

I D

INTEGRATED DIAGNOSTICS

VOLUME 2 • FALL 2012





Making Diagnostics Count: Building the Continuum of Care

Contrary to what people might think, Toshiba America Medical Systems, Inc. is not in the modality business. We are in the healthcare-solutions business. We are proud of the technology that we manufacture, and we continuously strive to improve our products, but we see our business as much broader.

We don't make big-box medical equipment and drop it at your door. Our goals are to provide you with a reliable technical solution that meets your specified clinical needs, install your technology, train your staff and then work with you to improve the efficiency and effectiveness of your service lines throughout the lifetime of the equipment. In the case of the last vascular laboratory at Rady Children's Hospital in San Diego, Calif., that lifetime was a remarkable 18 years (see article, page 19).

In our second issue of *Integrated Diagnostics*, we also chronicle the feat of installing 14 new Infinix™-i cardiovascular radiography systems at one time at the Gates Vascular Institute in Buffalo, N.Y. Our team worked with leaders at Kaleida Health's Buffalo General Medical Center to train a team of 150 caregivers, across multiple specialties, within a narrow window of time. I am proud to say that we did it—together.

Software is integral to optimizing the functionality of the sophisticated technology that we manufacture and that you deploy. That's why we invested in acquiring the well-regarded advanced visualization company Vital Images in Minnetonka, Minn., and it's the reason for our partnership with Pie Medical Imaging BV in Maastricht, Netherlands (page 39 Partnerships: Pie Medical).

Our cover story for this issue features the groundbreaking work done at the University of Florida College of Medicine in Gainesville, Fla., under the leadership of **Anthony A. Mancuso, M.D.**, where great progress is being made in standardizing diagnostic imaging practices. It is here that **Christopher Sistrom, M.D., M.P.H., Ph.D.**, has mapped clinical scenarios against diagnostic imaging procedures to devise an electronic-ready matrix for clinical decision support. Dr. Mancuso has institutionalized evidence-based medicine by standardizing protocols and customizing reports for clinical scenarios.

Increasingly, providers of healthcare will be measured on comparative effectiveness and be called on to provide not just healthcare, but healthcare that delivers results in the most effective and efficient manner possible. Consider all of us here at Toshiba your partners in making diagnostics count.

A handwritten signature in black ink that reads "Don Fowler". The signature is fluid and cursive, with a large, stylized "D" and "F".

Don Fowler
President and CEO
Toshiba America Medical Systems, Inc.

Contents



EDITORIAL MESSAGE

**Inside Front Cover | Making Diagnostics Count:
Building the Continuum of Care**
By Don Fowler, president and CEO

COVER STORY

2 | Building Care Protocols that Optimize Resource Use
Standardizing the radiology round-trip can lead to improved quality.

PATIENT EXPERIENCE

10 | TAVR Planning with CT: Where Cost Efficiency and Enhanced Care Meet
CT plays a critical role in surgical planning for transcatheter aortic-valve replacement, or TAVR.

EDUCATION

14 | Customized Training for Collaborative Care: Gates Vascular Institute
Imaging education plays key role in GVI's new hospital.

FEATURES

18 | Reliability and Performance: Workhorse Imaging Technology Goes the Extra Mile
Reliable imaging equipment helps Toshiba customers meet patient and operational demands.

24 | Vital is Honored for Exceptional, Transparent Customer Support
Vital recognized for providing outstanding customer support.

BENCH TO BEDSIDE

26 | AIDR-3D: Radiation Dose Reduction for Routine Clinical Imaging

30 | CTA for TAVR Planning

32 | NPH vs. Alzheimer's Disease: Cerebral Spinal Flow Imaging

34 | Atypical Fibroadenoma of the Breast

36 | Arteriovenous Malformation: Suspected AVM and Low-Contrast Imaging

PARTNERSHIPS

38 | Pie Medical Imaging Software and the Infinix-i: TAVR Planning Simplified
3mensio Valves™ and CAAS A-Valve™ from Pie Medical Imaging aid in planning of TAVR procedures.

INNOVATIONS

42 | Toshiba Puts State-of-the-Art CT Technology in Reach of Every Radiology Department
Toshiba extends its CT line to meet the needs of providers in all settings.

44 | Toshiba MR Offers Upgrade Path from Eight to 32 Channels
First scalable MR series offers a scalable solution with a full upgrade path.

45 | Shifting Liver Biopsies to Ultrasound
University Hospitals Case Medical Center (UHCMC) reduced CT liver biopsies by using Smart Fusion.

46 | Optimizing Dose in Fluoroscopy
Spot Fluoro is optimizing dose in fluoroscopy.

Volume 2

Integrated Diagnostics

Fall 2012

MEDICAL EDITOR

Frank J. Rybicki, M.D., Ph.D., F.A.H.A.
Applied Imaging Science Laboratory
Brigham and Women's Hospital and Harvard Medical School

EDITORIAL DIRECTOR Cathy Wolfe

CREATIVE DIRECTOR Jannay Morrison

MANAGING EDITOR Charlene DeBar

CONTRIBUTING WRITERS Cheryl Proval, Cat Vasko



Building Care Protocols that Optimize Resource Use

By Cheryl Proval

In our brave new world of healthcare, in which resources are limited and demand is projected to rise, one singular idea has taken root: If providers do what works and eliminate anything that doesn't, we can improve patient health and reduce costs without denying care.

In a nationwide system with many moving parts and multiple points of view, accomplishing this will be no small feat. Change will occur institution by institution, specialty by specialty and practice by practice, accelerated by technological advances, new payment models and collaborative approaches.

One hotbed of progress in imaging is the University of Florida College of Medicine in Gainesville, where Anthony A. Mancuso, M.D., has been chair of radiology for the past 11 years. There, Christopher Siström, M.D., M.P.H., Ph.D., has spent a decade articulating and describing a conceptual model of diagnostic imaging using two simple concepts: clinical scenarios and diagnostic imaging procedures (DIPs). These form a two-dimensional matrix just like rows and columns on a spreadsheet. Siström's work is part of a broader effort aimed at enabling

standardization of diagnostic imaging practices being developed at the University of Florida. In Mancuso's view, now is the time to accelerate the effort.

"In imaging, as in almost everything in life, there are times when you are growing and there are times when you consolidate on that base; then, you can improve from there," Mancuso says. "I believe we are, with regard to anatomical (not metabolic) imaging, at a stage of refinement and consolidation more than new discovery. The technologies are improving, but they are not improving at the pace seen at the invention of CT and MRI or the major advances in those two modalities."

He adds, "When you are at a point of consolidation, you are in a good position to standardize what you know. I'm not being pessimistic about continued growth (since we are in an obvious period of exponential general technology and IT growth), but I think we are at a good place to take stock of the current state of diagnostic imaging, organizing the things we do know and understanding what we don't know."



Anthony A. Mancuso, M.D.,
chair of radiology,
University of Florida College
of Medicine in Gainesville



Christopher Sistrom, M.D.,
M.P.H., Ph.D.,
University of Florida College
of Medicine in Gainesville

THE IMAGING MATRIX

During the last decade, Sistrom has helped to organize and translate the American College of Radiology Appropriateness Criteria (ACR-AC) into a structured and coded form that can be delivered in various computer applications. The concepts of clinical scenarios (topics and variants) and diagnostic imaging procedures were a natural way to deconstruct the ACR-AC. Once a particular clinical scenario and imaging procedure are specified, it makes sense to talk about appropriateness in terms of a score.

“The appropriateness score answers in a semi-quantitative way a theoretical question about a given clinical scenario and a given imaging procedure. That is, if the patient has this examination, compared with not having it, will he or she be better off?” he asks.

He continues, “It’s a measure of the utility of a particular imaging procedure, in a clinical situation, for a patient. In the ACR-AC, this is represented by a score of 1–9; 1–3 is considered inappropriate, 4–6 is considered equivocal or sometimes appropriate, and 7–9 is considered appropriate. The scores are given colors—in general, red, yellow and green, like a traffic light’s colors.”

Beyond appropriateness, a corollary is important to resource use in healthcare, Sistrom says: Is it necessary? “A procedure can certainly be appropriate to a clinical scenario, but you may or may not do it,” he explains.

Mancuso offers an example from his area of expertise, surveillance of head/neck cancer. “Someone might order a CT scan of the neck, chest, abdomen and pelvis in a patient with lymphoma when there is measurable disease in all three sites and the patient is getting systemic chemotherapy,” he says. “Why not pick just the one site which had the most disease prior to treatment? Arguably, scanning that one site would be necessary. While adding the other three sites might be appropriate, they reasonably could be omitted.”

On the other hand, there is little doubt about the benefit of a procedure considered necessary, and a physician would be ethically obligated to offer it to the patient. Sistrom provides the example of a head CT exam for severe head injury. “By definition in the appropriateness criteria, that would get a nine,” he notes. “Some people would go further and say it is not only appropriate but necessary. However, the ACR-AC as currently constructed does not presume to

make statements about medical necessity.”

Imaging has become too complex and specialized for many referring physicians to know which tests to order, but they have an important role to play, as patient advocates and consumers of the reports, in letting radiology hear what they want to know from a study for a specific indication. “We are involved in improving that process now, and other efforts at such process improvement have started appearing more frequently in the radiology literature,” Mancuso says. “Radiologists are getting together with groups (such as surgical subspecialists and cardiologists) and creating consensus for desired report content.”

STANDARDIZATION OPPORTUNITIES

Opportunities for standardization go well beyond test selection and can be found all along the route of what has been called the “radiology round-trip.” After the exam is selected, a protocol is chosen, the images are acquired, post-processing might be performed, the images are interpreted, the report is dictated and the results are delivered. Steps are being taken at the University of Florida to standardize each of these component activities.

The importance of protocols cannot be overemphasized, in Mancuso’s view, and the only way to ensure the maximum amount of information per study is to standardize and optimize the protocol for the clinical scenario, particularly where ionizing radiation is involved. “You can think of it as an information-to-radiation ratio,” he explains. “If you are going to irradiate the patient, you want to get the most information

out of that encounter to advance clinical decision making. Therefore, you need protocols that are indication specific.”

The protocol (including contrast timing and post-processing), Mancuso emphasizes, is what ensures that the machine yields the best-quality, most-desired information for the clinical scenario. It is the difference between a pituitary study that yields images with extraordinarily detailed anatomic information and a study in which one can barely see the anatomy of interest.

This is where Mancuso applies what he calls the information-to-radiation ratio. He says, “In fact, thinking in a modality-agnostic mode, it’s information per dollar, because if patients have suboptimal studies, we repeat them. That has financial and (for CT) radiation-burden costs, as well as a small contrast risk. All of that adds up to waste.”





STANDARDIZATION PROCESS

6 Mancuso and other members of the UF/Shands Radiology Practice Committee (representing each section: medical physics, IT and administrative leaders) gather weekly to address issues facing the department, including protocol development. Clerical staff members are on hand to take minutes and update projects on Redmine, an open-source project-management Web application written using the Ruby on Rails framework. Roughly 40 to 60 projects are in progress at any one time.

Any protocol that is standardized is posted as a new protocol on the department's internal website. Policies and procedures, including protocols, are posted on the department's public website (under Patient Care) and are available at www.xray.ufl.edu.

Report generation is a relatively new area of standardization, and Mancuso's department is actively seeking input from referring physicians

on what they do (and do not) want to see in the report, for each study, for a specific indication. An ongoing project has residents (supervised by a faculty member) organized into four teams of 11 by subspecialty to interrogate referring specialists on their report content preferences.

Body-imaging residents visited pancreatic surgeons and asked what they wanted to see in reports that would determine whether the surgeon would operate. "Out of that interaction came a list of things that they want and do not want to see in reports," Mancuso says. "For instance, they do not want us commenting on whether a lesion is operable. The language they want to see is, 'This lesion is encasing the superior mesenteric artery,' which might then be translated as an inoperable situation."

These considerations are of increasing importance with more and more patients reading their imaging reports.

DEVELOPING A CARE PROCESS

Developing a care process in radiology touches every department in the hospital, and when all steps in the transaction are considered, it is exceedingly complex. "It is rocket science in the sense that the technology and knowledge are already available and need to be applied with extreme precision and care," Siström says. "You start with getting the right test for the right indication—the right modality and body area—and once you've got the correct scenario, then you standardize the right way to perform, process, report and communicate the results."

If a physician orders a head CT exam and it's safe to use contrast, there are at least six different ways to do that, he adds, depending on

the scenario. “On top of that, a lot of these exams now get post-processed,” he explains, “so you add to that how the images are collected, how they are reconstructed and how they are post-processed; when you tie all of that together, you have a care process, for a given clinical scenario, that applies to a subset of patients in a certain situation.”

Mancuso believes that this approach also is a recipe for quality. “If you take the scenario approach—and you use the most detailed, best protocol to answer the question being posed—you get the best possible images out of it, and you are going to get the best possible clinical decision,” he says. “Therefore, you get the best quality, assuming the person looking at the study can interpret it.”

Mancuso has even extended his push for standardization into the interpretation process, according to Siström. “Once the images are collected and post-processed, they’re now ready to look at; what is the process by which you look at those images and come up with a meaningful report?” Siström asks. “Dr. Mancuso often talks about how you put mental or explicit checklists into place: For example, how do you call a study negative? Exactly what structures and observations are required to fall into a normal range?”

On the subject of report templates, Siström and some other thought leaders in radiology diverge. While Siström allows that generic, data-entry-type templates can be useful, he insists that the report must be predicated on the clinical scenario and the imaging protocol. Further, it must be thought about and constructed as

a logical argument based on indications and findings (premises) leading to conclusions. Articulating this for teaching and decision support may require something other than a template. He says, “It may be different formats: a document, a PowerPoint® file or an outline that, however is best, tells the interpreting person what to look for and what to say. In fact, we are developing short case-specific video clips where an expert navigates through an image set and narrates their observations and thought processes.”

“ In fact, we are developing short case-specific video clips where an expert navigates through an image set and narrates their observations and thought processes. ”

Christopher Siström, M.D., M.P.H., Ph.D.

Another target for standardization in the report is the radiologist’s recommendation for further imaging, which is currently somewhat personal, Siström says. Exceptions are the Fleischner Society’s follow-up recommendations for lung nodules and the ACR BI-RADS® diagnostic levels included at the end of the mammography report. Additional steps in standardization of the radiology round-trip are the criticality of a result and the level of communication warranted.

THE BIGGER PICTURE

Siström divides his time between the University of Florida and Massachusetts

General Hospital in Boston, where healthcare has traveled further along the reform path and where he is working on a risk-prediction model to determine how much imaging would be appropriate for large populations of people. In the not-too-distant future, he predicts, healthcare provider organizations will be held to cost standards and might be at financial risk for excessive cost of care for patients for whom they are accountable.

In fact, on July 31, the Massachusetts legislature passed a law that limits healthcare expenditure growth to that of the gross state product.

“In the fully capitated model, a healthcare organization would have 30,000 covered lives, and it would be paid a certain amount to take care of those covered lives for a year,” he explains. Among other services, imaging becomes a cost to the provider organization, which they must factor into predicting the average per-member premium. “Given that there are 30,000 people with known demographics and claims histories, how much and what types of imaging can I expect to do on these people in the coming year?”

Before a provider can intelligently write a contract, it needs to project not just volume, but also the amount and type of resources (including imaging modalities) required to accommodate the expected use and calculate a fair-market price. Not only would the organization seek to curb overutilization, but it would also have a vested interest in correcting underutilization. “What you have to do is come to this sweet spot,” Siström explains. “You have to come up

with an expectation of how much of each type of imaging the population will get. That is risk prediction, and appropriateness comes into that as well.”

In this environment, decision support at the point of ordering for clinicians will become important, Siström says. “Number one is order entry/decision support at the front end,” he notes, “and number two is risk prediction as an analytic approach. Of course, they inform each other, because if you are the healthcare organization and you come up with this optimal level of imaging, your physicians have to execute that. Decision support is one way to proactively make sure they do.”

MAKING IT COUNT

The ability to optimize resource use means nothing if patients’ health is compromised, and in Mancuso’s mind, standardization of every step in the radiology round-trip is the path to improved quality. Mancuso cites his institution’s chest-pain clinic as a success story and holds up his stroke program—with its 24/7 in-house interventional and stroke neurological team—against any in the country.

Mancuso reports that the UF/Shands Neuroradiology Service can have a stroke patient scanned in five minutes; from the raw data, they can produce a CT angiogram of the neck and head and can have a perfusion study from a non-contrast CT exam of the head on the network—ready to interpret, at home or in the hospital—within seven to 10 minutes.

“Many people would say that’s a 20-minute process, at best,” he says. “Our neuroradiology and IT group worked with Toshiba America

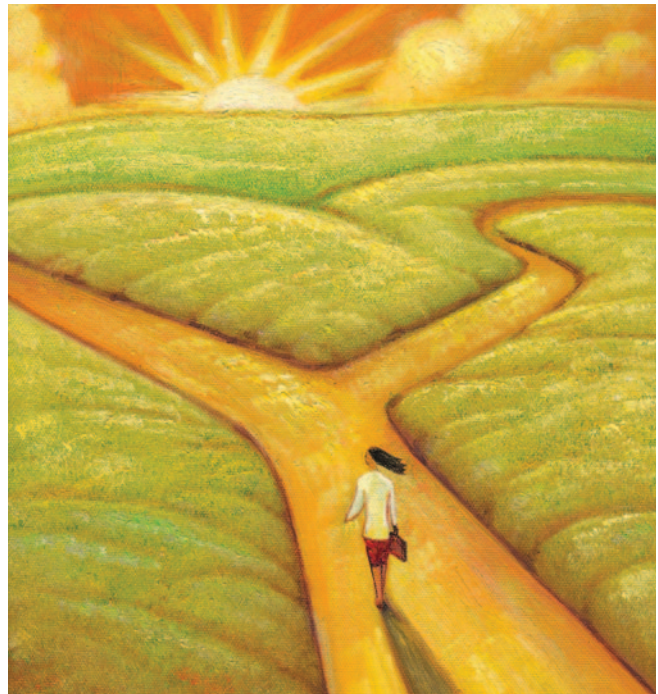
Medical Systems, Inc. and its software people to improve the process.”

“From Toshiba’s perspective, I believe that the Aquilion™ ONE dynamic volume CT system has fulfilled all expectations with regard to being an instrument that is extremely useful in the initial triage of cerebral-infarction patients,” he says. “I also believe, from the forthcoming clinical data, that it will assume an increasingly important role in chest-pain triage. It’s already important; it may even become dominant over other imaging modalities that might be used in triage.”

Collaborating with referring physicians to meet patients’ needs is also part of the emergency-care equation. At UF/Shands: The University of Florida Academic Health Center, Gainesville, this has meant agreeing to overread studies immediately for all emergency-department and trauma patients presenting with existing studies in hand, if the studies are readable and of diagnostic quality.

“You can imagine how that accelerates emergency-department triage and eliminates radiation burden (if it’s CT) because you don’t have to image them again—and, in a trauma patient, how it speeds care,” Mancuso notes. “We likely are in a minority of departments that offer official readings of those studies because, of course, we are infrequently reimbursed for that service.” That happens in at least 10 patients in a 24-hour period at UF/Shands, a busy level I trauma center.

There could even be economic benefits to this approach, as health systems move toward assuming risk for patients’ health. Siström notes, “In a capitated environment, if a patient comes in with a disc in hand from another hospital



(which already incurred the cost of making that scan) and I can interpret it—and I don’t have to repeat the exam—I win.”

ADAPTING TO THE NEW ORDER

As priorities shift toward the management of chronic disease, so does the value proposition of imaging. “In some chronic diseases, there will be a place for more imaging; in others, good primary care and home visits will obviate the need for imaging in acute exacerbations,” Siström says. “In an organization in which imaging is now a cost center, that’s a good thing.”

Mancuso says, “People will look more objectively at intervals for surveillance, the number of studies and their expense. There is a big job ahead in the standardization and electronic implementation of the radiology round-trip. That’s where we need to go.” **D**

Cheryl Proval is a healthcare writer living in Los Angeles.



TAVR Planning with CT: Where Cost Efficiency and Enhanced Care Meet

By Cat Vasko

CT increasingly plays a critical role in surgical planning, and this is particularly true of transcatheter aortic-valve replacement, or TAVR, an emerging intervention for cardiac patients for whom traditional valve-replacement surgery is not an option. Paul Hudson, M.D., is a cardiologist with Cardiology Associates of Bellin Health (Green Bay, Wis.). He explains, “We’re able to put a catheter into a groin artery and implant a new valve without having to have open-heart surgery. This enables us to treat patients who would not be able to undergo surgery, and in the near future, we may be able to treat high-risk (as well as inoperable) patients.”

Hudson and his colleagues at Bellin Health use the Aquilion™ ONE CT system from Toshiba America Medical Systems, Inc. to plan complex TAVR procedures, which require detailed anatomical information to work. “All the beauty of this procedure is in the detail,” Hudson notes. “There are so many things we need to ensure are appropriate, and CT plays a big role in telling us whether we have appropriate vascular access—a couple of millimeters here or there can make a big difference.”

EMERGENCE OF TAVR

TAVR initially gained ground as a valve-replacement option in Europe, and in November 2011, the FDA approved the first TAVR device for use in the United States: the SAPIEN valve from Edwards Lifesciences in Irvine, Calif. George Chrysant, M.D., a cardiologist at Integris Heart Hospital in Oklahoma City, notes that because the SAPIEN valve is sold in two sizes (23 and 26 millimeters), the anatomical information provided by cardiac gated studies on the Aquilion ONE is critical to choosing the appropriate valve for the patient.

“We need accurate representation so we can pick the right size of transcatheter valve to implant,” he says. “If you pick one that is too small, you risk leakage, while one that’s too big can rupture the aorta.”

CT is also used to visualize the path from the groin to the aorta and to check for calcification along the way that might interfere with implantation. Hudson notes that the Aquilion ONE includes a centerline imaging package for the peripheral vessels that allows increased accuracy in the navigation part of

the procedure. “The technologist will put a centerline down the middle of the vessel, giving a good approximation of its luminal diameter,” he says. “Centerline imaging is probably the most important of the advanced software packages that make this procedure possible.”

IMPROVING THE PATIENT EXPERIENCE

Hudson and Chrysant agree that the biggest benefit of TAVR with CT planning is the improvement in patient care that it makes possible. “Although the current FDA indication is only for patients who cannot undergo surgery, that smaller patient group is very important, because otherwise there would be no option for them whatsoever,” Hudson notes. “While there is definitely a potential cost benefit to CT TAVR, the real improvement is in patient safety. It allows you to see abnormalities you might not otherwise see.”

At Integris Heart Hospital, Chrysant adds, the use of CT enables patients to minimize their trips to the facility. “We have a wide area of service, with patients coming in from rural areas of Oklahoma, the panhandle of Texas and



Integris Heart Hospital, Oklahoma City, Oklahoma.



Bellin Health, Green Bay, Wisconsin.

southern Kansas,” he says. “When they come to our valve clinic, we want to do all the testing right then and there, instead of having them drive out multiple times. With CT, they come once for imaging, and the next time they come is when it’s time to implant the valve.”

Chrysant predicts that in the near future, the anatomical planning made possible by CT will eliminate the need for transesophageal echocardiography, or TEE, in planning TAVR procedures, further reducing their invasiveness while limiting imaging costs. “You can do the clinical equivalent of one-stop shopping with CT,” he says. “In the future, it will obviate the need for TEE—you’ll just need one set of CT images to get all the information you need.” Hudson concurs, adding, “The technology has reached the point where you can use CT data to assess the annular size appropriately, without having to do an additional, invasive and costly test in the form of TEE.”

STREAMLINING COSTS

In addition, Chrysant says, using CT for TAVR creates downstream cost efficiencies by making preprocedural planning more efficient



Thoracic and abdominal CTA used for interventional planning.

and accurate. “With CT, you know a lot of information ahead of time, including the angle, the valve size, whether the arteries are big enough, whether there is calcification, how easy or difficult it might be to steer the valve around the aorta—and overall, how easy it will be to perform the procedure from the femoral artery,” he says.

As a result, the procedure itself is simplified. “When you schedule a TAVR procedure, you are booking a hybrid operating room, a surgeon and a cardiac anesthesiologist, so this is information you need to know in advance,” he says. “It is important to have an idea of the angle of deployment prior to the day of the procedure to avoid having to perform multiple aortograms, which expose people many of whom have renal



issues to additional contrast.” Chrysant adds that peripheral angiography prior to TAVR can be performed simultaneously with the cardiac exam. “This avoids invasive angiography, which costs thousands of dollars,” he notes.

Both clinicians agree that the clinical potential of TAVR supported by the Aquilion ONE is exciting. “For us, it has been invaluable as a tool because of the speed of acquisition and because you can take the images without using a lot of contrast and radiation,” Chrysant says. Hudson adds, “We are at the tip of the iceberg when it comes to improving patient safety.” **D**

Cat Vasko is a healthcare writer living in Los Angeles, Calif., and is the editor of ImagingBiz.com.



Customized Training for Collaborative Care: Gates Vascular Institute

By Cat Vasko

Rapid advances in imaging technology are revolutionizing patient care, but they necessitate an often-invisible step between invention and implementation: caregiver training. The team at the Gates Vascular Institute (GVI) at Kaleida Health's Buffalo General Medical Center in Buffalo, N.Y., discovered making the most of new technology requires education of physicians, technologists and even nurses when installing 14 new Infinix™-i cardiovascular radiography systems from Toshiba America Medical Systems, Inc.

The rapid pace of the installation, as well as its large scale, required the development of a training plan that needed to be completely tailored to meet GVI's specific needs, says Andrea Weaver, X-ray, vascular clinical applications manager in Toshiba's Business Operations group. "The old hospital was closing its doors, and Toshiba had to not only ensure that its equipment at the new facility was installed properly, but that everyone at GVI understood how to best use the systems," she says. "We worked as a team to make sure that when the old hospital's lights went off and GVI's

turned on, everyone was ready to go without missing a beat."

President and CEO of Kaleida Health Jim Kaskie, describes the GVI as "a one-of-a-kind facility." As Lorie Mariano, M.S., R.T., director of procedural services for Kaleida Health, explains, "We designed a vascular center that combined the services of a large tertiary-care hospital in Buffalo with another hospital of ours that was closing and that had been doing a lot of vascular work. On one floor in the new facility there are 15 vascular laboratories (14 of which are from Toshiba) that constitute a shared environment. We're able to share staff, and the physicians can collaborate and do hybrid procedures on patients, all in one setting."

The facility's multidisciplinary focus is unique, Kaskie says, and Toshiba collaborated with the team at Kaleida to make the new venture work in a short time frame. "Never before have I heard of all these disciplines coming together in one facility, sharing labs and space ... The team from Toshiba all came to the table to work with us."

FAST START

The order for the vascular laboratories was placed in November 2011, and the new facility opened to patients on March 26, 2012. Weaver says, “We were turning over a large number of systems very quickly. We had to plan how best to train the staff—which included nurses, technologists and physicians—as quickly as possible.”

Mariano estimates that 150 caregivers required training from Toshiba’s team, including around 40 physicians, 25 technologists and more than 50 nurses (who “needed to be familiar with the equipment to be comfortable getting patients on and off the table, particularly in the event of an emergency,” she notes). An additional challenge was the multispecialty and multimodality scope of the new center, which called for a sophisticated training plan to ensure that every clinical angle was covered.

“They were combining neurology, cardiology, electrophysiology and vascular in one space,” she explains. “They were also getting a new feature, the Vitrea Enterprise Suite from Vital Images (Minnetonka, Minn.), which offers access to 3D images anywhere within the facility.”

TRAINING PLAN

Weaver and her team developed a comprehensive training program for GVI that stretched from one week before the equipment went live in March until the last week of May. The plan included enrolling 10 GVI technologists in Toshiba’s off-site vascular class prior to opening day. This was critical to ensure a portion of the technologists had extensive uninterrupted hands-on training. “One of my key objectives



Gates Vascular Institute, Buffalo, NY.

was to get to know the key players and build the relationship,” she recalls. “This represented two facilities joining together, so we started by observing the workflow at both sites: who controlled the equipment in the room, who was in the control room, how the physicians worked, and the programs and protocols they were using to image their patients.”

During this observation period, Weaver noticed that the Kaleida team had a unique workflow in which technologists monitored the patient from the control room while the nurse and physician worked at the table to control the equipment. “That workflow didn’t fit into Toshiba’s typical training, so we needed to customize our approach,” Weaver says. “Because GVI was replacing such a large number of systems, we needed to understand the image quality they were used to working with. At GVI, personnel also are very dose conscious. We chose to be proactive and get a look at their existing image quality and what dose settings they were used to having so we could

get those right—from the beginning.”

Mariano worked with Weaver to facilitate the training process for GVI’s staff. “We rotated the staff members through multiple stations; some had scheduled times, and for the physicians, we had both scheduled and open times to accommodate their schedules,” she recalls. “Andrea had a team of resources available throughout the laboratories, and we have different configurations in each, so staff could learn the nuances.”

The support from Toshiba tapered gradually over the next eight weeks, Mariano says. “The first week, Andrea even had Toshiba staff on call in case we got called in at night,” she says. “She then ramped down slowly. There was a lot of support, for quite a while, as she determined



which members of the staff needed extra help and provided additional support to them.”

The team from Toshiba also helped to facilitate the configuration of the new equipment within the facility, according to Nick Hopkins, M.D., chief of neurosurgery for the new institute. “They were instrumental in helping us

determine what configuration would work for this conglomerate of multiple specialties coming together to create the Gates Vascular Institute,” he says. “They were our partner in working with us to figure out what was going to work for our cardiologists, for our radiologists and for the combined unit.”

LAUNCHING THE LABORATORIES

Weaver notes that the biggest goal of Toshiba’s training program was to ensure that the caregivers at GVI could accommodate their usual volume immediately. “When you are training large numbers of staff at one time within the same institution, there are big challenges, and the biggest is making sure the customer has the needed skill set before going live on day one,” she says.

David Croston, corporate vice president of Kaleida Health, says Toshiba was instrumental in meeting this goal. “Toshiba brought in a team of highly qualified individuals that were really top-notch,” he notes. “They maintained an incredible schedule, day in and day out. Everyone was very aware of the timelines we had to hit and the benchmarks we were after.”

The comprehensive, customized training plan was proven successful on the very first day that the new vascular institute was open to patients, Mariano says. “When we opened on March 26, we planned on taking just a couple of patients in each modality that day,” she says. “The minute the physicians got to work, though, they said that they might as well do 12 cases, instead of four. We were planning to ramp up slowly, but the patient flow took off because there were no complications. It all went very smoothly.” **D**



Reliability and Performance: Workhorse Imaging Technology Goes the Extra Mile

By Cat Vasko

Today's imaging facilities and departments are under more pressure than ever before to maximize equipment uptime while delivering superior service to patients and upholding high standards of clinical quality. For these reasons, the reliability of imaging equipment—a multifactorial issue that includes its patient friendliness, durability and ease of maintenance—has never been more important.

Diane Ruhlman, executive director of Thumb MRI Center in Cass City, Mich., summarizes the changing service ethic of the imaging center: “We are open seven days a week, and we offer the best times that we can every day, so that people who work different shifts can undergo imaging at a time convenient for them. We want to accommodate everyone,” she says.

Christopher Hedley, M.D., medical director of imaging services at Huntington Hospital

in Pasadena, Calif., notes that in today's hospital environments, imaging equipment is often expected to do double duty. That has been the case at Huntington Hospital, where an Aquilion™ ONE CT system from Toshiba America Medical Systems, Inc. serves not only the Level II trauma center's emergency department patients but also its patients from the radiology, cardiology, neurology and pediatric departments. “It's our workhorse,” Hedley says. “We use it for everything.”

THE ROLE OF THE WORKHORSE

It's not surprising that reductions in reimbursement for imaging—as well as increases in equipment utilization—have created an environment that requires workhorse technologies that can accommodate the maximum possible number of patients and clinical scenarios.

“We have a lot of patients who are claustrophobic or of large size and need more space to be comfortable,” Ruhlman says. The need to serve these patients led to Thumb MRI Center’s selection of the Vantage Titan™ MRI system from Toshiba, which offers a 71-centimeter patient aperture. “We’re in a rural, underserved area so we can only justify one MRI system. The Titan gives us the high-field capabilities we need to get high-quality images, as well as the large opening for patients,” Ruhlman adds.

Hedley echoes Ruhlman’s sentiments, noting that a workhorse CT system accommodates Huntington Hospital’s existing service lines while creating the potential for new ones. “The plan was to use it for everything: We’re a stroke center, so we thought the advantages of getting the entire brain volume

with the 320-detector row system would be crucial to our neurologists,” he says. “With trauma, stroke and the hope of someday initiating a cardiac service line, we use the system constantly.”

The role of the workhorse is not limited to high-tech imaging modalities. At Le Bonheur Children’s Hospital in Memphis, Tenn., three RADREX™-i DR systems serve both inpatients and patients in the emergency department. Mildred Willis, manager of radiology, says, “In the emergency department, in a single day, we probably see a hundred patients on the RADREX. What we like best about it is that we don’t have to leave the patient’s side to change the imaging technique on the fly. We can do everything at the tube head.”

Willis notes that Le Bonheur Children’s Hospital’s DR systems need to be particularly



Aplio Artida.



Infinix-i biplane.

versatile because of the size range of the hospital's patients. "Any child who comes through our emergency department is likely to get a radiograph," she says. "Those patients could be any age, from just born to 18 years old. We get the whole size range of kids."

MAINTENANCE AND UPTIME

When equipment is being used so heavily, uptime is of critical importance. There might be no better test case for equipment uptime than the Oregon Institute of Technology, or OIT, in Klamath Falls, Ore., where sonographers in training put Aplio™, Xario™ and Aplio Artida™ ultrasound systems from Toshiba through their paces as part of a grueling educational schedule. Barry Canaday, assistant professor and program director of echocardiography at OIT, says, "The machines are on from the moment someone

walks in, on Monday at 9 a.m., and they run until all the students have left, at 11 p.m. The students are usually working with the scanners on weekends as well."

OIT's ultrasound systems are in constant demand, and on top of that, Canaday says, they can be treated roughly by students who are still learning. "We work our systems hard," he says. "These platforms have done really well; they're very reliable systems. I would use the word bombproof."

Maintenance plays a critical role in extending the lifespan of equipment. In 1994, Rady Children's Hospital in San Diego, Calif., installed a new vascular laboratory from Toshiba; the bi-plane digital catheterization laboratory was one of the first of its kind and was only decommissioned recently, after 18 years of

“ We don’t have a lot of room for downtime. We need good throughput. Toshiba’s equipment is very reliable, and the uptime is great. ”

Mildred Willis, manager of radiology,
Le Bonheur Children’s Hospital

service, according to John Moore, M.D., M.P.H., director of the hospital’s division of cardiology. “If you do your preventive maintenance and take care of your equipment, it will continue working,” he says. “The last day we used the laboratory, it was working fine, and for a pediatric laboratory, it was very well used—we used it every day, for multiple cases and long periods of time.” A new Toshiba lab will be installed at Rady Children’s.

When imaging technology does break down, fast, effective maintenance is also critical to preventing interruptions in patient care. “If the Toshiba people are already here checking on the CT system we have, I can always ask them to take a look at any problem we’re having with the RADREX, and they make themselves available to help us,” Willis says. “We don’t have a lot of room for downtime. We need good throughput. Toshiba’s equipment is very reliable, and the uptime is great.”

Hedley concurs. “The really crucial factor, when you talk about equipment reliability, is the level of service you get,” he says. “When we have a problem with the Aquilion ONE, which is rare, Toshiba can address it in a matter of hours.

We really can’t afford to be down, so that has made us very happy.”

A PREMIUM ON CARE

All five organizations emphasize the patient-care potential of reliable imaging equipment that offers optimal uptime. “Once our students start using the Artida, they don’t go back,” Canaday notes. “The keyboard is different from those of other models, and it has different menu structures, but once they get used to it, they prefer it because it images better.”

At Huntington Hospital, where the Aquilion ONE scans 70 to 75 patients on an average day, most CT exams are performed in a matter of minutes, offering all patients access to the advanced imaging capabilities of the 320-slice system. “We complete the exams quickly, and that helps us use the system for everything,” Hedley says. “Today, we only use our other CT system for extreme overflow or for our CT-guided procedures. The Aquilion ONE has been very reliable, and the service is impeccable.”

At Rady Children’s Hospital, the installation of the Toshiba bi-plane catheterization laboratory in 1994 was sufficiently groundbreaking that a member of the cardiology staff wrote an article¹

“ With image view at the tube, you can change your exam and technique while in the room — and in the pediatric world, not having to leave the patient is huge. ”

Mildred Willis, manager of radiology,
Le Bonheur Children’s Hospital

on the room's design. "Before the time of hybrid procedures, echocardiography machines and CT scanning, catheterization laboratories were very large rooms, and it's better, in pediatrics, to use a bi-plane (rather than a single-plane) laboratory," Moore says. Bi-plane laboratories offer improved dose reduction when compared with single-plane laboratories, and decrease total exam time. Moore adds, "The laboratory lasted a long time; it just kept working."

Willis notes that the design and durability of the RADREX-i enable the caregivers at Le Bonheur Children's Hospital to provide optimal care to even the smallest patients. "The table tracks up and down and has the ability to accommodate a wide range of weights," she notes. "With image view at the tube, you can change your exam and technique while in the

room—and in the pediatric world, not having to leave the patient is huge."

Ruhlman concludes that the reliability of Thumb MRI Center's Vantage Titan system (coupled with its impressive clinical capabilities) enables the imaging center to provide patients with personalized service. "We don't have to push people through; we're able to provide a relaxed atmosphere," she says. "We can scan efficiently without having to give up the coffee-and-tea time to talk with the patient about what he or she needs." **D**

Reference

1. Mathewson JW. *Building a pediatric cardiac catheterization laboratory and conference room: design considerations and filmless imaging. Pediatric Cardiology. 1996;17(5):279-294.*



RADREX-i.

Vital Is Honored for Exceptional, Transparent Customer Support

By Cat Vasko



In June 2012, Vital Images, Inc., in Minnetonka, Minn., a Toshiba Medical Systems Group company, announced that it has been certified under the J.D. Power and Associates Certified Technology Service and Support ProgramSM for the third consecutive year. Jason Aufderheide, director of customer support at Vital, explains that the program from J.D. Power in Westlake, Calif., recognizes Vital for providing “an outstanding customer-service experience.”

PROVEN RESULTS

The effectiveness of Vital’s approach is validated by the stringent TSIA/J.D. Power certification process. “Our internal processes and surveys give us the predictability to know we’re going to get good results,” Aufderheide says.

Aufderheide notes that providing optimal service is more important now than it has

ever been. “Hospitals have increasing budget demands. If we maintain a high standard of service in support, it makes it much easier for personnel to use Vitrea[®] solutions—and, by extension, complete their work—efficiently and effectively.”

The ultimate goal is improved patient care, he concludes. “Having someone on the other end of the line to work through a problem and get to a resolution goes hand in hand with care. We provide the answers that imaging staff needs to help with care delivery.”

Aufderheide notes that the J.D. Power certification process has two components. In order for the company to survey Vital’s customer base, Vital first has to pass an audit from the Technology Services Industry Association, or TSIA, in San Diego, Calif. “TSIA comes in and audits all of our support practices and measures

them against best practices,” he says. “If you pass, you are allowed to take the next step, which is being surveyed by J.D. Power.”

SERVICE ETHIC

Vital, which provides 3D advanced visualization and data management solutions, has always maintained a strong commitment to service, Aufderheide says. “Hospital networks are very complex, and it can be difficult for our customers to isolate the root cause of an issue,” he reports. “In the imaging business, so much of our customers’ income is based on how efficiently they can use our product; if they can’t overcome a snag quickly, it has an impact on the bottom line.”

The company had already performed its own internal audits of its support team, but pursuing the J.D. Power certification and the accompanying TSIA evaluation led to the formalization of its support processes, Aufderheide notes. The result was a consistent and scalable operation that easily expanded to cover a broader customer base following the company’s acquisition by Toshiba Medical Systems Corporation. “We were able to continue serving our customers in the same way, with the same processes, even as the customer base grew,” he says. “The TSIA audit was a springboard allowing us to create the infrastructure we have today.”

The company continues to survey every support interaction with customers to learn which facets of its service are most important to them. “The top priority that we keep hearing about is speed to engagement on an issue, which actually ranks higher than speed to resolution,” Aufderheide says. “Customers know

that product issues can be complex, but they don’t want to wait on the phone or stand by for a return email. As a result, we watch our service levels to ensure that we answer 80 percent of calls in 20 seconds or less.”

LESSONS LEARNED

Aufderheide says that he and his team have learned several lessons about service and support that are applicable to providers working to improve patient satisfaction. The most important of these, he says, is to establish (and be transparent about) expectations.

“A big service differentiator, for us, has been the creation of our service manual, which outlines what are considered our standard practices for our customer interactions,” he says. “If customers have unrealistic expectations from the beginning, it’s hard for them to know when we have gone above and beyond.”

For instance, Aufderheide says, by publishing its average response times, the support department is able to help customers understand how rapidly service really can be provided (while maintaining the company’s commitment to them). “We do the same things we’ve always done, but now, our customers have a better idea of when we are going the extra mile,” he says.

Surveying customers is also critical: In Aufderheide’s work, as well as in healthcare, there is no other way to understand the impact on outcomes, he notes. “The only way we can know the outcomes of our interactions with customers is to ask them,” he says. “After all that surveying, we know for sure what areas we need to focus on to provide customers with the best possible outcomes.” **D**

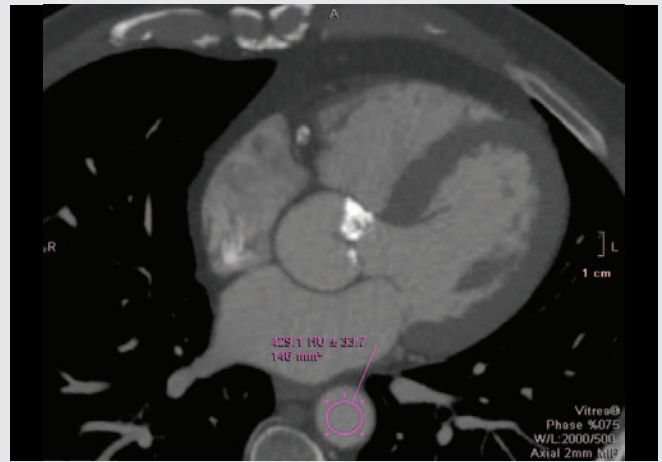
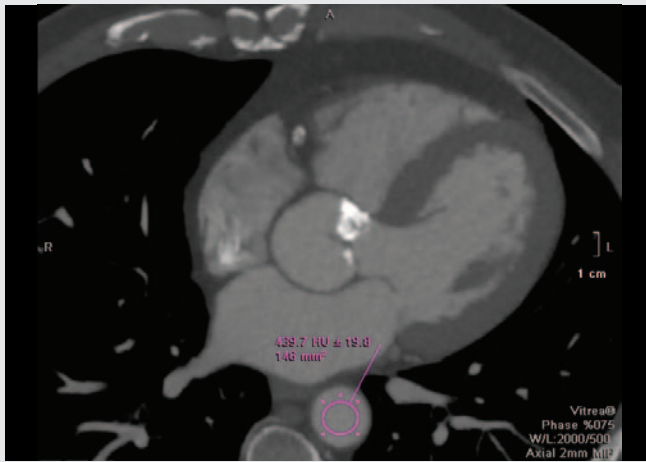


Figure 1: Axial CT image at the level of the aortic valve reconstructed by ADR 3D (left) and FBP (right). The ADR 3D image demonstrating much lower noise (19.8 vs 33.7) without significant difference in the signal (439.7 vs 429.1 HU) at the descending aorta as compared to the FBP image. SNR ADR 3D=22.2, SNR FBP=12.7. Routine coronary imaging at our institution uses ADR and a reduced tube current determined by the attending physician. Alternatively, automated tube current reduction can be achieved with ^{SURE}Exposure. For this patient, the total (including topograms and bolus tracking) radiation dose (0.14 conversion factor) was approximately 2.5 mSv, in keeping with our routine radiation exposure.

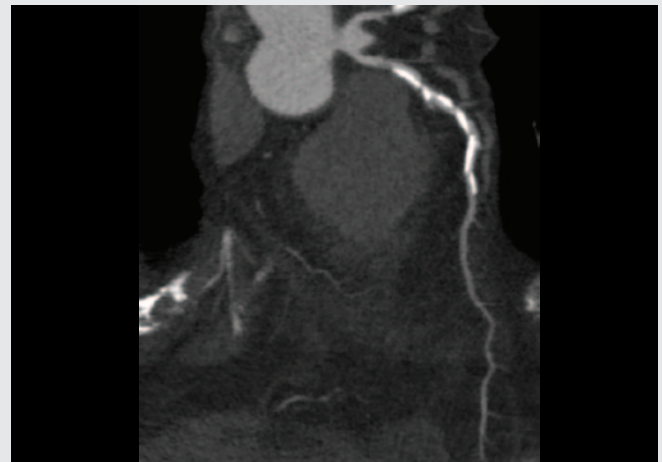
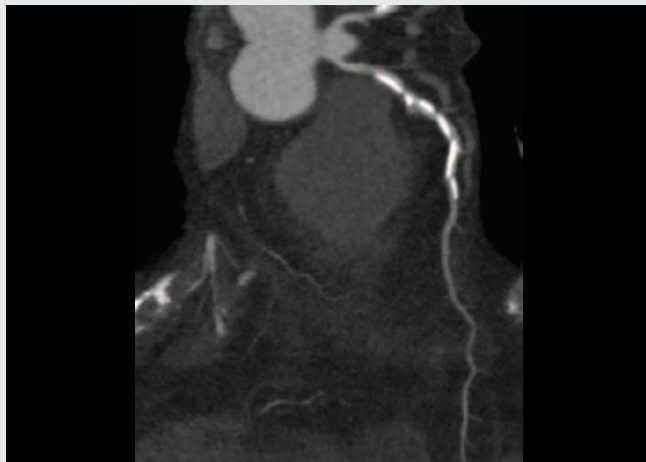


Figure 2: Image of a reformatted coronary artery generated by ADR 3D (left) and FBP (right) algorithm. Using 100 kV, radiation dose is less than 2 mSv.

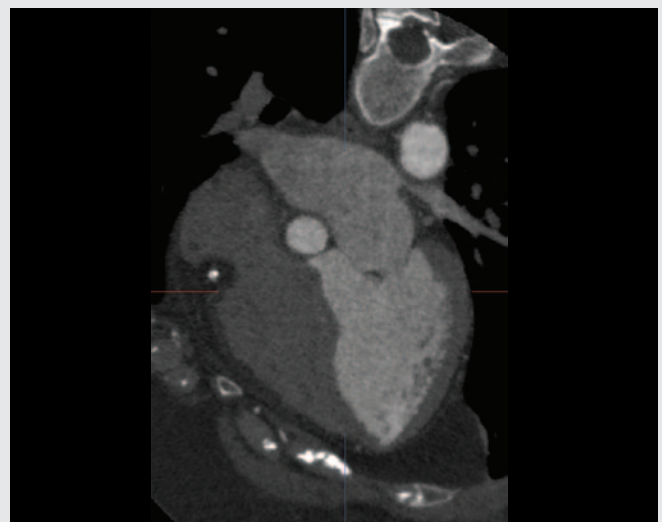
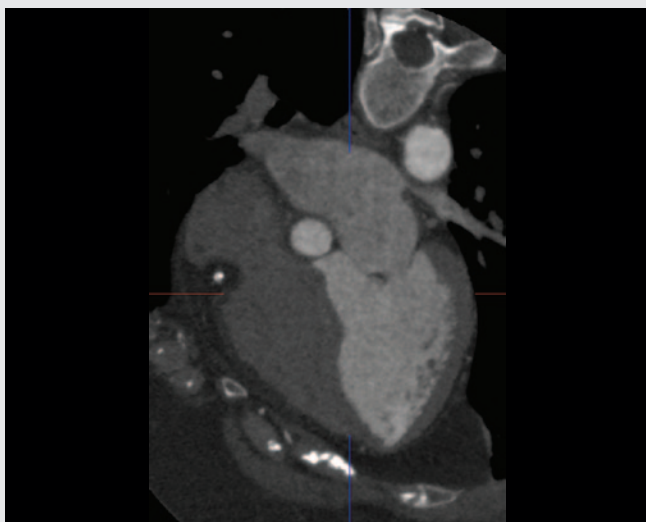


Figure 3: 4-chamber reformatted view of the heart, comparing the ADR 3D reconstruction (left) and FBP reconstruction (right). The image on the right has higher noise when compared to the image on the left.

AIDR-3D: Radiation Dose Reduction for Routine Clinical Imaging

Elizabeth George, M.B.B.S.¹, Kanako Kumamaru, M.D., Ph.D.¹, Kurt Schultz, R.T.², Frank J. Rybicki, M.D., Ph.D.¹

¹ Applied Imaging Science Laboratory, Department of Radiology, Brigham and Women's Hospital, Boston, MA 02115

² Toshiba Medical Research Institute USA, Vernon Hills, IL 60061

INTRODUCTION

There is a growing concern about the increasing utilization of imaging modalities and the resulting ionizing radiation exposure. The NIBIB/NIH Summit on the Management of Radiation Dose in CT held in February 2011 brought together experts in the CT community to identify the steps required to reduce the effective doses associated with most routine CT examinations to a level below the average annual dose from naturally occurring sources of radiation. They opined that this would require innovations in X-ray sources, detector technology and image reconstruction, data collection schemes and post-processing. Some of the existing and increasingly available techniques such as automatic exposure control, optimization of tube potential, beam-shaping filters, dynamic z-axis collimators, noise reduction, iterative reconstruction and post-processing algorithms have reduced the effective dose by a factor of two to four relative to the typical doses (1).

ITERATIVE RECONSTRUCTION

Iterative reconstruction involves generation of an initial estimate of the object being imaged from the acquired projection data using conventional filtered back projection (FBP) reconstruction method. The algorithm then generates a new set of projections from this FBP image and compares the simulated projections with the actual acquired projections, and uses the difference to update the initial image. This process is repeated until there is only an acceptably small difference between the actual and simulated projection. Iterative reconstruction reduces noise and artifacts, and provides higher spatial detail. This algorithm is useful when photon counts are low, enabling lower dose imaging, and also when projection data is incomplete, inconsistent or corrupted, as occurs with view truncation, metallic implants, etc. (1).

The AIDR 3D algorithm has been designed to work in both the three-dimensional (3D) raw data and reconstruction domains. First, within the raw data domain, adaptive photon noise reduction is achieved by using a statistical noise model and a scanner model. The statistical modeling characterizes both electronic and quantum noise patterns in projection space. The

scanner model analyzes the physical properties of the CT system at the time of acquisition. Second, an iterative technique optimizes reconstructions for the particular body region being scanned by detecting and preserving edges while simultaneously smoothing the image. Finally, a weight blending with FBP is added to maintain granularity and produce a natural-looking image (2). AIDR 3D Integrated is the third generation of Toshiba iterative reconstruction technology and has been fully integrated into the system design so that dose reduction is achieved automatically for tube current modulated studies.

CLINICAL APPLICATIONS

AIDR 3D is expected to have extensive clinical applications, especially in cardiac CT, pediatric imaging, dual energy CT, body perfusion CT and potentially in the trauma setting (2). As a recently introduced technology, though there are limited studies which have evaluated the effectiveness of AIDR 3D on dose reduction and image quality in the clinical

setting, the initial results appear promising.

Yamada et al (3) compared the image quality with FBP, AIDR (first-generation Toshiba iterative reconstruction technology) and AIDR 3D reconstruction algorithms in low dose setting and FBP in high dose setting in chest CT. AIDR 3D reconstructed images showed significantly reduced objective image noise and significantly increased signal-noise ratio (SNR) in all regions of the lung and mediastinum when compared to FBP reconstruction while allowing for a mean 64.2% dose reduction. The AIDR 3D images were also significantly superior (in terms of objective noise and signal to noise ratio) to the same low dose AIDR reconstructed images. While the AIDR reconstruction of the low dose images were significantly superior to the FBP reconstruction in all regions of the lung and mediastinum, they were comparable to the FBP reconstruction of the high dose images in some regions of the chest and superior in certain others.

Tomizawa et al (4) showed that in coronary CT angiography, AIDR 3D reconstruction, with

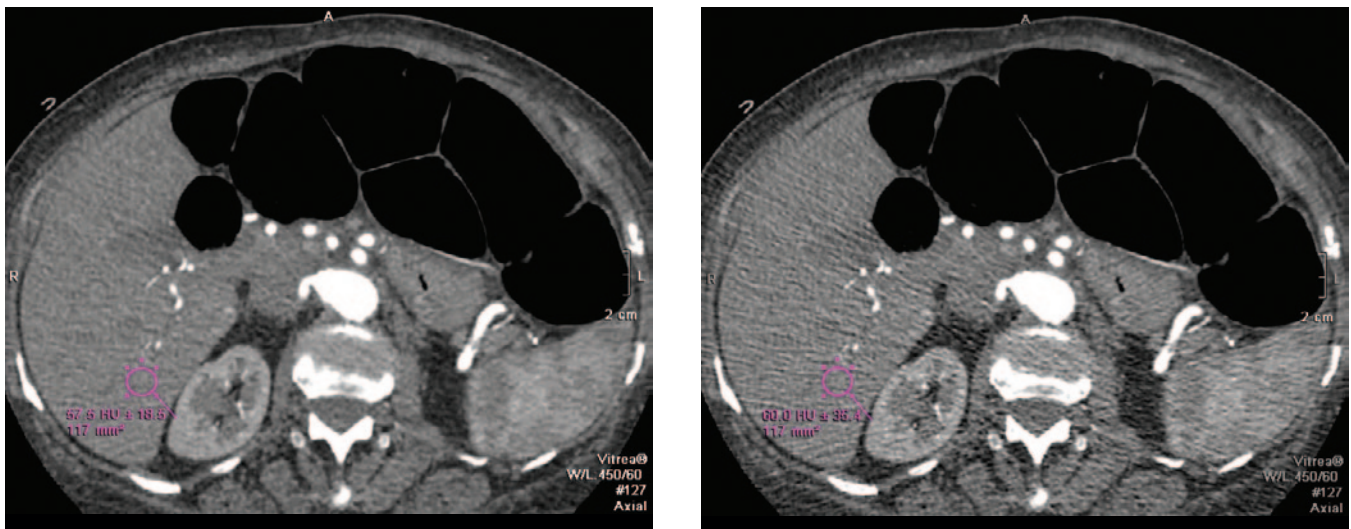


Figure 4: Axial image of contrast-enhanced CT of the abdomen in arterial phase, generated by AIDR 3D reconstruction (left) with much lower noise (18.5) compared to FBP reconstruction (right) with a noise level of 35.4. The signal on the AIDR 3D image is only mildly lower than that of the FBP image (57.5 vs. 60.0 HU), resulting in much higher SNR for AIDR 3D as compared to FBP (3.11 vs. 1.69).

a 22 percent lower median radiation dose, generated images that were not significantly different in objective or subjective quality when compared to FBP reconstruction. Another study (5) assessing image quality with AIDR 3D and FBP reconstruction in coronary CT angiography demonstrated that AIDR 3D reduced image noise by 39 percent without affecting CT density, thereby improving SNR and contrast- noise ratio (CNR). Subjective image quality was also significantly better with AIDR 3D, with better interpretability of mid and distal segmental classes.

Improved image quality achieved by AIDR compared to FBP has also been demonstrated in Hepatic Perfusion CT (6) and CT coronary

angiography (7). Large prospective studies are required to further clarify and document the image quality and dose reduction achieved by iterative reconstruction technology in various CT imaging protocols.

CONCLUSION

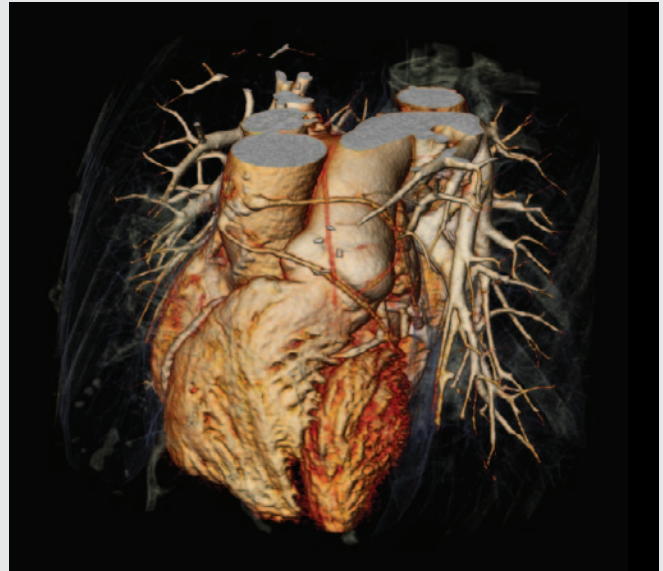
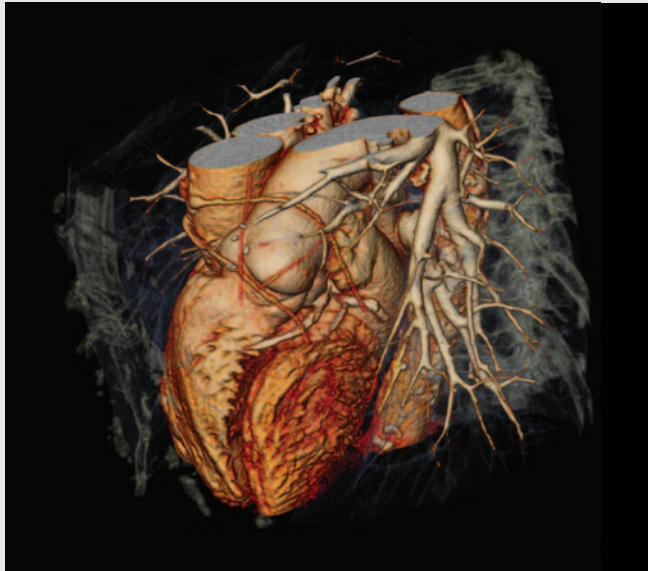
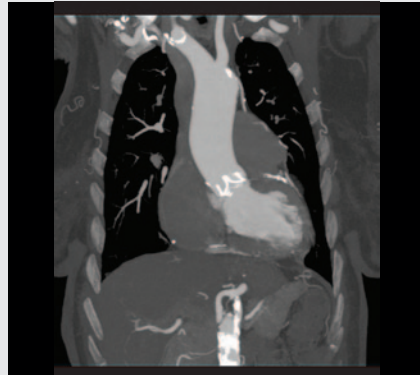
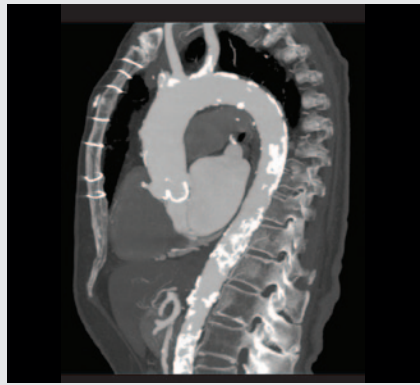
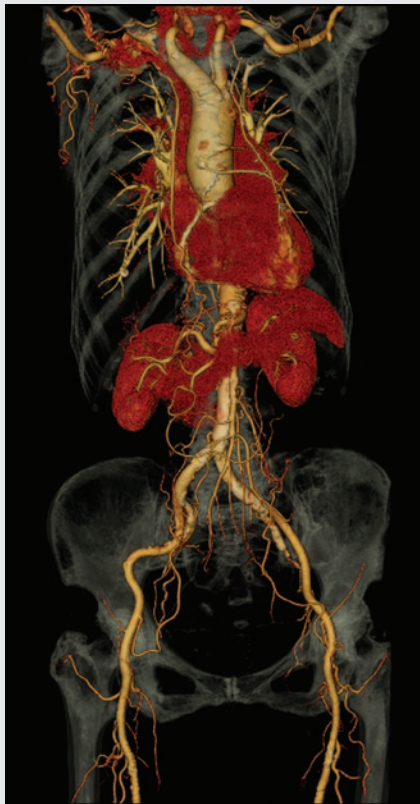
Iterative reconstruction methods for CT, although described over a decade ago, remained inapplicable to routine clinical use due to long reconstruction times. Modern technology has now enabled the full integration of this algorithm into the imaging chain to ensure automatic CT dose reduction while maintaining spatial resolution and image quality for clinical diagnostic purposes with no significant difference in image processing time. **D**





Dr. Elizabeth George received her medical degree from the All India Institute of Medical Sciences (AIIMS), New Delhi, India. She has received multiple awards from the government of India and was a member of the Indian delegation selected to attend the 61st Meeting of Nobel Laureates and Researchers at Lindau, Germany, in 2011. Dr. George is currently a Research Fellow at the Applied Imaging Science Laboratory, Department of Radiology, at the Brigham and Women's Hospital.

References

1. McCollough CH et al. Achieving Routine Submillisievert CT Scanning: Report from the Summit on Management of Radiation Dose in CT. *Radiology*. 2012 Aug; 264(2):567-580.
2. Irwan R et al. AIDR 3D - Reduces Dose and Simultaneously Improves Image Quality. http://www.toshiba-medical.eu/upload/TMSE_CT/White%20Papers/White%20Papers/Toshiba_White%20paper%20CT_nov11.pdf?epslanguage=en
3. Yamada Y et al. Dose reduction in chest CT: Comparison of the adaptive iterative dose reduction 3D, adaptive iterative dose reduction, and filtered back projection reconstruction techniques. *Eur J Radiol*. 2012 Aug 7. [Epub ahead of print]
4. Tomizawa N et al. Adaptive iterative dose reduction in coronary CT angiography using 320-row CT: Assessment of radiation dose reduction and image quality. *J Cardiovasc Comput Tomogr*. 2012 [Epub ahead of print]
5. Yoo RE et al. Image quality of Adaptive Iterative Dose Reduction 3D of coronary CT angiography of 640-slice CT: comparison with filtered back-projection. *Int J Cardiovasc Imaging*. 2012 Aug 26. [Epub ahead of print]
6. Negi N et al. Hepatic CT perfusion measurements: A feasibility study for radiation dose reduction using new image reconstruction method. *Eur J Radiol*. 2012 May 19. [Epub ahead of print]
7. Tatsugami F et al. The effect of adaptive iterative dose reduction on image quality in 320-detector row CT coronary angiography. *Br J Radiol*. 2012 Aug;85(1016):e378-82.



Scan Mode	Collimation	kVp	mA	HP	Rotation Time	Scan Range	Dose Reduction	CTDIvol	DLP	Effective Dose (k Factor = 0.014/0.0145*)
Volume	0.5 mm x 280	100	300	N/A	0.35 s	140 mm		2.8 mGy	38.6 mGy-cm	0.54 mSv
Ultra-Helical	0.5 mm x 80	100	SURE ^{EX} Exposure	111	0.35 s	633 mm		5.1 mGy	355.5 mGy-cm	5.1 mSv

*AAPM report no. 96.

CTA for TAVR Planning

HISTORY

86-year-old female patient, candidate for Transcatheter Aortic Valve Replacement (TAVR) procedure. A cardiac CTA, followed by a CTA Aorta and TAVR planning protocol, was ordered to evaluate the access route, obtain detailed information of the aortic annulus diameters, the relation between the annulus and the coronary arteries, and identify the appropriate size of the device.

TECHNOLOGY

Volume acquisition with ^{SURE}Cardio™ Prospective and real-time beat control; Ultra-Helical scanning without any field-of-view (FOV) limitation; ^{SURE}Start™; intermittent bolus tracking; and Adaptive Iterative Dose Reduction 3D (AIDR 3D).

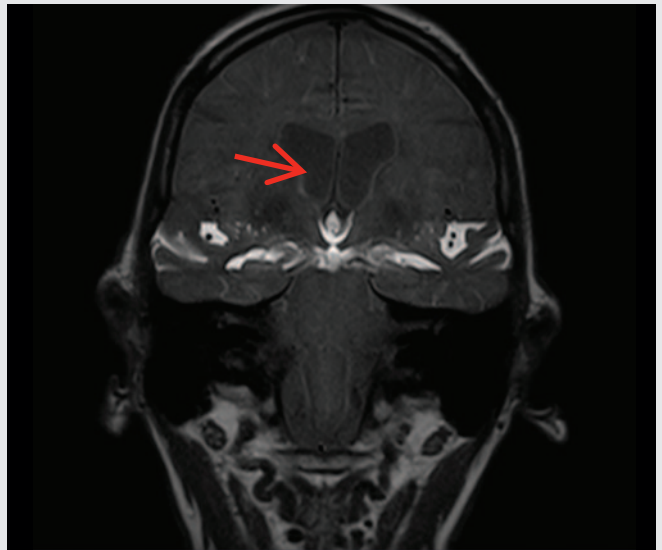
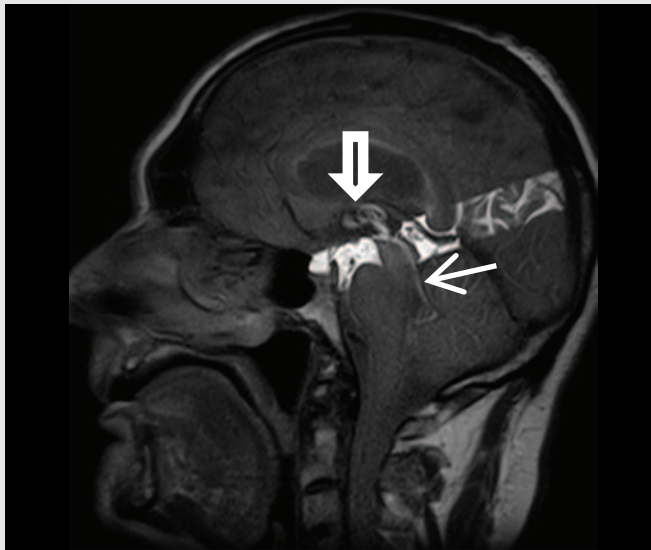
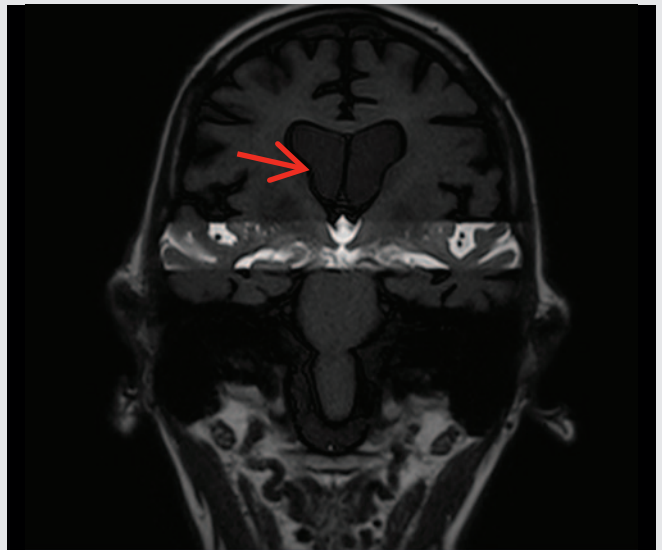
PLANNING AND ADDITIONAL FINDINGS

All aortic and iliac measurements for TAVR

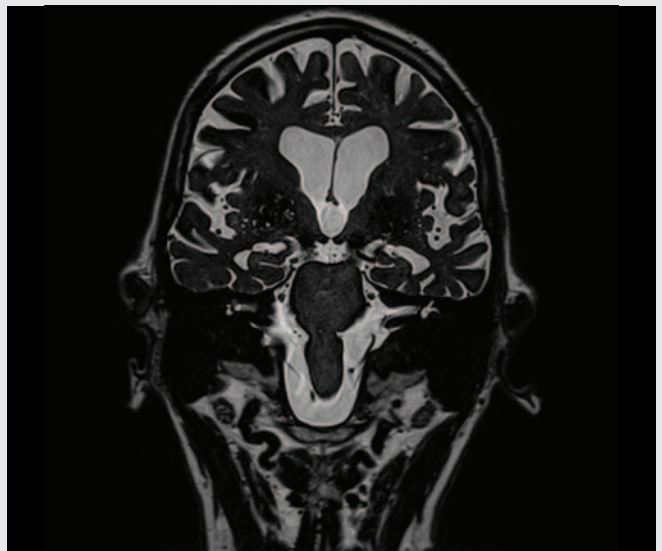
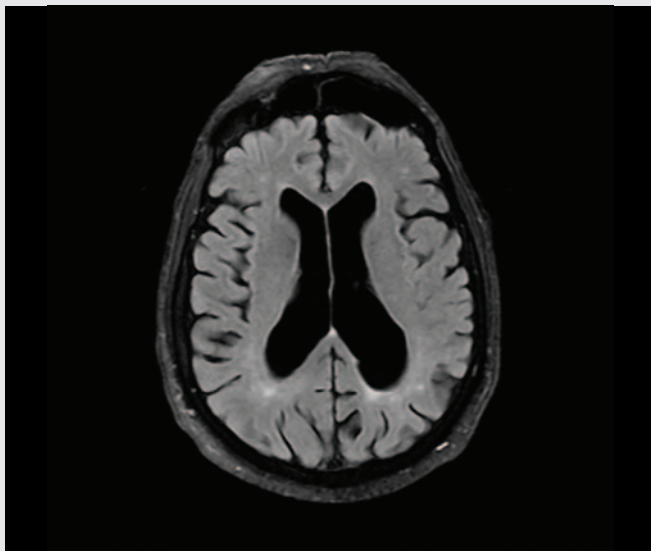
planning are performed based on multi-planar (MPR) and tridimensional volume rendered (3D VR) reconstructions as shown. Additional findings are severe three-vessel coronary artery disease with bypass graft to the left anterior descending (LAD) and circumflex (CX) coronary artery, diffuse aortic and bilateral iliac artery calcification.

CONCLUSIONS

Toshiba technology allows two ultrafast acquisitions, cardiac CTA and aortogram CT, to be performed with ultra-low dose due to the combination of prospective cardiac CTA, ^{SURE}Start, Ultra-Helical and AIDR 3D. It is a complete solution for TAVR planning offering integrated dose reduction technology for low dose, accurate and high-quality images in an accelerated workflow. **D**



The above two-panel sets are individual images taken from a cine series that was acquired over a 10-20 second period that demonstrates the movement of CSF.



Axial and coronal images were acquired to visualize the level of atrophy within the lateral ventricles.

NPH vs. Alzheimer's Disease: Cerebral Spinal Flow Imaging

DEFINITION

Alzheimer's disease and normal pressure hydrocephalus (NPH) can have similar symptomatic manifestations. Memory loss, gait disturbance and incontinence are common to both processes and can be difficult to differentiate with current imaging techniques.

HISTORY

84-year-old patient was referred to MRI complaining of difficulty expressing words and thoughts along with memory loss. Referral requested an MRI of the brain with and without contrast for normal pressure hydrocephalus (NPH). The patient denies any trauma, headaches or dizziness.

TECHNOLOGY

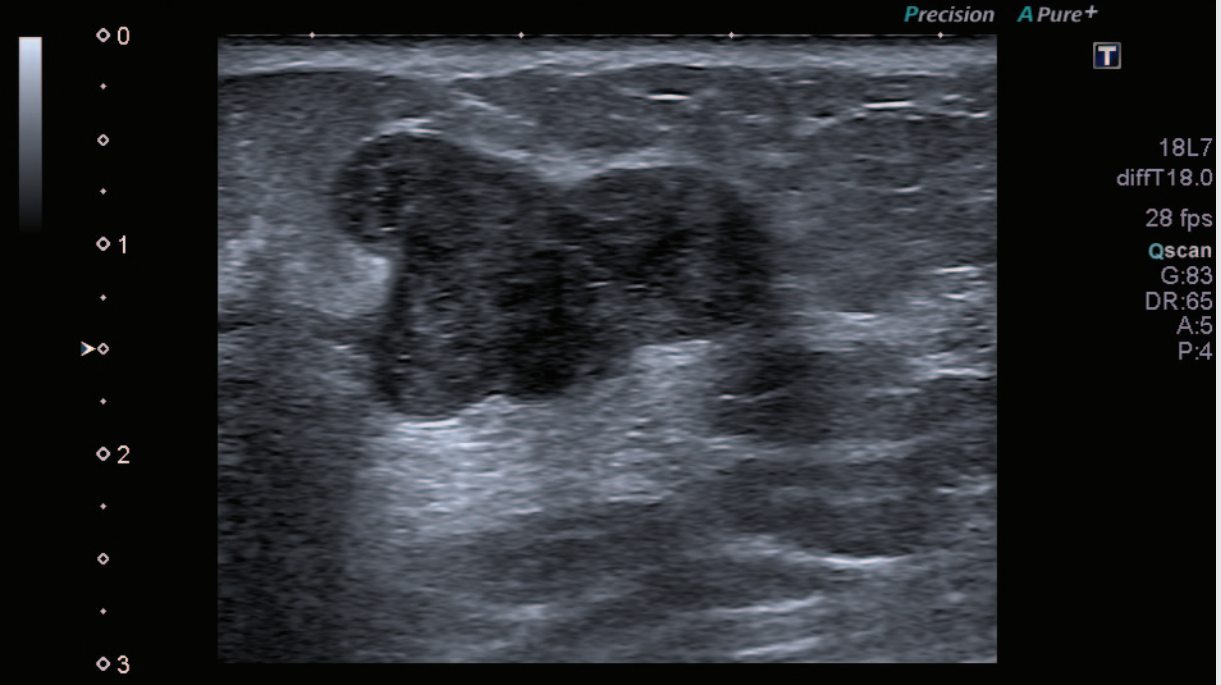
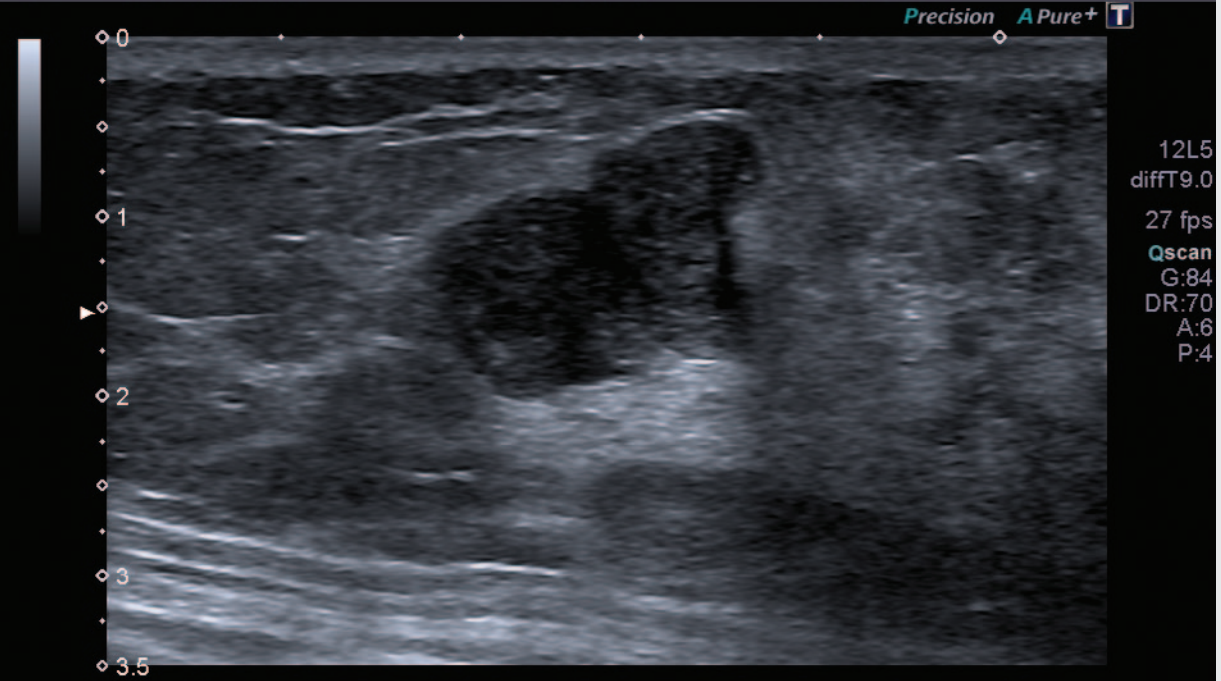
Toshiba 3T Titan MR System with M-Power software interface and neurovascular coil configuration was used. Using the exclusive Toshiba Time-SLIP technique, we are able to visualize the movement of CSF (cerebral spinal fluid) within the brain. This new imaging tool enables the radiologist to watch flow or the absence of flow to determine if the patient might benefit from a shunting procedure.

FINDINGS

The images display generalized atrophy and ventricular prominence with focal volume loss around the parahippocampal structures suggestive for Alzheimer's-type dementia.

CONCLUSIONS

Diffuse sulcal, gyral and ventricular prominence. Hippocampal atrophy noted bilaterally. These findings may be related to an Alzheimer's-type dementia pattern. A PET study may be helpful for further evaluation if indicated. No intracranial hemorrhage or intracranial tumor. MR findings appear stable when compared to the previous study of six years ago. There does appear to be some hyperdynamic flow through the third ventricle (large arrow). The aqueduct and the fourth ventricle also have flow within the structures (small arrow). This finding is seen with normal pressure hydrocephalus. Clinical correlation is suggested. There is also diffuse cortical and deep atrophy as previously described with hippocampal atrophy, which is also seen with Alzheimer's-type dementia pattern. Noted is the absence of CSF flow into the lateral ventricles suggesting the possibility of NPH (red arrow). **D**



Atypical Fibroadenoma of the Breast

HISTORY

25-year-old female presents with a palpable mass in the left breast at the 6:00 position 2 cm from the nipple.

TECHNOLOGY

Patient was imaged on the Toshiba Aplio™ 500 with an 18 MHz transducer, utilizing Differential Tissue Harmonics, Precision Imaging and ApliPure™+.

FINDINGS

On ultrasound, a lobulated solid mass with smooth borders, mildly hypoechoic, heterogeneous, with posterior enhancement was seen within the left breast, measuring approximately 2.2 cm x 1.5 cm x 1.3 cm.

Minimal vascular flow was seen within the mass. Based on the sonographic findings, patient was reassured that this atypical lesion was most likely benign and given the option to have a biopsy or follow the lesion in six months.

FINDINGS

Patient elected to have core needle biopsy, and a fibroadenoma was confirmed by pathology.

CONCLUSIONS

The advanced imaging capabilities of the Aplio 500 revealed superior detail and definition lesion characteristics, allowing the physician to confidently diagnose this lesion as an atypical fibroadenoma, saving the patient unjustified anxiety about having a malignant lesion. **D**

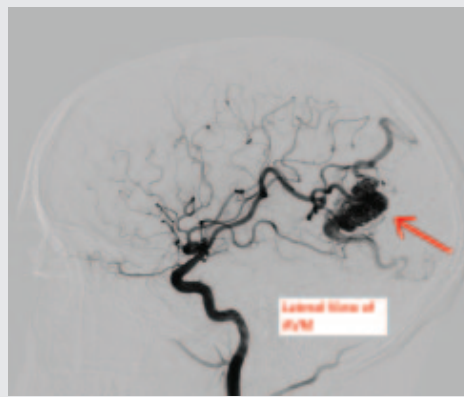
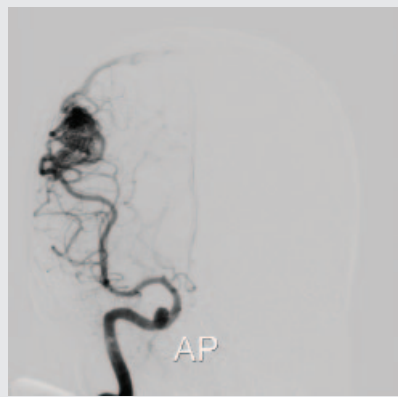


Figure 1: DSA images showing AP and Lateral View only.

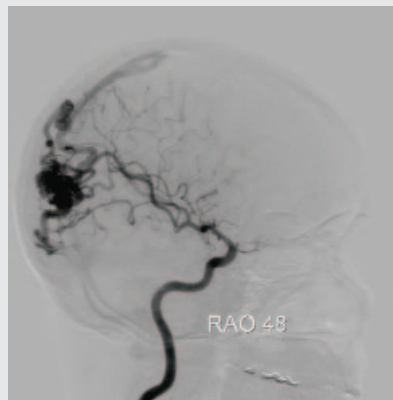


Figure 2: The images above are additional angles obtained from a 3D DSA injection.



Figure 3: Visualization of an entire volume of tissue is possible with 3D DSA imaging. The images can be manipulated and rotated to provide additional information that might have otherwise gone undetected.



Figure 4: The two above images are from the axial view in LCI imaging.

Arteriovenous Malformation: Suspected AVM and Low-Contrast Imaging

HISTORY

Female who has had headaches since childhood presents to the emergency room complaining of a pounding headache on the right side of her head. A CT scan without contrast was obtained showing a large vascular mass on the right side of her brain. The physician suspects an arteriovenous malformation (AVM).

TECHNOLOGY

Toshiba Infinix-i system uses biplane, AP and lateral (Figure 1) Digital Subtraction Angiography (DSA) with a single injection of contrast media through a catheter to delineate the lumen of the blood vessels.

FINDINGS

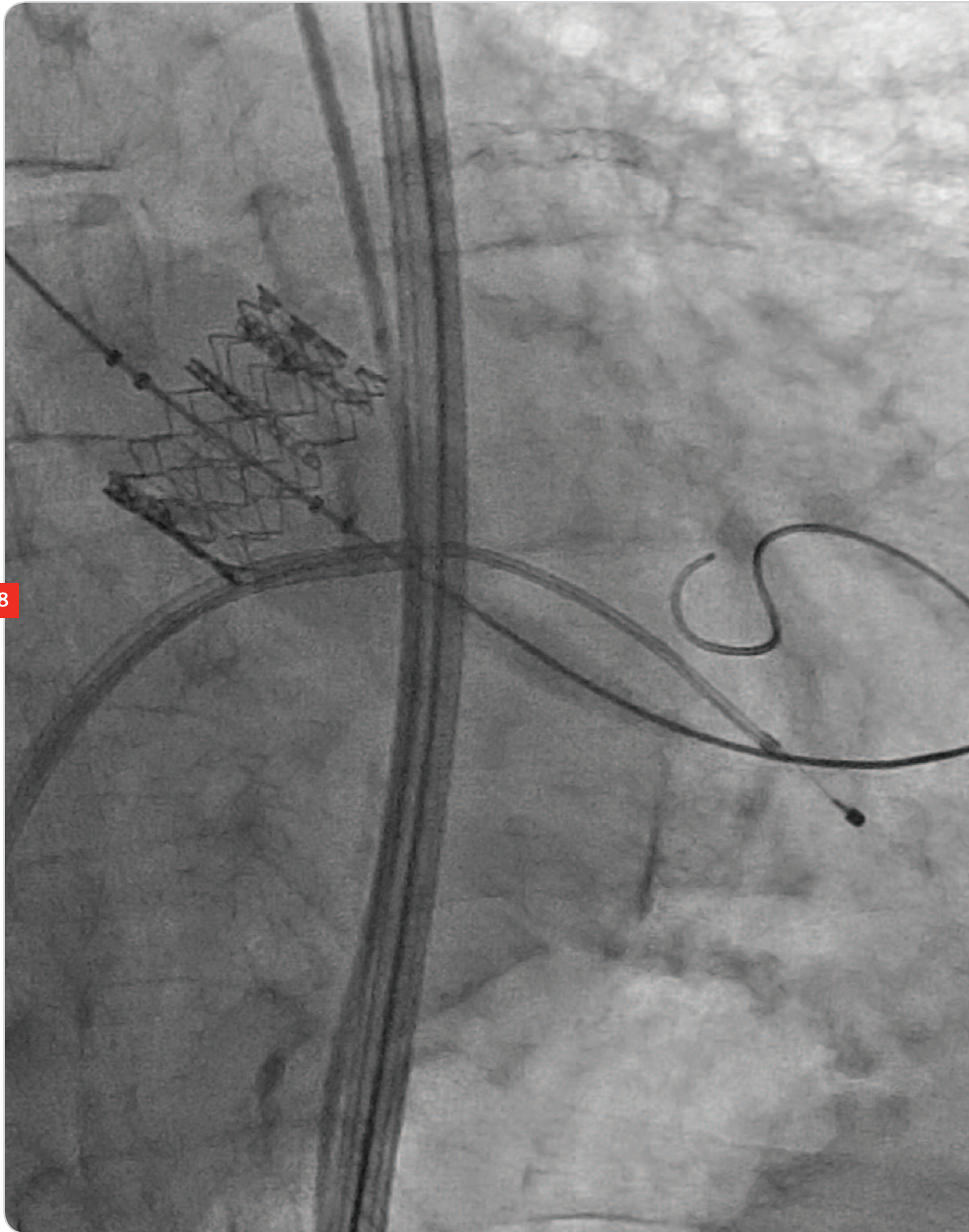
Angiographic imaging of the right internal carotid artery shows large, tortuous arteries and veins on the right side of the patient's brain. The images show an arteriovenous malformation in the brain. An AVM occurs during embryologic development in which abnormal connections of small and medium-sized arteries and veins develop in the maturing vascular spaces,

creating a direct communication between them, resulting in the lack of a capillary bed.

Due to the tortuous nature of the blood vessels in an AVM, further evaluation by 3D DSA rotational angiography (Figure 2) with three-dimensional (3D) reconstruction (Figure 3) was performed to outline the exact location of the AVM and to help determine the feeding vessels, the draining vessels and the flow pattern of the AVM. DSA and 3D DSA imaging are also useful in determining collateral blood vessel circulation of the tissue surrounding the area of the AVM. Low-Contrast Imaging (LCI, Figure 4), or CT-like imaging during the exam can reduce the need to transfer the patient to a CT scanner in suspected cases of arterial rupture or intracranial hemorrhage.

CONCLUSION

Toshiba's Infinix-i vascular systems provide technology to allow simplicity of imaging difficult pathologies, such as an AVM. 3D DSA imaging, as well as LCI, can be used to help determine the treatment plan for the patient and to reduce procedure time, thereby increasing patient safety. **D**



Partnerships: Pie Medical Imaging Software and the Infinix-i: TAVR Planning Simplified

By Cat Vasko

On May 9, Toshiba America Medical Systems, Inc. announced the integration of two new software solutions into its Infinix-i cardiovascular-radiography system: 3mensio Valves™ and CAAS A-Valve™ from Pie Medical Imaging BV in Maastricht, the Netherlands. Both solutions aid in the assessment of the aortic root for planning of Transcatheter Aortic Valve Replacement (TAVR) procedures.

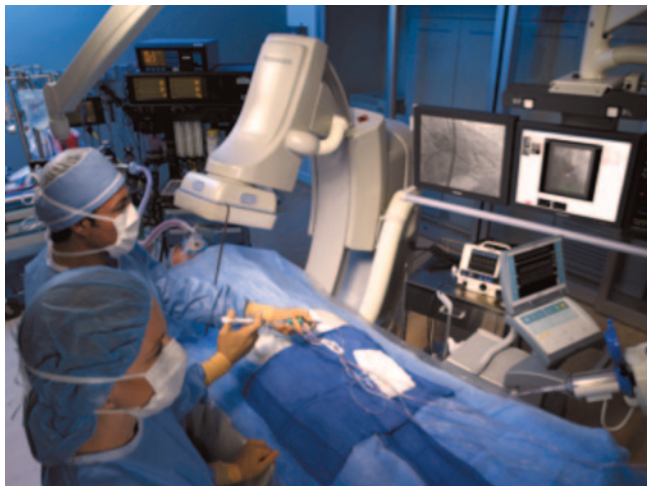
Replacing the aortic valve using a transcatheter approach is a new clinical solution for patients who are not eligible for open-heart surgery. As Allan Berthe, a senior product manager in Toshiba's X-ray Vascular Business Unit, explains, "The TAVR risk is weighed on a per-patient basis against the risk of a traditional surgery that involves a thoracotomy and the risk of treating the patient with medical therapy alone. The advantage of TAVR is that it is far less invasive than open-heart surgery. For most patients, the valve is deployed through a catheter that enters the patient via the femoral artery."

Betty Ashdown, clinical marketing manager at Toshiba, notes that preoperative assessment

is critical to determining the feasibility of the procedure. "How easy will it be to get to the heart?" she asks. "You have to assess not only the femoral artery but also the measurements of the aortic valve, ascending aorta and the angle of the aortic arch."

The 3mensio software solution utilizes a volumetric CT dataset to provide valuable assistance with pre-procedure TAVR planning, according to Tristan Slots, product manager with Pie Medical Imaging. He says, "With the CT dataset, we answer several questions. We evaluate the location and severity of arterial calcium, as the CT provides this mapping. It helps understand if a new valve can be deployed. Once that decision is made, we need to consider which is the most appropriately sized valve to use." Two sizes, 23 and 26 mm, are currently available in the U.S. for the transfemoral approach only.

Slots continues, "The software helps the physician plan the best possible outcome from the procedure; all of the anatomy is displayed by a combination of the CT data plus the



Infinix-i flexible positioning accommodates the clinical team by positioning the C-arm out of the way but right where it's needed. The integration with TAVR software provides optimal C-arm projection information during the procedures.

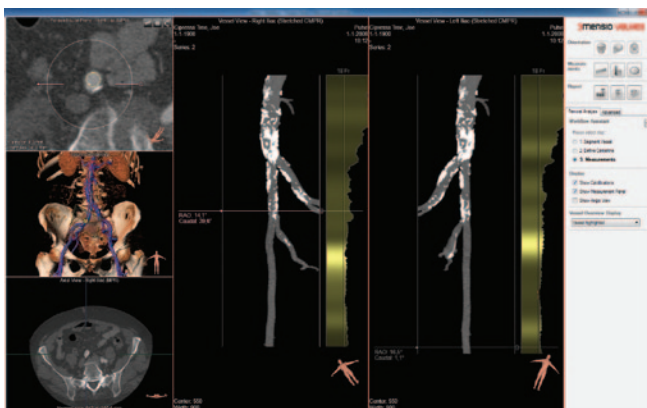
user-friendly software. We also simulate the conventional angiogram to show the aortic root as it will appear during the case.”

During the procedure, the CAAS A-Valve software from Pie Medical Imaging provides the optimal angle to view the aortic root, Berthe explains. “The software determines the optimal angle to view the aortic root, so the physicians know the correct plane for deployment of the valve,” he says. Slots adds, “The optimal angle is where the three cusps of the valve are visible and aligned. The physician can use the real-

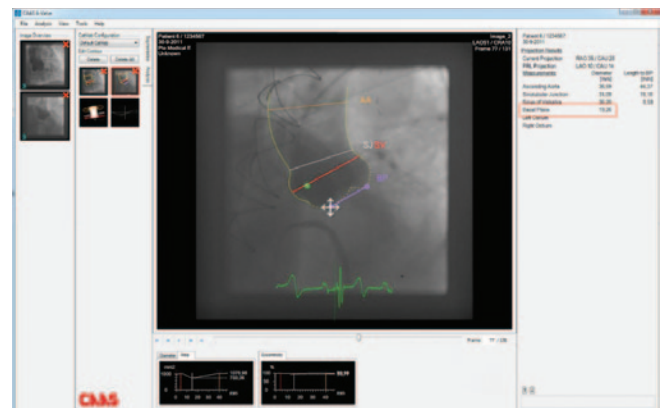
time X-ray data to check which viewing angle is best. There may be minor differences from the CT results because of how the patient was positioned, versus how the patient is positioned during the actual procedure.”

At this point, Berthe says, integration with the Infinix-i becomes critical. “The Infinix-i design uniquely accommodates the entire TAVR clinical staff and their support equipment,” he notes. “Once the angle has been determined by the software, with the push of a button, the C-arm on the Infinix-i assumes the correct angulation.” By using the software in this way, the risks associated with the procedure are reduced—as is the need for contrast media.

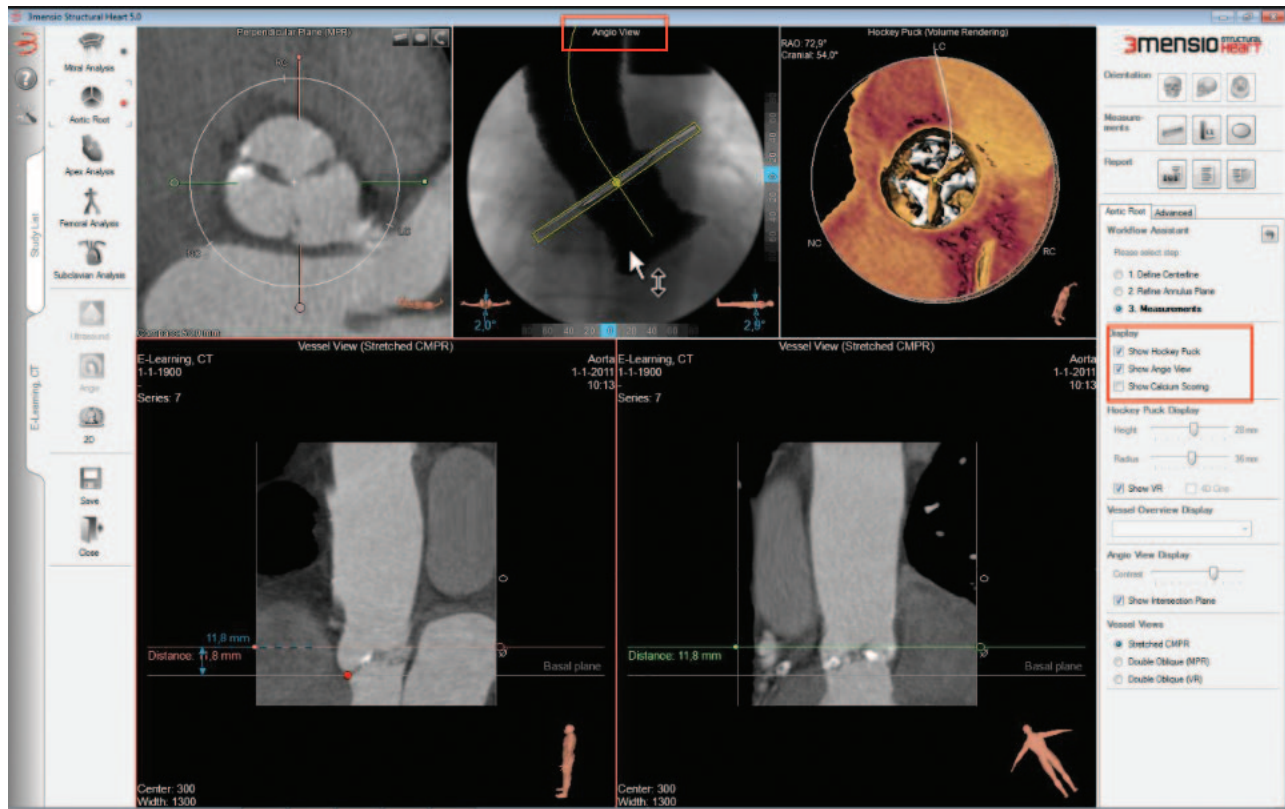
The result is a procedure that extends quality of life for those patients who are considered too high-risk for open-heart surgery, Slots explains. “People would have said, 10 years ago, that this was impossible to do without open-heart surgery—but already, tens of thousands of patients in Europe have received these valves,” he says. “It’s been amazing to see how 3D technology has evolved to help the physician understand the patient.” **D**



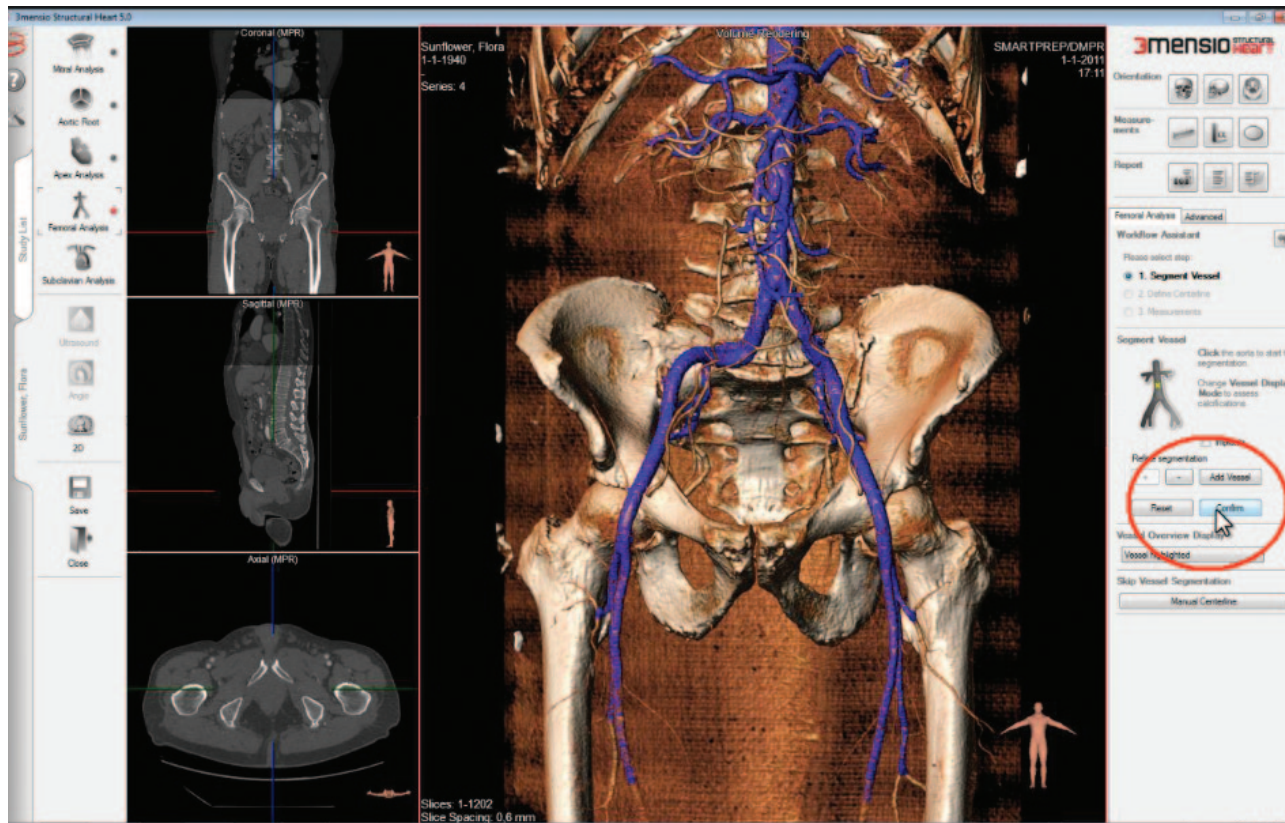
3Mensio software can utilize multi-modality images to define optimal access approach.



Example of the CAAS A-Valve software. Note the red line provides clinicians the dimensions and ideal positioning location to enhance valve placement.



Workflow simplified: accurately visualize & analyze the vasculature and the aortic valve with 3mensio.



3mensio software can utilize multi-modality images to define optimal access approach.

Innovations

TOSHIBA PUTS STATE-OF-THE-ART CT TECHNOLOGY IN REACH OF EVERY RADIOLOGY DEPARTMENT

In 2012, Toshiba America Medical Systems, Inc. successfully migrated its Aquilion™ ONE 320 technology to 80-detector row and 16-detector row CT systems, extending the line to meet the needs of providers in all settings.

Cleared by the FDA in January 2012, the Aquilion PRIME CT system features coneXact™ double-slice technology and an 80-detector row, 0.5-millimeter-detector row width. Using the double-slice technology, the 80-detector row system produces 160 slices over each 0.35-second gantry rotation, creating high-quality images. Its gantry's 78-centimeter (31-inch) aperture and its couch's 660-pound capacity with Tech Assist Lateral Slide options make



it the ideal system for use in emergency or bariatric cases.

The 16-detector row Aquilion RXL (FDA cleared in August 2012) is designed for the busiest departments and features a new flexible console for single or dual configuration,





4.2
cm

47 cm

4.2
cm

Innovations

in addition to accelerated data transfer and automated processing. Additionally, the RXL features 0.5-millimeter-detector row width, 0.5-second gantry rotation, a 70-centimeter bore and 450-pound patient couch.

Both systems feature reduced radiation exposure using strategies to optimize both the image acquisition and reconstruction. At acquisition, ^{SURE}Exposure™ 3D software calculates the minimum radiation exposure required for every exam, adjusting the dose for each patient based on a pre-set, targeted level of image quality. During reconstruction, AIDR 3D can be seamlessly integrated with ^{SURE}Exposure 3D. AIDR 3D is a sophisticated algorithm designed to work in both the raw data and image data space, reducing noise while attempting to maintain image quality. Finally, when the examination is complete, NEMA XR 25 Dose Check Software reinforces the principle of “as low as reasonably achievable” (ALARA) CT imaging with CT system dose-management tools.

Satrajit Misra is senior director of Toshiba’s CT Business Unit. He says, “Toshiba’s goal is to bring state-of-the-art technology to all customers. By making high-end CT features available in the mid- and value range, we can help healthcare providers improve patient care and overall departmental efficiency.”

TOSHIBA MR OFFERS UPGRADE PATH FROM EIGHT TO 32 CHANNELS

Toshiba America Medical Systems, Inc. has received FDA clearance on its new Vantage Titan™ 1.5T series, which features 8-, 16- and



32-channel MR systems. The series offers a scalable solution with a full upgrade path from the 8-channel to the 32-channel system. In addition to these upgrades, the entire Titan 1.5T MR line is enhanced with a new modern, sleek exterior, including new covers and soft, patient-soothing lighting around the bore.

The eight-channel model in the series is an ideal workhorse magnet; it has a 71-centimeter





bore and is capable of handling routine and advanced clinical applications. The 32-channel model builds on the 16-channel system's spatial and temporal resolution to obtain superior cardiac images.

All models in the series are equipped with Toshiba's exclusive Pianissimo™ noise-reducing technology, advanced non-contrast imaging and integrated coils with Octave SPEEDER™ technology and an intuitive M-Power user interface. This imaging capability is offered at a price that has no peers in the industry.

Stuart Clarkson, director of Toshiba's MR Business Unit, says, "With these new additions to the Vantage Titan 1.5T MRI line, hospitals now have scalable MRI-technology options to

meet a wider range of clinical needs. Healthcare facilities can acquire eight-channel systems today with the knowledge that they can be upgraded to high-end 1.5T MRI systems as the facilities' clinical applications expand and grow in the future."

SHIFTING LIVER BIOPSIES TO ULTRASOUND

Using a novel fusion capability that links ultrasound images to previously acquired CT images, University Hospitals Case Medical Center (UHCMC) in Cleveland reduced radiation dose to some liver-biopsy patients by lowering the number of CT procedures needed, according to Nami Azar, M.D., an assistant professor at Case Western Reserve University School of

Medicine and a radiologist at its primary affiliate, UHCMC. The enabling technology is the flagship Aplio™ 500 ultrasound system equipped with Smart Fusion technology from Toshiba America Medical Systems, Inc.

“Toshiba’s Aplio 500 ultrasound system and Smart Fusion improve visualization during liver biopsies, giving our team the ability to see CT and ultrasound images side by side, on a single

// Smart Fusion has shown the potential to reduce radiation dose by lowering the number of CT images needed to safely undergo the procedure. //

Nami Azar, M.D.

screen,” Azar says. “Smart Fusion has shown the potential to reduce radiation dose by lowering the number of CT images needed to safely

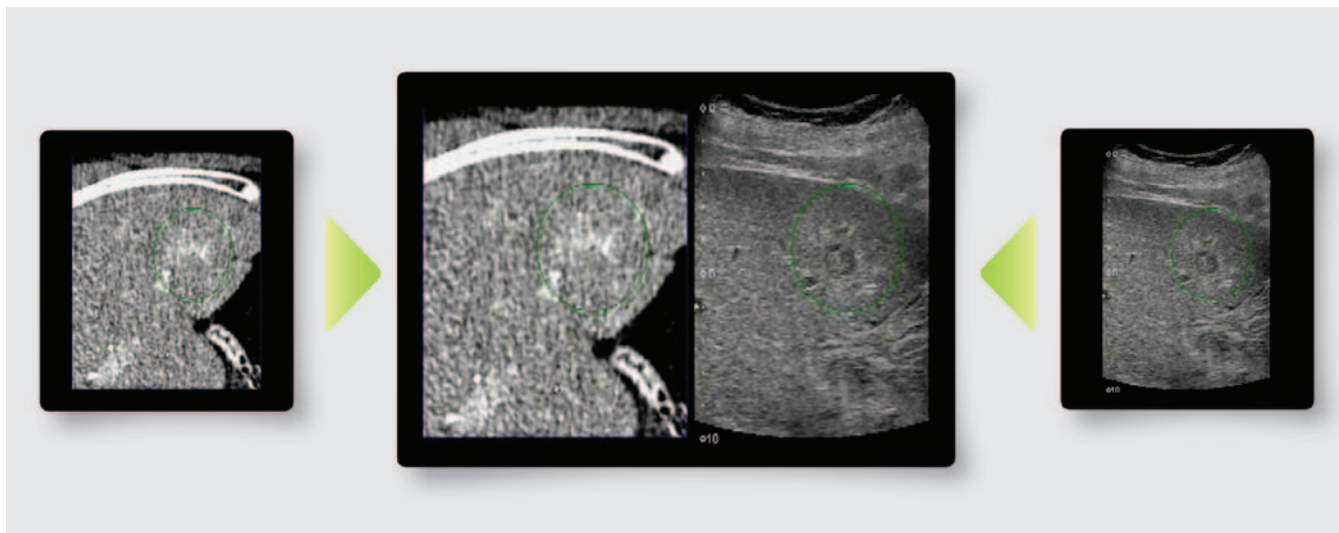
undergo the procedure. It also has the potential to decrease costs, compared with CT-only guided biopsies.”

Smart Fusion synchronizes previously acquired CT or MRI images with ultrasound images on a single screen, helping to locate hard-to-find lesions and facilitating more accurate ultrasound-guided biopsies. The Aplio 500 combines workflow automation and user-friendly ergonomics in a state-of-the-art system with advanced imaging capabilities.

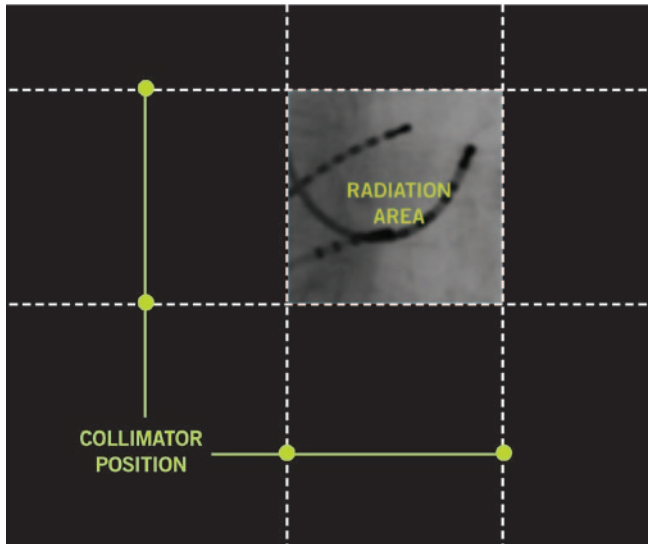
Tomohiro Hasegawa, director of Toshiba’s Ultrasound Business Unit, says, “Aplio 500 with Smart Fusion is an example of Toshiba’s ability to develop clinically effective multimodality solutions that improve patient safety and care. UHCMC’s use of Smart Fusion shows the clinical impact the technology has in facilitating more accurate and efficient biopsies while reducing radiation dose.”

OPTIMIZING DOSE IN FLUOROSCOPY

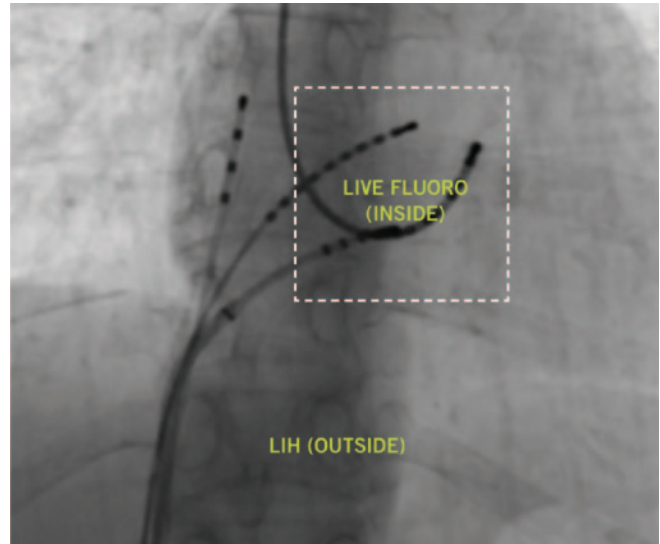
To enhance patient care and address dose concerns, Toshiba America Medical Systems,



With its intuitive set-up, Smart Fusion is the easiest to use fusion application on the market with a simple and quick two-step process.



This image shows the use of collimator blades to position to a windowed area. Notice that the blades also can be offset from center position.



This image shows the use of Spot Fluoro with the “invisible” blades over the Last Image Hold (LIH).

Inc. brings attention to dose optimization in fluoroscopy. Spot Fluoro dose-reduction technology is among the new capabilities of its Infinix-i bi-plane and single-plane vascular radiography systems.

The technology enables physicians to lower radiation dose by creating a target area of live fluoroscopy while showing the last image hold’s surrounding area, resulting in a more complete, reliable picture. Previous technology did not offer this dose-limiting technique.

Stephen Bumb, director of Toshiba’s X-ray Vascular Business Unit, says, “Toshiba’s Spot Fluoro is like having an invisible collimator in the imaging field, as it reduces dose exposure, but continues to allow the clinician to view the critical region of interest and the surrounding area at the same time. Toshiba is proud to bring innovative dose-reduction features to the market.”

Toshiba provides a comprehensive dose management package to the Infinix-i line to help

operators limit dose:

- Grid Pulse Fluoro allows the emission of more efficient X-ray pulses, reducing leading- and trailing-edge dose and providing a comprehensive, dynamic selection of grid pulse frame rates at the table.
- Virtual Collimation provides a visual display of collimator-blade position without using fluoroscopy.
- Live Zoom increases image magnification through digital processing without changing the field of view, providing a view magnified up to 2.4 times without increasing dose.
- Dose Displays indicate dose information on the system and fluoroscopic monitors, providing real-time feedback and dose estimates.
- Fluoro Record provides retrospective and prospective fluoroscopy recording at the table, making review possible and reducing the need for repeat exams. **D**



PICTURE. PERFECT.

Performance

HAS ARRIVED.

Come visit us
at RSNA 2012,
Exhibit 3438,
South Hall

Picture a perfect ultrasound system. Only one comes to mind. The Aplio 500. With advanced visualization capabilities that deliver excellent images combined with elegant design, this system captures it all. Discover an industry first, stunning 4D technology that allows you to soar through cavities, ducts, and vessels. It's ultrasound like you've never seen it before. Picture. Perfect.

medical.toshiba.com

