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## Preface

Atherosclerosis is a multifactorial and dynamic disease that makes the process of prevention and management highly complex. New methods of ultrasonic imaging have made the noninvasive visualization and assessment of arterial wall changes possible with precise measurements. The latter include the thickness of the intima media complex, estimation of the severity of stenosis due to atherosclerotic plaque, plaque thickness, area and volume, plaque characterization, and evaluation of the hemodynamic effects of the stenosis and forces on the plaque. The ability to assess plaque morphology and hence identify high risk individuals offers the advantage of monitoring plaque stabilization by drug therapies and the development of new therapeutic and prophylactic strategies, contributing toward the reduction of cardiovascular events. During the last two decades, the rapid advancements in imaging technologies, linked with the advancements in information technology, have significantly improved the objective assessment of carotid plaque morphology. This volume is intended to provide a comprehensive overview of the most recent advances in ultrasound image processing and applications on images of carotid plaques, and how these may affect clinical management.

The book consists of 37 chapters, grouped into 5 parts. Part I discusses the pathophysiology of carotid bifurcation atherosclerosis, related symptomatology, and the controversy over the management of patients with asymptomatic stenosis. Part II covers ultrasound image instrumentation and imaging techniques, including despeckling and ultrasound contrast agents. Part III deals with measurements and image analysis. It includes intima-media thickness (IMT), plaque thickness, area and volume measurements, automated classification of plaques, texture feature extraction, elastography, and plaque motion analysis. Part IV discusses the validated and emerging ultrasonic and other biomarkers associated with early atherosclerosis and their value in epidemiological studies and population screening with emphasis on advice for individual persons in terms of prevention. Part V covers late atherosclerosis, grading of internal carotid stenosis, the significance of hypoechoic plaques, and markers associated with the latter. It includes intravascular ultrasound (IVUS), transcranial Doppler (TCD), and carotid plaque characterization with emphasis on clinical applications such as the effect of statin therapy and stroke risk stratification. It indicates how methods described in previous sections can be applied for the benefit of the patient.

The book is intended for all those working in the field of atherosclerosis, ultrasound imaging, and cardiovascular risk, including the clinician, the vascular ultrasonographer, the epidemiologist, the molecular biologist, the biomedical engineer, and the informatics scientist. Furthermore, the book aims to bridge the gap between

researchers and clinicians who are keen to incorporate the latest results of research to their daily practice.

It is hoped that this volume will provide a forum for the dissemination of the most recent medical and technological advances in the area of ultrasound and carotid bifurcation atherosclerosis, thus facilitating the development of emerging imaging and informatics technological systems, and medical strategies for the investigation of both asymptomatic individuals and patients.

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Nicolaides, A.; Beach, K.W.; Kyriacou, E.; Pattichis, C.S.

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