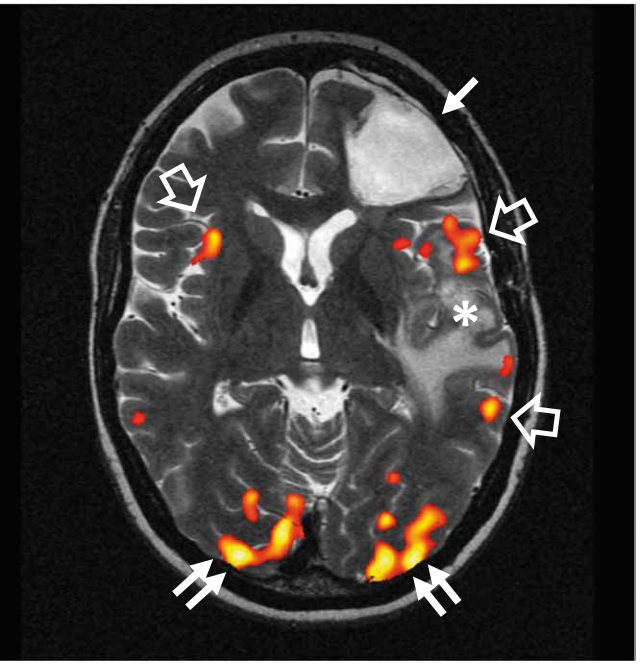


Figure 1 demonstrates a fMRI study of a patient with a relapsing malignant brain tumor (glioblastoma multiforme) of the left hemisphere (asterisk). A defect anterior to the current tumor location marks the site of the primary glioblastoma location (closed arrow). fMRI was applied to visualize the important brain area for speech recognition (Wernicke) near the site of the current tumor localization prior to a second operative resection. Active areas are highlighted by red color in fMRI (open arrow). The typical coactivation of the visual cortex is also highlighted (double arrow).

Department of Diagnostic and Interventional Radiology

Head of Department: Professor Dr. Meinrad Beer

Keywords: Functional imaging | molecular and metabolic imaging | tissue typing | minimal-invasive interventional procedures

The department provides all radiological services for Ulm University Medical Center as a tertiary hospital center. Additionally, it supplies two further hospital centers, one focused on Neurosciences and the other serving as a secondary hospital center. The department is equipped with cutting-edge technology.

Three divisions have been established. The Division of Neuroradiology (headed by Prof. B. Schmitz) was founded some years ago and has rapidly grown to encompass the fields of both diagnostic and interventional neuroradiology. The interventional treatment of intracerebral aneurysms has been expanded to include flow diversion in addition to surgical clipping and coiling procedures. The interventional treatment of acute stroke patients has considerably been improved through the use of stent retrievers.

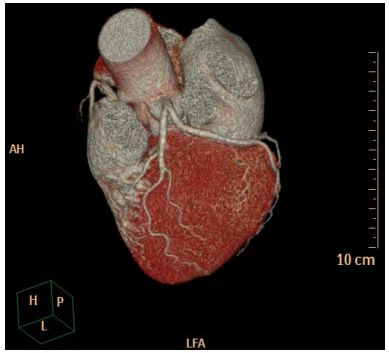
The impact of functional neuroimaging has significantly increased in recent years. The Division of Neuroradiology focuses its clinical and scientific interests especially on the areas of speech production and recognition by using functional MRI techniques (fMRI). fMRI studies allow a precise planning of primary surgery in brain tumor patients (figure 1). Additionally, fMRI studies in obese patients receiving minimal invasive therapy with a balloon catheter were started in order to analyse the interdependency between obesity and brain activation.

Two divisions were founded in 2013. The Division of Interventional Radiology performs a wide range of hepatic, vascular and biopsy interventions. The second division, the Division of Experimental Radiology founded in 2013, serves as a core facility for imaging in cooperative projects with other departments and develops its own imaging techniques.

One project deals with new T2* techniques for determination of liver iron content. Iron overload is an increasing clinical problem. New MR techniques based on multiple flip angles allow reliable measurements even at high levels of iron overload. A recent multicenter study, headed by our department, develops and applies these new state-of-the-art MRI techniques for non-invasive liver iron monitoring.

Research activities of the department also cover the field of cardiovascular radiology. CTCA (CT-coronary angiography) is applied for the planning of coronary interventions as well as minimal-invasive heart valve replacement (TAVI). The implementation of cutting-edge technologies for lowest dose-protocols allowed a significant improvement of CTCA techniques (figure 2a+b).

Further research projects are performed in collaboration with the Core Facility Imaging (headed by Prof. V. Rasche) and the Department of Nuclear Medicine (headed by Prof. A. Beer). Future research directions encompass neuroradiologic morphometric analyses (voxel-based volumetry), oncologic, metabolic and molecular imaging techniques (31P-MR-Spectroscopy and Diffusion-weighted Imaging -DWI) and, finally, noninvasive MRI-based tissue typing techniques (T1/T2/T2*-mapping and 1H-double triggered 1H-MRS).



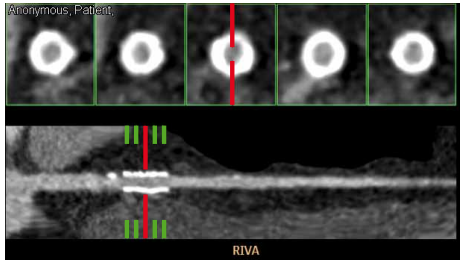


Figure 2a shows the superb 3D-visualization of the left main coronary branch with its two main side branches (LAD and CX). State-of-the-art reconstruction algorithms allow the stretched presentation of the complete course of single arteries as outlined in figure 2b. Improved CT-techniques enable the sight through coronary stents.

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Selected Publications:

- *Characteristics, changes and influence of body composition during a 4486 km transcontinental ultramarathon: results from the Transeurope Footrace mobile whole body MRI-project. Schütz UH, Billich C, König K, Würslin C, Wiedelbach H, Brambs HJ, Machann J. BMC Med. 2013;11: 122 (Impact=6.7).*
- *Liver iron content determined by MRI: spin-echo vs. gradient-echo. Juchems MS, Cario H, Schmid M, Wunderlich AP. Rofo. 2012;184: 427-31 (Impact:2.8)*
- *Diffusion-weighted MR imaging in comparison to integrated [19F]-FDG PET/CT for N-staging in patients with lung cancer. Pauls S, Schmidt SA, Juchems MS, Klass O, Luster M, Reske SN, Brambs HJ, Feuerlein S. Eur J Radiol. 2012;81: 178-82 (Impact=2.5).*
- *Substantial and reversible brain gray matter reduction but no acute brain lesions in ultramarathon runners: experience from the TransEurope-FootRace Project. Freund W, Faust S, Birklein F, Gaser C, Wunderlich AP, Müller M, Billich C, Juchems MS, Schmitz BL, Grön G, Schütz UH. BMC Med. 2012;10: 170 (Impact=6.7).*
- *Quantification of aortic valve area at 256-slice computed tomography: comparison with transesophageal echocardiography and cardiac catheterization in subjects with high-grade aortic valve stenosis prior to percutaneous valve replacement. Klass O, Walker MJ, Olszewski ME, Bahner J, Feuerlein S, Hoffmann MH, Lang A. Eur J Radiol. 2011;80: 151-7 (Impact=2.5).*