Longitudinal Common Carotid Artery Wall Motion –
mechanistic, prognostic and translational studies

AKADEMISK AVHANDLING

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av

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The thesis is based on the following papers:

I. Sara Svedlund, Li-ming Gan.

Longitudinal Wall Motion of the Common Carotid Artery Can be Assessed by Velocity Vector Imaging *Clin Physiol Funct Imaging. 2011 Jan;31(1):32-8. Epub 2010 Sep 23.*

II. Sara Svedlund, Charlotte Eklund, Sinsia Gao, Li-ming Gan.

Carotid Artery Longitudinal Displacement is Associated with Cardiac Wall Motion *Submitted*

III. Sara Svedlund, Charlotte Eklund, Per Robertsson, Milan Lomsky, Li-ming Gan.

Carotid Artery Longitudinal Displacement Predicts One Year Cardiovascular Outcome in Patients with Suspected Coronary Artery Disease *2nd revision submitted*

IV. Sara Svedlund, Li-ming Gan.

Longitudinal Common Carotid Artery Wall Motion is Associated with Plaque Burden in Man and Mouse *Accepted for publication in Atherosclerosis*

UNIVERSITY OF GOTHENBURG

Longitudinal Common Carotid Artery Wall Motion – mechanistic, prognostic and translational studies

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Abstract

The longitudinal arterial movement of the common carotid artery (CCA) has been less investigated during the past compared to the radial movement. This is probably due to lack of an adequate measuring method. Velocity vector ultrasound imaging (VVI) now enables assessment of the longitudinal movement. The general aim of this thesis was to evaluate the potential use of VVI in assessment of CCA longitudinal wall motion. Furthermore, its clinical correlates, possible mechanisms and predictive value were evaluated in studies from man to mouse.

VVI was studied from standard CCA B-mode ultrasound images in healthy volunteers, patients with established coronary artery disease (CAD) and in medium to high risk patients. All images were analyzed with specific interest of the longitudinal vessel wall movement of the far wall of the CCA. Additionally, the VVI technique was used to study the longitudinal CCA wall movement in a mouse model of atherosclerosis using high frequency ultrasound.

Findings from this thesis suggest that it is possible to assess longitudinal CCA vessel wall motion with VVI technique in man with good accuracy. Patients exhibiting low total longitudinal displacement (tLoD) showed greater intima-media thickness (IMT), increased clinically determined ischemia score and area on myocardial perfusion scintigraphy examination, and decreased cardiac performance as measured by tissue velocity also determined by VVI. In patients with suspected CAD, high tLoD predicted greater one year cardiovascular (CV) event-free survival. In a separate survival analysis including patients with IMT above and below the median value, tLoD provided an incremental value above IMT in prediction of event-free survival. Finally, tLoD is also measurable in mice and low tLoD was associated with greater atherosclerotic plaque burden in mice.

This thesis concludes that VVI can be used to study the longitudinal CCA vessel wall movement in both man and mouse. The tLoD seems to reflect both vessel wall structure and cardiac performance. VVI assessed longitudinal displacement has a predictive value for future short term CV events in patients with suspected CAD.

Key words: carotid artery, longitudinal wall motion, ultrasound, velocity vector imaging, risk factor.

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