

Introduction

A perspective on imaging cardiovascular disease

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Cardiovascular disease is the leading cause of mortality and morbidity in the Western developed world. Enormous efforts from biological scientists have significantly increased our knowledge of the atherosclerotic process. Yet, the clinical task of diagnosing and treating cardiovascular disease remains challenging. For example, we do not know how to predict heart attack and prevent the loss of lives. Currently a major approach to managing cardiovascular disease is imaging based diagnosis and treatment. Imaging medicine has largely been developed in the past half century by applying physical science and electronic and computer technology to obtain tissue information from patients and to guide therapeutic treatments. Medicine has been quietly revolutionized by imaging – major departments such as radiology, cardiology and pathology are imaging-based; all surgeries have been guided by imaging; psychiatry and various neurosciences are investing heavily in imaging-based diagnosis; genetic medicine may require successful development of molecular imaging. Medical imaging is a vital, vibrant and evolving field where physical science meets medicine and biological knowledge is translated from test tube to clinical bedside.

We hope to convey to our readers the important knowledge and the exciting developments of cardiovascular imaging. In this special focus issue, we review and report state of the art or recent developments in current major modalities for imaging cardiovascular disease: x-ray angiography, ultrasound, computerized tomography and magnetic resonance imaging. Though ultrasound is limited in signal-to-noise ratio and image resolution, it is economic, portable and has become an important first-line tool to identify serious vascular lesions in a physician's examination room. Presently, serious cardiovascular disease is mainly diagnosed and treated immediately with catheter-based x-ray angiography. Because of the invasiveness of catheterization, x-ray angiography is not suited for screening use on a broad patient population. Recently developed computerized tomography angiography (CTA) and magnetic resonance angiography (MRA) allow high resolution imaging of vascular diseases without catheterization and have revolutionized the diagnosis of cardiovascular disease. Both CTA and MRA are evolving and advancing technologies, particularly propelled by latest computer technology and the multi-detector approach. At the current time (June 2003), CTA has the advantage of fast speed for cardiac imaging but the disadvantage of x-ray and iodinated doses. MRA offers the advantage of high resolution vascular imaging without the use of ionizing radiation and nephrotoxic contrast agent and may be the method of choice for many diagnostic purposes.

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