

Top-of-the-line 64-slice CT Scanner Expands Services

Northwestern Memorial Hospital recently acquired a state-of-the-art 64-slice computed tomography (CT) scanner. The new Siemens Sensation 64 features innovative x-ray tube technology that makes it unique. Providing ultrafast and highly detailed images, the scanner will further expand the department's clinical and research capabilities.

"Just in the last few years, CT scanning technology has made incredible strides as a diagnostic tool," says Vahid Yaghmai, MD, MS, medical director of computed tomography at NMH. "As recently as last year, the technical gold standard was 16 slice, which required the patient to hold his or her breath for 25 to 40 seconds in the time it took to the perform the scan, as compared to 8 to 12 seconds with the 64-slice CT scanner."

The advances of the 64-slice imager will benefit specific clinical protocols requiring enhanced picture quality and speed such as noninvasive vascular and coronary artery CT angiography. For patients experiencing symptoms associated with heart disease, the new scanner provides images of the coronary arteries with improved resolution that may obviate the need for more invasive testing.

"This technology will need to undergo further evaluation," says Eric J. Russell, MD, chairman, Northwestern Radiology, "but it could dramatically alter the way we diagnose patients with neurovascular disease and suspected coronary disease and chest pain."

This new acquisition will expand the use of cardiac CT through the collabora-

tive efforts of the Section of Cardiovascular Radiology led by James C. Carr, MD, and the Division of Cardiology led by Charles J. Davidson, MD, chief, Cardiac Catheterization Laboratories. The 64-slice scanner will also be used for other critical applications such as identifying narrowed brain arteries that might cause stroke, and for evaluating blood flow in organs such as the liver and kidney.



The recently installed Siemens Sensation 64 scanner significantly advances Northwestern Radiology's diagnostic capabilities using CT technology.

Beyond clinical applications, the new 64-slice as well as the addition of an advanced 16-slice CT scanner will extend research collaboration between Northwestern Radiology and Siemens investigators. A Siemens CT scientist will join the Northwestern faculty and work on-site with the department's clinicians and researchers. This collaboration will assure that Northwestern Radiology stays at the cutting edge of CT technology.

In addition to the installation and availability of the new scanners, NMH is modernizing and expanding patient wait and holding areas to accommodate new patients. These improvements will enhance services for the department's patients and referring physicians.

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A Few Words from Eric J. Russell, MD . . .

Integrating Radiology and Oncology

None of us would argue about the fact that imaging plays a critical role in the diagnosis and management of cancer. However, the subspecialization of radiology training and clinical practice is organ-based, not disease-based. Perhaps this is why, as Gary J. Becker, MD, branch chief of image-guided intervention at the National Cancer Institute (NCI), recently said, “The culture at cancer centers is not rich with collaboration between radiologists and oncologists.”

While at Northwestern Radiology we have excellent working relationships with our oncology colleagues, we can go further. A new supplemental grant from the NCI is designed to stimulate the creation of Imaging Response Assessment Teams (IRATs) in NCI designated cancer centers. The objective is to better integrate radiologists and imaging scientists into efforts to employ imaging to assess the response of cancer to treatment strategies.

We need to move in this direction.

A related issue: while subspecialized radiologists deal with a broad spectrum of cancer patients from a systems approach, there is no integrated imaging section devoted to this disease. Perhaps oncologic imaging should become an official subspecialty within radiology, crossing organ system practice separations?

According to Daniel C. Sullivan, MD, head of the Cancer Imaging Program at the NCI, cancer imaging is rapidly evolving. At the 6th Annual National Forum on Biomedical Imaging and Oncology in Bethesda, Maryland, he stated that new information about the molecular basis of cancer and the development of imaging biomarkers to assess tumor response to therapy is creating a need for more sophisticated and reliable quantitative imaging techniques.

As genes and specific proteins are shown to be involved in cancer, treatment development will focus on these molecular targets. Imaging these targets can aid in diagnosing and staging cancer, planning therapy, and monitoring the response

to therapy. Imaging has the potential to speed clinical drug trials (and reduce their cost) by providing early identification of tumor response (or lack thereof) before any clinical evidence can appear. Such imaging strategies could eventually be employed to guide drug therapy in cancer patients, sparing them from the prolonged use of ineffective and potentially toxic medications by early assessment of tumor response.

At Northwestern Radiology, we are working on further integration of imaging tools for cancer diagnosis, and we will move toward improved images post-processing to provide truly quantitative 3D information for evaluating tumor response to treatment. We also intend to further develop molecular imaging in our department, employing a variety of imaging modalities, including a CT-PET scanner at Northwestern Memorial Hospital this year.

It is truly an exciting time to be a radiologist.

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Northwestern Radiology Faculty & Staff Notes

Dr. Rogers Rounds at Northwestern

Former Northwestern Radiology professor and chairman, Lee F. Rogers, MD, gave a Radiology Grand Rounds on “Trabecular Microfractures and the Pathomechanics of Spinal Deformity and Insufficiency Fractures in the Elderly” this spring. Past president of the American Board of Radiology, he also presented a board review to the department’s senior residents to help prepare them for their oral exams. Professor of radiology at the Arizona

Health Sciences Center in Tucson, Dr. Rogers recently retired from his position as editor-in-chief of the AJR.



Dr. Rogers has more than 700 visiting professorships, lectures, and scientific presentations to his credit.

Faculty Promotions

Effective September 1, the following faculty members have been promoted: **Albert Nemcek Jr., MD**, to professor; **David Casalino, MD**, to associate professor; **Helena Gabriel, MD**, to associate professor; **Eric Hart, MD**, to associate professor; **Frederick Hoff, MD**, to associate professor; **Vahid Yaghmai, MD**, to associate professor; **Stefanie Benjamin, MD**, to assistant professor; and **Andrew Larson, PhD**, to assistant professor.



MRI Advances in Cardiovascular Disease, Liver Cancer

Research Update ■ Research Update ■ Research Update ■ Research Update ■ Research Update

By Andrew C. Larson, PhD

Accurate detection and stratification of cardiovascular disease progression can improve patient management. Magnetic resonance imaging has recently demonstrated great promise for noninvasive anatomic and functional evaluation of the cardiovascular system. However, spatial resolution and overall image quality remains limited by the long acquisition time of MR imaging data relative to physiologic motion. To overcome these obstacles, Northwestern Radiology researchers are actively developing strategies to improve the efficiency of data acquisition.

Techniques to improve imaging efficiency include alternative k-space sampling strategies (radial or spiral sampling as opposed to conventional rectilinear sampling), parallel imaging strategies using receiver coil arrays to accelerate data acquisition, and high field scanners (3.0T vs. 1.5T), contrast agents, and advanced pulse sequences to increase image signal-to-noise and contrast-to-noise ratios. Employing these strategies, we hope to improve spatial and/or temporal resolution or shorten scan times for coronary and peripheral angiography, contrast-enhanced myocardial perfusion and infarct imaging, and cinematic imaging of myocardial motion and blood flow velocity.

For cardiovascular MRI, typically breath-holding and ECG gating are used to mitigate the affects of motion. While the aforementioned strategies provide much needed improvements in imaging efficiency, for many applications achiev-

able resolution and image quality continue to be limited by breath-hold duration.

Navigator echo (NAV) gating strategies track diaphragm respiratory motion and can decouple the selection of imaging parameters from breath-hold limitations. Unfortunately, NAV techniques are commonly ineffective for cardiovascular imaging applications, because diaphragm motion does not always parallel heart motion. We are currently developing respiratory gating techniques which track heart position (as opposed to diaphragm position) using information derived from the same datasets

aberrant cardiac motion. We will shortly begin NIH-funded studies combining imaging efficiency improvement techniques with self-gating strategies for high-resolution cardiovascular MRI.

Functional Tumor Imaging

Hepatocellular carcinoma (HCC) ranks as the fifth most common cancer worldwide in men and the fourth leading cause of cancer death in the United States. Early detection of HCC and accurate assessment of therapeutic response should significantly improve

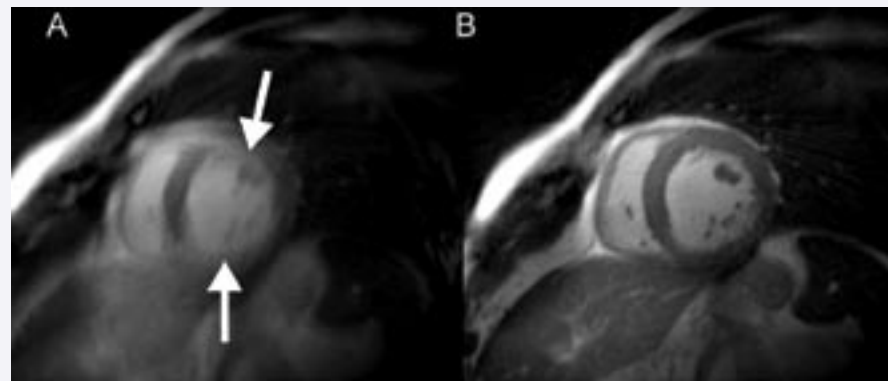


FIGURE 1. Cardiac MRI images (short-axis orientation) acquired during a free-breathing patient study. Image (A) was acquired using four signal averages. Image (B) was acquired using respiratory self-gating. Notice the motion artifacts and blurring in (A), see arrows, clearly mitigated by self-gating in (B).

acquired for imaging purposes. We have dubbed these techniques “self-gating.”

Self-gating techniques permit free-breathing 2D cine MRI with these same techniques currently undergoing further development for 3D cine and velocity encoded MRI, and coronary MRA. We have also used self-gating techniques for cardiac cycle synchronization, eliminating the need for ECG gating (problematic in a subset of patients) during cine MRI. Self-gating offers the potential for more robust arrhythmia rejection strategies based upon

patient survival. Response is assessed most commonly using contrast enhanced CT or MR imaging studies to evaluate changes in anatomic tumor size. However, there exists a growing resistance to the use of size criteria for response assessment, because tumor response does not always correlate with anatomic changes in tumor size. Traditional anatomic imaging criteria for HCC treatment response may be inaccurate. Furthermore, changes in

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Education and Training Update

In with the new and out with the well-trained. Northwestern Radiology welcomes eight first-year residents and 22 fellows this summer. The department congratulates graduating residents and fellows and wishes them well as they embark on new careers or additional subspecialty training in radiology.

Welcome 2005-06 First Year Residents

Eugene Huo, Northwestern; **Andrew Lipnik**, University of Michigan; **Jennifer Nicholas**, Duke University; **Bojan Petrovic**, University of Illinois at Chicago; **Siren Reddy**, Northwestern; **Ravi Singh**, Northwestern; **Georgia Spear**, University of Miami; and **Joshua Tepper**, University of Chicago.

Introducing 2005-06 Fellows

Body Imaging: **Jim Bankston**, University of Alabama at Birmingham; **Anish Kirpalani**, University of Toronto, Ontario, Canada; **Shana Landau**, Mount Sinai Hospital, New York; **Karen Seaberg**, University of Texas at Houston; **Aparna Vootkur**, Lahey Clinic, Burlington, Mass.; and **Cecil Wood**, Northwestern.

Interventional: **Mark Clift**, University of California at Davis; **Sudhen Desai**, University of California at San Francisco; **Brian Fagan**, Northwestern; **Jeffrey Himmelberg**, University of Nebraska; **Robert Lewandowski**, William Beaumont Hospital, Royal Oak, Mich.; **Suveer Tatineni**, Northwestern; and **Alex Trebelev**, Albert Einstein Medical Center, Philadelphia.

Neuroradiology: **Tarek Hijaz**, Medical College of Virginia; **Nicole Nelson**, Beth Israel Deaconess Medical Center, Boston; **Pamela Nguyen**, University of Illinois at Chicago; **Sathya Reddy**, University of Florida, Gainesville, Fla.; **Rodney Shaffer**,

Geisinger Medical Center, Danville, Pa.; and **S. Murthy Tadavarthy**, University of Minnesota.

Women's Imaging: **Amy Kelly**, University of Illinois at Chicago; **Shilpa Mehta**, Loyola University; and **Eric Schreiber**, Port Angeles, Washington.

Good Luck Graduates!

Residents' Future Plans: **Brian Fagan**, interventional fellowship, Northwestern; **Eric Kraemer**, musculoskeletal fellowship, Evanston Northwestern Healthcare; **Sean McKeon**, body imaging fellowship, Beth Israel Medical Center, New York; **David Mellman**, neuroradiology fellowship, University of Miami; **Nisha Patel**, musculoskeletal fellowship, University of California at San Diego; **Suveer Tatineni**, interventional fellowship, Northwestern; and **Cecil Wood**, body imaging fellowship, Northwestern.

Fellows' Future Plans

Body Imaging: **Aakash Ahuja**, MacNeal Hospital, Berwyn, Ill.; **Steven Herwick**, Illinois Masonic Medical Center, Chicago; **Akash Joshi**, Kansas University at Wichita; **Matthew Pearce**, Vista Imaging Associates, Waukegan, Ill.; **Nancy Rini**, Radiologic Associates of Middletown, Middletown, Conn.; and **Travis "Spencer" Sinclair**, Scott & White Clinic, Texas A&M University, Temple, Texas.

Cardiovascular Imaging: **Karin Dill**, faculty, Northwestern.

Endovascular Surgical: **Richard Parkinson**, St. Vincent's Hospital, Sydney, Australia.

Evanston Northwestern Healthcare (ENH): **Biren Patel**, faculty, Scripps Institute, San Diego, Calif.; **Samuel Sered**, private practice, Hollywood, Fla.; and **James Song**, continuing at ENH.

Interventional: **Thomas Aquisto**,

Radiology Imaging Associates, Ingalls Memorial Hospital, Harvey, Ill.; **Matthew Fitzpatrick**, private practice, Munster Community Hospital, Munster, Ind.; **Michael Hamblin**, attending, St. Francis Hospital, Evanston, Ill.; **Kevin Keele**, Radiology Imaging Associates, Ingalls Memorial Hospital, Harvey, Ill.; **Stanley Kim**, attending, Children's Memorial and Northwestern Memorial Hospitals, Chicago; **Imran Qureshi**, attending, Rush-Copley Hospital, Aurora, Ill.; and **James Walker**, private practice, Milwaukee.

Neuroradiology: **Guilherme Dabus**, endovascular fellowship, Washington University; **John Hopkins**, faculty, Northwestern; **Michael Kasotakis**, private practice, Ann Arbor, Mich.; **Jeffrey Miller**, surgical endovascular fellowship, Northwestern; **Erin O'Connor**, faculty, Temple University; and **Sharon Woods**, private practice, Milwaukee.

Women's Imaging: **Lakshmi Tegulapalle**, faculty, Northwestern and **Mariam Thomas**, private practice, St. Louis, Mo.

Kudos to Best Teachers, Students

The end of the academic year brings accolades for those who excelled in teaching and learning. Awards for outstanding performance in 2004-05 went to: **Rami Kaakaji**, Best Teaching Resident; **Nancy Rini**, Best Teaching Fellow (as voted by medical students); **Matthew Walker**, Best Faculty Teacher (as voted by residents); and **James Gehl** and **Debra Kanter**, Lee F. Rogers Award for Outstanding Achievement.



Welcome New Northwestern Radiology Faculty

Eric Bartlett, MD

Assistant Professor, Neuroradiology

Dr. Bartlett graduated from the University of Oklahoma College of Medicine in 1998. An intern and resident in diagnostic radiology at the University of Iowa from 1998 to 2003, he completed a two-year neuroradiology fellowship at the University of Toronto in June.

John Hopkins, MD

Instructor, Neuroradiology

Dr. Hopkins earned an MD degree from the National University of Ireland in 1991. Completing his internal medicine residency at the University College Hospital in Galway, Ireland, in 1994, he was an anesthesia resident at Beaumont Hospital in Dublin, Ireland from 1994–95. For two years, he served as an internal medicine physician in Middlesex, England. In 2004, he completed a residency in diagnostic radiology at the University of Mississippi. In June, he completed Northwestern's neuroradiology fellowship program.

Sandy Kwak, MD

Assistant Professor, Body Imaging

Dr. Kwak received an MD degree from Northeastern Ohio Universities in 1992 and completed a residency in diagnostic radiology at the University of Chicago (U. of C.) in 1996. After a fellowship in musculoskeletal radiology at the University of California at San Diego, she returned to the U. of C. where she was an assistant professor from 1997–99. She currently works with a private group at Rush-Copley Medical Center.

John Miller, MD

Assistant Professor, Body and General Imaging

Dr. Miller graduated with an MD degree from Northwestern in 1974. Following a surgery internship at his alma mater, he completed a three-year radiology residency in 1978. For the next 20 years, this Northwestern faculty member held appointments at Evanston and Glenbrook Hospitals. He “retired” in 1998 but “unretired” when he returned to practice

at Evanston Northwestern Healthcare in 2002. He was most recently at the University of Vermont before joining Northwestern Radiology.

Momin Muzaffar, MD

Instructor, Neuroradiology

Dr. Muzaffar received his MD degree from Northwestern in 1998 and completed a transitional internship at Weiss Memorial Hospital in 2000. He served as a resident in diagnostic radiology at the University of Cincinnati from 2000–04 and completed a one-year neuroradiology fellowship this June.

Eliza Shin, MD

Assistant Professor, Body Imaging

Dr. Shin earned her MD degree from Northwestern in 1996 and completed her residency in diagnostic radiology at the Mallinckrodt Institute of Radiology in 2001. Since finishing her radiology training, she has worked in private practice—most recently at the Illinois Masonic Medical Center in Chicago.

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MRI Advances in Cardiovascular Disease, Liver Cancer

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tumor size may not occur at sufficiently early stages to permit beneficial modifications to treatment regimens.

For these reasons, Northwestern Radiology investigators are actively developing MRI strategies for functional tumor imaging. These strategies include diffusion weighted imaging providing metrics of tumor necrosis and microvascular volume fraction, arterial spin-labeling for tumor blood perfusion measurements, and blood-oxygen-level-dependent imaging techniques providing metrics of tumor oxygenation.

We are currently using a VX2 rabbit liver tumor model to develop MRI techniques for monitoring tumor function in real-time during the administration of catheter directed therapies (to determine optimum end-points to maximize malignant tissue destruction while minimizing damage to normal tissues) and for accurate functional characterization of tumors following therapy.

Several of these diagnostic tumor-imaging strategies are currently undergoing early clinical translation. Applying for NIH funding for our HCC functional im-

aging projects, we ultimately plan to use these new techniques in the setting of future MRI-guided transcatheter liver therapies performed using the department's new MR-IR suite featuring a hybrid MRI and x-ray angiography system.

Andrew C. Larson, PhD, is an assistant professor of radiology at Northwestern

Upcoming CME Events

For more information, call 312-695-0517 or visit www.radiology.northwestern.edu.

International Symposium on Brain Perfusion

September 16 - 18, 2005

Northwestern Memorial Hospital

Windy City Imaging Update 2005: Advances in CT and MRI

September 21 - 25, 2005

Northwestern Memorial Hospital

Chicago International Breast Symposium

Co-sponsored by Northwestern Radiology and the University of Chicago

September 28 - October 1, 2005

Westin River North Chicago

Imaging at Saddlebrook: Hot Topics in MRI and CT

March 27 - April 1, 2006

Saddlebrook Resort, Tampa, Florida



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