Validation of a new rapid method for accurate non-invasive assessment of coronary artery disease: Hybrid ultrafast SPECT/high definition CT

Summary / Zusammenfassung
Aim:
The aim of the first two years is to validate a new rapid method for cardiac hybrid imaging in known or suspected chronic stable CAD with a short protocol time (below one hour) and a substantially reduced radiation dose below 4 mSv. This hybrid scan should non-invasively provide the information on coronary lesions and their pathophysiologic relevance. With this information the decision with regard to treatment strategy will be decided: 1. no treatment 2. medication 3. revascularization. This decision will be compared to the clinical standard, which is generally based on coronary angiography findings alone combined with routine SPECT-MPI or invasive fractional flow reserve measurement with pressure wire.

Data acquisition:
Standard of reference: Seventy to 100 patients referred for elective coronary angiography due to known or suspected CAD will be enrolled. Standard clinical routine includes: first, coronary angiography to exclude or document coronary lesions and, second: evaluation of the pathophysiologic relevance of a lesion, as particularly in intermediate stenoses with 50 to 75% luminal narrowing the anatomic findings alone do not allow predicting whether a lesion induces ischemia or not. The evaluation can be done by mental integration of the previously performed routine MPI-SPECT or can be performed invasively by use of pressure wire. Decisions with regard to one of the above treatment strategies will be taken according to the standards of clinical routine.

Hybrid method: Prior to the routine investigations low dose CTCA with prospective ECG triggering will be performed on a 64-slice LightSpeed VCT XT scanner (GE Healthcare, Milwaukee, USA) restricting the scan to one distinct end-diastolic phase of the RR-cycle (i.e. 75%, with a padding of 0 ms) as we have previously established. This allows CTCA scans at a radiation dose between 1 to 3 mSv. In order to achieve a low radiation dose exposure from SPECT-MPI we introduce a stress-only protocol, avoiding the radiation dose from the resting perfusion scan. At variance to the standard protocol only half of the recommended 99mTc-tetrofosmin activity will be injected because the scans will be performed on a cardiac ultrafast camera with highly sensitive new generation detector systems (cadmium, zinc, and telluride, CZT) instead of classic NaI-cristals. Furthermore, a new dedicated algorithm for iterative reconstruction (Evolution for Cardiac, GE Healthcare, Milwaukee, USA) will be used which allows for further tracer reduction by compensating for low count imaging. With this camera the acquisition time is reduced from over 15 minutes to a few minutes according to our preliminary results.

Analysis:
CTCA and rapid CZT SPECT-MPI will be fused to hybrid images. Clinical conclusions reached by the hybrid image will be validated against the clinical decision reached by clinical routine standard of reference as indicated above.

Keywords / Suchbegriffe
non invasive cardiac imaging, hybrid imaging, SPECT, CT coronary angiography

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