Department of Medicine 2 – Cardiology and Angiology

Chair of Internal Medicine II

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Research Focus
- Molecular and experimental cardiology
- Interventional cardiology
- Interventional valve therapy
- Electrophysiology
- Cardiac magnetic resonance tomography (MRT)
- Cardiac computed tomography
- Sports cardiology

Structure of the Department
Professorships: 1
Personnel: 210
- Doctors (of Medicine): 52
- Scientists: 4 (thereof funded externally: 1)
- Graduate students: 14

Clinical focus areas
- Interventional cardiology
- Electrophysiology
- Intensive care medicine
- Cardiac imaging

Research
The Department of Medicine 2 focuses on clinically oriented research. Several working groups pursue research projects particularly in the field of cardiac intervention as well as coronary heart disease and atherosclerosis. A special focus lies traditionally in the field of cardiac imaging, especially the link between cardiac imaging and its implementation for planning and guiding several cardiac interventions which has developed into a growing field of research in the recent years. Most of the research projects performed in the Department are patient-related projects with a close relationship to patient care.

Molecular and Experimental Cardiology
PI: Dr. B. Dietel, Dr. M. Tauchi-Brück
The laboratory for molecular and experimental cardiology is concerned with the fundamentals of the development of atherosclerotic vascular changes. A special focus is the influence of blood flow profiles on atherogenesis. It is of note that particularly in vascular bifurcations, atherosclerotic lesions arise due to turbulent shear forces. These shear forces activate endothelial cells and induce inflammatory processes that affect the progression of atherosclerosis. Using cell culture models, surface molecules of endothelial cells and their activation are analyzed. In addition to shear forces-induced activation of endothelial cells, various immunomodulatory therapeutic approaches in the atherosclerotic model of the ApoE (apolipoprotein E) knockout mice are investigated. The working group further analyzes mechanisms that contribute to plaque destabilization through histological analyses of human atherosclerotic plaques, supplemented by analysis of gene expression and naturally occurring genetic polymorphisms.

Interventional valve therapy
PI: Dr. M. Arnold
The scientific evaluation and further development of transcatheter heart valves, in particular for aortic valve replacement (TAVI), is a main focus of the Department of Medicine 2. Several research projects are performed together with colleagues of the Department of Cardiac Surgery, focusing on the value of cardiac computer tomography for planning and follow-up of patients referred for transcatheter aortic valve replacement as well as the advantages of a modified surgical approach for the transfemoral aortic valve replacement. In addition, the Department is involved in several national and international studies and long-term registries for interventional aortic valve replacement.

Optical Coherence Tomography: Overlap of two bioresorbable coronary scaffolds
ablation procedures for supraventricular arrhythmias is an area of evaluation.

**Cardiac magnetic resonance tomography (MRT)**

PI: Dr. G. Gitsioudis

The research focus of the working group - in collaboration with the Institute of Radiology and Siemens Healthineers Erlangen - is the assessment of morphological and functional cardiac function parameters for the improvement of individual patient-specific risk assessment for various cardiovascular diseases.

In the context of clinical trials, this working group investigates the importance of assessment of segmental myocardial function and late gadolinium enhancement (LGE) for the prediction of successful therapy after revascularization of chronically occluded coronary arteries. Moreover, the role of the T1 mapping for performing contrast-free imaging of areas of myocardial scarring and fibrosis in patients with myocardial infarctions or cardiomyopathies (such as dilated cardiomyopathy (DCM), hypertrophic cardiomyopathy (HCM), peri-/myocarditis, cardiac amyloidosis) is an important research area. Technically oriented projects concern the development of high-resolution sequences for optimizing assessment of myocardial ischemia by perfusion imaging under adenosine stimulation.

**Cardiac computed tomography**

PI: PD Dr. M. Marwan

The working group conducts numerous projects around CT imaging of the heart and coronary arteries. One of the main research areas is the characterization of coronary atherosclerosis. This includes the analysis and quantification of coronary atherosclerotic plaques and evaluation of their prognostic significance as well as the evaluation of the hemodynamic relevance of coronary lesions, for example by means of “virtual FFR”. Further projects - in cooperation with several national and international partners - concern the development and validation of strategies for the reduction of radiation exposure. Furthermore, the use of cardiac computed tomography to guide cardiac interventions in the sense of “therapeutic imaging” is a field of particular importance. Members of the working group comprehensively evaluate the use of CT for coronary interventions (especially for chronic coronary artery occlusions) and non-coronary cardiac interventions (transcatheter aortic valve replacement, left atrial appendage occlusion and other structural heart disease interventions).

**Sports cardiology**

PI: PD Dr. C. Stumpf

The working group investigates the effects of physical activity on the cardiovascular system for various age-groups and functional capabilities. A special focus of the working group is on the evaluation of the training therapy for chronic heart failure patients and its influence on remodeling as well as on the inflammatory mechanisms and their pathogenesis through endurance training (EndoHEART). A further focus of the working group is in the field of cardiovascular prevention, in particular in the assessment of the pathophysiological mechanisms of endothelial dysfunction and the influence on physical training on it.

**Teaching**

The Chair of Internal Medicine II participates in the curricular in medicine. The Chair supervises MD theses.

**Selected Publications**


**International Cooperations**

- Dr. U. Hoffmann, Massachusetts General Hospital, Boston: USA
- Prof. Dr. S. Neubauer, University of Oxford, Oxford: UK
- Dr. M. Ferencik, Knight Cardiovascular Institute, Oregon Health and Science University, Portland: USA