



I³ CENTRE WILL SET STANDARD IN CARDIAC CARE

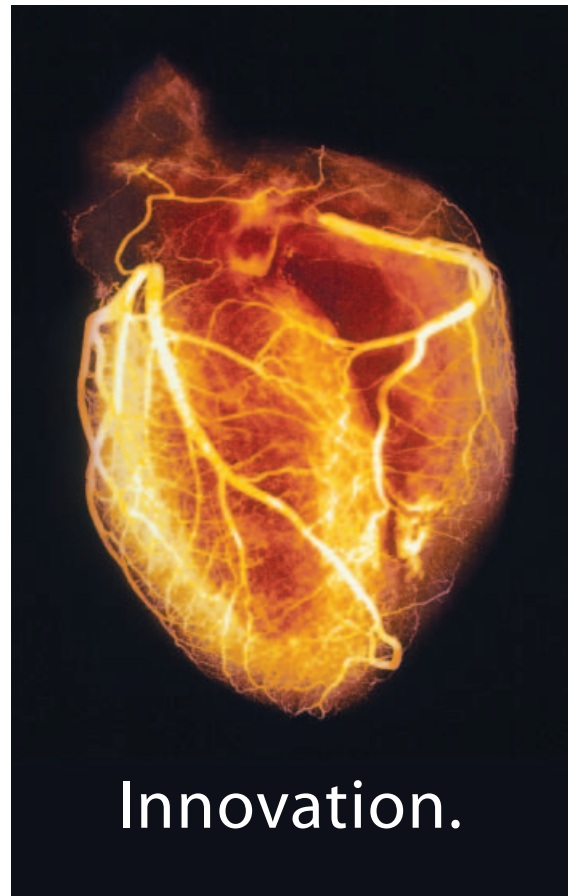
A generous and far-sighted private gift will help the Peter Munk Cardiac Centre (PMCC) to redefine excellence in cardiac care worldwide.

A \$37-million donation from Peter and Melanie Munk is being applied to an exciting initiative, the creation of the I³ Centre, one of the most advanced cardiac facilities in the world.

The Centre's name represents cardiac *Imaging*, *Intervention* and *Innovation*. Under the guidance of Development Director Dr. Harry Rakowski, it will bring together highly specialized and talented radiologists, cardiologists and cardiac and vascular surgeons in an integrated team to build knowledge and expertise, and to test new technologies and techniques. (Please see the interview with Dr. Rakowski on page 2.)

Most importantly, the I³ Centre – or “I cubed” as it has come to be known – will provide access to the most advanced diagnostic tools and treatments for patients who require cardiovascular care.

Advances in diagnostic imaging and intervention are radically transforming the treatment of cardiovascular care. Multi-slice CT scanners, the latest MRI technology and other imaging tools now produce sharper and more precise images. The I³ Centre will facilitate diagnosis of cardiac problems through less invasive methods and will support the development of less



Innovation.

intrusive treatments. The gift will also allow for the purchase of leading edge imaging equipment – some of which is not currently available anywhere in North America.

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ABOUT THE PMCC: A CENTRE OF CARDIAC EXCELLENCE

The Peter Munk Cardiac Centre (PMCC) is the premier cardiac centre in Canada. Each year, approximately 17,000 patients receive innovative and compassionate care from the PMCC's world-renowned multidisciplinary heart team. The PMCC is based at Toronto General Hospital, a member, along with Toronto Western Hospital and Princess Margaret Hospital, of University Health Network. All three are teaching hospitals affiliated with the University of Toronto.

IMAGING, INTERVENTION AND INNOVATION

Turning vision into reality

DR. HARRY RAKOWSKI SETS THE COURSE FOR THE I³ CENTRE

As Development Director of the I³ Centre, Dr. Harry Rakowski has taken on the role of bringing together and integrating the right technology, resources and, of course, people to ensure the new facility fulfills its vision of helping the Peter Munk Cardiac Centre (PMCC) provide “excellence in cardiovascular care, from bench to bedside”.

A graduate of the University of Toronto, Dr. Rakowski followed his postgraduate training in the city with a Research Fellowship at Stanford University in California, before embarking on a distinguished 29-year career at Toronto General Hospital. During that time he has held a number of positions, including Director of Clinical Cardiology and Deputy Director of the Peter Munk Cardiac Program. In addition to his clinical, teaching and administrative duties, Dr. Rakowski is a world-renowned researcher in hypertrophic cardiomyopathy, a heart muscle condition that is the leading cause of sudden death in young adults. He is currently the E. Douglas Wigle Chair for research in hypertrophic cardiomyopathy.

Dr. Rakowski took some time from his busy schedule to talk about his new role as Development Director and the impact that the I³ Centre will have.

Q: What is your vision for the I³ Centre?

“Our goal is a straightforward one. With the help of this very generous gift from the Munks, we plan to create a state-of-the-art centre of excellence that brings medical imaging, cardiology, cardiac surgery and vascular surgery together in a community of practice.

I³ will provide patients with access to the latest technology and innovations in imaging and intervention and, of course, the highest standards of care.”

Q: How important is imaging to the ability to provide patient care?

“We have already seen a dramatic decrease in deaths due to heart disease. This is due, in part, to improved prevention. But earlier, more accurate diagnosis, and



Dr. Harry Rakowski, Development Director of the I³ Centre, believes the Centre will help the PMCC create “a community of care that is unique in North America”.

improved interventional strategies have played a major role. Improvements in imaging technology and techniques have contributed significantly to these achievements.”

Q: What are some of the potential applications of this improved imaging technology?

“Technology has improved so much in just a few short years. There are so many examples. For instance, we have been performing coronary CT angiograms with 16 to 64-slice detectors. Now 256-slice systems are available. These dramatically improve image quality and, therefore, diagnostic accuracy.

In the MRI arena, the new 1.5 and 3.0 Tesla Magnet will allow us to expand our cardiac applications in unique patient populations. For example, in patients with congenital heart disease or cardiomyopathy, we will be able to evaluate whether or not heart muscle is viable and capable of recovering following surgery.

Improved technology can make a tremendous difference in areas like the Cardiac Catheterization Lab, where

crucial interventions are done. The PMCC is a recognized leader in a number of procedures, including using electrical procedures to regulate or restore rhythm and to resynchronize function in patients with end stage heart failure. The resources of the I³ Centre will allow us to improve our abilities in these areas and others – such as using implant devices to repair leaking heart valves and replace aortic valves without surgery. These less invasive procedures could be life savers in patients who, for a variety of reasons, including frailty, are not candidates for surgery.”

Q: How does I³ plan to use this new imaging technology?

“We won’t just be acquiring new technology. We will be assessing it and evaluating its effectiveness and safety. And we will be studying and pioneering new ways of using technology to improve patient care.

We have already proposed doing some research with the Ontario Ministry of Health and Long Term Care that will look at the use of CT angiography as a diagnostic tool in women at an intermediate risk of having coronary disease. By injecting dye into an arm vein and obtaining CT images of the heart, we can get high quality pictures similar to that of a much more invasive angiogram, which requires the insertion of a catheter into the heart. We hope that this will provide an important way of better detecting heart disease in women, who traditionally have disease detected later than in men.

Q: Exactly who will benefit from the work of the I³ Centre?

“As part of University Health Network, we will naturally serve a large patient population within the immediate area. However, we will also be a provincial resource, providing access to the latest cardiovascular diagnostic and interventional procedures not available at other hospitals. We will share both our technology and our insights into how it should be applied across Ontario and the country.

In fact, the I³ Centre will have an even greater impact. We will also be a training centre. As we evaluate new technology we will provide training for cardiologists and clinicians in its appropriate use. We will transfer our knowledge across Canada, Ontario and the world.”

Q: How do you see the I³ Centre impacting overall care at the PMCC?

“One of the goals of the I³ initiative is to develop and implement what is essentially a new integrated model of care. It means building a culture of collaboration, where everyone involved in cardiovascular care – radiologists, cardiologists, cardiac and vascular surgeons, nurses and others – work together towards common goals. We hope to create a community of practice that is unique in North America – one that we feel will optimize the care we provide our patients.”

I³ Centre continued from front page...

“This gift has allowed us to accelerate the development of our cardiac imaging program and establish the PMCC as an international leader in new modalities of cardiac imaging,” notes Dr. John Parker, Medical Director of the PMCC.

When completed, the Centre will provide a consolidated, contiguous space that optimizes patient flow and will include: the latest in MRI and CT technology, upgraded nuclear cardiology, four upgraded angio suites, four upgraded and expanded catheterization laboratories and a multi-modal specialized procedure room.

Construction of the I³ Centre will begin early next year, with the official opening scheduled for Spring/Summer 2008.

“The Munks’ vision for cardiac care will benefit Ontarians with access to cutting edge technology,” states George Smitherman, Ontario’s Minister of Health and Long-Term Care. “It will provide an International Centre of Excellence where we can evaluate and implement new technologies and clinical procedures.”

HEART HEALTH

Advanced diagnostic imaging vital to cardiac assessment

NEW CTCA TECHNOLOGY SHOWS PROMISE

By Dr. Narinder Paul

Diagnostic imaging can play a crucial role in helping identify the cause of cardiac dysfunction and in guiding the medical team in determining and implementing the appropriate treatment.

The most common cause of cardiac disease is a restriction of blood flow within the coronary arteries. The clinical presentation is variable, and may be as dramatic as sudden death in a previously well individual. Other important causes of cardiac dysfunction include congenital and acquired abnormalities of the myocardium (the heart muscle), the pericardium (the sac that envelops the heart), the cardiac valves, and the so-called great vessels – the aorta, pulmonary artery, pulmonary veins and vena cavae.

To be valuable as a diagnostic tool, an imaging assessment of the heart must effectively evaluate each of these structures, and must examine different parameters in each individual structure (see Table 1).

A promising imaging technology

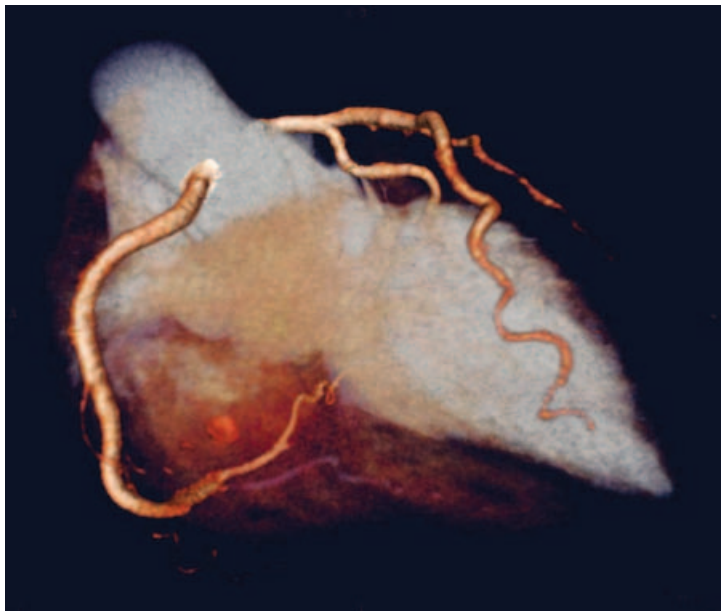
At present, there is no single diagnostic imaging test that fulfills all the requirements for a comprehensive evaluation. However, Multi-Detector Computed Tomography (MDCT) has the potential to fulfill this role.

The challenge for cardiac MDCT, specifically Computed Tomography Coronary Angiography (CTCA), is to accurately show very small diameter – or calibre – branching coronary arteries in what is, essentially, a moving structure. The development of new 64-row detector Computed Tomography (CT) has now provided sub-millimeter isotropic voxel imaging – the ability to accurately represent small anatomical structures, such as branching arteries, in three dimensions and without distortion.

However, the speed of image capture, as measured by temporal resolution, remains a focus for continuing

development. Temporal resolution refers to the precision of a measurement with respect to time.

A person with a heart rate of 60 beats per minute (bpm) experiences a complete cardiac cycle once every second – that is once every 1000 milliseconds (ms). The fastest image capture with current CT technology is an effective temporal resolution of 83 ms.



A semi-transparent three dimensional image of the coronary arteries as captured by Computed Tomography Coronary Angiography. Courtesy of Ivonna Verschuur.

Since the normal heart rate is between 70 and 90 bpm, for optimal imaging with MDCT, some type of heart rate control is sometimes required. This is usually in the form of beta blocker medications. These are used to slow the heart rate to 60 bpm per minute or less. In addition, glyceryl trinitrate is given a few minutes prior to the procedure in order to maximally dilate the coronary arteries and thereby improve image quality.

A simple procedure

All cardiac MDCT at University Health Network is performed at Toronto General Hospital in the Medical Imaging Department.

At present, cardiac MDCT is generally used only in patients with significant risk factors for coronary artery disease and/or those with specific indications. These include atypical symptoms, ambiguous cardiac stress test results, the need for assessment of coronary artery by-pass grafts and the need for evaluation of anomalous coronary arteries. Interestingly, an increasing number of cardiac patients are referred to the Medical Imaging Department expressing a preference for CTCA, rather than a conventional coronary angiogram.

The procedure is straightforward. On registering, the patient is directed to a dedicated cardiac evaluation area where they are reassessed for contraindications to CTCA by cardiac radiologists and intensive care trained nurses. Some contraindications include severe iodine contrast allergy, severe renal dysfunction and significant cardiac arrhythmia.

The procedure is explained in detail. Then, an electrocardiogram (EKG) is performed; the patient's blood pressure and heart rate are recorded and a small calibre intravenous catheter is inserted into an arm vein.

If required, an oral beta-blocker is administered and the blood pressure and heart rate measurements repeated. Once the optimal heart rate is achieved, the patient is escorted to one of the two cardiac enabled 64-row MDCT units. A Cardiac CT technologist explains the CT procedure and positions the patient on the mobile table.

The patient lies with their arms extended and comfortably positioned. A glyceryl trinitrate tablet is then placed under the patient's tongue and intravenous dye (contrast agent) is injected. The patient performs a short 'breath hold' of 8-12 seconds as they travel slowly through the CT unit. As the CT images are acquired, there is continuous monitoring of the patient's heart rate, with consequent adjustment of the table speed and gantry rotation to optimize image quality. Once the scan is completed the patient is escorted to the preparation area for monitoring blood pressure and heart rate for 20-30 minutes prior to discharge.

Analyzing the results

The initial CT scan produces in excess of 2000 images. These need to be extensively processed to produce an anatomical and functional assessment of the heart. A standard assessment includes evaluation of the coronary arteries and major branches; calculation of ventricular volumes and function; and evaluation of wall motion abnormalities.

CT Coronary Angiography is a promising and evolving technique, with a few engineering challenges to overcome. However, in the majority of patients who undergo this imaging procedure, a valuable diagnostic result is achieved. This allows clinicians to exclude significant coronary artery disease with a high level of confidence.

Dr. Narinder Paul is Head of the Division of Cardio-Thoracic Imaging at University Health Network and Mount Sinai Hospital. He is also an Assistant Professor at the University of Toronto.

Table 1 - Diagnostic Imaging: Evaluation Criteria

Cardiac structure	Crucial parameters
Coronary arteries	Origin, calibre, lumen patency
Myocardium	Wall thickness, regional wall motion, systolic contraction, perfusion
Pericardium	Calibre, calcification
Cardiac valves	Structure, function
Mediastinal vessels	Calibre, configuration

CARDIOLOGY

Cutting edge...without the cutting

PMCC LEADS THE WAY IN NON-SURGICAL VALVE REPAIR

For many patients who come to the Peter Munk Cardiac Centre (PMCC) with a serious heart condition, the road to recovery leads through the operating room. For others, surgery may not be the best choice, or simply may not be an option at all. Patients with defective heart valves, for example, can present significant challenges – some may be facing a fourth or fifth operation, while others may be too high risk for a major procedure.

Pioneering work at the PMCC is offering new hope for these patients. This hope comes in the form of innovative non-surgical heart valve repair, as currently being used by Dr. Eric Horlick and his colleagues.

Dr. Horlick is with the Adult Congenital Heart Program at University Health Network, and an Assistant Professor at the University of Toronto. He is an interventional cardiologist who specializes in structural heart disease. Together with cardiologist Dr. Leonard Schwartz, he is working closely with PMCC's Division of Cardiovascular Surgery to optimize the care provided to patients.

Repairing structural damage

"More and more today we are being asked to intervene not just in the coronary arteries surrounding the heart, but in the structure of the heart itself," says Dr. Horlick. "That includes closing holes in the upper and lower chambers of the heart and repairing or replacing



Dr. Eric Horlick's pioneering work with non-surgical heart valve repair could lead to a new viable treatment option for specific groups of patients, who may be too high risk for traditional open surgery.

the key valves that control the flow of blood, including the mitral, aortic and pulmonary valves."

"Traditionally, that meant open surgery – a procedure that involves stopping the heart and splitting the breastbone," he continues.

"My surgical colleagues are doing a brilliant job in patients who are at standard or moderate risk. But, there are specific populations that might be better served by this newer, much less invasive approach."

These populations include both the very young (patients with congenital heart disease) and the very old (patients with aortic valve damage).

The 'new' percutaneous (through the skin) approaches being utilized by Dr. Horlick involve repairing damaged valves with a special device or a replacement valve inserted directly into the artery through a small incision in the upper leg or between the ribs.

“For example, in this new aortic valve replacement procedure, we use a special stent with a new valve sewn in and place it directly within the old valve,” Dr. Horlick explains. “When the stent is deployed a new valve begins to function in place of the old. The skin incision is only 6-7mm long and the procedure can be done right in the cath lab.”

“For patients with severely diseased arteries in the leg, or whose arteries may not be large enough, a different minimally invasive procedure can be used. In this case, working with our surgeons, an incision is made between the ribs, and we guide the new valve directly into position through the apex of the heart. This has become known as a ‘valve on a stick’.”

To repair the mitral valve, a clip, implanted in the heart via a catheter, is used to seal leaks.

In all of these cases, Dr. Horlick explains, the procedure is done on the beating heart, without the need for the heart lung machine. They are significantly less invasive – and stressful – than full open surgery.

Treating the young and the old

As such, these new techniques may be the only option for patients deemed to be at too high a risk for major surgery. This is true in many instances of aortic valve disease in elderly individuals who are too frail, or simply too sick. At the other end of the age scale, catheter-based pulmonary valve replacement provides a welcome option for young patients with congenital heart disease.

“Many of these patients are in their teens and have already had three, four or more surgeries,” explains Dr. Horlick. “If we can delay or reduce the number of open heart operations these young people have to face, they would be very grateful. We could save them from the long recovery period that could mean significant time off school or work, interrupted social lives and so much more. Not to mention the inherent risks of multiple re-operations.”

Careful evaluation

As promising as these new procedures are for these patients,

Dr. Horlick is quick to emphasize that they are still very new. “So far only about 145 pulmonary valve procedures have been done, here and in London, England,” he notes. “For aortic valve procedures, there have been about 250 around the world, including here at the PMCC.”

“As with any new procedure, there are growing pains and we need to be vigilant and critical of the long-term results,” Dr. Horlick adds. “So far the results are excellent, and the development of these techniques has been responsible and well controlled.

“These non-invasive valve repair techniques will never replace surgery, and it is essential that we work very closely in partnership with our surgeons who are masters of valvular heart disease,” Dr. Horlick concludes. “But we are excited by their potential for a specific group of patients. The innovative work we have done here at PMCC positions us very well to continue to lead the way in perfecting this promising new technology.”

PETER MUNK CARDIAC CENTRE - CLINICAL & RESEARCH REPORT

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PMCC IN THE NEWS

Promoting heart research at the bottom of the world

Dr. Heather Ross, Medical Director of the Heart Failure & Cardiac Transplant Program at the PMCC, is leading a unique mission to raise awareness and funds to support the heart transplant program as well as research into heart disease.

In December, Dr. Ross will be leading a small team of dedicated climbers, including Dr. Patricia Murphy, UHN's Clinical Director of Cardiac Anesthesia, and heart transplant patient, Dale Shippam, on an expedition to Antarctica where they will attempt to climb the 4,897 metre high Mt. Vinson Massif.

The expedition will travel under the banner *Antarctica '06: Live Life. Test Your Limits. Climb A Mountain.*

By undertaking this demanding journey, Dr. Ross and her team hope to raise \$1 million and promote the important role of research in the development of improved cardiac treatments to extend and improve quality of life, as well as to potentially find ways to prevent heart disease through regenerative medicine.

For more information on Dr. Ross and the Antarctica expedition, visit www.testyourlimits-antarctica.ca



The PMCC's Dr. Heather Ross will climb a mountain in Antarctica to raise funds and awareness for heart research.



Dr. John Parker

Dr. John Parker named Program Medical Director of PMCC

Dr. John Parker has been appointed Program Medical Director for the Peter Munk Cardiac Centre and University Health Network (UHN) Heart and Circulation Program.

Dr. Parker is currently Head of the Division of Cardiology at UHN and Mount Sinai Hospital and is a Professor in the Departments of Medicine and Pharmacology at University of Toronto. He is also Medical Director for the Toronto General Hospital Clinical Studies Resource Centre.

"Dr. Parker is known for his dedication to clinical practice in cardiology, and is recognized internationally for his research contributions in the area of heart failure," says Dr. Catherine Zahn, UHN Executive Vice President, Clinical Programs and Practice.

Dr. Parker succeeds Dr. Christopher Feindel who served as Medical Director of the PMCC for over three years.

For more information about the Peter Munk Cardiac Centre please visit www.uhn.ca

For questions or comments about this newsletter or for more information on how you can help support the PMCC, contact:

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