Importance of Cardiac Reserve for Evaluation and Prediction of Cardiac Function and Morbidity assessed by low-dose dobutamine stress echocardiography

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Avhandlingen baseras på följande delarbeten:

I. **The function of left ventricular basal segments is most important for long-term recovery.** *M Scharin Täng, F Waagstein, B Andersson.*
Int J Cardiology 2007 doi:10.1016/j.ijcard.2006.11.014

II. **Influence of age, hypertension, and diabetes on cardiac reserve in rat model.** *M Scharin Täng, E Haugen, A Isic, M Fu, B Andersson.*
J Am Soc Echocardiography 2007 doi:10.1016/j.echo.2006.11.001

III. **Antibodies against the β_1-adrenergic receptor induce progressive development of cardiomyopathy.** *L Buvall, M Scharin Täng, B Andersson, M Fu.*
J Mol and Cell Cardiology 2007 doi: 10.1016/j.yjmcc.2007.02.007

IV. **Cardiac reserve in the transplanted heart: effect of a graft polymorfism in the β_1-adrenoceptor.** *M Scharin Täng, E Lindberg, B Grüner Sveälv, Y Magnusson, B Andersson.*
Subbmitted

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Importance of Cardiac Reserve for Evaluation and Prediction of Cardiac Function and Morbidity assessed by low-dose dobutamine stress echocardiography

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Abstract

This thesis aimed to evaluate the cardiac reserves capacity to be used to predict treatment effects, sub clinical heart disease and to evaluate β_1-adrenoceptor (AR) gene polymorphism (Ser49Gly).

Studies were performed in patients with dilated cardiomyopathy, in rats (young, healthy, diabetic and hypertensive), in mice (immunized against the β_1AR) and in heart-transplanted patients.

The cardiac reserve was assessed by low-dose dobutamine stress echocardiography. In both patient studies by dobutamine infusion until an increased baseline heart rate with ~20 bpm, in rats at doses of 10 μg/kg/min and 20 μg/kg/min dobutamine and in mice after an intraperitoneally injection of 1 μg dobutamine/g of body weight.

Both global and regional cardiac reserve can be used to predict treatment effect of metoprolol in dilated cardiomyopathy patients. However, only cardiac reserve in the basal segments of the heart was independently associated with recovery. In heart transplanted patients a gene-polymorphism in the β_1AR in the graft affects cardiac reserve. Patients having the β_1AR Gly49 variants had a lower resting heart rate, a better stress endurance and chronotropic reserve than patients homozygous for Ser49. They also had better diastolic function shown as better lusitropic capacity. Cardiac reserve can also be used to investigate sub clinical heart disease in β_1AR immunized mice and to predict heart disease development in these animals. Furthermore, cardiac reserve decreases with age and is depressed both in hypertension and in diabetes rat model.

We conclude that cardiac reserve can predict left ventricular recovery during beta-blocker treatment and that β_1AR polymorphism affects cardiac reserve in humans. Cardiac reserve decreases with age and is impaired both in severe heart disease and during progression of myocardial dysfunction in rats. Furthermore, cardiac reserve can be used to predict cardiomyopathy development after β_1AR immunization in mice.

Keywords: Stress echocardiography, Heart failure, Beta-1-adrenoceptor, Cardiac reserve.

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