



National Heart
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MURMURS

NHCS
WINS BCA
GREEN MARK
PLATINUM
AWARD

THE GREEN
WALL AT THE
NHCS NEW
BUILDING'S
VEHICLE
DROP-OFF
POINT



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A Glimpse into the Future**

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LEARNING FROM
BRIGHAM AND
WOMEN'S HOSPITAL

**NHCS surgeon and
nurse receive Healthcare
Humanity Award 2012**

NHCS NEW BUILDING WINS BCA GREEN MARK PLATINUM AWARD

Come 2013, heart patients can look forward to a greener expansion of the National Heart Centre Singapore (NHCS).

The new building's overall construction and architecture will incorporate various eco-friendly features, including priority parking lots and charging stations for electric vehicles. The conscious integration of these sustainable components has won NHCS the Building & Construction Authority Green Mark Platinum Award – the highest accolade in green building certification in Singapore.

"As a socially responsible healthcare organisation, NHCS is proud to play our part in promoting a greener and healthier environment for the community," said Associate Professor Koh Tian Hai, Medical Director, NHCS.

Keeping it cool

Air-conditioning is a major component of energy consumption in Singapore due to the country's equatorial temperatures. To reduce the amount of energy expended in cooling the interior air, the NHCS new building will be strategically positioned to minimise direct glare and heat from the sun. The 12-storey specialty centre will also be wrapped in an aluminium perforated "second skin" which further diffuses solar heat gain without sacrificing the amount of visible light streaming in. These structural features will work hand-in-hand with an energy-efficient air-conditioning plant, computer-aided assessment of thermal comfort and extensive natural ventilation at the concourse to achieve comfortable interior air temperatures at optimal energy performance levels.

Together with regenerative lifts and motion-activated light systems, NHCS will be able to save some 6,500,000 kWh of energy a year – equivalent to \$1.3 million off the annual electricity bill. In addition, the installation of low flow water fittings and rain-harvesting fixtures will help NHCS conserve about 12,000 cubic metres of water a year, which is almost sufficient to fill five Olympic-sized swimming pools.

Reducing carbon footprint

About 2,200 square metres of greenery will be planted at the terraces and open spaces to enhance the healing environment for patients. The soothing presence of the various trees and fronds will help to cut down the new building's carbon emission by 3,000 tonnes. This has the same effect as taking 525 cars off the road for a year.

The NHCS new building will be located opposite Block 4 of Singapore General Hospital and operational in late 2013.

THE GREEN FEATURES WILL HELP NHCS SAVE ABOUT \$1.3 MILLION A YEAR.



TELL US WHAT YOU THINK OF OUR NEW LOOK!

MURMURS is undergoing a visual transformation in anticipation of our new building. Drop us your thoughts at nhcs@nhcs.com.sg addressed to *The Editor, Murmurs*. We look forward to hearing from you!

The green wall at the NHCS new building's vehicle drop-off point presents a calming and natural healing environment for arriving patients and visitors.

Mr Alson Goh, Chief Operating Officer at NHCS (left), receiving the BCA Green Mark Platinum Award from Mr Lee Yi Shyan, Minister of State for Trade and Industry and National Development, at the awards ceremony held on 24 May 2012.

EUROPCR 2012: A GLIMPSE INTO THE FUTURE



By Dr Chin Chee Tang
Consultant
Department of Cardiology
National Heart Centre Singapore

A gathering of great minds in cardiology

After my last opportunity about five years ago, I had the good fortune to attend the EuroPCR meeting held in Paris earlier in May this year. EuroPCR is the annual scientific meeting for the European Association of Percutaneous Cardiovascular Interventions (EAPCI), a specialty community within the European Society of Cardiology. It is one of the most well attended interventional cardiology meetings worldwide, founded on a strong tradition of teaching and mentoring with an emphasis on clinically relevant issues and cutting-edge percutaneous coronary intervention (PCI) techniques and technology. Thought leaders in PCI from Europe, North America and Asia convened at this year's EuroPCR – reflecting the continued evolution and change in cardiology and the international practice of PCI. For me, all four days of the conference were excellent but the highlight was the session on the final morning of the congress, where some of the most exotic PCI complications were presented for discussion.

Thought leaders in PCI from Europe, North America and Asia convened at this year's EuroPCR – reflecting the continued evolution and change in cardiology and the international practice of PCI. For me, all four days of the conference were excellent but the highlight was the session on the final morning of the congress, where some of the most exotic PCI complications were presented for discussion.

Hypertension and renal sympathetic denervation

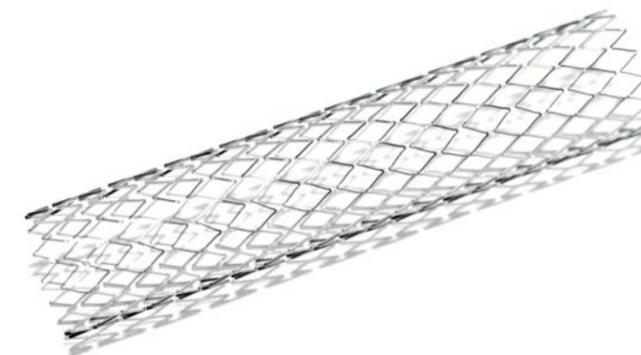
One of the two relevant areas at EuroPCR 2012 which piqued my interest immensely was the new developments in renal sympathetic denervation (RSD) for treating patients with extremely hard-to-control high blood pressure. The discourse on RSD underscored the importance of its emerging utility in managing other conditions such as heart failure and impaired glucose tolerance.

Perhaps the strongest indication that RSD is here to stay was from the industry players – at EuroPCR, numerous alternatives to the current Symplicity catheter for RSD were highlighted. The one arguably receiving the most interest was a catheter mounted 'basket' capable of achieving RSD with greater precision and in a shorter time compared to existing treatment options. This catheter has already been tested in a 'first-in-man' study in Australia and Greece with encouraging results – the EnLIGHTN-1 study showed excellent safety while maintaining efficacy with more than 80% of patients achieving more than a 10mmHg drop in systolic blood pressure at one month after the procedure.

Other novel methods for RSD showcased included invasive ultrasound energy delivery systems (such as the PARADISE and TIVUS catheters), a non-invasive high-intensity ultrasound system to target the renal sympathetic system, balloon-mounted radiofrequency energy catheters (such as the Covidien and Vessix systems), a beta-emitting radiation system and a magnetic nanoparticle targeting device. Most of these nascent systems have only just started testing in human subjects and it will be interesting to see which ones will graduate into large-scale trials and, ultimately, daily clinical use.

Coronary bifurcation treatment and dedicated stents

The other topic which I found intriguing was the treatment of bifurcation lesions. These lesions are essentially narrowings in the coronary arteries which occur at the branch points. Currently, it is a technical challenge to treat bifurcation lesions effectively and consistently, and this has made such treatments a hot topic at all intervention meetings but especially so at EuroPCR this year, with a focus on left main stem bifurcation disease treatment. It was intriguing to hear acknowledged leaders in bifurcation stenting such as Antonio Colombo endorse the provisional T and protrusion (TAP) technique as their current preferred method, which I believe is likely to disseminate into routine clinical practice.

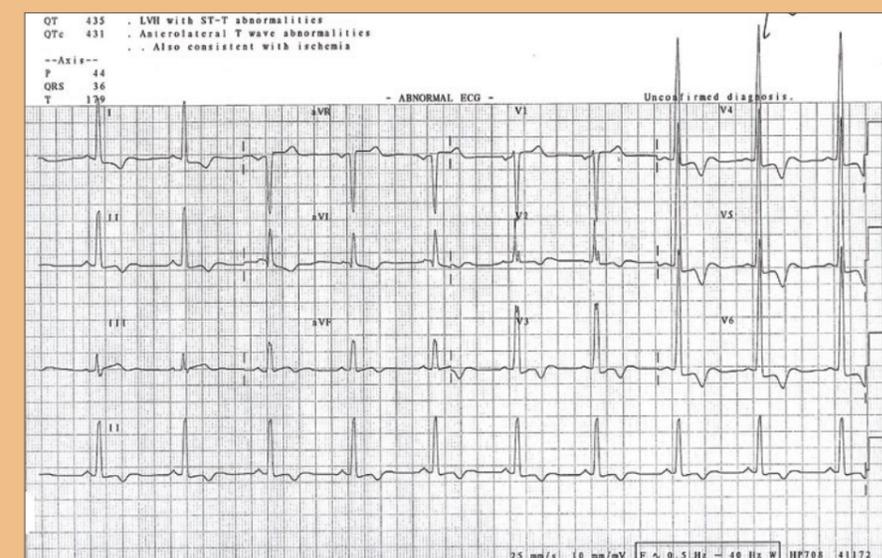


What I found most interesting though, was the continued highlight and discussion of dedicated bifurcation stents. Longer term results of the DIVERGE study (with the AXCESS stent), TAXUS Petal system, and the BIPAX trial (with the Nile stent) were encouraging. But it was striking to me how there is currently still no true one-size-fits-all dedicated bifurcation stent – certainly a potential area for future development.

Overall, EuroPCR was a fantastic experience. It provided me with the rare opportunity to speak to and pick the brains of international thought leaders, share in the challenging and interesting cases of the international PCI fraternity, experience novel emerging technologies first-hand and identify new areas for further study and research. I would encourage anyone interested in interventional cardiology to attend future EuroPCR meetings.

ANALYSE THIS

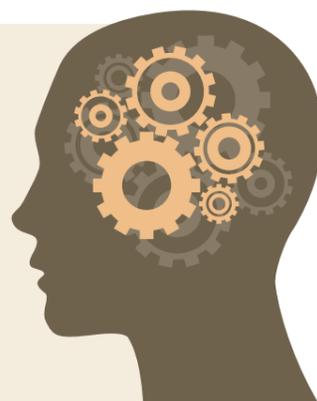
A 45-year-old man was referred for abnormal ECG. He was asymptomatic with no reported chest pain, breathlessness or palpitations. Clinical examination of him was unremarkable as well. The ECG of his heart is shown below.



A 12-lead ECG was performed which showed sinus rhythm with QRS axis of +36° and absent septal Q waves. Increased QRS voltages are seen in leads V3-V6, ranging from 20 to 38mm. Large negative T waves are also noted in leads V3-V6 measuring up to 6mm in depth.

WHAT IS A PROBABLE DIAGNOSIS FOR THIS PATIENT?

Refer to page 10 for the answer.



UNDERSTANDING AND PREVENTING STENT THROMBOSIS

The introduction of bare metal coronary artery stents (BMS) has improved the safety and result of percutaneous coronary intervention (PCI) but introduced an iatrogenic disease called in-stent restenosis (ISR), due to excessive vascular healing after stenting. ISR is recalcitrant to treatment with a very high recurrent ISR rate. Drug-eluting stents (DES) have reduced ISR to <10%. However, the impaired healing caused by DES may lead to another iatrogenic disease called stent thrombosis (ST), which is more life-threatening than ISR, albeit less frequent in occurrence (approximately 0.6% per year).

ST is not new and was frequent when BMS was introduced initially, where post-stenting patients were required to be treated with anticoagulants such as heparin followed by warfarin. This anticoagulant regime led to increased length of hospital stay, bleeding and vascular complications. Subsequent clinical trials showed that proper stent expansion with adequate post-dilatation with high pressure balloon after stent deployment and dual antiplatelet therapy (DAPT) of aspirin and ticlopidine for two weeks were crucial in preventing ST. DAPT has since become the standard of care for post-stenting patients, reducing overall ST rate to <1%. After two weeks, ST in BMS was extremely rare as the stent struts would have been fully covered by the endothelial cells. DES impaired and delayed normal healing which leads to exposure of stent struts to the blood elements and risk of ST, even many years after the stenting procedure (late stent thrombosis).



By Dr Aaron Wong
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ST is now classified depending on the certainty of the event (definite, probable and possible) and time frame after stenting: acute (<1 day), subacute (<1 month), late (<1 year) and very late (>1 year). Acute or subacute ST is usually due to technical problems during the PCI procedure (inadequate stent expansion or dissections) or clopidogrel resistance, and could happen in both BMS and DES. Late and very late ST almost exclusively happen in DES and are usually related to premature discontinuation of DAPT.

However, very late ST can occur even after the recommended DAPT of 1 year is given to patients who have been on single antiplatelet for a while. The reason for very late ST is unknown but is likely to be related to a combination of uncovered stent struts and sudden increase in platelet reactivity. The outcome of patients presented with ST is poor – 30% may die suddenly and 60% may present with massive acute myocardial infarction.

To reduce ST, both physicians and patients play important roles.

Proper selection and deployment of stents

FDA only approved DES to be used in simple lesions. Stenting in complex lesions (bifurcation or long lesions) increases risk of ST. Ironically, the benefit of DES is greatest in these complex lesions as ISR is high in complex lesions treated with BMS. Stents should be optimally placed and apposed in the vessel. The use of intravascular ultrasound may be used to achieve optimal deployment. Newer generation stents, which include bio-absorbable polymers or stents, may reduce ST rate or shorten the duration of DAPT. Recent availability of newer antiplatelet agents (prasugrel and ticagrelor) may also reduce the rate of ST by overcoming the problem of clopidogrel resistance.

Dual Antiplatelet Therapy

DAPT is recommended for at least 12 months after DES implantation. DES should be avoided in patients who are unable to complete 12 months of DAPT, either due to noncompliance, bleeding risk or the requirement for elective surgery within 1 year. Patients should alert their physicians prior to DES implantation if there is any possibility of discontinuing DAPT prematurely. They should not stop DAPT without consulting their physician even after 1 year, as some complex lesions may require a longer duration of DAPT.

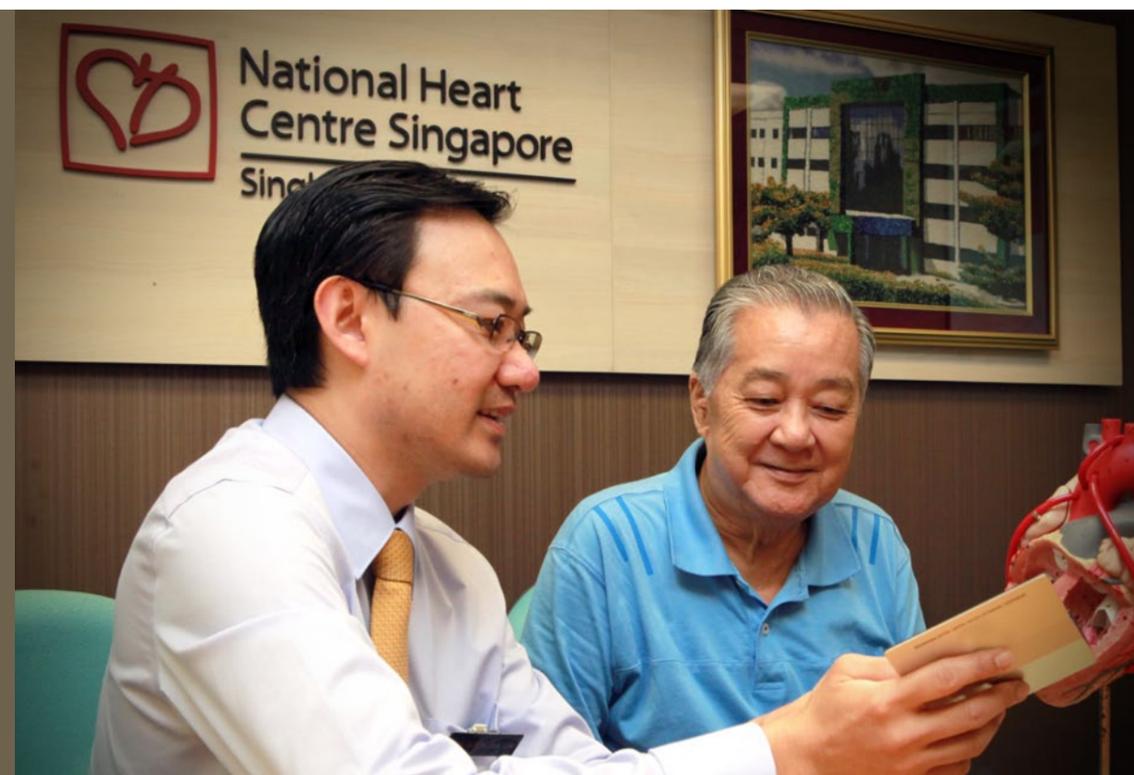
Future surgery

Elective surgery should be avoided for 12 months or longer after DES implantation when the patients are still on DAPT. If emergency surgery is required, clopidogrel should be stopped for five days prior to surgery and aspirin should be continued. Other antithrombotic or anticoagulant therapy may be used perioperatively to prevent ST but with uncertain benefit. For minor dental procedures, DAPT should not be stopped as this may lead to fatal consequences. If urgent dental treatment is required, DAPT should be continued and longer haemostasis manoeuvre should be applied.



NEW HOPE FOR HIGH-RISK PATIENTS WITH WORN-OUT HEART VALVES

Mr Anthony Cher, 72, suffers from chronic high blood pressure, high cholesterol, diabetes and kidney problems. He also had two open heart surgeries done years ago to fix his heart problems.



“I was very sick. Anything that can help me, I’m prepared to take it,” said Mr Anthony Cher.

Dr Soon Jia Lin explaining the mechanics of the mitral valve-in-valve procedure to Mr Anthony Cher.

In May 2011, his heart started failing due to a leaky mitral valve. He could neither eat nor sleep properly. By December 2011, the swelling in his legs was as bad as that of an elephant’s. He could barely walk and was home-bound. “I was very sick. Anything that can help me, I’m prepared to take it,” said Mr Cher. Doctors informed him that as he had two prior open heart surgeries, undergoing an open-heart surgery for the third time to fix the faulty valve will be of high risk and the recovery process could be long.

Fortunately, there is now a new procedure to help high-risk patients like Mr Cher.

On 14 February 2012, the multi-disciplinary surgical team led by Dr Soon Jia Lin, Consultant with the Department of Cardiothoracic Surgery at the National Heart Centre Singapore (NHCS), performed Asia’s first successful transapical transcatheter mitral valve-in-valve implantation.

The procedure, first carried out in Canada in 2007, involves making an incision 6 to 8 cm long on the patient’s chest to insert the new valve implant into the heart through a catheter tube.

A balloon inside the valve will then be inflated to expand the latter, which will stick to the interior walls of the old valve to seal the leak.

This minimally invasive method is safer compared to an open heart surgery, where the patient’s heart would have to be stopped and cut open during the operation to perform the valve replacement. The predicted mortality rate in Mr Cher’s case is 13.4% with a 27.8% predicted risk of prolonged hospital stay if he were to have his chest opened up a third time.

After the procedure, Mr Cher was able to walk again just five days later, and he was ready for home within a week. This was a marked improvement from his 11 days of hospitalisation back in 2005 after his first open heart surgery.

Mr Cher now enjoys a better quality of life and is able to resume his morning walks in the park.



The valve implants are available in different sizes.



National Heart
Centre Singapore
SingHealth

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GENERAL ENQUIRIES

Tel 6436 7800 Fax 6227 3562

Email nhcs@nhcs.com.sg

NHCS INTERVENTIONAL CARDIOLOGY PROCEDURES

- Coronary angiography / cardiac catheterisation
- Percutaneous coronary intervention (PCI) – angioplasty, stent implantation and rotablator treatment
- Percutaneous device closure of atrial septal defect (ASD) / patent foramen ovale (PFO)
- Percutaneous closure of the left atrial appendage using the Watchman device
- Percutaneous balloon valvuloplasty of mitral, aortic and pulmonary valves
- Transcatheter aortic valve implantation
- Transapical transcatheter mitral valve-in-valve implantation
- Intraaortic balloon counterpulsation (IVUS)
- Pressure wire measurement
- Percutaneous cardiopulmonary bypass
- MitraClip procedure
- Renal denervation
- Peripheral vascular intervention

OUR SPECIALISTS (INTERVENTIONAL CARDIOLOGY)

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A/Prof Lim Soo Teik

Medical Director and Senior Consultant
Head and Senior Consultant,
Director, Cardiac Catheterisation Lab

A/Prof Philip Wong
Dr Aaron Wong
Dr Paul Chiam
Dr Stanley Chia
Dr Jack Tan
Dr Yeo Khung Keong
Dr Chin Chee Tang
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Senior Consultant, Director, Research and Development Unit
Senior Consultant, Director, Interventional Cardiology
Senior Consultant
Senior Consultant, Director, Residency Programme
Consultant, Director, Coronary Care Unit
Consultant
Consultant
Consultant

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A/Prof Chua Yeow Leng
Dr Lim Chong Hee
Dr Tan Teing Ee

Head and Senior Consultant, Director, Quality Management
Senior Consultant
Senior Consultant, Director, Heart and Lung Transplant
Senior Consultant,
Director, Cardiothoracic Surgery Intensive Care Unit
Senior Consultant, Director, Operating Theatre
Senior Consultant, Director, Vascular Lab
Consultant
Consultant

For the full list of NHCS services and specialists, please visit www.nhcs.com.sg.

RESEARCH HIGHLIGHT

BMC Med Res Methodol. 2012 Apr 13;12:48.

The ARIC predictive model reliably predicted risk of type II diabetes in Asian populations

Chin CW, Chia EH, Ma S, Heng D, Tan M, Lee J, Tai ES, Salim A
Department of Cardiology, National Heart Centre, Singapore, Singapore

ABSTRACT

BACKGROUND: Identification of high-risk individuals is crucial for effective implementation of type 2 diabetes mellitus prevention programmes. Several studies have shown that multivariable predictive functions perform as well as the 2-hour post-challenge glucose in identifying these high-risk individuals. The performance of these functions in Asian populations, where the rise in prevalence of type 2 diabetes mellitus is expected to be the greatest in the next several decades, is relatively unknown.

METHODS: Using data from three Asian populations in Singapore, we compared the performance of three multivariate predictive models in terms of their discriminatory power and calibration quality: the San Antonio Health Study model, Atherosclerosis Risk in Communities model and the Framingham model.

RESULTS: The San Antonio Health Study and Atherosclerosis Risk in Communities models had better discriminative powers than using only fasting plasma glucose or the 2-hour post-challenge glucose. However, the Framingham model did not perform significantly better than fasting glucose or the 2-hour post-challenge glucose. All published models suffered from poor calibration. After recalibration, the Atherosclerosis Risk in Communities model achieved good calibration, the San Antonio Health Study model showed a significant lack of fit in females and the Framingham model showed a significant lack of fit in both females and males.

CONCLUSIONS: We conclude that adoption of the ARIC model for Asian populations is feasible and highly recommended when local prospective data is unavailable.

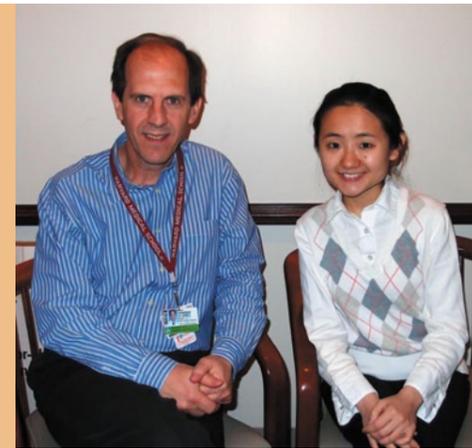
For the full list of NHCS publications, please refer to www.nhcs.com.sg.

ANALYSE THAT

Continued from page 5.

These ECG findings are characteristic of apical hypertrophic cardiomyopathy, where the apical segment potentials are most clearly reflected by large deep inverted T waves in the praecordial leads, particularly V4 and V5. Lesser degrees of T wave inversion and ST segment depression are the other most frequently noted abnormalities. Many patients also have left ventricular hypertrophy by voltage criteria. Other electrographic abnormalities reported less frequently include left and right atrial enlargement, left axis deviation, and first-degree atrioventricular block. Prolongation of the QTc interval has also been noted. Important causes for deep T wave inversion in the anterolateral praecordial leads include myocardial ischaemia, acute myocarditis and acute pulmonary embolism.

The patient subsequently underwent a coronary angiogram that revealed normal coronary arteries, and a left ventriculogram, which showed apical HCM. Transthoracic echocardiography further confirmed the diagnosis. No drug therapy was required as he was asymptomatic.



Dr Angela Koh with her mentor, Dr Marcelo Di Carli who is the Chief of Nuclear Medicine at BWH.

Why Brigham and Women's Hospital

Brigham and Women's Hospital (BWH), a teaching affiliate of Harvard Medical School, is renowned for its clinical and research excellence in cardiovascular medicine. It is also one of America's leading centres for heart, lung, heart-lung, kidney and bone marrow transplant surgeries.

The training focus

My clinical fellowship was in multimodality cardiovascular imaging with a focus in nuclear cardiology and cardiac computed tomography. I was actively involved in the day-to-day running of the imaging services at BWH, which gave me exposure to various clinical applications of basic and advanced cardiovascular imaging techniques.

In the programme, I acquired advanced skills in non-invasive cardiac imaging where I was involved in the protocolling, performance, troubleshooting, post-processing, interpretation, and reporting of cardiac single-photon emission computed tomography (SPECT), positron emission computed tomography (PET-CT) and cardiac computed tomography (CT) studies, and achieved Level 3 competency in these modalities. I also received formal training in the physics and radiochemistry aspects as well as radiation protection which are essential for a comprehensive understanding of cardiac imaging. My mentors include Dr Marcelo Di Carli, Dr Sharmila Dorbala and Dr Ron Blankstein, all experts in their respective areas of multimodality cardiac imaging.

REFLECTIONS IN CARDIAC IMAGING

This issue, Dr Angela Koh, Associate Consultant, Department of Cardiology, National Heart Centre Singapore (NHCS) shares on her fellowship at the Brigham and Women's Hospital at Harvard Medical School, Boston, Massachusetts, USA.

Memorable experience

On the professional front, I was generally very impressed by how hardworking everyone in the fellowship was, but what struck me most was their meticulous handling of every patient which left a deep impression on me. In the management of patients, no stone was left unturned in clarifying every aspect of their medical history and in considering the potential benefit of every investigation or treatment modality. My time in Boston has certainly taught me the importance of applying intellectual rigour when managing patients.

Besides the training, my most memorable experience living in Boston was dealing with the weather! I had arrived in a very, very cold winter season, and my first and lasting impression was how everyone could continue to go about their daily work and schedules, despite inconveniences with snowstorms and transport inaccessibility.

What's next

I am still involved in several ongoing research projects with my mentors, either as the leading or co-investigator. My research work revolves around the use of multimodality imaging in various conditions, such as the use of multimodality imaging [PET-CT and cardiac magnetic resonance imaging (MRI)] for diagnosis and risk stratification of patients with cardiomyopathy, preclinical, clinical and advanced coronary artery disease. I am also involved in an ongoing study on the comparative effectiveness of cardiac imaging studies with respect to downstream resource utilisation.

I hope to have the opportunity to play a part in enhancing NHCS' capabilities in the area of cardiac imaging. I believe PET-CT will be a useful add-on to our current armamentarium of tools as it will enhance our diagnostic and prognostic abilities for various clinical situations, and better serve local and regional needs. I also hope to be able to work on understanding and providing the evidence base for appropriate and effective strategies for the management of local cardiac disease conditions through research endeavours.



Dr Angela Koh (fourth from left) with the BWH medical staff.

NHCS IQC PROJECTS WIN 2 GOLD AND 1 SILVER AWARDS



The team from NHCS Ward 44 (back row) behind the gold award project which reduced patients' admission time from SGH Department of Emergency Medicine to NHCS.

National Heart Centre Singapore (NHCS) bagged three awards, two gold and one silver, at the Team Excellence Symposium in April 2012 where the results of the National Innovation Quality Circle assessment were announced. In a gold award project, the team reduced the patients' admission time from SGH Department of Emergency Medicine to NHCS, with 90% of them admitted to NHCS within three hours. This was a marked improvement, compared with 23 per cent of patients who waited more than four hours previously. For the silver award project, the team cut down the door-to-balloon time to 65 minutes, a savings of 21 minutes from the original 86 minutes. They also achieved an average of 85% of patients ballooned within 90 minutes, up from the previous 65%. Door-to-balloon time is defined as the time taken for a patient to get a coronary intervention after entering the hospital.



Paving the future for interventional cardiology

NHCS Medical Director A/Prof Koh Tian Hai (centre) was presented with the distinguished Chien Foundation Lectureship Award at the recent Angioplasty Summit TCTAP (Transcatheter Cardiovascular Therapeutics Asia Pacific) 2012 held in Seoul, South Korea from 24 to 27 April. First introduced in 2008, the Chien Foundation Lectureship Award is a symbol of commendation and appreciation given to exceptional interventional cardiologists for their efforts in driving education and research within the Asia Pacific region.



NHCS surgeon and nurse win Healthcare Humanity Award

A/Prof Chua Yeow Leng (3rd from right), Senior Consultant, Department of Cardiothoracic Surgery, and Ms Rokiah Binte Sulaiman (centre), Principal Enrolled Nurse with Ward 56 at NHCS were among the 61 recipients of the Healthcare Humanity Award this year. The award honours healthcare professionals who demonstrate exemplary dedication, integrity and compassion.

PROMOTIONS	DR VICTOR CHAO Senior Consultant Department of Cardiothoracic Surgery	DR SOON JIA LIN Consultant Department of Cardiothoracic Surgery	DR ANG CHIN YONG Associate Consultant Department of Cardiology	DR LIM CHOON PIN Associate Consultant Department of Cardiology
				
	Sub-specialty interests: Cardiac Surgery (Adult), Endovascular Surgery, Percutaneous Aortic Valve Therapy, Mechanical Heart Assist Device, Heart Transplantation, Thoracic Surgery, Vascular Surgery	Sub-specialty interest: Cardiothoracic Surgery (Adult)	Sub-specialty interest: Interventional Cardiology	Sub-specialty interests: Echocardiography, Heart Failure

ADVISOR A/Prof Koh Tian Hai
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