INTRODUCTION

The main function of the arterial tree in both extremities is to supply oxygen to the muscles and other tissues of the arms, legs and feet. Insufficient arterial flow to tissues causes ischemia and eventually necrosis. Arterial insufficiency may be acute or chronic, and occlusion may occur in a single artery or in more than one vessel along the arterial tree. [(1)]

Chronic occlusive arterial disease is more common than acute. Atherosclerosis is the leading cause of occlusive disease in patients older than 40 years, and the prevalence increases with age. Atherosclerotic disease of the lower extremities is a common disorder in modern society. Its debilitating nature calls for accurate diagnosis and treatment. [(2)]

Atherosclerosis is a chronic, progressive disease involving the deposition of cholesterol along the lining of the vessel wall. Eventually, the vessel lumen narrows enough to affect blood flow. [(1)] The three most prevalent sites of occlusion are the origin of the internal carotid arteries, the coronary arteries, and the peripheral arteries descending from the abdominal aorta, resulting in cerebral stroke, myocardial infarction, and lower limb ischemia, respectively. [(3)]

The first manifestation of peripheral arterial disease (PAD) is usually intermittent claudication. In a minority of patients, the disease progresses to critical limb ischemia, that is, rest pain and tissue necrosis. Diagnostic imaging is performed to assess PAD, it is also needed when PAD becomes lifestyle limiting and a revascularization procedure is considered. Decision making prior to surgery or percutaneous intervention depends on accurate characterization of the level, multiplicity, and severity of stenosis. [(4)]

The field of noninvasive vascular diagnosis is expanding, and there is a need in this field for a concise overview of the various imaging options available to the vascular team. [(5)] Over the last 5 years many diagnostic angiographic techniques have been completely replaced by the exquisite anatomical details available from modern magnetic resonance angiography (MRA) and computed tomographic angiography (CTA). Increasingly, diagnostic radiologists are exposed to a variety of vascular conditions such as acute aortic syndromes, aortic stent grafting and critical limb ischemia that now have their core decisions based on non-invasive imaging techniques. [(4)]

Duplex scanning extends the capabilities of indirect testing by obtaining anatomic and physiologic information directly from the sites of arterial disease. Continued clinical experience and advances in technology, particularly the availability of lower-frequency duplex transducers, have made it possible to obtain image and flow information from more deeply located vessels. Therefore, it is now feasible to evaluate the abdominal and lower extremity arteries with duplex ultrasound. **(6,7)**

Duplex scanning of the upper limb arteries is a well-established technique and provides comparable results to arteriography in most cases; this allows the vascular surgeon or physician to formulate a management plan without the aid of diagnostic arteriograms, which are known to carry a complication rate of 1–2%. For instance, it may be decided to treat the patient by conservative methods without further investigations. **(8)**

As cross-sectional imaging techniques continue to improve, radiologists will be pushed further into the ‘‘front-line’’ and it will become essential for all radiologists to be aware of the indications for intervention for a range of procedures for which radiology is now a key. **(9)**

CT angiography (CTA) is a minimally invasive vascular imaging modality that makes use of spiral CT technology**.** CTA can be defined as a fast thin-section volumetric spiral (helical) CT examination performed with a time-optimized bolus of contrast medium in order to enhance the arteries. **(9)**

The development of spiral computed tomography and subsequently multidetector CT has provided unparalleled opportunities for advancement of CT technology and clinical applications. One of the most influential developments has been CT angiography, which is the use of thin-section CT combined with post processing of imaging data by using a variety of three-dimensional reconstruction techniques to produce vascular maps that equal or exceed those provided by classic angiography in many applications. **(11)**

One of the cornerstones of multichannel CT (MCCT) is a very fast image-acquisition phase. Total body scanning times have been reduced to less than 30 seconds. This speed is beneficial when large segments of the body have to be scanned or image acquisition has to be fast to catch a dynamic event, such as brain perfusion or CT angiography. **(12,13)**

The applications of multi-detector CT (MDCT) in imaging the lower extremities are multiple and varied. They include the evaluation of peripheral arterial occlusive and aneurysmal disease, the patency and integrity of bypass grafts, and arterial injury owing to trauma. [14]

The development of MDCT has revolutionized CT angiography (CTA). Not only are new techniques now in the remit of CTA, but all the studies previously performed on single slice or helical CT can now be done with better resolution. The advantage of MDCT relevant to CTA is the ability to acquire high resolution, near isotropic data sets in a shorter acquisition time. Also the ability to achieve a longer scanning range in the arterial phase, which has seen the introduction of CTA of the peripheral arterial system. [15]

Image processing techniques have also progressed rapidly, with simplification of a previously cumbersome process. The high spatial resolution and relatively non-invasive nature make MDCT angiography a strong and serious competitor to established vascular imaging techniques. The implication is that traditional diagnostic pathways for evaluation of the vascular system have changed. [16]