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ATRIAL FIBRILLATION

"FIRE OR ICE" FOR THE TREATMENT OF ATRIAL FIBRILLATION?

Atrial fibrillation (AF) is the commonest heart rhythm problem in man – the condition can cause debilitating symptoms (such as palpitations, chest discomfort, breathlessness and dizziness) as well as causing blood clots to form in the heart which can increase the risk of stroke. Patients with AF that cannot adequately be controlled with medication may require a type of key-hole surgery called catheter ablation.

1. Catheter ablation of atrial fibrillation- what are the options?
Cather ablation of AF has traditionally been performed using radiofrequency energy to deliver a series of point-by-point lesions around the pulmonary veins (PVs) of the left atrium to "electrically disconnect" the PVs from the rest of the heart. This is because AF is triggered by ectopic heart beats from the PVs in the early stages.

The use of cryoablation to treat AF has recently been introduced into Singapore. The technique involves passing a specialized catheter (CB-A, Arctic Front Advance, Medtronic, Minneapolis, MN, USA) from the femoral vein up to the heart using X-ray guidance. The catheter is then passed through the inter-atrial septum and positioned in each of the pulmonary veins in turn (usually there are 4 of these) to deliver a series of "freezes" to the heart muscle around the vein (see Figure). The second generation cryoballoon has proven to be highly effective in achieving freedom from AF. The "Fire and Ice study" was a large, prospective, randomized, international multicenter study published last year in the prestigious New England Journal of Medicine which showed that the cryoablation for AF was non-inferior to the traditional method of using point-by-point radiofrequency ablation with a 3-dimensional mapping system (Kuck KH et al. New England Journal of Medicine, 2016; 374). The large studies in this field have reported success rates of between 80 to 90%, which is considered very good. If successful, patients' symptoms are markedly reduced and most are able to come off long term cardiac medication (which may cause side effects).

At the Harley Street Heart and Vascular Centre, we successfully performed the first cryoablation procedure in the private sector in Singapore in April 2017. The patient was a 54 year old man who experienced frequent symptoms of AF every time he exercised. Anti-arrhythmic medication was not effective and so he was keen for more definitive treatment. Since the ablation, he has not had any further AF and has been able to come off his medication.

2. What are the potential complications from cryoablation?
As with most invasive heart treatments and catheter ablation procedures, there are small risks which include heart attack, bleeding and stroke. Specific complications related to the cryoballoon catheter include the risk of causing damage to the phrenic nerve which runs alongside the right heart border and narrowing of the pulmonary veins. These potential complications are rare and can be reduced by taking certain precautions during the freezes.

3. Which is better- RF ablation or cryoablation for AF?
Traditional radiofrequency ablation procedures require the operator to create a 3-dimensional map of the left atrium and then to deliver a series of point-by-point lesions to encircle the pulmonary veins, usually in pairs. This traditional method is equally effective to cryoablation for AF, but requires extensive training for the operator to ensure that the ablation circles are complete with no gaps left. The benefits of cryoablation over conventional radiofrequency ablation are that it is easier and faster to perform and is less painful. The lesions are also better demarcated and there is less risk of thrombus formation. However, for more advanced forms of AF which affect the main body of the left atrium (i.e. the condition is no longer confined to the pulmonary veins), radiofrequency ablation may be more appropriate.

4. What is a patient's recovery process after the procedure like? How long does it take for patients to go back to their normal daily activities?
Patients usually stay in hospital for 1-2 days after an ablation procedure and are usually walking around the next day. They are advised not to exercise or carry any heavy items for the first 1-2 weeks whilst the groin wound is healing. Most patients return to work within a week and are back to their normal daily activities and exercise after one month.

Summary- The use of cryoballoon for AF ablation is safe and effective and should be considered in patients with symptomatic paroxysmal atrial fibrillation who continue to experience symptoms despite medication or are intolerant of medication. These patients should be assessed by cardiologists who specialize in heart rhythm disorders to discuss the best management options moving forwards.

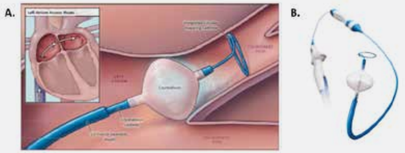

Figure- Cryoballoon for the ablation of atrial fibrillation. A. Cryoballoon positioned in the left upper pulmonary vein of the left atrium. B. Cryoballoon catheter. (Sources- Kuck KH et al. *New England Journal of Medicine*, 2016; 374. www.Medtronic.com)

By **Dr. Reginald Liew**
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HEART FAILURE

TIPS FOR MANAGING HEART FAILURE IN THE PRIMARY CARE SETTING

Heart failure (HF) is a highly prevalent disease, affecting the elderly in particular. A study by the National Heart Centre Singapore in 2016 showed that Singaporean patients suffer from heart failure at the average age of 61, about 10 years earlier than Americans and Europeans. The same study also showed that Singaporeans have a higher prevalence of three medical conditions that increase the risk of heart failure - Coronary artery disease (CAD), hypertension and diabetes compared to their Asian counterparts. Consequently, general practitioners (GPs) will play an increasingly important role in heart failure diagnosis and management. Early diagnosis and appropriate treatment is important to delay progression and prevent adverse outcome. Here are some practical tips for GPs to aid them in the diagnosis and management of heart failure in the community.

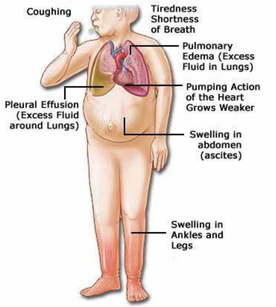
Quick tip - Diagnosis
The GPs should think about HF in any patient presenting with the following: a history of CAD, atrial fibrillation, chest infection or upper respiratory tract infection that is not improving, chronic obstructive pulmonary disease that is deteriorating much faster than expected, breathlessness in a diabetic or hypertensive patients, unexplained fatigue in the elderly and fluid retention. The next step would be to confirm heart failure with either serum BNP or NT-proBNP. These biomarkers can also be used to diagnose diastolic heart failure, although the values do not help differentiate between systolic or diastolic dysfunction. An echo is mandatory to evaluate the severity as well as underlying cause of heart failure.

Quick tip: Starting drug therapy
The strategy will need to be individualized, but in general, Beta-blockers and Ace-inhibitors (ACEI) should be started at the lowest doses and increased about every two weeks, with checks on the urea and electrolytes and blood pressure response. Use beta-blockers proven for heart failure, Bisoprolol, Carvedilol or Nebivolol. It is usual to see an increase in creatinine when commencing ACEI; this is usually around the range of 20-30% and should not immediately trigger cessation of the drug. Cessation should be considered if it causes symptomatic hypotension or significant hyperkalemia. Where possible, lowering the dose should be considered first, rather than stopping the dose immediately. Lower doses of beta-blocker and ACEI together also work better than one alone. If tolerated always work up towards therapeutic trial doses. In more severe cases, aldosterone antagonists, Spironolactone or Eplerenone should also be considered.

Quick- tip: Newer drug classes
A pair of heart failure drugs has recently made their way into new treatment guidelines. The American College of Cardiology, American Heart Association and Heart Failure Society of America have added Ivabradine and Sacubitril/Valsartan an angiotensin II receptor blocker neprilysin inhibitor (ARNI) to their updated guidelines.

A 2014 study showed that an ARNI Entresto reduced the risk of dying from cardiovascular causes or being hospitalized for worsening heart failure by 20% after more than two years, from 26.5% among patients taking the ACEI Enalapril to 21.8% among those taking Entresto. It is worth considering starting heart failure patients earlier on an ARNI or switching them from ACEI to an ARNI given the additional mortality benefit. Ivabradine's approval was based on a 2010 study that found only 24% of those taking the drug had either died from cardiovascular causes or had been hospitalized for heart failure after nearly two years, compared with 29% of those taking a placebo. That translated to an 18% reduction in risk. Ivabradine may be prescribed to patients whose resting heart rates are 70 beats per minute or higher, despite being on a traditional beta blocker therapy. Patients with heart rates 70 beats a minute or faster are at increased risk of hospitalization.

Quick tip: Following up heart failure
Review patients after any hospitalization to note any changes in their medication. If heart failure is stable, one should follow-up regularly and ensures that all coronary artery disease risk factors are well controlled. Each visit should include assessment of ability to perform activities of daily living; volume status and weight; current use of alcohol,



tobacco, illicit drugs, alternative therapies, and chemotherapy drugs; as well as diet and sodium intake.

For patients who have a change in clinical status, have experienced or recovered from a clinical event, or have received treatment that might significantly change these parameters, a follow-up echocardiogram is suggested to assess left ventricular ejection fraction and structural remodelling. Suspect a change in status when there is new development of angina, dyspnea on exertion, new onset atrial fibrillation or other arrhythmias and new left bundle branch block. More severe heart failure with refractory fluid retention should be co-managed with a specialist. Cardiac rehabilitation and patient education on self-management should be strongly encouraged. Avoid drugs or supplements that may worsen HF, such as non-steroidal anti-inflammatory drugs, certain antiarrhythmic dugs, calcium channel blockers and Thiazolidinediones. Appropriate preventative care includes pneumococcal vaccination and annual influenza vaccination.

Conclusion
Increasingly GPs will be the first to pick up heart failure in the community, often in the earlier stages. Diagnosing and referring for echo is the first stage of management, and appropriate lifestyle interventions and drug therapies should be instituted to slow the progression and reduce future complications. But even more important is to prevent heart failure developing in the first place, and this means ensuring that the most common causes for heart failure, CAD, hypertension and diabetes are adequately prevented or optimally treated

By **Dr. Peter Ting**
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CORONARY ARTERY DISEASE

BIOABSORBABLE SCAFFOLD TECHNOLOGY FOR THE TREATMENT OF CORONARY DISEASE

Coronary Artery Disease (CAD) is the most common type of heart disease and the leading cause of death. Percutaneous transluminal coronary angioplasty (PTCA) is a minimally invasive procedure used to open blocked coronary arteries by the deployment of stents to improve blood flow, thereby improving angina and also to reduce the risk of a myocardial infarction. The role of a stent is temporary, until it has re-endothelialized (healed) with the benefits of its long term presence in the artery wall questionable.

Stent technology has advanced to the use of fully bio-absorbable vascular scaffold (BVS), which is able to mechanically support the patency of the coronary artery for a predetermined time period. BVS represent a new paradigm of providing transient vessel support with drug delivery capability but theoretically without the long term restraining forces of metallic drug-eluting stents. These limitations include: permanent vessel caging, possible malapposition and the associated risk of late stent thrombosis, neoatherosclerosis and imaging-related artefact precludes the accurate follow up coronary disease with non-invasive imaging modalities such as computed tomography (CT). With stenting occurring at an earlier age, the presence of a permanent metallic footprint precludes the possibility of later surgical revascularization. Lactide polymers, particularly Poly-L-lactic acid, form the basis of several devices and are the most extensively investigated. They have proven conformability and flexibility to preserve vessel geometry and degrade into the benign by-products of carbon dioxide and water. Other materials include magnesium poly-anhydrates (salicylic acid and adipic acid) and poly-carbonates (amino acids).

Mechanism of Action
The principle of scaffold-based revascularisation is that vessel radial support is only required for a limited time. BVS provides the same vessel support and drug elution profile as contemporary metallic eluting stent and then as the scaffold dissolves over 3 years, the artery regains a more naturally regulated and pulsatile flow. Limited intravascular imaging evidence also suggests there is a late lumen gain with plaque regression after 3 years. The advantages and disadvantages of BVS technology are summarised in Table 1.

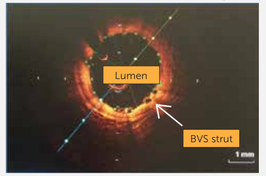
Table 1

Advantages	Disadvantages
No foreign material left behind	Increased risk of stent thrombosis
Restoration of functional endothelial coverage	Longer duration of use of anti-platelet therapy
Allows the restoration of physiological vasomotion	Not as strong as metal stents, which may result in recoil and limits size availability
Allow to graft stented segments of coronary artery	Accurate sizing and deployment requires intravascular imaging
Enables prevention of acute recoil or occlusion	
Improved subsequent coronary imaging using CT & MRI without artefacts	
Alleviate any patient concerns regarding permanent metal implant in their bodies	

Current Issues Associated with the Marketed BVS
The GT1 Absorb everolimus-eluting BVS (Abbott Vascular) was approved for use by the Food and Drug Administration (FDA) in July 2016. The largest trial of this BVS was the ABSORB III trial, which included 2008 patients, and which found the device to be non-inferior to a contemporary best-in-class metallic stent with respect to the composite end point of target-lesion failure (cardiac death, target-vessel myocardial infarction or ischemia driven target-lesion revascularization) at 1 year (with a rate of 7.8% with the Absorb scaffold vs 6.1% with the metallic stent, P=0.007 for non-inferiority). However, the rate of device thrombosis within 1 year after implantation was higher, although non-significantly higher in the group that received the BVS than in the group that received metallic stents (1.5% and 0.7%, respectively, P =0.13). In unpublished results at 2 years after implantation (reported at the 2017 meetings of the American College of Cardiology. The rate of target-lesion failure was significantly higher in the bio-absorbable scaffold group than the metallic-stent group (11.0% vs 7.9%, P =0.03 for superiority of the stent), but no significant difference in cardiac mortality.

Conclusion
Bio-absorbable scaffolds represent a breakthrough technology but are at an early stage in their evolution. For appropriately selected patients, they may be used safely. The lack of longer term performance data, including restoration of natural vessel function is noted. The publication of ongoing post-marketing registry experience with 1st generation BVS and the performance of newer generation technology is awaited. Overall, BVS is generally comparable with the drug eluting stent when the device is placed in appropriately sized vessels (avoiding smaller, <2.25mm, diameter) and applying procedural techniques, with special attention to vessel sizing, pre- and post-deployment dilation and intravascular imaging (Figure 1).

Figure 1
Use of optical coherence tomography (OCT) to ensure optimised deployment of an absorbable scaffold within the coronary artery



By **Dr. Rohit Khurana**
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VENOUS DISEASE

TRENDELENBURG IS HISTORY! A MODERN UNDERSTANDING OF VENOUS DISEASE

Friedrich Trendelenburg (1844-1924), a German physician and surgeon from the town of Leipzig is considered by many to be the father of venous surgery. The Trendelenburg test for sapheno-femoral junction incompetence and the Trendelenburg operation (high tie and stripping of great saphenous vein) have been the source of stress to many a medical student approaching their examinations. Venous intervention has since then moved on rapidly in the last decade to incorporate new, minimally invasive endovenous techniques like radiofrequency ablation (RFA), laser ablation, Clarivein therapy and Venaseal glue ablation. The combination of patient demand and the lucrative nature of these interventions has led to an explosion in the number of procedures performed, usually with the aid of a cursory Duplex scan of the superficial veins to guide intervention and at least in the US, placate insurers and claim re-imbursement.

Venous disease is however, far more complex than that. The management of venous disease today should be a far cry from the days of Trendelenburg, and assessments and procedures need to be tailored to the specific pathophysiology causing venous disease in an individual patient. One size does not fit all anymore.

A change began in the late 1990s with the understanding that the primary role of venous valves is not just to keep blood flowing in one direction, but to stop the transmission of venous pressure from the groin to the ankle – a mechanism called pressure segmentation. Each valve together with its collapsible infra-valvular segment of vein reduces the pressure transmitted in segments so that the venous pressures at the groin and at the ankle are approximately the same. In fact, that is the aim of all venous intervention – be it compression stockings, bandages, stripping operations or the new endovenous procedures – to reduce the ambulatory venous pressure at the ankle which when raised causes cramps, edema, venous pigmentation, dermatitis and ulceration.

Logically therefore, every venous surgeon must do two things. Firstly, assess if the symptoms and signs of the patient, which do not always include varicose vein formation are actually due to raised venous pressures at the ankle. This means the raised ambulatory ankle venous pressure or an indirect but objective and reproducible measurement of it should be taken. Secondly, the surgeon must localise the source of that high ambulatory venous pressure and the venous segments affected by it – deep venous segment or great saphenous vein above or below the knee, or short saphenous segment. It is this assessment of significant incompetence by a combination of venous hemodynamic studies like ambulatory venous plethysmography and Light Reflex Rheography with Duplex ultrasound scanning that should determine choice of procedure (Fig 1 and 2).

Our next great understanding came in 2006 with the description of the non-thrombotic iliac vein lesion (NIVL), and then again in 2010 with understanding the role of venous stenting for these lesions (Fig 3). Known in the past as May-Thurner syndrome, the NIVL is a compression of the left common iliac vein by the right common iliac artery against the spine as it crosses over in the pelvis, and for long it was thought to be rare. However, we now know that this compression is normally seen in over 70% of the adult population as a consequence of humans adopting an upright posture through evolution. We also know that there can be multiple sites of compression of the iliac veins on the right and left side, although 80% or so is on the left. This explains why varicose veins as well as DVT are commoner by a ratio of 4: 1 on the left than on the right. Although the lesion is common, it is asymptomatic in most people and needs no intervention unless the well-known clinical signs or symptoms of venous hypertension occur – namely varicose veins, DVT, venous eczema and ulceration and Pelvic congestion syndrome.

This new understanding of valve function and NIVL sheds fresh light on the pathophysiology of venous edema, dermatitis and ulceration. In clinical practice, it means that one cannot as a venous surgeon offer just one form of venous intervention. A determination if the primary cause of venous hypertension is incompetence of the superficial system alone or a venous outflow obstruction from an NIVL by venous hemodynamic assessment is an essential first step. A carefully directed duplex scan then helps determine specific venous segments involved – above knee or below knee great saphenous vein, short saphenous vein, anterior accessory or inter-saphenous veins. The appropriate choice of RFA, Laser ablation Clarivein or Venaseal glue will be determined by this, as not all methods can be used in all segments for fear of complications like nerve injury. An outflow obstruction will need a CT or MR angiography to rule out venous compression by other pelvic organs, and iliac vein stenting using vein-specific stents (arterial stents are biomechanically different) under intravascular ultrasound (IVUS) guidance may be needed. Venous ulcers and eczema may require venaseal glue ablation of the specific perforating vein transmitting high venous pressures.

Our current knowledge of venous pathophysiology and the availability of equipment for venous hemodynamic studies and duplex scanning should really mean that both patients and clinicians should be able to make to make informed choices for interventions tailored to the pathology that is specific to that patient. The old Trendlenburg-style approach of vein stripping for all with varicose veins followed by compression stockings forever must now be consigned to history.

Figure legend

Fig 1. Venous hemodynamic study measuring Maximal venous outflow (MVO) and Segmental Venous Capacitance (SVC)

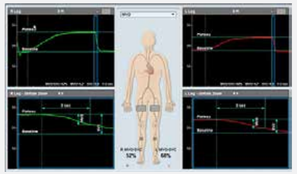


Fig 2. Venous hemodynamic study measuring Venous Recovery Time (VRT)

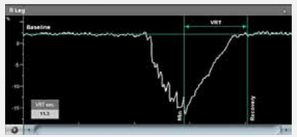
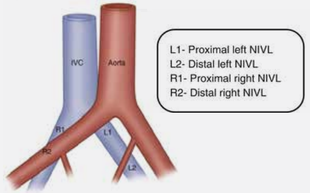


Fig 3. Non-thrombotic Iliac Vein Lesions (NIVL)

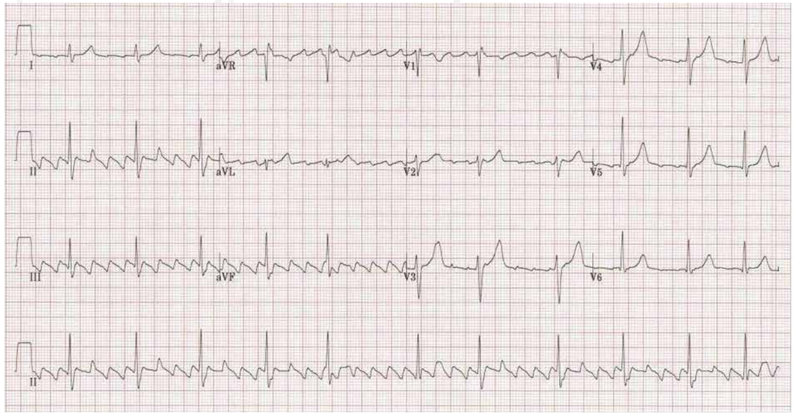


By **Dr. Sriram Narayanan**

Senior Consultant Vascular Surgeon
The Harley Street Heart & Vascular Centre

ECG QUIZ

Scenario:
The ECG below is that from a 43 year old man who presented with palpitations and feeling his heart rate remain high for longer than usual after exercising. He is normally very fit and active - he is a keen long distance cyclist and participates in triathlons. He has no traditional cardiovascular risk factors or significant medical history and is not on any regular medication.



Questions:

1. What does the ECG show?
2. How would you manage this patient?

Answer is available on our website:
http://www.harleystreet.sg/quiz-answers/medbulletin-sept-2017/

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THE HARLEY STREET HEART & VASCULAR CENTRE

MEDBULLETIN SEPTEMBER2017

THE HARLEY STREET HEART & VASCULAR CENTRE

From left to right:
Dr. Peter Ting, Dr. Reginald Liew, Dr. Rohit Khurana, Dr. Sriram Narayanan

INTRODUCTION

Greetings from the Harley Street Heart and Vascular Centre! We are pleased to present our second newsletter of 2017 in which we aim to provide the busy clinician with updates on the latest advances in the fields of cardiology and vascular medicine.

In this edition, it is our pleasure to welcome Dr Sriram Narayanan to The Harley Street Heart & Vascular Centre. Ram is a senior consultant in vascular surgery and provides a suite of investigations and clinical expertise for treating venous and complex peripheral arterial and aortic disease. The theme of this newsletter relates to medical and procedural innovations that are being brought into our specialist practice to improve patient experience and outcomes. Dr Rohit Khurana focuses on bioabsorbable stent technology for coronary intervention and Dr Reginald Liew, who has assisted the pioneering of cryoablation in Singapore, provides an overview on its indication and place in the curative treatment of atrial fibrillation. Dr. Peter Ting provides an update on the advances in the medical treatment of heart failure, a complex condition with increasing prevalence. Dr Sriram Narayanan shares an article on the contemporary evaluation of superficial and deep vein competency in patients with varicose veins.

We hope these articles are a stimulating read but also provide a value to your clinical practice. Please feel free to contact us (enquiries@harleystreet.sg) if you would like to provide any feedback or request a specific topic in future editions.

From The Harley Street Heart & Vascular Centre

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