was used to predict the probability for the presence of a stenosis per graft type using multiple MRI variables followed by receiver-operator-characteristics (ROC) analysis to assess the sensitivity and specificity of MRI.

Results. The sensitivity(95%CI) / specificity(95%CI) of MRI in detecting single vein grafts with a stenosis >=50% and with a stenosis >=70% was 94%(86-100) / 63%(48-79) and 96%(87-100) / 92%(84-100) respectively with ROC-areas(95% CI) of 0.90(0.82-0.97) and 0.96(0.92-1.00). In sequential vein grafts these values were 91%(78-100) / 82%(64-100) and 94%(83-100) / 71%(52-91) respectively with ROC-areas of 0.87(0.75-1.00) and 0.88(0.77-0.99). Similar ROC-areas were obtained in arterial grafts.

Conclusions. The presented MRI protocol accurately identifies grafts with moderate or severe stenosis. This approach allows noninvasive detection of graft stenosis in patients who present with recurrent chest pain after CABG in an outpatient setting prior to an invasive diagnosis.

1071-50 Noninvasive Detection of Internal Carotid Artery Stenosis: A Head-to-Head Comparison Between Ultrasonography and Magnetic Resonance Angiography

Mirco Cosottini, Alessandro Pingitore, Maria Chiara Michelassi, Michele Puglioli, Rosa Calabrese, Massimo Lombardi, *CNR, Institute of Clinical Physiology, Pisa, Italy, Department of Oncology, Transplantation and New Technology in Medicine, Pisa University, Pisa, Italy.*

Background: Color Doppler Ultrasonography (CDUS) and 3D-enhanced magnetic resonance angiography are non invasive techniques for detecting internal carotid artery (ICA) stenosis. High 2D-echo image resolution and high operator expertise for CDUS, and contrast enhancement magnetic resonance angiography technique with 3D reconstruction postprocessing made both techniques competitive with digital subtraction angiography (DSA).

Aim of the study: to compare CDUS and CEMRA, both at the state of the art technique, with DSA for detecting and grading severity of ICA stenosis.

Methods: 50 ICA of 25 pts (20 Males, 67±8 years) were evaluated. Patients underwent CDUS, CEMRA and DSA in different days and within 30 days of each other. ICA stenosis severity was graded as follows: moderate (≥ 40% to ≤ 70%) and severe (>70% to 100%). The results obtained by each technique were reported blind.

Results: 38 ICA stenosis were detected with DSA. Of these, 16 were moderate (42%, 95% CI 26 to 59), 22 severe (58%, 95% CI 40 to 73). Sensitivy, specificity and diagnostic accuracy were 100%, 91.6% and 98% for CEMRA and 94.7 (p=ns vs CEMRA), 91.6% (p=ns vs CEMRA), and 94% (p=ns vs CEMRA) for CDUS. Considering stenosis severity, CEMRA identified 14 moderate (36%, 95% CI 21 to 53, p=ns vs DSA and CDUS) and 25 severe (64%, 95% CI 47 to 79, p=ns vs DSA and CDUS) stenosis, CDUS 17 moderate (46%, 95% CI 29 to 63, p=ns vs DSA) and 20 severe (54%, 95% CI 37 to 70, p=ns vs DSA).

Conclusion: CDUS and CEMRA have similar diagnostic accuracy in the detection of ICA stenosis with CDUS having a tendency to understimate and CEMRA to overstimate ICA stenosis severity.

1071-51 Real-Time MRI Angioplasty Using Intravascular Guidewire Coils

Alexander J. Dick, Michael A. Guttman, Venkatesh K. Raman, Dana C. Peters, Richard B. Thompson, Robert J. Lederman, *National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, Maryland.*

Background: Direct MRI-guided cardiovascular intervention entails compromises between spatial and temporal resolution. Intravascular guidewire coils (IVGC) may improve both. We report feasibility of real-time MRI-guided (rtMRI) angioplasty using IVGC without roadmapping.

Methods: rtMRI was performed on a GE 1.5T scanner with a custom data reconstruction engine, high-impedance phased-array surface coils and in-room consoles. In 5 farm swine, a 0.030' loopless guidewire coil (Surgi-Vision, Gaithersburg, MD) was directed transfemorally using preformed non-metallic catheters into renal, mesenteric, and contralateral iliac arteries solely using rtMRI guidance and navigation was assisted by interactive saturation preparation, gating, channel scaling, coloring, and selective arteriography. Nonferrous 0.035' angioplasty balloons were positioned using the IVGC and inflated with 30mM gadolinium (Gd-DTPA). In 3 pigs, iliac and femoral stenoses were created using vascular tape.

Results: IVGC-enhanced balloon positioning was achieved with 4-6 complete frames/s and 1.25x2.5mm in-plane resolution. Balloon position, inflation profile, and caliber were visualized irrespective of vessels' alignment with $\mathbf{B_0}$. Multiple aorto-ostial and proximal inflations were achieved. Gd-DTPA filled balloons were readily visualized during inflation. Stenoses were crossed with guidewire coils and angioplasty balloon using rtMRI, which visualized a balloon 'waist' and even oversized balloon "melon seeding' during inflation. In 2 swine, balloon trauma to vessel wall was demonstrated using the guidewire coil to obtain high-resolution black blood vessel wall images using a fast spin-echo sequence before and after balloon inflation.

Conclusion: An intravascular loopless guidewire coil sufficiently augments MRI signal to permit wholly rtMRI-guided catheter tracking, selective arteriography, wall imaging, and percutaneous 'angioplasty' of medium caliber arteries in swine. Further improvement is necessary for satisfactory human rtMRI angioplasty.

1071-52 Magnetic Resonance Imaging Guided Deployment and Postinterventional Assessment of Endovascular Stents in the Pulmonary Position in Swine

Titus Kuehne, Phillip Moore, Maythem Saeed, Kelly Gleason, Oliver Weber, Daniel Turner, David Teitel, Charles B. Higgins, *University of California San Francisco, San Francisco, California.*

BACKGROUND

MRI has been used for quantification of pulmonary flow in patients with pulmonary stenosis (PS) and insufficiency (PI). Recently, endovascular and valved stents have gained wide acceptance in treatment of PS and PI. The aim of the study was to use MRI (1) to guide stent placement in the pulmonary position, and (2) to assess stent morphology and blood flow within the stent lumen after placement.

METHODS

The study was performed in a laboratory consisting of a x-ray angiography and a 1.5T short bore MRI unit. In 5 pigs nitinol stents were placed in the pulmonary position using MRI guidance. Image acquisition was performed with a balanced Fast Field Echo (bFFE) and a T1 weighted Turbo Field Echo sequence, which were partially ECG gated. Tracking of the interventional instruments was based on susceptibility and catheters doped with 1% Gadolinium solution. After stent deployment the morphology of the stent and pulmonary artery were assessed using multiphase bFFE. Blood flow volumes within the lumen of the stents were measured using velocity encoded cine (VEC) MRI. The results of the MRI guided intervention were validated with x-ray angiography.

RESULTS

Stent deployment was successful in all animals. In one animal the stent was placed across and in four animals 1-6 mm distal to the pulmonary valve. Measurements of blood flow volumes within the stent lumen showed pulmonary regurgitant flow (31.9± 3.4%) in the animal with the stent placed across the pulmonary valve, but not in animals with a stent placed distal to the pulmonary valve. No complication of the interventional procedure such as stent migration or aneurysms was noted. Position and morphology of the stents were confirmed with x-ray angiography.

CONCLUSION

The results of the study show that MRI can guide stent placement in the pulmonary position. Immediate postinterventional evaluation of the stents was possible using bFFE and VEC MRI. The advantage of this new technique is that it provides simultaneous information about the anatomy and physiology of the pulmonary system before and after deployment of the stents.

1071-67 Intravascular Guidewire Coil Facilitated Invasive Real-Time Magnetic Resonance Arteriography

Venkatesh K. Raman, Michael A. Guttman, Alexander J. Dick, Dana C. Peters, Richard B. Thompson, Robert J. Lederman, *National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, Maryland.*

Background: Real-time MRI (rtMRI) vascular intervention will require arteriography. We report feasibility of invasive rtMRI catheter-tracking and selective gadolinium (Gd) MR angiography (rtSMRA) facilitated by an intravascular guidewire coil (IVGC).

Methods: rtMRI used a GE 1.5T scanner and custom reconstruction engine, surface coils and in-room consoles. In 5 farm pigs, a loopless 0.030' IVGC (Surgi-Vision, Gaithersburg, MD) was directed percutaneously using non-ferrous catheters. Tandem IVGC/catheter movement permitted non-roadmapped navigation at 4-5 frames/s and 1.25x1.67mm resolution. Coronary, renal, mesenteric, and iliac arteries were engaged, and rtSMRA conducted using 30mM Gd hand-injections, saturation-preparation, Cartesian and projection-reconstruction gradient echo sequences.

Results: IVGC enabled rtMRI navigation and selective engagement. 2° and 3° branches were delineated as were parenchymal and venous phases. Proximal coronaries were engaged and visualized but mid- and distal vessels were not of diagnostic quality.

Conclusions: Tandem catheter movement with an IVGC facilitates accurate navigation and selective arteriography under rtMRI. Advantages of rtSMRA over non-invasive MRA include time-resolved imaging, absence of venous and parenchymal overlap, ability to visualize more distal branches, motion-insensitivity, and ability to perform multiple low-dose contrast injections.