
Atrial Fibrillation	8.3%	0.0%

Conclusions

Research is currently still in progress.

The results of this study aim to identify whether there is an association between nocturnal blood pressure phenotype and severity of CVD in ACS patients. This knowledge would help in developing and providing preventive care and optimal treatment (i.e multi-medication therapies) for ACS patients who are non-dippers. For example, if an association between nocturnal blood pressure and ACS severity is to be found, it can give way to possible precision medicine interventions such as giving antihypertensive drugs at night time to patients characterized as non-dippers.

By initiating optimal treatment from the start, it would reduce the possibility of rehospitalizations and frequent antihypertensive dose adjustments for ACS non-dipper patients in the future. This would also reduce overall healthcare costs for both the patient and the healthcare system.

References

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