

# Revolution CT Helps Imaging Center Expand Patient Volume and Services

In healthcare, one question that often surfaces is whether the advances in technology will provide a faster return on investment (ROI)—or any at all—for the hospital or health system. In an era of value-based medicine and reductions in reimbursements, this question is becoming more pressing in each medical imaging purchase.

Also consider that in the US disease management is becoming more costly. The CDC Foundation estimates that annually, one in every six US healthcare dollars is spent on cardiovascular disease (heart disease, stroke and other cardiovascular diseases)—or more than \$320 billion in annual healthcare costs and lost productivity.<sup>1</sup> Should these national healthcare costs also be included in any ROI discussion of medical imaging equipment?

For over 20 years, Matthew Budoff, MD, FACC, Los Angeles BioMedical Research Institute (“LA Biomed”) and Amery Medical Academy, has been researching ways to advance procedures that can help doctors identify patients at high-risk for cardiac events and progression of coronary calcium. He is widely recognized as a pioneer in the use of CT for cardiac imaging and an innovator in utilizing CT angiography (CTA) and coronary artery calcification for the non-invasive detection of cardiac disease.

As part of his effort to prevent heart attack and lower the overall cost of care through preventive medicine, Dr. Budoff recently implemented Revolution™ CT at LA Biomed.

“We decided to purchase Revolution CT because we do a lot of cardiac CT, perfusion imaging and advanced cardiac procedures such as transcatheter aortic valve implantation or transcatheter aortic valve replacement (TAVI/TAVR) and other structural heart disease,” explains Dr. Budoff. “We felt there was a discrete advantage the Revolution CT provides in this context and we also wanted a state-of-the-art scanner that allows us the highest success rate.”

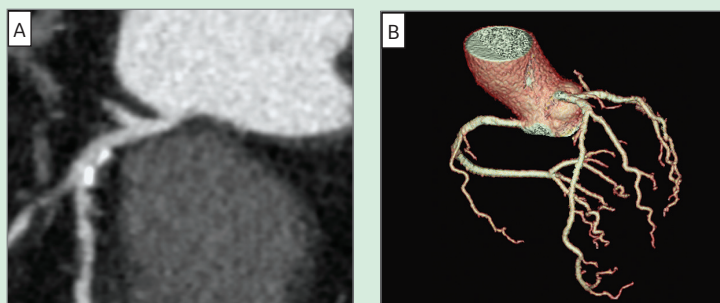
Dr. Budoff believes Revolution CT delivers some of the most advanced CT imaging capabilities available on the market today. He says there is an enhanced ROI and he’s seen the impact in just a few short months after installing the scanner.

“We’ve seen an increase in our case referrals because referring physicians know we have a better scanner that delivers higher resolution imaging,” Dr. Budoff explains. “We also have a higher success rate obtaining diagnostic quality studies and a lower cancellation rate. We’ve seen a return on multiple lines and it has really helped us to provide high quality studies more reliably.”

With a patient base that includes persistently high heart rates, it was not uncommon for Dr. Budoff to have non-diagnostic studies due to cardiac motion. Now, with Revolution CT Dr. Budoff can capture 160 mm whole organ coverage to achieve one-beat, motion-free

coronary imaging at any heart rate. Split-second volume acquisitions minimize motion artifact and ensure contrast uniformity.

The same is true of patients with irregular heartbeats. Mike Allen, JD, MBA, CEO of Amery Medical Academy, says that while the center previously captured diagnostic studies in 30-40% of patients with atrial fibrillation, he is confident that now 90% or more of these patients have a diagnostic quality exam.



**Figure 1.** (A) Curved reformat of the left main artery and the proximal left anterior descending artery demonstrating multiple lesions of both hard and soft plaques. (B) 3D rendered image of the proximal aorta and the coronary arteries; image can be rotated to any degree of obliquity required to review the entire structure and placed into routine catheterization angles easing analysis of image.



“With ASiR-V™,<sup>2</sup> what once took between 5-12 mSv for high quality diagnostic images now takes between 0.5-1.5 mSv; that’s a significant reduction in patient dose,” Allen says. “Considering some of our patients are very large-sized, we can push the boundaries of low-dose imaging with Revolution CT.”

Much of this success rate Allen attributes to the refined dose protocols on Revolution CT that enables the center to maintain a consistency in scanning from one patient to another. With the consistency in protocols, the exam quality is now less dependent on the technologist and more reliant on the machine’s ability to capture the patient automatically.

“Revolution CT protocols are well engineered to manage the dose and also reduce the time the patient is on the table,” Allen adds. “Our timed studies are more relevant because of the consistent acquisition.”

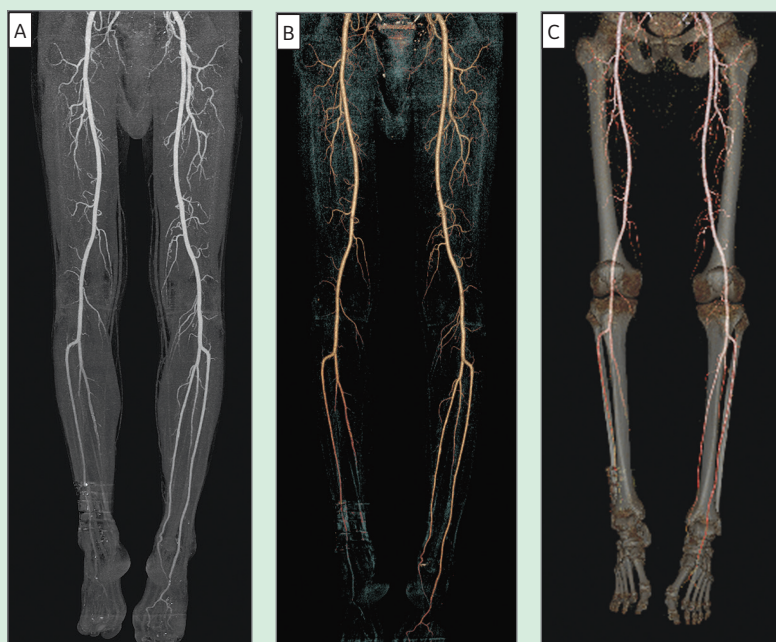
Exam consistency also impacts radiology reading time. “The exam quality on Revolution CT is the best we’ve seen,” Allen says. “The studies are easier to read and

tackle, and the radiologists and cardiologists have a far easier ability to look at the heart as well as the lung nodules and incidental findings.”

A good workflow and CT scanner are both essential to increasing patient throughput. “We have found we can fit more patients in a fixed amount of time on Revolution CT because the system is faster and very consistent. We also have a workflow that makes sense now with the way we take in patients,” Allen explains.

One important aspect of workflow is managing patient traffic and intake, Allen adds. Patient intake forms have been digitized on an iPad®. With a large patient volume, they’ve designed a patient staging area next to the scanner room with lounge chairs and soothing music to keep the patient calm—and help keep heart rates down. Allen says this change in physical layout has also helped the practice stay on schedule with the higher volume.

“We are now seeing between 30-60% more patients with the faster scanner, redesigned workflow and electronic patient intake,” Allen says.



**Figure 2.** (A) An antero-posterior MIP runoff image of the femoral arteries and distal vessels. Note the image quality of peripheral and distal vessels including Pedal arteries past hardware insertion point. (B) Volume Rendering of the femoral arteries and distal vessels. (C) Fusion of vascular anatomy as a primary view with the skeletal anatomy shown as a transparent fusion. This allows a referring physician or surgeon the opportunity to see both vascular and bony architecture together allowing for better surgical planning.

## Adding new services

It’s not just the success in cardiac imaging that Dr. Budoff and Allen say contribute to a higher ROI with Revolution CT.

“With the wide coverage and 50 cm field of view, Revolution CT is excellent for neuro CT and it has great applications for pediatric imaging,” says Dr. Budoff. “We are looking to expand our current scanning algorithms in these two areas that we historically have not pursued.”

In fact, Allen notes that the ability to expand the practice into other clinical areas has made Revolution CT a wise investment. With the continued decrease in reimbursement for CT imaging, Allen says that imaging centers have to diversify their imaging services and become an extension of the hospital in terms of patient care.

Dr. Budoff and Allen have identified other areas where they can include another appropriate study in addition to the patient's initial indication or referral. For example, many of the cardiac patients at LA Biomed may also benefit from low-dose CT lung cancer screening or bone mineral density testing. Allen has been working behind the scenes to develop decision criteria that would best identify these patients.

The digitized patient intake forms have not only made it easier for the patient to answer questions about his/her health, but the electronic capture enables the center to mine the data to look at trends and statistics.

"With a CT bone densitometry study, we are adding value for the patient without additional scanning or radiation," says Dr. Budoff. "This saves the patient an additional visit to CT or a DEXA scanner in the future and by properly identifying appropriate patients we can increase our reimbursement."

Dr. Budoff says that a lung, chest/heart or abdomen CT protocol will include the necessary view and information needed to evaluate bone density. So far, he says that 99% of patients identified as appropriate for the CT bone densitometry study have agreed to it.

For low-dose CT lung cancer screening, if the patient fulfills the appropriateness criteria determined by the US Preventive Services Task Force (USPSTF), then they are also asked if they would like to undergo a low-dose CT lung cancer screening exam. Dr. Budoff says that referring physicians may be unaware that this exam has been recommended by USPSTF and endorsed by numerous medical associations and, therefore are not sending their patients for lung cancer screening.

"Low-dose CT lung cancer screening affords a 20% reduction in mortality—literally one-fifth less people died in the study," Dr. Budoff says.<sup>3</sup>

## Building a referral base

Dr. Budoff is an active participant in promoting the value of cardiac CT through local radio and television shows. While the goal is to bring attention to CT and how it can help identify cardiovascular disease at an early stage, the advocacy has been an important vehicle for patient outreach.

"People want to know if they have a healthy heart; when we find a diseased heart we often discover disease in the vascular system and potentially other issues as well,"

Dr. Budoff says.

Dr. Budoff holds symposiums for local physicians on the latest medical imaging capabilities as well as more mainstream topics such as government and third-party reimbursement. In addition, he teaches CME courses on cardiac CT.

Allen adds it is important that an imaging center have a budget for referring physician marketing. Within the last few years, he has seen greater traction with the center's direct marketing to patients.

Plus, patients are savvier regarding their healthcare consumption. Reducing patient time on the table is good for patient satisfaction and that helps grow the practice through positive word-of-mouth. Most important, says Allen, is the confidence technologists and clinicians have that nearly every study is diagnostic, readable and repeatable—and that translates into better patient care.

"We have a strong confidence that what we captured on Revolution CT is precisely what we wanted," Allen says.

"Intrinsically, our CT technologists know that almost every study can be diagnosed so we aren't wasting anyone's time, including the patient. Reimbursement is fixed and it is a financial burden to a center to not capture a diagnostic exam the first time."

Dr. Budoff adds, "By expanding applications and capturing more revenue per patient visit with things like lung screening and bone density, and having fewer aborted procedures and failures, we're confident we will see a faster ROI on Revolution CT than we originally planned." ■

### References

1. CDC Foundation. Heart Disease and Stroke Cost America Nearly \$1 Billion a Day in Medical Costs, Lost Productivity. Available at [cdcfoundation.org](http://cdcfoundation.org).
2. In clinical practice, the use of ASiR-V may reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. Demonstrated in phantom testing using small, medium and large objects. Noise is defined as the standard deviation of the measured signal.
3. The National Lung Screening Trial Research Team. Reduced Lung-Cancer Mortality with Low-Dose Computed Tomography Screening. *N Engl J Med* 2011; 365:395-409.