



### University of Groningen

### Optimized detection, visualization, and quantification of the coronary artery plaque - which pathway?

Dobrolinska, Magdalena

10.33612/diss.846323181

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version Publisher's PDF, also known as Version of record

Publication date: 2024

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Dobrolinska, M. (2024). *Optimized detection, visualization, and quantification of the coronary artery plaque – which pathway*? [Thesis fully internal (DIV), University of Groningen]. University of Groningen. https://doi.org/10.33612/diss.846323181

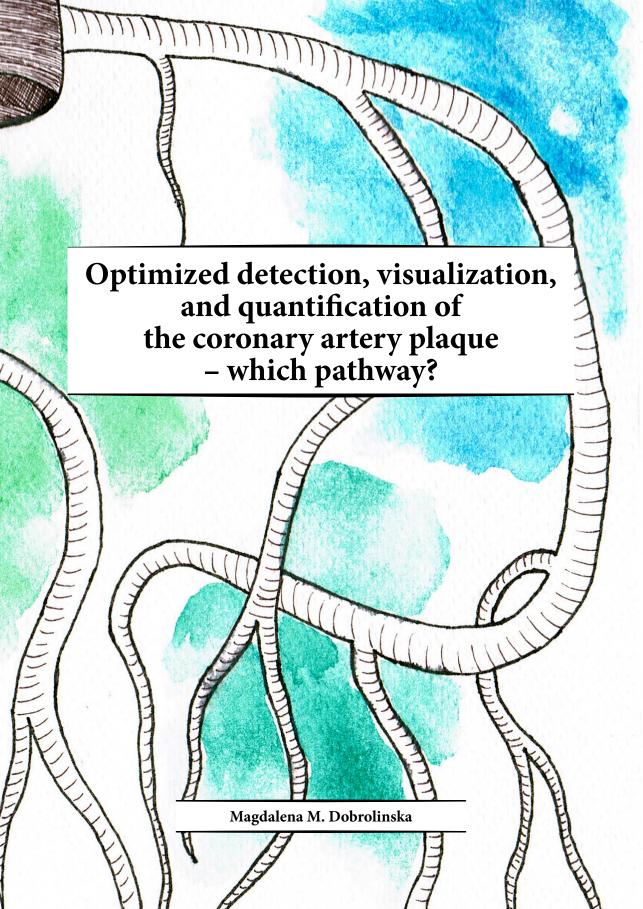
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverneamendment.

**Take-down policy**If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Download date: 24-06-2024



# Optimized detection, visualization, and quantification of the coronary artery plaque which pathway?

## Optimized detection, visualization, and quantification of the coronary artery plaque - which pathway? The printing of this thesis was financially supported by the Library of the University of Groningen. Cover design: Martyna A. Dobrolinska Layout: Roy Sanders Printed by: Drukomatic Dissertation of University of Groningen, Groningen, the Netherlands Copyright © Magdalena M Dobrolinska The Netherlands 2023. All rights reserved.



### Optimized detection, visualization, and quantification of the coronary artery plaque – which pathway?

### PhD thesis

to obtain the degree of PhD of the University of Groningen on the authority of the Rector Magnificus Prof. J.M.A. Scherpen and in accordance with the decision by the College of Deans.

This thesis will be defended in public on

Monday 8 January 2024 at 14:30 hours

by

Magdalena Marzena Dobrolinska

born on 20 January 1993

### **Supervisors**

Prof. R.H.J.A. Slart Prof. W. Wojakowski

### **Co-supervisors**

Dr. M.J.W. Greuter Dr. N.H.J. Prakken

### **Assessment Committee**

Prof. M. Tendera Prof. P. van der Meer Prof. A.W.J.M. Glaudemans

Financial support of this thesis by European Association of Cardiovascular Imaging (EACVI) Research grant 2020 and Club "30" Polish Cardiac Society Research Grant 2019, and Dutch Heart Foundation are greatly appreciated.

If you want to go fast,

Go alone.

If you want to go far,

Go together.

African Proverb

### **Contents**

Chapter 1	General introduction and outline of the thesis	9		
O	Part I – PRECLINICAL RESEARCH Optimisation and improvement of coronary artery calcium scoring			
Chapter 2	Systematic Assessment of Coronary Calcium Detectability and Quantification on Four Generations of CT Reconstruction Techniques: a Patient and Phantom Study	23		
Chapter 3	Classification of moving coronary calcified plaques based on motion artifacts using convolutional neural networks: a robotic simulating study on influential factors	47		
Chapter 4	Radiation dose optimization for photon-counting CT coronary artery calcium scoring for different patient sizes: a dynamic phantom study	71		
Chapter 5	Feasibility of virtual non-iodine coronary calcium scoring on dual source photon-counting coronary CT angiography: a dynamic phantom study	87		
Chapter 6	Vendor independent coronary calcium scoring improves individual risk assessment - the Multi-Ethnic Study of Atherosclerosis (MESA)	109		
Part IIa CLINICAL RESEARCH  How to derive valuable clinical information from low dose CT scans?				
Chapter 7	Performance of visual, manual, and automatic coronary calcium scoring of cardiac <sup>13</sup> N-ammonia PET/low dose CT	143		
Chapter 8	Automated cardiovascular risk categorization through AI-driven coronary calcium quantification in cardiac PET acquired attenuation correction CT	167		
Chapter 9	Added value of visual and automatic coronary calcium scoring from low dose CT <sup>15</sup> O-water PET scans to identify patients at high risk of cardiac events	193		

	Part IIb CLINICAL RESEARCH Invasive coronary artery plaque assessment			
Chapter 10	The influence of HDL-C on maximal lipid core burden indexing TCFA lesions as assessed by Near Infrared Spectroscopy	221		
Chapter 11	Performance of integrated near-infrared spectroscopy and intravascular ultrasound (NIRS-IVUS) system against Quantitative Flow Ratio (QFR).	237		
Part IIc CLINICAL RESEARCH  The puzzle of aortic stenosis and coronary artery disease				
Chapter 12	Myocardial perfusion and coronary physiology assessment of microvascular dysfunction in patients undergoing transcatheter aortic valve implantation – rationale and design	259		
Chapter 13	Summary and Discussion	275		
Chapter 14	Dutch Summary	297		
_	Acknowledgements	307		
	Publications	315		
	Curriculum vitae	321		

