Mechanisms of cardiovascular disease as defined by cardiac computed tomography

SCIENTIFIC IMPACT

Over the last decade, cardiac computed tomography (CT) has developed as a highly accurate non-invasive anatomical diagnostic imaging modality. Currently, ESC guidelines describe a central role for cardiac CT in diagnosing coronary artery disease (CAD). Increasing experience and technological advances ensure ever improving image quality with relatively low radiation exposure due to individualized acquisition. The role and the accuracy is dependent on the pre-test probability wherefore it is widely used in patients with a low to intermediate suspicion of obstructive CAD.

In addition to its widespread use in patients with chest pain, other patient populations may also benefit from early detection of CAD. We presented for the first time, that using cardiac CT in patients with suspected cardiac syncope could be of utmost interest since this could have important mechanistic, prognostic and therapeutic clinical implications. We believe that these data will serve as a good basis for future research into vascular mechanisms of syncope or the cost-effectiveness of cardiac CT in patients presenting with syncope.

Conventional cardiac CT-reading reports only coronary calcium score and presence of atherosclerosis and coronary stenosis caused by CAD. The data in this thesis show that cardiac CT can be used to quantify cardiovascular disease beyond mere coronary stenosis grading. These novel imaging hallmarks of CV disease can be quantified using specialized software, and in turn can be used as a risk stratifying imaging biomarker. In chapter 3 of this thesis we used dedicated software, defining detailed volumetric plaque parameters and investigated their association with cardiospecific biomarkers. These data support the clinical applicability of a multibiomarker approach combining these novel sophisticated CT-angiographic parameters with established cardiospecific serum biomarkers. We foresee that this combined approach will improve prediction of atherosclerotic plaque progression. Furthermore, the present data represent a firm stepping stone for future studies using sequential analysis of atherosclerotic plaques using advanced cardiac CT imaging e.g. to elucidate pathophysiology of plaque progression and the impact of novel interventional therapies including lipid-lowering, interleukin inhibition and novel anticoagulants. Such studies are currently underway, and plaque analysis has been established as a surrogate imaging endpoint. This allows rapid evaluation of novel therapies, and hopefully more rapid introduction of promising novel agents. Future research should focus more on individualized risk assessment and treatment of CAD, and include features such as advanced plaque analysis and epicardial adipose tissue. This should help guide treatment. Ultimately combining both biomarker, genetic and imaging data will enable more personalized risk assessment and preventive targeted treatment.