Biomarkers

Multimarker testing with NT-proBNP and sST2 in predicting of cardiovascular complications in patients with ST-segment elevation myocardial infarction

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Background: ST2 and NT-proBNP are preferred biomarkers in clinical practice for the diagnosis, risk stratification and guided therapy of STEMI and Heart Failure (HF). Purpose of the study was to determine the dynamics of NT-proBNP and ST2 and their correlations with the development of cardiovascular (CV) complications in patients with STEMI.
Methods: In total 60 patients (50 males and 10 females, mean age 60.95±9.26 years) with STEMI were examined. Patients were divided into 2 groups: group I – 22 patients with STEMI complicated with acute HF with Killip class III-IV and rhythm disturbances; group II – 38 patients with STEMI with HF Killip I. NT-proBNP and ST2 concentration in the serum were determined twice, on admission and on the 10th day of treatment.
Results: At admission mean levels of NT-proBNP were higher in group I patients with CV complications (612.8 [489.5; 860.4] pg/ml – group I) when compared to group II patients without severe CV complications (598.6 [326.6; 913.1] pg/ml – group II, $p > 0.05$). On the 10th day of treatment serum levels of NT-proBNP decreased to 340 [188; 434.5] pg/ml (group I) and 190.1 [113.3; 355.3] pg/ml (group II), respectively ($p > 0.05$). Mean levels ofST2 at admission were higher in patients with severe CV complications (61.1 [44.8; 133.6] ng/ml – group I) when compared to group II patients (40.8 [33.1; 64.3] ng/ml – group II, $p < 0.05$). On the 10th day of treatment mean level of ST2 decreased to 23.7 [18.8; 28.3] ng/ml (group I) and 24 [19.7; 28.7] ng/ml (group II), respectively ($p > 0.05$). Significant direct correlations of moderate strength were found between ST2 and NT-proBNP levels in group I on day 1 and on the 10th day of treatment ($r = 0.32$; $p < 0.05$ and $r = 0.36$; $p < 0.05$, respectively). Significant direct correlations of moderate and high strength were found between ST2 and NT-proBNP levels in group II on day 1 and on the 10th day of treatment ($r = 0.367$; $p < 0.05$ and $r = 0.768$; $p < 0.001$, respectively). Increase of ST2 and NT-proBNP above its threshold values indicates a significant risk of CV complications (sensitivity – 95.5 %, specificity – 63.2 %, AUC – 0.849, $p<0.05$).
In conclusion, the concentration levels of ST2 and NT-proBNP at baseline allows to predict more severe course of STEMI and the risk of CV complications. Treatment with optimal medical therapy alows to decrease biomarkers of myocardial fibrosis sST2 lower than 35 ng/ml therefore downturn the posibility of adverse outcome development in STEMI patients.

Hepatocyte growth factor as a new marker of pulmonary hypertension in heart failure patients.

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Background: Hepatocyte Growth Factor (HGF) is a major multifunctional cytokine derived from liver mesenchymal cells, promoting vascular endothelial proliferation, demonstrating also anti-apoptotic and anti-inflammatory effects. There are reports suggesting strong relationship between HGF level and development of pulmonary arterial hypertension. However, little is known about clinical significance of HGF level in patients with chronic heart failure.
Aim: We aimed to assess the usefulness of HGF as a marker of echocardiographically estimated pulmonary pressure in heart failure patients.
Methods: This cohort, single-centre study was carried out on 56 stable HF patients (53.6% males, NYHA II-III). The pulmonary pressure was estimated using peak tricuspid regurgitation velocity (TRPG) evaluated in routine transthoracic echocardiography. The HGF level was evaluated semi-quantitatively using the Proteome Profiler Human XL Cytokine Array Kit (R&D Systems, Minneapolis, MN). The NT-proBNP level was evaluated with the Elecsys NT-proBNP assay (Roche Diagnostics; Indianapolis, IN). Associations between TRPG, HGF and NT-proBNP levels were evaluated using Spearman correlation, linear and multiple regression analysis.
Results: Within the whole study group, HGF and NT-proBNP both correlated with TRPG ($r = 0.51$, $p < 0.001$; $r = 0.47$, $p < 0.001$, respectively). We found that TRPG correlates better with HGF than with NT-proBNP in patients with preserved ejection fraction (HFpEF) ($r = 0.59$, $p < 0.001$; $r = 0.43$, $p < 0.02$; respectively). In patients with left ventricular ejection fraction (LVEF) < 50% we found TRPG to strongly correlate with NT-proBNP ($r = 0.65$, $p < 0.001$). In this group there was a strong trend towards significant correlation between TRPG and HGF ($r = 0.4$; $p = 0.06$). Interestingly, there was no significant correlation between HGF and NT-proBNP, regardless of LVEF. In linear regression analysis HGF better than NT-proBNP explained the variance of TRPG ($R^2 = 0.37$; $p < 0.001$; $R^2 = 0.15$; $p < 0.01$, respectively). Multiple regression analysis showed that the HGF is the NT-proBNP independent predictor of TRPG ($\beta = 0.59$, $p < 0.001$; $\beta = 0.35$, $p < 0.001$; respectively).
Conclusions: HGF seems to be a new promising marker of pulmonary hypertension in HF patients. It can deliver additional and different to NT-proBNP information. Further studies are needed to assess its prognostic or therapeutic value.

Rehabilitation

The effects of cardiovascular rehabilitation in patients with reduced, mildly reduced, and preserved ejection fraction - do they benefit equally?

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Background: Coronary artery disease (CAD) is the leading cause of heart failure (HF). On the other hand, left ventricular ejection fraction (LVEF) is one of the greatest prognosticator in CAD patients. The beneficial effects of cardiac rehabilitation (CR) in CAD patients are well known but whether they depend on LVEF is rather unknown.
Purpose: To examine whether CAD pts with reduced, mildly reduced, and preserved EF benefit equally from comprehensive CR in terms of exercise tolerance.
Methods: Eight hundred twenty-eight CAD pts attended a three-week CR program at the residential center. Before attending CR all patients underwent an echocardiographic exam. At baseline and at the end of CR exercise stress test (EST) was taken. All pts were divided into three groups: with reduced (EF<40%), mildly reduced (EF 40-49%), and preserved LVEF (EF≥50%). All data were analyzed based on EF values.
Results: There were 84 pts (10.14%) with reduced, 246 pts (29.71%) with mildly reduced, and 498 pts (60.15%) with preserved LVEF. At the first EST (EST1) and at the second EST (EST2) patients with mildly reduced and preserved LVEF showed better strain tolerance compared to pts with reduced LVEF by reaching a higher strain levels and longer duration of EST. However, all three groups showed better strain tolerance at the EST2. Namely, they all reached higher strain level (for all three groups $p = 0.000$) and longer duration of EST (for all three groups $p = 0.000$). Also, in all three groups significantly higher percentage of patients reached submaximal heart rate at the EST2 compared to EST1 ($p = 0.001$ for reduced, $p = 0.006$ for mildly reduced, and $p = 0.000$ for preserved EF), but only pts with reduced LVEF had higher values of double product at the end of EST2 compared to the end of EST1 (0.031). On the other hand, pts with reduced LVEF had a significantly higher rate of arrhythmia at the EST2 compared to pts with mildly reduced and preserved LVEF ($p = 0.009$). Improvement of physical strain level and duration of EST on EST2 compared with EST1 was more pronounced in pts with reduced (by 19.2% and 28.7%), than in pts with mildly reduced (by 13.9% and 17.5%) and pts with preserved LVEF (14.1% and 16.8%).
Conclusion: Results indicate that CR significantly improved physical strain tolerance in patients with coronary artery diseases independent of ejection fraction. In pts with mildly reduced and pts with preserved LVEF CR resulted in higher level of strain tolerance than in pts with reduced LVEF. However, improvement in exercise capacity was more pronounced in pts with reduced LVEF.

Pharmacotherapy

Levosimendan in outpatients with advanced heart failure: single-center experience of 200 intermitent perfusions

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Background: Patients with advanced heart failure (AdHF) have a high rate of morbidity and mortality. The use of a 6-hour intermittent outpatient Levosimendan infusion has been proven to give symptomatic relief and lower the rate of HF episodes, allowing patients to be treated without having to be hospitalized.
Purpose: Evaluate the safety and efficacy of ambulatory Levosimendan administration in an AdHF population.
Methods: Single center prospective experience of consecutive AdHF referred for intermittent intravenous outpatient administration of Levosimendan, between January 2018 and March 2021. Levosimendan was administered every 2 weeks by a 6-hour intravenous infusion (0.2 μg/kg/min) for 12 weeks (6 cycles) in an ambulatory administration setting with non-invasive monitoring of vital signs. Patients in the