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Hybrid Operating Theatre for Endovascular Surgery

National University Heart Centre, Singapore

Screening Asymptomatic Adults for Coronary Artery Disease

A member of the NUHS
Cardiovascular disease remains the leading cause of death globally. It has no geographic, gender or socio-economic boundaries. Every year, cardiovascular diseases cause as many deaths as HIV/AIDS, tuberculosis, malaria and diabetes, plus all forms of cancer and chronic respiratory disease combined.

Data from the World Health Organisation (WHO) indicates that an estimated 17.1 million people died from cardiovascular disease in 2004, representing 29% of all global deaths and occurring almost equally in men and women. Of these deaths, an estimated 7.2 million were due to coronary heart disease and 5.7 million were due to stroke. The Singapore Heart Foundation estimate that every day in Singapore, an average of 15 people die from cardiovascular disease. In 2009, cardiovascular disease accounted for 32% of all deaths in Singapore.

Fortunately, modern and available treatments for heart and vascular disease have resulted in improved survival and quality of life. Great leaps in open cardiovascular surgery and cardiovascular interventions have been made in parallel over the last 50 years. These include open heart surgery with cardiopulmonary bypass, heart valve replacement, coronary stenting, drug eluting stents and endovascular aortic aneurysm repair. Some of these areas will be covered further in this issue.

Recently there has been convergence of these interventions towards hybrid procedures that afford a minimally invasive approach by a combination of surgical operations with precise imaging and endovascular techniques. Some examples are in the evolution of hybrid coronary revascularization, transcatheter aortic valve implantation, endovascular aortic surgery and endovascular intervention for limb salvage.

Several factors driving this convergence are an ageing patient population, improved device technology and better imaging. Patients with cardiovascular disease requiring treatment are increasingly elderly and consequently, have significant co-morbidity and therefore, tolerate these less invasive operations much better. Moreover, the proportion of emergency and complex cases that can be treated by a hybrid approach is increasing. Device technology and
Imaging continue to evolve rapidly. Endovascular devices can now be customised for disease-specific anatomy and delivered in smaller systems. The need for precision through better imaging will be paramount. These patients are now best served by a minimally invasive procedure in a safe and sterile environment with full anaesthetic support and monitoring.

A “Hybrid” operating room combines all the features of a standard operating room with state-of-the-art imaging. It’s a glimpse into the future of surgery and sets a new standard of care for patients with cardiovascular disease. The ideal hybrid Operating Theatre (OT) should be configured for flexible and ample working space with a fixed imaging system, a floating radiolucent OT table, laminar airflow environment for sterility and full anaesthetic support with heart lung bypass capability.

Multi-disciplinary teams have also evolved to perform these procedures in a hybrid operating theatre environment with excellent angiographic imaging with digital subtraction and 3-D imaging for planning and navigation. At the National University Hospital (NUH), these complex procedures are performed by multi-disciplinary teams comprising cardiac and vascular surgeons, interventional cardiologists and radiologists, as well as anaesthetists.

The newly-built hybrid cardiovascular OT at NUHCS features an advanced Siemens Artis Zeego angiographic system. The Siemens Artis Zeego, is a multi-axis system based on robotic technology that can be positioned any way the operator wants and provides cross-sectional, large volume 3D imaging comparable to that of a traditional CT scanner. The Artis Zeego’s robotic C-arm “senses” the location of the operating table, giving surgeons extraordinary flexibility to maneuver the imaging system at almost every angle without moving the patient. As a result, internal organs and vessels can be seen from a “fly around” perspective in three dimensions, in great detail. This enables the surgeon to perform precise imaging in 2-D or 3-D on any part of the body in real time during surgery with optimal safety.

The angiographic system is fully integrated with other imaging systems at NUH, so that patients’ CT and MRI scans, as well as live ultrasound imaging of the heart or great vessels, can be viewed on the large High Definition LED operating screen. “CT-like imaging” and intravascular ultrasound imaging can all be done in the same room while complex surgery is being performed. This improves the precision and safety in which these operations can be done and allows surgeons to combine procedures that previously had to be done in a staged manner, in two places. Without ever leaving the operating theatre, the surgical team can use ultrasound, CT and angiography technologies during a stent graft surgery to treat a patient’s leaking abdominal aortic aneurysm. The Hybrid OT now brings into the operating theatre many imaging technologies previously only available in imaging suites outside the OT. This will benefit many patients who can have imaging and treatment in one setting, where multiple trips were required in the past.
Patients who require a coronary stent and then heart valve repair, for example, previously needed to have the stent inserted in the Cardiac Catheterization Lab and valve repair subsequently in the OT. Patients with disease in the coronary arteries, heart valves, and aorta as the peripheral blood vessels may now benefit from minimally invasive procedures in this hybrid OT suite. The Hybrid OT also opens up doors to new procedures, such as branched endografts for thoracoabdominal aneurysms and percutaneous heart valve repair, for which imaging is crucial.

Hybrid Coronary Revascularization (Minimally Invasive Coronary Artery Bypass Graft and Coronary Artery Stent Placement)

The minimally invasive Coronary Artery Bypass Graft (CABG) procedure uses robotic-assisted techniques that allow surgery to be performed using small incisions between the ribs rather than through a midline incision dividing the sternum. The hybrid CABG involves a LIMA graft to the left anterior descending (LAD) artery performed robotically by a surgeon, followed by stenting of the other coronary arteries by an interventional cardiologist. Recovery from robotic-assisted CABG is shorter and may be associated with fewer complications. Most patients are able to leave the hospital within three to four days and return to full activity, including work, in two to three weeks, rather than the two-month recovery generally required following traditional CABG. While traditional CABG remains the first-line treatment for multiple, severe coronary blockages, the hybrid procedure is appropriate for patients with LAD disease and one or two other blockages that can be treated with stents. Hybrid coronary revascularization has been shown to be a durable, safe and effective option for carefully selected patients, but more data are needed to assess long-term outcomes and determine which patients are most appropriate for the procedure.

Aortic Disease

Endovascular aortic aneurysm repair (EVAR) involves the placement of a covered stent within the enlarged aortic aneurysm sac to exclude blood flow and prevent fatal rupture. Unlike standard open surgery, in which a large incision is made, endovascular aortic repair can be done percutaneously. Newer adaptations of standard EVAR are the Hybrid EVAR, fenestrated or branched EVAR and Chimney EVAR.

A hybrid procedure aims to combine endovascular procedures with limited open surgery. The stent graft deployment is performed in combination with an open operation to revascularise selected arteries that will be “covered” by the stent graft, i.e. deprived of arterial inflow. In this method, more extensive EVAR devices can be deployed to treat the primary lesion while preserving arterial flow to critical arteries.

Thoraco-abdominal aneurysms (TAA) typically involve such vessels and deployment of the EVAR device will cover important arteries, e.g. visceral or renal arteries, resulting in end organ ischaemia which may be critical. The open operation component aims to bring a bypass graft from an artery outside the stent graft coverage to vital arteries within the coverage region. This component adds to the EVAR procedure in time and risk but is usually judged to be a lesser risk than the traditional open thoracoabdominal operation.

Another common example is revascularisation of the left common carotid artery and/or the left subclavian artery from the innominate artery or the right common carotid artery to allow treatment of a distal arch thoracic aneurysm. Continued design improvement in stent graft including branched endografts will reduce but not eliminate this type of surgery.

“Chimney stents” into the carotid artery with TEVAR into the proximal aortic arch have recently been described. All such hybrid procedures aim to reduce the morbidity and mortality of treating aortic disease in a patient population that is increasingly older and less fit than when major open repairs were developed and popularised. Even then, significant risks were accepted in the understanding that the large open operation was the only option. Now with hybrid
EVAR performed in hybrid OTs, these complex procedures can be done with much lower risks. The trade off is that durability and problems such as ‘endoleaks’ require careful surveillance.

The Hybrid OT also promises to improve care in life-threatening emergencies such as aortic dissection or transection.

**Transcatheter/ Transfemoral Aortic Valve Implantation**

The transcatheter aortic valve integrates balloon-expandable stent technology with a replacement tissue heart valve. The National University Heart Centre, Singapore (NUHCS) is one of the few centres in Asia to perform percutaneous transcatheter aortic valve replacement. During the procedure, a catheter is advanced to the aortic valve, either through the femoral artery or through a small chest incision and through the left ventricle. Once the catheter is in place, a tissue valve with a metal stent scaffolding is positioned and deployed. Fluoroscopic guidance provides real time visualisation. The force of the expanding stent anchors the new valve in place, completely avoiding the need for sutures, cardiopulmonary bypass, open surgery — and their associated effects.

**Endovascular Limb Salvage**

Rest pain, tissue loss, and gangrene are manifestations of critical limb ischemia caused by peripheral arterial disease and define a patient subgroup at highest risk for major limb amputation. The diagnosis of critical limb ischemia mandates prompt medical and surgical management to achieve the best chance of limb salvage.

Surgical intervention has evolved from primary amputation to open bypass to the present era of endovascular therapy. The goals of surgical bypass and endovascular therapy are to improve perfusion sufficiently to permit healing. Endovascular therapy has been shown in multiple retrospective studies to achieve limb salvage similar to open bypass. At NUHCS, we are able to achieve a 75% twelve-month amputation free survival using an endovascular first approach in patients presenting with critical limb ischaemia.

Close clinical surveillance and serial monitoring of limb perfusion by means of non-invasive arterial studies are needed to determine the need for further vascular intervention. Limb salvage patients suffer from multiple co-morbidities and benefit from a minimally invasive and multi-disciplinary team approach to care.

Combining traditional operations with angiographic imaging technology in the same suite promises to transform the care of patients, with improved safety and outcomes, while stimulating innovation. What previously involved two separate procedures can now be done in one. When the best approach for a patient involves a combination of coronary artery bypass and stenting, we can reduce the stress of surgery and improve recovery time by performing both at the same time. The imaging technology can also be used after a standard bypass to ensure the bypass graft is providing adequate blood flow to the heart.

Published research has shown that this approach can reduce the number of complications. All of these imaging technologies are coordinated and presented to the surgeon through an advanced large display LED monitor — an
eight-megapixel high-definition screen that displays patient medical information along with reference and live images in the OT. The system also allows for video conferencing in the hospital and permits broadcast of live videos for teaching purposes.

**Conclusion**

In conclusion, the potential for improved patient outcomes and safety is huge, its utilization synergistic and its reach multi-disciplinary. The “Hybrid” Operating Theatre at NUHCS combines all the features of a standard operating room with advanced imaging. It’s a glimpse into the future of surgery and sets a new standard of care for patients with cardiovascular disease.

**Associate Professor Peter Robless**

Associate Professor Peter Robless is a Senior Consultant in the Dept of Cardiac, Thoracic and Vascular Surgery (CTVS) in NUHCS. He holds several appointments including the Head of Division of the Vascular and Endovascular Surgery, Director of the Non-Invasive Laboratory, and co-ordinator for the Vascular Medicine and Therapy Programme at NUHCS.

He also serves as a Council member for the Asian Society for Vascular Surgery and the Asian Venous Forum.

A/Prof Peter Robless graduated MBChB from the University of Aberdeen in 1992. He then completed training in General and Vascular Surgery in Glasgow and London, UK. He underwent sub-specialty training in vascular surgery at St Mary’s Hospital, London with further training in Endovascular Surgery at St George Hospital, Sydney, Australia before returning to Singapore in 2004. He was awarded a Doctorate of Medicine from the University of London in 2006. In 2009, he was awarded a Health Manpower Development Program grant to study the vascular surgical programs at Beth Israel Deaconess Hospital, Harvard Medical School, Boston and The Cleveland Clinic.

He is a Fellow of the Royal College of Surgeons, UK, the European Board of Vascular Surgery and the American Society of Angiology.

In addition to his surgical practice, Associate Professor Robless has several research interests, including carotid disease, endovascular surgery and vascular biology.

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Surgery for Congenital Heart Diseases

Dr Maung Aye, Consultant, Department of Cardiac, Thoracic & Vascular Surgery, National University Heart Centre, Singapore.

Open heart surgical programme at the NUH began with a congenital heart surgical procedure. The very first heart surgery performed in NUH by Prof. CN Lee in 1985 was a closure of Atrial Septal Defect (ASD). The patient was a 6-year-old boy. He made an excellent recovery after the surgery. In later years, he remained in good physical shape and completed National Service in the 1st Battalion, Singapore Guards unit as a Guardsman. He is now 33 years old and recently just got married.

This heartwarming story was followed by many similar examples of how a good team of dedicated medical professionals (surgeons, cardiologist, intensivists, nurses, perfusionists and allied health specialists) can make a difference to people’s lives. These children would have lived only several years without surgery. We are indeed privileged to be in this special field, to be able to be of help to make lives better.

The complexity of surgical procedures has increased over the years, from ASD closure to procedures such as complex Neonatal Arterial Switch operations.

Dr Winn Maung Maung returned from his Health Manpower Development Programme (HMDP) in the United Kingdom to join the Congenital Cardiac Surgical team in April 2009. Together with paediatric cardiologists, cardiac anesthetists, intensivists and nurses, they now form the core of the Congenital Cardiac Surgery Programme.

Since April 2009, the number of congenital cardiac surgical procedures gradually increased from average of 20 – 30 per year before April 2009 to 49 procedures by the end of 2009 and 93 procedures by the end of 2010. The patients’ ages range from a day to 35 years old (Adult Congenital). The smallest patient is a newborn premature baby requiring PDA ligation. He weighed 800 grams at the time of surgery.

Various types of total corrective, or temporary, palliative cardiac surgeries are performed for newborns, infants, children and adults with congenital cardiac defects.

The procedures performed include:

**Closed Heart Procedures:**
- Insertion of Modified BT shunts / Central Shunt
- PDA ligation (performed in NICU – usually weighs less than 1 kg)
- Neonatal Coarctation of Aorta Repair, Glenn (BCPC) and Fontan (TCPC) Procedures, etc.

**Open Heart Procedures:**
- Closure of ASD
- Closure of Ventricular Septal Defect (VSD)
- Repair of Tetralogy of Fallot
- Repair of Total Anomalous Pulmonary Venous Drainage (Supra-Cardiac, Intra-cardiac & Infra-cardiac)
- Arterial Switch Operation for Transposition of Great Arteries
- Repair of Interrupted aortic arches
- Rastelli Procedure
- Rastelli-Senning Procedure
- Homograft Replacements

All our congenital cardiac patients for surgical intervention are discussed in depth in weekly meetings. It is a multidisciplinary team approach, which involves the Congenital Cardiac Surgical team, Paediatric Cardiologists, Adult Congenital Cardiologists, Paediatric Cardiac Anaesthetists, Paediatric ICU team, Nursing Staffs and Allied Health Professionals. In the event that antenatal cardiac defect cases are to be discussed, Obstetricians will be present to discuss the details.

Cardiac defect antenatal counseling usually take place in the outpatient clinics conducted by the Congenital Cardiac
Surgical team, together with Paediatric Cardiology team. In recent years, we have also seen increasing referrals from other institutions with antenatal diagnosis of cardiac defects. These pregnancies are then closely monitored by our Obstetricians. The deliveries are usually done in NUH, with a multi-disciplinary team on stand-by to carry out necessary interventions for the baby, if needed.

NUH has also set up a monthly birth defect meeting, where all the birth defects are discussed by the multi-disciplinary teams, including genetics specialists.

Extracorporeal Membrane Oxygenation (ECMO) and Extra-Corporeal Life Support (ECLS) for neonatal/ paediatric patients has been well-documented to be life saving for critically-ill paediatric patients with severely impaired cardiopulmonary function. To date, 13 paediatric patients were put on emergency ECLS/ECMO support with off ECMO survival of 90%. The longest duration on ECMO was a 6-year-old boy from UAE with leukemia complicated by pneumonia. He was on ECMO for 38 days and came off ECMO successfully and has since returned to the UAE.

Since April 2009, all the paediatric cardiac surgical patients are now nursed in the Paediatric Intensive Care Unit (PICU -Ward 46A) in NUH.

The Paediatric Cardiac Surgical team also makes regular charity trips, every 3 months to Siem Reap, Cambodia, to offer free cardiac surgery for poor children with cardiac defects.

We truly aim to make NUHCS a national and regional referral Centre for congenital cardiac surgery and ECLS / ECMO support for paediatric patients, and are dedicated to improving the lives of children with heart problems.

For more information, please contact us at:

Heart Clinic @ Level 1
Tel: 6772 5278 / 9723 6347
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Ear Implant Surgery

Conventional hearing aids without the need for surgery are the usual way to go when it comes to addressing hearing impairment. However, with advances in medical technology, there are now surgically implantable hearing device to treat all types of hearing loss.

The external component of a semi-implantable middle ear implant is a 50-cent coin-sized sound processor that is held in position simply via magnetic attraction on the scalp. It is easily hidden behind a patient’s hair. There is no ear mould in the ear canal. The internal component has a magnetic part that attracts the external processor, and is surgically placed under the scalp about three centimetres behind a patient’s ear, driving a floating mass transducer that is placed on the stapes middle ear bone.

In patients with normal ear canals and middle ear bones (i.e. for those who suffer from age-related, noise induced or congenital hearing loss), the transducer is crimped onto the incus middle ear bone. Other advantages of the middle ear implant include natural sound quality, no obstruction of the ear canal, no feedback, and the easily-hidden external sound processor.

A/Prof Lim performed the first semi-implantable middle ear implant in Asia in 2006, and the first total-implantable “invisible” middle ear implant in Singapore in 2008.

Unlike semi-implantable ear implants, a totally implantable implant is placed under the scalp, without any component above the skin; the microphone, sound processor and rechargeable battery are placed completely under the skin. The device is controlled by a remote control to regulate the volume and the programmes that are tailored to different listening situations.

When To Consider Getting Ear Implants

There is a need for careful evaluation to assess patients’ suitability, and proper counselling of realistic expectations and risks. Individuals who suffer from moderate to severe hearing loss in the outer ear canal, middle ear, and inner ear cochlear may benefit from ear implants when conventional hearing aids are not sufficient. This includes people without ear canals, abnormal middle ear bones from disease or congenital, age-related, noise-induced hearing loss or hearing loss from infections or trauma.

The Benefits Of Ear Implants

Middle ear implants do not require ear moulds in the ear canal, thus freeing the ear canal from the occlusion effect, wax impaction, skin irritation or infection.

The sound quality is more natural with a middle ear implant as it amplifies sound by directly vibrating the middle ear bones or cochlear windows. It is possible to avoid feedback even at high amplifications of sound, even for the higher frequencies. Ear implants can also be used in cases where there are absent or stenosed ear canals from congenital anomalies or infections, and abnormal middle ear bones that have failed multiple ear bone surgeries. In addition, the totally-implantable ear implant is invisible, allows 24-hour hearing even during sleep, and does not have restriction on activities like sports or swimming.

For more information about hearing impairment and treatment options, contact the NUH Department of Otolaryngology (ENT) – Head & Neck Surgery.

The ENT – Head & Neck Surgery Clinic provides comprehensive diagnostic ear, nose, throat and head and neck services to both adult and child patients.

**ENT Clinic**
Kent Ridge Wing 2, Level 3

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**Appointment tel:** (65) 6772 2002
**Email:** ent@nuhs.edu.sg
One of the more challenging and disheartening gastrointestinal (GI) conditions a general physician (GP) is faced with is that of a chronic abdominal pain – challenging due to the spectra of diagnoses it encompasses, disheartening because after clinical assessment and investigations have shown no organic pathology, the physician is still faced with a patient with very real symptoms to whom he/she is unable to confidently assign a diagnosis and treat effectively. This article seeks to outline a suggested approach to such a patient.

Making the Diagnosis
A host of disorders can produce chronic abdominal pain, and while there is no singular algorithm on work-up and assessment, a sound approach would be to have a list of diagnoses in mind (as outlined in Table 1), whilst performing a clinical assessment followed by the necessary radiologic or endoscopic investigations.

History & Physical Examination
Ask about the duration of the pain – if it has been there for years, why is the patient seeking medical attention only now? Very often the pain has not changed, but the visit has been prompted by new concerns (e.g. A relative dying from a GI cancer resurrecting fears within the patient), stressors at work or new symptoms.

What is the nature of the pain? Intermittent versus constant, relationship to meals and (often forgotten) is there a link with stress and emotions. Enquire about red-flag symptoms such as weight loss, change in bowel habits and blood in stools. Ask about a family history of inheritable conditions such as colorectal cancer, porphyria, and inflammatory bowel disease.

The physical examination should be systematic. Start with a general exam for anemia, jaundice and weight loss and possible contributory systemic illness. Move to the abdomen and beyond looking for evidence of organic GI disease, it is also useful to evaluate for functional disease elements e.g. by eliciting a positive Carnett’s sign and “closed eye sign”. End off with a perianal exam and a rectal exam, where indicated.

If the physician has established a likely functional diagnosis, for example Functional Abdominal Pain Syndrome (FAPS), he/she will do well to go into a deeper clinical and psychosocial assessment on co-existing psychiatric diagnoses, impact of the illness on daily functioning etc.

Investigations
The utility of diagnostic tests should be focused on making a definitive diagnosis or excluding a significant differential. For example, an ESR and CRP are useful in excluding an active inflammatory bowel disease or helping indicate an underlying smoldering inflammatory or infective process.

Radiologic investigations should similarly be tailored towards making a diagnosis – for example a CT scan ordered to evaluate a palpable abdominal mass in a patient as versus a scan in an individual with no red-flag symptoms done to evaluate “vague abdominal pain”. Endoscopy should be done to confirm suspected pathology, and in patients who meet the criteria for elevated risk for GI malignancies.

“Don’t just do something – stand there!”
When tests come back negative, there is pressure from the patient (and often from within the physician himself) to run more tests. A vicious cycle ensures where the patient expects answers, gets frustrated as he goes through an increasing number of investigations which come back as negative, and this further feeds into the physician’s need to secure a diagnosis and start treatment of some form.

Often, the physician needs to take a step back, pause and re-evaluate the situation – “Don’t just do something – stand there!” Consider that the patient may not have a pursuable organic pathology, and could be suffering from a functional GI disorder.

The management of these disorders requires a different mindset, and the emphasis is on helping the patient understand his/her
illness, set treatment parameters and work together to manage the symptoms. Two of the more common (but often less considered) causes of chronic functional abdominal pain are discussed:

**Functional Abdominal Pain Syndrome (FAPS)**
FAPS is defined (Rome III) as a continuous or nearly continuous abdominal pain, which is poorly related to physiologic events e.g. defecation, in a patient who does not have sufficient symptoms fulfilling other functional GI disorders that would explain the pain. These patients have some loss in daily functioning and would have met the above criteria for the last 3 months and had a symptom onset for at least 6 months prior.

The pathophysiology of FAPS is believed to be related to alterations in the pain conduction pathways – namely the cortico-limbic and cortico-pontine pain modulation circuits, descending pain pathways and possibly a contributory neuropathic element. Studies have also shown a link with affective disorders, especially anxiety and depression.

The management of FAPS starts with setting realistic treatment goals and then basing the treatment on symptom severity and degree of disability. Pharmacologic therapy involves the use of 3 groups of drugs – namely the antidepressants, anxiolytics and analgesics. The choice of agent and dosing depends on the symptoms and is titrated against possible side-effects experienced. No specific psychological treatment study has been done on FAPS, but the strong psychological component suggests that psychotherapeutic intervention may be of benefit.

**Irritable Bowel Syndrome**
IBS is a functional bowel disorder where abdominal pain or discomfort is associated with defecation, a change in bowel habits or disordered defecation. The diagnostic criteria are listed in Table 2.

The pathophysiology of IBS is a complex and multi-faceted one. The dualistic approach of an organic pathology versus a psychiatric diagnoses has been replaced by a model incorporating genetic and environmental (enteric infection, abuse history) factors. These act to cause GI motor disturbances, visceral hypersensitivity, abnormal afferent sensation processing and psychological affects, all of which summate to cause symptoms in the IBS patient.

Management starts with making a confident diagnosis and educating the patient both on the illness as well as what to expect from the treatment. GPs care for the majority of IBS patients, and are well positioned with intimate knowledge of their symptoms, personalities and families. Treatment is both graded and multi-component, consisting of the following:

**Drugs** – this is directed at the dominant symptom. For example, anti-diarrheals in IBS-D, laxatives in IBS-C. For patients with a strong component of abdominal pain, there is a role for use of anti-depressants such as the TCAs. The practice is now shifting beyond the tricyclics to SSRIs, SNRIs and in severe cases other psychotropic agents, with a greater understanding on the role of altered afferent processing and targeting of the brain-gut axis.

**Psychological Treatment** – Psychotherapy, cognitive behavior therapy and hypnotherapy have also shown effects in trials.

**Intestinal Flora Manipulation** – there is a limited role of antibiotics in patients with small intestinal bacterial overgrowth. Greater promise lies in the use of probiotics, and now prebiotics in IBS. Trials have shown benefits, but the questions of the right strain selection, optimal dosing and indication still remain to be optimally answered.

**Suggested Reading:**
2. Sleisenger and Fordtran’s Textbook of Gastrointestinal and Liver Disease

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**Table 2: Rome III diagnostic criteria for Irritable Bowel Syndrome**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Symptom</th>
</tr>
</thead>
</table>
| Recurrent abdominal pain/discomfort for > 3 days in the last month, that is associated with > 2 of the following: | • Improvement with defecation
• Onset associated with change in frequency of stools
• Onset associated with change in form of stools |

Criteria fulfilled for the past 3 months (for at least 6 months prior to diagnosis).

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**Dr Reuben Wong Kong Min**

Dr Reuben Wong is a Consultant in the Department of Gastroenterology and Hepatology, National University Hospital (NUH), Singapore and an Assistant Professor at the Yong Loo Lin School of Medicine, National University of Singapore (NUS).

He obtained his MBBS from NUS and attained his MRCP (UK) in 2004. In 2008, he became a Fellow of the Academy of Medicine, Singapore.

He pursued his sub-specialty training at the University of North Carolina (UNC) Center for Functional Gastrointestinal Diseases under the mentorship of Professors Douglas Drossman and William Whitehead.

Dr Wong remains an Adjunct Assistant Professor of Medicine at UNC, in recognition of grants secured and continuing collaborations.

As a sub-specialist in Functional Gastrointestinal and Motility Disorders, Dr Wong helms the Functional Gastroenterology Clinic and recently started the Gastroenterology-Psychology multi-disciplinary service. Following his training at UNC, Dr Wong, who is also Clinical Director of the Gastrointestinal Motility Laboratory, was the first to introduce High Resolution Manometry in Singapore. This laboratory has since established itself as a referral center and regional training hub.

Dr Wong has research interests and publications over a wide range of subjects, but his forte remains in the realm of gastrointestinal motility, neuro-gastroenterology and Irritable Bowel Syndrome (IBS), which he actively pursues. In recognition of his achievements, he has received several accolades, including three Young Investigator Awards and the National Leadership in Academic Medicine Award.

Dr Wong is also actively involved in undergraduate and postgraduate medical education. His passion for public outreach sees him serving as Vice-President of the IBS Support Group of Singapore.

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Introduction

Coronary artery disease (CAD) is a leading cause of mortality and morbidity worldwide. Given its clinical impact, early detection of the disease whilst in its pre-clinical (asymptomatic) stage may allow high-risk individuals to be treated with the appropriate therapy (intensive risk factor control and/or coronary revascularization) which in turn, may improve their prognosis.

Although screening for CAD is intuitive and popular, uncertainties remain regarding the appropriateness of screening, the type of screening test and its cost-effectiveness. There is also a lack of direct evidence to show that screening significantly increases the detection of severe CAD in asymptomatic individuals or, the subsequent follow-on treatment actually improves clinical outcomes. Thus, the uncertain benefits of screening would need to be balanced against the potential harm from screening such as radiation exposure, additional investigative procedures, anxiety, over-treatment and “labeling”.

The Ministry of Health (MOH) had published its guidelines for CAD screening in January 2011 and the recommendations are summarised in Table 1.

Identifying patients at risk for screening

Several factors are associated with a higher risk for coronary events including old age, male gender, family history of premature CAD, diabetes, high blood pressure, smoking, abnormal lipid levels, ethnic origins, obesity, sedentary lifestyles etc.

A number of multi-variate risk models based on the presence of such risk factors have been developed to help clinicians more accurately predict the cardiovascular risks in asymptomatic individuals, e.g. Framingham risk score, ASSIGN, SCORE and QRISK2.

The Framingham risk score incorporating weightage of local risk factors has been developed and the MOH has recommended its application for the local population as the first step for assessing an individual’s global cardiovascular risk. The 10-year risk of developing major CAD events including MI and coronary death in asymptomatic individuals are categorised as follows:
- Low risk = <10%
- Intermediate risk = 10 to 20%
- High risk = >20%

The risk calculator is available online at http://www.hpb.gov.sg/hpb/healthjournal/jou06b.asp?id=461

The modified Framingham risk scores do not predict other adverse cardiovascular events such as stroke or claudication, or account for the increased risk from a family history of premature CAD. Diabetics were not included in the risk model as they were already assumed to be in the high-risk category, although the concept of diabetes being a CAD equivalent is now questionable after a recent metanalysis found that diabetics without prior MI had a 43% lower risk of developing CAD events than non-diabetics with prior MI.

<table>
<thead>
<tr>
<th>Level of risk (modified Framingham risk score)</th>
<th>Screening Tool</th>
<th>Grade of Recommendation</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt;10% 10-year risk of CAD)</td>
<td>Routine screening not recommended</td>
<td>C</td>
<td>2++</td>
</tr>
<tr>
<td>Intermediate (10% - 20% 10-year risk of CAD)</td>
<td>Exercise treadmill test may be performed: i) as a guide to risk reduction therapy ii) to evaluate men &gt;45 years old and women &gt;55 years old before starting vigorous exercise iii) to evaluate diabetics before starting vigorous exercise iv) to evaluate those in occupations in which impairment may impact public safety Cardiac stress imaging or stress echocardiography may be considered in an individual with moderate to high CAD risk and an abnormal exercise ECG</td>
<td>C</td>
<td>2++</td>
</tr>
<tr>
<td></td>
<td>Coronary calcium score on cardiac CT may be used to re-stratify an individual into high risk status based on a high calcium score</td>
<td>C</td>
<td>2++</td>
</tr>
<tr>
<td></td>
<td>CT coronary angiography not recommended</td>
<td>D</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Ankle brachial pressure index may be measured for re-stratifying risk status</td>
<td>B</td>
<td>2+</td>
</tr>
<tr>
<td>High (&gt;20% 10-year risk of CAD)</td>
<td>Exercise treadmill test and cardiac stress imaging indications as in intermediate risk group Coronary calcium score not recommended CT coronary angiography indication uncertain</td>
<td>D</td>
<td>4</td>
</tr>
</tbody>
</table>
The MOH recommends that for adults over the age of 18, global cardiovascular risk assessment should be done every 5 years, sooner for individuals at higher risk.

**What is the value of additional screening tests?**

Although risk-factor models can improve the prediction of coronary risks, their accuracy is considerably below 100% (the C-statistic [discriminant accuracy] for Framingham risk score = 0.774). Consequently, other supplementary methods of screening have been regularly used with the aim of identifying those at lower or higher risk of CAD events and re-classifying their risk categories. Such re-classification, if accurate, could intensify the cardiovascular risk reduction therapies in individuals re-classified into the high risk category.

However, direct evidence showing the benefits associated with such risk refining strategies is lacking and the classification thresholds remain somewhat arbitrary. The current tests available for CAD detection (ischaemia and/or atherosclerotic burden) involve a trade-off between accuracy, cost, radiation and invasiveness. Clinical judgment is required to avoid indiscriminate screening which could waste resources on tests that will not alter preventive interventions or result in treatment with unproven efficacy in the population being screened.

1. **Resting ECG**

The sensitivity of resting ECG abnormalities for predicting CAD events is low. Approximately 30% of individuals with angiographically-proven CAD have normal resting ECG and likewise, approximately 30 – 50% of individuals with normal coronary angiogram have ECG abnormalities.

A local study of asymptomatic adults who were referred to a tertiary cardiac centre with ECG abnormalities (suspicious of coronary artery disease) found a prevalence of 0.8% in this population, further indicating that using ECG as a screening tool is not helpful.

The MOH recommends against the routine use of resting ECG for screening in asymptomatic individuals.

2. **Exercise treadmill test (ETT)**

ETT is an important tool in the evaluation of patients with known or suspected CAD providing information on diagnosis, prognosis and response to therapy. However, in asymptomatic individuals, there is a great deal of controversy surrounding its use as a screening tool because of its low predictive value in subjects without known disease.

In the latest systematic review of the evidence on screening asymptomatic adults with resting ECG or ETT, commissioned by the US Preventive Services Task Force (USPSTF) in 2011:

- No randomised controlled studies that compared screening versus without screening on clinical outcomes were identified,
- No studies were found that evaluated how screening affected the use of interventions to reduce cardiovascular risk,
- No studies estimated how accurately resting ECG or ETT (plus traditional risk factor assessment) classified patients into high, intermediate or low risk groups compared with classification with traditional risk factor assessment alone, and,
- No studies that reported downstream harms associated with follow-up testing or interventions after screening. Pooled analysis showed that some abnormalities on ECG or ETT are associated with an increased risk (pooled hazard ratio 1.4 to 2.1) for subsequent cardiovascular events, after adjustment for traditional risk factors.

Given the persistence of absence of evidence, the USPSTF is likely to re-affirm its recommendations in 2004 against routine screening with resting ECG or ETT. The MOH guidelines stipulated that ETT may be performed in intermediate to high risk individuals in the following situations:

- Evaluate individuals with multiple risk factors as a guide to risk-reduction therapy
- Asymptomatic men > 45 years and women > 55 years of age who plan to start vigorous exercise
- Individuals with certain occupations in which undetected CAD may impact public safety
- Individuals with diabetes above 40 years old who plan to start vigorous exercise

3. **Cardiac stress imaging**

In patients who cannot undergo ETT, the prognostic value of myocardial perfusion imaging (MPI) or stress echocardiogram has not been well studied but seems to be low even in populations at high risk. The use of cardiac stress imaging in the asymptomatic individual is generally reserved for those at increased risk of CAD who have had an abnormal ETT.

The Working Group on Nuclear Cardiology and Cardiac CT of the European Society of Cardiology (ESC) 2011 did not recommend MPI for risk stratification in any risk category of patients except for perhaps first degree relatives of patients with premature CAD.

A recently published trial, DIAD (Detection of Ischaemia in Asymptomatic Diabetics) randomising over 1,100 diabetic patients to screening with MPI versus standard medical care, found low cardiac event rates overall in the study population with no difference between the two randomised groups after 5 years of follow-up. Possible reasons for the lack of benefit from screening included optimal contemporary medical therapy for both groups, and unproven benefits of revascularization in asymptomatic individuals.

The ESC Working Group recommended against unselected routine screening for CAD in asymptomatic individuals with type 2 diabetes but gave a class IIa indication for MPI assessment of asymptomatic type 2 diabetics with significant coronary calcification.

4. **Coronary artery calcium (CAC) score**

In the coronary arteries, calcifications occur almost exclusively in the context of atherosclerosis. Heavier degree of calcifications correlates with older age, higher number of coronary risk factors and a greater extent of atherosclerosis. CAC was measured using electron beam computed tomography (EBCT) but multi-
detector row CT (MDCT) with higher temporal resolution has become more widely available than EBCT and most CAC assessments will now be done using MDCT scanners.

The absence of detectable CAC in asymptomatic individuals is associated with a very low (<1% per year) risk of major cardiovascular events over the next 3 – 5 years whereas an up to 11-fold increase in risk has been reported in subjects with extensive coronary calcification.

It has also been established that CAC in asymptomatic individuals has prognostic power above and beyond the traditional risk factors with increasing CAC scores predicting higher cardiac event rates in each Framingham risk category. Individuals with low or high Framingham risk scores will not have their risk reduction strategies altered by their CAC scores (the increased risk in the low risk category is still below treatment threshold) and so screening for CAC in these two groups is not recommended. However, in the intermediate risk category, a high CAC score identifies a group of high-risk subjects in whom intensive treatment of risk factors may be warranted whereas absence of CAC reclassifies the individuals to low risk. CAC assessment is also deemed appropriate for individuals with low Framingham risk score but with a family history of premature (ACCF/AHA appropriate use criteria 2010).

Patients referred for CAC should be informed of the small theoretical risks of malignancy from radiation exposure, estimated lifetime excess cancer risk of 9 and 28 cancers per 100000 persons for men and women respectively in a single screening at age 40 years based on a median dose of 2.3mSv.

The effective radiation dose for various studies is as follows:
- Chest X-ray: 0.1mSv
- CT coronary angiography: 2.5-30mSv
- Myocardial perfusion imaging: 3 - 30mSv
- Invasive coronary angiogram: 7mSv

5. CT coronary angiography (CTCA)
After intravenous injection of contrast agent, CTCA allows visualisation of the coronary artery and its lumen. Since 2005, coronary CT angiography using MDCT scanners has been aggressively marketed to the consumer and this has led to the decreased use of isolated CAC scanning. CTCA has a high negative predictive value (>95%) and is a useful tool for ruling out CAD.

In asymptomatic individuals however, the prognostic role of CTCA is unclear. In a study which included 1,000 asymptomatic Korean subjects aged 35-75 years old, 22% of individuals had coronary atherosclerosis but only 5% showed significant (>50%) angiographic stenosis and 2% had severe (>75%) stenosis. All but one adverse coronary events were revascularisations (triggered by the detection of the coronary stenoses), not necessarily indicating a less favourable prognosis had CTCA not been done.

In the ACCF/SCCT/ACR/AHA/ASE/ASNC/SCMR appropriate use criteria 2010, CTCA screening in asymptomatic adults in low risk and intermediate risk groups was rated as inappropriate and in the high risk group, uncertain.

6. Carotid and peripheral artery imaging
In asymptomatic individuals, increased carotid artery intima-media thickness or reduced arterial flow (low ankle-brachial index) is associated with as much as a threefold increase in cardiovascular risk after adjustment for traditional risk factors.

However, studies of incremental predictive value in asymptomatic individuals are few. The MOH does not recommend measurement of carotid intima-media thickness for routine cardiovascular screening but considers ankle-brachial index measurement reasonable for the purpose of re-classifying an individual who has intermediate risk of CAD.

Conclusion
More work needs to be done to determine whether the improved risk prediction provided by some tests translates into better patient care and outcomes, and whether these screening tests are cost-effective, generalisable to different ethnicities and are not harmful. In low risk asymptomatic adults, current guidelines recommend against routine screening for CAD. Screening should only be offered on a case-by-case basis to asymptomatic individuals at increased risk after careful discussion with the patient about the risks and benefits of screening.

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Percutaneous Intervention for Valvular Heart Disease

Dr Edgar Tay, Consultant, Cardiac Department, National University Heart Centre, Singapore

Epidemiology of valvular heart disease

Significant valvular heart disease accounts for approximately 2.5% of the total burden of cardiovascular disease. The incidence of disease increases exponentially with age. Until recently, conventional heart surgery remained the mainstay of treatment. As such, a large proportion of patients who are eligible for treatment were unable (due to co-morbidities and surgical contra-indication), or, unwilling to undertake open heart surgery.

The evolution of new percutaneous therapies

Aortic valve stenosis

Over the past 10 years, research and refinement of techniques have now made percutaneous treatment of aortic valve stenosis a clinical reality. Dr Blase Carabello, one of the thought leaders in valvular heart disease, has called this “one of the most exciting events in cardiology in the last 50 years”. This new procedure is called transcatheter aortic valve implantation or TAVI.

There are currently 2 valve systems available for clinical use. The Edward SAPIEN XT is a balloon expandable valve produced by Edward Lifesciences (Figure 1) while the Medtronic CoreValve is a self expanding aortic valve (Figure 2).
Both valves can be delivered through the femoral artery utilizing a 18Fr/19Fr sheath in a retrograde fashion to the aortic root (Figure 3). When the transcatheter heart valve is deployed, the native diseased aortic valve leaflets are displaced to the side and the new valve functions immediately. There is a dramatic reduction in transvalvular gradient after the procedure. In patients with inadequate or small femoral arteries, the valves can be delivered and deployed through the apex of the left ventricle using a limited thoracotomy (Edward SAPIEN) (Figure 4) or via the left subclavian artery (Corevalve). The natural history of untreated severe symptomatic aortic valve stenosis is well-established with patients having a median survival of 3 years. The approximate time interval from the onset of symptoms to death is 1.5-2 years for heart failure, 3 years for syncope, and 5 years for angina. A recent trial (PARTNER trial cohort B-conducted in Canada, US and Germany)\(^2\) compared the outcomes in patients (deemed surgically inoperable) undergoing TAVI through the femoral site using the Edward SAPIEN valve against patients who were treated medically. This trial showed a resounding benefit of TAVI over medical therapy with a 1 year all cause death of 30.7% versus 50.7%. The co-primary endpoint of this study which was a composite of death and hospitalisation was also significantly lower in the TAVI group. There was also significant improvement in heart failure class in patient surviving up to 12 months following TAVI. Among patients undergoing TAVI, there was, however, an increase in stroke rates and major vascular complications, a difference that reached statistical significance for vascular complication.

A second trial compared the TAVI procedure (Edward SAPIEN) versus conventional heart surgery in patients deemed at high surgical risk (PARTNER trial cohort A)\(^3\). The result of this trial was greeted with comments like “absolutely spectacular” when it was presented in the American College of Cardiology Scientific meeting. In this trial, deaths at 30 days were numerically lower in the TAVI group but this did not reach statistical significance. At 1-year, death in both groups were almost identical and met the predefined criteria of non inferiority. Major strokes and vascular complications were more frequent in the TAVI group while bleeding and atria fibrillation rates were more common in the surgical group.

The durability of these valves has been good thus far. Since the Edwards programme commenced in Vancouver British Columbia, Canada in 2005, many patients have returned for reviews and there has not been any published case requiring a re-intervention for valve degeneration. In fact, these valves (Edward SAPIEN) are constructed in the same fashion and treated with the anti-calcification technique as the surgical bioprosthetic valves.

At the National University Heart Centre Singapore, we have treated several patients with this technique with good results for more than a year. Prior to commencement, our core team had received training in Vancouver (where this technique was pioneered) for 1 year. In our Heart Centre, patients who present with dyspnoea and a suspected valvular disease
are rapidly and rigorously screened by a dedicated valve clinic. This clinic utilises state-of-the-art diagnostic imaging and research/emerging diagnostic tests which provide accurate and rapid results. The patient’s clinical case is then discussed in a combined multi-disciplinary round involving the interventional cardiologists, surgeons, imaging cardiologist, TAVI radiologist, cardiac anaesthesiologist and general cardiologists and a decision regarding the best modality of therapy is chosen.

A dedicated TAVI team (consisting of 2 interventional cardiologists, 2 cardiothoracic surgeons, an echocardiologist and cardiac anaesthesiologist) then takes over the care of the patient subsequently until discharge. A core team of TAVI trained nurses and allied health professionals also contribute to the care of these often frail patients to ensure good outcomes.

**Mitral regurgitation**

In parallel with the commencement of TAVI, significant progress has also been made in treating mitral regurgitation. Severe mitral valve regurgitation is associated with dyspnoea, and if left untreated, would ultimately result in heart failure and death. Conventional surgery either by repair or replacement of the mitral valve was the only available treatment. A new percutaneous technique has been recently introduced. This is known as the MitraClip, mitral repair system (Figure 5).

Conceptually, this involves repairing the mitral valve by clipping the anterior and posterior mitral leaflets converting the native mitral orifice into 2 separate orifices and reducing the extent of regurgitation without causing stenosis. The idea of treating mitral valve regurgitation in this fashion was introduced by Dr Ottavio Alfieri, a cardiac surgeon from Milan who proposed the Alfieri stitch. He suggested that instead of removing part of the diseased valve, a surgeon could stitch together the valve’s two leaflets so that they’re pulled tight when the valve is closed and are still able to let blood flow through “bow-tie” orifices on either side of the stitch when the valve opens. Dr Mehmet Oz, a heart surgeon at Columbia University’s College of Physicians and Surgeons, later helped design the MitraClip for doing the procedure percutaneously.

A right femoral venous access is first obtained. After this, a trans-septal access is performed using standard techniques assisted by transesophageal echocardiography (access through the interatrial septum). A dedicated manoeuvrable sheath is then used to guide the MitraClip to its intended site. The success of the procedure is closely linked to the availability of real-time 3 dimensional transesophageal echocardiography, which enables the clip to be positioned in the desired position.

A recent clinical trial, the EVEREST trial II\(^\text{4}\) compared this technique with conventional heart surgery in patients with moderately severe to severe mitral regurgitation. The primary composite endpoint for efficacy was freedom from death, from surgery for mitral-valve dysfunction, and from grade 3+ or 4+ mitral regurgitation at 12 months. The primary safety end point was a composite of major adverse events within 30 days. At 12 months, the rates of the primary end point for efficacy were 55% in the percutaneous-repair group and 73% in the surgery group (P=0.007). Major adverse events

![Figure 5: MitraClip](image)
occurred in 15% of patients in the percutaneous-repair group and 48% of patients in the surgery group at 30 days (P<0.001). At 12 months, both groups had improved left ventricular size, New York Heart Association functional class, and quality-of-life measures, as compared with baseline.

This led the investigators to conclude that although percutaneous repair was slightly less effective at reducing mitral regurgitation than conventional surgery, the procedure was associated with superior safety and similar improvements in clinical outcomes. This technique has been used in >3000 patients worldwide with improvement in success rates. This is especially useful in patients with severe co-morbidities who are deemed too high risk for conventional surgery.

In the NUHCS, a team comprising of cardiac surgeons, interventionist, imaging and heart failure cardiologist constitutes the MitraClip team. Advanced imaging techniques including, but not limited to 3-dimensional transesophageal echocardiography, are used to screen patients for technical suitability and the team meets regularly to discuss the modality of therapy that is most suited to individual patients.

**Patients with degraded bioprosthesis and paravalvular regurgitation**

Some patients who had previously undergone open heart surgery may require re-do surgeries when the implanted valve degenerates. The advent of TAVI now also provides a possibility for treating these valves percutaneously. New devices have also been introduced to seal paravalvular leaks in these valves when they occur. Many patients undergoing re-do cardiac surgery are at increased risks and these new techniques may provide an alternative strategy.

**Conclusion**

The advent of new percutaneous valvular therapies provides alternatives to patients with valvular heart disease. This is especially important in patients who had previously no surgical options because of co-morbidities.

You may refer to our website at http://www.nuhcs.com.sg and watch our video on Transcatheter Aortic Valve Implantation (TAVI) under “Our Services”.

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**References**


Reconstructive Surgery for Facial Paralysis

Dr Ong Wei Chen, Consultant, Division of Plastic, Reconstructive & Aesthetic Surgery, University Surgical Cluster

Our facial muscles play an integral role in the normal daily function of an individual. There are 17 paired muscles and one sphincteric muscle (orbicularis oris). These muscles work not only to allow us to convey our expression, but also to allow important functions such as eye closure, oral continence and speech. Hence, facial paralysis is a condition that not only contributes significant physical-aesthetic disturbance to the patient, but also many functional and psychosocial problems.

Causes of facial paralysis
There are many causes of facial paralysis (Table 1). The causes can be broadly divided into congenital or acquired. Most of the cases of facial nerve palsy that we see today are due to acquired causes. The most common cause of facial nerve palsy is Bell’s palsy. A large majority of patients with Bell’s palsy make a full recovery. Patients with brain or parotid tumours that affect the facial nerve often suffer permanent irreversible damage.

Clinical Problem
Facial asymmetry is the most visible result of facial paralysis involving one side of the face. This usually troubles the patient most due to the resultant discordance between the two halves of the face. Patients with facial paralysis may or may not have significant facial asymmetry at rest but is made more apparent with facial animation like smiling. They often seem to have a sad appearance on the paralysed side because of brow and cheek ptosis, and the down turning of the angle of the mouth.

Brow ptosis from paralysis of the unilateral frontalis muscle is a more serious problem for the older patient. Heavy forehead tissue may cause the brow to sag below the superior orbital rim. Together with upper eyelid ptosis or droop, the patient will have difficulty looking up. This may result in impaired vision and diminished visual fields.

The orbicularis oculi muscle functions to enable eye closure. This is not only protective against foreign matter from entering the eye, but also keeps the eye moist to prevent drying out of the cornea. The muscle also acts like a pump on the lacrimal sac to allow tears to be drained away effectively. Patients with facial paralysis are unable to attain proper eye closure. Over time, they may suffer from significant corneal exposure and dryness, resulting in excessive tearing and even blindness if the cornea is damaged. In chronic cases, the eyelid develops an ectropion, moving the lacrimal punctum away from the eye, hence exacerbating the problem of epiphoria.

### Table 1 - Types of Facial Paralysis

<table>
<thead>
<tr>
<th>CONGENITAL</th>
<th>ACQUIRED</th>
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<tbody>
<tr>
<td>- Birth trauma</td>
<td>• Idiopathic</td>
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<tr>
<td>- Mobius syndrome (bilateral)</td>
<td>- Bell’s palsy</td>
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<tr>
<td>- Hemifacial microsomia</td>
<td>• Infectious</td>
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<tr>
<td></td>
<td>- Ramsay-Hunt syndrome</td>
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<tr>
<td></td>
<td>- Otitis media</td>
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<tr>
<td></td>
<td>- Cholesteatoma</td>
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<tr>
<td></td>
<td>• Trauma</td>
</tr>
<tr>
<td></td>
<td>- Temporal bone fracture</td>
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<tr>
<td></td>
<td>- Mandible fracture</td>
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<tr>
<td></td>
<td>- Facial laceration</td>
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<tr>
<td></td>
<td>• Neoplastic</td>
</tr>
<tr>
<td></td>
<td>- Parotid tumour</td>
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<tr>
<td></td>
<td>- Acoustic neuroma</td>
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<tr>
<td></td>
<td>- Facial neuroma</td>
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<tr>
<td></td>
<td>- Glomus tumour</td>
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<td></td>
<td>• Latrogenic</td>
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Paralysis of the muscles around the mouth can create problems with speaking and eating. Patients are unable to purse their lips and have difficulty making the “b” or “p” sounds. Very often, the speech may be unclear. Paralysis of the buccinator muscle gives rise to problems with the control of food boluses in the mouth. Food may collect in the buccal sulcus on the paralysed side. The patient may also bite on the mucosal side of the cheek while chewing. It may be difficult to maintain oral continence with liquids, and in severe cases, drooling of saliva may occur.

All these problems can contribute to difficulty in social interaction for the patient. In the long term, significant psychosocial problems may surface.

**Management of Facial Paralysis**

Once facial paralysis is diagnosed, it is important to exclude conditions such as Ramsay-Hunt syndrome, acoustic neuroma, trauma, middle ear infections and parotid tumours as possible causes of the paralysis. Acute presentation of Bell’s palsy is managed accordingly.

For those with persistent paralysis, treatment can be surgical or non-surgical. Medical treatment mainly includes measures to protect the eye from exposure keratosis. The patient is advised to tape the eye or use a protective eye pad while asleep. Eye lubricants in the form of eye drops to be used in the day, or ointment which can be used at night, are usually prescribed. Patients with incomplete facial paralysis or some remnant functioning muscle may benefit from facial physiotherapy.

There are many surgical options available (Table 2). These are usually directed at correcting the different areas affected and should be tailored to the individual patient or problem. Major surgical procedures are performed only after there is a fair amount of certainty that the patient has permanent facial paralysis. This often includes electroneurography, electromyography, possibly imaging and at least a one-year wait for spontaneous recovery.

The main aims of surgery are to:
1. Restore facial symmetry
2. Restore facial animation and expression
3. Improve function

Almost any patient can undergo surgery as long as there are no major medical problems or contra-indications to general anaesthesia. The type of surgery is then tailored to each individual’s requirements and expectations.

<table>
<thead>
<tr>
<th>Table 2</th>
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</thead>
<tbody>
<tr>
<td><strong>Brow ptosis</strong></td>
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<tr>
<td>- Excisional brow lift</td>
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<tr>
<td>- Endoscopic brow lift</td>
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<tr>
<td><strong>Eyelids</strong></td>
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<tr>
<td>- Gold weight (upper eyelid)</td>
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<tr>
<td>- Tendon sling (lower eyelid)</td>
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<tr>
<td>- Lateral canthoplasty with lid shortening (lower eyelid)</td>
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<tr>
<td>- Cartilage graft (lower eyelid)</td>
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<tr>
<td><strong>Lips/Mouth</strong></td>
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<tr>
<td>- Facial slings (static or semi-dynamic)</td>
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<tr>
<td>- Muscle transfer (microsurgical free tissue transfer)</td>
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<tr>
<td>- Rhytidectomy</td>
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<tr>
<td>- Wedge excision of lower lip</td>
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</tbody>
</table>

Most of the patients with facial paralysis who come to see us hope to restore facial symmetry and some form of expression and function. A static facial sling will be able to provide some symmetry at rest but asymmetry may be noted during smiling. A semi-dynamic sling using a regional muscle (not innervated by the facial nerve) can provide some animation during smiling as well as symmetry. To restore smiling and facial symmetry powered by the facial nerve, a microsurgical free muscle transfer together with nerve coaptation is necessary.

Microsurgical free muscle transfer is usually offered to motivated and young patients who have a high recovery potential. This type of reconstruction is usually staged, with 2 procedures over a period of about 12 months. In the first operation, a branch of the intact facial nerve (usually buccal branch) from the contralateral side is dissected out and coapted with a nerve graft. The sural nerve is often used as
the nerve graft. The free end of the nerve graft is then tunneled to the other side of the face. This nerve graft is then left there for a period of time to allow neuronal regeneration.

The second stage, usually performed 12 months after the first, involves microsurgical free muscle transfer, usually latissimus dorsi or gracilis muscle. The motor nerve supplying the muscle transferred is coapted to the nerve graft after microsurgical anastomoses of the vessels has been performed. Movement of the muscle can only be noticed 6 or more months after this operation. The patient is then required to undergo vigorous physiotherapy to train this muscle. Results with this operation may be unpredictable.

Static slings can be performed using either autologous fascia (fascia lata) or synthetic material. One end is sutured to the parotid fascia in the preauricular region, and the other end anchored to the areas where suspension is aimed eg. nasal alar base, modiolus. Gillies first described turning down the temporalis muscle from its origin in the temporal fossa over the zygomatic arch for use in suspension. This gives the problem of temporal hollowing and also destroys normal muscle function. McLaughlin described detaching the temporalis tendon from its insertion into the coronoid process of the mandible, suturing fascia to the tendon and fixing it at the various points for suspension. Contraction of the temporalis muscle allows a pull of the tendon and the connected fascia sling up, hence bringing up the mouth during smiling.

At the National University Hospital, we offer a semi-dynamic sling using a modification of the McLaughlin method. A preauricular approach is chosen as this allows us to simultaneously perform soft tissue suspension and rhytidectomy to correct the often neglected problem of cheek ptosis. The temporalis tendon is then detached and sutured to fascia lata harvested from the thigh. The other end of the fascia lata is split and anchored to the various points where suspension is required. There is minimal morbidity, and patients are able to appreciate visible improvement immediately after the operation. Post-operatively, our patients undergo training to voluntarily control the temporalis muscle in creating a smile.

Eyelid procedures provide adjunct but important surgical correction for problems created by facial paralysis. Placement of a gold weight in the upper eyelid helps to pull the eyelid down when the patient closes the eye. Lateral canthoplasty helps to tighten and elevate the lower eyelid, again improving eye closure.

In the acute setting, when the facial nerve is cut either as a result of oncological surgery or trauma, microsurgical anastomoses with or without a nerve graft can be performed. In the case that the proximal facial nerve is irreversibly damaged, the hypoglossal nerve (CN XII) or nerve to the masseter (CN V) can be coapted to the distal end cut end of the facial nerve supplying the facial muscles.

A whole myriad of treatment and reconstructive procedures are available after facial paralysis. Patient education and cooperation is paramount in making these procedures a success both for the patient and the physician.

References:

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Endometriosis is defined as the presence of endometrial glands and stroma outside the endometrial cavity. First described in medical literature in the 1800s, it is an increasingly diagnosed condition that affects up to 22% of all women, with about 20-30% of patients presenting with sub-fertility and up to 45% of women presenting with chronic pelvic pain.

The principal symptoms of endometriosis are pelvic pain, dysmenorrhoea, dyspareunia, cyclical bowel or bladder symptoms, and infertility. The presentation of the condition is variable, some women being asymptomatic while others having debilitating symptoms, affecting their physical, mental and social well being.

Laparoscopy is the gold standard for the diagnosis of endometriosis and provides an opportunity to diagnose as well as treat the condition at the same occasion. Often, however, both patients and doctors are reluctant to perform surgery and prefer medical options, at least initially. The aim of medical therapy is suppression of endometrial proliferation as well as the accompanying inflammatory response. However, this does not totally eradicate the condition and therefore, symptom recurrence is as high as 68% upon cessation of therapy.

According to the Practice Committee of the American Society for Reproductive Medicine, “Endometriosis should be viewed as a chronic disease that requires a life-long management plan with the goal of maximising the use of medical treatment and avoiding repeated surgical procedures”. Treatment for each patient needs to be individualised, taking into account the severity of symptoms, the extent and location of disease, whether there is a desire for pregnancy, the age of the patient, side effects of medication, surgical complication rates and cost.

Treatment options include:

- **Medical therapy**
  - Analgesics
  - Hormonal medical therapy
    - Estrogen-progesteron oral contraceptive pills, cyclic or continuous
    - Gonadotropin-releasing hormone (GnRH) agonists
    - Progestins, given by an oral, parenteral, or intrauterine route
    - Danazol
    - Aromatase inhibitors
  - Surgery
    - Conservative (retain uterus and ovarian tissue)
    - Definitive (removal of the uterus and possibly the ovaries)
  - **Combination therapy** - in which medical therapy is given before and/or after surgery

The treatment options primarily depend on the presenting symptoms of the patient.

**Medical treatment**

Women with chronic pelvic pain who are suspected to have endometriosis may be managed with empiric medical therapy prior to establishing a definitive diagnosis by laparoscopy. Various medications can be used alone or in combination.

Estrogen-progesteron oral contraceptive pills — OCPs result in decidualisation and subsequent atrophy of ectopic endometrial tissue, hence improve symptoms of pelvic pain and dysmenorrhoea, making them a good choice for women with minimal or mild pain who also desire contraception. They have also been postulated to retard progression of disease, but evidence for this is conflicting.

A Cochrane review, although including only one small RCT, found the OCPs, to be as effective in reduction of pain as GnRH agonists.

It is still unclear whether a cyclic, continuous, or tricycle regimen is most effective. If pain does not respond well to cyclic therapy, switching to continuous OCP administration can be tried.

For women with early stage disease who are not achieving adequate pain relief after a three- to six-month trial with analgesics or OCPs, other hormonal interventions can be tried: Gonadotropin-releasing hormone (GnRH) agonist analogs, Danazol, and progestins.

GnRH agonists induce a state of ‘pseudomenopause’, resulting in atrophy of endometriotic implants and can be used for treatment of moderate to severe pain associated with endometriosis. GnRH agonists can be administered by daily nasal spray, or intramuscular injections every one to three months. Generally, initial treatment with a GnRH agonist is continued for six months.

While they provide good symptom relief, their use is limited by side effects such as vasomotor symptoms and vaginal...
dryness. If used for more than 6 months, they have been shown to result in loss of trabecular bone density. To deal with these side effects, add-back therapy, in which a hormonal preparation is given together with the GnRh agonist has been tried successfully.

Various agents for add-back therapy include Progestins alone (norethindrone acetate 5 mg daily), tibolone (2.5 mg daily), or estrogen and progestin combination preparations.

Progestins — Progestins inhibit endometriotic tissue growth by causing decidualisation followed by atrophy. They also inhibit pituitary gonadotropin secretion and ovarian hormone production.

There are several options for progestin therapy, depending upon the contraceptive requirement, the side-effect profile, and patient preference.

- Oral medroxyprogesterone acetate (MPA) (10 mg three times a day, maximum total dose 100 mg daily) or norethindrone acetate (5 mg daily and increased by 2.5 mg every two weeks if pain persists, maximum total dose 15 mg daily for six-months).

- Depot medroxyprogesterone acetate (DMPA) is given as an injection (150 mg every three months). Side effects include irregular menstrual bleeding, nausea, breast tenderness, fluid retention, and depression. However, prolonged use may result in loss of bone mineral density.

- A few small studies have demonstrated that the levonorgestrel-releasing intrauterine contraceptive device (Mirena) reduced both chronic pelvic pain and dysmenorrhea in women with endometriosis. Irregular menstrual bleeding and amenorrhea are common side effects, but there is no adverse effect on bone density. Few systemic side effects, and its effectiveness as a long acting contraceptive makes it an attractive option for women who have no desire for fertility in the near future.

- There is some evidence that etonogestrel subdermal implant (Implanon) is effective for endometriosis-related pain. Again, its contraceptive benefit can be attractive for women desiring long term contraception.

- Dienogest (Visanne) is the new progestin, showing promise in the medical treatment of endometriosis. A randomised trial including 253 women found Dienogest 2 mg/day orally to be equivalent in efficacy to leuproplide at standard dose in relieving the pain associated with endometriosis and had the advantage of fewer hypoestrogenic effects, but patients had more unscheduled bleeding.

Duration of therapy — for practical reasons, most clinical trials of progestin therapy have been limited to 6 or 12 months duration. Based on clinical experience in patients with endometriosis and other disorders, progestin therapy can be extended, if effective and well-tolerated.

Bone loss is a concern with long-term administration of DMPA or high dose oral MPA, especially in women with risk factors for osteoporosis, but bone density generally improves if the woman returns to normal ovulatory function and estrogen production.

Long-term use of norethindrone acetate can lead to a significant reduction in HDL cholesterol and significant increases in LDL cholesterol and triglycerides. Given these risks, bone mineral density and lipid levels may be monitored, as appropriate, in patients on long-term therapy.

Danazol, a 19-nortestosterone derivative with progestin-like effects, is effective in treating mild or moderate stages of disease, with over 80 percent of patients experiencing relief or improvement of pain symptoms within two months of treatment.

It inhibits pituitary gonadotropin secretion and also has a direct inhibitory effect on the growth of endometriotic implants. Danazol is given orally in divided doses ranging from 400 to 800 mg daily, generally for six months.

Most women taking danazol have side effects that are dose-dependent. These include weight gain, muscle cramps, decreased breast size, acne, hirsutism, oily skin, decreased HDL levels, increased liver enzymes, hot flashes, mood changes, and depression; and often, the cause of discontinuation is treatment.

Aromatase inhibitors (AIs), although not approved for the treatment of pelvic pain caused by endometriosis, its use is a novel approach. These agents appear to regulate local estrogen formation within the endometriotic lesions themselves, in addition to inhibiting estrogen production in the ovary, brain, and periphery (e.g. adipose tissue).

While initial evidence is promising, we await more robust evidence before using AIs routinely as a treatment of endometriosis.

Surgical treatment

Laparoscopic surgery is the gold standard for establishing the diagnosis of endometriosis. If disease is found, it can be treated at the same time, thus relieving the symptoms. The laparoscopic approach for treatment of endometriosis
Insight

is recommended except in cases of deep infiltrating endometriosis involving the bowel, in which case laparotomy may be the better approach.

For the surgical treatment of pain due to minimal to mild endometriosis, excision and ablation are effective and there is no statistically significant difference between the two modalities.

For moderate to severe endometriosis, both excision and laser ablation are effective in providing pain relief; however, severe disease should be managed by experienced surgeons/teams to minimise surgical complications from difficult surgery.

Surgical management of ovarian endometriomata provides the best pain relief and least possibility of recurrence; however, treatment should be judicious and performed by an experienced surgeon to prevent inadvertent premature ovarian failure especially when dealing with bilateral disease.

For infertility due to minimal to mild endometriosis, surgical treatment increases the chances of pregnancy; however, the magnitude of benefit is likely to be small.

The number needed to treat for each additional pregnancy is 7.7 and whether this is acceptable to doctors and patients remains to be seen. Infertile patients with moderate to severe disease seem to benefit from surgical treatment especially if they are symptomatic; however, its efficacy in improving fertility remains unproven.

Proper pre-operative assessment and counseling and a multi-disciplinary approach are essential in operation planning and minimising complications. If this strategy is not followed, there is a higher chance of surgical complications as well as repeated surgeries.

Hence, the Department of Obstetrics and Gynecology at NUH has recently launched a dedicated Endometriosis Management Centre in which Gynaecologists, Colorectal Surgeons and Urologists who have a special interest in the management of endometriosis, take part in the treatment planning and management of these patients. This approach facilitates treatment planning so that surgeries could be planned with a multi-disciplinary approach and minimise complications, and the team will try to do a complete surgery at one sitting rather than repeated surgeries.

Post-operatively, if the patient desires fertility, she should be encouraged to get pregnant as soon as possible, failing which early recourse to assisted reproduction should be offered. If fertility is not a concern, she should be started on medical therapy to prevent the recurrence of the disease.

**Emotional Support**

Endometriosis is a chronic disease that often results in a deleterious effect on the quality of life of most patients and apart from adequate treatment, good emotional support from nursing and peer group support can help them cope with this disease. Nurses should be trained to provide empathetic care to these women and at NUH, we also hope to start a patient support group in the near future.

Endometriosis remains an enigmatic disease which significantly affects the quality of life of the patient. We as treating physicians can help these patients cope with this recurrent illness by providing a holistic approach to the condition.

Family doctors or general practitioners are usually the first line of contact for most of these patients, and by referring patients appropriately, can help facilitate access to the most suitable treatment available.

On the same note, specialists need to individualise treatment for each patient, taking into account her special circumstances. Nursing and peer support groups can help the woman cope with and ease its effect on her quality of life.

The members of the NUH Minimally Invasive Surgery team are Dr Fong Yoke Fai, Head & Senior Consultant; Dr Stephen Chew, Senior Consultant; Dr Anupriya Agarwal, Consultant; and Dr Ng Ying Woo, Associate Consultant.

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**Dr Anupriya Agarwal**

Dr Anupriya completed both her MBBS and postgraduate (MS) degree from the Kanpur University, India. She obtained her postgraduate qualification in Obstetrics & Gynaecology from the UK College (RCOG) in 2002. She is currently a Consultant in the Divisions of Benign Gynaecology and Reproductive Endocrinology & Infertility, at the Department of Obstetrics & Gynaecology.

Her main interest is in the field of reproductive endocrinology, including assisted reproduction as well as minimally invasive gynaecological surgery. Her current research interests are in the field of adolescent gynaecology and polycystic ovarian syndrome.

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Doctor’s Heartbeat

Specialist in Focus:
Dr Seow Swee-Chong
Consultant, Cardiac Department, National University Heart Centre, Singapore.

Dr Seow Swee-Chong is a Consultant at the National University Heart Centre, Singapore, and its Director of Cardiac Electrophysiology and Pacing. He is also Director of the Heart Rhythm Programme (Arrhythmia Service). Dr Seow is a Cardiac Electrophysiologist (Heart Rhythm Specialist) who is accredited in Interventional Cardiac Electrophysiology and Cardiac Pacing/Defibrillation under the European Society of Cardiology.

Dr Seow graduated with the degrees of Bachelor of Medicine and Surgery from the National University of Singapore and subsequently obtained Membership of the Royal College of Physicians (United Kingdom). He completed his Fellowship in Clinical Cardiac Electrophysiology and Pacing at Westmead Hospital, Sydney (Australia).

Apart from General Cardiology, Dr Seow’s sub-speciality interests include heart rhythm disorders (arrhythmias), pacemaker, loop recorder and cardiac defibrillator implants as well as cardiac resynchronization therapy for heart failure. He runs the Heart Failure Clinic, concentrating on patients with concomitant arrhythmias and/or cardiac devices.

Dr Seow performs diagnostic coronary angiograms, radiofrequency catheter ablation of arrhythmias, diagnostic electrophysiological studies and implantation of pacemakers as well as defibrillators.

Heart disease is a major cause of ill health in the world.

In Singapore alone, 15 people would die from cardiovascular disease (heart disease and stroke) every day. Cardiovascular disease accounted for 31.6% of all deaths in 2009. This means that 1 out of 3 deaths in Singapore is due to heart disease or stroke.\(^1\)

As our population ages, we are also expecting a rising burden of heart diseases.

Backed by substantive expertise and experience, the National University Hospital (NUH) was chosen by the Ministry of Health in 2007 to set up a new national specialist centre, the National University Heart Centre, Singapore (NUHCS), to meet the growing need for expert care to look after the increasing number of people suffering from heart disease.

In this issue, we have a chat with Dr Seow Swee-Chong.

\(^1\) Source: Ministry of Health (MOH), Singapore
Why did you choose to be a cardiologist? Have you always wanted to be a doctor?
The route to Medicine happened partly by choice and partly through “social engineering”.

In my school-days, the academically stronger students were channelled to the triple-science, double-maths combination. This offered the widest choice in terms of eligibility for university courses, including Medicine. In the beginning, it was simply a matter of doing your best, to give yourself the widest choice of possible career paths. Back then, qualifying for Medicine was considered the pinnacle of academic achievement, not least because of the stringent entry criteria. So one could say that I ended up in Medicine by default - a natural choice if one wanted to achieve his fullest potential.

But it was also a conscious, rational decision. At the risk of sounding clichéd and contrived, I wanted a career that made a tangible difference in people’s lives. Something that gave me meaning and allowed me to see the reason for and direct result of what I was doing; the purpose for which I was sacrificing my social and family time.

Nothing can compare with the job satisfaction that doctoring brings. What could be more rewarding than treating a patient who is very ill, and seeing him restored back to health? Neither is there anything sweeter than the appreciation of a grateful patient; although we see less of it now after Medicine has been degraded of late into a “fee-for-service” industry that is not too different from the retail or hotel sector. Doctors have the unique privilege of trust from their patients. Complete strangers place their lives into our hands simply because we are in this noble profession.

I chose to do Cardiology because of personal interest. It is a field which provides a good mix of intellectual sleuthing and procedural dexterity. Things move very quickly in Cardiology. A patient can be well one moment and dead in a matter of minutes. In contrast, he can be on the verge of death today and well the next day if the right treatment is given. Advances in techniques, research, and new devices are also rapidly evolving in the field of Cardiology, making it an exciting and “frontier” discipline, always pushing the boundaries of what is possible.

Had I not become a doctor, I would probably have taken up teaching. This is another noble profession that presents an opportunity to enrich and positively influence young lives for the better.

We all have limited time in this life. We should therefore choose wisely what to invest our time in. In my opinion, investing in another person’s life is the most worthy pursuit.

Its impact is long-lasting and far-reaching. Doctoring and teaching are two ways in which to do this.

You have particular interests in heart rhythm disorders, heart failure and cardiac devices. What inspired you to specialise in these areas?
I chose to sub-specialise in heart rhythm disorders (arrhythmias) partly because I, like many others, was terrified by it when I was a junior doctor. Nobody seemed really to understand what was going on, much less explain them to me. It does not help that the field of arrhythmias is pretty esoteric and rhythm abnormalities are represented by squiggly lines on an ECG tracing.

So in a perverse sort of way - I chose to face my fears and conquer them. As I studied arrhythmias, I found the subject both intriguing and challenging. It is like a puzzle game that I enjoy playing. When faced with an ECG recording of an arrhythmia, one has to look for clues to deduce what the mechanism is. The patient may be brought for an electrophysiological study (EPS) to confirm this, following which the problem can often be cured with ablation. Interpreting tracings during an EPS can be complex, requiring reasoning and deduction. During the procedure, good hand skills are required to do the job well. Hence, sub-specialising in arrhythmias to me represents the best of both worlds – cerebral and procedural dexterity.

Cardiac devices are used mainly for management of rhythm disorders, so they are really an extension of the same specialty. Men adore “toys” and gadgets. Using a new therapeutic device or tool is therefore, always exciting– not unlike having a new smart-phone or electronic widget!

What are the more recent developments or breakthroughs in these areas that you think have resulted in better treatment for patients?
Undoubtedly, the advent of device therapy for heart failure has revolutionalised its management. It has given new hope and life for patients who were formerly at the end of the road without any treatment options left, other than to undergo a heart transplant. Cardiac resynchronization therapy (biventricular pacing) is able, in suitable patients, to improve heart function, exercise capacity and life expectancy. Best of all, it requires only a minor procedure.

Please elaborate on your current clinical work and research projects.
Apart from managing Cardiology patients in the inpatient wards, I run an Arrhythmia Clinic where I see referrals for patients with heart rhythm problems. I also run a Cardiac Device (pacemakers and defibrillators) Clinic and a Heart Failure Clinic for patients with heart failure and concomitant arrhythmias or cardiac devices.
Each week, I have sessions in the Invasive Cardiac Laboratory where I perform procedures like diagnostic coronary angiography, electrophysiological studies and radiofrequency ablation, implant of pacemakers, defibrillators (ICDs) and cardiac resynchronization therapy. The Arrhythmia Service, of which I am a part, sees inpatient consults on heart rhythm and cardiac device issues. It also provides pre- and post-procedure counseling and follow-up.

I am currently involved in a genetic study on sudden death with the Defence Science Organization, wherein we are elucidating the culprit genes in our local population. Apart from this, I am also collaborating with a government-assisted start-up company on the development of an arrhythmia management device.

Clinical research based on patients whom we treat is also always ongoing.

What other responsibilities do you have?
As expected with an Academic Medical Centre, education of junior doctors, nurses, medical and dental students forms part of my job description. This takes the form of formal lectures, bedside tutorials, teaching clinics and such. I am also involved in continuing medical education for GPs (family physicians), and deliver lectures in regional/international Cardiology meetings.

Training of regional Cardiology specialists takes the form of foreign doctors coming to our department to train as Fellows. We also make overseas trips to regional countries to perform procedures with their local Cardiologists to impart skills and knowledge.

Could you share with us some memorable experiences and personal reflections that you have since becoming a cardiologist?
I am proud to be part of the Cardiac department in NUH. Most of us have worked, trained, and grown together for the better part of the last decade. As such, the camaraderie is very strong amongst my colleagues in the department.

For example, when things go awry in the lab and a patient deteriorates, all hands are on deck and everyone chips in to help save the patient without being asked. Nothing can describe the gratitude you feel when you are at the receiving end of such grace. This friendship and feeling of belonging is irreplaceable.

It is always interesting to see the social impact of our treatment on patients’ lives. I have a patient (let’s call him ‘M’) who worked as a rubbish collector. He was single, did not have any family and stayed in a home for the destitute. He had coronary heart disease with a bypass done previously, but was in heart failure with poor heart function, which was only a third of what was normal. M had a biventricular pacemaker implanted to help his heart failure. A year later, his heart function was normal. He changed jobs, was able to travel and found himself a wife! He also started up a profitable business and is now self-sufficient.

Do you have any other interests or hobbies?
I find gardening therapeutic. It develops patience and allows me a little time to myself to be quiet and shrink away from the daily madness.

When my children join me at times, it becomes an opportunity to bond with them. Otherwise, I enjoy tinkering around at home, an example of which is a plant rack that I built two weeks ago using wood from my children’s old baby cot.

Please tell us a bit about your family.
My wife is also a doctor. We have 2 children in primary school.

The greatest challenge I face is in achieving work-life balance. For someone who enjoys his work, I would say that it requires much discipline to pull yourself away and return home than to simply linger on in the hospital. Work is never finished, even if we have twice the number of hours in a day. As such, we have to prioritise what is urgent and important. My children are at an age when they need parental guidance, to instill correct values, to build their character – these cannot be done in absentia or by proxy.

People who claim that it is the quality of time spent and not the quantity that matters understand only half of the story. This hit home very clearly in my earlier years when I was busy preparing for postgraduate exams and my son was just a year old. I spent what I thought was “quality time” (of a very limited quantity) with him because I was concentrating on work and study. By the time the exams were over, my son did not want to be near me, much less play together. Fortunately, the intensive remedial action that ensued limited the damage and I am now his greatest hero 10 years later.

Where do you see yourself in the next 5 years in terms of career, personal and family life?
In terms of work, I enjoy what I am doing – so I do not see myself doing any differently in the short to mid-term future. In the midst of my work responsibilities, I also seek to strike a balance with my other roles as a father, husband, son, brother and friend.
Upcoming Events

NUH GP CME Programme 2012
Please refer to our GPLC website for online registration.

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<tr>
<td>14 Jan</td>
<td>Gastroenterology &amp; Hepatology&lt;br&gt;Approach to Abnormal Liver Panel Tests</td>
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<td>Ophthalmology&lt;br&gt;Recent Developments in Myopia and Common Oculoplastic Conditions in Children</td>
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* Event information listed is correct at time of print. While every attempt will be made to ensure that all events will take place as scheduled, the organisers reserve the rights to make appropriate changes should the need arises. Please refer to our events calendar at www.nuh.com.sg/nuh_gplc/index/index.htm for more updates and information.

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