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Imaging of the Heart: Specific Aims

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A hundred years ago fluoroscopy was the only imaging modality for the heart. Today imaging of structure with three dimensional resolution, metabolism on a molecular level, function of valves and myocardium, plaques with chemical analysis, and migration of stem cells after transplantation has become reality.

Interventional cardiologists carry out a wide range of minimally invasive procedures through a few millimeter puncture in the groin. The traditional instrumentarium of catheterisation, angioplasty and echocardiography is now being complemented by Magnetic Resonance (MR) and Computed Tomography (CT), which have evolved to cardiac imaging tools in recent years.

Cardiac MR is indicated in a broad spectrum of diseases such as masses, cardiomyopathy, congenital heart disease, pericardial disease, valvular disease and CAD with respect to myocardial function, perfusion and viability (1). MR coronary angiography would also be desirable and is currently very promising but has not yet become a robust tool for coronary angiography. Despite early misgivings in the 1980's, CT is now a robust tool for coronary angiography in selected patients. Both MR and CT are increasingly used for more efficient diagnostic management in cardiology, stimulated by patient demand for imaging that is non-invasive; highly sensitive and specific; available to outpatients; and with little or no radiation exposure.

Introduction of MR and CT in patient care now requires re-design of diagnostic algorithms, treatment strategies, and interdisciplinary cooperation.

Today specific expertise is needed for MR and CT, since image acquisition and analysis are technically demanding and interpretation requires profound knowledge of cardiac pathophysiology. Reading can be focused on the heart, but must include careful review of extracardiac findings such as pulmonary embolism, infiltration or masses visible on cardiac MR or CT (3). Thus best results are achieved when all experts (e.g. cardiologist, radiologist, nuclear cardiologist, physicist) work together. Involvement of numerous experts can potentially cause conflicts, also referred to as turf battles. Avoiding such turf battles and establishing a prosperous cooperation are major steps towards a successful cardiac imaging centre focussed on enhanced patient care.

Other important issues are reimbursement and standards. Reimbursement of cardiac MR and CT is still not sufficiently defined in most European countries. It should compensate for the enhanced effort required for ECG gated image acquisition, long room time, postprocessing and analysis of data, set up for pharmacological stress testing and also the interdisciplinary contribution of all involved partners.

Quality standards have to be established, matched by specific physician training for such standards. A license for cardiac imaging may be issued to demand a certain level of training, available for all clinical partners with specific interest in cardiac imaging.

The following articles focus on CAD, because CAD is the most frequent cardiac disease and the leading cause of death in Europe. Recent progress in diagnostic and therapeutic management has resulted in improved life expectancy and quality for patients with CAD. However, this effect is counteracted by various factors. Most important are demographic changes in European society and the increasing number of diabetic patients, an important risk factor for CAD.

Today, a comprehensive diagnostic work requires studies in various departments and is time consuming. MR and CT can provide most of this information in a one- or two-stop shop that is convenient for the patient, saves time and is cost-efficient. Applications and limitations of cardiac CT and MR for management of CAD are discussed in the following articles from various perspectives.

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