Echocardiographic assessment and B-type natriuretic peptide for risk evaluation in acute coronary syndromes

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin vid Göteborgs Universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Academicum, Medicinaregatan 3, Göteborg.

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av

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Avhandlingen baseras på följande delarbeten:

I. **N-terminal pro-B-type natriuretic peptide and long-term mortality in acute coronary syndromes.** Omland T, Persson A, Ng L, O´Brien R, Karlsson T, Herlitz J, Hartford M, Caidahl K. *Circulation 2002;106:2913-8*
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II. **Long-term prognostic value of mitral regurgitation in acute coronary syndromes.** Persson A, Hartford M, Herlitz J, Karlsson T, Omland T, Caidahl K. *Heart 2010; 96:1803-8*

III. **The long-term prognostic value of a single echocardiographic view in acute coronary syndromes.** Persson A, Hartford M, Herlitz J, Caidahl E, Karlsson T, Caidahl K. *Submitted*

IV. **Restrictive left ventricular filling and B-type natriuretic peptide as prognostic indicators in acute coronary syndromes.** Persson A, Hartford M, Caidahl E, Herlitz J, Karlsson T, Omland T, Caidahl K. *Submitted*

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Abstract

Acute coronary syndrome (ACS) is one of the most common causes of emergency medical care and the single most common cause of death in Sweden in both men and women. Despite a significant improvement in survival in the acute phase, the frequency of rehospitalization and death in subsequent years is unacceptably high. An estimation of future risk should therefore be a central part of the care of patients with ACS. Echocardiography for the evaluation of left ventricular (LV) function has become an important component in risk assessment. Further, the usefulness of various biochemical variables has been recognized and B-type natriuretic peptide (BNP) has been proven to be an important prognostic marker among patients with heart failure (CHF) and recently also in ACS.

The aim of this thesis was to assess whether the incorporation of BNP and Doppler echocardiographic variables in risk stratification strategies in patients with ACS can improve the prediction of mortality and rehospitalization for CHF during long-term follow-up.

The study included consecutive patients with ACS who received coronary care at Sahlgrenska University Hospital from September 1995 to March 2001. Clinical variables were collected during hospitalization, blood for the determination of BNP was sampled in the acute phase and a Doppler echocardiographic examination was performed. The echocardiographic 4-chamber view and Doppler curves were saved digitally or digitized and a range of systolic and diastolic variables, which reflect cardiac structure and function, were calculated. Patients were followed prospectively for a maximum of 110 months with regard to death and rehospitalization due to CHF.

We found that BNP was significantly higher in deceased patients than in those who survived. BNP provided prognostic information, even when adjusting for Killip class >1, age and LV ejection fraction (LVEF), and also among patients without clinical evidence of CHF (Killip class<1).The presence of significant mitral regurgitation, low LVEF and increased levels of BNP were all independently associated with death, while rehospitalization for CHF was predicted by mitral regurgitation and LVEF. In a multivariate analysis, the LV volume index in systole (LVVIs) and the ratio of maximum systolic and diastolic pulmonary venous flow velocities (PV-S/D) were associated with all-cause mortality, cardiovascular mortality and rehospitalization due to CHF.
Patients with a restrictive LV filling pattern had a poorer prognosis than those with normal filling and this diastolic abnormality remained a significant predictor of outcome even after adjustment for BNP and clinical risk factors, as assessed by the GRACE risk score. Further, additional prognostic information was provided by the LV outflow tract velocity integral (LVOT-VTI), LVEF and (PV-S/D) ratio.

In conclusion, our results indicate that BNP, as well as a restrictive filling pattern, mitral regurgitation and other Doppler echocardiographic variables, such as LVOT-VTI, LVVIs, LVEF and (PV-S/D) ratio, provides prognostic information on long-term survival and rehospitalization due to CHF in patients with ACS, over and above clinical risk factors. For this reason, both information from a single echocardiographic view and BNP levels appear to be useful tools in the identification of high-risk ACS patients. Further studies are needed to clarify exactly how these risk markers should be used in the clinical routine.

Key words: acute coronary syndrome, BNP, NT-proBNP, mitral regurgitation, Doppler echocardiography, mortality, congestive heart failure, restrictive filling pattern

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