B-type Natriuretic Peptide and Doppler Echocardiography for Identifying CHF Patients at Risk of Acute Heart Failure Decompensation during Beta-blockade Titration

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DISCLOSURE INFORMATION

No Conflict of Interest

ABSTRACT

B-type Natriuretic Peptide and Doppler Echocardiography for Identifying CHF patients at Risk of Acute Heart Failure Decompensation during Beta-blockade Titration

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Background
As plasma BNP concentrations and Trans Thoracic Echocardiography (TTE) parameters are strongly related to outcome of patients with chronic heart failure (CHF), we hypothesized that BNP and TTE may predict tolerance during beta-blockade titration in stable CHF.
Methods and results
Fifty consecutive stable CHF patients (age: 61±2 years, male: 88%) with Left Ventricular Ejection Fraction (LVEF) < 40% and creatininemia <250 µmol/l were included in the study. Beta-blockers were started and/or increased as recommended by ESC Guidelines. Plasma BNP (Biosite) and TTE (GE Vivid 5) were performed the same day in a blind manner, at admission then once a week during 3 weeks.
At admission, NYHA class was 2.3±0.1, mean creatininemia: 99±3 µmol/l, plasma BNP: 489±46 pg/ml, LVEF : 28±1%, E/A ratio: 1.9±0.2, E/Ea ratio : 9.8±0.6, E Deceleration Time (EDT) : 160±9 ms, systolic pulmonary artery pressure (PAP): 40±2 mmHg and inferior vena cava diameter (IVC): 16±1 mm. Acute heart failure (HF) occurred in 32% of the study population (16/50). On univariate analysis, age and admission values of NYHA class, plasma BNP concentration, log BNP, E/A ratio, EDT, systolic PAP and IVC diameter predicted increased risk of acute HF during beta-blockade titration. On multivariate analysis, only BNP concentration predicted acute HF decompensation. The combined inframedian BNP (464 pg/ml) and supramedian EDT value (147 ms) was associated with 100% negative predictive value of acute HF decompensation during beta-blockade titration.
Conclusions
The combination of plasma BNP and Doppler echocardiography may identify stable CHF patients with LV systolic dysfunction at low risk of acute heart failure during beta-blockade titration.

BACKGROUND

1. Beta-blockers improve prognosis in CHF patients with LV systolic dysfunction but their large use is limited in clinical practice by the unpredictable occurence of acute HF.

2. BNP and echocardiography (TTE) are related to LV filling pressures and outcome of patients with CHF.

HYPOTHESIS

BNP and TTE may predict acute HF in CHF patients with LV systolic dysfunction during beta-blockade titration

METHODS

Study Population

1. Inclusion Criteria	2. Exclusion Criteria
- Stable CHF - > 18 years - LVEF < 40% - No β- or β- < 2 months	- β- contra-indications - Decompensated CHF - Renal Impairment (creatininemia > 250 µmol/l)j

TTE and BNP

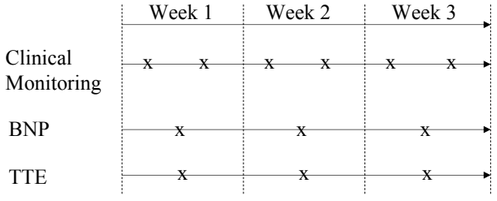
Doppler Echocardiography M-mode, 2-D images, flow and DTI (GE Vivid 5)

Measurement of BNP Concentrations
Analyzed within 4 hours with Triage BNP assay (Biosite), completed in 15 minutes

Study Design

β- initiated and/or increased as recommended by ESC Guidelines (bisoprolol, carvedilol, metoprolol)

HF decompensation:
- Pulmonary edema
- Increase in NYHA > 1 class
- Increase in weight > 2 Kg/week



BNP and TTE performed in blind manner

RESULTS

CHF Patients Baseline Characteristics

	All CHF (n=50)	Stable CHF (n=34)	Decompensated CHF (n=16)
Age	61±2	63±2	55±3*
Male	88%	85%	94%
Ischemic DMC	78%	71%	94%
NYHA	2.3±0.1	2.1±0.1	2.6±0.2†
SBP (mmHg)	104±2	107±3	96±3*
Rest Heart Rate (bpm)	75±2	75±2	76±4
BNP (pg/ml)	489±46	402±50	676±78†
LVEF (%)	28±1	29±1	26±2
LVEDV (ml)	170±8	169±9	172±15
E/A Ratio	1.9±0.2	1.5±0.2	2.9±0.3§
EDT (ms)	160±9	177±11	121±5†
E/Ea Ratio	9.8±0.6	9±1	10±1
Systolic PAP (mmHg)	40±2	38±2	47±3*
IVC Diameter (mm)	16±1	14±1	18±1†

§ indicates p<0.001, † p<0.01, * p<0.05 vs stable CHF

Treatment at Admission

	All CHF (n=50)	Stable CHF (n=34)	Decompensated CHF (n=16)
Betablockers	55%	59%	47%
ACEI	92%	88%	100%
Diuretics	71%	65%	87%
Spironolactone	49%	44%	60%

Predictors of Acute HF Decompensation during Beta-blockade Titration

Univariate Analysis

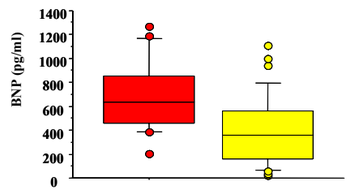
	Chi 2	p
Age	6.04	0.014
NYHA Class	5.57	0.018
Weight	0.06	0.81
Systolic Blood Pressure	6.11	0.013
Diastolic Blood Pressure	7.17	0.007
Rest Heart Rate	0.45	0.50
BNP	5.88	0.015
log BNP	5.38	0.020
LVEF	1.41	0.24
LVEDV	0.73	0.39
E/A Ratio	10.3	0.0014
EDT	7.23	0.007
E/Ea Ratio	5.24	0.02
Systolic PAP	5.83	0.016
IVC Diameter	5.50	0.019

Multivariate Analysis

- Studied parameters:
Age, NYHA class, blood pressure, LVEF, E/A, BNP

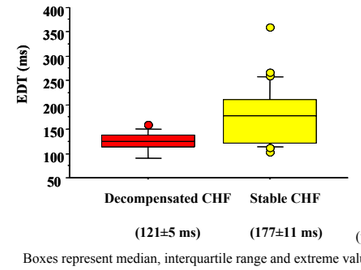
- Only admission plasma **BNP** concentration predicted acute HF decompensation (Chi 2=3.88, p=0.049)

Admission Plasma BNP Concentrations in Decompensated and Stable CHF



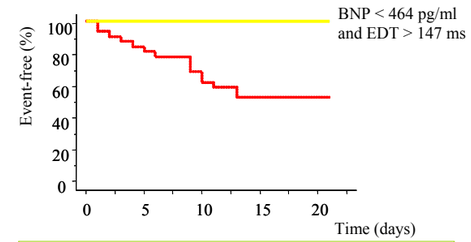
Boxes represent median, interquartile range and extreme values

Admission EDT Values in Decompensated and Stable CHF



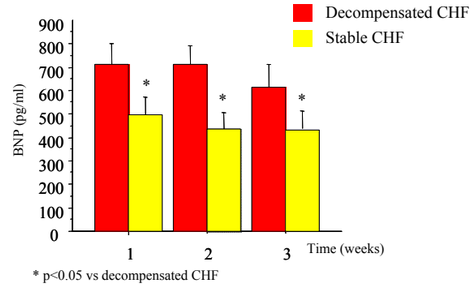
Boxes represent median, interquartile range and extreme values

Kaplan-Meier Event Curves for Time to Acute HF Decompensation during Beta-blockade Titration according to Median BNP and EDT Values



BNP < 464 pg/ml and EDT > 147 ms: NPV= 100%

Time-Course of Plasma BNP Concentrations throughout the Hospitalisation



* p<0.05 vs decompensated CHF

STUDY LIMITATIONS

Because of the small size of the population, these results need to be confirmed by larger studies

CONCLUSIONS

Combination of plasma BNP and TTE

may identify stable CHF patients with LV systolic dysfunction at low risk of acute HF decompensation during beta-blockade titration

→ may help to initiate and/or increase betablockers in these patients

Whereas regular monitoring of BNP seems to be less helpful.