Mapping and ablation of atrial tachyarrhythmias : from signal to substrate

Groot, N.M.S. de

Mapping and Ablation of Atrial TachyArrhythmias

From Signal to Substrate

Natasja MS de Groot

The research described in this thesis was performed at the department of cardiology and cardiothoracic surgery of the Leiden University Medical Center, Leiden and the department of physiology, Cardiovascular Research Institute Maastricht, Maastricht University, the Netherlands.

Financial contribution to the costs associated with the publication of this thesis from:
Biosense Webster/Johnson & Johnson Medical BV, St Jude Medical Nederland BV, Guidant Nederland BV, Boston Scientific Nederland, Merck, Sharp & Dome, Bard Electrophysiology, Philips Medical Systems, Siemens, Servier, Astellas Pharmas, Toshiba Medical Systems Nederland BV, Medtronic BV and Vitatron.

Cover design by Natasja MS de Groot

Lay out by:
Buijten & Schipperheijn

Printed by:
Buijten & Schipperheijn, Amsterdam, the Netherlands

ISBN-10 90-9020960-3
ISBN-13 978-90-9020960-9

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Proefschrift

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van de Rector Magnificus Dr. D.D. Breimer,
hoogleraar in de faculteit der Wiskunde en
Natuurwetenschappen en die der Geneeskunde,
volgens besluit van het College voor Promoties
te verdedigen op donderdag 14 september 2006
klokke 13.45 uur

door

Natasja Mireille Silvia de Groot

geboren te Heemstede
in 1972

Promotiecommissie

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

Als je doet wat je leuk vindt, hoef je nooit hard te werken

Mahatma Gandhi

dankzij mijn ouders

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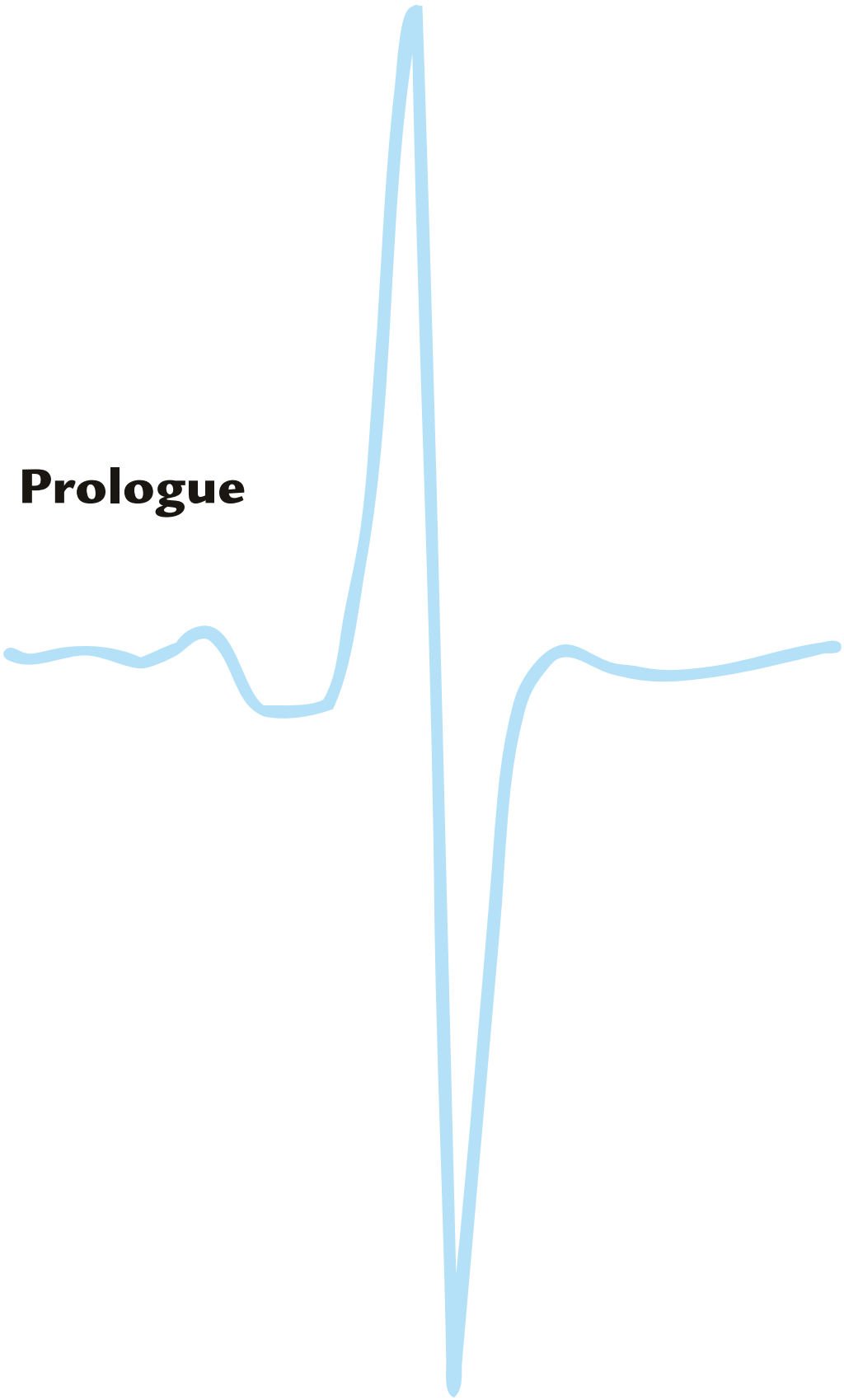
Prologue



Prologue

Atrial tachyarrhythmias are defined as supraventricular tachycardias that do not require the atrioventricular node or ventricular tissue for initiation and perpetuation.
It is expected that the number of patients presenting with atrial tachyarrhythmias will continue to rise in the next decades. This is mainly caused by ageing of our population as the incidence of atrial tachyarrhythmias is higher in older subjects. In addition, there is also a growing group of patients presenting with atrial tachyarrhythmias who have had corrective or palliative cardiac surgery for congenital heart defects. Refinement of surgical techniques has resulted in an improved life expectancy of this patient group. As the incidence of atrial tachyarrhythmias increases over time, late post-operative atrial tachyarrhythmias in subjects with congenital heart defects is nowadays becoming a more frequently encountered clinical problem. Another new growing patient population presenting with atrial tachyarrhythmias are endurance athletes as excessive sports activity is a risk factor for development of, for example, atrial fibrillation.
Atrial tachyarrhythmias can result in electrophysiological, structural and/or functional alterations of the myocardium (tachycardia-induced cardiomyopathy) and treatment is therefore essential. Pharmacological treatment of atrial tachyarrhythmias is often ineffective and limited by side effects. In the last decades, technological progress has resulted in development of (catheter based and surgical) ablation therapy. The introduction of ablative therapy has made it possible to treat atrial tachyarrhythmias curatively. In order to successfully eliminate atrial tachyarrhythmias by catheter ablation, correct diagnosis of the underlying mechanism of the arrhythmia is essential. The surface electrocardiogram is often not reliable and cardiac mapping is therefore compulsory to diagnose an atrial tachyarrhythmias for example as a focal atrial tachycardia, typical (counter) clockwise atrial flutter, atypical atrial flutter or an incisional atrial tachycardia. Data acquired by cardiac mapping also determines the mode of ablative therapy (e.g. focal application or construction of linear lesions). Yet, ablative therapy is not always successful which may be caused by insufficient understanding of the mechanism of the arrhythmia. Also, recurrences after ablation may be caused by progressive atrial myopathy or by incomplete ablative lesions.
Experimental and clinical mapping studies per se are essential in order to continue to increase our knowledge of atrial tachyarrhythmias and to provide a basis for development of innovative therapies or to improve existing treatment modalities.