



**Universiteit  
Leiden**  
The Netherlands

## **Imaging of coronary atherosclerosis and vulnerable plaque**

Velzen, J.E. van

### **Citation**

Velzen, J. E. van. (2012, February 16). *Imaging of coronary atherosclerosis and vulnerable plaque*. Retrieved from <https://hdl.handle.net/1887/18495>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/18495>

**Note:** To cite this publication please use the final published version (if applicable).

**Imaging of Coronary Atherosclerosis  
and Vulnerable Plaque:  
From Mechanism to Management**

**Joëlla E. van Velzen**

The research described in this thesis was performed at the Departments of Cardiology and Radiology of the Leiden University Medical Center, Leiden, The Netherlands.

Design Cover: Merel Anne de Boer, mereldeboer@gmail.com

Lay-out: Optima Grafische Communicatie, Rotterdam, The Netherlands

Printed by: Optima Grafische Communicatie, Rotterdam, The Netherlands

ISBN: 978-94-6169-189-7

Copyright © 2012 J.E. van Velzen, Rotterdam, The Netherlands. All rights served. No part of this book may be reproduced or transmitted, in any form or by any means, without prior permission of the author.

Financial support for the costs associated with the publication of this thesis was gratefully received from: Astellas Pharma BV, Bioclinica BV, Boehringer Ingelheim BV, Boston Scientific Benelux BV, Bristol-Myers Squibb, J.E. Jurriaanse Stichting, Medis medical imaging systems BV, Merck Sharp & Dohme BV, Roche Nederland BV, Sanofi-Aventis BV, Servier Nederland Farma BV, Stichting Imago, Toshiba Medical Systems BV and Volcano Europe BV.

**IMAGING OF CORONARY ATHEROSCLEROSIS  
AND VULNERABLE PLAQUE:  
FROM MECHANISM TO MANAGEMENT**

**Proefschrift**

ter verkrijging van

de graad van Doctor aan de Universiteit Leiden,  
op gezag van Rector Magnificus prof. mr. P.F. van der Heijden,  
volgens besluit van het College voor Promoties  
te verdedigen op donderdag 16 februari 2012

klokke 16.15 uur

door

Joëlla Esther van Velzen

geboren te Fullford, Groot-Brittannië  
in 1982

## **PROMOTIE COMMISSIE**

Promotores: Prof. Dr. E.E. van der Wall  
Prof. Dr. J.J. Bax

Co-promotor: Dr. J.D. Schuijf

Overige leden: Prof. Dr. J.W. Jukema  
Prof. Dr. Ir. J.H.C. Reiber  
Prof. Dr. M.J. SchaliJ  
Dr. G.J. de Grooth  
Dr. L.J. Kroft  
Dr. M. Meuwissen (Amphia ziekenhuis, te Breda)

The research described in this thesis was supported by a grant of the Netherlands Heart Foundation (grant nr. 2007B223).

The financial support by the Netherlands Heart Foundation for the publication of this thesis is gratefully acknowledged.

Voor mijn ouders  
en voor Rolf

## TABLE OF CONTENTS

### General introduction and outline of the thesis

<b>Chapter 1</b>	Imaging of atherosclerosis: invasive and noninvasive techniques	11
------------------	---	----

### Part 1 Diagnosis of coronary atherosclerosis and vulnerable plaque

<b>Chapter 2</b>	Evaluation of coronary plaque type and composition with 320-row multidetector computed tomography: comparison to virtual histology intravascular ultrasound	43
<b>Chapter 3</b>	Plaque type and composition in relation to the degree of stenosis as evaluated non-invasively by MSCT angiography and invasively by VH IVUS	59
<b>Chapter 4</b>	The site of greatest vulnerability is most often located proximally to the site of most severe narrowing: a virtual histology intravascular ultrasound study	75
<b>Chapter 5</b>	Diagnostic performance of non-invasive multidetector computed tomography coronary angiography to detect coronary artery disease using different endpoints; detection of significant stenosis versus detection of atherosclerosis	89
<b>Chapter 6</b>	Non-invasive assessment of atherosclerotic coronary lesion length using multidetector computed tomography angiography: comparison to quantitative coronary angiography	105
<b>Chapter 7</b>	Comprehensive assessment of spotty calcifications on computed tomography angiography: comparison to vulnerable plaque characteristics on virtual histology intravascular ultrasound	117
<b>Chapter 8</b>	Positive remodeling on coronary computed tomography as a marker for plaque vulnerability on virtual histology intravascular ultrasound	135

## **Part 2 Imaging of coronary atherosclerosis and clinical management**

<b>Chapter 9</b>	Monitoring and investigations in ICCU: CT angiography and other applications of CT	149
<b>Chapter 10</b>	Reduction of radiation dose using 80 kV tube voltage: a feasible strategy?	179
<b>Chapter 11</b>	Diagnostic accuracy of 320-row multidetector computed tomography coronary angiography in the non-invasive evaluation of significant coronary artery disease	187
<b>Chapter 12</b>	Performance and efficacy of 320-row computed tomography coronary angiography in patients presenting with acute chest pain – results from a clinical registry	203
<b>Chapter 13</b>	Comparison of the relation between the calcium score and plaque characteristics in patients with acute coronary syndrome versus patients with stable coronary artery disease, assessed by CTA and VH IVUS	221
<b>Chapter 14</b>	Non-invasive computed tomography coronary angiography as a gatekeeper for invasive coronary angiography	235
<b>Chapter 15</b>	Predictive value of multislice computed tomography variables of atherosclerosis for ischemia on stress-rest single photon emission computed tomography (SPECT)	247
	Summary and Conclusions	267
	Nederlandse Samenvatting	275
	List of Publications	283
	Dankwoord	289
	Curriculum Vitae	293



