Musculoskeletal Applications of Multidetector CT

By Gerald J. Ondr, MD

Since the introduction of multidetector CT (MDCT) in late 1998, the number of applications of CT has increased dramatically due to its inherent advantages over its single slice predecessor. The technologic ability to obtain four slices with each tube rotation and a decrease in time of a 360-degree rotation of the x-ray source has reduced imaging time by 4-10 times. These advances have allowed for an increase in the number of CT applications for pediatric imaging, CTA, virtual endoscopy, cardiac imaging, screening procedures, and musculoskeletal imaging.

The most beneficial advantage of MDCT with regards to musculoskeletal imaging is the ability to obtain coverage of large body parts in a short time. The other advantage is that MDCT allows for high resolution in the z-axis and near isotropic imaging where the voxels have equal dimension in the x, y, and z axes. High-resolution multiplanar reconstruction images, in any arbitrary plane, can be obtained with spatial resolution identical to the original scanning plane. Near isotropic imaging makes MDCT an invaluable tool in the evaluation of musculoskeletal pathology. The advantages of MDCT make it ideal for evaluation of multitrauma patients, spinal abnormalities, soft tissues, congenital anomalies, and technically difficult cases.

Complex injuries of the axial and appendicular skeleton can be evaluated rapidly, saving precious time in the unstable trauma patient. High-resolution reconstructions can be reviewed in any arbitrary plane with equivalent resolution to the scan plane. The need to scan in multiple planes is eliminated, and motion artifact is reduced. Volume rendering of the data at a workstation allows for discrimination between bone and soft tissue structures. Muscles, tendons, bone and their interfaces can be assessed with MDCT. Our early experience has shown that (continued on page 2)

62 year-old female presenting acute low back pain and radiation to the left lower extremity. The patient had a pacemaker and MRI could not be performed. Multidetector CT study showed a large extruded disc at the L5-S1 level (arrow) on the left side.

3-D reconstruction of a rigid painful flat foot. Patient had a previously resected calcaneonavicular bar. The bony bar reformed (arrow) two years after the surgery, and patient had recurrent symptoms.
Notes from the Chair

It is with considerable pride for the department and the institution, as well as with some sense of personal relief, that I use this column to welcome Laurie L. Fajardo, M.D., as the new Professor and Head of the Department of Radiology in the University of Iowa Roy J. and Lucille A. Carver College of Medicine. Dr. Fajardo becomes the sixth chair the department has had over its eighty-year history. And, by the time you read this, she will be on board.

I must reveal a personal prejudice regarding Laurie. When it was announced (over a year ago) that we would begin the search for a new department head, I sent a letter to Dean Kelch outlining my personal suggestions for candidates for the job. Dr. Fajardo was at the top of that list. My opinion that she was a leading academician who would be an excellent department head here was further reinforced during her visits to our institution. The College could have saved a lot of time and effort, with the same end result, if they would have just allowed me to pick the incoming chair!

Dr. Fajardo received her bachelor’s degree from Washington University, and Doctor of Medicine from the University of Chicago. After residency in diagnostic radiology at the University of Arizona, she joined the faculty there in 1990. In 1994, she was recruited to the University of Virginia, Department of Radiology as Vice Chair of Research; in 1999, she moved to Johns Hopkins Medical Institutions, serving in the same role. Dr. Fajardo’s clinical practice and research interests have focused on breast and general digital imaging, and she has published extensively in these areas. She has received funding for research in breast cancer prevention, digital mammography, health services research and stereotactic biopsy. She holds patents for innovations in digital mammography, and for a stereotactic breast biopsy system.

Dr. Fajardo is nationally recognized as a superb academician. She serves in an editorial capacity for several journals and is active in many professional organizations. She was president of the Association of University Radiologists from 1999-2000. All in all, Dr. Fajardo is widely recognized as a “young Turk,” a true leader of academic radiology. Her professional expertise and management skills will allow development of further excellence in the Department of Radiology at The University of Iowa. All the faculty and staff of the Department of Radiology join me in welcoming Laurie, and we offer our full support in helping her to progress to further academic excellence for our department.

Edmund A. Franken, Jr.  MD
Professor and Interim Head, Department of Radiology

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patients unable to undergo a MRI can be effectively studied with MDCT to evaluate soft tissue masses, as well as tendon and muscle abnormalities.

Complex congenital anomalies of the spine and peripheral skeleton are evaluated well with MDCT. 3-D reformatted images can be reviewed for pre- and postoperative planning. Clubfoot, tarsal coalition, articular cartilage abnormalities, developmental dysplasia of the hip and spine anomalies are routinely evaluated.

A frequently encountered problem in musculoskeletal radiology is evaluation of the postoperative patient to assess hardware complications. Unlike its predecessors, MDCT can effectively evaluate patients with metal hardware. By increasing the mA setting, photon starvation is diminished and a significant reduction in metallic artifacts is accomplished.

MDCT has become the cornerstone of musculoskeletal radiology and will continue to change the way that musculoskeletal pathology is evaluated.

Education

The Expanding Role of Radiology in Medical Education

Just as radiologists are playing an ever-greater role in a well-managed clinical care team, so too are they playing a greater role in well-managed medical education programs. The same skills and technology that increase our roles as clinical anatomists and pathophysiologists also mandate that we pass these skills on to future physicians. Our roles as clinical consultants and problem solvers give us the aptitude to be effective teachers throughout medical training, particularly with the increasing focus on case-based learning and the integration of clinical disciplines. Indeed, the department’s faculty are now being asked to teach, not only in all four years of the College of Medicine, but also in the Colleges of Arts and Sciences, Dentistry, Engineering, Nursing and the School of Library and Information Sciences. This is all in addition to our residency program, continuing medical education programs and outreach efforts.

The residency program continues a dynamic course with the appointment of Joan Maley, MD, as Program Director. Joan brings a fresh and exciting approach to build on the long-standing success of the program. The number of residents will increase to 33 over the next few years, and the educational opportunities continue to expand with new clinical rotations in body MRI and a rotation in Community Based Radiology at Mercy Hospital in Iowa City.

The year’s most important development for our medical students has been a redesign of the two-week rotation to a focused curriculum reflecting the mission statement “to teach future clinicians the basics of radiology so that they may better
A related research project, with substantial long-term funding, is Virtual Naval Hospital™ (http://www.vnh.org), a digital library of naval medicine and military medicine, designed and operated for the U.S. Navy Bureau of Medicine and Surgery since 1997. Virtual Naval Hospital is now a key component of U.S. Navy Medicine and has seen service with U.S. forces around the world.

Michael P. D’Alessandro, M.D.
Associate Professor of Radiology

Magnetic Surgery System Being Installed at UIHC

A revolutionary new technology for therapeutic interventions is being installed in the Radiology Department’s lower level MRI Center. The “Stereotaxis System™” is an interventional workstation with a magnet-guided catheter. The device provides digital control of the working end of catheters, guidewires or endoscopes anywhere in the body, and is designed to navigate and control flexible instruments in both vascular and non-vascular lumens and parenchyma (tissue). This minimally invasive technique may be used in a wide range of interventional procedures, from cardiology and neurosurgery, to urology and gastroenterology.

This investigational device was invented by Dr. Matthew Howard, Chairman of Neurosurgery, and brought to The University of Iowa by Dr. Michael Vannier, Professor of Radiology. It is one of only four such systems in the world and represents a breakthrough for interventional medicine and image-guided surgery.

John Haller, PhD
Adjunct Assistant Professor
New Faculty

Kosei Ishigami, MD

Kosei Ishigami, M.D., joined the Abdominal Imaging Section as a Visiting Assistant Professor in November 2001. He received his medical training at Kyushu University and is certified by the Japanese Board of Radiology and the Educational Commission for Foreign Medical Graduates. He spent seven years training at Kyushu University’s Department of Radiology and its affiliated hospitals, focusing primarily on CT and MRI of the abdomen and pelvis, and gastrointestinal radiology. He comes to Iowa City with his wife, Naoko.

Kenjirou Ohashi, MD

Dr. Kenjirou Ohashi, Visiting Associate Professor, joined the Musculoskeletal Section at The University of Iowa in April 2002. He received his medical training at the School of Medicine, Yokohoma City University, Japan. He completed a residency in Radiology at St. Marianna University Hospital in Japan, and a residency in Nuclear Medicine at the University of Cincinnati Medical Center in Ohio. Prior to his appointment at UIHC, Dr. Ohashi was an Associate Professor of Radiology at St. Marianna University Hospital. Dr. Ohashi also served as Visiting Associate Professor at UIHC between 1994-1995. He looks forward to working again with so many people he came to know during his previous appointment at UIHC.

Wendy K. Smoker, MD, FACR

Dr. Wendy Smoker returns to The University of Iowa as Professor of Radiology. She serves as the Director of Neuroradiology, Co-Director of the MRI Center and Director of Fellowship Training in Neuroradiology. Dr. Smoker completed all of her education at The University of Iowa and was an Assistant Professor for 4 years in our department. Upon her departure, she joined the faculty at the University of Utah as Associate Professor in Neuroradiology for 4 years, before accepting a position at the Medical College of Virginia, serving as Professor of Radiology, Neurosurgery, and Otolaryngology, and serving as Division Chief of Neuroradiology where she has practiced for the past 12 years. Dr. Smoker is past President of The American Society of Head & Neck Radiology and was a Deputy Editor of Radiology for a number of years. She is a member of The American Board of Radiology’s Diagnostic Radiology Written Exam Committee and holds a Certificate of Added Qualification in Neuroradiology from the American Board of Radiology. She has been a Fellow of the ACR since 1994.

Patricia E. Thorpe, MD

Patricia Thorpe, M.D., arrived in January 2002 to serve as Chief of Interventional Radiology. Dr. Thorpe is a Fellow of the Society of Interventional Radiology and The American Heart Association’s Cardiovascular Board. She is a past President of the Nebraska Radiological Society. She is Board Certified and has a Certificate of Added Qualification in Vascular & Interventional Radiology. She has served as an American Board of Radiology Examiner for both the Diagnostic and the CAQ-IR exams. Dr. Thorpe received her medical degree from the University of Oregon before matching in neurosurgery at the University of Minnesota. After several years of surgery, she decided to enter interventional radiology and completed a radiology residency at Minnesota, and a Cardiovascular-Interventional fellowship at Stanford. She subsequently became Chief of Interventional Radiology at Creighton, where she spent 12 years developing the section. Dr. Thorpe plans to establish a comprehensive venous center for minimally invasive endovenous therapies.

New Research Scientists

Kenneth Beck, PhD

Dr. Kenneth Beck joins Dr. Hoffman’s group as a Research Scientist. Dr. Beck received his PhD in Physiology and Biophysics from the University of Washington in Seattle. He studied with Drs. Stephen Lai-Fook and Robert Hyatt at the Mayo Clinic, then joined the staff there as Technical Director of the Pulmonary Function Laboratory, serving 14 years. His research interests have included anatomical distribution of pulmonary blood flow, pulmonary gas exchange, exercise physiology in normals, and asthma and congestive heart failure in humans. Dr. Beck will be using Dr. Hoffman’s techniques to image regional lung function in both humans and animals, and use that to develop models of gas exchange and airway mechanics in normal and diseased lungs. Dr. Beck is member of the American Physiological Society, the American Thoracic Society and the American College of Sports Medicine.
Honors and Awards

Monzer Abu-Yousef, MD
— Elected Vice Chair of the General and Abdominal Section of the American Institute of Ultrasound in Medicine effective 2002-2004.

Georges El-Khoury, MD
— Elected President Elect of the Iowa Radiological Society.

Malik Juweid, MD
— Appointed to serve as a member of the Editorial Board of the Journal of Nuclear Medicine effective January 1, 2002.

Brian Mullan, MD
— Became a Fellow of the Harvard-Macy Institute of Harvard University, having completed the Program for Physician Educators in May 2002.
— Selected to participate in the April 2002 inaugural Introduction to Management Program of the Association of University Radiologists in Phoenix.
— Named to the Editorial Board of the journal, Chest.

Wendy Smoker, MD, FACR
— Selected for inclusion in the 2001 edition of “Best Doctors.”
— Elected to serve for a second term as the ACR Councilor from The American Society of Head and Neck Radiology.

— Selected as the recipient of the 2002 American Association for Women Radiologists Research and Education Foundation Professional Leadership Award to attend the Association of Medical Colleges Professional Development Seminar in Washington, DC.

Ge Wang, PhD
— Elected as a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and inducted in the National Academy of Sciences on March 1, 2002 for “seminal contributions to the development of single-slice spiral, cone-beam spiral, and micro CT.”

Donald Young, MD
— Appointed to the FDA National Mammography Advisory Committee as a Physician Member in September 2001.

RSNA Scientific Meeting 2001

Becky Smith, Wilbur Smith, MD, Marlene Stanford, Edmund A. Franken, Jr., MD, William Stanford, MD

Janet Roe, Niall Warnock, MB, ChB, Brad Jansen, MD

William Yuh, MD, Edmund A. Franken, Jr., MD, Becky Belsaas, MD, Jason Bridie

William Erkonen, MD, Nancy Montgomery, William Montgomery, MD

Donald Young, MD, Tess Young, Carl Raboi, MD, Mark Nathan, MD

William Erkonen, MD, Elvira Lang, MD
New Residents

PGY-1
Eve Clark, MD
University of Iowa
Brent Harris, MD
University of Iowa
Saheb Sabri, MD
University of Jordan

PGY-2
Mehul Doshi, MD
University of Wisconsin
Earl Maes, MD
University of Iowa
Josh McDonald, MD
University of Iowa
Kim Olsen, MD
University of Iowa
Adnan Qalbani, MD
University of Iowa

PGY-5
Geetika Khanna, MD
St. Louis University

Service Awards

5 years:
Gene Bontrager -- Diagnostic Radiology

10 years:
Stephen Baker -- Diagnostic Radiology
Marie Beelner -- Diagnostic Radiology
Kevin Hatfield -- Diagnostic Radiology
Tracy Pettinger -- Diagnostic Radiology
Julie Riggert -- Nuclear Medicine
Janet Roe -- Diagnostic Radiology
Kelli Zimmerman -- Diagnostic Radiology

15 years:
Brian Bauer -- Radiology Engineering
Cynthia Beaumont -- Diagnostic Radiology
Jane Klopfenstein -- Diagnostic Radiology
Richard Langholdt -- Nuclear Medicine

20 years:
Anthony Knight -- Diagnostic Radiology

25 years:
Denise Lange -- Diagnostic Radiology
Barbara Mayberry -- Diagnostic Radiology
Cindy Vest -- Diagnostic Radiology

30 years:
Dave Owen -- Radiology Engineering

2001 Employee of the Year

Susan Curtis
Nancy Harney