

A surgical stabiliser

Pioneer of off-pump coronary artery bypass, **Dr Murali P Vettath** discusses his vast contributions to heart surgery. He details cost-saving innovations and the incomparable reward of saving a life

How did your career as a coronary artery bypass graft (CABG) surgeon begin?

When I trained as a cardiac surgeon in the early 1990s, coronary surgery was in its infancy in India. Nearly 50 per cent of surgeries were on valves, 30 per cent were for congenital heart disease and only 20 per cent were for coronary artery disease (CAD). The incidence of CAD was very low in those days, but witnessing the rise in fast food consumption and the Westernisation of our lifestyle, I was sure that CAD was going to be our next big problem, and it was. I later trained in Australia on CABG and had the opportunity to work in Dhaka, Bangladesh. I set up two cardiac centres and trained several cardiac surgeons there.

What motivates you in your work?

Every day patients come in for CABG with more and more diffuse heart disease, and the challenge of bypassing gets bigger and bigger. While training in Australia, all CABGs were performed using a Heart-Lung Machine, and there was no off-pump coronary artery bypass (OPCAB) surgery. Even today, only 5 per cent of bypass surgeries are performed by OPCAB in Australia. I also witnessed a high incidence of stroke in older patients, in which the aorta was cannulated or side clamped. The first thing that motivated me was a desire to avoid using the pump. My first invention, the Vettath anastomotic obturator (VA), was a metallic device to aid anastomosis of the top end of the vein graft on to the aorta during

CABG surgery. This was well accepted by the surgical community as a useful tool.

Can you comment on the cardiovascular disease (CVD) landscape in India, with reference to the challenges facing surgeons and healthcare providers in this country?

In India, 90 per cent of CVD patients have CAD. It is much more prevalent than rheumatic heart disease, a trend that started to emerge in the 1990s. India also has a rising diabetic population. As diabetics are more prone to diffuse CAD, we have had to modify our surgical technique to tackle diffuse disease. Healthcare providers in the country are also tasked with making patients aware of the risk factors of CAD (such as diabetes, hypertension and dyslipidaemia).

To what extent has your international training equipped you for your current role at the Malabar Institute of Medical Sciences, India?

In Australia, CABG is carried out frequently and cardiac surgeons are trained with hands-on experience. When I was training in India, it was not possible to gain such experience, as CABG was not very popular. However, Australia accepted my basic training in cardiovascular and thoracic surgery and allowed me to take independent cases as a senior registrar. That gave me the confidence to perform CABG.

Around this time, the first stabiliser was developed in Holland, where I attended a

facilitated anastomosis workshop, which inspired me to start working on OPCAB. The first stabiliser was not widely used, but the next generation, which had a flexible arm, was well accepted. With that came the rise of OPCAB surgeries around the world. Soon after, I performed the first beating heart CABG in Dhaka in 1999.

You have recently developed a novel, reusable metallic stabiliser. What was the rationale behind this invention?

The existing commercially available stabilisers were disposable, meaning they had to be purchased for every surgery, creating high costs. We wanted to develop an instrument that could be re-sterilised and used many times. The only elements to be replaced should be those in contact with the patient's heart, and it should cost no more than £10. We have achieved all of these aims.

You have received an impressive range of awards for your research to date. Of which are you most proud?

I have only done research to aid my work and improve surgical techniques, so that I could deliver excellent results to my patients and avoid unnecessary intervention. In doing so, I have also reduced costs. The awards I have received are not what I am most proud of. What truly makes me happy are the individual lives I have been able to save. I am yet to receive an award that rivals a thank you hug from a patient or relative.



Indigenous invention

The Director of the International Centre of Excellence in off-pump coronary artery bypass at the **Malabar Institute of Medical Sciences** has developed a reusable stabiliser for heart surgery, which could save Indian hospitals thousands each year

CORONARY HEART DISEASE is the biggest killer worldwide. As a result, coronary artery bypass graft (CABG), better known as heart bypass surgery, has become one of the most commonly performed surgical procedures. CABG treats coronary heart disease by diverting blood around narrowed or obstructed parts of the major arteries to improve blood flow to the heart.

Already a mainstay of modern cardiac surgery, CABG was revolutionised by the development of 'beating heart surgery', or off-pump coronary artery bypass (OPCAB). Because the heart is still beating, this variation on the technique does not require a Heart-Lung Machine (HLM) or 'pump' to support the body while the heart is stopped, and thus reduces both surgical complications and costs. Over the years, OPCAB became the definitive surgical technique to perform CABG for patients with coronary artery disease in many centres.

However, the technique is not without its flaws. By the early 2000s, its reproducibility and the quality of the connections made between blood vessels (anastomosis) had come under question. As a result, it dropped out of favour. A divide was created among coronary surgeons, those who performed the technically demanding technique and, the majority, those who opted for CABG with the help of the HLM.

Dr Murali Vettath is one cardiac surgeon who decided to stick with OPCAB. He since mastered the technique and is now one of a handful of surgeons worldwide who perform 100 per cent of their coronary surgeries on the beating heart without the use of a pump. He has individually performed the surgery over 3,800 times in the last 12 years, with the help of his team at India's Malabar Institute of Medical Sciences (MIMS). In order to perform all of these surgeries without the HLM, he has invented a plethora of innovative devices and techniques.

SURGICAL INNOVATIONS

Throughout his career, Vettath has trained surgeons around the world in the use of his cutting-edge technologies, which are all based on the needs of his patients. His Vettath anastomotic obturator (VAO), a tool that can connect the vein graft to the aorta without the need to use a side clamp, was one of his earliest patented inventions. He developed this technique to perform top-end anastomosis of the vein graft, using the VAO, as well as a modification of the aorto-coronary shunt.

In 1999, Vettath took his inventions to Bangladesh, where he was the first to perform beating heart surgery in the country. He remained there for three years, setting up two new cardiac centres and training surgeons, cardiologists, anaesthesiologists and nurses.

TOWARDS PREVENTION

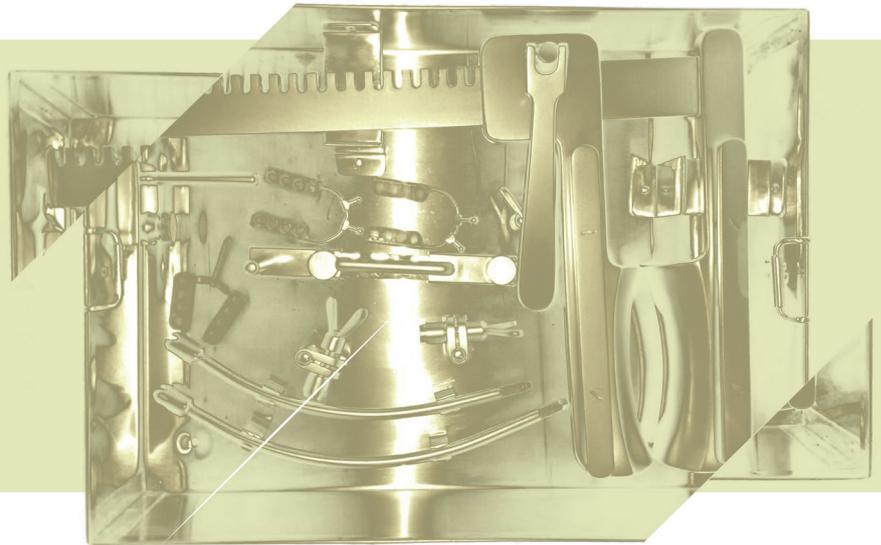
As well as his clinical and research roles, Vettath has organised a number of programmes to increase public awareness of heart disease. He:

- Has organised public marches on World Heart Day since 2006, in which over 2,000 people participate
- Established monthly awareness camps to increase understanding of heart problems and therefore help prevent them
- Set up the SAVE A HEART – SAVE A LIFE programme, whereby underprivileged patients can receive coronary artery bypass graft without cost. He has already operated on more than 90 such patients, with many more to follow

He is now Chief of Cardiac Surgery at MIMS, in his home town of Kozhikode in Kerala, India. Since joining the Institute in 2002, he has cemented its position as a leader in beating



Vettath's 'all-in-one' simple Indian-made stabiliser (SIMS) set.



DEVELOPMENT OF A SIMPLE INDIGENOUS STABILISER FOR BEATING HEART SURGERY

OBJECTIVE

To create and implement a reusable stabiliser for beating heart surgery that could save Indian hospitals thousands of dollars every year.

FUNDING

Vettath Foundation

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DR MURALI P VETTATH is a new-generation coronary surgeon – one of the very few in the world to perform 100 per cent of his coronary surgeries on the beating heart without the use of a Heart-Lung Machine. He has been a pioneer and protagonist of this cutting-edge technology and has trained numerous surgeons and anaesthesiologists around the world in this field of cardiac surgery. He has 24 years of post-MCh experience in Cardiothoracic & Vascular Surgery, including 14 years as Chief Cardiothoracic Surgeon. He has performed over 6,500 open-heart surgeries, with more than 3,800 of them on the beating heart, for coronary artery bypass surgery, with a mortality of less than 0.5 per cent. He trained in coronary artery surgery in Australia, Holland and Paris.

heart surgery. As well as improving treatment options for local people, he established the Institute as an acclaimed Center of Excellence in OPCAB, which trains surgeons from all over the world.

A SIMPLE STABILISER

In spite of all this progress, in order to perform OPCAB, Vettath still had to import one part from the US – the stabiliser. The stabiliser is an important tool in beating heart bypass surgery, required to immobilise the area of the heart where the surgeon needs to work. Indeed, operating on a beating heart is no easy feat, and a stabilisation system is essential to keep the heart steady for the surgeon. Yet, aside from the costs of import, the stabiliser could only be used once, generating high costs for each surgery.

Disheartened by this, Vettath and his team attempted to make a similar stabiliser themselves. Although they were successful, the result was not cost-effective. The stabiliser was made out of plastic and therefore had to be replaced after every few uses.

To tackle this reusability issue, the team set out to create a more durable stabiliser. After a year's research, they created a stabiliser made out of metal. Much like the commercial version, this stabiliser had a suction pod to hold the surface of the heart stable, which can be changed if necessary. Although the scientists initially used pods from commercially available stabilisers, they have since developed their own.

AN ALL-IN-ONE KIT

The stabiliser itself is made of a curved metallic rod, which is hollowed out to contain another rod within it. This inner rod is pushed from behind by a screw to tighten a small metal piece (locking rod) in front of it. This piece in turn tightens the ball end of the suction pod.

When placed parallel to the coronary artery to be grafted, the pod stabilises the region of the heart on which the surgery will take place. The stabiliser rod is tightened onto a vertical metal stand using a screw, which is fixed onto a sternal spreader (which opens the ribcage), modified to hold the stabiliser in position.

Importantly, the sternal spreader, stand and stabiliser all come together. This 'all-in-one' combo package allows Indian surgeons to perform OPCAB without the need for any imported devices. Aside from the initial cost, which would still be under £1,000, the recurring expenses are negligible.

REDUCING HEALTHCARE COSTS

Despite being developed just months ago, Vettath's simple Indian-made stabiliser (SIMS) has already been used on more than 100 patients. His long-term goal is for all OPCAB stabilisers in India to be SIMS, eliminating the need for imported ones.

This reusable and affordable stabiliser could revolutionise heart surgery in India, especially for smaller institutions and government hospitals. It would save them huge amounts of money every year, as once procured it can be used time and again. "This would cut the recurring cost of the disposables used for OPCAB," Vettath adds.

But Vettath's inventive mind has not stopped to rest. He is already working on new Left Ventricular Assist Devices to treat heart failure, and even fully artificial hearts, which are currently prohibitively expensive in India. Looking even further ahead, Vettath hopes to improve surgical practice more broadly. "We are currently in the process of standardising minimally invasive surgery, with less instrumentation," he concludes.