

Wireless Acoustic Miniature Pulmonary Pressure Sensor in Patients with Congestive Heart Failure (CHF)

Ricardo Tobar, Zeev Halfin, Alexander Izthaki, Valentine Witzling, Sophie Logvinenko,
Yoseph Rozenman

Cardiology, C.H.F. Unit, Wolfson Medical Center, Holon, Israel

BACKGROUND: Decompensation is frequent in patients with CHF despite improved medical therapy. Heart catheterization is the most accurate way to define hemodynamic state, but its invasive nature limits its use to patients with severe decompensation. Therefore, the noninvasive detection of hemodynamic abnormalities before clinical deterioration occurs might be helpful to improve care.

AIMS: This study describes a new wireless pulmonary artery (PA) pressure measurement system comprising a miniature PA device implant using right heart catheterization.

METHODS: 10 pts (aged 71 ± 10 y, 8 males, 7 CAD, 8 LVEF $< 35\%$) underwent right heart catheterization. A miniature device was implanted in 6 pts (the anatomy of the PA was not suitable for implantation in 4 pts.). Safety of implantation and functionality of the device - The ability to obtain PA pressure from the implant using wireless acoustic communication in clinic and during daily measurement at home was examined.

RESULTS: The device was successfully implanted in the PA using right heart catheterization in 6 pts. Patients were discharged 1 day after the procedure. No device or implantation related complications occurred during the following 3 months.

Pressure measurements were successfully and repeatedly obtained from all implants. Compared to measurement at implantation accuracy of the implant was checked [mean \pm SD (mmHg): 22 ± 6 versus 19 ± 5 , $p=ns$]. Five patients used the home unit to obtain daily measurement of their PA pressure. Altogether >500 PA tracings were obtained from these patients. Trends of change in PA pressure over time were obtained. In one patient medical therapy was changed based on these measurement. None of the patients had a decompensation event during the monitoring period.

CONCLUSIONS: This study demonstrated that wireless communication with a miniature PA pressure sensor is feasible. Repeated, high-quality PA tracings were easily obtained that might be helpful to improve management of patients with CHF.

Prevalence and Hemodynamic Consequences of Sleep Apnea in Advanced Systolic Heart Failure Patients using Novel Cardiovascular Sleep Markers

Offer Amir^{1,2,3}, Daniel Reisfeld², Hagar Paz³, Hila Sbero², Rafael Wolff^{1,3}, Basil S Lewis¹

¹ Cardiology, Lady Davis Carmel Medical Center, Haifa, Israel, ² Widemed Company, Herzelia, Israel, ³ Cardiology, Lin Medical Center, Haifa, Israel

Background: Sleep apnea is associated with poor prognosis in heart failure (HF) patients although its prevalence and implications are still debatable. With the aim of assessing the incidence of sleep apnea in advanced systolic HF and its hemodynamic consequences, home sleep studies of 60 patients, routinely treated in a HF clinic, were conducted and analyzed using standard and novel sleep markers.

Methods: 60 patients (52 males, 8 females, age 65±13 years) with advanced systolic HF were included. Mean New York Heart Association Classification was 3; left ventricle ejection fraction per echocardiogram was 25±8%; ischemic cardiomyopathy was the HF etiology in 38 (63%) patients. Beta blockers were used in 56 (93%) patients.

Each patient was home sleep monitored (Somte ambulatory polysomnograph and Mortara H12 scribe Holter) for a full night. WideMed's Morpheus system was used for scoring and analysis (including novel cardiovascular apnea markers) and the results were manually validated.

Results: Total sleeping time was 5±1 hours. Apnea-hypopnea index was 35±19 episodes per hour; Cheyne-Stokes breathing was present in 57 (95%) patients.

We define cardiovascular response to an apnea by ≥3% desaturation, increase of at least 10% in heart rate, and peripheral (finger) vasoconstriction of at least 75%. Out of 55 patients with complete Holter recordings, 40 (73%) patients had at least 10% of their apneas resulting in a complete response; 6 (11%) showed only heart rate response; 5 (9%) showed only vasoconstriction response, and the remaining 4 (7%) were below the thresholds.

Conclusions:

Assessment of the prevalence and hemodynamic consequences of sleep apnea in advanced systolic HF resulted in the following:

1. The prevalence of apnea as well as Cheyne-Stokes breathing is much higher than had been previously reported: both were observed in almost all the studied patients. This may be attributed to the severity of HF condition in this study.
2. Novel sleep parameters were used to assess hemodynamic consequences of sleep apnea: episodes of sleep apnea are associated with desaturation, increased heart rate and peripheral vasoconstriction. These repeated hemodynamic events related to sympathetic reactivation may provide a basis for using sleep apnea as a prognostic marker in HF patients.

Trend in Admission Rate and One Year Mortality of Heart Failure Patients Admitted to Clalit Hospitals, 2002-2005

Alan Jotkowitz¹, Victor Novack^{1,2}, Avi Porath²

¹ *Internal Medicine, Medicine, Soroka University Medical Center, Beer Sheva, Israel,*

² *Harvard Clinical Research Institute, Harvard University, Cardiology, Boston, USA*

Aim: The study aim was to evaluate the admissions time trend, patient characteristics and one year mortality of patients admitted for heart failure.

Methods: All heart failure admissions to the seven major general hospitals of the Clalit Sick Fund during years 2002-2005 throughout Israel were screened. Patients with a principal diagnosis of heart failure were enrolled. Patients with acute heart failure due to myocardial infarction were excluded. Data on diagnoses, co-morbid conditions, medications, laboratory findings, in-hospital management and mortality were assessed.

Results: 8,246 consecutive patients were included into the study cohort. Average age was 76 years, 48% male patients, 61% of ischemic origin. A significant decline in rate of first admission from 250 to 170 cases per month was noted during the study period. Seasonality in admission rate was associated with a two-fold difference between summer and winter.

Hospital mortality rate was 5.7%. One year mortality rate 28.7%. A small decline in one year mortality from 31% to 27% was noted during the study period. One year mortality and was associated with patients' age, co-morbid conditions, routine admission laboratory results and pre-admission medications in Cox regression survival analysis. ACEI/ARBs, statins and beta-blockers were protective, while spironolactone and diuretics were associated with increased mortality risk.

Conclusions: This observational, quasi-national study demonstrated some significant time trends in admission rate and outcome of heart failure patients. Changes in drug management prior to admission could have contributed to both the decline in rate of admission and the one year mortality of these patients.

Predictors of 1-Year Mortality in Elderly Hospitalized Patients with Acute Heart Failure

Alon Barsheshet¹, Avraham Shotan², Moshe Garty³, Basil S Lewis⁴, Roseline Schwartz¹, Solomon Behar¹, Eyal Zimlichman¹, Ilan Goldenberg¹, Shmuel Gottlieb^{1,5}

¹ Neufeld Cardiac Research Institute, Sheba Medical Center, Ramat Gan, ² Heart Institute, Hillel Yaffe Medical Center, Hadera, ³ Recanati Center for Internal Medicine and Research, Rabin Medical Center, Petach Tikva, ⁴ Cardiology Department, Lady Davis Carmel Medical Center, Haifa, ⁵ Cardiology Department, Bikur Cholim Hospital, Jerusalem, Israel

Background: Heart failure (HF) is associated with high mortality, particularly in elderly patients. However, the difference between prognostic risk factors in older and younger HF patients is unclear.

Objectives: To identify and compare predictors of 1-year mortality in patients older and younger than 75 years hospitalized with acute HF.

Methods: We analyzed the data of 2336 patients with acute HF, who were hospitalized during a 2-month prospective national survey in all public hospitals in Israel (HFSIS 2003). Patients were divided into 2 groups: >75 years (elderly), and ≤75 years (younger). Independent predictors of 1-year mortality and their significance were analyzed in each group.

Results: The elderly group included 1182 (47% males), and the younger group 1154 (63% males) patients. Strong independent predictors of 1-year mortality in the younger group included low left ventricle ejection fraction (LVEF), renal failure, hyponatremia and anemia. In the elderly group, admission systolic blood pressure (SBP) <115 mmHG, renal failure and NYHA functional class were strong predictors of mortality (Table). The relationship between admission SBP and mortality in the younger group took a reversed 'J-shape' curve, while in the elderly group a reversed steep linear curve was noted.

Conclusions: In hospitalized patients with HF younger than 75 years 1-year mortality risk is strongly associated with low LVEF, while in older patients mortality risk was inversely related to admission SBP, including the hypertensive range. These findings suggest different mechanisms of outcome in young and older patients with HF.

Independent Predictors of 1-Year Mortality				
	Age ≤ 75 years (n=1154)		Age >75 years (n=1182)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
LVEF<30% vs. LVEF ≥ 50%	2.22	1.44-3.42	1.3	.95-1.86
Admission SBP <115 mmHG	1.46	1.04-2.04	2.00	1.51-2.65
GFR <30 ml/min	1.81	1.01-3.24	1.91	1.01-3.59
NYHA III/IV	1.57	1.15-2.13	1.70	1.31-2.21
Sodium <136 meq/dL	1.65	1.20-2.25	1.17	.89-1.55
Hemoglobin < 12g/dL	1.56	1.13-2.17	1.3	1.00-1.69