Digital Breast Tomosynthesis

by Paul R. Fisher, M.D., Director of Breast Imaging

Digital Breast Tomosynthesis is an exciting new technological achievement used to find and diagnose early breast cancers. Mammography detects up to 85% of early diagnosis of breast cancer, and is the best modality to date for this important health screening. The remaining 15% of women who develop breast cancer are initially missed on mammography. These cases are often undetected because the breast tissue is dense which blocks the x-rays and produces poor image quality.

Recently, Stony Brook University Medical Center and the Carol Baldwin Breast Care Center (now located at the new Ambulatory Care Pavilion) have entered into an exciting collaboration with Siemens Corporation, testing and developing clinical applications for digital breast tomosynthesis. A state-of-the-art Siemens Digital Breast Tomosynthesis unit, one of only three in the world, was installed at the new Ambulatory Cancer Center. Patients will soon be enrolled in a number of clinical trials there. These screenings are part of a multi-center trial for tomosynthesis screening in collaboration with Duke University and The University Hospital of Malmö, Sweden.

Digital Breast Tomosynthesis works by taking a series of projections through the breast using a modified x-ray tube and detector. Computer algorithms then reconstruct images for review by a radiologist, similar to the reconstruction performed for CT and MRI images. A series of 60 or more images are produced for each patient and reviewed on a high resolution mammographic display station. By constructing “slices” through the breast tissue, the images show lesions much more clearly, since they reduce the amount of overlapping breast tissue shown on a given slice. Ordinarily, dense breast tissue can obscure lesions, and early studies...
The Department is pleased to announce the opening of the new Outpatient Imaging Center located adjacent to the Ambulatory Surgery Center on the Medical Center’s campus. Many of you are familiar with Elaine Gould, M.D. who has accepted the position of Medical Director, Maryanna Mason, M.D. as Assistant Director and Charles Mazzarrese, M.P.S., R.T. as the Technical Director of the Imaging Center. The Carol M. Baldwin Breast Center has also moved from Tech Park to this location. The Centers will provide easy access to patients and their referring physicians.

The Department of Radiology is blessed with many outstanding faculty members. We are pleased to complement the group with the successful recruitment of Dr. Cliff Bernstein in the Division of Breast Imaging and Dr. Andrei Kranz in the Division of Interventional Radiology.

On a sad note, we all mourn the passing of Dr. Jack Deitch who was a devoted colleague and friend. Jack was a Professor on the Emeritus Staff and an active member of the Department for over twenty years. He was also a faculty member when the campus was being built and prior to the opening of University Hospital. We are also saddened by the passing of Dr. Paul Lauterbur who was a Professor of Chemistry and Radiology at Stony Brook in the 1970s and 80s. Dr. Lauterbur is renowned for his work in developing magnetic resonance imaging (MRI) technology and shared the 2003 Nobel Prize in Medicine for this accomplishment.

One of the exciting new areas is the formation of a Cardiovascular Section in the Department. Drs. Hong Meng, John Ferretti, William Moore, Erica Posniak and Marlene Zawin are working together as a team to provide excellent care for our cardiovascular patients. It is planned that the next issue of the Radiology Letter will include an article on CT cardiac angiography.

We are looking forward to a successful year and providing our patients with the best possible care.

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### Managed Care Update

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New Faculty

Andrei Kranz, M.D. joined the faculty staff as an Assistant Professor of Clinical Radiology in the Division of Interventional Radiology. Dr. Kranz received his medical degree at the Institute of Medicine and Pharmacy in Cluj-Napoca, Romania. He completed a three-year Surgical residency at Wyckoff Heights Medical Center in Brooklyn, New York, followed by a Radiology residency at the Nassau University Medical Center in East Meadow, New York. Dr. Kranz previously worked at Southside Hospital, Huntington Hospital and Brookhaven Memorial Hospital. He is a member of the American Medical Association, Medical Society of the State of New York, Society of Interventional Radiology and the American College of Radiology.

Cliff S. Bernstein, M.D. completed a fellowship in Breast Imaging at Stony Brook and joined the faculty as an Assistant Professor of Clinical Radiology in the Division of Breast Imaging. Dr. Bernstein received his medical degree from the State University of New York at Stony Brook and completed a Radiology residency at the Harlem Hospital Center. Dr. Bernstein is a member of the American College of Radiology, the Radiological Society of North America, and the Society of Breast Imaging. Dr. Bernstein is Board Certified in Diagnostic Radiology.

In Memory

Jack S. Deitch, M.D., who was Chief of Diagnostic Radiology and Head of Mammography from 1979 until 1999, passed away on January 4, 2007. He was one of the founders of the Department of Radiology at Stony Brook. Prior to coming to Stony Brook he worked at the Veterans Administration Medical Center in Northport, New York. Dr. Deitch will be dearly missed by his family, friends and colleagues.

Paul C. Lauterbur Dies
Won Nobel Prize for MRI

Paul Lauterbur, Ph.D., who shared the 2003 Nobel Prize in Medicine for his work in developing magnetic resonance imaging (MRI) technology while a member of the Stony Brook University faculty in the 1970s and 80s, passed away on March 28, 2007.

Dr. Lauterbur was a Professor of Chemistry and a Professor of Radiology at Stony Brook when he began using magnetic resonance spectroscopy to study living organisms. He eventually learned that, by placing an organism inside a constant magnetic field then applying a second magnetic field of varying strength, he could produce sharper images of the different tissues in the organism than previously possible.

The MRI went on to revolutionize diagnostic medicine in the latter quarter of the 20th Century and remains one of the most important developments in medical technology. Dr. Lauterbur received the Nobel for Medicine and returned to Stony Brook with his Nobel Medal in September 2004 to deliver a lecture and meet with students. He was honored in a campus ceremony attended by many of his early colleagues. His original MRI device remains on display in the University’s Chemistry Building along with a replica of his Nobel Medal – the first one ever awarded to a faculty member for research conducted while at Stony Brook.

Lauterbur’s breakthrough was in realizing that by varying the strength of the magnetic field and analyzing the frequency of resulting radio signals, he could use nuclear magnetic resonance to create a two or three-dimensional picture. This laid the foundation for what eventually became the MRI.

The research began in 1971 when Lauterbur watched as colleagues used nuclear magnetic resonance (NMR) to examine tissue from a cancerous tumor. Two years later, in 1973, the British scientific journal Nature published an article by Lauterbur describing an NMR technique for taking three-dimensional pictures of body organs and vessels, without the use of ionized radiation or toxic dyes. It was this technique that was used as the basis for MRI equipment.

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Morton A. Meyers, M.D., Jack S. Deitch, M.D., Donald P. Harrington, M.D. (left to right)
Co-registration in Molecular Imaging

Robert Matthews M.D., William Stanley C.N.M.T., and Nand Relan Ph.D.

Fusion imaging has been increasingly employed over the past few years, especially with the introduction of hybrid PET-CT cameras. PET and other molecular imaging techniques used in nuclear medicine demonstrate functional or physiological bio-mechanisms, while CT and other anatomical imaging modalities provide structural detail. In the evaluation of malignancies with PET, current and prior studies are often referenced for comparison. Newly developed software applications not only allow co-registration of functional and anatomical images, but allow a variety of fusion combinations. PET-PET fusion imaging offers an innovative approach for assessment of malignancies in patients with prior and follow-up studies. These topics were discussed in a paper entitled “Evaluation of Co-registration in Molecular Imaging: PET-PET Fusion” presented by three nuclear medicine technologist students, Jamie Bevilacqua B.S., Jasmine Guevara B.S., and Joseph Weiss B.S. at the Greater New York Society of Nuclear Medicine Symposium held in Atlantic City.

Fourteen cases, each with old and new PET scans, were evaluated for overall quality of fusion, quality of lesion co-registration, and changes in both standard uptake value (SUV) and tumor volume. A PET-PET fusion subtraction method, developed by MIM Vista, was subsequently implemented to evaluate the progression or regression of individual lesions. Quality of subtraction was rated based on changes in volume and SUV of the lesion.

When gross quality of fusion was rated high, rating of individual lesions during the subtraction method also were rated high. The most challenging anatomical region for subtraction was the neck region where patients tended to change the position of the heads between old and new PET studies. Overall, average distance of misalignment was observed only to be 1.01±0.15 centimeters in all anatomical regions.

PET-PET fusion with subtraction technique proved to be an efficient and accurate diagnostic tool for evaluating the different stages and status of malignancies. But for subtraction technique to be effective, good quality of co-registration is important. Under optimal conditions, PET-PET fusion subtraction method can provide greater confidence for the physician in the final interpretation of PET studies.

University Medical Center at Stony Brook offers a 40-slice PET CT. Appointments can be made by calling (631) 444-1880.
Dynamic MR Imaging of Pelvic Organ Prolapse

by Hong Meng, M.D. and Jamil Rehman, M.D.
Department of Radiology and Department of Urology

With the installation of our state-of-the-art 1.5 Tesla and 3 Tesla whole body magnets in the spring of 2004, the Department of Radiology at Stony Brook University Medical Center has been able to broaden the clinical applications for body imaging to assist clinicians from various specialties in diagnosis and management of benign or malignant diseases. One of the more specialized imaging techniques is dynamic magnetic resonance (MR) imaging of pelvic organ prolapse, which assists the urologist and gynecologist in the management of patients suffering from varying degrees of pelvic floor weakness and dysfunction.

Pelvic organ prolapse is a relatively common condition primarily affecting women. It can be debilitating as well as embarrassing and significantly impacts their quality of life. It may involve one or multiple pelvic organs including urethra, bladder, uterus, vagina vault, rectum, and small bowel. Patients may present with pain, pressure, urinary and fecal incontinence, constipation, urinary retention and defecatory dysfunction. Pelvic organ prolapse has a significant impact on society. Urinary incontinence alone affects 10 million women in the United States at an annual health care cost of approximately ten billion dollars.

Pelvic organ prolapse is diagnosed primarily via pelvic examination. Imaging is useful for patients when clinical diagnosis is uncertain and/or for pre-surgical planning. MR imaging has an advantage over other imaging techniques in evaluating pelvic organ prolapse due to its lack of ionizing radiation, excellent depiction of pelvic organs and pelvic floor soft tissue, and multiplanar and dynamic imaging capability. Also, contrast administration is not needed.

For patients with clinical concern of pelvic organ prolapse, dynamic MR imaging sequences are added to our routine female pelvic imaging protocol. The patient is in a supine position with knees mildly flexed. The phase-array body coil is tightly placed over the pelvic region to cover the pelvic floor structure at the center of the imaging field of view. The patients are carefully coached to collaborate with graded straining, mimic laboring or defecation. Real time imaging is acquired at 2-3 image frames/second for about 100 dynamic images during patient’s graded Valsalva maneuver, from rest to maximal straining. These images are reviewed in cine movie mode for real-time assessment of pelvic floor movement and organ descent, and static images are used for measurement of pelvic floor landmarks and organ prolapse (figure 1-3).

Imaging Center Opens

Continued from cover

Medical Director, Dr. Elaine Gould, Assistant Director Dr. Maryanna Mason, Technical Director, Charles Mazzarese, as well as all the attending radiologists, technologists and staff have contributed to the Center’s success. Patient appointments can be made by calling (631) 444-1880.
News in the Department

Clinical Trial

A phase II clinical trial sponsored by ActivBiotics has been recently approved by the University IRB Committee and recruitment has begun. This project is lead by the principal investigator Dr. Hong Meng in the Department of Radiology in collaboration with the co-investigator Dr. Apostolos Tassiopoulos from the Division of Vascular Surgery. This study is for randomized evaluation of short-term Rifalazil treatment on carotid atherosclerosis using 3 Tesla high-resolution MR imaging of the carotid wall and atherosclerotic plaques. Any patient who has significant atherosclerotic disease in any part of body including coronary artery disease, peripheral vascular disease and cerebrovascular disease may be eligible for participation. For additional information and patient enrollment, please contact Eileen Finnin at (631) 444-5454 and Aimee Minton at (631) 444-2471.

Congratulations to Iakavos (James) Koutras, M.D. who was appointed Chief Resident. Welcome to our new Clinical Research Associate, Aimee Minton. Aimee will serve as a Co-Research Coordinator with Veronica Geronimo. Congratulations to Erin McCormack, Ph.D. who defended her Ph.D. thesis in Biomedical Engineering entitled “Quantitative Measurements of Intracranial Cerebrospinal Fluid Dynamics: Methods to Evaluate Changes in the Biomechanics of the Brain in the Presence of Disease”. Dr. McCormack will be staying on as a postdoc for another year. Christina Rivera, Radiology Librarian, has done a phenomenal job in organizing The Morton A. Meyers, M.D. Department of Radiology Library.

Dr. Harris L. Cohen, M.D., seen displaying his work as co-editor of the American College of Radiology PSE test and syllabus 51st text in the third series - Neuroradiology.

Dr. Mohit Naik and Iakavos (James) Koutras assisted in coordinating the 2006 Unknown Cases Ultrasound Project for the Radiological Society of North America's Annual Meeting in December 2006. The five cases used and their posters and presentations were the result of the collective efforts of many members of the Department. Included are Drs. Nancy Budorick, Jared Dunkin, Ekta Gupta, Iakavos (James) Koutras, Amer Naem, Mohit Naik, Vaibhav Mangrulkar, Erica Posnaiak, Hsiu Su, Nandita Wadhwa, and Marlene Zawin. Dr. Harris L. Cohen was the faculty coordinator of the project. The excellent work on a similar RSNA project in 2005 by Drs. Mohit Naik and Amit Patel and a similar SRU project coordinated by Dr. Kal Al-Dulaimy, was given by the RSNA as the reason for the project being re-offered to Stony Brook in 2006.

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Dr. Harris L. Cohen was a participant of the organized Radiology's Editors Forum held at the RSNA offices in Chicago in September 2006. The Organization includes the Editors-in-Chief of key radiology publications in the United States and abroad. Dr. Proto of Radiology and Dr. Olmsted of RadioGraphics helped organize the 2006 meeting. Dr. Cohen was there as Editor-in-Chief of the American College of Radiology's Syllabus (PSE) series. Dr. Proto was a former Editor-in-Chief of the PSE series. The American College of Radiology published the 51st text in its PSE Syllabus series in December 2006. The book, entitled Neuroradiology III was edited by Drs Mauricio Castillo (University of North Carolina, Chapel Hill), James G. Smirniotopulis (Uniformed Services University of Health Sciences, Bethesda) and Harris L. Cohen (University Medical Center at Stony Brook, Stony Brook). A new text, Chest VI is being coordinated with Dr. Jeffrey S. Klein (Fletcher Allen Health Care, Burlington, Vermont), his Associate Editor and Dr. Cohen with an expected date of publication, Dec 2007.

Jerome Liang, Ph.D. received the IEEE Long Island Section’s Fellow Award at the IEEE Long Island Section Annual Awards Banquet on Friday, April 13, 2007 at the Huntington Hilton in Melville, New York. The citation on the Award is “For contributions to medical imaging reconstruction and virtual colonoscopy.” Congratulations Jerome! Michael J. Cortegiano was appointed President of AAARRAD (Association of Administrators in Academic Radiology) for 2007 - 2008.

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have confirmed that lesions are much more conspicuous on the tomosynthesis images (perhaps as much as four times for an equivalent x-ray dose). The overall radiation dose is comparable to standard Two-Dimensional mammography, but the exposure time is significantly longer (approximately 12 seconds on our prototype unit). The clinical trials will offer us insight into the stringent demand for breast immobilization for such a long exposure and will help illustrate how well our patients at The Carol Baldwin Breast Center can tolerate the tomosynthesis exams.

The cover image shows a single slice from a tomosynthesis study, performed at Duke recently. The woman’s mammogram was read as normal, while a small cancer was detected only on their tomosynthesis unit.

There are many questions that remain unanswered about this exciting new technology. They include how best to obtain the images, how best to process them, and even how best to compress the breast for the longer time demands for image acquisition. We will examine how often this new research tool detects cancers missed by the currently used mammography modalities. Just as importantly, we will examine how many “false alarms” are generated by tomosynthesis. Stony Brook Radiology will remain at the forefront of research to answer these and other questions, as we gain experience in this exciting new technology of breast tomosynthesis.
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