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Imaging Coronary Artery Disease: A Radiologist's Perspective

Authors:

Jens Bremerich, MD; Georg Bongartz, MD

Title: Department of Radiology, University Hospital Basel

Email: JENS.BREMERICH@UNIBAS.CH

Reference are Available at EDITORIAL@IMAGINGMANAGEMENT.ORG

Coronary artery disease (CAD) is the leading cause of death in Europe. Efficient imaging management of CAD is important today and will even be more important in the future due to:

- demographic changes of our society;
- improving life expectancy and quality for patients with CAD, and;
- increasing socioeconomic importance of CAD in an environment of restricted resources.

Invasive angiography remains the gold standard for imaging of coronary arteries, because no other modality provides such high spatial and temporal resolution. Moreover, only invasive imaging enables treatment of coronary lesions by angioplasty or stent implantation. However, invasive angiography can be complicated by haemorrhage, emboli, or even death. Furthermore, capacities of invasive catheter institutions are limited in many European countries resulting in waiting lists.

Approximately one third of all invasive angiographies are normal without need for further treatment or intervention. This is interesting, since Computed Tomography (CT) is now becoming available for non-invasive imaging of coronary arteries. CT has a high negative predictive value and thus seems to be particularly useful to exclude CAD. There is a substantial interest in referring selected patients to CT rather than to invasive angiography, because CT is non-invasive, can be done in outpatients, and allows interventional cardiologists to focus on therapeutic interventions rather than spending their time on imaging normal arteries.

Magnetic Resonance (MR) angiography of coronary arteries is not yet available. But MR provides perfusion images with better spatial resolution than scintigraphy and without radiation exposure. Today MR is the gold standard for imaging wall motion and mass. MR enables imaging of myocardial viability at better resolution than Positron Emission Tomography (PET), is cheaper than PET and avoids radiation exposure. Spatial resolution is particularly important to distinguish transmural from non-transmural infarction and to predict recovery of wall motion after therapy (1). Sending a patient to a one-stop-shop examination by MR rather than to a series of examinations by perfusion scintigraphy, wall motion echocardiography, and viability PET, saves time, money, and radiation exposure.

Who is referring patients to one modality or another? Most patients are referred by cardiologists. Some patients are sent by general practitioners and some patients call the radiologist directly because they heard about the test in the internet, in a newspaper or from a friend. But there is not one single diagnostic test that fits all.

CT can be a good test to exclude CAD in a middle-aged man with low pre-test probability, because CT has a high negative predictive value (Figure 1). But CT is probably the wrong test in a 75-year-old man with diabetes and effort induced chest pain. In this case CT is probably non-diagnostic because severe calcified arteriosclerosis produces artifacts and this patient has to undergo catheter angiography anyway (2). At the University Hospital in Basle we work in close cooperation with Cardiology, which also includes triage of patients. The most important factors for triage are risk stratification and age (3). This reduces unnecessary testing. A patient with intermediate risk may have MR (wall motion, perfusion at stress/rest, viability) on day 1, catheter angiography for diagnosis and therapy on day 2, and be discharged on day 3 of hospitalisation.

Close cooperation with cardiology also includes consensus reading and reporting of studies. Consensus reading enables:

- synergism of radiological and cardiologic expertise;
- quality control; and

- continuous technical improvement.

Consensus reporting enhances the confidence of referring physicians. Thus at the University Hospital Basel we feel that close cooperation between cardiology and radiology is the key issue to set up a successful cardiac imaging centre.



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