MultiTransmit leads the way in 3.0T imaging

Bonn: Achieva 3.0T TX overcomes high field challenges
Enhanced breast imaging in University of Chicago Hospitals
SmartExam excels in multi-center ASL study
TRANCE optimizes non-CE MRA in extremities
“We need maximum flexibility of the MR system to deal with every patient. A patient-adaptive system like the Achieva 3.0T TX with MultiTransmit helps to make this a reality.”

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Philips leads the way in 3.0T imaging with MultiTransmit technology

Achieva 3.0T TX, Achieva 1.5T SE, Elite Breast with MammoTrak are talk of the town at RSNA 2008

Philips made a strong showing at the RSNA in Chicago with meaningful innovations such as the new Achieva 3.0T TX and MammoTrak.

On November 30, the opening day of the RSNA meeting, a crowd applauded the unveiling of the new Achieva 3.0T TX by Conrad Smits, Chief Executive Officer (Magnetic Resonance Imaging) at Philips.

**MultiTransmit optimized for speed, uniformity and consistency**

Achieva 3.0T TX uses proprietary MultiTransmit technology to provide up to 40% faster scanning speed, enhanced image uniformity and consistency for a wide range of applications and patients.

Conventional 3.0T presents challenges such as dielectric shading and SAR limitations. MultiTransmit employs multiple RF sources which can be individually tuned to each patient’s unique anatomy, thereby addressing dielectric shading at the source. For more information, visit www.philips.com/AchievaTX

Clinical results from the world’s first Achieva 3.0T TX installation at the Bonn University Hospital enthused many visitors at the booth.
Dear Friends,

The industry gathered in Chicago in November for RSNA, and Philips once again delivered the MR highlight of the show!

The unveiling of the Achieva 3.0T TX drew a large, enthusiastic crowd. Its MultiTransmit technology is leading the way into routine 3.0T imaging with multiple RF sources for uniformity and consistency. In this issue of Field Strength, Winfried Willinek, MD of the University of Bonn reports on the clinical excellence of the first Achieva 3.0T TX system. See also Bonn’s contributions at ISMRM.

Be sure to read about the Achieva 1.5T SE, also launched at RSNA, an energy-efficient, environmentally-friendly solution for superb scanning, with powerful gradients and unrestricted upgrade paths.

Also in this issue, Gillian Newstead, MD of the University of Chicago discusses the benefits of our Breast Elite Clinical Solution, with beautiful accompanying images.

I hope you enjoy these and all the articles in Field Strength!

Falko Busse
VP, Chief Technology Officer
Business Unit MRI
Philips Healthcare

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**Elite Breast Clinical Solution enables efficient breast exams**

Another Philips highlight at RSNA was the Elite Breast Clinical Solution. With the MammoTrak dockable patient support, integrated SENSE Breast coil, flexible biopsy setup kit and DynaCAD Enterprise workstation for efficient MR data analysis and biopsy planning, it is truly a complete clinical solution that addresses the challenges of Breast MR.

Two available integrated MammoTrak SENSE Breast coils offer exceptional coverage, including the axilla. The 16-channel MammoTrak SENSE Breast coil provides superb spatial and temporal resolution to aid in early diagnosis of breast lesions. The open 7-channel SENSE MammoTrak Breast coil enables imaging and biopsy. The DynaCAD Enterprise Solution allows automatic calculation of target coordinates for MR-guided interventions accessible on the MR console.

**Achieva 1.5T SE well received**

Achieva 1.5T SE generated a high level of interest among RSNA visitors for its strong clinical capabilities at an attractive economical proposition. Its energy-saving feature, PowerSave, keeps running costs low, and it also exemplifies Philips’ effort to reduce the environmental impact of its products.

Philips provides a Lunch Symposium on MultiTransmit at the ISMRM meeting on Monday, April 20.
Achieva 3.0T TX overcomes high field challenges

MultiTransmit technology at University of Bonn helps to improve quality of 3.0T MR imaging

MR imaging at 3T has always been subject to challenges such as dielectric shading and local SAR limiting speed. Now, the Achieva 3.0T TX scanner has fundamentally addressed those challenges by using multiple RF sources. The first Achieva 3.0T TX was installed at University of Bonn in October.

Unlike conventional 3T imaging systems, the Achieva 3.0T TX uses Philips’ proprietary MultiTransmit parallel transmission technology to project multiple independent RF transmit signals, thereby addressing dielectric shading at the source to enhance image uniformity and consistency. Additionally, local RF deposition can be reduced, which enables a gain in scanning speed.

Winfried A. Willinek, MD, is Associate Professor of Radiology at the University of Bonn (Bonn, Germany), where more than 200 patients have been scanned on the new Achieva 3.0T TX since October 2008. He says that although imaging at 3T was already quite mature, patient-adaptive MultiTransmit technology offers several distinct advantages over conventional 3T imaging.

“The main advantage, of course, is the improved RF field homogeneity and consistency. MultiTransmit provides multiple independent RF signals adjusted to each individual patient, therefore yielding more uniform excitation. In turn, that improves B1 homogeneity and consistency of MR imaging in all patients. This is required in daily clinical practice in order to enhance diagnostic confidence. The better RF distribution control at 3T enables us to accelerate imaging by 30-40% in many applications.”

The Achieva 3.0T TX features the illuminated Ambient Ring for an enhanced patient experience, as well as dual-sided controls and wireless physiology for ease of use.
“In liver cirrhosis patients, MultiTransmit with patient-adaptive RF shimming improves the image quality significantly.”

**MultiTransmit benefits liver imaging**
Achieva 3.0T TX is helping to improve imaging in some of the most difficult MR exams. “Liver imaging at 3T, particularly in patients with cirrhosis and ascites, used to be very challenging due to dielectric shading,” says Dr. Willinek. “In patients with liver cirrhosis we see fluid collections in the abdomen quite regularly. In these cases, the Achieva 3.0T TX system with multiple RF transmission and patient-adaptive RF shimming improved the image quality significantly.”

This is particularly important in patients for whom an MR exam is vital, such as those who are anticipating a liver transplant and need to exclude the possibility of a tumor before surgery can be performed. If tumors are indeed present, says Dr. Willinek, the surgeon needs information on the lesions. “Surgery is one treatment option, but not if too many lesions are present or the tumor is too big. Alternatively, image-guided interventional techniques like embolization or RF ablation can be selected, but exact knowledge of the tumor size, number of lesions and the localization is pivotal.”
Guido Kukuk, MD, who is collaborating with Dr. Willinek and Philips’ Jürgen Gieseke, PhD, in a liver project on the MultiTransmit system, adds, “Using MultiTransmit technology, B1-inhomogeneity clearly decreases and lesion detectability significantly improves. This is especially true in the most critical areas, which are the left liver lobe, the peripancreatic and paravertebral region and the posterior parts of the right liver lobe.”

**Increased speed aids spine exams**

In spine imaging, the increased speed of Achieva 3.0T TX is a boon to patients with severe back pain. “We encountered SAR limitations with conventional 3T spine imaging, and acquisition time could be quite long – up to 30 minutes,” says Dr. Willinek. “The time consumed with imaging often resulted in patient discomfort and deteriorated image quality due to patient movement and motion, necessitating re-scanning for good diagnostic image quality.”

Intraindividual comparison of lumbar spine MRI at 3.0T. With MultiTransmit a total scan time reduction of 40% was achieved in combined T1- and T2-weighted TSE imaging as opposed to conventional imaging at 3.0T (4:35 vs. 7:39 min.).
“We need maximum flexibility of the MR system to deal with every patient. A patient-adaptive system like the Achieva 3.0T TX with MultiTransmit helps to make this a reality.”

Dr. Willinek says the results at University of Bonn are also very promising for future development and even higher field strengths such as 7T. “In body imaging especially, the higher the field strength, the more pronounced are the challenges. Therefore, for higher field strengths it is very beneficial to have a MultiTransmit system such as Achieva 3.0T TX.”

Michael Nelles, MD, who is collaborating in the Achieva 3.0T TX spine project in Bonn summarizes, “MultiTransmit in spine examinations yields an effective gain of time (on average 30-40%) with diagnostic image quality readily comparable to that of standard single transmission sequences.”

Versatility of MultiTransmit will step up the future of 3.0T imaging
Torso and body imaging at 3T have been traditionally very challenging, says Dr. Willinek. “Because of the high image quality and consistency with the Achieva 3.0T TX, the high field system can now be used for the first time without diagnostic impairment even in patients with ascites.” Dr. Willinek adds, “In our hospital, for instance, we have a kind of triage system, where we schedule patients by their clinical need for a scan. Therefore, we need maximum flexibility of the MR system to deal with every patient – no exceptions. A patient-adaptive system like the Achieva 3.0T TX with MultiTransmit and parallel RF transmission helps to make this a reality.”
The team of breast radiologists at the University of Chicago (Chicago, Illinois, USA) provides a full range of diagnostic services, including digital mammography, breast ultrasound and dynamic breast MRI to more than 20,000 patients every year. Recently, it became the first site in the United States to use Philips’ Elite Breast Clinical Solution. With the dockable MammoTrak patient trolley, integrated 16-channel SENSE Breast coil and software for efficient MR data analysis, the Breast Clinical Solution enables outstanding image resolution, excellent breast coverage and more efficient workflow.

“...We now have a much improved visualization of the axilla, which is important in staging our patients with a new cancer diagnosis.”

Gillian M. Newstead, MD is Professor of Radiology at The University of Chicago. She uses the Elite Breast Clinical Solution with a Philips Achieva 1.5T scanner for all routine breast MR imaging at the University of Chicago Hospitals.

“This is a great solution,” she says. “It provides superb image quality, as evidenced by the clinical cases we’ve been doing.” The solution begins with the improved patient throughput provided by the MammoTrak patient support system, a dedicated breast MR patient support with an integrated coil. Because MammoTrak is dockable to the MR system, less time is spent preparing the patient at the magnet.

Patient comfort is an important feature of MammoTrak. “Patient motion is the enemy of good breast MRI, and more comfort means less motion,” says Dr. Newstead. The MammoTrak ramp is ergonomically designed, and uses more comfortable construction materials. “The feet-first approach into the magnet is also a huge advantage,” she adds, “because it’s less claustrophobic for the patient.”

Coil enables considerably higher resolution than before

Dr. Newstead currently uses the 16-channel integrated MammoTrak SENSE Breast coil for all diagnostic breast imaging. “With the introduction of SENSE in breast imaging a huge step was made; with the introduction
A 47-year-old patient with history of left breast cancer diagnosed in 2006 and re-excision of the scar in 2007 for additional tumor. Post-surgical scar due to prior surgery is noted in the lower outer quadrant of the left breast.

of this new 16-channel coil another tremendous leap forward is made,” she says. “This coil really optimizes diagnostic imaging, and our spatial and temporal resolution have improved significantly. We can visualize smaller lesions, which is so important for early detection and improved treatment.”

Both the new 16-channel and seven-channel MammoTrak Breast coils have larger coverage, she adds. “We now have a much improved visualization of the axilla, which is important in staging our patients with a new cancer diagnosis.”

Dr. Newstead will soon begin performing biopsies as well, using the SENSE MammoTrak Breast coil with seven channels and integrated lighting. “I think as breast MR is becoming more widely used, everyone will have two coils, one coil specifically for biopsy work and another coil for the best possible diagnostic work. We are doing medial and lateral biopsies, so overall I think we need to keep the biopsy procedures separate from the diagnostic procedures. Philips got this design exactly right.”

“The new biopsy setup is very well integrated,” she says. “Biopsy planning is now available at the MR console, with a display that shows the best trajectory to breast lesions.”

With DynaCAD Enterprise as a part of the solution, access to the substantial amount of patient information is available from multiple computers in the hospital. DynaCAD offers customizable viewing protocols, and standard reporting according to BI-RAD standards.

**E-THRIVE / VISTA comparison used for better diagnosis**

Dr. Newstead is using e-THRIVE, a 3D T1-weighted technique for fast dynamic scanning with sub-millimeter in-plane resolution. E-THRIVE is a combination of techniques optimized for high homogeneity and good fat suppression. “The e-THRIVE technique is based on linear k-space filling with near-isometric voxels,” Dr. Newstead explains. “I haven’t been able to approach this kind of spatial resolution — in-plane, the e-THRIVE sequence has 0.76 mm resolution, with a temporal resolution of 60 seconds — on any other scanner I’ve used. In my mind, this is a huge breakthrough, and it has made such a difference.”
Using VISTA — instead of a T2-weighted multislice scan — and e-THRIVE with the same voxel size (0.76 x 0.76 x 1 mm), images are matched slice to slice between e-THRIVE and VISTA. They match in-plane as well as through-plane, and have the same characteristics, so exact comparison of both image sets is possible.

Dr. Newstead recognized early on that the comparison was important to improving the specificity of diagnosis, and feels that it should be done in each case where there is an abnormal finding. “In general, people are using thicker slices in the T2-weighted sequence(s) than in the dynamic sequence,” she says. “They may use STIR or T2-weighted images with or without fat suppression. However, I feel that it is extremely important to have the spatial resolution in the T2-weighted image sequence exactly match the resolution in the dynamic acquisition so that we can compare the signal intensity characteristics and morphology of the lesion on the dynamic images with the T2-weighted VISTA images. If the slice thicknesses do not exactly match, these sequences will be too different. I think the images are dramatically improved with the new technique.”

Ambassadors Network brings opinion leaders together
The e-THRIVE / VISTA comparison technique is one of the many aspects of breast MRI that Dr. Newstead is sharing with other physicians. As a member of the Philips Breast MR Ambassadors Network, she conducts educational programs such as Web seminars and hands-on courses. “There is a tremendous need in the radiology community to optimize breast MR imaging,” she says. “When I show these breast MR cases to other physicians, they want to know how to achieve the images I’m getting. I think the network is a great teaching tool, especially now that we have these images that just knock their socks off.”

With the Ambassadors Network, Philips is working toward a goal of a global network of key opinion leaders in Breast MRI. Dr. Newstead and others continue to work closely with Philips, offering input that addresses clinical needs and creates innovative solutions to benefit both physicians and patients.

Medical Center preparing to increase breast MRI volume
Dr. Newstead says the Breast Clinical Solution will be even more important in the near future. The American Cancer Society (ACS) recently recommended the use of breast MRI as a screening tool for high-risk women. The Breast Clinical Solution will help medical centers prepare for this increased volume of breast MRI scans.
A 52-year-old patient with FNA-proven breast cancer, seen here as a round mass with irregular margins in the left breast. Additional suspicious lymph nodes are seen between the pectoralis minor and major muscle, and a few subcentimeter simple cysts were noted bilaterally.

“Because of these recommendations, we are gearing up to significantly increase the amount of breast MRI exams which very few sites are doing yet. When that becomes more of a clinical reality, as it certainly will in the next few years, the volume of breast MRI in the U.S. will increase.”

“There is a tremendous need in the radiology community to optimize breast MR imaging.”
SmartExam excels in large multi-center ASL study

A recent large-scale multi-center ASL perfusion study demonstrated the value of SmartExam in the planning of MR scans, giving reproducible results in each and every patient included in the study.

Researchers Xavier Golay, PhD and Esben Petersen, MSc at the National Neuroscience Institute, Singapore, recently completed a large-scale multi-center study to test the feasibility of a user-independent ASL protocol they have developed for brain-perfusion measurement. Conducted at 28 Achieva 3.0T sites, all utilizing Philips’ SmartExam automatic planning tool, the study convincingly demonstrated the value of SmartExam as a reliable, user-independent planning tool in multi-center studies, as well as showing excellent reproducibility results for the ASL method.

Xavier Golay, PhD is currently Professor of MR Physics and Translational Neuroscience at the Department of Brain Repair and Rehabilitation within the University College London’s Institute of Neurology, London, UK. Before that he was head of the Laboratory of Molecular Imaging, Singapore Bioimaging Consortium (SBIC), Singapore, with a joint appointment at the National Neuroscience Institute of Singapore.

Arterial Spin Labeling (ASL) is a powerful technique for measuring brain perfusion non-invasively by using water in the arterial blood flowing into the brain as an endogenous contrast agent. Although the history of ASL goes back nearly twenty years, it has only recently become commercially available. Development efforts and the recent trend towards high field systems such as the Philips Achieva 3.0T, have overcome many of the technical challenges, especially those associated with signal-to-noise. Moreover, work by researchers Professor Xavier Golay and Esben Petersen at the National Neuroscience Institute, Singapore, has shown that their ASL protocol with SmartExam gives reliable quantitative information on cerebral blood flow (CBF) in a user-independent manner and without the need for specialist personnel.

“The study shows that this ASL sequence, which we’ve named QUASAR, provides user-independent information on cerebral perfusion in quantitative terms.”

“The new ASL sequence provides user-independent information on cerebral perfusion in quantitative terms.”
perfused tissue can be obtained and used to calculate the perfusion map,” explains Prof. Golay.

Initial evaluation of the method was done in a limited clinical trial at the Singapore Institute on 10 healthy volunteers. The results were highly encouraging, showing that this ASL sequence with SmartExam was able to provide estimates of blood perfusion completely automatically, thus eliminating the need for specialist personnel. To fully validate the method, however, the Singapore researchers then embarked on an ambitious worldwide multi-center test/re-test study. Its aim was to determine if the results could be fully replicated in the clinical setting, across users and across centers.

**Interest to participate exceeds expectations**
"There was tremendous interest in the proposed study, not just from the sites we originally contacted, but from many other sites that had heard about it and were keen to take part,” recalls Dr. Golay. “This was all the more surprising since we were not able to offer any financial incentive – every group having to rely on their own funding.”

Eventually the researchers recruited 28 Achieva 3.0T sites for the study, in roughly equal numbers from Asia, Europe and the US. Over half were clinical sites with only a very few university hospitals. This was a significant factor for the Singapore researchers as their aim was primarily to demonstrate the usefulness of their ASL sequence with SmartExam in the standard clinical setting.

Each site was required to recruit a minimum of 10 healthy volunteers, again in roughly equal proportions of males and females. The sites all had to have the latest release of the Achieva 3.0T software with Philips’ SmartExam Brain for automatic planning. The Singapore researchers supplied each site with the special QUASAR software including the ExamCard with the scan protocols.

“SmartExam worked extremely well. Average displacement due to repositioning and motion was within 1.26 mm, average rotation within 1.5°.”

**Multi-center study shows value of SmartExam**
A total of 283 volunteers were included in the study making it the largest multi-center ASL study so far conducted. Four perfusion measurements were performed on each volunteer in two sessions on separate days, at least a week apart. In one of the sessions, the volunteer was removed from the scanner between perfusion measurements. After each session of perfusion measurements, a high resolution 3D IR-TFE scan was performed.

“We used the high resolution 3D scans to estimate the precision of SmartExam’s repositioning algorithm,” explains Dr. Golay. “We found that SmartExam worked extremely well. Over the whole study, the average displacement due to repositioning errors and subject motion was within 1.26 mm, and average rotation within 1.5°.”
The value of SmartExam in multi-center studies

SmartExam is a powerful tool for assisting MR users with automatic planning, scanning and processing of MR scans on Philips systems in order to provide radiologists with reproducibly planned slices in each and every patient, regardless of the exact position of the patient within the scanner, the anatomy of the patient or the experience of the radiographer.

SmartExam first detects anatomical landmarks in the patient and then uses these to automatically plan scan geometries, taking account of the patient’s actual position in the scanner – without any interaction from the radiographer. The geometries SmartExam uses are contained in a trained database developed in previous manual planning sessions.

The Singapore team fully appreciated the value of SmartExam during their multi-center reproducibility study. “SmartExam allowed us to remove virtually all extraneous influences and concentrate on the main issues relating to the reproducibility of our ASL method,” emphasizes Dr. Golay. “Without it, repositioning would have been much more difficult. And you have to keep in mind that these multiple test/re-test procedures can be rather boring for the radiographer who has to perform them. Mistakes can easily happen in these situations, but SmartExam reduced the number of failed exams to only 4% and increased positional accuracy to within 1.26 mm. That’s pretty impressive performance by anyone’s standards.”

Example of automatic planning by SmartExam.

Multi-center trial participants

Children’s Medical Center of Dallas, Dallas, TX, USA, NK Rollins
Columbia University, New York, NY, USA, A Borogovac, I Asllani
Diagnostic Radiology Department (DRD) NIH, Bethesda, MD, USA, ND Gai, JA Butman
Glostrup Hospital, Copenhagen, Denmark, HBW Larsson, AE Hansen
Imperial College London, London, UK, DJ Larkman
Johns Hopkins University, Baltimore, MD, USA, MJ Donahue, PC van Zijl
Kumamoto University, Kumamoto, Japan, T Hirai, M Kitajima
Kyung-Hee University, Seoul, Korea, G-H Jahng, DM Yang
Kyushu University, Kyushu, Japan, T Yoshiura, T Noguchi
Lund University Hospital, Lund, Sweden, L Knutsson
National Neuroscience Institute, Singapore, ET Petersen, X Golay
Queen’s Medical Centre, Nottingham, UK, S Goode, P Morgan
Ramathibodi Hospital, Bangkok, Thailand, A Kampaengtip, J Laothamatas
Seoul National University Bundang Hospital, Seoul, Korea, JH Kim
Sungkunkwan University School of Medicine, Seoul, Korea, ST Kim, JH Lee

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Results of non-invasive ASL comparable to PET and CT
Out of the 283 subjects, the Singapore researchers received 272 data sets without protocol errors. The mean gray matter CBF was found to be 47 ml of blood per 100 g of tissue per minute with a significantly higher CBF in females than in males (48 ml/100g/min in females versus 46 ml/100g/min in males). Standard deviation was 5.7 ml/100g/min, leading to a repeatability of around 16 ml/100g/min. No smoothing was performed on the data and all data was included, even apparently anomalous measurements.

“This result compares very favorably with oxygen PET and xenon CT, which are considered the current gold standards for measuring perfusion quantitatively,” stresses Dr. Golay. “These other methods are not only invasive but also extremely expensive. Our study has shown that our QUASAR sequence with SmartExam can achieve the same reproducibility, allowing CBF to be measured without contrast agent during a routine MRI scan. What’s more, thanks to SmartExam, the whole procedure becomes little more than a push-button operation, and is completely operator independent, making it suitable for use in the general clinical environment with no need of specialist personnel.”

References
1 Petersen ET, Golay X
Is Arterial Spin Labeling Ready for Prime Time? Preliminary results from the QUASAR Reproducibility Study

2 Petersen ET, Zimine I, Golay X
Validation of user independent planning tool for consistent data acquisition in multi-center trials

3 Non-invasive brain perfusion imaging using Arterial Spin Labeling
Field Strength Publication for the Philips MRI Community Issue 35 September/October 2008, 24-27
Clinical case report

ASL study of carotid stenosis

Contributed by Dr. Nobuo Kawauchi (radiologist) and Dr. Hiroaki Sato (neurosurgeon), Tokyo Metropolitan Police Hospital, Japan

**Patient history**
The patient (75-year-old male) with right carotid stenosis without symptoms underwent an MRI examination before and after carotid artery stenting (CAS). The purpose of the initial MR exam was to determine the presence of any cerebral infarction, and qualitative evaluation of perfusion using ASL perfusion. Scans were also assessed to visualize the extent of carotid stenosis, the low return flow, and lateralization of blood flow.

**MR examination**
The MR examinations were performed on an Achieva 3.0T X-series using the 16-channel SENSE NeuroVascular coil.

On T1w, T2w, FLAIR and DWI images a small lacunar infarction is seen on the right side, no other abnormalities noted.

Pre-intervention inflow MRA shows decreased flow in the right middle cerebral artery due to stenosis of the right internal carotid artery. Collateral flow is seen from the left anterior communicating artery.
3D VISTA images reformatted in an oblique sagittal plane help to visualize the extent and character of the plaque and the structure of the vessel wall.

Pre-intervention multi-phase, multi-slice ASL scans show differences between right and left sides of brain.

Post-intervention inflow MRA in the brain shows that the blood flow is normal after the CAS intervention.

Clinical value of ASL
Arterial Spin Labeling (ASL) is a technique to measure brain perfusion. The scan is non-invasive and does not require contrast agents, because ASL uses magnetically labeled water protons in the arterial blood flow into the brain as the contrast agent, to evaluate perfusion. Multislice scanning (e.g. 5 slices) is preferable to evaluate the central cerebral blood flow. Multi-phase ASL is especially important to visualize the temporal characteristics of the blood passage.
Hyogo Brain and Heart Center (Himeji, Hyogo, Japan) opened in April 1981 with 350 beds. With specialists in cardiology and neurology and a critical care center that supports the Hyogo prefecture, the Center sees more than 1800 outpatients every week. The Center has been using an Achieva 1.5T and an Achieva 3.0T scanner for MRI examinations and developed the TRANCE technique for non-contrast enhanced MR angiography, with very good results.

Kazunari Ishii M.D., Ph.D., Director of the Department of Radiology and Nuclear Medicine at Hyogo Brain and Heart Center, says the Center scans seven or eight patients in a week using the TRANCE technique, mainly for the lower extremities.

Non-contrast enhanced MR imaging gained more clinical interest among physicians because of concerns regarding gadolinium-based contrast agents and their relation to nephrogenic systemic fibrosis (NSF). For patients who are at risk for NSF, such as those with renal insufficiency, MR imaging without gadolinium-based contrast agents is preferred.

“We saw a clinical need for implementing a non-contrast enhanced (non-CE) imaging technique for our patients with peripheral arterial disease (PAD) and contraindications for the use of contrast medium, for instance because of a decline in kidney function or renal artery stenosis.”

**TRANCE optimized for best performance**

Hyogo Brain and Heart Center pioneered the TRANCE technique for non-CE MR angiography. With TRANCE, two high-resolution images are acquired, one in diastole and one in systole. In systole, arterial blood flows quickly, causing dephasing of signal. This leads to flow voids, so arteries are black. In diastole, arterial blood flow is slower, so the signal does not dephase and arteries are bright. TRANCE subtracts systolic from diastolic images resulting in a high-resolution, 3D dataset of bright arteries and dark background.

In this 80-year-old male with bilateral stenosis of the superficial artery, 1.5T TRANCE visualization of the arterial stenosis and collateral vessels is equivalent to CTA.
The TRANCE technique

Philips TRANCE (Triggered Angiography Non-Contrast Enhanced) is a cardiac triggered 3D TSE technique that subtracts images from different phases in the cardiac cycle to obtain high resolution arterial images with bright vessels and dark background.

TRANCE makes use of signal intensity differences in the arteries due to flow changes throughout the cardiac cycle. During systole, signal intensity within the arteries drops because blood acceleration causes flow voids due to dephasing. At the same time, signal intensity within veins is preserved because that flow is much lower. During diastole, signal intensity is high in both the arteries and the veins.

The TRANCE technique uses cardiac triggering to enable data acquisition during systole and during diastole. Using ImageAlgebra, the TRANCE technique subtracts these two high resolution datasets, resulting in only arterial signal as the bright signal of the veins is cancelled out. Thus flow changes throughout the cardiac cycle are used to better differentiate arteries from background tissue without using a contrast agent.

TRANCE is compatible with large FOV’s (380 to 450 mm) and high matrix sizes with scan times in the range of 2:15 to 5:10 seconds per phase.

The subtracted dataset can be further processed with VolumeView. For bright arteries, Maximum Intensity Projections (MIP) can be made.

“TRANCE background suppression is mostly excellent and we can easily see collateral blood circulation. We can use a large FOV in the coronal plane, and scan time is faster than TOF.”

Left poplitial artery stenosis

In this 59-year-old male patient with stenosis to the left poplitial artery, TRANCE at 3.0T produces significantly better images than 2D time-of-flight MRA, and visualizes arterial stenosis and collateral vessels as in CTA.
Right iliac artery stenosis and left iliac artery occlusion

CTA shows severe calcification of the iliac artery in this 72-year-old female, but stenosis cannot be seen. DSA and TRANCE provided excellent images that demonstrate stenosis of the right iliac artery and left iliac artery occlusion. TRANCE enables a larger FOV, which gives a broader overview than DSA.

Left common iliac artery stenosis

In this 65-year-old female, TRANCE at 3.0T demonstrates the stenosis of the left common iliac artery as clearly as DSA.

Bilateral superficial artery stenosis

TRANCE at 3.0T provides image quality comparable to CE-MRA in this 63-year-old female with stenosis of the bilateral superficial artery.

"We believe this non-invasive technique will gain much importance in diagnosis of peripheral arterial disease."
“We have carefully optimized our scan parameters, for instance, the refocusing angle and flow compensation in particular at 3.0T,” Dr. Ishii explains. “A higher refocusing angle yields higher signal intensity, but SAR limitations need to be taken into account. We found that using flow compensation in the diastolic phase yields the brightest signal in the arteries. Adding sensitized flow compensation in the systolic phase provides the lowest signal in the arteries because of flow voids.” Takeshi Ishimoto, R.T., technologist at Hyogo Brain and Heart Center, says TRANCE is easy to use. “The TRANCE technique doesn’t require any specific system type, field strength or gradient.” Together with the Philips Japan team they built a TRANCE ExamCard, that performs the subtraction automatically. We often use inverted display of TRANCE images to make the image appearance similar to DSA. TRANCE is completely non-invasive, and it is used for almost all patients.

**TRANCE provides fast, high quality MRA**

Dr. Ishii prefers TRANCE over time-of-flight (TOF) MR angiography as TRANCE images show better vessel conspicuity. “Because TRANCE is a subtraction technique, background suppression is mostly excellent, and better than with TOF. We can easily see collateral blood circulation,” he says. “We can use a large FOV in the coronal plane, and the scan time is faster than with TOF.”

“While TRANCE is used most often for imaging of the lower extremities, the simplicity and flexibility of this technique make it attractive to explore its use in other anatomies,” says Dr. Ishii. “In diagnosis of peripheral arterial disease, however, we believe this non-invasive examination technique will gain much in importance.”

**References:**

1. Mitsue Miyazaki, Satoshi Sugiura, Fumiaki Tateishi, Hirofumi Wada, Yoshimori Kassai, Hirohiko Abe  
   *Non-Contrast-Enhanced MR Angiography Using 3D ECG-Synchronized Half-Fourier Fast Spin Echo*  
   JMRI 12:776–783, 2000

2. Mitsue Miyazaki, Vivian S. Lee  
   *Nonenhanced MR Angiography*  

   *MR Angiography of Peripheral, Carotid, and Coronary Arteries*  
   AJR 149:1097-1109, 1987

   *Projective imaging of pulsatile flow with magnetic resonance.*  
   Science 230: 946–948, 1985

   *MR gated subtraction angiography: evaluation of lower extremities.*  
   Radiology 159:411–418, 1986
Benefits of Panorama HFO’s openness in studying contortionists

Dynamic whole-spine imaging in contorted positions yields information on fractures

Contortionism involves dramatic twisting of the body into positions that most humans cannot attain. In the first study of its kind, the NIC team led by William W. Orrison, Jr, MD, MBA, imaged five contortionists from a circus school in Mongolia to better understand the pathological conditions within their spines that might be associated with their art. Researchers also wanted to establish the total range of motion in their spines, and to look at injuries in more detail. This included the so-called “anterior limbus fractures,” in which a tiny segment of bone separates from the edge of the vertebral ring.

Panorama accommodates contorted positions

Whole-spine MR images were first obtained on a Philips Achieva 3.0T system, with participants in a supine position. Then, using the Philips Panorama High Field Open (HFO) scanner and its unique, integrated quadrature body coil, dynamic whole-spine imaging was performed in contorted positions. While the contortionists are comfortable in flexion positions (bending forward), they can’t hold the extension positions (bending backward) for more than a few minutes. Panorama HFO’s wide space accommodates the contortionists during imaging both flexed and extended. “This study would have been very difficult to complete in any other scanner and was only possible because of the wide, movable table and the large aperture of the Panorama,” says Dr. Orrison. The images showed a remarkable range of motion of 238 degrees between full flexion and full extension. The imaging also showed that all patients in this study had extremely straight spines in the sagittal plane, without the normal cervical and lumbar curvature, which could be due to genetics or to their training from a very young age. However, they all demonstrated a mild dextroscoliosis, presumably due to their training.

Three of the five contortionists had anterosuperior limbus vertebrae at T-11 and the upper lumbar levels.

The researchers hypothesize that the anterior limbus fractures in contortionists are likely related to hyperextension. One possibility is that when these contortionists hyperextend, the ligaments pull hard enough to actually cause the limbus fractures. Dr. Orrison explains that there appears to be very little stress on the spinal column of the contortionists during flexion, with most of the flexion occurring at the hips (more than 180 degrees) and with the contortionists able to hyperflex for long periods of time comfortably. However, they can maintain hyperextension for only a few minutes and experience back pain when holding the hyperextended positions for a longer period of time. Thus, it appears that the major...
Contortionist in extension position in Panorama HFO

Spine extension image using FFE, 400 mm FOV, 12 mm slice thickness, 128 x 256 matrix and TR/TE 7.3/3.7 with a 45° flip angles and a scan time of 0.96 sec. per slice.

3.0T whole spine

The sagittal T2-TSE image (left) shows lack of normal cervical and lumbar curvature. The coronal T2-TSE image (center) demonstrates a mild dextro-scoliosis.

Anterior limbus vertebrae

Sagittal 3.0T T2-TSE image of a contortionist with anterior limbus vertebrae at T-11 and L-1 (arrows).
The sagittal spine FFE image in flexion was acquired in two stations, with MobiView used to fuse the images. FOV 400 mm, 12 mm slices, matrix 128 x 256, TR 7.3 ms, TE 3.7 ms, flip angle 45°, scan time 0.96 sec. per slice. The coronal T2-weighted image of the hips in the flexion position demonstrates more than a 180-degree rotation of the hips. Single-shot T2-TSE, TSE factor 73, FOV 350 mm, a 6.0 mm slices, matrix 146 x 240, TR 8000 ms, TE 90 ms, scan time 0.4 sec. per slice.

“The Panorama provides unique access to a variety of patients who would otherwise be difficult or impossible to image with MRI.”

stress on the spine occurs during hyperextension in these remarkable individuals. Since this study, the troupe has altered its training regimen and other exercises to minimize these types of injuries.

**Whole-spine dynamic imaging a valuable tool**

In this study, whole-spine MRI was very valuable in evaluating the spinal anatomy and pathological conditions of the contortionists. The dynamic real-time imaging during active contortion in the Panorama HFO provides a unique opportunity to demonstrate the severe stressors imposed by extreme extension of the spine. Advantages offered by the Panorama HFO’s wide-open patient space include the ability to examine the entire spine in full motion through flexion and extension, improved resolution, and direct visualization of the spinal cord, intervertebral discs, and paraspinal soft tissues. In the future this method may also be used in other applications involving limited spinal motion and vertebral, disc or spinal cord displacement, such as pain management and traumatic spine injuries.

“The Panorama provides unique access to a variety of patients who would otherwise be difficult or impossible to image with MRI. This not only includes patients with claustrophobia, but also patients who are unable to enter other MRI systems due to size, body habitus, or a requirement for unusual positioning such as this extreme example during contortion.” Dr. Orrison stated.

**Reference**

Peoples RR, Perkins TG, Powell JW, Hanson EH, Snyder TH, Mueller TL, Orrison WW.
Whole-spine dynamic magnetic resonance study of contortionists: anatomy and pathology.
J Neurosurg Spine 2008; 8:501–509
Achieva 1.5T SE: higher performance and lower operational costs

Favorable economics combined with outstanding system design for diagnostic confidence

In addition to powerful new Pulsar HP+ gradients, the Achieva 1.5T SE features a scalable FreeWave RF platform and the largest homogenous imaging field of view (up to 53 cm) in its class. The Achieva 1.5T SE system uses Philips innovations to facilitate easy, efficient scans. SENSE parallel imaging enables up to eight times faster acquisition. ExamCards and SmartExam enable easy one-click planning, scanning and processing for reproducible, consistent scans. ExamCards can be downloaded directly into the scanner from the Philips MRI NetForum Community web site.

Smarter economics
Achieva 1.5T SE features Philips’ proprietary PowerSave technology. Smart power management adapts energy consumption to the actual system status – system off mode, stand-by mode and scanning/measurement mode – thereby enabling significant savings in energy use. PowerSave can reduce energy consumption by up to 50 percent, thus dramatically cutting energy cost and sparing the environment. PowerSave is the result of Philips’ continuous focus and drive to improve the sustainability of its products. All Philips MRI systems comply with green product requirements for environmental impact improvement, which are externally audited and result in a green logo.

The compact minimum siting requirement of the Achieva 1.5T SE – just 27 square meters /290 square feet for the entire system – increases the flexibility of the space and further reduces costs.

Easy upgrades are available at any time, for newer, more advanced applications and even higher performance. With minimal upgrade times and a choice of upgrade paths, the system can expand to 16/32 RF channels.

Proven solutions and attractive life-time cost
Using the proven technology of the Achieva family, the Achieva 1.5T SE is a true workhorse system that enables superb image quality. Operational cost is minimized by PowerSave and the system’s small footprint. It offers a broad collection of proven clinical solutions from the beginning and ample upgrade possibilities to newer, more advanced applications when needs grow. In summary, Achieva 1.5T SE is designed for excellent results – now and in the future – at a favorable financial and environmental value.

For institutions and centers that are looking for an MR system with high-end performance and an attractive economical proposition the Achieva 1.5T SE offers the ideal solution. With the best gradients in its class, eight RF channels, compact siting and Philips PowerSave technology, the Achieva 1.5T SE delivers the right clinical performance and yet is surprisingly affordable.
Utilization Services helps to cut exam waiting time at Catharina

Dramatic improvements realized after Philips’ Utilization Services helped reveal planning deficiencies

The Catharina Hospital is a large teaching hospital in Eindhoven, The Netherlands, which operates three Philips MRI scanners. The waiting list for MRI exams was rather long, and the management of the radiology department decided to look into ways of reducing it. With the help of Philips’ Utilization Services, the department achieved significant improvements in overall scanning efficiency and a major reduction in exam waiting time.

Philips’ Utilization Services helps to pinpoint and minimize wasted time by acquiring objective data on system utilization via Philips Remote Services (PRS) including system idle time, intervals between scans, patient preparation time, examination time and scan time. The Head of Radiology at the Catharina Hospital, Philip Jurgens, MD, was already aware of the efficiency improvements achieved in other institutions with the help of the Utilization Services tool, and he was eager to see if it could help his department to reduce its waiting list for MRI exams. “At an average of around 30 days, our waiting time for an MRI exam was too long, and although we’d lived with this for some years, the inconvenience to patients and referring physicians meant we had to take action to reduce it,” he says.

Objective analysis of ‘dead time’
A team was set up that included Philips workflow experts plus representatives from the Catharina’s Quality and Radiology Departments. The efforts initially focused on identifying problems in the scanning process itself based on an initial Utilization Quick Scan analysis. These included all non-scan times such as patient changeover time and time lost due to patient no-shows, patients arriving at the scanner improperly prepared (e.g. for a necessary contrast injection during scanning). This was followed by actions to determine the root causes of problems in the scanning process and taking steps to eliminate them using a standard methodology known as ‘Lean Six Sigma’ embodying a DMAIC (define, measure, analyze, improve, control) process.

Planning system identified as hidden bottleneck
Surprisingly, even after the department had adapted its procedures to reduce the scanning time, initially there was hardly any improvement in throughput. This led the team members to look for causes outside the scanning process. By interviewing everybody involved in the whole process, they discovered that a major issue was the planning process.

Having evolved over several years, the planning process had become very complex with a lot of complicated and rigid planning rules such as rules predefining fixed slots in the day when specific types of exams would be done.
Moreover, all planning information was textual so that the scheduler could not readily deduce the length of an exam or see if there was an open slot between exams, which meant many open slots were not being filled. In total, over the department's three scanners, around 85 minutes of available scanning time per day were unfilled.

"With the help of a Philips specialist, a new simplified planning system was developed that gave the schedulers far better oversight of available scanning time per day," explains Joline Verhulst, Quality Manager at Catharina Hospital.

The new planning system was also more flexible with fixed blocks reserved only for acute care patients and for scans that have to be coordinated with other departments within the hospital, for example a patient needing a series of exams in different departments. All other blocks are free to plan for any exam.

To keep the planning as simple as possible, all exam slots were set at the same length of 30 minutes, which was found to be the average exam length over the working day. And as actual exams can vary in length depending on the type of exam and procedures included, by randomly distributing the different exams over the day, some shorter than 30 minutes and some longer, the schedule balances out by the end of the day.

**A perfectly balanced process**

"We obviously had some serious issues with our planning process but these were initially masked by bottlenecks in the scanning process itself. Philips' Utilization Services enabled us to adopt a holistic approach to develop a perfect balanced planning and scanning process which has proven itself by increasing throughput by around 10%," points out Dr. Jurgens. "This has also had a dramatic effect on exam waiting time which since the introduction of the new regime has been cut from 30 to around 5 days."

It was also essential to demonstrate that the introduction of the new regime would not negatively affect patient satisfaction. Measurements before and after its introduction showed there was virtually no change in time spent in the waiting room before an exam when the new schedule was introduced. In both instances 95% of patients had to wait less than 30 minutes.

"Throughput increased by about 10% and waiting time was cut from 30 days to about 5 days."

Average waiting time dropped

Average waiting time for an MRI exam at the Catharina Hospital was cut from around 30 days to just 5 days.
Tips for working with the SENSE Head Spine coil

The SENSE Head Spine coil for Achieva 3.0T and 1.5T systems of release 2.1.3 or higher enables optimized neuro and spine imaging. Full coverage from head to sacrum can be performed without patient repositioning, including axial scanning on all levels.

Coil element selection is fully flexible when using the SENSE Head Spine coil. It combines the SENSE Spine 15 coil and the SENSE NeuroVascular 16 coil. The anterior coil part can be replaced by a dedicated top-off part for scanning lumbar spine only or for claustrophobic patients. In top-off scanning selectable elements are TO-HNPC or TO-NPC.
Tip 1: Use the ExampleCards on the scanner

Two dedicated ExampleCards for the SENSE Head Spine Coil are provided with the system.

The Total Neuro ExamCard for SENSE Head Spine coil includes high resolution, three-station T1W TSE, T2W TSE and STIR scans.

In this ExamCard, Scan Align enables easy planning of all stacks at once and Geolinks enable fusing by the MobiView package. Coil element selection is optimized for the different stations.

Tip 2: Select the right coil elements

The ExampleCard uses a two-station survey: first station with the NeuroVascular 16 coil, second station with Spine 15 coil. The signal drop shows where the NeuroVascular 16 coil coverage ends and the Spine 15 begins. In this low signal area a station using both coils in dual-coil mode should be planned, as indicated in the figure on the right.

This table shows which elements are recommended for scanning different parts of the spine. On a 16-channel system a maximum of 16 elements per scan can be selected. Selecting too many elements may lead to conflicts.

<table>
<thead>
<tr>
<th>Cervical spine</th>
<th>Top off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil selection</td>
<td>SENSE-NV-16</td>
</tr>
<tr>
<td>element selection</td>
<td>SENSE-NV-16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thoracic spine</th>
<th>Top off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil selection 1</td>
<td>SENSE-NV-16</td>
</tr>
<tr>
<td>element selection</td>
<td>SENSE-Spine-15</td>
</tr>
<tr>
<td>Coil selection 2</td>
<td>SENSE-Spine-15</td>
</tr>
<tr>
<td>element selection</td>
<td>SENSE-Spine-15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lumbar spine</th>
<th>Top off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil selection</td>
<td>SENSE-Spine-15</td>
</tr>
</tbody>
</table>

Tip 3: Optimizing the number of elements

In general, using more elements will result in better SNR.

For the sagittal scans in the ExamCard, it is recommended to use all elements, as this avoids errors in selecting the correct elements when using or reusing the ExamCard.

For similar reasons, also choose a wider range of elements for the axial scans in the ExamCard. Use one additional row above and below the targeted scan position.

Note that not more that 16 elements per scan can be selected on a 16-channel system.
Tip 4: Use the 31-channel SENSE Head Spine coil in dual mode

The 31-channel SENSE Head Spine coil is a combination of the 16-channel SENSE NeuroVascular coil and 15-channel SENSE Spine coil. In dual mode, elements from both coils can be selected for combined use.

Select Dual coil = yes
Select coil 1 = SENSE-NV-16
Select required elements
Select coil 2 = SENSE-Spine-15
Select required elements

Tip 5: CLEAR, homogeneity correction with SENSE Spine 15 coil

For the SENSE Spine 15 coil homogeneity correction is built into the coil file. Therefore, the homogeneity correction parameter is not visible for this coil.

Switch CLEAR on to obtain a CLEAR reconstruction. When CLEAR is switched off a normal synergy reconstruction is performed.

Tip 6: Setting up a dual coil reference scan

The Philips RefScans folder contains a dual coil reference scan for the SENSE Head Spine coil. Select the same elements for the reference scan as used in the anatomical scans.

To modify an existing reference scan into a dual coil reference scan:
• Open an existing RefScan, for instance the NV_16 RefScan.
• Select Dual coil.
• Select as second coil SENSE-Spine-15.
• Select for each coil the same elements as in the anatomical scans.

Tip 7: Optimize the ExamCard according to user preferences

When customized ExamCards are needed, it is recommended to use one of the SENSE Head Spine coil ExampleCards on the system as a starting point for optimization, because features like ScanAlign, Geolinks and optimal coil element selection are already setup in the ExampleCards. Then optimize number of slices, slice thickness and resolution according to the local preferences.

For Total Spine imaging, the SENSE Head Spine coil may be used with the top-off part instead of the anterior coil part. The Philips preset database also provides an ExampleCard with elements selection adapted for top-off scanning.

For easy workflow CLEAR is not used in the ExampleCards. If CLEAR is desired, Refscans must be added to the ExamCard. For best fusion results it is recommended to not use CLEAR at 3.0T.
Pediatric MR users gather in Dallas

International participants value information sharing among themselves and with Philips

An enthusiastic group of more than 70 people gathered in Dallas (Texas, USA) for the 5th Philips Pediatric MR User Meeting on February 1-3, 2009.

Elizabeth van Vorstenbosch, Philips MR Pediatric Applications Consultant, says the meeting was very interactive with much discussion and feedback to help guide future developments and innovations. Imaging of different anatomies was presented by experts in the field of Pediatric MR e.g., Dr. Ken Martin from Children’s Hospital Oakland, USA, presented on 3D BFFE applications in neuro imaging and Dr. Hyan Woo Goo, from ASAN Medical Center in Korea spoke on Total Body MRI in children.

Dr. Tracy Kilborn, Pediatric Radiologist at RCW Memorial Children’s Hospital, Cape Town, South Africa, says, “Philips has been very willing to work with us for the benefit of pediatric patients.” Michael Pawlak, member of the Pediatric Clinical segment team adds, “There was an easy exchange of information, a sharing of experiences and protocol exchange.”

Pediatric MR course at Children’s Medical Center Dallas

After the user meeting, the first Pediatric MR hands-on training course was held in collaboration with Children’s Medical Center of Dallas and Dr. Nancy Rollins, Medical Director, Department of Radiology. “The course focused on both 1.5T and 3T,” explains Ms. van Vorstenbosch. Lectures and hands-on scanning covered neuro, body, angio, cardiac and MSK applications in pediatric imaging.

“The hands-on course was very useful. Overall, this meeting has been a great way to share new information,” says Sarah Foote, Lead Superintendent in Neuroradiology at St. Georges Hospital, London, UK. Dr. Elsie Cintron, Co-Director of Radiology at San Jorge Children’s Hospital in San Juan, Puerto Rico, agrees, “I’ve met people with the same interests, equipment, and even problems. We are all here for the sake of the children, because they are the future.”
Performing biopsies with the Elite Breast Clinical Solution

This application tip presents an overview of the workflow for performing biopsies using the Elite Breast Clinical Solution. Biopsies are performed using the SENSE Breast 7 coil with unilateral or bilateral breast immobilization. Needle placement can be done with lateral, medial, or cranial access using either a biopsy grid or a pillar device.

Step 1: Preparing the immobilization device

Set up the needle placement system of choice: either the grid or the pillar device. Needle insertion is perpendicular to the grid. The pillar device allows needle insertion under an angle, which may be an advantage if the lesion is close to the chest wall. Both systems enable lateral, medial, or cranial biopsy access. Fill the fiducial markers and place them in the immobilization system.

Step 2: Preparing the patient

Position the patient on the MammoTrak dockable patient support. This can be done in a dedicated preparation room, outside the scanner room. The patient can use the special grips on the sides of the patient support to position herself easily on the breast coil. Adjust the height of the head support for a comfortable position.

The patient may hold her arms next to her head, or downwards next to the body. Ensure that the breasts are hanging freely in the coil, and that breast and axilla areas are free of skin folds. Apply compression in the medial-lateral or cranial-caudal direction, depending on the immobilization device used. Do not over-compress, as this could constrict the arteries and reduce flow.
Step 3: Moving the patient to the magnet

Transport the patient to the scanner room in position on the MammoTrak. Slide the MammoTrak over the patient support with the patient’s feet towards the scanner and dock it. Slide the patient feet-first into the scanner.

Step 4: Starting ExamCard Breast

Select the corresponding ExamCard and start it via the MR console. A first scan is initiated to locate the fiducial markers. A 3D T1w sequence is initiated, containing three dynamic acquisitions, to locate the lesion to be biopsied. The first dynamic may serve as a mask. Proceed as usual with dynamic breast imaging.

Step 5: Biopsy planning on console

The acquired image data sets are automatically loaded onto the DynaCAD client on the console. The lesion to biopsy can be selected by positioning the crosshairs on the lesion. The crosshairs are visible in all image directions. The needle entry point and depth needed to target the lesion are automatically calculated and displayed in the bottom left corner of the screen.

Step 6: Viewing biopsy planning on the in-room display

The images and needle entry coordinates are shown on the in-room display near the magnet. This display avoids the need to make extra notes for use in the exam room. If an in-room display is not present at the site, a printout of the screen can be made and taken into the magnet room.
**Step 7: Inserting the needle**

Insert the needle according to the coordinates calculated by DynaCAD. The needle depth can be marked by fixing the blue distance ring. The needle used depends on the preferred biopsy procedure.

![Biopsy grid](image1)

![Pillar device](image2)

**Step 8: Checking needle position**

Repeat the 3D T1w sequence to verify that the needle is at the right location. The images in the right column show the needle placement.

![Pre-biopsy Subtraction](image3)

![Pre-biopsy 3D T1w](image4)

![Post-biopsy 3D T1w](image5)

**Step 9: Performing the biopsy**

Once the needle is in the correct position, the biopsy can be performed. Depending on the estimated time needed for the biopsy, the biopsy can be done at the scanner or the patient can be moved out of the scanner room on the MammoTrak so that the actual VAB (vacuum assisted biopsy) procedure can be performed in the preparation room. The scanner is then available for the next patient.

**More information**

For detailed instructions on setup of the biopsy devices, refer to

- Application Guide addendum
- Application Tip on NetForum (login required): Breast biopsy using the SENSE Breast 7 coil

Visit the MRI NetForum user community for ExamCards and more application tips on breast imaging.

www.philips.com/netforum
MSK council meets in Vancouver

Philips gathered 15 experts in the field of musculoskeletal MRI in Vancouver (BC, Canada) in September 2008 to collect their views and opinions. The musculoskeletal MRI experts represented universities, general hospitals, imaging centers and private practices from all over the world.

Philips regularly organizes meetings with key opinion leaders to discuss needs, trends and challenges. The input and advice from these MSK experts help to design MRI solutions – comprising system features, coils, software – that meet the actual clinical needs of customers.

Very useful input was obtained, for example from the coil session, where participants brainstormed on clinical specifications for MSK coils.

Field Strength Reader Survey results

Many readers participated in the survey on Field Strength. The results will help us move forward in 2009 to make the content of Field Strength support you further.

Most of you liked the new design of Field Strength and the content is considered relevant and useful. The most frequently entered request in the open questions was to include more application tips. We have immediately acted on that by doubling the effort there, and have included two application tips in this issue, instead of the usual one.

Field Strength also online or per email

The survey also demonstrated that most of you read a printed version of Field Strength. You can also read Field Strength online at www.philips.com/fieldstrength in an attractive flipover format that includes movies and offers possibilities for easy printing or downloading of only the pages you want. In addition, you can subscribe to receive new Field Strength issues by email.

Thanks for participating – we value your opinion.

And the Philips LivingColors lamps have been sent to the three winners.
3.0T
AMIGENICS/NIC 3.0T courses
Las Vegas, Nevada, USA
Info: Colleen Perone, cperone@niclw.com, Tel. (+1) 702-214-9741

Visiting Physician Fellowship Programs
Combination of didactic lectures and interactive MRI case reading with experienced 3.0T MR radiologists.

Radiology Technologist Practicum
Hands-on experience and technical insights.

Breast MRI
Advanced Breast MRI Workshop
Cleveland, Ohio, USA
Date: October 8-9
Two-day course for radiologists, technologists. Participants have basic knowledge of MRI, breast imaging. The course combines lectures and the clinical practice of breast MR. Note that class size for this course is limited.
Info: charlotte.dangelo@philips.com

Erasmus Course on Breast/Female MRI
Wroclaw, Poland
Date: June 1-5, 2009
Info: www.emricourse.org

The Chicago International Breast Course
Chicago, USA
Date: October 1-4,
Info: www.radiology.northwestern.edu/education/cme/the-chicago-international-breast-course-2009

Soc. of Breast Imaging Postgraduate course
Colorado Springs, CO, USA
Date: April 26-29,
Info: www.sbi-online.org

Advances in Breast MRI
Las Vegas, USA
Date: October 22-24
Info: radiolgycme.stanford.edu/2009bmri

Musculoskeletal
Erasmus Course on Musculoskeletal MRI
Bratislava, Slovakya
Date: October 5-9
Info: www.emricourse.org

MR Angiography
Contrast-enhanced MRA in clinical practice
Maastricht, The Netherlands
Date: t.b.d.
For physicians and radiographers. Includes teaching sessions and volunteer and patient scanning.
Info: Tim Leiner, MD, PhD, leiner@rad.unimaas.nl

Cardiac MR
Cardiac MR courses at CMR Academy
German Heart Institute, Berlin
All courses are for cardiologists and radiologists. Some parts will be offered in separate groups.
Info: www.cmr-academy.com,
info@cmr-academy.com,
Tel. +49-30-4502 6280

Fellowship
Dates: Feb. 9-20 and Mar. 21 – May 1;
Intensive course including hands-on training at the German Heart Institute, and reading and partially quantifying over 250 cases

Compact course
Dates: October 19-23
CMR diagnostics in theory and practice, including performing examinations and case interpretation.

CVMRI Practicum: New Techniques and Better Outcomes
St. Luke’s Episcopal Hospital,
Houston,Texas
Date: t.b.d.
On principles and practical applications of Cardiac MRI.
Info: rose@slleh.com
Tel. +1-832-355-4201, Fax: +1-832-355-4741

International Cardiac MR course
Leeds, England
Dates: June 15-19, Oct. 18-22
Deals with theoretical principles and practical applications of Cardiac MRI. Daily practical scanning and post-processing sessions in small groups.
Info: www.leedscmr.org/cardiac_course,
Mgreen@leeds.ac.uk

Erasmus Course on Cardiovascular MRI
Leiden, Netherlands
Date: October 19-23
Focuses on clinical applications of cardiac MR.
Info: www.emricourse.org

Cardiac MRI Training
Washington Hospital Center
Washington, DC, USA
Date: Three-month fellowship
Info: www.cvmri.com
Pamela Wilson
Tel. +1-202-877-6889

Cardiac MR Imaging in Clinical Practice
Leeds, England
Date: t.b.d.
Designed by cardiologists for cardiology trainees and cardiologists. Includes the basics of CMR methodology and its daily applications. Lectures are presented with firmly clinical focus in a case-based format.
Info: www.cmr.leeds.ac.uk,
j.c.beeton@leeds.ac.uk
Tel. +44-113-3922735

CMR case review
Leeds, England
Date: t.b.d.
50 cases in a day — intensive course for cardiology or radiology trainees or physicians.
Info: www.cmr.leeds.ac.uk,
j.c.beeton@leeds.ac.uk
Tel. +44-113-3922735

Cardiovascular MR training courses and fellowships
St. Louis, Mo., USA
Date: March 11-14
Lecture format (2.5 days) or lecture plus hands-on (4 days). Also offered are hands-on technologist training courses and three-month fellowships.
Info: cttrain.wustl.edu,
cme@wustl.edu
Tel. +1-314-454-7459

MR Spectroscopy
MR Spectroscopy course (1.5T and 3.0T)
Zurich, Switzerland
Date: July 6-10, 2009
Theory sessions and daily practical scanning and post-processing sessions in small groups.
Info: www.biomed.ee.ethz.ch/education/education-centre,
dmeier@ethz.ch

Advanced MR Spectroscopy
Cleveland, Ohio, USA
Dates: September 29 - October 2
Four-day course for clinical scientists, MR engineers, research technologists, physicians, and physicists of Philips MR sites, interested in MR spectroscopy. Participants require basic MR scanning experience. Note that class size for this course is limited
Info: charlotte.dangelo@philips.com

Register on NetForum to have free access to online training modules on use of Philips MR scanners and packages, use of coils, MR safety.
Essential Guide to Philips in MRI

Different locations, UK
Dates: June 22-25; Oct. 12-15
Specifically designed for Philips users, past, present and future. It is designed to provide a modular approach to accommodate all levels of knowledge
Info: Helen.Scargill@philips.com

MRI self-directed visiting fellowship

ProScan Education Foundation
Cincinnati, Ohio, USA
Date: continuously throughout the year.
Info: http://www.proscan.com/fw/main/Visiting_Fellowships-448.html, mrieducation@proscan.com
Tel. 1-866-MRI-EDUC

North American off-site training courses

Dates: upon request
Info: lori.hawkins@philips.com
Tel. 1+440-483-2260
Fax: +1-440-483-7946

MR Basics
Chattanooga, TN, USA
Designed for beginner technologists with little or no previous MR experience. Lectures cover the basic concepts and theory of MRI.

MR Essentials for Achieva, Intera and Panorama HFO users
Cleveland, Ohio, USA
This comprehensive course for technologists covers all basic scanning and system functionality. Lectures cover MRI safety, scan parameters, and pulse sequences.

MR Advanced for Achieva, Intera and Panorama HFO users
Cleveland, Ohio, USA
Didactic and hands-on course covering advanced applications including advanced scan parameters, pulse sequences, advanced Neuro, Ortho, Body and Breast imaging techniques, fMRI and spectroscopy.

Extended MR WorkSpace for Achieva, Intera and Panorama HFO users
Cleveland, Ohio, USA
Didactic and hands-on course covering basic system maintenance, EWS functionality, and all MR analysis packages with lectures in Cardiac imaging, fMRI and Diffusion Tensor imaging and Fiber Tracking.

Cardiac Imaging for Achieva, Intera and Panorama HFO users
Cleveland, Ohio, USA
Didactic and hand-on course covering all cardiac views, heart valves, Q-flow, coronary arteries and the postprocessing packages on the EWS.

Events calendar 2009

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 4-7</td>
<td>Charing Cross Symposium</td>
<td>London, UK</td>
<td><a href="http://www.cxsymposium.com">www.cxsymposium.com</a></td>
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<tr>
<td>April 16-19</td>
<td>Japan Radiology Congress – JRC</td>
<td>Yokohama, Japan</td>
<td><a href="http://www.j-rc.org">www.j-rc.org</a></td>
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<tr>
<td>April 18-24</td>
<td>International Society for Magnetic Resonance in Medicine – ISMRM</td>
<td>Honolulu, Hawaii</td>
<td><a href="http://www.ismmr.org">www.ismmr.org</a></td>
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<tr>
<td>April 21-25</td>
<td>Society for Pediatric Radiology – SPR</td>
<td>Carlsbad, CA, USA</td>
<td><a href="http://www.pedrad.org">www.pedrad.org</a></td>
</tr>
<tr>
<td>April 30 – May 3</td>
<td>Jornada Paulista de Radiologia - JPR</td>
<td>Sao Paolo, Brazil</td>
<td><a href="http://www.spr.org.br">www.spr.org.br</a></td>
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<tr>
<td>May 19-22</td>
<td>Paris Course on Revascularization – EuroPCR</td>
<td>Barcelona, Spain</td>
<td><a href="http://www.europcr.com">www.europcr.com</a></td>
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<tr>
<td>May 20-23</td>
<td>Deutscher Röntgenkongress</td>
<td>Berlin, Germany</td>
<td><a href="http://www.drg.de">www.drg.de</a></td>
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<tr>
<td>May 29 – June 2</td>
<td>American Society of Clinical Oncology – ASCO</td>
<td>Orlando, FL, USA</td>
<td><a href="http://www.asco.org">www.asco.org</a></td>
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<tr>
<td>May 31 – June 4</td>
<td>European Society of Paediatric Radiology – ESPR</td>
<td>Istanbul, Turkey</td>
<td><a href="http://www.espr.org">www.espr.org</a></td>
</tr>
<tr>
<td>June 8-10</td>
<td>UK Radiological Congress - UKRC</td>
<td>Manchester, UK</td>
<td><a href="http://www.ukrc.org.uk">www.ukrc.org.uk</a></td>
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<tr>
<td>July 26-30</td>
<td>American Association of Physicists in Medicine – AAPM</td>
<td>Anaheim, CA, USA</td>
<td><a href="http://www.aapm.org/meetings">www.aapm.org/meetings</a></td>
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<tr>
<td>August 28-29</td>
<td>Highfield MR Symposium</td>
<td>Bonn, Germany</td>
<td><a href="http://www.uni-bonn-radiologie.de">www.uni-bonn-radiologie.de</a></td>
</tr>
<tr>
<td>Aug. 29 – Sept. 2</td>
<td>European Society of Cardiology – ESC</td>
<td>Barcelona, Spain</td>
<td><a href="http://www.escardio.org">www.escardio.org</a></td>
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<tr>
<td>September 1-4</td>
<td>Röntgenevecan</td>
<td>Jönköping, Sweden</td>
<td><a href="http://www.roentgenevecan2009.se">www.roentgenevecan2009.se</a></td>
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<tr>
<td>September 17-20</td>
<td>European Society of Neuroradiology – ESNR</td>
<td>Athens, Greece</td>
<td><a href="http://www.esnr.org">www.esnr.org</a></td>
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<tr>
<td>October 1-3</td>
<td>European Society for Magnetic Resonance in Medicine and Biology – ESMRMB</td>
<td>Antalya, Turkey</td>
<td><a href="http://www.esmrmb.org">www.esmrmb.org</a></td>
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<tr>
<td>October 7-11</td>
<td>American Society of Head Neck Radiology – ASHNR</td>
<td>New Orleans, LA, USA</td>
<td><a href="http://www.ashnr.org">www.ashnr.org</a></td>
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<tr>
<td>October 16-20</td>
<td>Journées Françaises de Radiologie – JFR</td>
<td>Paris, France</td>
<td><a href="http://www.sfmnet.org">www.sfmnet.org</a></td>
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<tr>
<td>Oct. 17-18</td>
<td>High Field MRI – The impact on Clinical Practice</td>
<td>Las Vegas, NV, USA</td>
<td>radiologycme.stanford.edu/dest/</td>
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<tr>
<td>Nov. 29 – Dec. 4</td>
<td>Radiological Society of North America – RSNA</td>
<td>Chicago, IL, USA</td>
<td><a href="http://www.rsna.org">www.rsna.org</a></td>
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*because no two patients are alike, we designed an MR unlike any other.*

The Achieva 3.0T TX automatically adjusts to each patient’s unique anatomy. Proprietary MultiTransmit parallel RF transmission technology tailors signals for enhanced image uniformity, reduced scan times and improved throughput across a broad range of clinical applications. Fast, robust and versatile. It just makes clinical and economic sense. Learn more at www.philips.com/healthcare.