NONINVASIVE IMAGING OF CARDIAC METABOLISM

edited by
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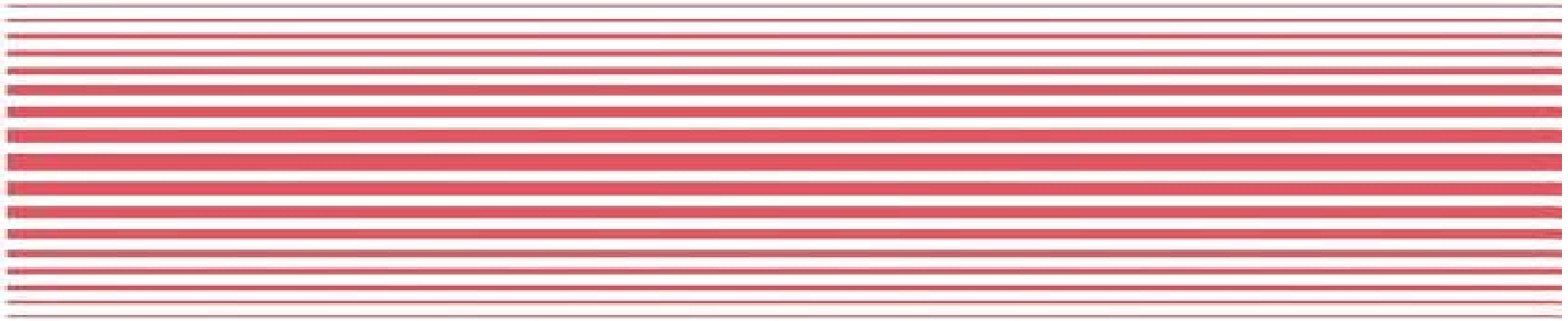

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Noninvasive Imaging Of Cardiac Metabolism

Heitaroh Iwata,John B. Lombardini,Tomio Segawa

Noninvasive Imaging Of Cardiac Metabolism:

Noninvasive Imaging of Cardiac Metabolism Ernst E. van der Wall,2012-12-06 F J Th WACKERS Metabolic imaging The future of cardiovascular nuclear imaging Since cardiovascular nuclear imaging emerged as a new subspecialty in the mid 1970s the field has gone through an explosive growth Radionuclide techniques became readily recognized as important new diagnostic aids in the armamentarium of the clinical cardiologist Initially cardiovascular nuclear imaging focused on static myocardial imaging using either thallium 201 or technetium 99m pyrophosphate for diagnosing acute myocardial infarction Shortly thereafter multigated equilibrium radionuclide angiocardiography became the most widely used noninvasive method for assessing cardiac function Furthermore attention and clinical application shifted towards the use of radionuclide techniques in conjunction with exercise testing either with thallium 20 1 myocardial perfusion imaging or technetium 99m left ventricular function studies The future of cardiovascular nuclear imaging appeared exciting and promising However around 1980 pessimists predicted the premature demise of cardiovascular nuclear imaging with the introduction of digital subtraction angiography and nuclear magnetic resonance imaging These doomsayers have been proven wrong in 1985 cardiovascular nuclear imaging is thriving and in many centers even expanding Although digital substraction angiography and magnetic resonance imaging provided exquisite anatomic detail for practical evaluation of patients with ischemic heart disease in the Coronary Care Unit or exercise laboratory nuclear techniques appeared to be more practical *What's New in Cardiac Imaging?* Ernst E. van der Wall,H. Sochor,A. Righetti,M.G. Niemeyer,2012-12-06 Since the introduction of myocardial perfusion imaging and radionuclide angiography in the mid seventies cardiovascular nuclear medicine has undergone an explosive growth The use of nuclear cardiology techniques has become one of the cornerstones of the noninvasive assessment of coronary artery disease In the past 15 years major steps have been made from visual analysis to quantitative analysis from planar imaging to tomographic imaging from detection of disease to prognosis and from separate evaluations of perfusion metabolism and function to an integrated assessment of myocardial viability In recent years many more advances have been made in cardiovascular nuclear imaging such as the development of new imaging agents reevaluation of existing procedures and new clinical applications This book describes the most recent developments in nuclear cardiology and also addresses new contrast agents in MRI What s New in Cardiac Imaging will assist the clinical cardiologist the cardiology fellow the nuclear medicine physician and the radiologist in understanding the most recent achievements in clinical cardiovascular nuclear imaging **The Scientist's Guide to Cardiac Metabolism** Michael Schwarzer,Torsten Doenst,2015-11-04 The Scientists Guide to Cardiac Metabolism combines the basic concepts of substrate metabolism regulation and interaction within the cell and the organism to provide a comprehensive introduction into the basics of cardiac metabolism This important reference is the perfect tool for newcomers in cardiac metabolism providing a basic understanding of the metabolic processes and enabling the newcomer to immediately communicate with the expert as

substrate energy metabolism becomes part of projects The book is written by established experts in the field bringing together all the concepts of cardiac metabolism its regulation and the impact of disease Provides a quick and comprehensive introduction into cardiac metabolism Contains an integrated view on cardiac metabolism and its interrelation in metabolism with other organs Presents insights into substrate metabolism in relation to intracellular organization and structure as well as whole organ function Includes historical perspectives that reference important investigators that have contributed to the development of the field **Pericardial Disease** J. Soler-Soler,G. Permanyer,J. Sagristà-Sauleda,2012-12-06 In November 1986 I was invited to attend a symposium held in Barcelona on Diseases of the Pericardium The course was directed by Dr J Soler Soler director of Cardiology at Hospital General Vall d Hebron in Barcelona During my brief but delightful visit to this institution my appreciation of the depth and breadth of study into pericardial diseases carried out by Dr Soler and his group grew into the conviction that these clinical investigators have accumulated a wealth of information concerning pericardial diseases and that investigators and clinicians practicing in English speaking countries would greatly profit from ready access to the results of the clinical investiga tions into pericardial disease carried out in Barcelona The proceedings of the Barcelona conference were published in a beauti fully executed volume in the Spanish language edited by Dr Soler and pro duced by Ediciones Doyma Because I believe that this work should be brought to the attention of the English speaking scientific and clinical com munities I encouraged Dr Soler to have the book translated into English I knew that this task could be accomplished and that the book would be trans lated into good English without change of its content My confidence was based upon a translation of my own book The Pericardium into Spanish undertaken by Dr Permanyer who is a contributor and co editor of the pre sent volume Stress Doppler Echocardiography Steve M. Teague,2012-12-06 For almost 40 years a small but intense group of cardiovascular investigators have evaluated cardiac performance by measuring the mass velocity and acceleration of blood ejected from the left ventricle These studies reveal that energy is transferred from ventricle to blood very early in systole and that the left ventricle is charac terized as an impulse generator Recent explosive developments in Doppler echocar diography have allowed study of the energetics of ventricular contraction through noninvasive acceleration velocity and volumetric flow measurements Compared against reference standards of ejection fraction dP dt and instantaneous pressure gradient across the aortic valve Doppler acceleration and velocity measurements are highly sensitive to changes in ventricular performance Most patients seeking cardiovascular care present with coronary artery disease as a chief concern This book focuses upon identification of coronary disease presence and severity through the evaluation of left ventricular Doppler ejection responses to stress loading Chapters I through 4 detail basic research on the dynamics of left ventricular ejection in ischemic and nonischemic animal models Chapters 5 through 13 present clinical correlates of changes in the Doppler systolic ejection pulse during exercise and under pharmacologic stress loading Angiographic anatomy thallium perfusion defects and radionuclear ejection fraction responses serve as reference standards

Chapters 14 15 and 16 address applications of Doppler echocardiography during the stresses of brief coronary occlusion myocar dial infarction and post infarction recovery while chapters 17 and 20 illustrate applications of stress Doppler techniques in valvular heart disease **Drugs Looking for Diseases** R. Vos,2012-12-06 We all know how much time effort and money it takes to develop a new drug Hundreds of chemical compounds have to be synthesized and thousands of different activities in biology physiology pharmacology clinical investigation management and marketing have to be initiated and coordinated Each new drug starts a voyage of discovery through an unmapped terrain which is shrouded in mist and beset by pitfalls as Dr Rein Vos puts it in his absorbing inside story of the development of the beta adrenoceptor blocking agents and the calcium antagonists Indeed we know for example how long it took before the theory of Ahlquist of the alpha and beta adrenergic receptors was widely accepted Similarly it suffices to memorize shortly the difficulty of expanding the new concept of calcium antagonism through the national German boundaries into the world This shows how laborious and complex pharmaceutical progress is and we all will benefit from a deeper understanding of the process of innovative drug research **PTCA An Investigational Tool and a Non-Operative Treatment of Acute Ischemia** P.W. Serruys,Rüdiger Simon,Kevin J. Beatt,2012-12-06 Obstruction of coronary blood flow and the resultant consequences are the center stage pathophysiologic events in cardiology today The speculations of Jenner Burns Heberdin McKenzie Prinzmetal and many others had until now been left to observations of isolated tissue and intact animal experimentation Only with the advent of Gruentzig s technique which allowed us to work safely inside the coronary arteries are we able to observe the effects of coronary occlusion in living conscious man PTCA provides not only a therapeutic modality for non operatively opening coronary obstructions but has also provided the best model for studying the effects of acute ischemia on the heart The procedure also lead the way to all other interventional cardiology developments including modern thrombolysis in the setting of acute myocardial infarction In his previous works Serruys has examined how PTCA can serve as a model for studying acute ischemia In this book he and his co authors discuss the effects of balloon induced ischemia on the electrocardiographic changes coronary blood flow dynamics cardiac muscle metabolism and left ventricular function as well as measures to counter these effects and provide for reperfusion in unstable angina and acute myocardial infarction Technology has expanded the eyes of the observer of these events The authors use many techniques including ECG recording from surface endocardium and intracoronary electrodes angiographic assessment of coronary flow pattern using digital techniques as well as doppler flow measurements biochemical assessment of metabolic products stimulated by ischemia and digital angiographic and echo doppler assessment of left ventricular function *Occult Atherosclerotic Disease* A-M. Salmasi,A.N. Nicolaides,2012-12-06 Occult atherosclerotic diseases impose great challenges in the cardiovascular practice Although their pathology is not much different from that of the overt group of diseases the clinical approach to their diagnoses remains a puzzle This has mainly emerged as a result of the problems faced in trying to pick up the vulnerable subjects from among the

general public More definitive candidates to be evaluated are those belonging to one of the high risk groups There are no statistical figures available on the incidence of occult atherosclerotic disease in the non risky general public and this is definitely an area that needs further investigation Atherosclerotic disease whether they are in the cerebral coronary renal or lower limb arteries are theoretically interrelated because the basic patho logical changes are usually similar However there still remain some differ ences which are mainly due to variation in the flow pattern in the arteries Thus it will be important clinically and from the management point of view to investigate for the presence of occult disease in other arteries if an atherosclerotic disease in a certain artery has been discovered This approach is of a great significance especially from the preventive point of view in order to avoid catastrophic events which may have resulted from pathology in the other region

Coronary Blood Flow J.A. Spaan,2012-12-06 by JULIEN IE HOFFMAN One of the earliest coronary physiologists was Scaramucci who in 1695 postu lated that during systole the contracting myocardium inhibited coronary blood flow Since then the many contributions that have been made to our knowledge of the coronary circulation can be arbitrarily divided into three phases based on advances in technical methods The early phase of research into the coronary circulation done with great difficulty with crude methods may be regarded as ending in the 1940s and it included major discoveries made by such well known investigators as Georg von Anrep Ernest Starling Carl Wiggers and Louis Katz who formulated much of our basic understanding of the field After 1940 the field of coronary physiology entered a new phase when instruments for high fidelity registration of coronary flow and pressure became available This era was domi nated by Donald Gregg who combined careful attention to the function of these instruments some of which he helped to develop with an extraordinary ability to discern mechanisms from apparently minor changes in coronary flow and pressure patterns His book The Coronary Circulation in Health and Disease set a new standard in the field After 1960 techniques for measuring regional myocardial blood flow became available and enabled a large group of eminent investigators to make major advances in understanding the physiology and pathophysiology of myocardial blood flow *Computed Tomography of the Cardiovascular System* Thomas C. Gerber,Birgit Kantor,Eric E. Williamson,2007-12-20 Computed tomography of the heart and cardiovascular system continues to show an impressive and tremendously successful development Technical improvements translate into new applications and enhanced diagnostic accuracy and the new diagnostic opportunities may potentially be beneficial for many individuals with known or suspected cardiovascular dis **Cardiac Positron Emission Tomography** Ernst E. van der Wall,P.K. Blanksma,M.G. Niemeyer,A.M. Paans,2012-12-06 Myocardial viability has become one of the most important issues in clinical cardiology In particular absence or presence of viability may be decisive in patient management and the decision to perform angioplasty PTCA or bypass surgery CABG is frequently based on the accurate assessment of viability Although echocardiography and conventional nuclear medicine techniques may provide valuable information on viability positron emission tomography PET is currently considered to be the gold standard for the assessment of myocardial viability The

simultaneous evaluation of myocardial metabolism and perfusion allows precise delineation and accurate quantification of residual myocardial viability in affected regions In addition accurate quantification of myocardial perfusion alone may provide insight into the basic mechanisms of syndrome X and may assist in the appropriate clarification of this clinically complicated but frequently occurring phenomenon Besides that cardiac PET may deepen our insight into metabolism and perfusion of cardiac muscle disease particularly in hypertrophic cardiomyopathy Furthermore receptor imaging studies with PET will become important as the study of cardiac neurohumoral regulation in heart failure has gained in interest Cardiac Positron Emission Tomography Viability Perfusion Receptors and Cardiomyopathy describes the most recent developments in cardiac PET as these are related to myocardial viability and myocardial perfusion studies of syndrome X The value of PET for receptor imaging and cardiac muscle disease is also discussed For cardiologists nuclear medicine physicians radiochemists physiologists technicians and basic researchers interested in understanding the most recent achievements in cardiovascular PET **Taurine and the Heart** Heitaroh Iwata,John B. Lombardini,Tomio Segawa,2012-12-06 The first Taurine Symposium organized by Dr Ryan Huxtable and the late Dr Andre Barbeau was held in Tucson Arizona in 1975 Since that auspici ous event nine international symposia on the role of taurine in biology have taken place The locations for these meetings have been Tucson two times Rome Philadelphia Tokyo Vancouver Mexico City Helsinki and Florence In 1977 due to the large number of scientists in Japan who were interested in the role of this unique amino acid in biological systems we organized the Japanese Research Society on Sulfur Amino Acids with the encouragement and financial assistance of the Taisho Pharmaceutical Co Ltd Tokyo Annual meetings have been held and the membership has expanded from 78 to 414 in 1987 the number of presentations has increased during this time span from 29 to 74 The symposium in Tokyo in 1982 Sulfur Amino Acids Biochemical and Clinical Aspects 1 was held to celebrate the 5th Annual Meeting of our Society I would like to emphasize that in Japan we have an active Research Society especially directed to the study of sulfur amino acids We have published our own semi annual journal entitled Sulfur Amino Acids Our society is an inter disciplinary research society since taurine is a highly diversified compound that interconnects physiology biochemistry pharmacology nutrition and medicine One exciting fringe benefit of taurine research and the society has been the fostering of contacts with distinguished scientists from many varied medical fields Oxygen Radicals in the Pathophysiology of Heart Disease Pawan K. Singal,2012-12-06 Over two centuries ago oxygen was discovered as air vital the component of the earth s atmosphere necessary for life Less than five years after this discovery it was found that oxygen was both a life sustaining and life threatening inhalant as it plays a role in the two extremes of the animal kingdom life and death In the subse quent years we have made major strides in understanding the role of oxygen in maintaining life and volumes of information are now available on this topic Our knowledge of the contribution of oxygen in cellular dysfunction and cell death which for the most part had lagged behind has begun to catch up The deleterious ef fects of oxygen radicals and activated oxygen species on a variety of biological systems

have now been described Recently attention has also been focused on the toxic effects of oxygen on the cardiovascular system The major aim of the present treatise is to offer an integrated view of the pathophysiological aspects of oxygen toxicity in the heart and blood vessels coupled with a review of therapeutic approaches hopes with free radical scavengers and antioxidants Internationally known expert investigators provide a concise and critical review on the topic of their expertise which also contains data from their own research *Biomedical Index to PHS-supported Research: pt. A. Subject access A-H* ,1994 **Ventricular Tachycardias** E. Aliot,Ralph Lazzara,2012-12-06 The rhythm of the heart its normal functioning and pathologic disturbances has been a favored subject of investigation by clinical and basic scientists in recent decades This heightened interest and attention was stimulated by the somber and surprising revelations from epidemiologists and pathologists of the enormity of the number of sudden arrhythmic deaths in the Western world and the concurrent advancement of technology for recording and control of electrical activity of the heart Technological advancements have included the recording of intracellular potentials from cardiac cells the recording of intracardiac extra cellular potentials generated by specific cardiac structures simultaneous record ings from numerous sites with computer processing for spatial mapping of activa tion or potential variations with time high gain high resolution recordings with signal averaging for detecting potentials of low amplitudes complex stimulation protocols various high energy stimulation modes intracellular voltage control of multicellular preparations and single cardiac cells and the isolation of single cardiac cells for electrophysiological study The interest and technology have produced an increasing bounty of information and understanding acceptable solutions to some clinical problems and definite progress toward solutions to other problems Progress in research in electrophysiology and arrhythmias has been reviewed and highlighted in various meetings and books in recent years Because the body of information has become so large general overviews of the field have neces sarily been superficial in certain aspects or have contained gaps **Arterial and Venous Systems in Essential Hypertension** Michel Emile Safar,2012-12-06 The hemodynamic mechanisms of hypertension are often limited to the study of three dominant parameters blood pressure cardiac output and vascular resis tance Accordingly the development of hypertension is usually analyzed in terms of a struggle between cardiac output and vascular resistance resulting in the classical pattern of normal cardiac output and increased vascular resistance thus indicating a reduction in the caliber of small arteries However during the past years the clinical management of hypertension has largely modified these simple views While an adequate control of blood pressure may be obtained with antihypertensive drugs arterial complications may occur involving mainly the coronary circulation and suggesting that several parts of the cardiovascular system are altered in hypertension Indeed disturbances in the arterial and the venous system had already been noticed in animal hypertension The basic assumption in this book is that the overall cardiovascular system is involved in the mechanisms of the elevated blood pressure in patients with hypertension not only the heart and small arteries but also the large arteries and the venous system For that reason the following points

are emphasized First the cardiovascular system in hypertension must be studied not only in terms of steady flow but also by taking into account the pulsatile components of the heart and the arterial systems Second arterial and venous compliances are altered in hypertension and probably reflect intrinsic alterations of the vascular wall *New Developments in Quantitative Coronary Arteriography* Johan H. C. Reiber,P.W. Serruys,2012-12-06 There are few techniques that have influenced therapeutic strategies in modem cardiology to a similar extent as coronary arteriography Bypass surgery as well as transluminal coronary angioplasty would not have been possible without coronary angiography serving as a midwife in their evolu tion Despite the widespread and long standing use in clinical practice however the interpretation of coronary angiograms has not changed very much since the early days Most angiogr s are still reviewed in a visual and semi quantitative and thus often very subjective way In the face of an almost exploding field for interventional catheterization including thrombolysis balloon dilatation and other rapidly evolving techniques for transluminal revascularization or recanalization a more detailed and quantitative analysis of coronary arteriograms is urgently required In addition to the delineation of coronary morphology we need dynamic and functional information about flow and perfusion to understand the physiological significance of anatomic abnormalities Coronary arteriography contains and can provide most of this information With the application of appropriate techniques it can be made available in the catheterization laboratory even during the patient s investiga tion thus facilitating and improving clinical decision making Objective and reproducible analysis will furthermore enhance our understanding about the pathophysiology of coronary disease *Progress in Digital Angiocardiography* P.H. Heintzen,J.H. Bürsch,2012-12-06 According to Schopenhauer problems are usually passing through three stages in the first stage they are ignored or just smiled at in the second stage they are fought and in the third stage they are considered to be self evident just taken for granted Whereas digital subtraction angiography DSA has obviously reached stage three of that scale i e routine use in radiology digital angiocardiography in particular imaging the heart and coronary circulation is still on its way to the final goal the filmless heart catheterization laboratory for all invasive and interventional procedures A few pioneers have already completely abandoned the conventional cine coronary and angiocardiographic technique others as we do still combine both digital and conventional methods in clinical routine but most cardiol ogists up till now stay sceptically aside We hope that at least some of the articles published in this volume may convince more and more cardiologists that digital imaging procedures are the method of choice in particular if quantitative assessment of the anatomical or functional status of the cardiovascular system is required pre and post operations or pre and post interventions Such a critical control of all therapeutic procedures be it by surgical catheter or medical interventions is indeed an urgent and widely under estimated or neglected requirement Nuclear Cardiology and Cardiac Magnetic Resonance Ernst E. van der Wall,2012-12-06 Cardiovascular nuclear medicine emerged 15 years ago as a new noninvasive technique for the detection of human cardiac disease It arised from the fields of nuclear medicine and cardiology and the

cooperation of both specialties has been very productive At present nuclear cardiology techniques belong to the routine armamentarium of the clinical cardiologist Results obtained by perfusion markers metabolic tracers and radionuclide angiography have shown to have important impact on patient management Although exercise electrocardiography and echocar diography yield the large bulk of necessary data in the cardiac patient nuclear cardiology provides important data that go far beyond the results obtained by the standard procedures Magnetic resonance imaging is a relative newcomer in cardio logy and has still to prove its value in clinical cardiology Yet initial results have been encouraging both in congenital heart disease and in coronary artery disease This book is based on 16 review publications that have been written throughout the period of 1985 till present time Most chapters have been published in the period 1989 until 1991 the preceding review papers have been updated as much as possible Furthermore Chapter 15 entitled What s new in cardiac imaging has been espe cially written for this book The Chapters 9 11 and 13 have been recently written and have not been published yet

Practical Signal and Image Processing in Clinical Cardiology Jeffrey J Goldberger,Jason Ng,2010-07-28 Modern signal and image acquisition systems used in the field of cardiology acquire analyze and store data digitally Surface electrocardiography intra cardiac electrogram recording echocardiograms x ray magnetic resonance imaging and computed tomography are among the modalities in the cardiology field where signal processing is applied Digital signal processing techniques allow us to automate many of the analyses that had previously been done manually with greater precision accuracy and speed as well as detect features and patterns in data that may be too subtle to observe by eye As more cardiologists are becoming more reliant on such technology a basic understanding of digital signals and the techniques used to extract information from these signals are required

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