EACTS
European Association For Cardio-Thoracic Surgery

Daily News

The official newspaper of the 30th EACTS Annual Meeting 2016

Issue 4 Tuesday 4 October

In this issue

‘Neulich nachts in Houston’

Monday’s Presidential Address offered a chance for Friedrich-Wilhelm Mohr to share his perspectives as EACTS President, his professional journey, as well as a few of his personal insights gleaned over more than 40 years of dedication to the field.

He was introduced with kind words from EACTS Vice-President Miguel Sousa Uva, who gave a short biography detailing Professor Mohr’s professional and personal milestones in life – accolades, it seems, which are as far-ranging as they are impressive. Stepping up to the podium, Professor Mohr had one key message running throughout his speech: we owe a lot to those who support us – both personally and professionally – in all of our endeavours.

“The title of my speech is: ‘Neulich nachts in Houston’. You may wonder what this means!?

I stand here today, as the president of EACTS, at the end of a long, exciting, beautiful and fulfilling professional journey as a surgeon. I would like to share some parts of this journey with you.

Last fall, I was invited to participate in the AATS board meeting in Houston, by my close friend and AATS president, Joseph Coselli. When I arrived in Houston, after a long flight, late in the afternoon I was extremely tired and headed up to the bar to have a beer and a burger.

On the way back to my room, all of a sudden, I was approached by Professor Song Wan from Hong Kong in the elevator.

He asked me directly: ‘What will be your presidential address?’. My immediate response was: ‘I have no idea!’. This got me thinking and even dreaming all night, but I just could not find a suitable answer. I woke up in the middle of that night, and remember being in a similar hotel when I was a resident myself, and memories cam flashing back to my mind, memories of more than 40 years.

So, the title of my presidential address ‘Neulich nachts in Houston’ represents a very special occasion or turning point in my professional life. ‘Neulich’, which is a German word, can mean the other night, recently, yesterday, the day before yesterday, or it can be a whole time frame. For me it represents a whole time frame, starting 40 years ago at a night in Houston, when I was 25 years old. I visited the Texas Heart Institute to watch Denton Cooley and Michael DeBakey perform surgery.

At that time, cardiac surgery in Germany was still in its early days. But the pioneering work in the field, the work of Dr Cooley and Dr DeBakey, took place in Houston.

This was well emphasised by Hans Borst in his honoured guest lecture ‘Hands across the Ocean’ at the AATS in 1985. He referred to the period before the Second World War, when American surgeons used to visit Germany to learn thoracic surgery. It was particularly Professor Mikulicz in Breslau who trained many American surgeons. His famous OR from 1897 is still the same. I had the chance to visit it recently together with Marian Zembala. However, in the seventies and eighties, German surgeons visited the United States for advanced training in cardiac surgery – so did I.

Last fall, in 2015, exactly 40 years later, I visited Houston again – not as a resident, but as the president of the EACTS.

This made me realise that I somehow started my whole journey in cardiac surgery in Houston, in the presence of those great leaders and visionaries of that time, who got me further interested in surgery and curious on how to advance the field, how to make progress, how to move forward and on how to cross borders.

It is my true belief that not only I myself, but also we as a society, owe all of our knowledge and skills to our teachers and mentors, to those who educated and trained us, who got us interested in this magnificent field of medicine and supported us.”

Cardiac | Professional Challenge | Fighting infection in cardiac surgery

Sooner is better than later for valve repair surgery in mitral valve infective endocarditis

Ahead of his presentation during Tuesday's 'Fighting infection in cardiac surgery' session, Gebrine El Khoury, Head of the Cliniques Universitaires Saint-Luc's Cardiovascular and Thoracic Surgery Department, and Professor at Université Catholique de Louvain (UCL), Brussels, Belgium, spoke to EACTS Daily News to give an overview of contemporary approaches to mitral valve repair in MV endocarditis.

How big a challenge is infective endocarditis in the 21st century?

Infective endocarditis (IE) remains a big challenge for the medical community, and particularly for the cardiac surgeons. Despite improvements in patient care, the global burden of IE remains high worldwide largely because the population at risk, namely the elderly and fragile patients, has increased.

Prior to the antibiotic era, IE was a fatal disease. After antibiotics were used to treat IE, patient survival improved dramatically. However, antibiotics alone are not able to cure many patients. Patients who developed complications despite antibiotic treatment had to be treated by surgery to avoid severe sequelae or death caused by congestive heart failure, uncontrolled sepsis or recurrent embolization.

What were the risks and limitations of surgical options?

IE leads to complications requiring surgery in up to 70% of patients. In the past, prosthetic valve replacement was the standard therapy for those patients. However, in the setting of complicated IE, besides the higher perioperative morbidity and mortality of valve replacement compared to standard valve surgery, there is a further substantial risk of recurrent infection on the prosthesis itself. For these reasons, antibiotic treatment was extended and surgery delayed whenever possible in order to reduce the risk of IE recurrence.

Meanwhile, we have learned the limitations and disadvantages of prosthetic valves. In the mitral position, bioprosthetic valves have a limited durability while lifelong anticoagulation required for mechanical prostheses is associated with a significant rate of major bleeding and thromboembolic events. Nonetheless surgeons initially did not dare to intervene and attempt a repair of the valve in the early stage of the infection fearing to find fragile tissue unsuitable for repair. The prevalent idea was therefore to wait for sterilisation of the MV by the antibiotics and to allow the healing process to reinforce the MV tissues, which would eventually resist better to surgical sutures. Further, delayed surgery could supposedly reduce the risk of recurrence in case of prosthetic valve replacement. Therefore, the first attempts of MV repair in IE were performed in patients who survived the active phase of infection but presented persistent severe MV regurgitation.

> *"From most of the data in the literature, MV repair seems superior to replacement in terms of mortality and morbidity."*
>
> Gebrine El Khoury

Why did surgeons opt for replacement rather than MV repair in these cases?

Despite the fact that MV repair has been shown to be feasible in cases of healed IE, most patients continued to receive valve replacement. The reason is that the combination of late diagnosis and delayed surgery often times led to severe or even complete valve destruction making the repair impossible without the use of large patches, which is not the best option. In other patients, delayed surgery leads to congestive heart failure forcing the surgeon to perform "quick replacement" instead of "long and difficult repair".

How has practice changed in the last 20 years?

The main improvement in the management of patients with IE has been a faster diagnosis with cardiac echo and a multidisciplinary approach to the disease. A significant quality improvement of cardiac echo has allowed more precise diagnoses of vegetations and even of very small lesions prompting earlier treatment before complications occur.

The multidisciplinary team, which includes cardiologists, infectious disease specialists, neurologists and cardiac surgeons – is aimed to optimise medical treatment and timing of surgical intervention. Therefore all specialists should be involved into the discussions from the diagnosis and should be kept informed of the patient's progress.

What are the advantages of intervening early?

Since the last 20 years we firmly believe in the potential advantages of early surgery and MV repair in IE. We have learned not only that the myth of fragile tissue during acute stage of the disease was wrong but also that surgery during the early stage is feasible and offers in most of the patients the possibility to repair the valve, as the lesions are limited and well defined.

IE can affect previously normal valves, as well as pathological ones, and can randomly affect all the different parts of the valve (any segment of the anterior or posterior leaflet, commissures, chordae, MV annulus). Therefore, in addition to a rigorous valve analysis to detect both infected lesions and underlying non-infected lesions (such as degenerative prolapse, rheumatic involvement, or calcium), surgeons must be able to perform various MV repair techniques including classical Carpentier's techniques, artificial chordae and leaflet reconstructions with patch. Nevertheless, the main rule in IE is that the infected tissues should be radically excised with a security margin. However, if repair is the primary goal, the surgeon should take care to preserve and not to damage all the non-infected tissue. In doing so, it is often surprising that IE lesions that appeared bulky and extensive before resection involved in fact only a relatively limited segment of the valve. We have repeatedly observed in early surgery that beyond the infected tissue there is healthy and solid tissue that makes the repair possible.

> *"We actually have the tools to make early and definitive diagnosis in most IE cases."*
>
> Gebrine El Khoury

In our experience, performing early surgery whenever indicated and using a wide armamentarium of repair techniques, including patches, MV repair can be done in up to 80% of IE cases. Patches are necessary in 60% of the repairs in order to replace a segment (or partial segment) of the anterior or posterior leaflet, or a commissure.

How has training reflected this change of approach?

Obviously, training in MV repair of simpler aetiologies, like degenerative disease, is a mandatory requisite before starting to approach more complex pathologies like IE. Further experience of repair in rheumatic disease is also important because in some aspects rheumatic disease looks like IE with destruction of the valve and inflammation of the tissue. So, in our center we have developed over the years an advanced MV repair program that has extended also to MV-IE.

Over the past decades, the overall rate of MV repair for degenerative disease has progressively increased because of the better knowledge of the disease and improved surgeon experience and information. Therefore, we can reasonably expect that MV repair rate will continue to increase in the same manner for IE. To achieve this goal we have to provide high quality surgical formation and teach young surgeons how to perform simple and complex valve repair, as it may become a major field of their activity in the future. Nevertheless, in MV repair for degenerative disease there is a trend towards less valve resection and more use of artificial chordae. However, we have to teach young surgeons also how to resect a valve and how to deal with it because this is of paramount importance for repair in IE.

Can you tell us a little about your own research?

In 2012, we reported mid- to long-term outcomes of 109 patients having MV repair for active IE (mean age 59, 70% male). In this cohort, 70% of the patients were operated on within the first two week of antibiotic therapy, and 30% during the first week. Antibiotic therapy was continued after surgery for a total of four to six weeks as recommended by the guidelines. At eight years, overall survival was 62% and freedom from cardiac death was 82%. Linearised rate of IE recurrence and thromboembolic or bleeding event was 0.3% and 1%/patient-year respectively. Freedom from MV repair failure (recurrent severe MI or stenosis) was 91% in repair without patch and 80% in repair with patch (p=0.09). We consider these outcomes as very encouraging and they support our current approach but need further confirmation by other teams. We hope to provide an update of this series in the coming years.

Where does this leave the patch technique now?

The use of patch is an indicator of the extension of the leaflet resection or destruction. When the valve is cleaned from any infected lesions, the location, size and the amount of residual tissues is evaluated. Whenever possible, patch repair is avoided. On the posterior leaflet, sliding plasty, annulus plication/compression may compensate for relatively large defects of half of a segment, and allow primary closure. On the anterior leaflet, any defect of more than 5 mm is generally repaired with patch to avoid deformation and valve restriction. Extensive patch repair of more than one valve segment was rarely necessary in our experience.

As expected, long term outcomes showed more repair failures in patients with patch compared to those without patch, but the difference was smaller than what we imagined, and statistically not significant.

What lessons have been learned from your analysis of long-term outcomes of patch mitral valve repairs in active IE?

The main lesson is that patch repair is a valid alternative to replacement in IE. It does not increase operative or long-term mortality in comparison to repair without patch. It allows patients to be cured from IE, with low risk of recurrence, and good repair durability. In other words, the use of patch doesn't impact negatively the outcome of the patient.

What other issues will you be highlighting in your presentation?

The use of prosthetic ring annuloplasty is still controversial in IE. In our experience, we use it in half of our repairs. Pericardial bands (12% in our experience) or no annuloplasty (33% in our experience) are also alternative options. For us, the use of prosthetic ring annuloplasty is safe, and not associated with recurrent IE, nonetheless we recommend following the general principles

EACTS Daily News

Publishing and Production
MediFore Limited

EACTS President
Friedrich W. Mohr

EACTS Secretary General
A. Pieter Kappetein

Editor-in-Chief
Peter Stevenson

Managing Editor
Rysia Burmicz

Editor
Joanne Waters

Design
Peter Williams

Industry Liaison Manager
Amanda D'rojcas

Head Office
51 Fox Hill
London SE19 2XE
United Kingdom
Telephone: +44 (0) 7506 345 283
mary.kennedy@medifore.co.uk

Copyright © 2016: EACTS. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted in any form or by any other means, electronic, mechanical, photocopying, recording or otherwise without prior permission in writing from the EACTS or its associated parties. The content of EACTS Daily News does not necessarily reflect the opinion of the EACTS 2016 Annual Meeting, its Chairs, Scientific Advisors or Collaborators.

of decontamination of the operative field (radical excision of infected tissue, extensive washing with saline solution).

What are the current and future challenges? Are there any new techniques that could potentially make this repair even more successful?

One of the big challenges in valve repair surgery is the rapid but systematic degeneration of the patch material (xeno or autologous pericardium), which clearly limits the long-term durability of most valve repairs when using such material.

"Using patch repair techniques, reparability rate in IE can be 80%, with excellent durability."

Gebrine El Khoury

New extracellular matrix patches promiseno structural degeneration, rather tissue in-growth, celldifferentiation and adaptive remodelling into the host tissues. If these characteristics are confirmed, avalve repaired with patch may remain functional in the long term, and the overall rate of complex MV repair may increase dramatically, because many surgeons are still reluctant to perform patch repair with conventional materials.

What is your take-home message?

My take-home message for this meeting is that we actually have the tools to make early and definitive diagnosis in most IE cases. The patient should benefit from it, have early diagnosis, receive adequate antibiotic therapy and the opportunity of early surgery whenever indicated (large mobile vegetation, embolism, severe MI with congestive heart failure, uncontrolled sepsis including MV abscess, etc..). What's more, patients' treatment should be discussed case-by-case within a multidisciplinary team dedicated to IE.

Early surgery is safe, feasible and allows durable repair with an extremely low rate of IE recurrence. From most of the data in the literature, MV repair seems superior to replacement in terms of mortality and morbidity. Surgical techniques rely on radical excision of infected tissue with preservation of all the healthy tissue to optimise the reparability of the valve. Using patch repair techniques, reparability rate in IE can be 80%, with excellent durability if the valve is repaired without patch, and very acceptable results for repair with patch.

Congenital | Professional Challenge | Management of coarctation in newborn and infants

Treating aortic coarctation in babies

Today's programme will feature a Keynote Lecture by Morten Helvind, a paediatric heart surgeon from Rigshospitalet, Copenhagen, Denmark, who will offer his insights to kick-start a session dedicated to treating aortic coarctation in babies and infants.

Coarctation of the aorta is one of the more common congenital heart defects accounting for 6 to 7% of all congenital heart defects, affecting 50 out of 100,000 newborns.

"This is really, on the surface at least, a simple defect," said Dr Helvind. "It's a short narrowing of the aorta, and the treatments seem simple because you just have to remove the narrow part, and in a child, you can reconnect the aorta afterwards. But really it is more complex than that because if it's not diagnosed and treated, children will go onto develop hypertension later in life.

"It is an operation which should be done sooner rather than later in my view – the question is how soon – but at least before school age, and probably in the first year of life. In my opinion if it's diagnosed it should be operated on as soon as possible – usually very soon after diagnosis."

Symptoms of coarctation in a newborn

Symptoms depend on how severe the aortic coarctation is; the most severe cases will cause symptoms that will become apparent very soon after birth, including heart failure and acidosis and even result in death, but less serious coarctations may not cause obvious symptoms, and may not be detected until adulthood.

"The signs of coarctation include heart murmur and also the absence and weakening of the pulses in the lower limbs," clarified Dr Helvind. "All small children in the Western world get their pulses checked when they are newborns, and this is to try and detect this condition.

"Sometimes though, the condition goes undiagnosed, and doesn't get picked up until the person is a young adult. A classic presentation would be where a young person develops hypertension."

Dr Helvind continued: "One of the problems is that although you might be able to hear a murmur with a stethoscope, a child can be asymptomatic, and the first sign can be a serious complication – so it's really important it's picked up early. In the days when people were conscripted for military service it was sometimes picked up then, but of course that doesn't happen much now in the Western world."

Why it's important to diagnose aortic coarctations early

"If it's not treated, life expectancy is reduced; a coarctation will definitely shorten your life. The expected survival at 25 years is about 20% lower than for the background population; there is 75% mortality at the age of 46," said Dr Helvind. "You die from complications due to the hypertension, and not due to the narrowing itself.

"Blood pressure management is facilitated by the kidneys, and as the kidneys are situated below this narrowing, they will signal to the circulation that there should be a higher blood pressure – which means that you get a higher blood pressure in the upper body, above the narrowing, and this can cause heart failure, aneurysms and potentially fatal haemorrhaging in the brain."

Prenatal diagnosis of coarctations

Dr Helvind noted that in the modern era, most aortic coarctations are diagnosed prenatally in the womb via foetal echocardiogram at around 20 weeks, meaning that surgery can be planned for after the child's birth.

"But one of the difficulties with diagnosing prenatally is that an aortic coarctation can sometimes be a marker for the much more serious hypoplastic left heart syndrome (HLHS)," he said. "Sometimes it is obvious that it's HLHS (such as where the left hand side of the heart is so small), but it's not always so apparent. In around 10 to 20% of foetuses, aortic coarctation is a marker for HLHS."

Dr Helvind went on to stress that these babies will be closely monitored for other signs of HLHS and in many of these cases, if the foetus is thought to have HLHS, the parents will usually opt for a termination.

"For the patients who continue with the pregnancy when HLHS is suspected – it can be a rollercoaster – a really difficult emotional journey for them," said Dr Helvind. "They may have had to discuss termination and/or proceeding with pregnancy and then discover after their baby is born that they just had an aortic coarctation and only need a relatively minor operation to correct the problem. The trouble is we can't protect parents from this uncertainty – we have to be honest about what we find on a scan and try to give them the information they need to make a decision.

"In newborns, all the procedures are done surgically, and in a teenager everything is done interventionally. Then, depending on institutional preferences, there is a sliding scale of which procedures are used for different age groups."

Morten Helvind

"Foetal scanning has shifted the psychology of being diagnosed with HLHS; 20 years ago these babies would have been born and at that point the diagnosis would be made and there would be a big crisis. Now the big crisis comes earlier, in weeks 20 to 24 of the pregnancy, when the parents have to decide whether to terminate or not."

Which procedure is best in babies and children?

As Dr Helvind underlined, surgery is the best option usually for correcting aortic coarctation in babies, where the narrowing can be cut out and the aorta reconnected. While for teenagers and adults, balloon dilation and stent implantation is more likely, the technology is not suitable for newborns and infants at the current time. "The problem with using balloons in babies is that the balloons cannot be re-dilated to an adult size, thus you will have to remove and replace them later," he explained.

"The other problem is that the blood vessels in babies are very small and can be damaged. In our centre babies weighing under 10kg will be given surgery because of these risks."

He went into more detail about the challenging balance between the treatment options in these very young patients: "There is more interventional cardiology in babies done now, although again, in newborns, all the procedures are done surgically, and in a teenager everything is done interventionally. Then, depending on institutional preferences, there is a sliding scale of which procedures are used for different age groups.

"Sometimes there is a tug of war between the different specialities – there may be an interventional cardiologist who is keen on doing an interventional procedure, and says they could do it with balloons, but then there may be a heart surgeon who will say 'We've been doing this procedure for 20 years, with good results, so why change?' Sometimes it comes down to those sort of individual/local factors rather than scientific findings."

Safety of coarctation operations

" Very few die from having a repair of a coarctation, but there is a 15% recurrence rate, and this is higher the younger the patient is," said Dr Helvind. "The risk is that if it you do the operation too soon the aorta will narrow again."Reoperation (surgically) is difficult and is very rarely done. This is because the blood vessels in that area supply the brain and nerves to the vocal cord and diaphragm is close by, so you are in a dangerous area.

"In addition, a high percentage of these babies (40 to 50%) will have another congenital heart defect, so correcting the aortic coarctation may be just a small part of a larger operation in that situation."

Dr Helvind offered his conclusions: "As we gain more experience and new techniques are refined to overcome existing problems, in the future more and more coarctations will be corrected using interventional cardiology techniques in much younger children."

Vascular | Focus Session | Arch surgery: Towards a low mortality and low complications rate

15 years of arch replacement with the frozen elephant trunk technique: what have we learned?

Malakh Shrestha (Hannover Medical School, Germany) will today present a summary of his centre's 15-year experience with the frozen elephant trunk (FET) technique in aortic arch replacement. The talk's subtitle, 'The good, the bad and the ugly', is apt, bringing out as it does the complexity of treatment choices that persists for today's patient despite the many technological advances that have occurred over the years. In an interview with *EACTS Daily News*, Professor Shrestha discussed the development of the FET technique and his advice to surgeons.

Could you outline the major breakthroughs that have taken place over the past 15 years of the FET technique?

Even after the advent of cardiac surgery in the 1950s, this was technically the most difficult surgery that one can do in the human body. The problem was that we had to stop the blood flow to the brain to replace this part of the aorta. As we all know, under normal human body temperature, the brain can only live for about three minutes without oxygen. But obviously surgeons need more than three minutes to replace the whole aorta. So in the early 1970s, for the first time, a series was operated where the patients were cooled down to below 20 degrees. Under these conditions, the brain and body can live for up to 40-50 minutes. One had to be very quick to replace the arch, but at the same time if the descending aorta was also involved, usually the only way was to operate twice, once from the front and later from the side.

In the early 1980s, Professor Hans Borst, one of the founders of the EACTS, started a new technique, called the elephant trunk; the arch was replaced through a medial sternotomy, and the second phase of the operation was done some time (3-4 months) after the operation when the patient had recovered from the first operation. And one did not need to prepare the aortic arch from the left again; one could just grab the dangling graft (the 'elephant trunk') and do the operation.

Stent technology came in the 1990s. Both these techniques were combined to so that a stent was used for the 'elephant trunk' part. This technique, called the 'frozen elephant trunk technique' (FET), was performed for the first time in Hannover in 2001.

Now, we want to present our data from the last 15 years, in fact it is one of the longest series in the world. It is of 251 patients. Because we were the first, we used different grafts over this 15-year period as new more modern grafts and technologies came about. So the results keep on getting better. Also, of course, we have learned a lot – and we didn't make the same mistakes twice!

I chose the title 'Good, bad and ugly' in the sense that I want to make it clear that the mistakes that we made, others need not repeat; so for me, the 'bad' part is also important. 'Ugly' is of course the most important, because if this graft infects there is almost nothing that you can do for the patient. That is why it is so important that every precaution should be taken to avoid graft infection.

"You have to think about the procedure as a whole; how to reduce the risks of the operation. It is not only how to use the graft, but to know when not to use the graft. We cannot treat everything."

Malakh Shrestha

Over these 15 years we can see that incidences of mortality and complication have fallen dramatically. But you have a lot of advice to give in terms of persisting controllable factors – factors that are still important despite the advent of new prostheses, hybrid theatres, etc. Could you describe some of these?

The most important thing is for the surgeons to understand: it is not just the graft, but the whole procedure that is difficult. Just like in *Formula One*, just because you have a brand new car it does not mean you will become the champion; you also need to be a good driver, and not everyone can drive like Lewis Hamilton!

You have to think about the procedure as a whole; how to reduce the risks of the operation. It is not only how to use the graft, but to know when not to use the graft. We cannot treat everything. Also, basic surgical techniques (taking care that there is no infection, etc.) are still as important today as they were to Dr Lister in the 18th century.

How have protective strategies evolved – not just cerebral protection, but myocardial and visceral protection too?

In the beginning, in the 1970s, we were cooling down the body to 15-20 degrees. We had a safe period, we thought, of about 50-60 minutes where we could shut down the flow to the brain. Then we also started putting in two catheters into the cerebral arteries to perfuse the brain, but we were not doing anything for the heart.

But our results have changed drastically in the last two years in Hannover; we said that if you replace the arch, there is no reason for the heart to be stopped, so we started perfusing the heart while replacing the aorta. This is called the 'beating heart' technique, and it brought down our mortality rate from 21% to 6% within one year. That was, for me, an amazing thing, because everything else (including the surgeons) remained the same.

Before the beating heart technique, I myself was doing most of these difficult cases. Now, other surgeons have been trained to do the technique, too. Recently, we have even assisted our residents in doing it. If everything is perfused, then there is no problem, because you no longer have to be that quick. Instead of two minutes, you can take 10 minutes.

The second thing that has changed is the grafts. The first grafts were really rudimentary, like cars from the 1950s. The new grafts are very easy to implant, which is important because an exceptional surgeon (the 'Lewis Hamiltons') can always work fast. But now the technique is reproducible between many surgeons. That change has occurred in the last four or five years.

"Our results have changed drastically in the last two years in Hannover ... we started perfusing the heart while replacing the aorta. This is called the 'beating heart' technique, and it brought down our mortality rate from 21% to 6% within one year."

Malakh Shrestha

Could you say a few words about the importance of patient follow-up?

This is very important. One senior aortic surgeon, a pioneer of aortic surgery, Dr E Stanley Crawford (Houston, TX, USA), used to say that all of these patients with aortic disease always come back. This is because a group of them have a genetic disease – e.g. Marfan syndrome – and in these patients the aorta becomes dilated or dissected. So you replace the ascending part and then later the descending part becomes dilated.

Therefore, we recommended all these patients to be kept in very strict follow-up, such that every patient that gets this operation has to have a CT scan and come back after three months, and thereafter (depending on the CT scan) either every six months or every year – lifelong.

It is very important that GPs and surgeons work closely together. These patients should also understand that nowadays we can do a lot of things, provided that they come at the right time. If they come after the aorta has ruptured, there is not much we can do. That is why follow-up is so important.

'Fifteen year experience of total aortic arch replacement with the frozen elephant trunk technique in over 250 patients: the good, the bad and the ugly' will be presented during the session, 'Arch surgery: Towards a low mortality and low complications rate', taking place between 10:15 and 11:45 today in Room 113.

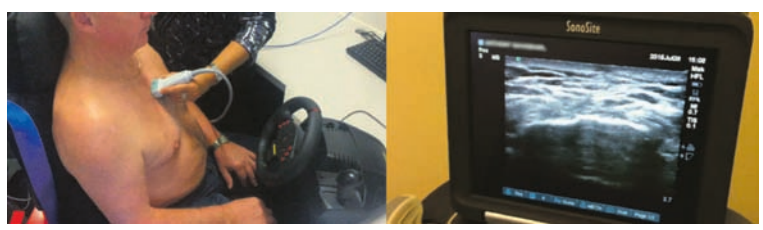
Cardiac | Allied Health Professionals Programme | Abtracts

Driving after cardiac surgery: Mechanical and neurocognitive considerations

Doa El-Ansary, a senior lecturer at the Department of Physiotherapy, University of Melbourne, Australia was the winner of the an EACTS award for best research in the allied medicine category. Dr El-Ansary won her award for her presentation "Motor vehicle driving after cardiac surgery via a medium sternotomy: mechanical and neurocognitive considerations" which explored the concerns and considerations attached to driving after cardiac surgery. The pilot study was conducted with 27 people over two years.

"We believe that screening patients to test their driving skills and cognitive function before surgery may be a predictor of their general recovery."

Doa El-Ansary

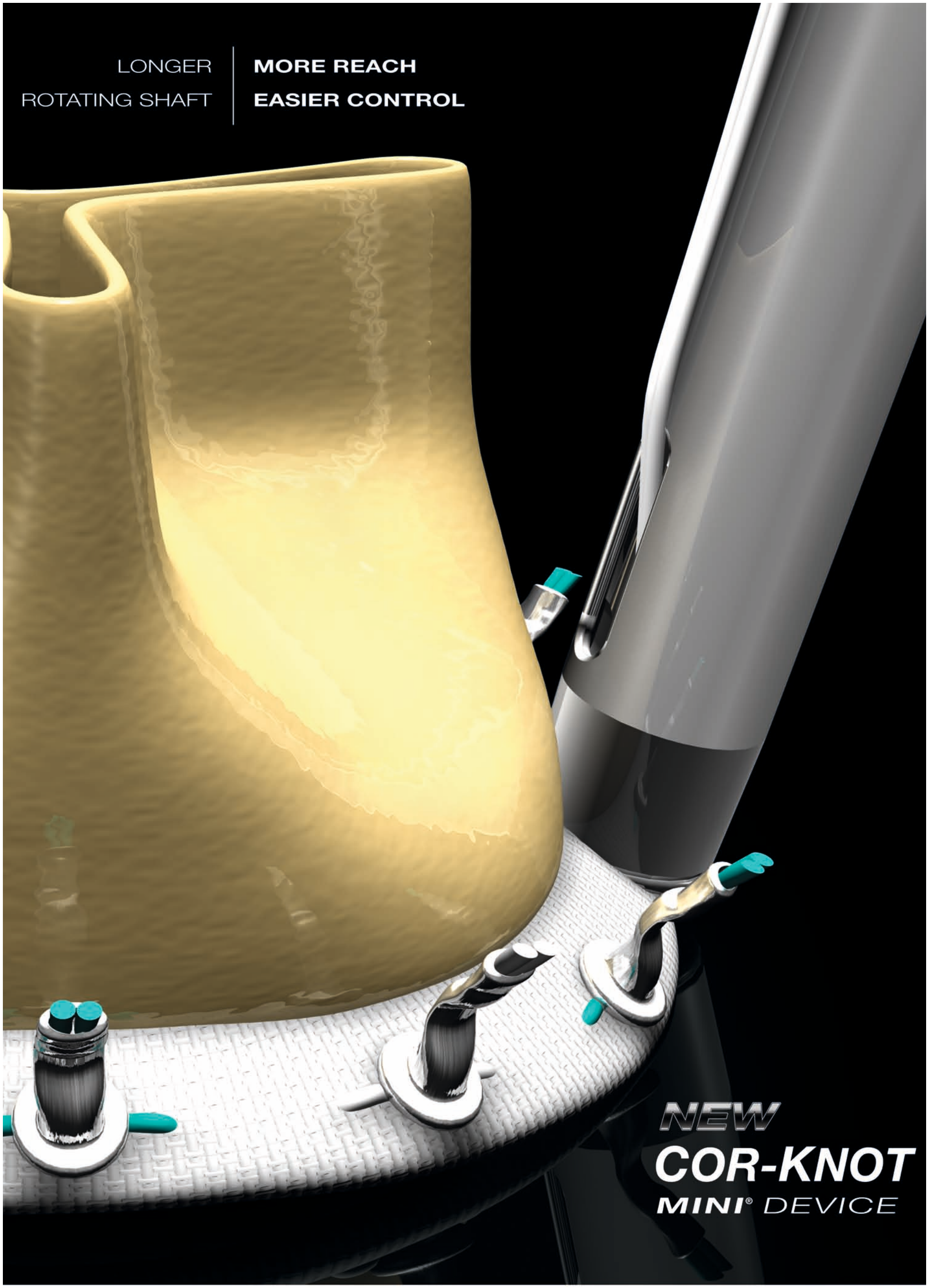


"At the moment, after cardiac surgery – worldwide – people are told to follow strict precautions, and to adhere to limitations of the upper limbs and trunk. They are not usually permitted to drive for anything from six weeks to three months – but there isn't research to support this," explained Dr El-Ansary.

"People are told not to drive for two reasons: firstly, long-acting anaesthetic from the operation may impact on cognitive function, reaction time and attention focus, and secondly the patient essentially has broken bones, thus it is thought that restricting driving will be a safer option in terms of preventing sternum complications. But it can be a big inconvenience for people not driving for a long time."

Dr El-Ansary and her colleagues devised a research programme where patients participated in a simulated driving game, performing driving-related actions such as putting on their seat belt and reverse parking, while simultaneously having an ultrasound on their sternum. Driving

Continued on page 6



LSI SOLUTIONS® **BOOTH 30**

Cardiac | Allied Health Professionals Programme | Abtracts

Driving after cardiac surgery: Mechanical and neurocognitive considerations

Continued from page 4

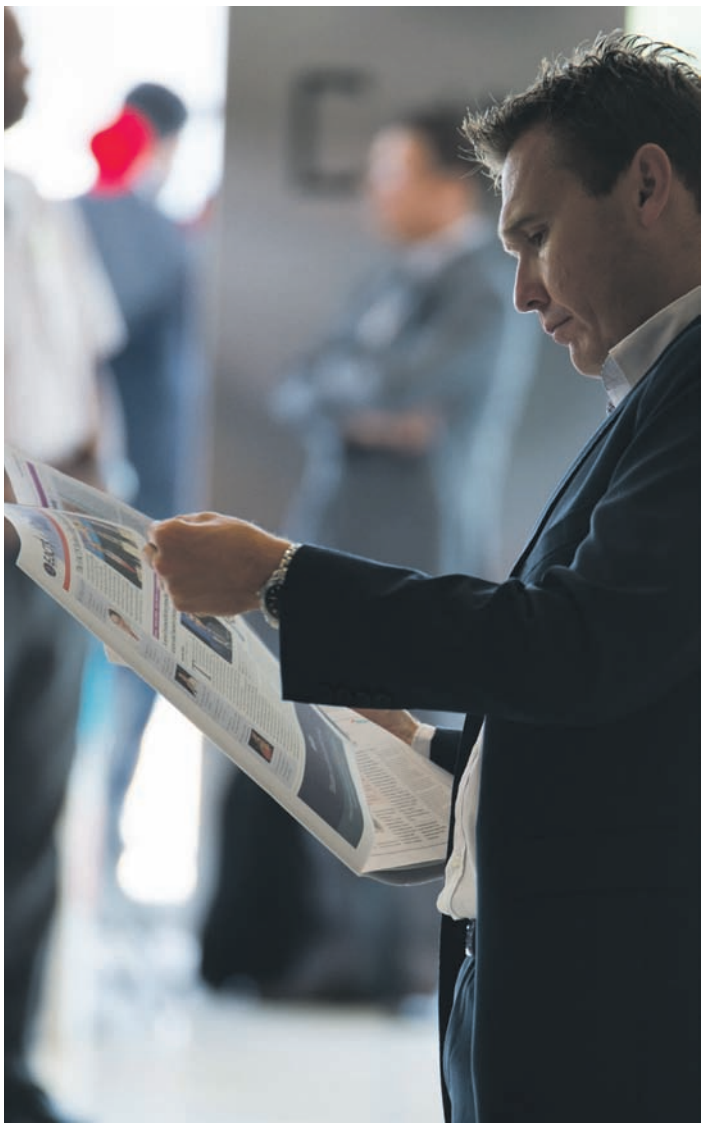
skills were tested pre-operatively using the driving game, and the patients were assessed at day three to five post-surgery using neurocognitive tests. At 4 and 12-weeks post-surgery they were returned to the driving simulator, along with cognitive testing and sternum micro motion ultrasound.

The tests found that sternal micro motion was minimal; it resulted in less than 2 mm bone motion.

"The other finding was related to cognitive function," continued Dr El-Ansary. "Patients who had good driving scores before surgery also recovered better in terms of cognitive function. It showed that testing patients with a battery of cognitive tests may be a predictor for how well they will recover– but we do need further studies on this.

"At four weeks, if the patient's driving was as good as it was before surgery, then their overall recovery was better. Overall recovery, including neurocognition at baseline, may be predictive of driving performance and safety.

"We found that fitter people could drive around four weeks after surgery, but the sicker patients tended to need a little bit longer. We believe that screening patients to test their driving skills and cognitive function before surgery may be a predictor of their general recovery."



Cardiac | Abstract Session | Coronary artery bypass graft: Minimally-invasive and hybrid revascularisation

Multi arterial minimally-invasive coronary artery bypass graft: benefits and drawbacks

Piroze Davierwala Department of Cardiac Surgery, Herzzentrum Leipzig, Germany

The concept of treating coronary artery disease (CAD) by surgery performed directly on the coronary tree is over a century old. Since then, coronary artery bypass grafting (CABG) has evolved from experiment to reality, edging into clinical practice. It has metamorphosed from aortocoronary bypass (predominantly involving the use of vein grafts) to mixed venous and arterial grafts with use of the left internal mammary artery (IMA), to the current era of total arterial revascularisation (TAR).

Every additional arterial graft has been shown to provide a survival advantage when compared to venous grafts. TAR confers significantly better survival, with lower morbidity, and thus is highly recommended, at least in young patients. This advantage can be further extended by the use of bilateral IMAs, which are associated with unparalleled supremacy over the use of a single IMA and veins, or other arterial grafts with regards to long-term survival and freedom from cardiac-related events (such as unstable angina/myocardial infarction and the need for repeat revascularisation due to better patency rates).

However, the main obstacles that hinder the universal acceptance of TAR are the greater technical difficulty of these operations, the potential for perioperative spasm associated with radial arteries and the increased length of operative time and risk of sternal wound problems associated with bilateral IMA use.

The major drawback of CABG is its invasiveness caused by a sternotomy and use of cardiopulmonary bypass (CPB). Tremendous strides in the field of minimally-invasive cardiac surgery, especially in terms of the performance of valve operations through small thoracotomies or mini-sternotomies, and significant advances in percutaneous coronary intervention (PCI) have encouraged specialist coronary surgeons to develop a plethora of surgical approaches to reduce the invasiveness of CABG.

The most widely-utilised operation today (and with more than 20 years of experience behind it) is minimally-invasive direct coronary artery bypass (MIDCAB), which principally involves grafting the left anterior descending artery with the left IMA through a small left thoracotomy. Expanding this technique to multi-vessel grafting, commonly known as minimally-invasive multi-vessel coronary surgery (MICS-CABG), helps accomplish an off-pump complete revascularisation through a 7-8 cm lateral thoracotomy, which fulfils both prerequisites of a minimally-invasive operation: avoiding sternotomy and cardiopulmonary bypass. It should, however, be performed in a select group of patients with preserved ventricular and pulmonary function and good coronary anatomy, and be preferably avoided or performed with CPB assistance in patients with severe chest deformities, obesity, ventricular dysfunction or dilatation and severe diffuse multi-vessel disease.

The major drawbacks of the procedure are that it is more time-consuming and technically very demanding and thereby is associated with a steep learning curve. Nevertheless, if the basic principles of patient selection are observed and if it is performed meticulously by highly experienced off-pump coronary surgeons, the perioperative mortality is low (<1.5%) with a reduced need for blood transfusion, lower surgical site infection rates, and earlier recovery and return to full physical activity. Patency rates have been very good in experienced hands. Most importantly, it helps achieve complete revascularisation in 95% of patients and enables all possible graft configurations performed through a sternotomy (since it allows access to all the three territories of the heart).

Combining TAR, especially bilateral IMAs, and MICS-CABG would obviously result into an excellent surgical revascularisation strategy. Recently there have been reports of direct-vision bilateral IMA harvest and grafting through this approach. We have performed close to 25 cases of bilateral IMA grafting MICS-CABG with good patency on pre-discharge angiograms. We are still in the early developmental phase of this operation, which has the potential of becoming the most ideal revascularisation procedure, at least in the hands of some surgeons. It would also be very cost-effective for the health care system as a whole due to the lower event and readmission rates at follow-up after bilateral IMA grafting and lower perioperative costs due to reusable surgical equipment and decreased transfusion and infection rates following the minimally-invasive approach. Hybrid coronary revascularisation could also be facilitated by performing bilateral IMAs to the left coronary system and PCI of the right coronary artery.

If this technique can be refined to a point where the majority of surgeons can perform it with relative ease, coupled to excellent early and long-term outcomes, it could make CABG the revascularisation choice for most forms of CAD once again.

Edwards Lifesciences

How a robust research program can lead to innovation: the new RESILIA tissue

B. Meuris, MD, PhD
University Hospitals Leuven, Belgium

Although the use of tissue valves is growing fast world-wide, they will face two challenges in the future: life expectancy of elderly people is increasing and, many younger patients want to enjoy the benefits of a biological valve; these are strong drivers towards a constant improvement in long-term durability of valve tissue. Despite the optimal hemodynamic performance and good durability of bioprostheses, there is still room for improvement in younger and more active population with many years to go.

Within the quest to improve current pericardial tissue, research has led to more efficient detoxification and preservation of glutaraldehyde-fixed tissue. Through chemical modifications, it is now possible to produce an irreversible covalent binding of free-glutaraldehyde remnants (free-aldehydes). Stable capping these remnants leads to a significant reduction in binding sites for calcium. Also, by replacing water by glycerol, it's possible to store a tissue valve in dry condition, thereby avoiding the need for glutaraldehyde-based storage, further preventing additional free-aldehydes and the need for rinsing.

Recently, this new tissue, named RESILIA, was extensively tested in a large pre-clinical test involving 45 mitral valve implants in juvenile sheep, the current gold-standard in pre-clinical valve long-term performance testing[1]. The RESILIA tissue was used to build a tissue valve, using the well-known PERIMOUNT design, a frame that has proven its performance with more than 25y follow-up. The frame is important because, next to tissue treatment, valve design are critical for the long-term result. Using the PERIMOUNT valve (6900P) as a control, the calcification levels and the mean gradients in the RESILIA tissue were significantly lower. This result was obtained after 8 months in mitral position in juvenile sheep, which we believe equates to about a 10y period in an adult patient; Based on the pre-clinical evidence we expect an even longer durability.

Moreover three large studies (COMMENCE) encompassing aortic, mitral and pulmonic valve position have already enrolled over 800 patients to assess safety and efficacy of RESILIA tissue using the Magna Ease valve platform. The preliminary results of the aortic arm at 1 year were disclosed during the 2016 AATS meeting[2]. Follow up will continue up to 5 years.

References

1) Flameng W. J Thorac Cardiovasc Surg, 2015;149:340-5
2) http://aats.org/annualmeeting

Come meet us
at the Edwards booth

The next **class** is here...

See the new class in virtual reality

Edwards, Edwards Lifesciences and the stylized E logo are trademarks of Edwards Lifesciences Corporation.

© 2016 Edwards Lifesciences Corporation. All rights reserved. E6369/08-16/HVT.

Edwards lifesciences • Route de L'Etraz 70, 1260 Nyon, Switzerland • edwards.com

Edwards

INSIDE BARCELONA
Where to go? What to do?

Time to get out and about and see more of Barcelona this evening, so here's our suggestions of some top bars and eateries!

EATING & DRINKING

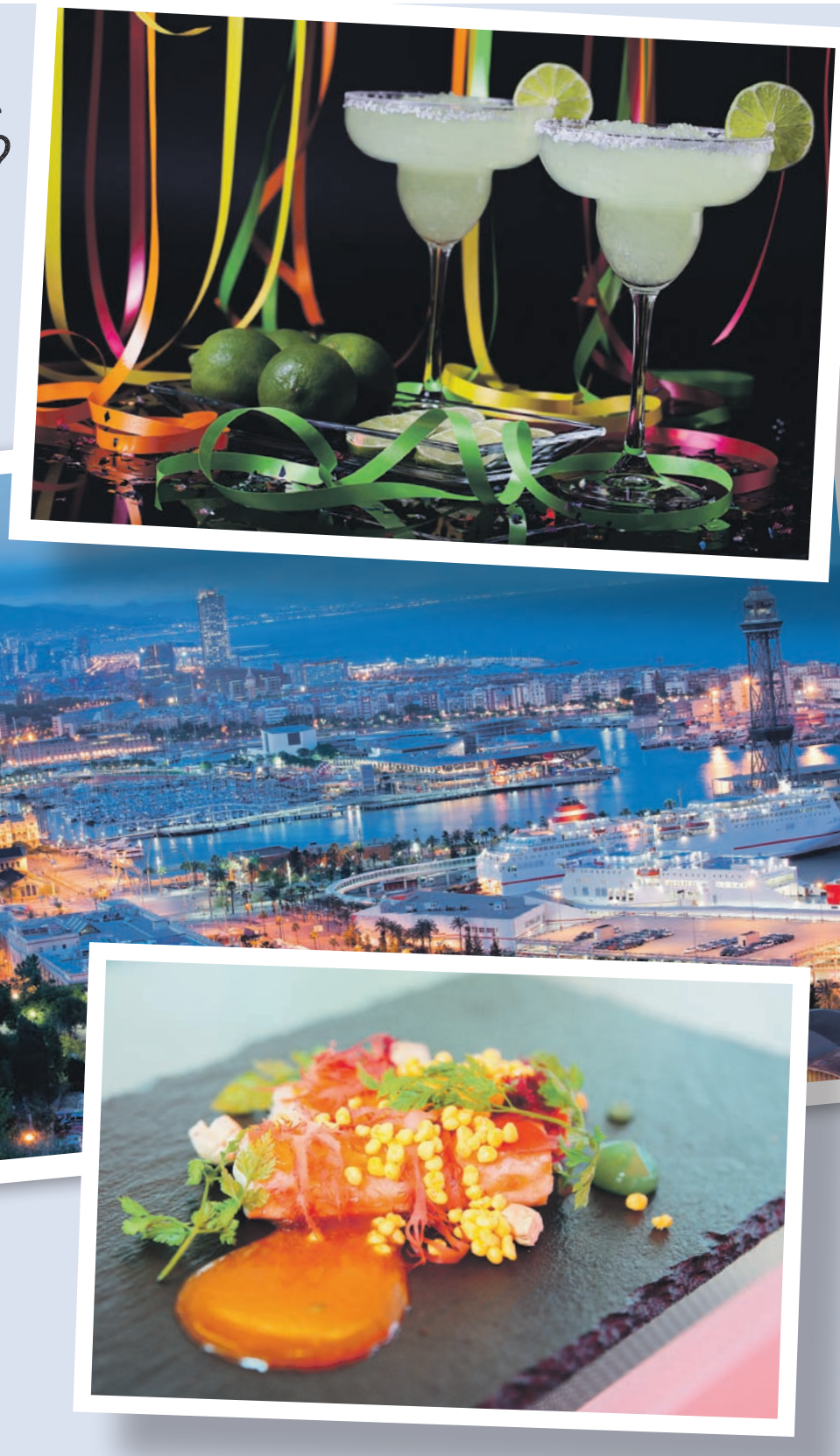
1881 PER SAGARDI
Head to the rooftop at sundown and enjoy the last flourish of Barcelona's long summer at this bar on top of the Museu d'Història de Catalunya, complete with views of the marina. Apparently they sell some mean Cuban cocktails too...

SANTA MARTA
This tiny beach bar is an unpretentious hangout – a great place to pass an hour or two. Think beach vibe and cocktails, and you've got it spot on.

ALTERNATIVELY...

DOS PALILLOS
Voted Barcelona's number one restaurant, its Michelin-starred chef Albert Raurichi once worked at Spain's most famous restaurant, El Bulli. The food is a delicious mix of Spanish tapas with an Asian twist. Okay, you'll be lucky to get a table but of you do, expect to pay 55 or 75 Euros for a one-and-a-half or two-hour tasting menu.

TRY: The Cantonese Iberian pork and prawn steamed dumplings



VEST venous external stent, demonstrating perfect patency of vein grafts at 5 years

In recent years, external stenting is emerging as a promising strategy with a potential to significantly improve vein graft patency and the outcome of CABG. The poor longevity of vein grafts remains the Achilles Heel of CABG and despite extensive efforts to develop novel strategies to treat vein graft disease, no major breakthroughs have reached the clinical setting.

Several studies evaluated the early effect of external stenting on vein grafts. Taggart et al (ATS, 2015) have shown that 1 year after CABG, VEST external stent significantly reduces intimal hyperplasia and increase vein grafts perfect patency rates. Meirson et al (JTCVS, 2015) demonstrated that VEST reduces oscillatory shear stress which was correlated with the reduction of intimal hyperplasia. Webb et al (EHJ Imaging, 2015) performed OCT analysis of supported and unsupported vein grafts and showed that VEST improves lumen uniformity and reduces thrombus formation.

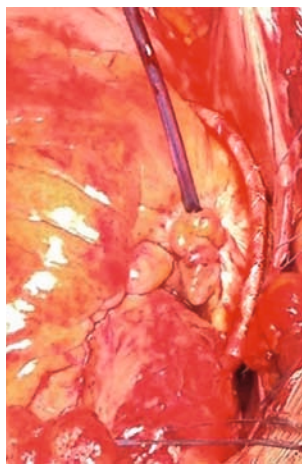


Figure 1: Application of VEST external stent over SVG to the right territory

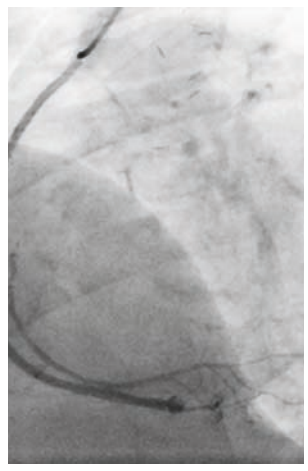


Figure 2: 5 years follow up of VEST supported SVG demonstrating perfect patency

Early clinical experience generated important technical data. The use of fibrin glue and over constriction of the vein graft's outer diameter (<4mm) were found to be associated with early graft failures. In addition, Taggart et al (VEST II study, AATS 2016) demonstrated that avoiding clip ligation of side branches and/or fixation of the external stent to the anastomoses improves the early patency of externally stented vein grafts to the right coronary territory.

VEST external stent, has the potential to create a new hybrid conduit which combines the benefits of arterial and venous grafts: available, versatile high flow conduit with high resistance to intimal hyperplasia and atherosclerosis.

Several ongoing randomized trials aim to establish the role of external stenting of saphenous vein grafts. Long term angiographic data from the VEST IV study (4-5 years after CABG) will be published in 2017. Initial results are promising and demonstrate that externally stented vein grafts maintain perfect patency (Fitzgibbon I) also at 5 years.

Cardiac | Abstract Session | CABG: Minimally invasive and hybrid revascularisation

Hybrid coronary revascularisation versus off-pump coronary artery bypass grafting: Comparative effectiveness analysis with long-term follow-up

Vincenzo Giambruno
Division of Cardiac Surgery, Department of Surgery, Western University, London Health Sciences Centre, London, Ontario, Canada.

Hybrid coronary revascularisation (HCR) is defined as the combination of coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) to treat multivessel coronary artery disease. HCR most commonly combines a minimally-invasive CABG procedure involving a left internal thoracic artery (LITA) to the left anterior descending coronary artery (LAD) anastomosis with PCI to non-LAD vessels. The rationale behind this technique is that the combination of CABG and PCI to treat multivessel coronary artery disease offers the advantages of both surgical and percutaneous revascularisation, eliminating at the same time the disadvantages of both procedures. HCR, by definition, generally refers to a revascularisation strategy which has been strategically planned in a coordinated fashion by both interventional cardiologists as well as the cardiac surgeons. The sequence and timing of the surgical and interventional component of hybrid therapy can be in three different ways: PCI first followed by surgery, surgery followed by PCI (two stage HCR), or both during the same setting (single-stage HCR). Additionally, the increased use of telemanipulation surgical systems in the last 15 years has further minimised surgical trauma. On the other hand, there has been a continuous improvement in drug-eluting stent (DES) performance, and PCI can now provide, in low-risk patients and in those with single vessel disease, comparable short- and mid-terms outcome to CABG. However, the safety and effectiveness of HCR is still under-studied. Our institution has embraced this revascularisation strategy since 2004, and we have carried out a comparative analysis of HCR to conventional off-pump CABG with long-term follow-up.

Our sample consisted of all double off-pump CABG (n=216) and HCR (n=147, robotic-assisted minimally-invasive direct coronary artery bypass graft of the LITA to the LAD and PCI to one of non-LAD vessels) in our institution between March 2004 and November 2015. We performed an adjusted analysis using inverse-probability weighting (IPW) based on the propensity score of receiving either off-pump CABG or HCR.

In the two groups, we found similar results in terms of re-exploration for bleeding, perioperative myocardial infarction, stroke, blood transfusion, in-hospital mortality and ICU length of stay. HCR was associated with a higher in-hospital re-intervention rate (CABG 0, HCR 3.4%, P=0.029), lower prolonged mechanical ventilation (>24 hours) rate (CABG 4%, HCR 0.7%, P=0.017) and shorter hospital length of stay (CABG 8.1±5.8 day, HCR 4.5±2.1 day, P<0.001).

Table 1. Outcomes

Outcome	Off-pump n = 201	Hybrid n = 143	Propensity Score-Adjusted Risk Difference (95% CI)	P value
In-Hospital Outcomes				
Conversion to sternotomy, n (%)	n/a	7 (5%)	n/a	n/a
Re-opening for bleeding, n (%)	3 (1.5%)	5 (3.5%)	2.2% (-2.6 to 7.1)	0.36
Re-intervention (PCI/CABG), n (%)	0	5 (3.4%)	2.8% (0.3 to 5.3)	0.029
Postoperative atrial fibrillation, n (%)	38 (19%)	17 (12%)	-7.1% (-16 to 2.1%)	0.13
Myocardial infarction, n (%)	1 (0.5%)	2 (1.4%)	0.7% (-0.8 to 2.2)	0.36
Stroke, n (%)	2 (1%)	3 (2.1%)	-0.2% (-1.9 to 2.2)	0.88
Mechanical ventilation greater than 24 hrs, n (%)	8 (4%)	1 (0.7%)	-3.3% (-5.9 to -0.6)	0.017
Hemodialysis, n (%)	1 (0.5%)	0	-0.3% (-0.9 to 0.3)	0.31
Any transfusion of packed red blood cells, n (%)	56 (28%)	21 (15%)	5.6% (-15 to 26)	0.60
Death, n (%)	2 (1.0%)	0	-0.8% (-1.9 to 0.3)	0.15
			Propensity Score-Adjusted Difference in Means (95% CI)	
ICU length of stay, days, mean (SD)	1.8 (1.3)	1.0 (0.8)	-0.42 (-0.93 to 0.09)	0.10
Hospital length of stay, days, mean (SD)	8.1 (5.8)	4.5 (2.1)	-2.5 (-3.2 to -1.8)	< 0.001
Follow-up To-Date Outcomes				
Follow-up time, months, median (IQR)	81 (48-113)	96 (53-115)		
Alive, n (%)	146/172 (85%)	129/134 (96%)	5.7% (-0.09 to 11.6)	0.054
Freedom from angina (amongst survivors), n (%)	107/146 (73%)	116/129 (90%)	20.8 (12 to 30)	< 0.001
Freedom from any revascularization (amongst survivors), n (%)	133/145 (92%)	117/129 (91%)	-1.0% (-8.7 to 6.8)	0.80

Adjusted risk differences and differences in means obtained from inverse probability of treatment-weighted analysis. Differences in risk or means are for the hybrid group relative to the off-pump group. Therefore, for adverse events like death, a negative number is in favour of the hybrid group. 'Freedom from angina' is defined as Canadian Cardiovascular Society class zero. When denominators do not equal sample size, this is either due to missing data or because the patient could not experience the event due to death.

Abbreviations: CI = confidence interval; PCI = percutaneous coronary intervention; CABG = coronary artery bypass grafting; SD = standard deviation; ICU = intensive care unit; IQR = inter-quartile range.

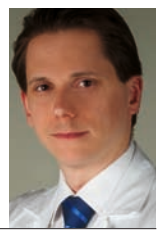
After the median follow-up period of 81 (48-113) months (CABG group), and 96 (53-115) months (HCR group) there was no significant difference in survival (CABG 85%, HCR 96%, P=0.054) and freedom from any form of revascularisation (CABG 92%, HCR 91%, P=0.80). HCR was superior in freedom from angina (CABG 73%, HCR 90%, P<0.001). Our results are summarised in Table 1.

HCR seems to be safe, with faster post-operative recovery and similar outcomes when compared with standard off-pump CABG. It represents a truly minimally-invasive coronary revascularisation approach for patients with multivessel coronary disease, with excellent short- and long-term outcomes. However, randomised prospective control trials comparing HCR with conventional CABG procedures or multivessel PCI will be necessary to further evaluate the effectiveness of this alternative technique of coronary artery revascularisation.

Cardiac | Professional Challenge | Fighting infection in cardiac surgery

Direct sternal administration of vancomycin and gentamycin during closure prevents wound infection in a high-risk patient population

Martin Andreas, Moritz Muckenhuber, Doris Hutschala, Florian Thalhammer, Guenther Laufer, Tatjana Fleck
Medical University of Vienna, Austria



Deep sternal wound infection is still a major complication in patients undergoing cardiac surgery. We previously identified mammary artery harvesting as a risk factor for decreased antibiotic tissue penetration. In addition, other risk factors including diabetes may inhibit sufficient tissue penetration of perioperative antibiotic prophylaxis with cefazolin. A novel closure protocol, applying two topical antibiotics and further recommendations for sternal wiring, was introduced at our department to decrease the number of sternal wound infections.

A 12-month period prior to and after the introduction of a novel sternal closure protocol was studied (March 2013 – February 2014 and July 2014 – June 2015, respectively). All sternal wound infections resulting from an operation during this period were analyzed. The closure protocol consisted of the intra-sternal application of vancomycin and the subcutaneous application of gentamycin. Vancomycin (3 g) was mixed with 4 ml of normal saline and stirred until a paste was formed. It was put into the sternum halves similar to bone wax directly prior to sternal wiring (Figure 1). Gentamycin (160 mg) was directly applied onto the sternal wires prior to subcutaneous closing. Furthermore, we increased the number of sternal wires for a more uniform distribution of lateral forces (Figure 2).

All adult patients operated upon via a full sternotomy – acute and emergent cases, cardiac transplantations and left ventricular assist devices – were included, resulting in a high overall predicted risk (EuroSCORE II = 7.2±10.7). Patients in both groups were comparable regarding demographic data and risk factors. 53 out of 919 patients operated upon prior to the protocol change developed a superficial or deep sternal infection (5.8%). The introduction of the novel sternal closure protocol reduced this number to 19 out of 932 patients (2.0%; p<0.001). The mean total number of sternal wires increased from 8.4±1.9 to 9.0±2.5 per patient (p<0.001). A multiple linear regression including common risk factors revealed a strong independent risk reduction by the novel protocol (OR 0.322, p<0.001). However, the number of sternal wires had no significant effect in this analysis.

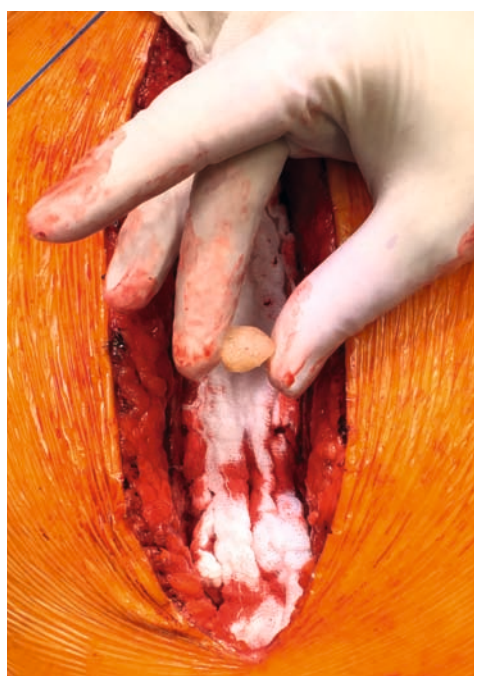


Figure 1. Intrasternal application of vancomycin paste.

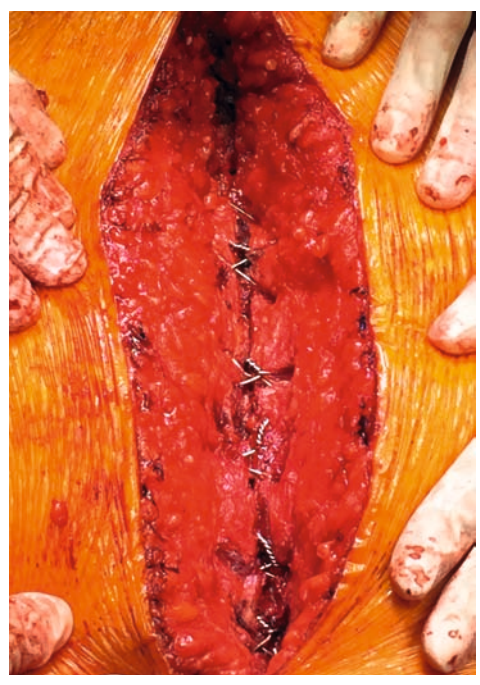


Figure 2. Six figure-of-eight sternal wires are applied for high mechanical stability.

In conclusion, the topical application of two antibiotic agents significantly reduced sternal wound infection. We hypothesize that this protocol overcomes impaired tissue penetration as well as bacterial resistance.

Thoracic | Abstract Session | Video & Case Study 2

Tracheo-innominate artery fistula: Successful intervention of a fatal complication of tracheostomy

Fatmir Caushi, Artur Xhumari, Petrika Gjergo, Mentor Petrela University Hospital of Lung Diseases "Shefqet Ndroqi", Tirana, Albania

Tracheo-innominate artery fistula (TIF) is a rare, yet life-threatening complication of tracheostomy with an incidence of 0.1-1%. The innominate artery has a close anatomical relationship with the trachea, with injury occurring at the 7th to 9th tracheal ring.[1] TIF has a peak incidence between the 1st and 2nd week post-tracheostomy. The survival rate in patients who develop bleeding from a TIF has been reported as 14.3%, and only patients who receive immediate surgical treatment survive.[2] Mechanisms of fistula formation include mucosal necrosis due to pressure exerted by the cuff of the tracheostomy tube.[2]

An 18-year old patient was diagnosed with cerebral fourth ventricle lesion (suspected ependymoma) which was totally removed through a suboccipital median craniotomy using a telovelar approach. The postoperative period was marked by a severe lower cranial nerve palsy necessitating a tracheostomy. Five weeks after the tracheostomy, herald bleeding around the tracheostomy cannula was noticed. The tracheostomy cuff was inflated, which caused the bleeding to stop temporarily. No abnormality was noticed in the bronchial tree through flexible bronchoscopy, while several clots were aspirated. An enhanced CT-scan of thorax and neck revealed close contact between the trachea and the innominate artery (IA) at the level of the tracheostomy cuff, suggesting TIF (Figure 1). The patient was immediately sent to the operating room and underwent total sternotomy. The thymus was dissected and the innominate artery was visualized. An orotracheal airway was secured whilst removing the tracheostomy cannula, which resulted in abundant hemorrhage from the IA, which was controlled with clamping (Figure 2). Careful dissection of TIF exposed a IA defect measuring less than 5 mm, which was repaired with polydioxanone (PDS) USP 5-0 suture. After debridement, the tracheal defect was left open for granulation tissue to develop. A subcutaneous patch was placed in between the trachea and the innominate artery to prevent any potential contact. The patient was extubated after 48 hours and a Montgomery tracheal stent was placed at the site of the previous tracheostomy to prevent potential tracheal stenosis. The patient left the hospital in good conditions 2 weeks after the intervention.

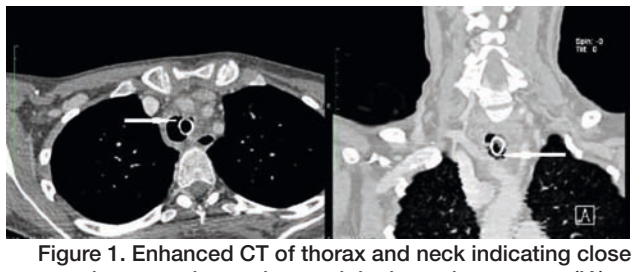


Figure 1. Enhanced CT of thorax and neck indicating close contact between the trachea and the innominate artery (IA) at the level of the tracheostomy cuff, suggesting TIF.

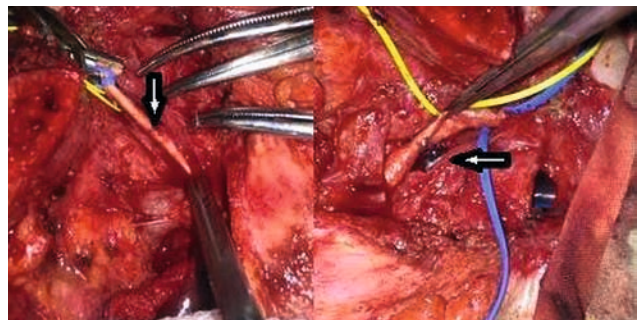


Figure 2. An orotracheal airway was secured whilst removing the tracheostomy cannula. The resulting abundant IA hemorrhage was controlled with clamping.

As soon as TIF is suspected, the patient must be immediately transported to the OR to perform flexible bronchoscopy while slowly deflating the tracheostomy cuff and then gradually withdrawing the tracheostomy tube.[3] Two management techniques have been reported for the innominate artery bleeding, one being the maintenance of flow through either direct repair of the defect or by interposition grafting, and the other is interrupting flow by simple ligation or resection of the innominate artery.[4] The effectiveness of endovascular stent grafting has been recognized in many vascular diseases, but there is a possibility of graft contamination from the trachea through the fistula.[5]

In our case, because the fistula dimension was small, the treatment we provided by directly repairing the innominate artery and leaving open the tracheal defect with the post-operative placement of a Montgomery tracheal stent resulted in the successful management of an otherwise catastrophic condition.

References

1. Grant, CA et al. Tracheo-innominate artery fistula after percutaneous tracheostomy: Three case reports and a clinical review. Br J Anaesth. 2006; 96: 127-131.
2. Wood DE, Mathisen DJ. Late complications of tracheotomy. Clin Chest Med1991; 12: 597-609.
3. Cooper JD, Grillo HC. The evolution of tracheal injury due to ventilatory assistance through cuffed tubes: A pathologic study. Ann Surg 169:334, 1969.
4. Gasparri MG et al. A novel approach to the management of tracheoinnominate artery fistula. Ann Thorac Surg. 2004; 77:1424-1426.
5. Parsons RE et al. Comparison of endovascular and conventional vascular prostheses in an experimental infection model. J Vasc Surg. 1996; 24: 920-926.

Cardiac | Abstract Session | Complications in mitral valve surgery

Short- and Long-term Results after Prosthetic Mitral Valve Implantation in Patients with Severe Mitral Annulus Calcification

Ronny Ben-Avi, Boris Orlov , Leonid Sternik, Alexander Kogan, Raphael Kuperstien, Amjad Shalabi, Eilon Ram, Alexander Lipey, Ehud Raanani Leviev Cardiothoracic and Vascular Center, Tel Aviv, Israel
Sheba Medical Center, affiliated to the Sackler School of Medicine, Tel Aviv University, Israel

Mitral annulus calcification (MAC) is a chronic, degenerative process in the fibrous base of the mitral valve (MV). It is estimated that the prevalence of MAC is between 3% and 9% in patients undergoing MV replacement.[1-5] MAC is associated with an increased incidence of cardiovascular disease, MV disease, arrhythmias and sudden cardiac death.[6] MV replacement in the presence of MAC is considered to be associated with worse surgical outcomes; its presence could sever fixation sutures of the mitral prosthesis, thus leading to paravalvular leak and clinical deterioration.[5] Short and long-term outcomes of a conservative decalcification approach in mitral valve replacement (MVR) surgery in the presence of mitral annulus calcification (MAC) were investigated.

Of 1,031 patients who underwent MV replacement, 126 patients (12%) were found to have significant degrees of MAC with at least 30% of the annular circumference heavily calcified. Two groups of 119 patients were created using Propensity Score Matching (PSM), where the control group consisted of patients who underwent MV replacement without having MAC. A prospective follow-up of all patients was carried out by our database team and outpatient clinics. All operative results and the early and late clinical and echocardiographic outcomes were compared between groups.

All prostheses were implanted using the supra-annular technique, non-everted interrupted matrass sutures and a Teflon felt in the ventricular side of the MV annulus. Patients with MAC underwent conservative annular decalcification (Figure 1A), and supra annular pericardial patch at the calcified areas of the MV annulus; complete circular patch, posterior pericardial patch, or focal patch reinforcement (Figure 1B). Annular decalcification was achieved mostly with blunt instruments with the goal of achieving a patent circular orifice and smooth annular surface without calcific bulging for the precise sitting of the mitral prosthesis. The prosthesis together with the patch were secured using interrupted sutures with a Teflon felt passed first through the MV annulus, then through the pericardial patch and finally to the prosthesis outer ring.

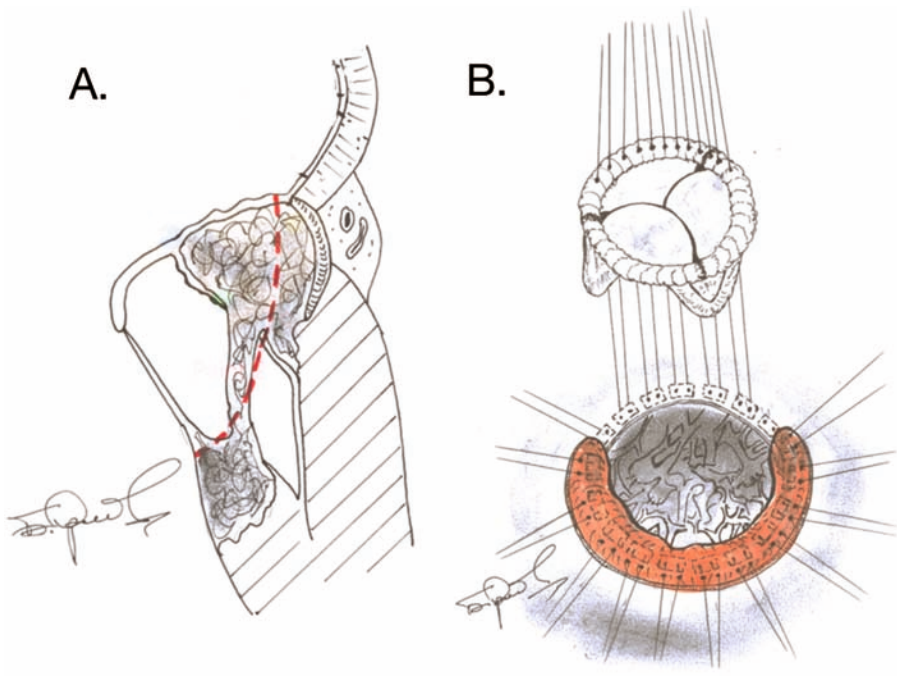


Figure 1. A) Conservative decalcification (dashed red line) is completed. Decalcification into the AV groove is not pursued. B) After conservative decalcification, posterior supra-annular pericardial patch reinforcement and valve implantation are completed.

Concomitant procedures were performed in 91 patients (77%) in both groups (p=0.39). A bioprosthesis was implanted in 81 patients (68%) in the MAC group and in 84 patients (71%) in the non-MAC group (p=0.779). Prosthesis valve implant size was not significantly different between the two groups: 28.5±2.0 (range 25-35) and 28.4±3.2 (range 25-33) for the MAC and non-MAC groups respectively (p=0.79).

There were six early deaths in each group with an overall mortality of 5% (p=1.00). Early complications included one major stroke in the non-MAC group and acute renal failure needing dialysis in two and three patients in the MAC and non-MAC groups respectively. Mean follow-up was 55±37 months and 99.1% completed. There were 38 (33%) and 33 (29%) late deaths in the MAC and non-MAC groups, respectively (p=0.567, Figure 2). At FU, functional class did not differ between groups (p=0.093). Mean echo follow-up time was 40±35 months and was 83% complete; freedom from moderate or severe mitral regurgitation was 94% and 97% (p=0.561), and mean gradient was 5.0±2.3 mmHg and 5.3±2.3 mmHg for MAC and non-MAC groups, respectively (p=0.405).

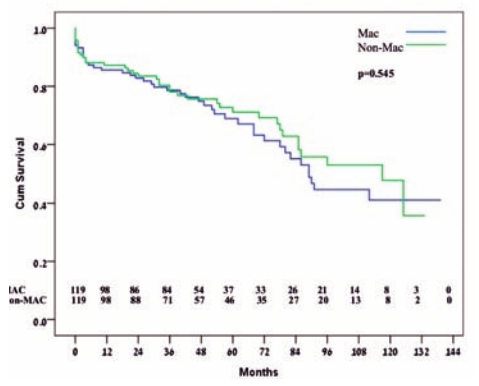


Figure 2. Long-term survival curve comparison between MAC and non-MAC patients (p=0.68)

We conclude that using a conservative approach for dealing with MAC in MVR surgery provides good outcomes. Early and late clinical and echocardiographic outcomes did not differ between the MAC and non-MAC patients, including freedom from early and late occurrence of MV prosthesis paravalvular leak.

References

1. Deluca G et al. The incidence and clinical course of caseous calcification of the mitral annulus: a prospective echocardiographic study. J Am Soc Echocardiogr. 2008;21(7):828-33.
2. Willens HJ et al. Prevalence of mitral annulus calcification in African Americans: comparison with non-Hispanic whites and Hispanics. Ethn Dis. 2008;18(1):48-52.
3. Elmariah S et al. Risk factors associated with the incidence and progression of mitral annulus calcification: the multi-ethnic study of atherosclerosis. Am Heart J. 2013;166(5):904-12.
4. Pomerance A. Pathological and clinical study of calcification of the mitral valve ring. J Clin Pathol. 1970;23(4):354-61.
5. MacVaugh H et al. Unusual complications during mitral valve replacement in the presence of calcification of the annulus. Ann Thorac Surg. 1971;11(4):336-42.
6. Quick E, Byard RW. Mitral annulus calcification and sudden death. J Forensic Leg Med. 2013;20(4):204-6.

Cardiac | Abstract Session | Complications in mitral valve surgery

Circumflex artery distortion following mitral valve surgery: a prospective study to identify high-risk anatomy and its management using preoperative Coronary Computed Tomography Angiography

I. Birdi, V. Caruso, A. Bivona, J. Dada, S. Gedela, B. Middleton, W. Serino
The Essex Cardiothoracic Centre, Essex, UK

Mitral valve surgery is known to be associated with the potential risk of disturbance of circumflex artery (CX) flow, as its course is intimately related to the mitral valve annulus (MVA). The true mechanism for this is still unclear, with authors suggesting iatrogenic mechanisms such as direct suturing, laceration or annuloplasty device distortion during mitral valve repair. Its perioperative diagnosis can be extremely difficult to detect, especially before lateral wall injury to the left ventricle becomes irreversible; it is often only realised postoperatively as left ventricular dysfunction of unknown aetiology. The consequence of CX flow disturbance is severe with implications far greater than the prognostics benefits of mitral valve surgery. As a result, this complication needs to be better understood and avoided.

To investigate this further, we prospectively studied 45 consecutive patients referred for mitral valve surgery using pre-operative computed coronary tomography angiography (CCTA). The distance between the circumflex artery and mitral annulus were assessed using a 'five zone system'. This data was used to identify high risk anatomy, and surgical technique was modified accordingly. To date, 30 of these patients have undergone mitral valve surgery. We used the data derived from CCTA to modify our mitral valve repair strategy with avoidance of suturing at the high risk zones, and by use of a flexible band whenever possible.

In the 45 patients studied, the shortest distance between CX and MVA was at zone 1 (4.36±2.81 mm). Six patients were identified with potentially high risk anatomy (mean distance 1.8±1.06 mm). In this group, four patients underwent implantation of a flexible band applied to the 'safe zones' only, with no stiches or band placed in the high risk zones. One patient received an undersized rigid annuloplasty applied to the safe zone only. None of these patients suffered new regional wall motion abnormalities or ischemia peri-operatively. In one patient with high risk anatomy, a semi-rigid annuloplasty was applied to the safe zones because of the nature of the mitral valve pathology. CX flow disturbance was observed and replacement of the semi-rigid ring with a flexible band re-established CX flow.

vOur experience has led us to believe that annuloplasty device choice may be a crucial risk factor for the development of CX flow disturbance in high risk anatomy. The use of a flexible band in high risk anatomy may be a safer surgical option in these cases if annulus reduction is not a requirement of the repair (as in cardiomyopathy or ischaemic pathology).

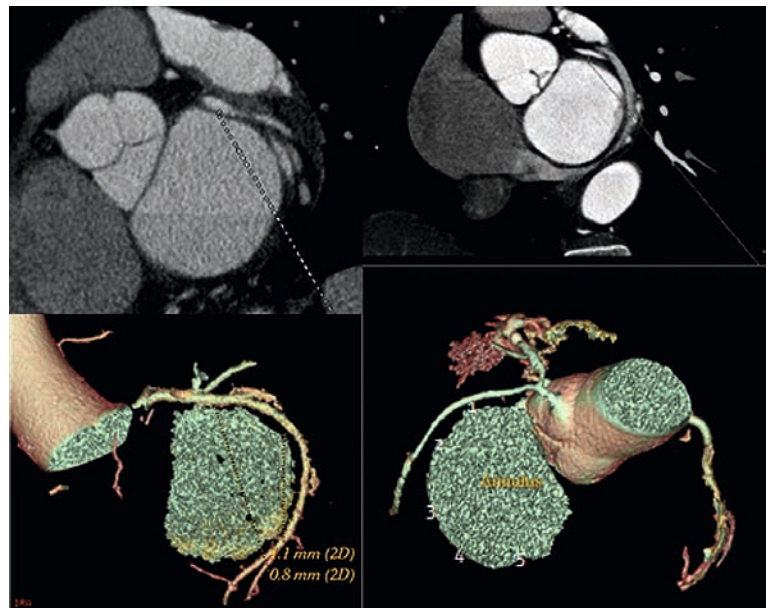


Figure 1.

Preoperative assessment with CCTA has allowed us to make changes to our surgical techniques which may be helpful in avoiding this poorly understood phenomenon.

Cardiac | Rapid Response | Risk modelling and scoring systems in cardiac surgery

Is it time to determine EuroSCORE II risk category boundaries?

Duski Nezic Dedinje Cardiovascular Institute, Belgrade, Serbia

Risk-adjusted perioperative mortality rate following cardiac surgery has been widely used as an indicator of quality of care as well as for comparison of outcomes among institutions and surgeons. Therefore, scoring systems have been used as a measure of perioperative risk and as a benchmark for the assessment of the quality of adult cardiac surgery for the last few decades. Moreover, scoring models made it possible to target high-risk surgical patients in need of new therapeutic interventions.

Over the last 15 years, two stratification risk models have come to predominate, namely: The Society of Thoracic Surgeons (STS) Risk Score in North America and the EuroSCORE (European System for Cardiac Operative Risk Evaluation) in Europe. Although both versions of the old EuroSCORE (additive, introduced back in 1999, and upgraded logistic form from 2002) have retained a very good discriminatory power, suspicions were confirmed that aged models no longer accurately predict operative mortality due to an overestimation of the adult cardiac surgical risk (poor calibration) in the range of two to three fold. Therefore, the old EuroSCORE has recently (2012) been renewed into EuroSCORE II.

The vast majority of papers published to date presenting EuroSCORE II external validation underline that the model over-predicts mortality in low risk categories, and under-predicts mortality in high risk patients. The old additive EuroSCORE suggested perioperative risk to be low for values of 0-2 points, moderate for 3-5 points and high for 6 or more points. However, the threshold that defines low, moderate, high, and very high-risk patients is not uniformly determined for the EuroSCORE II by the literature at present. Some authors checked EuroSCORE II performances, constructing risk group boundaries according to the old EuroSCORE values (using predominantly logistic EuroSCORE). Others divided their samples into quartiles (with a similar number of patients in each quartile). Later ones then reported high risk patients to be those with EuroSCORE II above 2.35%, or even above 1.64%.

In our opinion, such a division does not represent the real world scenario. Therefore, our suggested risk category boundaries are as follows: (1) low risk category, with mortality predicted by EuroSCORE II of 0.50-2.49%; (2) moderate risk category, 2.50-5.99%; (3) high risk category, 6.00-9.99%; and (4) very high risk category, ≥ 10%.

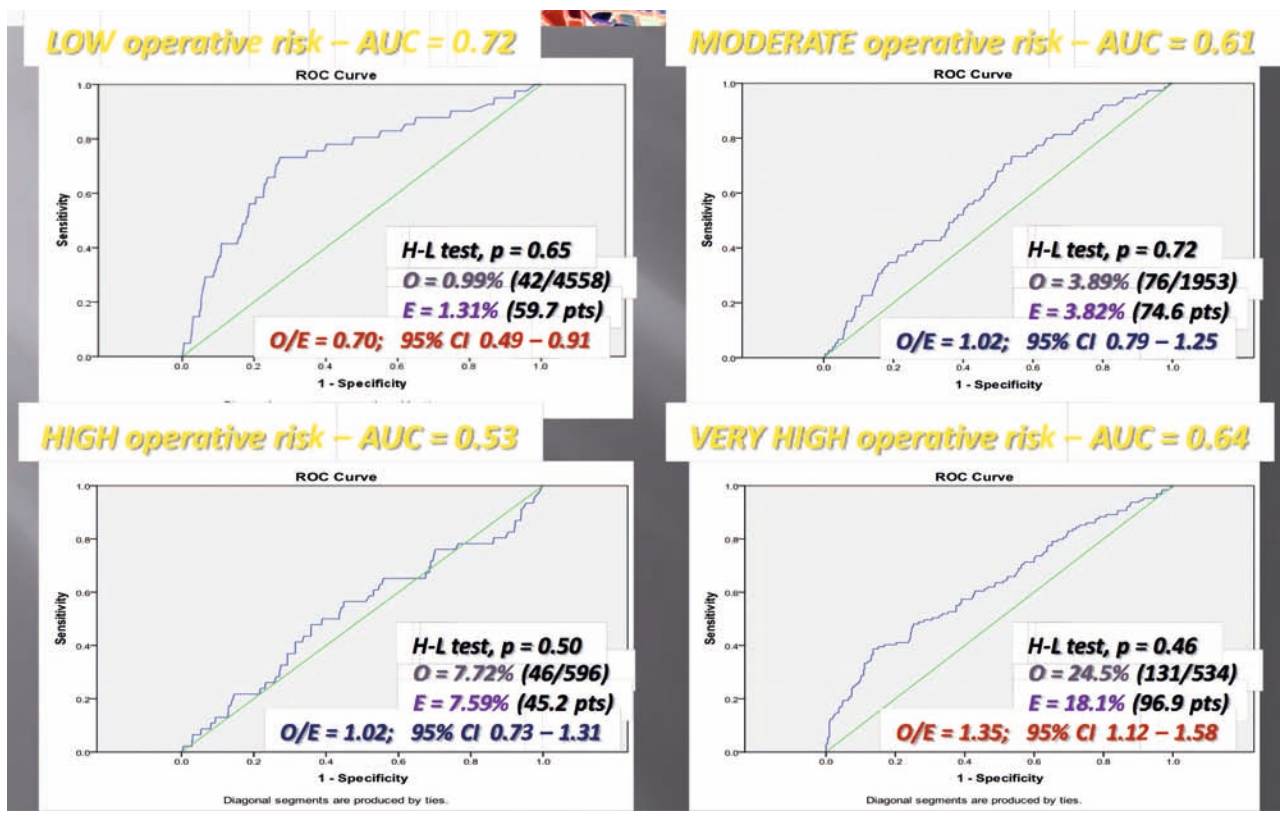


Figure 1. Discrimination and calibration over EuroSCORE II risk category groups

Discrimination measures the capacity of the model to distinguish between patients who will develop an event (in this case perioperative death) and those who will not. Discrimination can be assessed by the area under the receiver operative characteristic curve (AUC). The AUC is a percentage of randomly drawn pairs (meaning one patient with event and one without event patient-pairs) for which it is true that a patient who had an event had a higher risk score than a patient without event. The discriminative power is thought to be excellent if the AUC is >0.80, very good if >0.75 and good (acceptable) if >0.70. Disappointingly, only patient in low risk group have acceptable AUC (0.72).

Calibration refers to the agreement between observed events and predicted probability of occurrence of these events. The Hosmer-Lemeshow (H-L) test has been the most popular test to validate calibration, measuring the differences between observed and expected outcomes over deciles of risk. A well-calibrated model gives corresponding p-value of >0.05. We have also evaluated EuroSCORE II model calibration using the observed to expected (O/E) mortality ratio. Ideally, this ratio equals 1 (the observed mortality equals expected mortality, thus the predictive model is perfectly calibrated). A value above 1 means that the model underestimates mortality, whereas a value below 1 means that the model overestimates mortality. If the 95% confidence interval (CI) of the O/E mortality ratio includes the value 1.0, the model is well calibrated. Good calibration using the H-L test has been confirmed in all risk group categories, and in moderate and high risk groups using O/E mortality ratio.

Cardiac | Rapid Response | Minimizing sternal wound complication

The SternaLock Blu study: A multi-centre, randomised trial evaluating the impact of sternal closure with rigid plate fixation versus wire cerclage on patient outcomes

Keith B Allen[1], Vinod H Thourani[2], Yoshifumi Naka[3], Kendra J Grubb[4], John Grehan[5], Nirav Patel[6], T. Sloane Guy[7], Kevin Landolfo[8], Marc Gerdisch[9], Mark Bonnell[10] 1. Saint Luke's Mid America Heart Institute and University of Missouri-Kansas City School of Medicine, Kansas City, MO, Kansas City, MO, USA, 2. Emory University, Atlanta, GA, USA, 3. Columbia University Medical Center, New York, NY, USA, 4. University of Louisville, Louisville, KY, USA, 5. Allina Health, Saint Paul, MN, USA, 6. Lenox Hill Hospital, New York, NY, USA, 7. Temple University, Philadelphia, PA, USA, 8. Mayo Clinic, Jacksonville, FL, USA, 9. Franciscan St. Francis Health, Indianapolis, IN, USA, 10. University of Toledo, Toledo, OH, USA

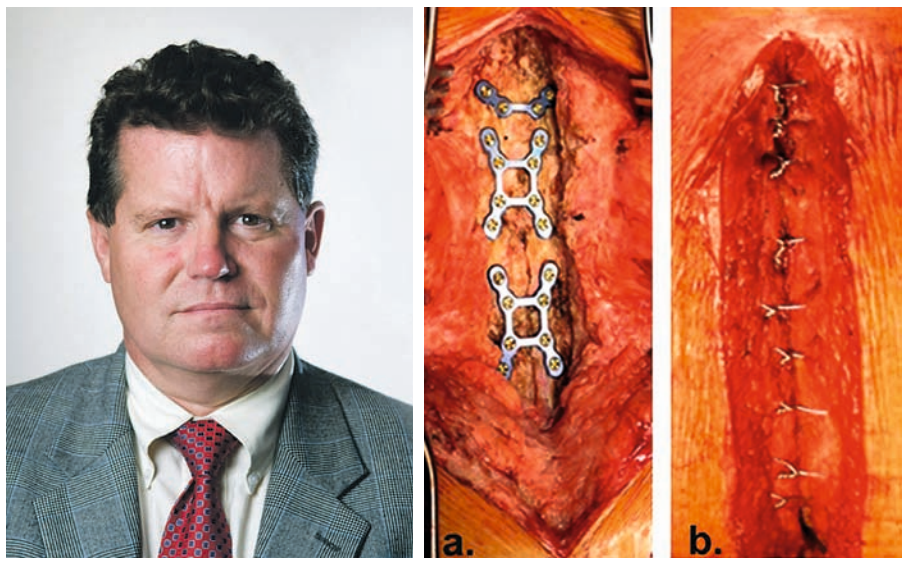


Figure 1. A) Rigid plate fixation or B) wire cerclage

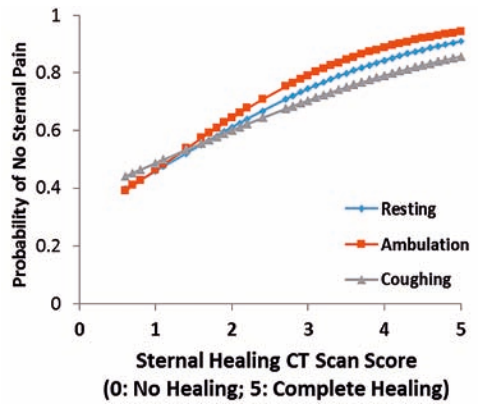


Figure 2. Correlation between sternal healing and degree of pain

Results from the SternaLock Blu Study were presented at EACTS yesterday by the study's Principal Investigator, Keith B. Allen. The SternaLock Blu Study (a multi-centre, randomised trial evaluating the impact of sternal closure with rigid plate fixation versus wire cerclage on patient outcomes) was designed to compare sternal healing and complications, patient recovery and cost following sternal closure with either rigid plate fixation or wire cerclage.

"Every surgical discipline that is involved in fracture and osteotomy management, except cardiac surgery, adheres to the principles of approximation, compression, and stabilisation of bone using rigid fixation," Dr Allen told *EACTS Daily News*. "The vast majority of cardiac surgeons, however, continue to use wire cerclage for sternotomy closure because of the low cost of wires and the perceived low sternal complication rates with wire cerclage. This study was designed to determine if rigid plate fixation compared to wire cerclage resulted in improved sternal healing based on computed tomography and if that translated into improved clinical endpoints such as sternal complication rates, pain, function and quality of life.

"An important secondary endpoint in this trial was a rigorous core laboratory economic analysis of health-care related costs to compare the overall cost differences between these two sternal closure techniques."

This prospective, single-blinded, multi-centre trial randomised 236 patients at 12 US centres at the time of sternal closure to either rigid plate fixation (Figure 1A) or wire cerclage (Figure 1B). Patients randomised to rigid plate fixation had significantly better sternal healing scores (p=0.0007) and sternal union rates at three- (41% vs. 16%; p<0.0001) and six-months (80% vs. 67%; p=0.03), which translated into fewer sternal complications through six-months follow-up (0% vs. 5%, p=0.03). Although RPF was associated with a trend toward higher index hospitalisation costs, six-month follow-up costs tended to be lower, resulting in similar total costs from randomisation through six-months (p=0.6). From a health economic perspective, Dr Allen commented: "That a treatment which improves outcomes without increasing costs is considered 'economically dominant', that indicates a high degree of economic value."

As reported at EACTS, the impact of the results from the trial were not limited to just the primary endpoint. Importantly, improved sternal healing with RPF also resulted in improved clinical outcomes such as reduced post-operative pain and improvements in patients' quality of life SF-36 scores.

One of the most significant findings from this study was that there was a direct correlation between the amount of sternal healing at six months and the incidence of postoperative pain (p<0.002). This finding supports that radiographic healing has clinical relevance, as patients with improved healing were less likely to exhibit sternal pain. Patients with minimal sternal healing had a 40-50% probability of having significant sternal pain, whereas 85%-90% of patients with complete sternal healing were completely pain free (Figure 2).

In a prospective RCT, sternal closure with rigid plate fixation resulted in improved sternal healing, fewer sternal complications, reduced postoperative pain and improved quality of life scores through six-months, without increasing cost compared with wire cerclage.

Cardiac | Focus Session | Basic Science – Cardiac

Stem cell reality in regenerative medicine – current insights and future directions

Mariann Gyöngyösi
Medical University of Vienna, Austria

Recent randomized studies and meta-analyses have led to contradictory statements on the efficacy of cell-based therapy in cardiac regeneration. Previously, publication-based meta-analyses of clinical studies (which included patients with recent acute myocardial infarction (AMI) randomized to either placebo or intracoronary autologous stem cells) were in agreement that this type of regenerative therapy successfully increases the global left ventricular ejection fraction (EF), finding an increase in EF of 2.07-4.21% compared to placebo.

However, the ACCRUE (Meta-Analysis of Cell-based CaRdiac stUdiEs), the recently published individual patient data-based (IPD) meta-analysis, and the most up-to-date Cochrane review revealed that intracoronary administration of regenerative cells has no effect on the left ventricular performance if administered shortly after AMI (mean difference of EF of 0.9% between groups; not significant). In contrast with aggregate data-based meta-analyses, ACCRUE could not find any confounding factors influencing this negative results. ACCRUE revealed too, that placebo group patients with low baseline EF also show improvement at 1-year follow-up, similar to the cell-treated patients.

In contrast with cell therapy in AMI, several small- or medium-size randomized clinical studies, and all aggregate data-based meta-analyses, showed encouraging results of cell-based therapy in patients with chronic ischemic heart failure. The intramyocardial application of different kinds of stem cells led to angina pectoris relief and improvement in exercise capacity. Surrogate endpoints, such as decrease in ischemic myocardial area or increase in cardiac performance, showed a positive effect of stem cell treatment. An IPD meta-analysis of intramyocardial regenerative studies is currently ongoing.

After 15 years of intensive clinical research many questions remain unanswered, such as the best cell types, or the delivery mode for cardiac repair. New, more sensitive imaging modalities are necessary to make visible the improvement of perfusion of the ischemic myocardium, or to detect small changes in segmental contractility. Personalized treatment with individual clinical decisions and new system biology approaches should be developed to ensure that the right cardiac regenerative treatment is given to the right patient at the right time.

Vascular | Focus Session | Arch surgery: Towards a low mortality and low complications rate

Early and mid-term outcomes of endovascular and open surgical repair of true aortic arch aneurysm

Daijiro Hori, Homare Okamura, Takahiro Yamamoto, Satoshi Nishi, Koichi Yuri, Naoyuki Kimura, Atsushi Yamaguchi and Hideo Adachi
Saitama Medical Center, Jichi Medical University, Shimotsuke, Tochigi, Japan

Despite improvements in perioperative care and surgical strategies, the incidence of morbidity and mortality after conventional open thoracic aortic surgery ranges from 2.7 to 28.6%. The ageing population adds another important aspect to these set of patients, wherein this complicated treatment is now demanded for increasing numbers of high-risk patients. With the introduction of endovascular stent graft technology, a variety of surgical options exist to treat aortic aneurysms especially in those involving major aortic branches. The purpose of this study was to evaluate the early and mid-term outcomes of endovascular repair and open surgical repair in patients with true aortic arch aneurysm.

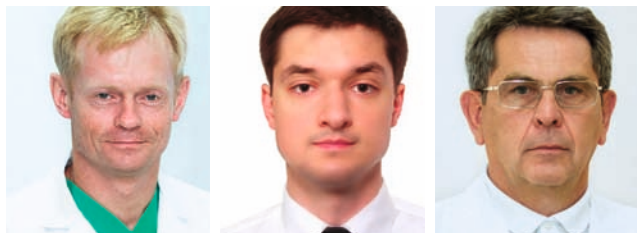
In our series of 199 patients who underwent surgical treatment for isolated true aortic arch aneurysm, 133 underwent open surgical repair while 66 underwent endovascular repair. For patients treated by endovascular repair, 47 patients (70.2%) were treated by semi-customized fenestrated stent graft, 'NAJUTA', and 20 patients (29.8%) were treated by debranched thoracic endovascular aortic repair. Patients who underwent open surgical repair were younger (71 years vs. 75 years, p<0.001) and had a lower prevalence of ischemic heart disease (10.5% vs. 34.8%, p<0.001). ICU stay (open 3 days vs. endovascular 1 day; p<0.001), hospital sta y (open 17 days vs. endovascular 11 days; p<0.001), and surgical time (open: 390 minutes vs. endovascular: 208 minutes; p<0.001) were lower in patients treated by endovascular repair. There were 3 (2.3%) in-hospital deaths within the open surgery group and 3 (4.5%) in the endovascular treatment group (p=0.40). Mid-term survival was better in the open surgery group (log rank p<0.001) and freedom from re-intervention were also better in the open surgery group (log rank, p=0.009). Causes of deaths included cardiac events, cerebral events and pneumonia. However, there was no aneurysm-related death in either group. In propensity score matched comparison (n=58), hospital stay (open 18 days vs. endovascular 11 days; p<0.001), and surgical time (open 392 minutes vs. endovascular 202 minutes; p<0.001) were lower in patients treated by endovascular repair. The incidence of cerebral infarction was higher in the open surgery group compared to the endovascular group (13.8% vs. 1.7%; p=0.032), and there was a trend towards lower incidence of acute kidney injury in the endovascular group compared to the open surgery group (open 24.1% vs. endovascular 10.3%; p=0.08). Mid-term survival was better in the open surgery group (log rank p=0.011), but there were no significant differences in re-intervention between the two groups (log-rank p=0.28).

The early and the mid-term outcomes of endovascular repair of the true aortic aneurysm were comparable to that of open surgical repair. Endovascular repair may provide less invasive treatment, which is especially beneficial to the elderly at high risk for open surgery. Confinement to simple endovascular techniques and close follow-up after surgery may reduce the risk of morbidities and aneurysm-related deaths, and can provide acceptable outcomes in patients undergoing endovascular repair of the aortic arch aneurysm.

Congenital | Abstract Session | Tetralogy of Fallot / pulmonary atresia

Surgical treatment of pulmonary atresia with major aortopulmonary collateral arteries in 83 consecutive patients

Oleksandr D Babliak, Yaroslav B Mykychak, Illya M Yemets
Ukrainian Children's Cardiac Center, Kyiv, Ukraine



Pulmonary atresia with ventricular septal defect and major aortopulmonary collateral arteries (MAPCAs) is a complex congenital cardiopulmonary malformation with variable anatomy of pulmonary segmental blood supply. Surgical management goals are to achieve a single confluence for all sources of pulmonary blood flow (this is termed unifocalisation), and then to complete the repair with the ventricular septal defect closure and creation of the right ventricle-to-pulmonary artery connection. Initially performed as staged procedures over years, unifocalisation can be performed in a single operation. Both one-stage and multi-stage approaches have yielded varying outcomes for early and late mortality and complete repair, and the choice of surgical approach for these patients is mostly institutionally specific. At our centre, we have used different surgical approaches to treat this complex heart defect and since 2010 developed a strategy (figure 1) which is based on the preoperative pulmonary arteries (PA) and MAPCA(s) morphology. The following anatomic factors were included in the decision making process: unilateral or bilateral absence of the central native PA, size of the central native PA, quantity of pulmonary segments with arborisation anomalies and significant distal PA multiple stenosis.

We choose surgical pathways with one-stage unifocalisation if native central PAs are at least of 3 mm in diameter. Depending on the quantity of pulmonary segments with abnormal arborisation, and depending on the size of central native PA, surgical repair may be accomplished with central shunt or with complete repair. For absent or diminutive central PA, we prefer to use the surgical pathway with multi-stage unifocalisation. In cases of unilateral or bilateral absence of central PA we start with unifocalisation procedures through thoracotomies; in cases of diminutive central native PA we start with Melbourne (Mee) shunt.

In total, 83 patients were operated upon in 2007-2014 and were divided in two groups (28 patients operated in 2007-2009 and 55 patients operated in 2010-2013) depending on the surgical algorithm applied for choosing the surgical approach. Median follow-up was 5.17 years and 98% complete. The overall survival was 92.6%.

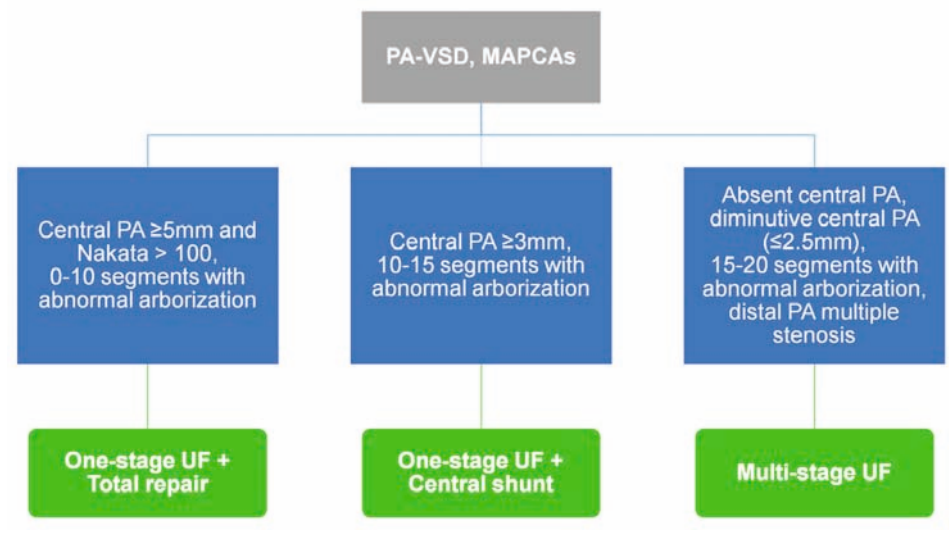


Figure 1. Surgical management algorithm (UF – unifocalisation).

Implementation of the surgical management algorithm changed the frequency of utilisation of three different surgical approaches. The frequency of one-stage unifocalisation with total repair dropped from 71% to 11%, the frequency of one-stage unifocalisation with central shunt increased from 18% to 44%, and frequency of multi-stage unifocalisation increased from 11% to 45% (p<0.0001). The positive outcome of the new strategy was a significant reduction in early mortality from 5.7% in 2007-2009 to 0% in 2010-2014, (p<0.05). We didn't observe surgical mortality in more than 100 consecutive operations. Also, the total operation time and cardiopulmonary bypass time significantly decreased in the latter group, and intensive care unit stay became twice shorter comparing to early group.

In summary, we conclude that surgical management based on preoperative pulmonary arterial anatomy features allows the surgeon to choose the surgical approach and improves early surgical results.

Thoracic | Abstract Session | Oncology 2

Lobectomy or not lobectomy? A single-institution comparison between left upper lobe, trisegmentectomy and lingulectomy

Vittorio Aprile
University of Pisa, Italy

Lobectomy has been considered the gold standard treatment for resectable non-small cell lung cancer (NSCLC) for the last 20 years. Recently, a renewed interest in sub-lobar resection for early stage NSCLC has been fuelled by several factors: the improvement of diagnostic techniques that allows an earlier diagnosis; the increasing interest for postoperative lung function and quality of life; and lastly, the possibility to easily perform a sublobar anatomical resection with a minimally invasive technique such as video-assisted thoracoscopic surgery (VATS) and robotic-assisted thoracoscopic surgery (RATS) with comparable oncological outcomes and improved quality of life compared to the open technique.

In fact, several authors reported intentional limited resections, not only in patients with marginal pulmonary function or impaired performance status, but also in patients who could have been suitable for lobectomy. These reports all showed no significant differences between a sub-lobar resection and lobectomy in terms of loco-regional recurrence rate and overall survival.

The main aim of this study was to compare clinical and oncological outcomes of patients undergoing a 'super-segmentectomy' (trisegmentectomy and lingulectomy) and left upper lobectomy for surgical treatment of early stage (T1-2, N0) NSCLC of the left upper lobe. We therefore divided all selected patients in two groups according to the extent of lung resection. We compared survival and recurrence rate of two groups and analysed possible factors affecting them.

We did not observe any differences in term of recurrence rate, overall survival and disease-free interval. Our results confirm that trisegmentectomy and lingulectomy might be considered oncologically comparable to lobectomies for patients with T1 or T2 N0 NSCLC.

Edwards SAPIEN 3 Transcatheter Heart Valve

Changing the World of Aortic Stenosis Therapy

EACTS 2016

› Visit the Edwards Lifesciences booth to see how the SAPIEN 3 valve is transforming treatment today

For professional use. See instructions for use for full prescribing information, including indications, contraindications, warnings, precautions, and adverse events.

Edwards Lifesciences devices placed on the European market meeting the essential requirements referred to in Article 3 of the Medical Device Directive 93/42/EEC bear the CE marking of conformity.

Material for distribution only in countries with applicable health authority product registrations. Material not intended for distribution in USA or Japan. Indications, contraindications, warnings, and instructions for use can be found in the product labeling supplied with each device.

Edwards, Edwards Lifesciences, the stylized E logo, Edwards SAPIEN, Edwards SAPIEN 3, SAPIEN, and SAPIEN 3 are trademarks of Edwards Lifesciences Corporation.

© 2016 Edwards Lifesciences Corporation. All rights reserved. E6416/09-16/THV

Edwards Lifesciences • Route de l'Etraz 70, 1260 Nyon, Switzerland • edwards.com

Edwards

Cardiac | Rapid Response | Beyond lines and clips

Left atrial appendage ligation

Mubashir Mumtaz
Pinnacle Health Harrisburg Hospital in Harrisburg, PA, USA

Figure 1. First generation AtriClip devices. The AtriClip device is rectangular in shape, is applied epicardially, and gives immediate benefit of appendage closure with endocardial tissue apposition

Figure 2. The AtriClip PRO2™ device. The AtriClip PRO2 device is currently available in the U.S. under 510k clearance and in Europe under CE Mark

Figure 3. (left) The AtriClip PRO•V; (right) the closed-ended and open-ended clips

Left atrial appendage (LAA) thrombus and its relation to stroke in patients with atrial fibrillation is well established. Several studies have suggested LAA closure plays a protective role. In 2010 the AtriClip™ device received 510k clearance by the FDA in the US after the EXCLUDE trial met safety and efficacy end points.

Even though the AtriClip device does not carry the specific indication of stroke prevention, it has been shown to reliably exclude the LAA. Since 2010, more than 70,000 AtriClip devices have been implanted worldwide. The device is available in short and long shafted appliers, and in clip length sizes 35 mm, 40 mm, 45 mm and 50 mm.

First generation devices had limited manoeuvrability and required cutting of sutures with a scalpel or scissors to release the clip from the applier. This was somewhat awkward and at times required help from the surgical assistant. Subsequent modifications increased manoeuvrability, and yielded an easier release mechanism. The limitation that remained following these modifications was the black hoop (Figure 1). The black hoop must be carefully removed from the surgical site following clip deployment.

In 2014, the next generation AtriClip PRO device was designed (Figure 2). This was a quest to further simplify the implantation and applier removal of the clip device in minimally invasive cardiac surgical procedures. The following enhancements were designed into the new applier: a smaller diameter (12 mm), allowing streamlined placement in confined anatomical spaces; enhanced manoeuvrability, allowing placement close to the base of the LAA; and hoop-less end effector enhancing applier removal following clip deployment.

In 2014 an additional open-ended device was developed called AtriClip PRO•V™ (Figure 3, left). The new open-ended design of the AtriClip PRO•V device allows the clip to be applied from a base approach without the need to tease the appendage within the original rectangular legacy Atriclip. From the perspective of the LAA, the clip has identical forces and pressure specifications to the current closed-ended AtriClip device.

We looked at the feasibility, safety and efficacy of PRO•V and PRO2 devices in our canine model. Five dogs with 10 appendages (right atrial appendage and left atrial appendage) were randomised to receiving the closed-ended clip or the open-ended clip (Figure 3, right).

To ensure appendage occlusion at implant the appendages were assessed both visually by the surgeon and with epicardial echocardiography. At 90 days, all appendages were examined by CT, gross pathology and histology. No anticoagulation was used during this follow-up period. The animals were then euthanised and necropsy was performed.

All appendages were found to be encased in scar tissue without any erosion of surrounding structures. No residual appendages were seen. No clot was seen within any of the appendages. There was no evidence of thromboembolism on examination of end organs: thus meeting the endpoints of safety, efficacy and feasibility. These devices currently have FDA 510k clearance. Additional research is underway before release in the United States to gather patient data.

With the development of these sophisticated devices one can clearly see the obvious possibility of less invasive procedures for left atrial appendage management. Being epicardial, these clips do not require any anticoagulation, as with catheter based technologies during the period of endothelialisation. We know these clips occlude appendages; however, a study evaluating possible stroke reduction would be very helpful. This would not only help us to better utilise this treatment option, but also to justify the economic impact of these devices.

Cardiac | Abstract Session | Functional mitral insufficiency

Inferior Patch Plasty normalises tethering in ischemic mitral regurgitation inferior aneurysm/dyskinesia cases

Matteo Pettinari, Gabriele Tamagnini, Nicola Testa, Philippe Bertrand, Roger Devotini, Christiaan Van Kerrebroeck, Robert Dion and Herbert Gutermann

Ziekenhuis Oost Limburg, Genk, Belgium

The presence of an inferior aneurysm/dyskinesia has recently been identified as a predictor for recurrence of ischemic mitral regurgitation after restrictive annuloplasty. The aim of our study was to report clinical and echocardiographic data from the inferior patch plasty (IPP) technique concomitant with restrictive annuloplasty in the case of ischemic mitral regurgitation with an inferior aneurysm/dyskinesia.

Out of 90 patients with ischemic mitral regurgitation who had been treated with a restrictive annuloplasty (RMA) since April 2007, 10 received a concurrent IPP because of an inferior aneurysm/dyskinesia. Patients undergoing an IPP were younger than those receiving a restrictive annuloplasty (59.1±5.6 vs 69.2±9.2 years, p<0.01), had a higher rate of inferior myocardial infarction (100% vs 22.5%, p<0.01), more severe tenting distance (TD; 9.6±3.2 vs 5.9±2.8 mm, p=0.01) and slightly increased left ventricle end-diastolic volume (185.1±54.6 vs 140±49.2 ml, p=0.08).

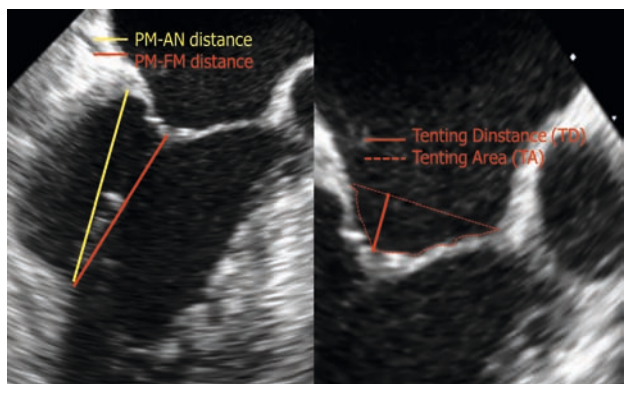


Figure 1. Secondary tenting parameters: PM-AN (distance AB) = posterior papillary muscle and MV annulus distance; PM-FM (distance BC) = distance between the posterior papillary muscle and tip of the posterior leaflet free margin

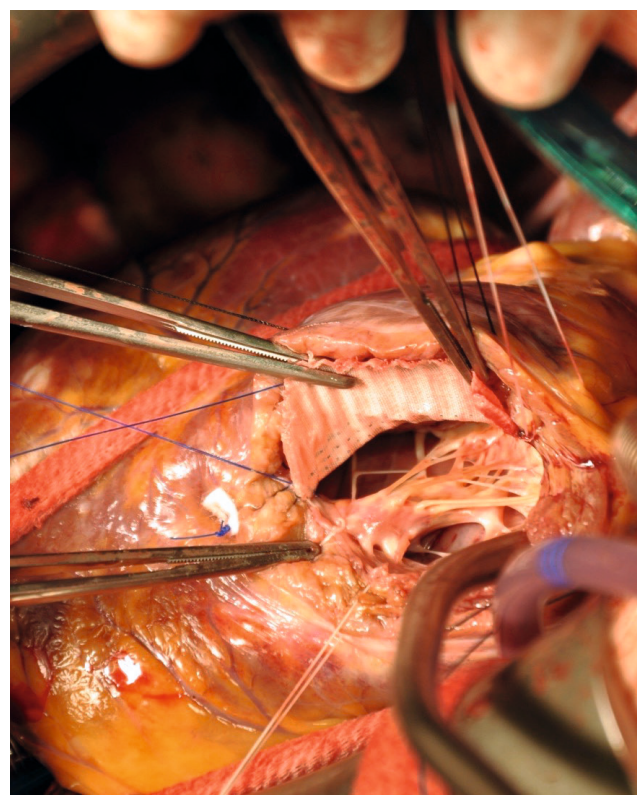
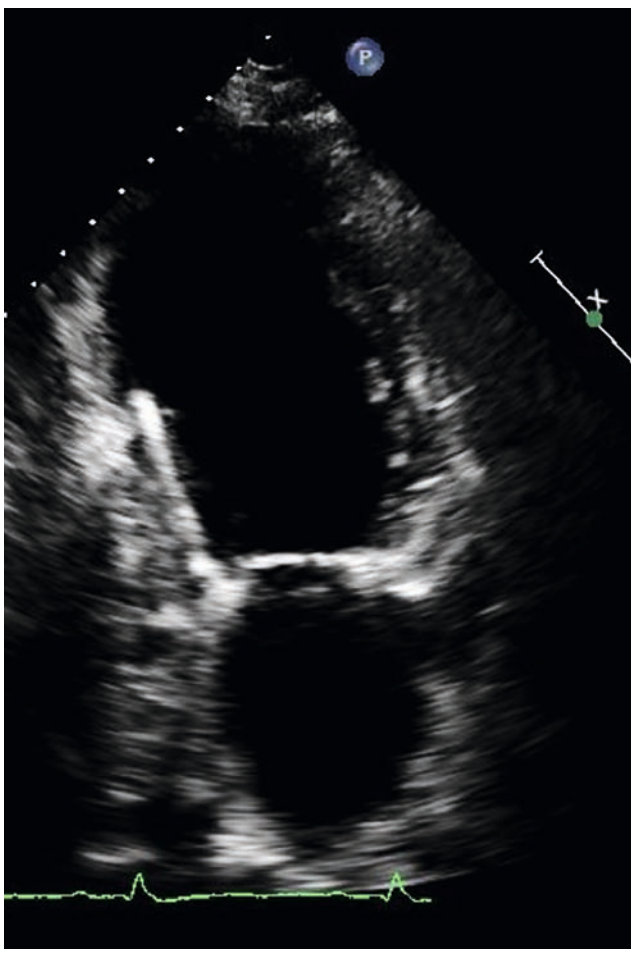


Figure 2. Intraoperative picture of the inferior patch plasty



(Left) Figure 3. Postoperative echocardiography showing the patch between the MV and the base of the PPM

Patients undergoing IPP were younger (59.1±5.6 vs 69.2±9.2 years, p<0.01), had better pulmonary function (2.9±0.9 l vs 2.1±0.6 l, p=0.03) and higher rate of transmural inferior infarct (100% vs 22.5%, p<0.01). Clamping time (184.2±26 vs 151.7±41.1, p=0.01) and CPB time (237.2±32 vs 208.5±52.5 min, p=0.03) were longer.

In the IPP group, all patients were alive at 30 days, while in the RMA group the survival was 91.3±3.2% (p=0.20). An adequate MV coaptation length was achieved in both groups (RMA8.6±1.1 vs IPP=8.2±1.3 mm, p=0.39). None of the patients had more than mild MV regurgitation at discharge.

At four years, all patients in the IPP group were alive in contrast to those in the RMA group (65.4±5.7%, p=0.07). MaxVO2 (17.1±4.1 vs 18.8±3.5, p=0.21), and freedom from NYHA>2 (80±15.5 vs 89.4±3.9, p=0.39) were not significantly statistically different between groups at four years.

At a median echocardiographic follow-up of 3.1±2 years, the degree of tenting improved significantly in the IPP (Tenting Area (TA) from 1.4±0.7 to 0.3±0.1 cm^2, p=0.03; TD from 9.6±3.2 to 3.3±1.1 mm, p<0.01) and in the RMA group (TA from1.2±1.0 to 0.6±0.4 cm^2, p<0.01; TD from 5.9±2.8 to 4.4±1.7 mm, p<0.01). The TD and TA were smaller in the IPP group and the incremental difference in TD was larger. At follow-up the systolic PM-AN distance (Figure 1) return to a similar value. LVESV (IPP from 119.3±44.4 to 86.7±36.6, p=0.03; RMA from 85.1±39.1 to 64±30.8, p<0.01) and LVESVi decreased significantly in the IPP group (LVESV from 119.3±44.4 to 86.7±36.6, p=0.03; LVESVi from 60.8±23 to 43.3±19, p=0.03) and the RMA group (LVESV from 85.1±39.1 to 64±30.8, p<0.01; LVESVi from 45.3±19.8 to 34.4±17.4, p<0.01). At three years, freedom from more than mild MV regurgitation was similar (IPP=87.5±11.7% vs RMA=92.3±4.3%, p=0.1).

In patients with ischemic mitral regurgitation and inferior aneurysm/dyskinesia, IPP promotes a significant reversal in left ventricular remodeling and near normalisation of the posterior leaflet tethering.

Cardiac | Abstract Session | Catheter based mitral valve techniques

Impact of failed mitral valve repair on hospital outcome of redo-mitral procedures

Francesco Onorati[1], Giuseppe Gatti[2], Andrea Perrotti[3], Giovanni Mariscalco[4], Daniel Reichart[5], Aldo Milano[1], Ester Della Ratta[6], Antonio Rubino[7], Giuseppe Santarpino[8], Antonio Salsano[9], Fausto Biancari[10], Christian Detter[5], Sidney Chocron[3], Cesare Beghi[11], Marisa De Feo[6], Carmelo Mignosa[7], Theodor Fischlein[8], Aniello Pappalardo[2], Francesco Santini[9] and Giuseppe Faggian[1] 1. University of Verona, Italy 2. A.O.U. Riuniti, Trieste, Italy 3. University Hospital of Becancon, France 4. Leicester University Hospital, Leicester, UK 5. Univesitat Klinikum Eppendorf, Hamburg, Germany 6. Second University of Naples, Italy 7. University of Catania, Italy 8. Klinikum Nürnberg – Paracelsus Medical University, Nuremberg, Germany 9. University of Genoa, Italy 10. Oulu University, Finland 11. University of Insubria, Varese, Italy

Mitral valve repair has been established as the gold standard surgical method to address mitral valve regurgitation of any aetiology, with a class I recommendation in 2012 ESC Guidelines.

However, despite excellent results, some rates of recurrences – because of failed mitral repairs (FMR) – have been always reported, especially if suboptimal repairs at the time of first surgery were noticed. It is worth noting that, despite extensive literature to date on the determinants of mitral valve repair durability, little attention has been paid to the prognostic significance of being admitted to hospitals with an indication of redo surgery for a FMR. Furthermore, scant data exist on the efficacy of biological mitral prostheses when employed for FMR at redo.

However, the 'old nature' of previous reports (possibly mirroring old surgical practice) and the recent availability of a large multicentre European Registry enrolling hundreds of consecutive redo mitral valve surgeries from 9 different institutions (with Italy – Verona, Genoa, Napoli, Varese, Trieste, Catania – and within Germany – Hamburg, Nuremberg; France: Besancon) have forced focus upon analysis of the prognostic role of FMR in patients admitted for a surgical indication of redo mitral surgery.

In particular, we entered FMR into the multivariable analysis aimed at identifying independent predictors of hospital mortality after redo surgery in the entire population. We then focused attention upon identifying independent predictors of hospital mortality in patients undergoing any redo mitral surgery due to FMR, regardless of combined concomitant surgery, and in those undergoing only isolated redo mitral surgery for FMR. Finally, we compared propensity-matched sub-populations of patients undergoing redo mitral surgery for FMR versus primary mitral surgery in a redo context, versus redo mitral surgery due to a previously-implanted failed mitral prosthesis.

In this study, we first found that FMR per se did not impact mortality at multivariable analysis (p=0.64). Second, we also found that preoperative GOLD≥2 COPD, LVEF<30%, major injury of cardiovascular structures at re-entry or of a patent LIMA-CABG, independently predicted hospital mortality in the entire FMR population (figure 1).

Third, in isolated mitral redo surgery for FMR, GOLD≥2 COPD, age, and cardiopulmonary bypass duration predicted mortality (figure 1). In particular, the 4th (>68 years, equivalent to 13.8% mortality) and 5th quintile of age (≥70 years equivalent to 14.8% mortality) reported the highest mortality (figure 2).

Finally, in propensity-matched cohorts, no differences were reported in mortality or major morbidities between FMR and native valves, whereas more perioperative dialysis and transfusions were noticed in failed prostheses versus FMR (figure 3).

We conclude that a failed mitral repair does not seem to impact hospital outcome of eventual redo surgery per se, and that anticipation of eventual redo mitral surgery seems crucial for failed repairs, given the prognostic impact of severe LV dysfunction and advanced age on hospital outcome.

Figure1. Determinants of hospital mortality after any redo-mitral for failed mitral repair (FMR) or after isolated redo-mitral surgery for FMR

Independent Predictors of Hospital Mortality -All "Failed" Mitral Valve Repairs (FMR)	O.R.	95% C.I.	p.
GOLD≥2 COPD	15.2	3.5-67.1	<0.01
LVEF < 30%	21.5	2.6-79.3	<0.01
Injury of Major CV structures at re-entry	27.2	4.3-91.1	<0.01
Injury of patent LIMA-CABG at re-entry	7.6	1.3-45.6	0.03
Independent Predictors of Hospital Mortality -FailedMV Repairs >>> Isolated MV surgery	**O.R.**	**95% C.I.**	**p.**
GOLD≥2 COPD	12.3	1.1-150.1	0.049
Age (by year)	1.15	1.0-1.3	0.049
CPB duration (by mins)	1.02	1.0-1.1	0.022

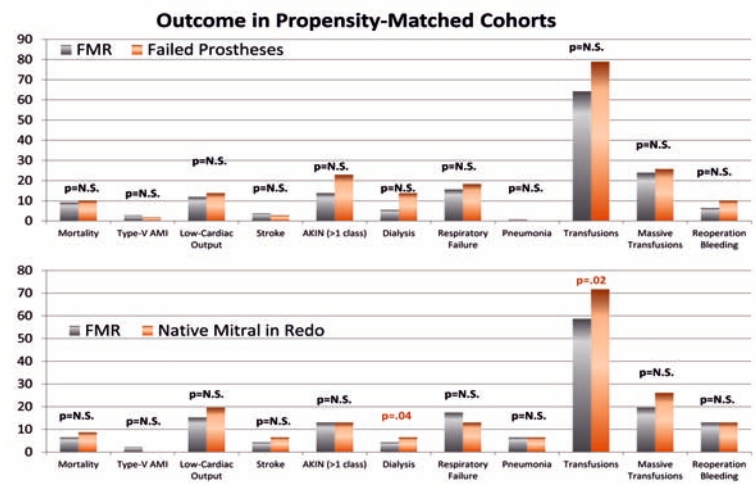
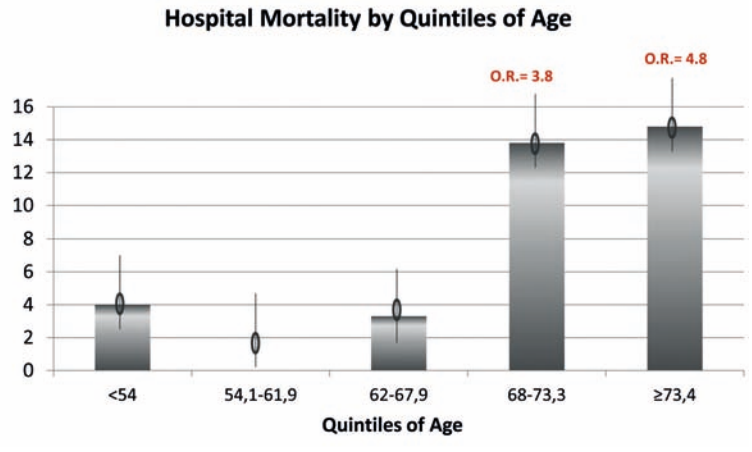


Figure 2. Impact of 'age at surgery' (stratified by quintiles) on hospital mortality following isolated redo-mitral for FMR

Figure 3. Outcome in propensity matched cohorts



Cardiac | Rapid Response | Coronary artery bypass graft: Decreasing complications and improving graft potency

Does using saphenous vein grafts lead to a 50% higher late death rate in triple vessel coronary artery disease?

Alistair Royse University of Melbourne and Royal Melbourne Hospital, Australia

Overwhelmingly the coronary artery bypass grafting (CABG) technique of choice is to use a single internal mammary artery graft to the left anterior descending artery, and all of the remaining grafts are completed with saphenous vein (SVG). Since the average number of drafts per patient is about 3.5, it therefore stands to reason that at least 70% of all coronary artery bypass grafts are performed with SVG.

There is significant evidence that using more arterial grafts leads to improved survival, but there are very few studies that examine whether any use of SVG (even one graft) is detrimental. Whilst total arterial revascularisation (TAR) as a grafting strategy is not common, there are good logical reasons to propose this approach. But in most centres the use of TAR is generally reserved for highly selected and/or younger patients and therefore subject to significant selection bias.

In this series, from 1996 to 2003, and with a median follow-up of 14.6 years, we examined a cohort of patients from a single major institution where 89% of all grafts were arterial, and TAR was performed as a predominant method in 78% of cases. In other analyses, the selection bias appeared to favour those receiving SVG, rather than TAR.

Nevertheless, the question of selection bias was closely examined by way of a group of patients in which the number of confounding variables was as far as possible restricted. Thus, 2,012 patients with triple vessel coronary artery grafting and with LIMA-LAD (left internal mammary artery – left anterior descending), as well as having primary, isolated coronary surgery and the remaining grafts being either radial artery or SVG only (combinations of these two grafts being excluded). Survival analysis was significantly worse for those receiving any use of SVG (p<0.001; OR 1.8). To further reduce potential selection bias, propensity score matching was performed, twice. The first was performed on this group (196 pairs) and revealed worse survival for those receiving any SVG (OR 1.5 (95% CI 1.2-2.0), p<0.001; figure 1). In the second analysis, propensity score matching was performed including a match for each calendar year of the study period to address any potential changes of operative technique over time (106 pairs), and again survival was worse for those receiving any SVG (OR 1.7 (95% CI 1.2-2.5), p=0.003; figure 2).

These data introduce an interesting new experience. There are a few units practising routine total arterial revascularisation with such long follow-up. The sustained survival advantage from using arteries only in this series cannot be ascribed to a highly selected and biased subset of practice, since the great majority of patients were receiving total arterial revascularisation. The argument that only the poorest candidates then received saphenous vein graft was addressed by the propensity score matching that was performed stringently, and the two groups were very well matched; yet a significant survival advantage was seen when all saphenous vein grafts were avoided. Overall, the effect size varied from 1.5-1.8, translating to a 50-80% difference over this time frame, according to which analysis was examined.

This series examined the survival effect of even a single saphenous vein graft when compared to total arterial revascularisation and found that survival was adversely affected in a group of patients that would represent the typical triple vessel coronary bypass patient.

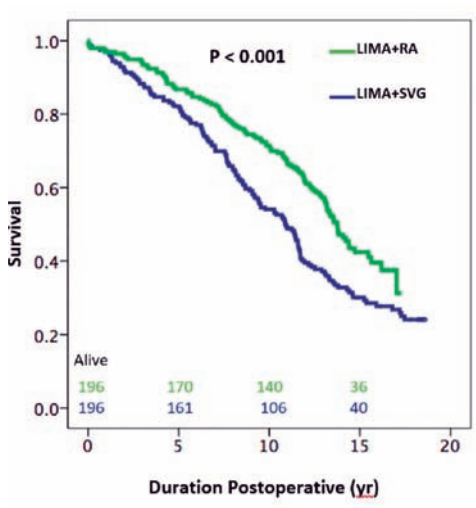


Figure 1. Survival LIMA with RA or SVG propensity score matched in elective, primary CABG, grafted to all three coronary territories and with LIMA-LAD (n=196 pairs).

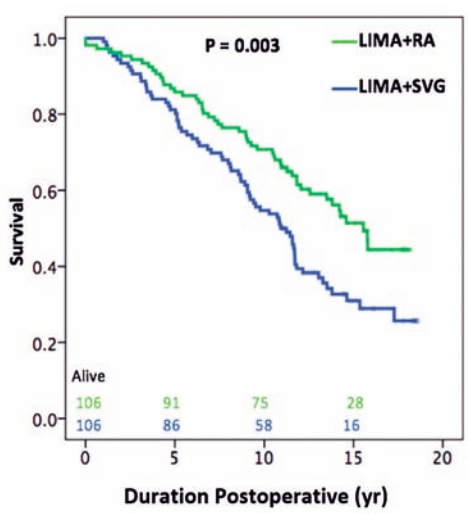


Figure 2. Survival LIMA with RA or SVG propensity score matched including year of surgery in elective, primary CABG, grafted to all three coronary territories and with LIMA-LAD (n=106 pairs)

Thoracic | Focus Session | Video & Case Study 1

Perioperative outcomes of off-pump minimally invasive coronary artery bypass grafting (MICS CABG) with bilateral internal thoracic arteries under direct vision

Keita Kikuchi
Wuhan Asia Heart Hospital, Wuhan, China

kikuchi-cvs@outlook.com

Objective

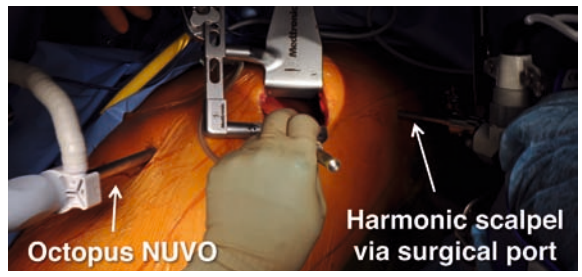
The limitation of minimally invasive coronary artery bypass grafting (MICS CABG) had been the difficulty in harvesting the RITA (right internal thoracic artery) for revascularisations with BITA (bilateral internal thoracic arteries).We previously introduced techniques to harvest and utilise the RITA in MICS CABG via a single left thoracotomy for revascularisation with BITA.[1,2] We report our short-term outcomes of patients who underwent MICS CABG using BITA and single internal thoracic artery (SITA).

Methods

Consecutive patients who underwent MICS CABG using BITA or SITA by a single surgeon at a Japanese heart centre between February 2012 and December 2015 were reviewed retrospectively. Preoperative, intraoperative, and 30-day postoperative outcomes were analysed. Perioperative data for SITA cohort is presented to provide a context in which the outcome of BITA cohort can be evaluated.

Surgical technique

The patient is positioned in a 40-degree right lateral decubitus position. An 8-10 cm left thoracotomy is made on the intercostal space (ICS) below the left nipple. Thoratrak retractor (Medtronic, Inc., MN, USA) is used to open the intercostal space, and is pulled cephalad and toward right with an additional retractor. The mediastinal space is dissected beneath the sternum from the innominate vein to the diaphragm with an electrocautery and the right pleura is visualised. The right lung is depressed by an octopus NUVO stabilizer (Medtronic inc.) that is inserted via a subxiphoid incision. A 5 mm port is inserted into the opened ICS 5 cm away from the incision. A 32 cm dissecting hook-type harmonic scalpel (Ethicon Endo-Surgery, Inc., NJ, USA) is inserted



through the surgical port to harvest the RITA (Figure 1, 2). The RITA is skeletonised with Harmonic scalpel. The LITA is harvested in a similar fashion. Then the pericardium is opened completely. The main pulmonary artery is retracted caudally with octopus NUVO stabilizer and the ascending aorta is dissected from the pulmonary artery. Cygnet® (Vitalitec Inc., Plymouth, MA, USA) flexible side biting clamp is placed on the ascending aorta, and proximal anastomosis is hand-sewn to the ascending aorta. Distal anastomoses are completed as done in off-pump CABG through the thoracotomy with three deep pericardial sutures or direct retraction technique we reported previously.[3]

Results

25 and 37 patients underwent BITA and SITA revascularisation, respectively. Mean duration of the operation was longer in the BITA group compared to the SITA group (265±104 vs. 336±73 minutes). All BITA grafts were harvested without major complications. 68% of RITA was used as in-situ RITA, of which 16 was grafted to the LAD and one was grafted to the first diagonal branch. There was no mortality in the BITA group and one morality in the SITA group. There was no conversion to sternotomy and no case of stroke in either cohort. (Table)

Conclusions

Bilateral internal thoracic arteries can be safely harvested in a reproducible manner under direct vision via a small left thoracotomy. The potential advantages of MICS CABG using BITA, although yet to be established, include a long-term survival benefit conferred by BITA grafts and eliminated risk of sternal wound infection, in addition to the established advantages of minimally invasive coronary surgery.

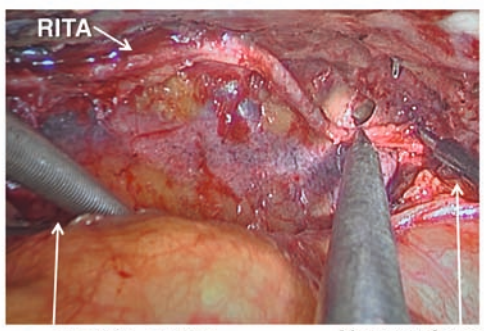
References

1. Kikuchi K, Une D, Kurata A, Ruel M. Off-pump minimally invasive coronary artery bypass grafting using the bilateral internal thoracic arteries and the right gastroepiproic artery. Eur J Cardiothorac Surg 2016;49:1285-6.
2. Kikuchi K, Une D, Endo Y, Matsuyama T, Fukada Y, Kurata A. Minimally Invasive Coronary Artery Bypass Grating Using Bilateral In Situ Internal Thoracic Arteries. Ann Thorac Surg 2015;100:1082-4.
3. Kikuchi K, Une D, Suzuki K, Endo Y, Matsuyama T, Osaka S, et al. Off-Pump Minimally Invasive Coronary Artery Bypass Grafting With a Heart Positioner: Direct Retraction for a Better Exposure. Innovations (Phila) 2015;10:183-7.

Table

Variables	SITA (n=37)	BITA (n=25)	p-value
Age (years)	71.9±11.1	66.5±11.0	0.06
Female	8 (22%)	4 (16%)	0.7
Height (cm)	163.0±9.6	164.2±8.0	0.3
Weight (kg)	61.8±11.8	68.3±13.8	0.4
Exertional angina	33 (89%)	23 (92%)	1.0
Unstable angina	4 (11%)	2 (8%)	1.0
Old MI	10 (27%)	8 (32%)	0.8
Recent MI	1 (3%)	0 (0%)	1.0
Acute MI	0 (0%)	0 (0%)	1.0
Emergent case	0 (0%)	0 (0%)	1.0
Single vessel disease	10 (27%)	1 (4%)	0.04
Double vessel disease	11 (30%)	8 (32%)	1.0
Triple vessel disease	16 (43%)	16 (64%)	0.13
Left main trunk	11 (30%)	7 (28%)	1.0
Ejection fraction (%)	62.1±9.6	58.4±11.1	0.2
Graft characteristics			
Multi vessel	26 (70%)	24 (96%)	0.019
Number of distal anastomoses	2.3±1.2	3.0±1.2	0.024
LITA			
Single target	34 (92%)	23 (92%)	1.0
Sequential targets	2 (5%)	1 (4%)	1.0
RITA			
In-situ RITA	1 (3%)	17 (68%)	<0.0001
Composited RITA	1 (3%)	8 (32%)	0.002
I-graft	0 (0%)	3 (12%)	0.06
Y-graft	0 (0%)	4 (16%)	0.02
V-graft	1 (3%)	1 (4%)	1.0
Gastroepiploic artery	1 (3%)	1 (4%)	1.0
ICU length of stay (days)	2.6±3.5	2.3±1.2	0.7
Hospital length of stay (days)	14.8±8.9	12.8±3.9	0.3
Post-operative MI	1 (3%)	0 (0%)	1.0
New onset A.fib	2 (5%)	0 (0%)	0.5
Pleural effusion	15 (40%)	20 (80%)	0.0037
Surgical site infection	0 (0%)	2 (8%)	0.15
New hemodialysis	1 (3%)	1 (4%)	1.0
Death	1 (3%)	0 (0%)	1.0

Figure 2



ST. JUDE MEDICAL

In October of 2015, St. Jude Medical received CE Mark approval for the HeartMate 3™ Left Ventricular Assist System (LVAS), a cardiac support option for advanced heart failure patients who are awaiting transplantation, are not candidates for heart transplantation, or are in myocardial recovery.

The HeartMate 3 system is the first commercially approved centrifugal-flow left ventricular assist device (LVAD) utilizing Full MagLev™ technology, which allows the device's rotor to be "suspended" by magnetic forces. This design aims to reduce trauma to blood passing through the pump and improve outcomes for patients.

The device is implanted above the diaphragm, immediately next to the native heart, and is attached to the aorta leaving natural circulation in place while providing all of the energy necessary to propel blood throughout the body.

Across Europe, CE Mark approval for the HeartMate 3 LVAS was based on data from the HeartMate 3 LVAS CE Mark clinical trial, which met its primary endpoint and demonstrated a 92 percent six month survival rate; the best six month survival rate to date to be documented in an LVAD CE Mark clinical study. Enrollment included both bridge-to-transplant (BTT) and destination therapy (DT) patients in New York Hospital Association Class IIIb or IV heart failure. In the U.S., the HeartMate 3 LVAS is currently being evaluated with the MOMENTUM 3 IDE trial, which is the largest study of its kind and will enroll more than 1,000 patients. In June, the HeartMate 3 LVAS was awarded a CARDIOSTIM-EHRA EUROPACE Innovation Award in the category of Patient Care Improvement.

"The HeartMate 3 cardiac assist device brings real benefit to patients suffering from heart failure and is an encouraging solution, in particular, for those awaiting transplantation," said Dr. Philippe Ritter, a heart rhythm specialist from the University Hospital of Bordeaux.

For more information about the latest HeartMate 3 LVAS data, trials and outcomes, visit St Jude Medical at booth 115 at The

European Association for Cardio-Thoracic Surgery (EACTS) Annual Meeting 2016 and attend the MCS symposium:
Title: More Than Just a Pump: Using the HeartMate 3 LVAS in Clinical Practice
Date: Tuesday 04.10.2016
Time: 12.45-14.00
Room: 114

Brief Summary

Prior to using these devices, please review the Instructions for Use (IFU) for a complete listing of indications, contraindications, warnings, precautions, potential adverse events and directions for use.

Indications

The HeartMate 3™ Left Ventricular Assist System is intended to provide long term hemodynamic support in patients with advanced, refractory left ventricular heart failure. It is intended either for temporary support, such as a bridge to cardiac transplantation (BTT), or as permanent destination therapy (DT). The HeartMate 3 Left Ventricular Assist System is intended for use inside or outside the hospital.

Adverse Events

The following adverse events may be associated with the use of the HeartMate 3 Left Ventricular Assist System. Adverse events are listed in anticipated decreasing order of frequency, except for death, which appears first as it is a non-reversible complication: • Death • Bleeding (perioperative or late) • Local infection • Cardiac arrhythmia • Respiratory failure • Sepsis • Driveline or Pump pocket infection • Right heart failure • Renal failure • Psychiatric episode • Stroke • Peripheral thromboembolic event • Hepatic dysfunction • Neurologic dysfunction • Hemolysis

Unless otherwise noted, ™ indicates that the name is a trademark of, or licensed to, St. Jude Medical or one of its subsidiaries. ST. JUDE MEDICAL and the nine-squares symbol are trademarks and service marks of St. Jude Medical, Inc. and its related companies.
© 2016 St. Jude Medical, Inc. All Rights Reserved.
EM-EACTS-0816-0030 | Item approved for international use only.

Visit St. Jude Medical at Booth #115

PLEASE JOIN US

More than just a pump: Using the HEARTMATE 3™ LVAD in clinical practice

TUESDAY OCTOBER 4, 2016
12:45-14:00 | BOOTH #115

HeartMate 3™
Left Ventricular Assist Device

Respects the Flow

HeartMate 3™ LVAD with Full MagLev™ Flow Technology

SJM.com

ST. JUDE MEDICAL

Brief Summary: Prior to using these devices, please review the Instructions for Use for a complete listing of indications, contraindications, warnings, precautions, potential adverse events and directions for use.

Caution: Product referenced is approved for CE Mark. Device depicted may not be available in all countries. Check with your St. Jude Medical representative for product availability in your country.

Unless otherwise noted, ™ indicates that the name is a trademark of, or licensed to, St. Jude Medical or one of its subsidiaries. ST. JUDE MEDICAL and the nine-squares symbol are trademarks and service marks of St. Jude Medical, Inc. and its related companies. © 2016 St. Jude Medical, Inc. All Rights Reserved.

EM-EACTS-0816-0025 | Item approved for international use only.

Vascular | Rapid Response | The old, the new, the evident in aortic surgery

Minimally invasive approach for frozen elephant trunk surgery: early results

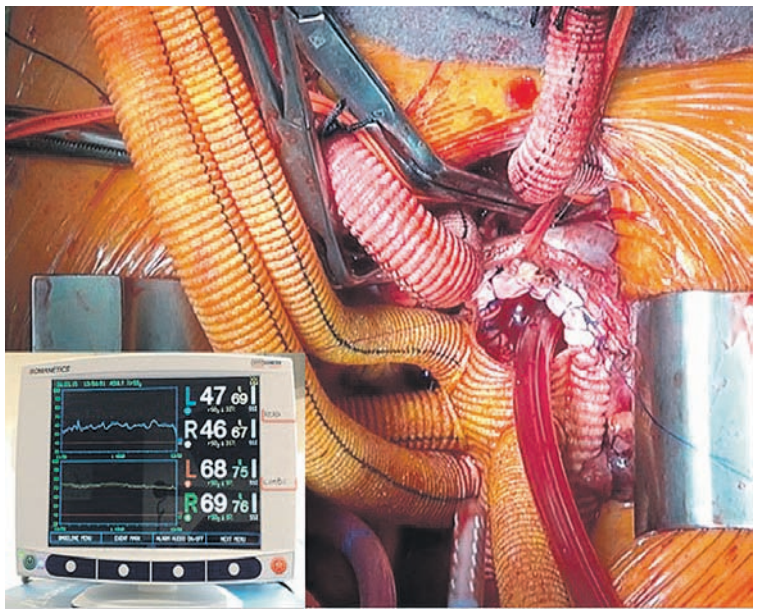
Giampiero Esposito Città di Bari Hospital, Bari, Italy

Frozen elephant trunk (FET) repair represents the state of the art for the treatment of extensive aortic pathologies in a single step, but its invasiveness is still not negligible. It has also been demonstrated that ministernotomy, very frequently applied in the modern era of cardiac surgery, has been associated with a lower incidence of wound complication, less postoperative pain and shorter in-hospital stay.

From September 2013 to March 2016, we applied these two combined strategies in 25 patients with aortic arch pathology of different aetiology in a so-called minimally invasive FET technique ('mini-FET'), characterised by the following features:

- Approach via a J-shaped mini-sternotomy at IV intercostal space extended into a 2 cm left cervicotomy to improve the exposure of the aortic arch;
- Antegrade distal aortic perfusion (ADAP). During the distal circulatory arrest (DCA) an ADAP catheter is placed into the FET stent graft in order to perfuse the lower spine and the visceral organs, thus reducing the DCA to ~15 minutes, allowing a mild to moderate hypothermic cardiopulmonary bypass.

Mini-FET inclusion criteria were: (1) aortic arch aneurysm extending into the descending thoracic aorta, and (2) acute/chronic type B aortic dissection with arch involvement.

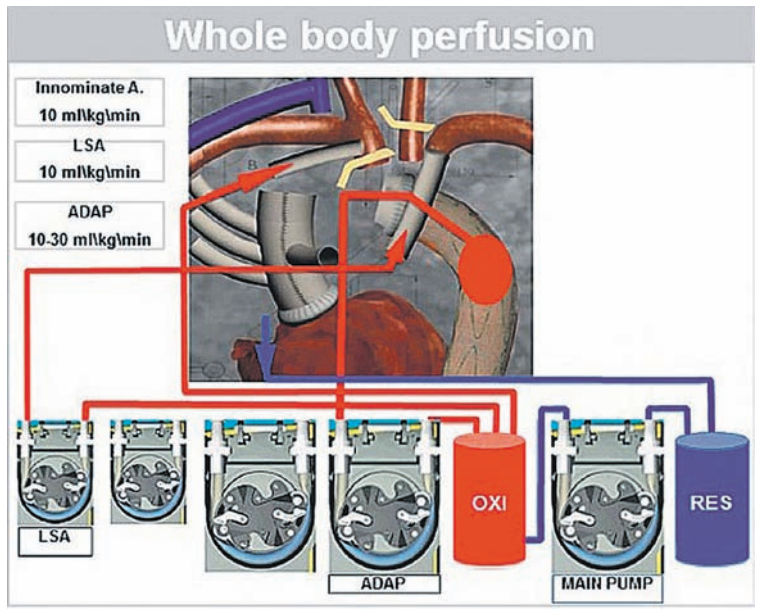


Perfusion temperature was 28°C in 8 patients, 30°C in 10 patients, and 32°C in the final 7 patients. Distal circulatory arrest was 14.1±4.8 minutes with ADAP of 24.0±5.1 minutes at a flow of 2120±430 ml/minute.

The ADAP catheter used for distal perfusion was a 24 French foley catheter with Dufour tip. Of the 25 patient total, hospital mortality was nil. Two patients (8%) had post-operative paraparesis, completely restored in three months.

In conclusion, this is the first described experience of aortic arch repair performed with use of mini-FET combining mini-sternotomy, whole body perfusion (WBP) and mild-to-moderate hypothermia.

The development of the concept of WBP with the use of the ADAP catheter has allowed for the significantly shortening of the time of DCA and to safely increase perfusion temperature to 30-32°C. In selected cases, mini-FET was a safe and feasible approach for aortic arch surgery. The early results of this complex strategy appear promising, with advantages of mini-FET in terms of invasiveness and tolerability when compared to conventional FET.



LivaNova

LivaNova Cardiac Surgery Devices Reduce Physiological Impact of Surgery

Minimizing the impact of highly invasive cardiothoracic surgical procedures is essential to improving patient outcomes.[1] Understanding this challenge, LivaNova created innovative solutions including cannulae, aortic valve replacement devices and mitral valve repair devices specifically designed to reduce the physiological impact of surgery.

Mitral valve repair (MVr) is the preferred treatment for the majority of patients presenting severe mitral regurgitation (MR), preserving the native valve and minimizing surgical impact.[2] The MEMO 3D RECHORD™ mitral annuloplasty ring is the newest and most innovative device developed by LivaNova for patients presenting MR. It represents an excellent solution to mitral valve disease, and the innovative super-elastic ring preserves physiological annular dynamics and facilitates repair,[3-7] with durable patient outcomes.

"The revolutionary structure of MEMO 3D RECHORD translates into a simpler, more streamlined procedure," said Mr. Prakash P. Punjabi, M.D., Imperial College Healthcare NHS Trust and Imperial College School of Medicine, London, UK. "It represents a physiological solution to MVr, mimicking the patient's natural anatomy to preserve the real-life 3D motion of the mitral annulus."

MEMO 3D RECHORD features a series of loops in the posterior region of the ring that act as temporary reference elements for easier sizing of chord length. This innovative chordal guiding system allows a correct implantation of PTFE neochordae without requiring chordal measurement. Standardized chord replacement in both open and minimally invasive cardiac surgery (MICS) approaches allows for reproducible results, improves accuracy and results in minimal procedural time.[7]

For native or prosthetic aortic valve replacement (AVR), the PERCEVAL™ sutureless biological valve from LivaNova offers a less invasive AVR option that can minimize the physiological impact of surgery through reduced complications and recovery time.[8]

"Surgeons appreciate PERCEVAL's ability to minimize the invasiveness of the procedure and reduce the risk of damage to aortic structures," said Mattia Glauber, M.D., Sant'Ambrogio Hospital, Milan, Italy.

The valve's reduced diameter increases visualization and facilitates more complex procedures[9,10] while PERCEVAL's standardized technique and ease of implant enable and facilitate minimally invasive AVR.[11] PERCEVAL's super-elastic stent and truly sutureless design further supports MICS through a small incision and reduces the need for manipulation inside the aortic root.[9,10,11]

CANNULAE for MICS are specifically designed to ensure high performance while providing easy insertion and minimal intrusion into the surgical field.[12] To help reduce the trauma associated with cannulation, LivaNova developed a series of cannulae that provide optimal hemodynamics in MICS procedures[13-25]: the RAP venous femoral cannulae with dual stage tip design able to drain from the superior and inferior vena cava without interference in the right atrium; the EASY FLOW™ aortic cannulae featuring an integrated obturator and malleable stylet to help cannula insertion from remote access; and the EASY FLOW DUO™ arterial femoral cannulae, the only femoral dispersion tip cannula on the market.

Pioneering innovative devices to reduce the physiological impact of cardiac surgery, LivaNova is cutting through complexity with simplified procedures and better outcomes.

Find out more at LivaNova Booth No. 111.

References

1. Iribarne A, Easterwood R, et al. The golden age of minimally invasive cardiothoracic surgery: current and future perspectives. Future Cardiol. 2011;7(3):333-46
2. Jouan J., Mitral valve repair over five decades. Ann Cardiothorac Surg. 2015;4(4):322–33
3. Ryomoto M, Mitsuno M, et al. Is physiologic annular dynamics preserved after mitral valve repair with rigid or semirigid ring? Ann Thorac Surg. 2014;97:492-8
4. Nishi H, Toda K, et al. Annular dynamics after mitral valve repair with different prosthetic rings: A real-time three-dimensional transesophageal echocardiography study. Circulation. 2013 Nov 26;128(22 Supplement):A16940
5. Wan S, Lee AP, et al. The choice of mitral annuloplastic ring beyond "surgeon's preference." Ann Cardiothorac Surg. 2015;4(3):261-5
6. Santarpino G, Pfeiffer S, et al. First-in-man implantation of a Sorin Memo 3D ring: mitral annular flexibility is still preserved at 5 years of follow-up! Int J Cardiol. 2012;23;159(2):e23-4
7. Glauber M, Ferrarini M, et al. Minimally invasive mitral valve repair using a semi-rigid annuloplasty ring with a new chordal sizing system: the Memo3D ReChord. Ann Cardiothorac Surg. 2015;4(3):298-300
8. Di Eusanio M, Phan K, et al. Sutureless Aortic Valve Replacement International Registry (SU-AVR-IR): design and rationale from the International Valvular Surgery Study Group (IVSSG). Ann Cardiothorac Surg. 2015;4(2):131-139
9. Shrestha M, Folliguet TA, et al. Aortic valve replacement and concomitant procedures with the Perceval valve: results of European trials. Ann Thorac Surg. 2014;98(4):1294-300
10. Glauber M, Miceli A, et al. Minimally invasive aortic valve replacement with sutureless valve is the appropriate treatment option for high-risk patients and the "real alternative" to transcatheter aortic valve implantation. J Thorac Cardiovasc Surg. 2016;151(3):610-3
11. Gilmanov D, Miceli A, et al. Sutureless implantation of the perceval s aortic valve prosthesis through right anterior minithoracotomy. Ann Thorac Surg. 2013;96:2101-8
12. Muehrcke DD, Cornhill JF, et al. Flow characteristics of aortic cannulae. J Card Surg 1995; 10(4 Suppl):514–9
13. Modi P, Hassan A, et al. Minimally invasive mitral valve surgery: a systematic review and meta-analysis. Eur J Cardiothorac Surg. 2008;34(5):943-52
14. Galloway AC, Schwartz CF, et al. A decade of minimally invasive mitral repair: long-term outcomes. Ann Thorac Surg. 2009;88(4):1180-4
15. Schmitto J, Mohr FW, et al. Minimally invasive aortic valve replacement: how does this perform in high-risk patients? Curr Opin Cardiol. 2011;26(2):118-22
16. Grossi E, Galloway AC, et al. Minimally invasive mitral valve surgery: a 6-year experience with 714 patients. Ann Thorac Surg. 2002;74(3):660-3
17. Suri RM, Schaff HV, et al. Survival advantage and improved durability of mitral repair for leaflet prolapse subsets in the current era. Ann Thorac Surg. 2006;82:819-26
18. Gillinov AM, Wierup PN, et al. Is repair preferable to replacement for ischemic mitral regurgitation? Ann Thorac Surg. 2005;80:811-9
19. Schmitto JD, Mokashi SA, et al. Minimally-invasive valve surgery. JACC. 2010;56(6):455-62
20. Seeburger J, Borger MA, et al. Minimal invasive mitral valve repair for mitral regurgitation: results of 1339 consecutive patients. Eur J Cardiothoracic Surg. 2008;34:760-5
21. Holzhey DM, Shi W, et al. Minimally invasive versus sternotomy approach for mitral valve surgery in patients greater than 70 years old: a propensity-matched comparison. Ann Thorac Surg. 2011;91:401-5
22. Suri RM, Schaff HV, et al. Thoracoscopic versus open mitral valve repair: a propensity score analysis of early outcomes. Ann Thorac Surg. 2009;88:1185-90
23. Iribarne A, Russo MJ, et al. Minimally invasive versus sternotomy approach for mitral valve surgery: a propensity analysis. Ann Thorac Surg. 2010;90:1471-8
24. Iribarne A, Easterwood R, et al. A minimally invasive approach is more cost-effective than a traditional sternotomy approach for mitral valve surgery. J Thorac Cardiovasc Surg. 2011;142(6)1507-14
25. Scharfschwerdt M, Richter A, et al. Improved hydrodynamics of a new aortic cannula with a novel tip design. Perfusion. 2004;19(3):193-7

Cardiac | Rapid Response | Coronary artery bypass graft: Decreasing complications and improving graft potency

Early results after external saphenous vein mesh implantation reveal bypass constriction six months after coronary artery bypass grafting

Alicja Zientara Triemli Hospital Zurich, Switzerland, Department of Cardiac Surgery

Background

Saphenous veins undergo dramatic morphologic changes when used as coronary bypass grafts because of arterial pressure followed by graft degeneration and intimal hyperplasia. The external saphenous vein mesh is a knitted nitinol wire mesh used to provide external support of the vein graft to improve long-term patency. The mesh prevents overexpansion of the vein under arterial pressure and imparts a mild to moderate downsizing to the diameter of the vein to decrease the size mismatch between the vein and the coronary artery.

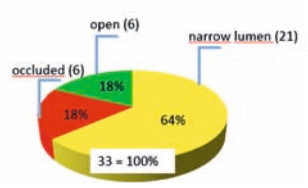


Figure 1. Chart indicating outcomes at six months as evidenced by CT. 33 patients were followed up, revealing six occluded veins, 21 veins with a small narrowed lumen over the entire length of the graft, and 6 open veins

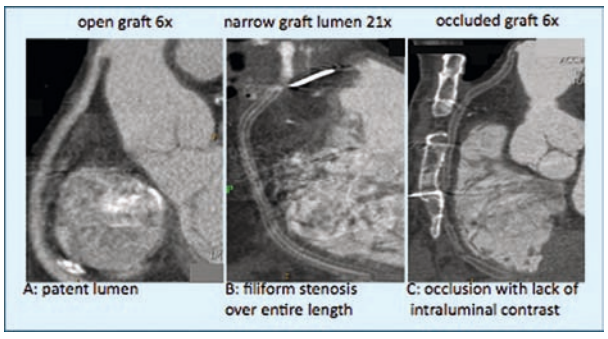


Figure 2. Examples of typical CT results obtained at six months of open graft, narrow lumen graft and occluded graft

Preliminary results of computed tomographies (CT) at discharge published in 2013 confirmed a good 95% patency in 20 patients, as well as 1 (5%) constriction of the distal anastomosis leading to graft occlusion. The aim of this study is to assess graft patency in mesh covered saphenous vein grafts six months after coronary artery bypass grafting by CT.

Patients and methods

40 patients (3 female, 37 male) received one mesh vein during off-pump coronary artery bypass grafting from February to December 2012. As target vessel for mesh vein implantation, the right coronary artery or the posterior descending artery was chosen. After six months, 33 patients were followed up by cardiac CT (3 patients were excluded due to renal insufficiency, and 4 due to refusal of CT). The preparation of the mesh was performed according the manufacturer guidelines. Veins were harvested endoscopically. All side branches were secured with suture and the grafts were measured to fit the criteria determined for the use of the mesh including double wall thickness and vein diameter. After mesh coating the vein was covered with fibrin glue. First, the distal and then the proximal anastomosis were constructed using 7-0 and 6-0 polypropylene sutures, including vein wall and mesh in each suture. Intraoperative graft patency was determined by transit time flow measurement on all grafts using the Medi-Stim VeriQ flow measurement technology. Patients received aspirin, clopidogrel and heparin after the operation, then life-long aspirin 100 mg and clopidogrel 75 mg for the first postoperative year.

Results

At discharge 38 patients received a CT, which confirmed 36 open and two occluded veins. After six months 33 patients were followed up by CT, which revealed six occluded veins, 21 veins with a small narrowed lumen over the entire length of the graft, and six open veins. The comparison of the intraoperative flow measurement and pulsatile index showed no significant differences between occluded, open and narrowed grafts. In five patients a coronary angiography was performed 7-17 months after the operation, which confirmed the occlusion of six occluded and three narrowed grafts.

Conclusion

Preliminary good results of mesh vein patency obtained at discharge cannot be reproduced six months postoperatively. Angiographies of selective patients confirmed total occlusion in two patients and subtotal filiform stenosis of three narrowed grafts, which was diagnosed by CT before. Because of luminal constriction over the entire length of the mesh vein, we hypothesise a potential relation to the use of fibrin glue as external fixation. Improvement of the implantation technique and material has to be focused upon further research on external vein mesh. Until then, we would advise against the use of external vein support by mesh graft in combination with covering fibrin glue.

The 30th EACTS Annual Meeting

EACTS @ 30

EACTS Daily News spoke to Adriano Barberis, who heads communication at LivaNova's cardiac surgery business unit. After 38 years with the company (first Sorin, now LivaNova), he shared some insights into the congress' early years: "The first EACTS was in 1986 and in 1987 it was held at the Meridien Hotel in Paris. We made just a table-top exhibition. So it was a very small congress.

"After that, it started being a real congress. In 1988, in Bordeaux, we made a big exhibition. Sorin has always participated at EACTS. I have missed only one! But even then I did still prepare it.

"In 2000, in Frankfurt, Sorin was the first company to make a lunchtime symposium, and this happened again and again after that. I am very pleased, because I have seen the congress grow and grow every year!"

LivaNova

LivaNova Meets Challenges of Valve Repair and Replacement with Technological Innovation, Proven Clinical Outcomes, Better Patient Care

In the most challenging heart valve repair and replacement cases, technological innovation is critical1-3 to provide personalized, clinically proven treatments that restore the patient's physical condition and deliver peace of mind. That is why LivaNova has created innovative solutions for aortic and mitral valve treatment that conform to the patient's anatomy, provide optimal hemodynamics and improve patient outcomes.

For surgical aortic valve replacement (AVR), the treatment of choice is the PERCEVAL™ sutureless biological valve. A significant and growing body of evidence on sutureless valves shows excellent outcomes and advantages over traditional valves.4 PERCEVAL combines a simplified sutureless design with the proven benefits of a tissue platform and homocysteic acid treatment to deliver excellent durability.5,6

"Technological advances and an increased incidence of aortic stenosis have led to the increasing adoption of sutureless valves for the treatment of medium-to high-risk patients undergoing aortic valve replacement," said G. Santarpino, M.D., Department of Cardiac Surgery, Klinikum Nürnberg, Paracelsus Medical University, Nürnberg, Germany.

PERCEVAL demonstrates good hemodynamic results with low transvalvular gradients that remain stable over time,7,8 and it is the most widely adopted AVR surgical option. PERCEVAL is associated with very low mortality7,8 and structural valve degeneration rates and no valve migrations or valve thrombosis after five years of follow-up.7

For young patients with severe aortic stenosis, mechanical aortic valves represent a valid treatment option.4 The CARBOMEDICS™ and BICARBON™ families of mechanical heart valves from LivaNova are uniquely designed for easier surgical procedures, long-lasting performance9,12 and favorable hemodynamic properties stemming from a 100 percent orifice-to-annulus match in aortic position for CARBOMEDICS TOP HAT™ and BICARBON OVERLINE™. They also represent a perfect solution for double valve replacement due to limited interference with the mitral-aortic continuity.

The CARBOMEDICS TOP HAT and BICARBON OVERLINE supra-annular aortic valves accommodate diverse and challenging annulus anatomies, thereby reducing surgical complexity. Both valves are built on proven platforms and designed for ease of implant.

In elderly patients with aortic stenosis, surgical AVR using stented biological valves is the standard of care.13 The CROWN PRT™ stented aortic bioprosthesis represents an ideal solution to this challenge, with no need for lifelong oral anticoagulation and a long-lasting design14,15,16 facilitated by LivaNova's Phospholipid Reduction Technology (PRT).17 CROWN PRT features extreme control, easy handling and simplified implantation.

Many patients diagnosed with heart valve dysfunction want to return to a normal, active lifestyle. The SOLO SMART™ aortic heart valve and MEMO 3D RECHORD™ mitral annuloplasty ring provide native-like solutions with superior hemodynamic performance,18-21 helping patients resume normal activities after surgery.

With SOLO SMART, the implantation time is similar to stented valves.22 Other benefits include a reduced learning curve and improved control, with excellent visibility of the implantation site during procedures. SOLO SMART also features a temporary stent for added support and easier implantation.

With the MEMO 3D RECHORD, the physiological motion of the mitral annulus is proven to maximize blood flow,19-21 even more than five years after implantation.23 Furthermore, its innovative chordal guiding system promotes standardized chord replacement, offering reproducible results while accelerating procedure times.24

The treatment of choice for younger, highly active patients requiring mitral valve replacement is a mechanical heart valve.13 To help meet this challenge, the CARBOMEDICS OPTIFORM™ offers an adaptable solution supported by a long history of proven results.25-31

The CARBOMEDICS OPTIFORM's unique design features a symmetrical cuff that allows supra-, intra- or subannular placement by varying suture entry and exit sites. CARBOMEDICS OPTIFORM also easily conforms to difficult annular anatomies and offers a unique solution in mitral redo surgery and double valve replacement. A titanium stiffening ring allows the valve to be rotated in-situ for optimal valve positioning in every situation.

Pioneering innovative devices for valve repair and replacement with excellent solutions and optimal hemodynamics, LivaNova is cutting through complexity with simplified procedures and better outcomes.

Find out more at LivaNova Booth No. 111.

References

1. Nicolini F, Agostinelli, A. et al. Biomed Res Int. 2014;2014:736298
2. El Oakley R, Kleine P, et. al. Choice of prosthetic heart valve in today's practice. Circulation. 2008;117(2):253-6
3. Lad VS, Newcomb AE, et al. Surgical Techniques for the Management of the 'Hostile Mitral Annulus.' Heart Lung Circ. 2014;23(3):217-23
4. Gersak B, Fischlein T, et al. Sutureless, rapid deployment valves and stented bioprosthesis in aortic valve replacement: recommendations of an International Expert Consensus Panel. Eur J Cardiothorac Surg. 2016;49(3):709-18
5. Folliguet TA, Le Bret E, et al. Pericarbon pericardial bioprosthesis: an experience based on the lessons of the past. The Annals of thoracic surgery. [Evaluation Studies]. Ann Thorac Surg. 2001;71:S289-92
6. D'Onofrio A, Auriemma S, et al. Aortic valve replacement with the Sorin Pericarbon Freedom stent-less prosthesis: 7 years' experience in 130 patients. J Thorac Cardiovasc Surg. 2007;134:491-5
7. Shrestha M, Fischlein T, et al. European multicentre experience with the sutureless Perceval valve: clinical and haemodynamic outcomes up to 5 years in over 700 patients. Eur J Cardiothorac Surg. 2016;49(1):234-41
8. Fischlein T, Meuris B, et al. CAVALIER Trial Investigators. The sutureless aortic valve at 1 year: A large multicenter cohort study. J Thorac Cardiovasc Surg. 2016 Jan 22. pii: S0022-5223(16)00174-4. doi: 10.1016/j.jtcvs.2015.12.064. [Epub ahead of print] PubMed PMID: 26936009.
9. Azarnoush K, Laborde F, et al. The Sorin Bicarbon over 15 years clinical outcomes: multicenter experience in 1704 patients. Eur J Cardiothorac Surg. 2010;38(6):759-66
10. Celiento M, Filaferro L, et al. Single center experience with the Sorin Bicarbon prosthesis: a 17-year clinical follow-up. J Thorac Cardiovasc Surg. 2014;148(5):2039-44
11. Misawa Y, Muraok A, et al. Fifteen-year experience with the Bicarbon heart valve prosthesis in a single center. J Cardiothorac Surg. 2015:10:89
12. Bouchard D, Mazine A, et al. Twenty-year experience with the CarboMedics mechanical valve prosthesis. Ann Thorac Surg. 2014;97:816–23
13. Nishimura RA, Otto CM, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014;63(22):e57-e185
14. Jamieson WR, Forgie WR, et al. Hemodynamic performance of mitroflow aortic pericardial bioprosthesis – optimizing management for the small aortic annulus. Thorac Cardiov Surg. 2010;58:69-75
15. Yankah C, Pasic M, et al. Aortic valve replacement with the Mitroflow pericardial bioprosthesis: Durability results up to 21 years. JTCVS. 2008;136:688-96
16. The ISTHMUS Investigators. The Italian study on the Mitroflow postoperative results (ISTHMUS): a 20-year, multicentre evaluation of Mitroflow pericardial bioprosthesis. Eur J Cardiothoracic Surg. 2011;39:18-26
17. Herijgers P, De Praetere H, et al. Anticalcification Treatments of Bioprosthetic Pericardial Heart Valve Tissue: a Comparative Experimental Study. Poster presented at the 64th European Society for Cardiovascular and Endovascular Surgery (ESCVS), Istanbul, March 26-29, 2015
18. Pibarot P, Dumesnil JG, et al. Prosthetic heart valves: Selection of the optimal prosthesis and long-term management. Circulation. 2009;119(7):1034-48
19. Ryomoto M, Mitsuno M, et al. Is physiologic annular dynamics preserved after mitral valve repair with rigid or semirigid ring? Ann Thorac Surg. 2014; Feb;97(2):492-8
20. Nishi H, Toda K, et al. Annular dynamics after mitral valve repair with different prosthetic rings: A real-time three-dimensional transesophageal echocardiography study. Circulation. 2013 Nov 26;128(22 Supplement):A16940
21. Wan S, Lee AP, et al. The choice of mitral annuloplastic ring – beyond "surgeon´s preference." Ann Cardiothorac Surg. 2015;4(3):261-5
22. Wollersheim LW, Li WW, et al. Stentless versus stented aortic valve replacement in the small aortic root. Seminars in Thoracic and Cardiovasc surg 2016 (in press)
23. Santarpino G, Pfeiffer S, et al. First-in-man implantation of a Sorin Memo 3D ring: mitral annular flexibility is still preserved at 5 years of follow-up! Int J Cardiol. 2012;23;159(2):e23-4
24. Glauber M, Ferrarini M, et al. Minimally invasive mitral valve repair using a semi-rigid annuloplasty ring with a new chordal sizing system: the Memo3D ReChord. Ann Cardiothorac Surg. 2015;4(3):298-300
25. Carrier M, Pellerin M, et al. Fifteen years of clinical and echocardiographic follow up with the carbomedics heart valve. J Heart Valve Dis. 2006;15(1):67-72
26. Kang CH, Ahn H, et al. Long-term result of 1144 Carbomedics mechanical valve implantations. Ann Thorac Surg. 2005;79(6):1939-44
27. Tominaga R, Kurisu K, et al. A 10-year experience with the Carbomedics cardiac prosthesis. Ann Thorac Surg. 2005;79(3):784-9
28. Aagaard J, Tingleff J, et al. Fifteen years' clinical experience with the CarboMedics prosthetic heart valve. J Heart Valve Dis. 2005;14(1):82-8
29. Kuwaki K, Tsukamoto M, et al. Ten year clinical experience with the CarboMedics heart valve implants. Artif Organs. 2002;26(8):695-702
30. Onoda K, Suzuki T, et al. Long-term results of valve replacement with the CarboMedics prosthetic heart valve. Artif Organs. 2002;26(5):479-82
31. Bouchard D, Mazine A, et al. Twenty-year experience with the CarboMedics mechanical valve prosthesis. Ann Thorac Surg. 2014;97:816-23

Cardiac | Focus Session | Bioprosthetic valve durability: also for younger patients?

What's the evidence on valve durability for elderly and younger patients nowadays?

Thierry Bourguignon
Tours University Hospital, France

The use of bioprostheses has increased considerably in the two last decades and has led to a substantial reduction of mechanical valve implantations.[1] This trend may be explained by an increasing number of studies reporting improved long-term durability of more recent tissue valve models.

What is valve durability?

Although the authors of most studies use the definition of structural valve deterioration (SVD) mentioned in the 2008 Guidelines for Reporting Morbidity and Mortality after Cardiac Valve Intervention, i.e. "dysfunction or deterioration involving the operated valve (exclusive of infection and thrombosis), as determined by reoperation, autopsy or clinical investigation,"[2], there is no doubt that this definition is imprecise. Deterioration is not reoperation and one should probably prefer a definition of SVD based on strict echocardiographic criteria.[3]

The elderly

After the age of 60 in aortic position and 65 in mitral position, the use of bioprostheses seems to generate consensus and now represents 75% of valve implants.[1] We, like others, reported excellent very long-term outcomes using pericardial bovine bioprostheses in more than 3,000 elderly patients. Actuarial freedom from SVD at 15 and 20 years were respectively 77.7±3.4% and 53.0±8.0% in aortic position[3], and 62.5±7.3% and 29.6±14.6% in mitral position.

Expected valve durability, calculated from the median survival time without SVD, was thus longer than 18 years in aortic position and around 16 years in mitral position.

Excellent results in the elderly were also reported with porcine aortic bioprostheses, with a 20-year actuarial freedom from SVD of 85.2±3.7% in patients aged 60 to 70, and 99.8±0.2% in patients older than 70.[4]

Younger patients

Biologic valve replacement in patients younger than 60 years remains controversial. Despite the fact that bioprostheses are increasingly used in younger patients, there remains little data on the incidence of SVD and need for reoperation in this population.

As others have[4], we found age at implant was a significant risk factor for SVD. For patients aged 60 years or younger at implantation, we found that the expected valve durability of pericardial bioprostheses remained above 17 years in aortic position.[3] Freedom from SVD at 15 and 20 years was 66.8±4.2% and 37.2±5.4%, respectively. In patients younger than 65 undergoing mitral valve replacement with a pericardial bioprosthesis, actuarial freedom from SVD at 15 and 20 years were respectively 47.3±6.5% and 19.1±7.0%. Expected valve durability was 14.2 years for this age group.[5]

In the interest of a balanced interpretation though, it should be remembered that the decision to implant a bioprosthesis in young patients is made due to a combination of factors. In this age group, comorbidity may play a role on survival more important than age or the valve itself, underlying the importance of selection of patients.

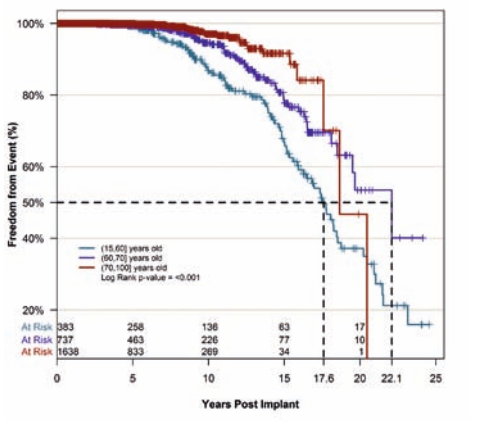


Figure1 Actuarial freedom from aortic pericardial bioprosthesis explant due to SVD by age group

Conclusion

While the use of bioprostheses seems to generate consensus after the age of 60 in aortic position and after the age of 65 in mitral position, tissue-valve replacement remains controversial in young patients because of increased risk of reoperation. However, even if literature concerning valve durability in young patients is scarce, low operative risk now reported for isolated redo AVR and the perspective of transcatheter valve implantations in deteriorated bioprostheses may extend the indications of tissue-valves.

References

1. Isaacs AJ et al. National trends in utilization and in-hospital outcomes of mechanical versus bioprosthetic aortic valve replacements. J Thorac Cardiovasc Surg. 2015 May;149(5):1262–3.
2. Akins CW et al. Guidelines for reporting mortality and morbidity after cardiac valve interventions. J Thorac Cardiovasc Surg. 2008 Apr;135(4):732–8.
3. Bourguignon T et al. Very long-term outcomes of the Carpentier-Edwards Perimount valve in aortic position. Ann Thorac Surg. 2015 Mar;99(3):831–7.
4. David TE et al. Hancock II Bioprosthesis for Aortic Valve Replacement: The Gold Standard of Bioprosthetic Valves Durability? Ann Thorac Surg. 2010 Sep;90(3):775–81.
5. Bourguignon T et al. Very late outcomes for mitral valve replacement with the Carpentier-Edwards pericardial bioprosthesis: 25-year follow-up of 450 implantations. J Thorac Cardiovasc Surg. 2014 Nov;148(5):2004–11.ww

EACTS 2016 **Agenda**

Saturday 1 October

Techno College

08:00	Aortic valve	Forum	Cardiac
10:30	Atrioventricular valve 1	Forum	Cardiac
13:15	Aorta, Ablation, and Assist devices	Forum	Cardiac
15:10	Atrioventricular valve 2	Forum	Cardiac
09:00	Beyond conventional video assisted thoracic surgery: Part 1	113	Thoracic
13:30	Beyond conventional video assisted thoracic surgery: Part 2	113	Thoracic

Wetlab

14:00	Valve sparing aortic root replacement	114	Congenital

Sunday 2 October

Professional Challenge

08:15	EACTS/STS – Acute type A dissection	113	Vascular
10:00	EACTS/STS – Type B aortic dissection	113	Vascular

Focus Session

08:15	Latest trials in cardiovascular medicine	116 & 117	Cardiac
08:15	Perfusion – Session 1	115	Cardiac
09:45	TAVR versus SAVR: David and Goliath	116 & 117	Cardiac
08:15	State of the art in airway and esophageal endoluminal therapy	131 & 132	Thoracic
08:15	Basic science: Thoracic	120 & 121	Thoracic
08:15	Failing Fontan	111	Congenital
09:00	Allied Health Professionals Programme – Pain	133 & 134	All Domains
10:00	Perfusion – Session 2	115	Cardiac
10:00	When strategy fails – Case based	112	Cardiac
10:00	Training in cardiothoracic surgery	118 & 119	Cardiac
10:00	Meet the experts – nightmare/complicated cases	111	Congenital
10:00	Neuroendocrine lung tumours: where do we stand?	131 & 132	Thoracic
10:00	Allied Health Professionals Programme – Innovation	133 & 134	All Domains
10:30	QUIP Adult Database: Present and Future	120 & 121	All Domains
10:45	Allied Health Professionals Programme – Nursing	133 & 134	All Domains
13:30	Perfusion – Session 3	115	Cardiac
13:30	Latest news and research on treatment of aortic valve stenosis	112	Cardiac
13:30	Treatment of patients with bicuspid aortic valves	118 & 119	Cardiac
13:30	Basic Science – Cardiac	120 & 121	Cardiac
13:30	Oncology tumour board	131 & 132	Thoracic
13:30	Allied Health Professionals Programme – Abstracts	133 & 134	All Domains
15:15	Expanding indications for transcatheter heart valves	116 & 117	Cardiac
15:15	Monitoring Quality in Your Unit: State of the Art	112	Cardiac
15:15	Surgery for advanced infectious disease	131 & 132	Thoracic
15:15	Allied Health Professionals Programme – Closing the day	133 & 134	All Domains
15:15	Balancing a surgical career with a family	114	All Domains

Abstract Session

08:15	Young Investigator Awards	212	Cardiac
13:30	Surgical videos	111	Congenital
13:30	Defining good outcomes after aortic root surgery	113	Vascular
15:15	Arch and descending aortic pathology	113	Vascular

Abstract Rapid Response

15:15	Congenital Rapid Response – Miscellaneous	211	Congenital
15:15	Trends in Aortic valve replacement	212	Cardiac

Training in Research Session

08:15	Preparing your scientific breakthrough: from abstract to paper	122 & 123	All Domains
13:30	Statistics from scratch: finding your way through the forest of options…	122 & 123	All Domains

Plenary

11:45	The whole is greater than the sum of its parts: a strong team for a better outcome	116 & 117	Plenary

Competition

13:30	Jeopardy Competition Round 1	212	Competition

Monday 3 October

Professional Challenge

08:15	Wire skills transcatheter aortic valve implantation	116 & 117	Cardiac
14:15	Rhythm Surgery in the upcoming decade	112	Cardiac

Focus Session

08:15	Personalized revascularization strategies	115	Cardiac
08:15	Aortic valve repair – When and how	114	Cardiac
08:15	Evidence based decision making in aortic valve surgery	112	Cardiac
08:15	Joint Session EACTS SBCCV PASCaTS – Cardiac surgery in underserved regions	120 & 121	Cardiac
08:15	Update on thymic surgery	129 & 130	Thoracic
08:15	The aorta and the bicuspid valve	113	Vascular
10:15	Robotics revisited	122 & 123	Cardiac
10:15	The future of early stage non-small cell lung cancer	129 & 130	Thoracic
10:15	Repairing a bicuspid valve	113	Vascular
10:15	Nightmares in cardiothoracic surgery	115	All Domains
10:15	Your educational pathway in surgery: how can EACTS help you?	118 & 119	All Domains
10:15	How can we work together? Latin America, Africa and Asia Perspective	120 & 121	All Domains
14:15	Mitral valve repair beyond P2	116 & 117	Cardiac
14:15	Hypertrophic obstructive cardiomyopathy revisited	115	Cardiac
14:15	How to – video session 1	113	Vascular
16:00	Minimally invasive aortic valve replacement – How to do it right in all patients	118 & 119	Cardiac
16:00	Diaphramatic disease	129 & 130	Thoracic
16:00	Thoracic and thoraco-abdominal aneurysms treatment: Surgery after thoracic endovascular aortic repair and thoracic endovascular aortic repair after surgery	113	Vascular
16:00	Meet the experts	122 & 123	All Domains

Abstract Session

08:15	Extra corporeal circulation/Left ventricular assist device/ Transplantation 1	133 & 134	Cardiac
08:15	Univentricular heart – Fontan	111	Congenital
08:15	Oncology I	131 & 132	Thoracic
08:15	Work in progress	122 & 123	All Domains
10:15	Coronary artery bypass graft and percutaneous coronary intervention	114	Cardiac
10:15	Endocarditis	112	Cardiac
10:15	Extra corporeal circulation/Left ventricular assist device/ Transplantation 2	133 & 134	Cardiac
10:15	Basic science and lung transplantation	131 & 132	Thoracic
10:15	Hypoplastic left heart syndrome	111	Congenital
14:15	Transcatheter aortic valve implantation	114	Cardiac

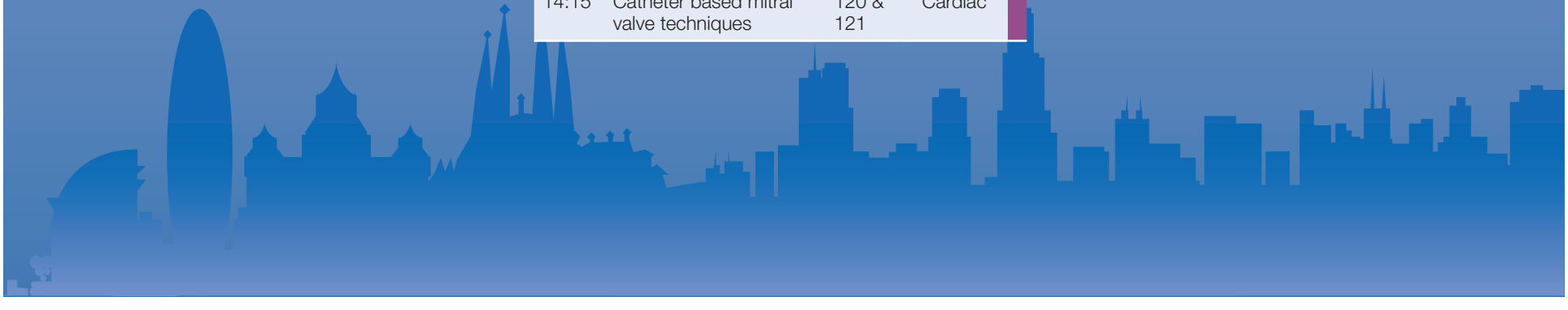
14:15	Blood management	133 & 134	Cardiac
14:15	Oesophagus	131 & 132	Thoracic
14:15	VATS lobectomy	129 & 130	Thoracic
14:15	Congenital miscellaneous 1	111	Congenital
16:00	Improving outcomes in hypertrophic obstructive cardiomyopathy (HOCM)	115	Cardiac
16:00	Translational vascular biology	133 & 134	Cardiac
16:00	Regeneration – Preservation	120 & 121	Cardiac
16:00	Congenital miscellaneous 2	111	Congenital
	Abstract Rapid Response		
08:15	Minimising sternal wound complication	211	Cardiac
08:15	Type A Aortic dissection from research to clinical application	212	Vascular
10:15	Cardiac General	211	Cardiac
10:15	An update on mitral valve interventions	212	Cardiac
14:15	Developments in assist devices and transplantation	211	Cardiac
16:00	Adult Cardiac	211	Cardiac
16:00	Thoracic	212	Thoracic
	Training in Research Session		
08:15	How to perform more advanced statistics: basics and pitfalls	118 & 119	All Domains
14:15	Meta-analysis from start to finish	118 & 119	All Domains
	Plenary		
11:50	Presidential Address	116 & 117	Plenary
	Competition		
14:15	Jeopardy Final	212	Competition

Tuesday 4 October

	Professional Challenge		
08:15	Fighting infection in cardiac surgery	116 & 117	Cardiac
08:15	Management of coarctation in newborn and infants	111	Congenital
10:15	Management of aortic arch obstruction beyond infancy	111	Congenital
	Focus Session		
08:15	Bioprosthetic valve durability: also for younger patients?	115	Cardiac
08:15	Atrial fibrillation and management of the left atrial appendage	114	Cardiac
08:15	Experimental models for basic research in thoracic surgery	129 & 130	Thoracic
08:15	Translational regenerative medicine for cardio-thoracic surgeons	118 & 119	Cardiac
08:15	Bicuspid aortic valve and its challenges	122 & 123	Cardiac
08:15	Connective tissue disorders and aortic disease: New frontiers in diagnosis and management	113	Vascular
10:15	Late tricuspid regurgitation after previous mitral valve surgery	115	Cardiac
10:15	Improving outcome of left ventricle assist device therapy	120 & 121	Cardiac
10:15	Interdisciplinary maximally invasive thoracic surgery	131 & 132	Thoracic
10:15	Arch surgery: Towards a low mortality and low complications rate	113	Vascular
10:15	Simulation based training	122 & 123	All Domains
14:15	People skills for surgeons	116 & 117	Cardiac
14:15	Designing a valve centre of excellence; not just numbers!	113	Cardiac
14:15	Electrophysiology and the surgeon	112	Cardiac
14:15	Pro and Cons debates	122 & 123	All Domains
16:00	From cardiac surgery guidelines to aircrew licensing regulations	133 & 134	Cardiac
16:00	Future surgical approach for routine anatomical lung resections	131 & 132	Thoracic
16:00	Endovascular competence for the cardiac surgeon. Keeping in track.	113	Vascular
16:00	EACTS publications: Best papers	211	All Domains
	Abstract Session		
08:15	Tricuspid valve – repair and replacement	112	Cardiac
08:15	Mesothelioma	131 & 132	Thoracic
10:15	Transcatheter aortic valve implantation 2	118 & 119	Cardiac
10:15	Stand-alone and concomitant MAZE is an evidence based procedure	114	Cardiac
10:15	Coronary artery bypass graft: From start to finish	112	Cardiac
10:15	Functional mitral insufficiency	133 & 134	Cardiac
10:15	Non-oncology	129 & 130	Thoracic
14:15	Coronary artery bypass graft: Minimally invasive and hybrid revascularisation	115	Cardiac
14:15	Who will do well after aortic valve replacement?	114	Cardiac
14:15	Catheter based mitral valve techniques	120 & 121	Cardiac
14:15	Chest wall and mediastinum	131 & 132	Thoracic
14:15	Valves	111	Congenital
16:00	Complications in mitral valve surgery	116 & 117	Cardiac
16:00	Tissue repair and myocardial homestasis	114	Cardiac
16:00	Aortic valve replacement – rapid deployment valves	112	Cardiac
16:00	Oncology 2	129 & 130	Thoracic
16:00	Tetralogy of Fallot / pulmonary atresia	111	Congenital
	Abstract Rapid Response		
08:15	Coronary artery bypass graft: Decreasing complications & improving graft potency	211	Cardiac
10:15	Risk modelling and scoring systems in cardiac surgery	212	Cardiac
14:15	Thoracic	212	Thoracic
14:15	The old, the new, the evident in aortic surgery	211	Vascular
16:00	Beyond lines and clips	212	Cardiac
	Training in Research Session		
08:15	Starting a trial: what you must know	120 & 121	All Domains
14:15	Interpreting randomized trial data	118 & 119	All Domains
	Plenary		
11:50	Honoured Guest Lecture	116 & 117	Plenary
	Resident's luncheon		
12:30	Resident's luncheon – The force awakens: training of the new Jedi	Banquet Hall 1	All Domains

Wednesday 5 October

	Advanced Techniques		
09:00	Controversies and catastrophes in Adult Cardiac Surgery	122 & 123	Cardiac
09:00	Multiple arterial grafting: vhow I do it	133 & 134	Cardiac
09:00	A future without suture: where we stand?	112	Cardiac
09:00	How to do it, with live in box?	127 & 128	All Domains
	Abstract Session		
09:00	Video & Case Study 1	129 & 130	Thoracic
11:00	Video & Case Study 2	129 & 130	Thoracic
	Wetlab		
09:00	Mitral Valve Repair	111	Cardiac
09:00	Thoracic	131 & 132	Thoracic
09:00	Aortic Valve Repair	118 & 119	Vascular
11:00	Thoracic	131 & 132	Thoracic



30 years for EACTS!

The EACTS is celebrating its 30th year anniversary. The founders had a clear mission which was expressed by Francis Fontan in 1987 in Vienna during his Presidential Address: to pool enthusiasm, dynamism and skills. They wanted the European National Societies to work together.

These goals, over the last 30 years, have been very well accomplished. EACTS is now one of the leading societies in the field of cardiothoracic surgery. During each annual meeting, surgeons and industry from all around the world consider this meeting as the most attractive, which of course is reflected in the high attendance rate. What are the reasons for this success? First I think EACTS has a strong leadership in its enthusiastic European surgeons, but in addition, the office in Windsor, UK provides a strong basis and organises many on-site courses.

Besides the regular meeting, an extra day for new technologies is hosted, both for cardiac and thoracic teaching. This "Techno College" is extremely attractive by itself. What's more, let me highlight the important new activities of EACTS which of course are presented during the meeting:

- ONLINE LEARNING through the *MMCTS* electronic textbook, including video demonstrations of how to perform a surgical procedure
- Advanced Training Courses at the Windsor Academy, and in accredited centres of excellence; Database development and risk score analyses with QUIP Database and Euromacs, and development of a portfolio that residents can use to track their training

Furthermore, there is an increase of educational activities in underserved regions worldwide in cooperation with other international societies. Finally, we have activated the programme for the young generation: The Residents Club has become the podium for an independent program during the meeting and they even have their own lounge for better communication.

With all these actions we follow the ideas of the founding members, and look faithfully into the future.

FW Mohr
President of EACTS

"[Our] goals, over the last 30 years, have been very well accomplished. EACTS is now one of the leading societies in the field of cardiothoracic surgery."

Friedrich Wilhelm Mohr

30th Anniversary Celebratory Evening

Join us in celebrating 30 years of EACTS from 19.30-24.00 on Tuesday 4 October. To mark the decade in which EACTS was founded we are holding a special 80s themed evening at the Museu Nacional d'Art de Catalunya (MNAC). A full programme of entertainment is planned, including dancing to the EACTS House Band. 80s dress is encouraged with a prize for the best outfit! Admission is by invitation only and must be purchased in advance at €90 per person (subject to availability).

EACTS
European Association For Cardio-Thoracic Surgery

31st EACTS
Annual Meeting
Vienna, Austria
7 - 11 October 2017

Deadline for Abstracts - 30 April 2017

To find out more or to register for the event visit:

www.eacts.org

Raising Standards through Education and Training

Cardiac | Abstract Session | Functional mitral insufficiency

Beneficial effects of restrictive annuloplasty on subvalvular geometry in patients with functional mitral regurgitation and advanced cardiomyopathy

Satoshi Kainuma[1], Toshihiro Funatsu[1], Koichi Toda[1], Haruhiko Kondoh[1], Hajime Matsue[1], Takenori Yokota[1], Yasuhiro Shudo[1], Shusaku Maeda[1], Takashi Daimon[2], Masami Nishino[1], Naoki Kimura[1], Minako Furukawa[1], Yuji Masaki[1], Shin-ichi Fujita[1], Yoshiki Sawa[3], and Kazuhiro Taniguchi[1] 1 Japan Organisation of Occupational Health and Safety Osaka Rosai Hospital, Sakai, Osaka, Japan; 2 Hyogo College of Medicine, Nishinomiya, Hyogo, Japan; 3 Department of Cardiovascular Surgery, Osaka University Graduate School of Medicine, Suita, Osaka, Japan

Objectives

It remains unclear whether and to what extent restrictive mitral annuloplasty (RMA) without subvalvular intervention relieves subvalvular leaflet tethering, the main mechanism of functional mitral regurgitation (MR). We evaluated changes in left ventricular (LV) function, MR severity and leaflet tethering parameters after RMA in patients with clinically relevant functional MR and clarified their associations.

Methods

In 44 patients who underwent RMA utilising a complete annuloplasty ring and 12 controls, annular anteroposterior (AP) and commissure-commissure (C-C) diameters, tenting height, tenting area, leaflet coaptation length, distances between papillary muscle (PM) tips and anterior mitral annulus (PM-tethering distance), leaflet angles relative to lines connecting annuli, and interpapillary muscle distance (IPMD) at end-systole were quantified before, 1 month after, and late (66±37 months) after surgery.

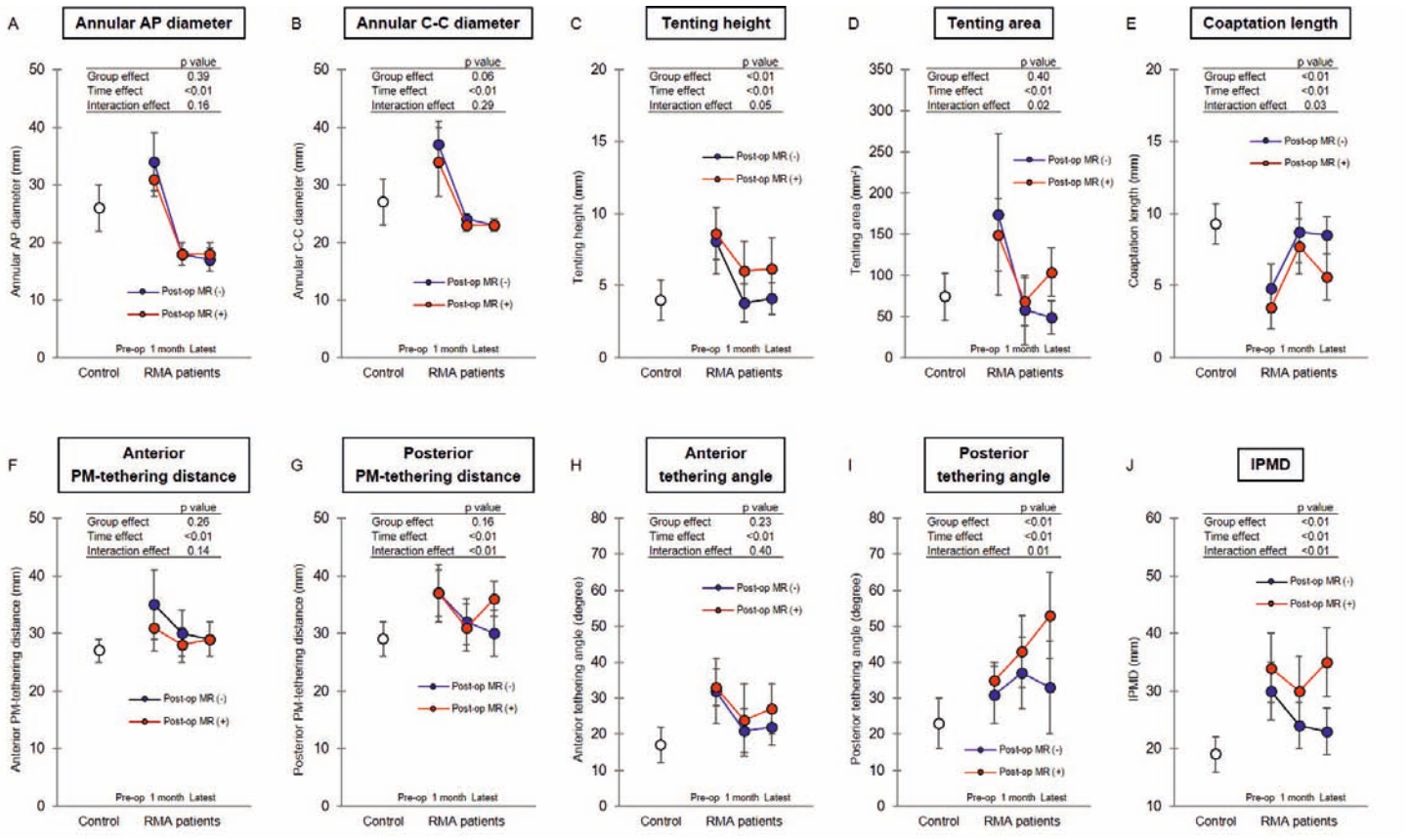


Figure. A comparison of 44 RMA patients with 12 controls. Annular anteroposterior (AP) and commissure-commissure (C-C) diameters, tenting height, tenting area, leaflet coaptation length, distances between papillary muscle (PM) tips and anterior mitral annulus (PM-tethering distance), leaflet angles relative to lines connecting annuli, and interpapillary muscle distance (IPMD) at end-systole were quantified before, 1 month after, and late (66±37 months) after surgery

Results

Early after surgery, LV function and MR severity improved, accompanied with increased coaptation length (4.5±1.7 to 8.5±2.1 mm) and decreased tenting height (8.2±2.2 to 4.4±1.8 mm) and tenting area (168±87 to 61±39 mm2). The anterior (34±5 to 30±4 mm) and posterior PM-tethering distance (37±4 to 32±4 mm), anterior leaflet angle (32±8 to 22±7 degrees), and IPMD (31±6 to 25±5 mm) were decreased, while these variables remained abnormal and the posterior leaflet angle was increased (34±8 to 48±14 degrees) ($p<0.01$ for all). Patients with late MR ≥ moderate grade (n=11) showed worsened tethering with less LV function recovery, while those without it (n=33) restored subvalvular geometry with reverse LV remodeling, with no significant differences in the annular AP and C-C diameters (see Figure). Multivariate analysis showed that the change in the IPMD had the most important contribution to change in the MR severity (standardised partial regression coefficient [SPRC]=0.39, $p<0.01$), followed by change in the coaptation length (SPRC=-0.32, $p<0.01$). In addition, the IPMD change was independently correlated with change in the LV end-systolic dimension (SPRC=0.46, $p<0.001$), while not with the posterior leaflet angle change ($\rho=0.26$, $p=0.065$).

Conclusions

The present results suggest that RMA procedure partially relieved leaflet tethering, evidenced by decreased tenting area, tethering distances and IPMD; the latter was the main determinant of MR. These beneficial effects might be mainly attributed to post-RMA reverse LV remodelling, independently of augmented posterior tethering angle.

Cardiac | Abstract Session | Tissue repair and myocardial homeostasis

Metabolomic profiling in patients undergoing Off-Pump or On-Pump coronary artery bypass surgery

H. M. Kirov, M. Schwarzer, S. Neugebauer, G. Faerber, M. Diab and T. Doenst Jena University Hospital, Germany. Integrated Research and Treatment Center, Center for Sepsis Control and Care (CSCC), Jena, Germany

Recent studies have shown that specific metabolic profiles may independently predict adverse events after coronary artery bypass grafting (CABG)[1] or in heart failure patients[2]. While these investigations addressed the metabolic signatures either before and/or after the surgical procedure, the direct impact of cardiopulmonary bypass (CPB) surgery has thus far not been addressed. CPB has been implicated with a plethora of alterations and changes in many systems of the human organism[3]. CABG without cardiopulmonary bypass (Off-Pump) has been one area in which surgeons have tried to avoid the potentially detrimental effects of cardiopulmonary bypass (On-Pump). However, the controversial benefits and risks of Off-Pump compared to On-Pump CABG are still a subject of ongoing discussion[4].

In the present study, Kirov et al. hypothesised that patients undergoing CABG On-Pump and those operated Off-Pump would show substantial differences in their plasma

metabolomic profile using targeted metabolomic analysis. The investigators assessed five analyte classes (41 acylcarnitines, 14 amino acids, 92 glycerophospholipids, 15 sphingolipids, sugars, lactate) using a mass-spectrometry-based kit in paired arterial and coronary sinus blood obtained from 10 consecutive On-Pump and 10 Off-Pump patients. Cardioplegia for On-Pump was warm blood Calafiore. On-Pump outcomes were corrected for hemodilution through crystalloid priming.

Demographic data were equal in both groups with normal ejection fraction, renal and liver function. Patients received 2.25±0.64 bypass grafts. All postoperative courses were uneventful. One would expect that establishing cardiopulmonary bypass leads to major changes in the metabolic composition of the blood. However, the overall changes observed were rather minor. Less than 10% of metabolites were altered. There were more long-chain acylcarnitines Off-Pump and more short-chain acylcarnitines On-Pump. Glycerophospholipids showed lower concentrations On-Pump and arginine (as the only different amino acid) Off-Pump. Interestingly, plasma arginine (nitric oxide precursor) concentration at the end of surgery correlated inversely with postoperative vasopressor need ($r=-0.7$; $p<0.001$; Figure 1). Assessing arterial/venous differences revealed phosphatidylcholine-production and acylcarnitine-consumption. These findings were unaffected by cardiopulmonary bypass, cardioplegia or temporary vessel occlusion during Off-Pump surgery.

The authors conclude that cardiopulmonary bypass and warm blood cardioplegia cause only minor changes to the metabolomic profile of patients undergoing bypass surgery and that acylcarnitines are elevated in both Off-Pump and On-Pump, but chain lengths differ. Furthermore they show a significant correlation between arterial arginine concentration at the end of surgery and postoperative vasopressor needs in the immediately following time period in the intensive care unit.

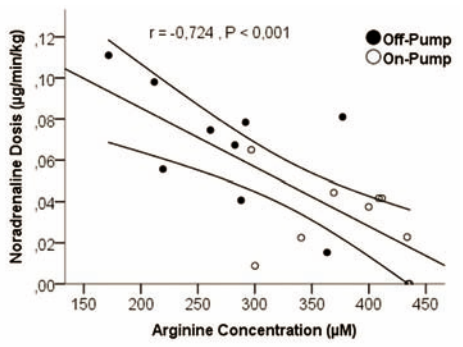


Figure 1. Pearson correlation between postoperative noradrenaline doses and arterial arginine concentration measured at the time of the last distal anastomosis in the On-Pump and Off-Pump group including regression line and 95% confidence interval.

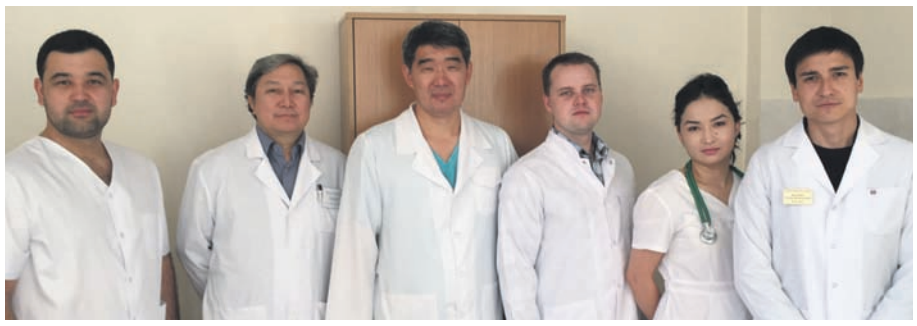
References

1. Shah AA et al. Metabolic profiles predict adverse events after coronary artery bypass grafting. The Journal of thoracic and cardiovascular surgery 2012;143:873-8.
2. Ahmad T et al. Prognostic Implications of Long-Chain Acylcarnitines in Heart Failure and Reversibility With Mechanical Circulatory Support. Journal of the American College of Cardiology 2016;67:291-99.
3. Murphy GJ, Angelini GD. Side effects of cardiopulmonary bypass: What is the reality? J Cardiac Surg 2004;19:481-88.
4. Doenst T et al. Cardiac surgery 2014 reviewed. Clin Res Cardiol 2015;104:1006-20.

Thoacic | Abstract Session | Non-oncology

Surgical treatment of bilateral pulmonary echinococcosis

Shirtaev BK, Sundetov MM, Kassenbayev RZh, Voronin DS National Scientific Center of Surgery, Almaty, Republic of Kazakhstan



The National Scientific Surgery Center of Almaty, Kazakhstan, was established in 1945 on the base of the Military Hospital. Since then, in the department of thoracic surgery, operations have been carried out in both children and adults.

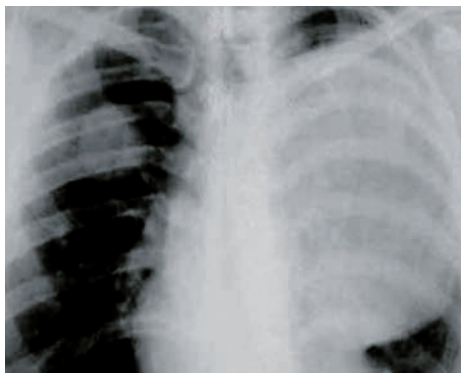
Over the past 20 years at our centre, we have operated upon a total of 638 patients with lung echinococcosis. Of these, 92 patients had hydatid cysts of both lungs and, depending on the overall condition of the patient, we have adhered to the tactic of either staged or single-stage surgery. For 33 patients (34.8%), we performed staged thoracotomy-echinococcectomy with a 3-4-week interval. 62 patients (65.2%) underwent single-stage bilateral echinococcectomy. In 23 cases, we performed one-stage bilateral thoracotomy with echinococcectomy, with surgery beginning on the side where large cysts or potential complications were present.

In bilateral lung echinococcosis with hydatid cysts located in the upper lobe and in any part of the other lung, we carry out a one-sided lateral thoracotomy, and the hydatid cyst is removed from one lung. We then perform a resection of the retrosternal mediastinal pleura; by this approach, we perform echinococcectomy of the cyst of the upper lobe of the other lung. Then the two pleural cavities are drained using two drainage tubes; the first is placed in the pleural cavity on the side of the thoracotomy; the second goes through the mediastinal approach to other pleural cavity, with the tube exiting through the chest wall on the side of the thoracotomy.

The advantage of this single-stage bilateral echinococcectomy using a transmediastinal approach is that it reduces cosmetic defects and reduces pain.

Since 1996, we have performed video-thoracoscopic echinococcectomy. The indications for this technique are: (1) cortical and subcortical located cysts; (2) small and medium-sized cysts; and (3) unilateral and bilateral cases, both uncomplicated and complicated. In 28 patients, we performed a single-stage sequential bilateral videothoracoscopic echinococcectomy of the lungs.

In conclusion, the single-stage surgical treatment of bilateral lung echinococcosis using a retrosternal mediastinal approach and a video-thoracoscopic technique can reduce trauma as a result of the operation, shorten the duration of treatment, and relieve patients of both the anxious wait in between surgical stages and repeated anaesthesia.



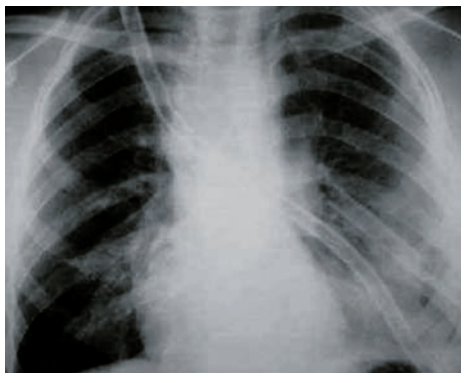
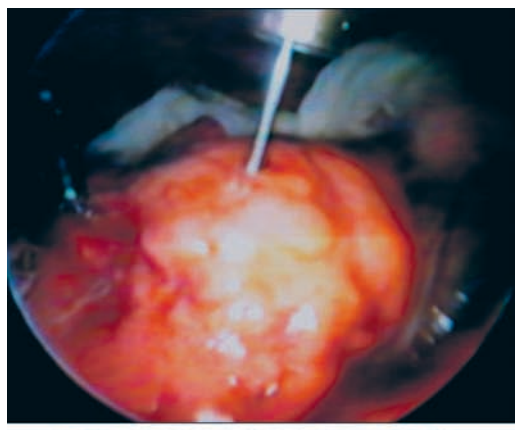
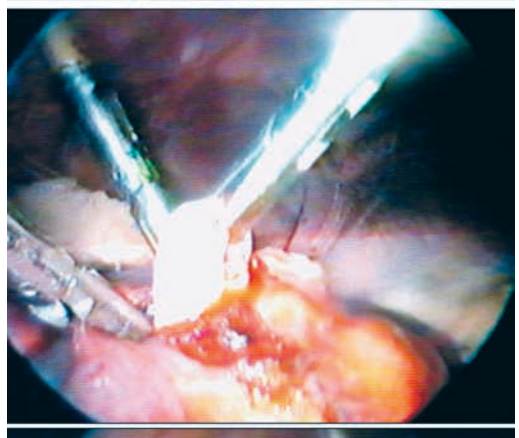


Figure 1. X-ray of bilateral lung echinococcosis before (left) and after (right) the single-stage bilateral echinococcectomy using a transmediastinal approach.





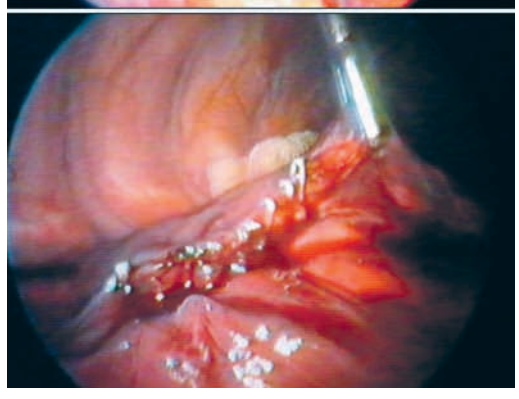


Figure 2. Stages of videothoracoscopic echinococcectomy with clipping cyst bed after irrigation with 10% povidone-iodine

Cardiac | Rapid Response | Coronary artery bypass graft: Decreasing complications and improving graft potency

Graft patency following coronary artery bypass grafting: a review between the left and right coronary artery systems and arterial and venous grafts

Ana-Catarina Pinho-Gomes and David P Taggart Oxford University Hospitals NHS Trust, Oxford, United Kingdom

Despite the long history of coronary artery bypass surgery, little is known about bypass graft fate between the left and right coronary artery systems, which are considerably different with regards to anatomy and physiology. Yet this is an important question because the effectiveness of coronary artery bypass surgery relies above all on long-term maintenance of stable graft patency. [1,2] Therefore, we conducted the first study comparing the fate of grafts anastomosed to the right coronary artery and left coronary artery territories, with a particular emphasis on the different behaviours of arterial and venous grafts.

Our literature review included a total of 53 studies for qualitative analysis, although only 49 of them provided data with enough detail to be included in the pooled analysis of graft patency. This resulted in an extraordinary analysis of 42,211 grafts in total (30,174 and 12,037 on the LCA and RCA systems, respectively). Although there were some methodological limitations imposed by the quality and quantity of data provided by the individual studies, any potential biases were likely diluted in that huge number of grafts.

Overall graft patency was significantly better for left-sided vessels, with a 4.2% higher patency than right-sided grafts (p=0.013). Furthermore, this difference seemed to be driven by the better performance of arterial grafts in the left coronary system, with an overall difference of 6.7% (p=0.002). In contrast, venous graft patency was similar irrespective of the coronary artery territory (p=0.628).

Evidence hitherto available suggests that graft patency following coronary artery bypass surgery depends on a complex interaction between multiple factors, which are related to the individual patient, the choice of grafts and surgical procedure and technique in general. Furthermore, the influence of different factors seems to vary over time and exert a distinct impact on arterial grafts when compared to venous grafts. This, together with the substantial physiological and morphological differences between the left and right coronary systems, precludes drawing definite conclusions about the underlying mechanisms of the lower graft patency that we demonstrated for right- versus left-sided grafts. Given the exploratory nature of this review, further research is warranted to confirm its findings and underpin potential strategies that may mitigate the poorer performance of arterial grafts on the right coronary artery territory and thus improve long-term outcomes of coronary artery bypass surgery.

References

1. Fitzgibbon GM et al. Coronary bypass graft fate and patient outcome: angiographic follow-up of 5,065 grafts related to survival and reoperation in 1,388 patients during 25 years. J Am Coll Cardiol. 1996;28:616–26.
2. Harskamp RE et al. Frequency and Predictors of Internal Mammary Artery Graft Failure and Subsequent Clinical Outcomes: Insights From the Project of Ex-vivo Vein Graft Engineering via Transfection (PREVENT) IV Trial. Circulation. 2016;133:131–8.

Congenital | Professional Challenge | Management of coarctation in newborn and infants

Modified reverse aortoplasty versus extended end-to-end anastomosis in surgery for coarctation of aorta: a prospective randomised study

Ilya Soynov, Igor Kornilov, Alexander Bogachev-Prokophiev and Alexander Karaskov Novosibirsk State Research Institute of Circulation Pathology, Siberia, Russia

The Paediatric Cardiac Surgery Department, Novosibirsk State Research Institute of Circulation Pathology, Siberia, Russia.

Currently there are different approaches to surgery for coarctation of aorta with distal aortic arch hypoplasia. One of the most preferable procedures is the modified reverse aortoplasty technique. This approach excludes the use of foreign materials, preserves the possibility of native aorta growth, and potentially reduces the rate of late complications.

We made a prospective randomised study of 54 neonates and infants with a mean age of 65.5 days (IQR 12; 94), with coarctation of the aorta and distal aortic arch hypoplasia. Patients were divided in two groups by surgical approach: modified reverse aortoplasty with subclavian flap (n=27), and extended 'end-to-end' anastomosis technique (n=27) (Figure 1).

There were 2 hospital deaths, 1 from each group, caused by the development of necrotising enterocolitis in low-weight immature neonates both. The follow-up period was 25 (21; 30) months. Recoarctation of the aorta developed in 1 (3.8%) case after modified reverse aortoplasty, and in 2 (7.7%) patients after extended anastomosis. The only risk of recoarctation evidenced was low weight (OR (95% CI) 0,016 (0.001-0.51), p=0.047). All cases of recoarctation were successfully treated by balloon angioplasty. The most common late complication was residual arterial hypertension that was developed in 2 (7.7%) patients in the reverse aortoplasty group, and in 8 (30.8%) patients in the 'end-to-end' anastomosis group (p=0.03) (Figure 2). Risk factors for arterial hypertension included endocardial fibroelastosis (OR (95% CI) 211.8 (4.4; 10.13), p=0.007) and precoarctation aortic wall rigidity (OR (95% CI) 28.5 (2.3; 3.42), p=0,032). We identified 2 cases (7.7%) of distal aortic arch aneurysm in the modified reverse aortoplasty group (p=0.15); risk factors haven't been established, but aneurysm in these cases was probably due to a weakness of the subclavian flap arterial wall (Figure 3).

Modified reverse aortoplasty with left subclavian artery flap allows for a reduced rate of residual arterial hypertension at mid-term follow up; however, the potential risk of distal aortic arch aneurysm requires further study.

Figure 1. Surgical technique: A – modified reverse aovrtoplasty with subclavian flap. B – extended 'end-to-end' anastomosis.

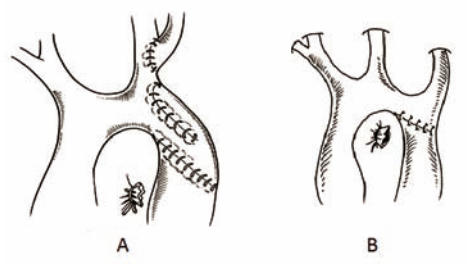


Figure 2. Kaplan-Meyer freedom from arterial hypertension (where EEA refers to extended 'end-to-end' anastomosis).

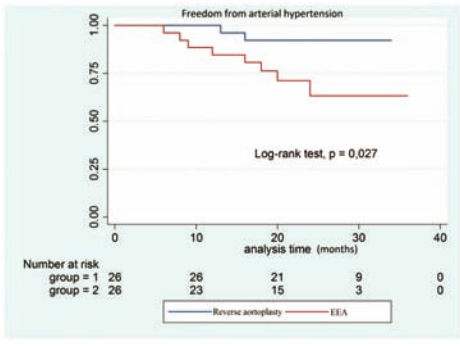
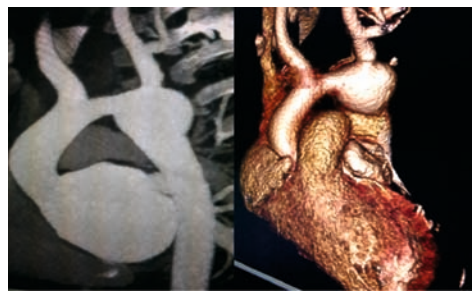


Figure 3. The aortic aneurysm after modified reverse aortoplasty with subclavian flap technique.



Thoracic | Abstract Session | Mesothelioma

Lung and diaphragm sparing surgery for early stage pleural mesothelioma

Pietro Bertoglio Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

The treatment of malignant pleural mesothelioma is still under debate, with the role of surgery uncertain. Lung sparing techniques are gaining increasing consensus among surgeons, because they allow the possibility of reduced postoperative complication rate with a similar oncological long term outcome. Nevertheless, there is no consensus regarding the treatment of early stage mesothelioma and results of publication are often inconsistent.

In the present study we report our 10-year experience using a lung and diaphragm sparing technique in conjunction with hyperthermic intrathoracic chemotherapy (HITHOC) in 26 early stage (IMIG stage I and II) mesothelioma. We performed a pleurectomy and focal decortication with a routinary sparing of diaphragm and pericardium; HITHOC was run using Cisplatin and Epirubicin for 60 minutes at a target temperature of 42.5°C.

Our approach is novel, because we aim to complete the possible macroscopic radicality of surgery (R1 or minimal R2) with a local chemotherapy, completely preserving the respiratory function. We observed a 46-month and 23-month overall survival for stages I and II respectively, and an 18-month and 16-month disease free interval respectively. No mortality was seen during the first 90 days after surgery, and the major postoperative complication rate was 30%.

Our results showed better long term outcome for stage I mesothelioma. These results were comparable for stage II when compared with other reported experiences using extrapleural pneumonectomy or extended pleurectoy and decortication, but we were able to achieve a much lower postoperative complication and mortality rate. Nevertheless, larger cohorts of patients are needed to confirm our results.

Our experience proposes a new and less invasive surgical approach for early stage mesothelioma, allowing for a total sparing of respiratory function and promising oncological long term outcomes.

Edwards Lifesciences

The COMMENCE Trial: Initial experience with a bioprosthetic aortic valve with the novel RESILIA tissue

John Puskas, MD John.Puskas@mountsinai.org
Department of Cardiovascular Surgery, Mount Sinai Beth Israel, New York, NY

Up to 2 year follow-up results with RESILIA, a novel bovine pericardial tissue for aortic valve replacement

I am pleased to report our results from the COMMENCE trial on behalf of study investigators. The COMMENCE trial is a prospectively designed, single arm trial evaluating the safety and efficacy of RESILIA tissue, a new class of bovine pericardial tissue for surgical aortic valve replacement (AVR). RESILIA tissue represents an important innovation featuring a novel preservation technology designed to reduce calcification, the primary mode of failure for surgical tissue valves. RESILIA tissue builds upon the well-established safety and effectiveness of PERIMOUNT bovine pericardial tissue and features stable-capping which permanently caps free aldehydes, a major source of tissue calcification. In addition, RESILIA tissue is preserved using glycerol, further preventing exposure to additional free aldehydes, and enabling dry storage.

A total of 689 patients across 27 sites were implanted with the study valve, an Edwards PERIMOUNT Magna Ease valve that incorporated RESILIA tissue. The mean age of COMMENCE patients was 67 years, including 21% of patients 59 years and younger. Safety endpoints and hemodynamic performance were evaluated by independent Clinical Events Committee and an Echocardiographic Core Lab, respectively. Isolated AVR procedures were performed in 59% of patients, while 41% of patients received concomitant procedures, including Coronary Artery Bypass Graft (CABG) procedures in 24% of patients.

Early results (<30 days) demonstrate an excellent safety profile with low mortality (1.2%), few thromboembolic events (2.2%), and 1 case of paravalvular leak requiring medical intervention (Major PVL, 0.1%). There were no early cases of valve thrombosis or endocarditis. With up to 2 years of follow-up, mortality was 2.7%/patient-year, thromboembolism was 3.1%/patient-year, and major PVL occurred was 0.2%. There were no cases of structural valve deterioration or valve thrombosis at follow-up.

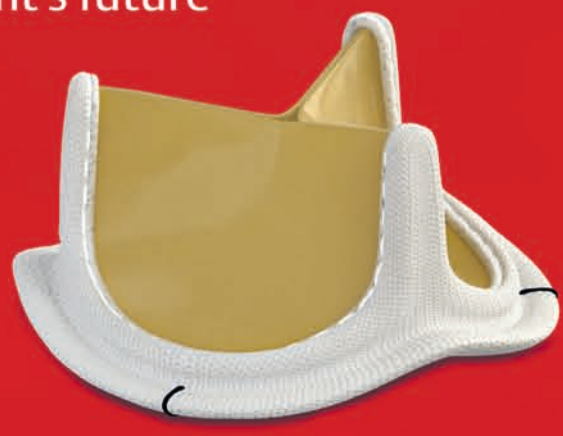
In addition, our results show good hemodynamic performance over time with a mean transvalvular gradient of 10.1±4.2mmHg and a mean Effective Orifice Area of 1.6±0.5 cm2 for all valve sizes. Additionally, improvement of symptoms, as measured by NYHA functional class, was observed 65.7% of patients.

The results of the COMMENCE trial indicate that the novel RESILIA tissue provides a safe and efficacious option for the treatment of aortic valve disease.

Thank you,
John D. Puskas, MD

INSPIRIS
RESILIA Aortic Valve

An ideal foundation
for your patient's future



Introducing the INSPIRIS RESILIA aortic valve – **the first product offering in a new class of resilient heart valves.**

Shouldn't your patients have a valve as resilient as they are?

Discover more at Edwards.com

For professional use. See instructions for use for full prescribing information, including indications, contraindications, warnings, precautions, and adverse events.

Edwards Lifesciences devices placed on the European market meeting the essential requirements referred to in Article 3 of the Medical Device Directive 93/42/ECC bear the CE marking of conformity.

Material for distribution only in countries with applicable health authority product registrations. Material not intended for distribution in USA or Japan. Indications, contraindications, warnings, and instructions for use can be found in the product labeling supplied with each device.

Edwards, Edwards Lifesciences, the stylized E logo, INSPIRIS, INSPIRIS RESILIA and RESILIA are trademarks of Edwards Lifesciences Corporation or its affiliates. All other trademarks are property of their respective owners.

© 2016 Edwards Lifesciences Corporation. All rights reserved. E6372/08-16/HVT PP--EU-0024 v1.0

Edwards Lifesciences • Route de l'Etraz 70, 1260 Nyon, Switzerland • edwards.com

Edwards

Thoracic | Rapid Response | Thoracic

Clinical benefit of comprehensive preoperative pulmonary rehabilitation including intensive nutritional support through an interdisciplinary team approach

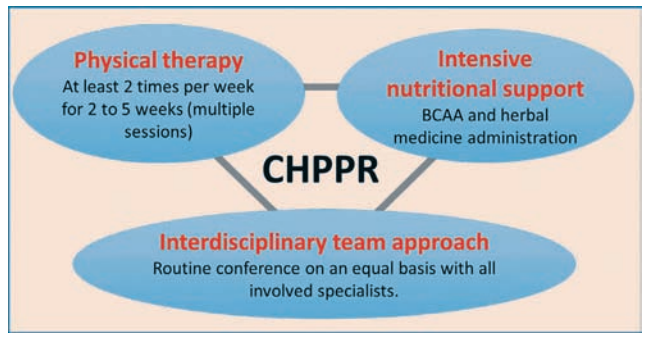
Hiroaki Harada NHO Kure Medical Center and Chugoku Cancer Center, Hiroshima, Japan

Since surgical resection is the treatment of choice for localized lung cancer, developing an effective strategy to reduce the risk of postoperative complications caused by insufficient preoperative preparation is important. Therefore, improving general and physical conditioning preoperatively should be considered essential for patients scheduled to undergo lung surgery. Pulmonary rehabilitation has been demonstrated to be a beneficial intervention for improving pulmonary conditions. However, the duration of a standard program has generally been 6-12 weeks. Thus, an effective, short-term, preoperative pulmonary rehabilitation program should be adopted, because patients with malignant disease should undergo surgery without delay.

Since June 2009, we have prospectively implemented a comprehensive preoperative pulmonary rehabilitation (CHPPR) program that includes 3 significant elements (Figure). The first element of the CHPPR program consists of multiple sessions of possibly high-intensity physical therapy and exercise (at least twice a week for 2 to 4 weeks), guided and assessed by physical therapists. The second element is intensive nutritional support with branched-chain amino acids and herbal medicine supplementation, guided and assessed by registered dieticians. Additionally, team conferences on an equal basis with all involved specialists, including doctors, physical therapists, dieticians, nurses, physiology laboratory technicians, and a clinical research coordinator, are held routinely to discuss efficient strategies for improving each patient's status; this interdisciplinary team approach is the third element of the CHPPR program.

From June 2009 to February 2016, 106 patients aged over 70 years underwent surgical resection for lung cancer at our hospital, and 106 of them underwent lobectomy. Of the 106, 78 underwent surgery after participating in the CHPPR program. 28 patients declined to participate. The assignment of patients was mainly based on their preference; therefore, this was not a randomized study.

There was no significant difference in patient characteristics and preoperative conditions between the CHPPR group and the non-CHPPR group. We defined morbidity as the ratio of patients who developed postoperative complications with grade 2 or higher in the Clavien-Dindo classification. The morbidity rates in the CHPPR group and in the non-CHPPR group were 14.1% and 35.7%, respectively (p=0.014). Severe postoperative complications occurred predominantly in the non-CHPPR group. Univariate logistic regression analysis showed that operative approach,



operative time, amount of blood loss, and CHPPR participation were statistically significant factors associated with morbidity (p=0.006, p=0.024, p=0.042, and p=0.018, respectively). Multivariate analysis revealed that CHPPR participation was an independent beneficial factor for reducing morbidity (p=0.004).

In conclusion, although this was not a randomized control study and the sample number was limited, the relatively short-term CHPPR protocol, which comprised 3 fundamental elements, appeared to have beneficial effects for elderly (over 70 years old) patients scheduled to undergo standard lobectomy for lung cancer.

Vascular | Rapid Response | The old, the new, the evident in aortic surgery

Impact of sarcopenia on the outcomes of elective total arch replacement in the elderly

Yuki Ikeno, Noriyuki Abe, Takashi Matsueda, Yoshikatsu Nomura, Hiroaki Takahashi, Takeshi Inoue, Hiroshi Tanaka and Yutaka Okita Kobe University, Kobe, Japan

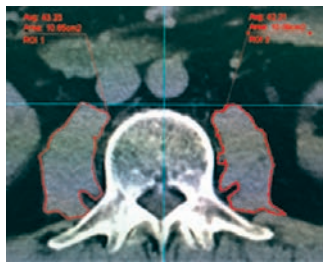


Figure 1. Measurement of psoas area index (PAI) at L3 level

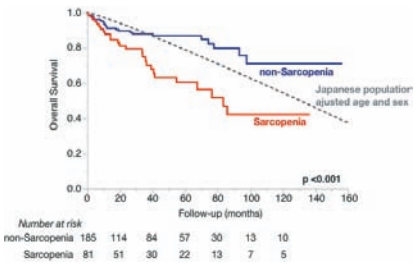


Figure 2. Overall survival of patients with or without sarcopenia and Japanese population adjusted age and sex

Sarcopenia, the progressive loss of skeletal muscle size and function associated with aging, was initially reported by Rosenberg et al. Although several reports demonstrate that sarcopenia had a significant association with overall or cardiac-related death, the preferred imaging modality for diagnosing sarcopenia, together with concrete cut-off levels, are still controversial.

In recent reports, sarcopenia has also been linked to surgical outcomes following abdominal operations, thoracic surgery, and cardiac surgery. However, to the best of our knowledge few studies have described the relationship between sarcopenia and aortic arch surgery. Within this field, the number of surgical candidates, including the elderly, has been increasing.

The aim of this study was to determine the cut-off levels of sarcopenia by measuring psoas muscle area index (PAI) and to evaluate the impact of sarcopenia on the early and long-term outcomes of elective total arch replacement.

Sarcopenia was assessed by a measurement of the psoas muscle area index (PAI, psoas muscle area at the L3 level in computed tomography (cm2) / body surface area (m2)). The cut-off value for sarcopenia was defined as less than two standard deviations below the mean PAI value for each gender in the normal control population. Between October 1999 and July 2015, 266 patients of 65 years or older with evaluated PAI underwent elective total arch replacement. These patients were classified into two groups: sarcopenia (group S, n=81), and non-sarcopenia (group N, n=185).

The mean age was 76.1±5.6 in group S and 75.7±5.7 in group N (p=0.553). Hospital mortality was 3.7% (3/81) in group S and 2.2% (4/181) in group N (p=0.483). Length of hospital stay was significantly longer in group S (median, S: 26.0 days vs. N: 22.0 days, p=0.012).

Mean follow-up duration was 41.1±36.4 months. 5-year survival was significantly worse in group S (S: 61.0±6.9% vs. N: 86.7±2.9%, log rank p<0.001; Figure 2). Patients in group N had relatively better 5-year overall survival compared with the whole of Japanese people adjusted for age and gender. Freedom from aortic related death was also low in group S (S: 89.9±4.1 vs. N: 96.7±1.5%, log rank p=0.012). Multivariate Cox hazard analysis showed that sarcopenia was a significant risk predictor of overall survival (odds 2.39, 95%CI 1.31-4.42, p=0.005).

According to the cut-off point, we demonstrated the impact of sarcopenia on outcomes of elective total arch replacement in the elderly. Sarcopenia was not a predictor of hospital death following total arch replacement, whereas the incidence of prolonged hospital stay was greater in patients with sarcopenia. Moreover, sarcopenia was adversely associated with long term survival, including aortic related death. Sarcopenia should therefore be recognized as a new risk predictor of thoracic aortic surgery.

The Heart Valve Society
An International Heart Team. Leaders in Evaluation, Management & Research.

HVS – the Heart Valve Society – leading the future of the Heart Team in Action

Many societies profess to embrace Heart Valve Surgery and Treatment, but only one provides a home for the entire Heart Team – the cardiac surgeons, the cardiologists, and the scientific researchers and practitioners who make up the team that treats patients suffering from heart valve disease.

Other societies have meetings which present science focused in their specialty area, and often the language suggests that one avenue of treatment is better than another. Sometimes there is even a sense of competition among the providers, implying that their way is the only way. Those groups don't encompass the team concept that is vital to the total well-being of heart valve patients. But the Heart Valve Society does just that. The Heart Valve Society is the first truly collaborative, multi-disciplinary society dedicated to the full range of treatment of heart valve disease internationally. Its membership is reflective of an inclusive international organization.

The Heart Valve Society held its second incredibly successful meeting in New York in March, a meeting that saw almost 600 total attendees. The meeting featured sessions of interest to all heart valve practitioners – from surgeons and cardiologists, to researchers, scientists, PA's and nurses. They came because they know of the importance of The Heart Team. And the Heart Valve Society is truly representative of its tagline – the Heart Team in Action.

The very first meeting of the Heart Valve Society was held in Monaco in May of 2015, and even in its first year, had 500 attendees. The interest in a medical society that emphasizes positive collaboration among the providers, and that embraces open discussion about the best routes of treatment for different types of heart valve patients, is boundless.

Next year the Society returns to the beautiful Grimaldi Forum in Monte Carlo, Monaco, with Dr. Gilles Dreyfus as President. Our Abstract submission site is open now and we urge you to send your best work for consideration for presentation – we will feature plenary sessions, multiple concurrent sessions, and poster sessions as well as display posters. Our dates are March 2 – 4, 2017, and early spring will be arriving in Monaco for this extraordinary meeting.

Whether you are a cardiologist, surgeon, researcher, scientist, or another member of the crucial valve disease treatment team, the HVS welcomes you to become a part of something very unique. HVS also offers all members of the heart valve community the opportunity to volunteer, participate, and become active in our committees and working groups. Work with the AVIATOR Registry, volunteer to serve in one of the many aspects of the ever-growing Scientific Research Committee, and inquire about our new Robotic Registry. If you are interested in helping shape the 2017 program – it's not too late to volunteer to be a part of our 2017 Scientific Program Committee and review our 2017 abstracts. Submit your work! Join the HVS! You can learn more about us and sign up for membership and submit abstracts via our website: www.heartvalvesociety.org.

The Heart Valve Society is proudly attending the EACTS Annual Meeting in Barcelona! Visit us while you are in the Exhibit Hall at Booth #18 and let us help you become the newest member of The Heart Team in Action!

Cardiac | Abstract Session | Stand-alone and concomitant MAZE is an evidence based procedure

Randomised trial of concomitant maze procedure using nitrous oxide-based versus argon-based cryoablation in patients with persistent atrial fibrillation

Pyowon Park Samsung Medical Center, Seoul, Korea

Cryoablation is the most common energy source for concomitant maze procedure with valve surgery due to its consistent transmurality, good lesion demarcation, tissue death without collagen matrix destruction, and lower risk of coronary artery injury. Currently, two disposable cryoprobes are available (nitrous oxide based and argon gas based). These two probes are different in terms of cooling agent, cooling temperature, cryoablation time, range of frost area and defrosting time.

The aim of this study was to evaluate the early outcomes of the concomitant maze procedure using nitrous oxide-based cryoablation (N20 group) compared to argon-based cryoablation (Argon group) in patients with longstanding persistent atrial fibrillation and heart valve disease. This study was a single-centre, prospective, randomised, controlled clinical trial (NCT01812356).[1]

60 consecutive patients who underwent valve surgeries were enrolled between March 2013 and August 2015. Exclusion criteria included: (1) previous cardiac surgery; (2) aged over 75 years; 3) left atrial size over 80 mm; and 4) severe tricuspid regurgitation. The operation was performed under standard median sternotomy. An enlarged posterior wall of the left atrium was excised routinely. The total number of cryoablation lesions required for completion were five. The duration of cryoablation was 2 minutes for argon probe and 2 minutes 40 seconds for nitrous oxide probe. The sequence of cryoablation was left side of box lesion, mitral isthmus, right atrial isthmus, lower part of left atrial box lesion and SVC-IVC line. The orifice of the left atrial appendage was internally closed. Total ablation time was also checked. Warfarin was given for a minimum postoperative period of 3 months. Clinical assessments, 12-lead electrocardiography, 24 hour-Holter monitoring and echocardiography were routinely performed on all patients at the 3-, 6- and 12-month follow-up visits.

The mean age of patients was 58 years. Rheumatic aetiology was the most common pathology (70%). Valve replacements were performed in 51 patients (mitral, n=30; aortic, n=12; both, n=9). Concomitant tricuspid annuloplasty was performed in 44 patients (73%). The treatment groups were generally well balanced with regard to baseline characteristics.

Although the duration of cryoablation was longer in the N20 group than in the Argon group, the overall ablation time (time to target temperature + cryoablation time + defrosting time) was similar between groups (21.20+3.15 vs 21.06+3.54 minutes) (table). No early death and no pacemaker implantation occurred.

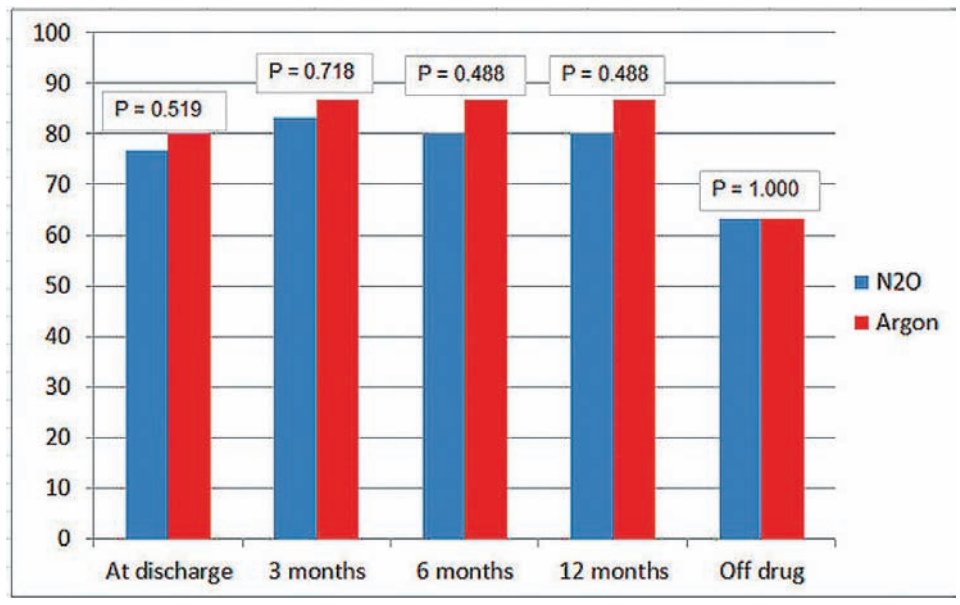


Figure. Freedom from atrial fibrillation, comparing nitrous oxide-based cryoablation group (N20) and argon-based cryoablation group (Argon).

The prevalence of AF at discharge was 11.6% (7/60). AF recurrence detected by 24-hour Holter monitoring occurred in six patients (20%) in the N2O group, as compared with 4 (13%) in the Argon group (P=0.488) at 12 months post-procedure. No inter-group difference was detected at any time point (figure). Preoperative BNP level and early AF episode before discharge were predictive of atrial arrhythmia events during follow up. The septal mitral valve A-wave, reflecting left atrial activity, was observed to a greater degree in the N2O group than in the Argon group at the time of discharge (odds ratio 6.1, 95% CI 1.1 to 34.9, p=0.043). However, the difference was not apparent at postoperative six months.

In conclusion, both N2O- and argon-based cryoablation have similar mid-term rates of sinus rhythm maintenance and atrial arrhythmia events. Left atrial contractile activity tends to return earlier in the N2O group; however, this difference was not found after six months.

Reference

1. The Concomitant Cryomaze Procedure Using Nitreous Oxide Cryoprobe: Comparison With Argon Based Cryoprobe. ClinicalTrials.gov https://clinicaltrials.gov/ct2/show/NCT01812356 (retrieved September 2016).

Cardiac | Abstract | Improving outcomes in hypertrophic obstructive cardiomyopathy

Pathoanatomic findings and treatment in hypertrophic obstructive cardiomyopathy surgery: the role of mitral valve

Giuseppe M Raffa
Department for the Treatment and Study of Cardiothoracic Diseases and Cardiothoracic Transplantation. IRCCS – ISMETT (Istituto Mediterraneo per i Trapianti e Terapie ad alta specializzazione), Palermo, Italy

giuseppe.raffa78@gmail.com

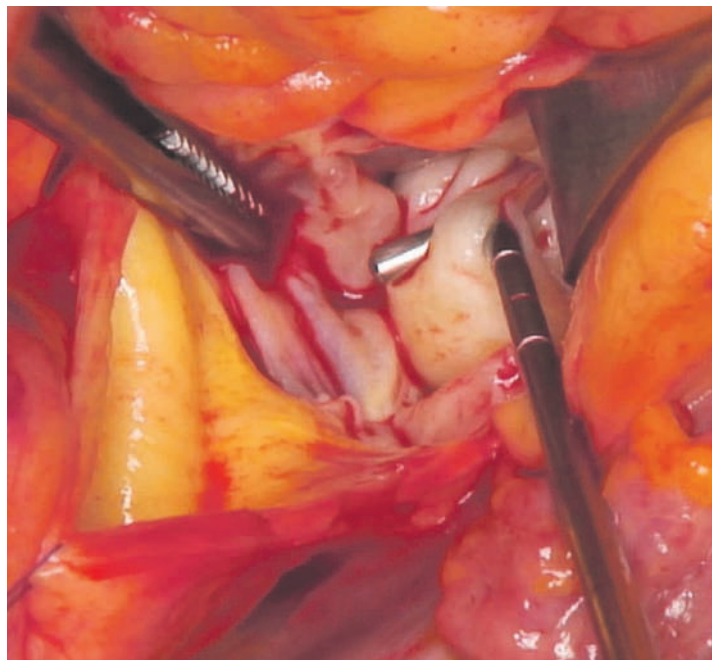


Figure 1. Secondary chordae thickened and retracted anchoring the anterior leaflet of the mitral valve to the septum were identified and resected.

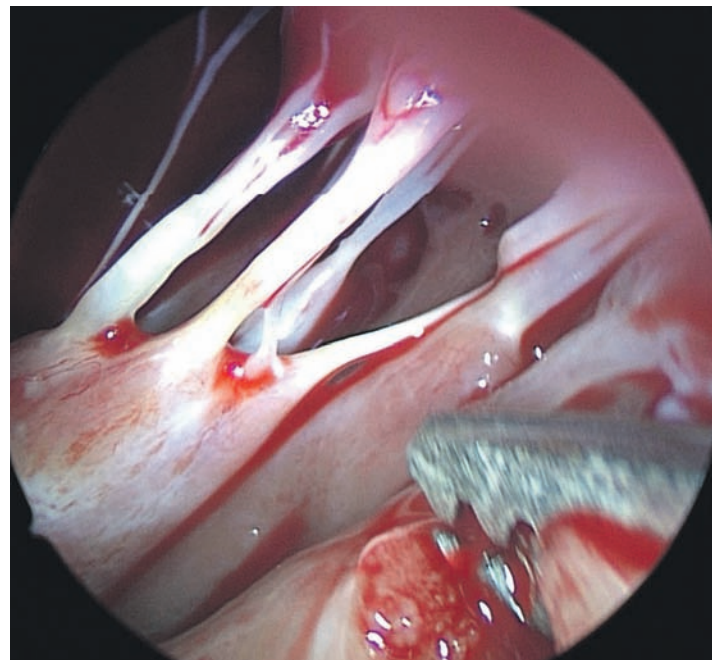


Figure 2. Hypertrophy of the papillary muscle and secondary chordae thickened.

Hypertrophic obstructive cardiomyopathy (HOCM) is the most frequently inherited cardiovascular disease (prevalence in the general population of 1/500) which is characterised by significant left ventricular hypertrophy, especially in the inter-ventricular septum, combined with small-volume cardiac cavities. The transaortic surgical septal myectomy is the most commonly used technique to treat HOCM, and is associated with low operative morbidity and mortality and reduction of the outflow gradients. The 0.4% (17/3695 patients) composite operative mortality from five major high-volume centres in North America [Mayo and Cleveland clinic, Tufts medical Center (Boston), Toronto General (Ontario) and Mount Sinai-St.Luke's and Roosevelt (New York)] highlights the role of dedicated HOCM units. The involvement of the mitral valve in the pathophysiology of HOCM has been addressed as systolic anterior motion (SAM)–related left ventricle out flow tract (LVOT) obstruction. Hypertrophic cardiomyopathy mitral malformations include leaflets elongation and a wide array of malformations of the papillary muscles (PM) and chordae that can be detected by transthoracic and transoesophageal echocardiography and by cardiac magnetic resonance.

Because they participate fundamentally in the predisposition to SAM, they have increasingly been repaired surgically. Twenty-seven consecutive patients who underwent HOCM surgery at IRCCS-ISMETT from 2007 to 2016 were retrospectively reviewed in order to assess the role of the mitral valve (leaflet, chordae and PM) in the LVOT obstruction and the results of the surgical treatment. Indications for operation included patients with severe symptoms unresponsive to or intolerant of optimal medical therapy with LVOT pressure gradients greater than or equal to 50 mmHg (measured with Doppler echocardiography either under resting conditions and/or with provocation, preferably utilizing physiologic exercise). Secondary chordae tendineae tractioning the anterior mitral leaflet to the interventricular septum, and systolic anterior motion were detected in the majority of the patients. Anomalous, hypertrophied, and fused PM with muscularis trabeculae hypertrophy were also commonly observed. Four patients had posterior leaflet redundancy. Secondary chordae, PM, and muscularis trabeculae resection, and PM splitting and elongation were added variably to septal myectomy. Nine procedures on mitral valve leaflets were performed. Long-term follow up was 4±2.8 years. There was no hospital mortality, and NYHA classification, LVOT gradient, mitral valve regurgitation and septum thickness were significantly reduced after surgery.

The mitral valve substantially contributes to LVOT obstruction in patients with HOCM. Thus, surgical correction in addition to extended myectomy is recommended during surgery. Surgeons with expertise in mitral valve anatomy and extensive repair techniques, guided by a dedicated team for planning the proper operative strategy, can help guarantee the best operative results.

Cardiac | Abstract Session | Catheter based mitral valve techniques

Transapical transcatheter valve in valve implantation versus minimally invasive surgery for failed mitral pioprostheses

Alfredo Giuseppe Cerillo G Pasquinucci Hospital, G Monasterio Foundation, Massa, Italy

Reoperative mitral valve replacement is a complex operation, since it entails chest re-entry, dissection of thick adhesions, poor exposure, fragile tissues and – last but not least – removal of the failing bioprosthesis. Moreover, many patients are fragile and old, and many have significant comorbidities.[1] In recent years, transcatheter mitral valve-in-valve implantation (M-VIV) has emerged as a possible alternative to open heart surgery: this promising technique allows the avoidance of cardiopulmonary bypass, and does not require opening of the heart. The valve in valve international data (VIVID) registry has now collected data of almost 500 mitral valve-in valve and valve-in-ring procedures, and has shown promising results.[2] However, data comparing the safety and efficacy of this approach with those of open heart surgery are lacking.

Since 2005, more than 2,000 patients underwent mitral valve surgery through a right minithoracotomy at the G. Monasterio Foundation, Massa, Italy. Of these, 40 underwent minimally invasive redo mitral valve replacement (MIMVR). We used this patient population as the control group for a propensity score adjusted comparison with 21 consecutive patients undergoing M-VIV at our centre.

Compared with the MIMVR group, patients who underwent M-VIV implantation were older (p=0.03) and were more likely to have chronic kidney disease (p=0.04), history of atrial fibrillation (p=0.03) and pulmonary hypertension (p=0.02). In addition, M-VIV patients had a significantly higher Logistic EUROscore (p=0.001).

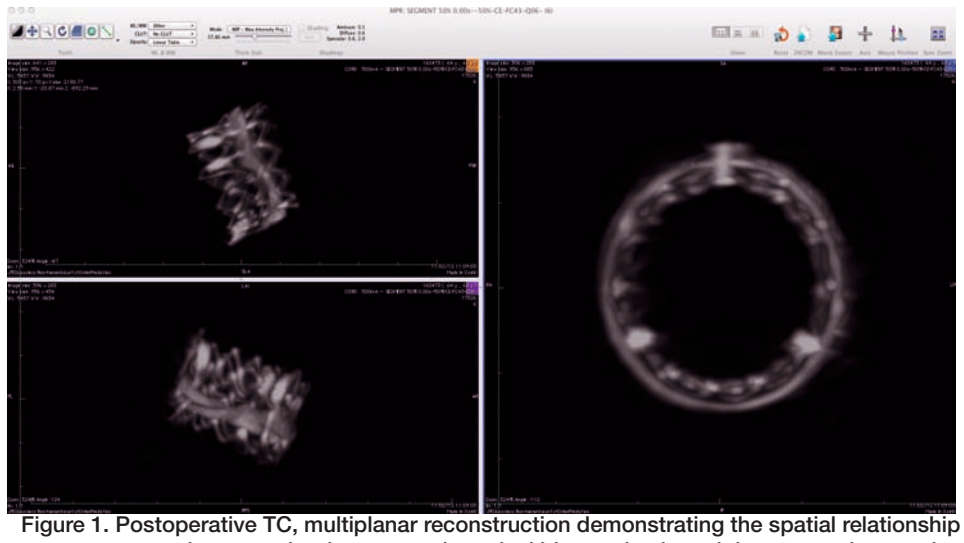


Figure 1. Postoperative TC, multiplanar reconstruction demonstrating the spatial relationship between the degenerated surgical bioprosthesis and the transcatheter valve

The overall in-hospital mortality was 6.4% (4/61) without significant differences between the two groups (MIMVR 7.5 % vs 4.5% M-VIV; p=0.67). Despite not being significant, there was a clear trend towards a higher incidence of stroke (12.5% vs 4.5% p=0.476), pulmonary complications (20% vs 9% p=0.177), reoperation for bleeding (14.6% vs 4.5% p=0.532) and blood transfusion (35% vs 22.7% p=0.349), in the MIMVR group. In addition, M-VIV patients had a significant lower intensive care unit (p=0.02) and hospital length of stay (p=0.03). Interestingly, the only death in the M-VIV group occurred in the first patient, and was due to a technical misconception: having no previous reference, and according to the results of pre-clinical studies[3], we implanted the transcatheter valve too ventricular, and this led to valve embolisation. All the subsequent procedures were successful, and all patients survived. A similar trend has been reported by others, indicating that after the initial learning phase, in experienced centres technical success can be achieved in almost 100% of patients, and the operative mortality can be extremely low.[4,5]

Our study was based on a small population and the results were affected by a heavy selection bias. In fact, we always tried to choose the optimal therapy for any individual patient. For this reason, we made efforts to reduce this bias by using a propensity score analysis. Due to the small sample size, we decided to use multivariable adjustment, because matching would have reduced the study size even further and stratification can be difficult to interpret. Using a propensity score as the sole means for adjusting outcomes was preferable due to the low number of events in our study, and it provides better adjustment for those factors driving treatment selection. The overall effect is more complete risk adjustment.[6]

Our data demonstrate that M-VIV is a valid alternative to open heart surgery in selected candidates, with the potential to significantly reduce the surgical trauma. Further studies on larger populations are needed to confirm our findings.

References

1. Seeburger J et al. Minimally invasive mitral valve surgery after previous sternotomy: experience in 181 patients. Ann Thorac Surg 2009; 87:709-14.
2. Gallo M et al.Transcatheter valve-in-valve implantation for degenerated bioprosthetic aortic and mitral valves. Expert Rev Med Devices. 2016 Aug;13(8):749-58.
3. Webb J et al. Transcatheter valve-in-valve implantation for failed bioprosthetic heart valves. Circulation. 2010 Apr 27;121(16):1848-57.
4. Ye J et al. Transcatheter aortic and mitral valve-in-valve implantation for failed surgical bioprosthetic valves: an 8-year single-center experience. J Am Coll Cardiol Intv 2015;8:1735–44.
5. Schaefer A et al. Valve-in-Valve Procedures in Failing Biological Xenografts Using a Novel Balloon-Expandable Device: Experience in Aortic, Mitral, and Tricuspid Positions. Thorac Cardiovasc Surg. 2016 Aug;6:366-73.
6. Blackstone EH. Comparing apples and oranges. J Thorac Cardiovasc Surg 2002;123:8–15.

Cardiac | Abstract Session | Coronary artery bypass graft: From start to finish

Transit flow measurement in CABG: new ideas to increase assessment quality

Nikolaos Bonaros
Medical University of Innsbruck, Austria

It is unanimously accepted that both short and long outcomes of CABG depend on anastomotic quality. Transit time flow measurements (TTFM) have been used for evaluation of coronary anastomosis with contradicting results in the past mainly due to the high false positive rates. The addition of a Doppler flow measurements, evaluation of flow profile (Pulsatility Index, PI) and more recently 2D-mode anastomotic imaging with epicardial ultrasound can tremendously increase the positive predictive value from 10% to 90%.

In the present study, we aimed to use transit time flow measurement to understand the physiology of coronary circulation and to establish correlations between TTFM findings with the degree of the native vessel stenosis and the size of the coronary vessel.

Patients with multivessel coronary disease underwent on-pump CABG on the arrested heart using one or two in-situ IMA grafts. Only IMA grafts were included in the analysis. We included 60 patients into this analysis and separately evaluated 60 LIMA to LAD grafts as well as 25 RIMA to OM/IMED/Cx system.

Graft evaluation was performed according to the following protocol: 1) TTFM on the arrested heart was used to measure the flow in IMA graft at the absence of native coronary flow. 2) Epicardial two-dimensional evaluation of the distal anastomosis was performed at the long and short-axis. 3) TTFM after weaning from cardiopulmonary bypass and removing the cannulas was repeated for final graft evaluation.

Flow on the arrested heart under standardised arterial pressure conditions, final flow after CPB discontinuation under the same mean arterial pressure, final pulsatility index after CPB discontinuation were determined and documented using the MEDISTIM documentation software. Percentage of flow change (FC) was calculated according to the following formula:

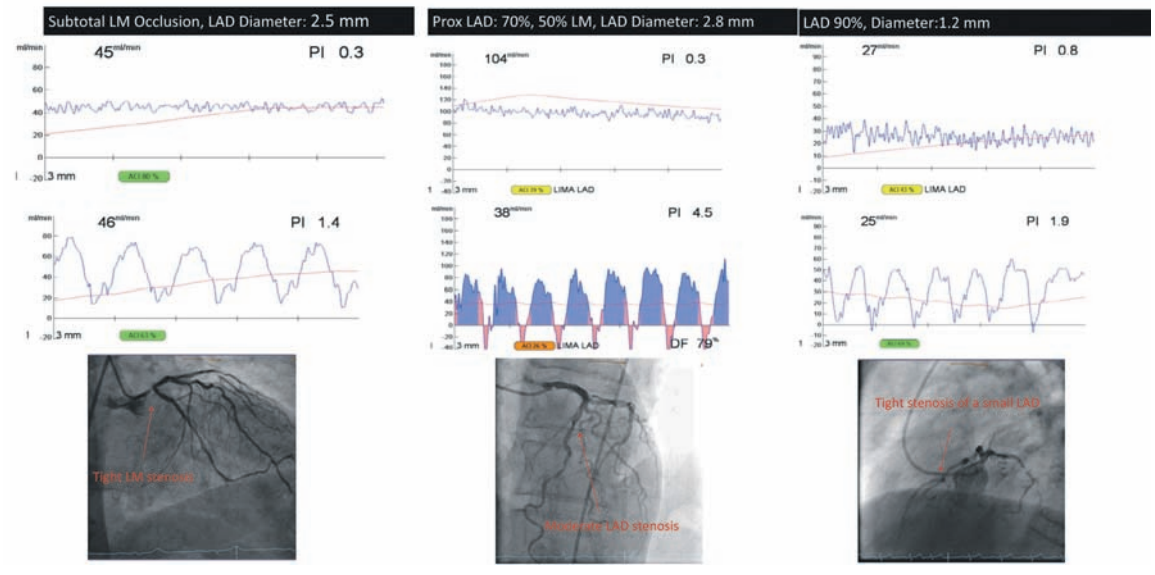
FC% = (FF-AHF / AHF) x 100%

where FC% is the percentage of flow change, FF is the final flow after discontinuation of CPB, AHF is the graft flow on the arrested heart without native coronary circulation.

AHF correlated with the diameter of the target vessel and the final PI after weaning off-pump. On the other side, the FF correlated only with the degree of the stenosis. Both the size of the target vessel and the degree of the stenosis were found to be related to the final PI. The percentage of change between the average flow under physiological pulsatile conditions, as compared to the graft flow on the arrested heart was found to have a positive correlation to the final PI.

The presence of small target vessels (<1.5 mm) and moderate stenosis (<80% in QCA) were isolated as risk factors for decreased FF. Both factors remained significant at the multivariate analysis and could be identified as risk factors for decreased graft flow at TTFM. The presence of a moderate stenosis as well as flow reduction between AHF and FF were identified as risk factors for increased PI. Only moderate stenosis was recognised as an independent risk factor for increased PI at the multivariate analysis. Graft flow reduction observed after weaning off-pump as compared to the graft flow on the arrested heart may jeopardise graft patency. The presence of moderate stenosis, small target vessel, or increased PI were identified as risk factors for graft flow reduction in univariate analysis. In multivariate analysis, only the increased PI was identified as an independent risk factor.

This easy reproducible way to evaluate graft flow may not only provide information on anastomotic quality but also enhance understanding of coronary physiology especially at the presence of moderate stenosis.



Thoracic | Abstract Session | Oncology 2

Optimal evaluation of the solid component in pulmonary tumour with ground glass opacity on thin section computed tomography

Shunki Hirayama
Juntendo University School of Medicine, Tokyo, Japan

Objectives

In part-solid nodules with several solid components in non-small cell lung cancer (NSCLC), how the size of several solid components should be measured is currently controversial. We investigated the most optimal measurement to reflect prognosis on thin section computed tomography (TSCT).

Methods

A retrospective study was done in 853 patients with resected clinical stage IA in NSCLC between 2009 and 2014. We evaluated the following radiological factors on TSCT with 1 to 3 mm collimation: maximum tumour dimension, maximum solid part dimension on lung or mediastinal window; we measured maximum size of solid part (MSP), size of the largest island solid part (LSP), and the sum of each solid part (SSP) on lung and mediastinal window and investigated to predict prognosis. The median follow-up period was 3.1 years.

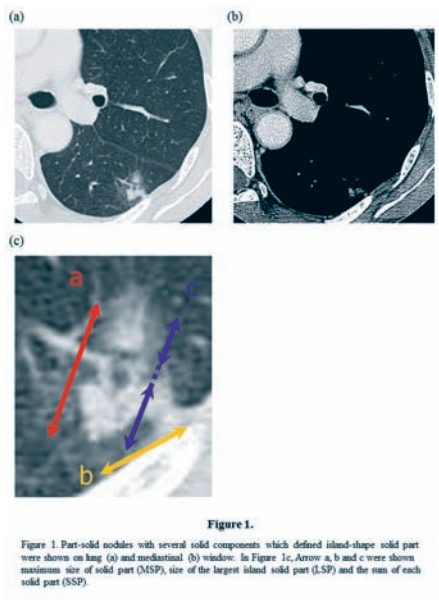


Figure 1.

Figure 1. Part-solid nodules with several solid components which defined island-shape solid part were shown on lung (a) and mediastinal (b) window. In Figure 1c, Arrow a, b and c were shown maximum size of solid part (MSP), size of the largest island solid part (LSP) and the sum of each solid part (SSP).

Results

The 5-year survival rate for MSP, LSP and SSP in the lung window (sized between 0 and 1-10mm) was not significantly different (p=0.306, p=0.364 and p=0.295, respectively). The 5-year survival rates for LSP in the mediastinal window of 0, 1-10, 11-20, and 21-30mm were 99.5%, 93.8%, 79.9%, and 62.9%, respectively (p=0.020, p<0.001 and p=0.003). In adenocarcinoma, the 5-year survival rates for LSP in the mediastinal window of 0, 1-10, 11-20 and 21-30mm were 99.5%, 94.3%, 84.6% and 68.5%, respectively (p=0.025, p=0.006 and p=0.013). In non-adenocarcinoma, the 5-year survival rates for LSP in mediastinal window of 1-10, 11-20 and 21-30mm were 75.0%, 61.8% and 55.8%, respectively (p=0.623 and p=0.511).

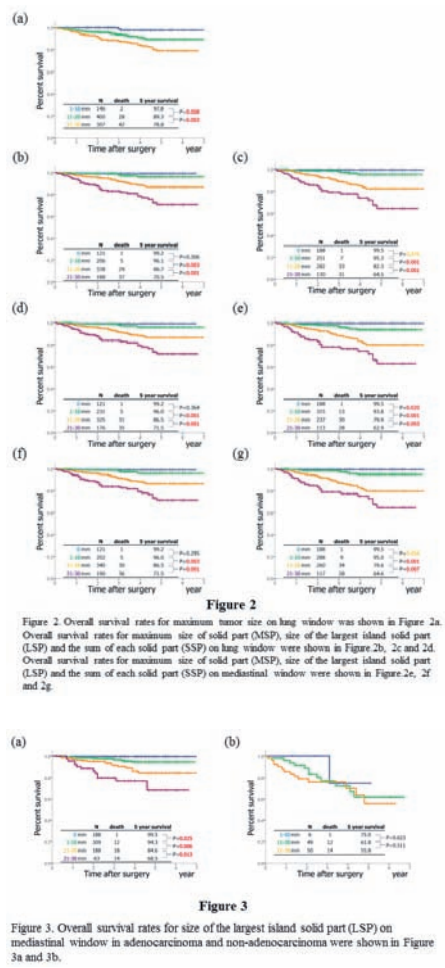


Figure 2

Figure 2. Overall survival rates for maximum tumor size on lung window was shown in Figure 2a. Overall survival rates for maximum size of solid part (MSP), size of the largest island solid part (LSP) and the sum of each solid part (SSP) on lung window were shown in Figure.2b, 2c and 2d. Overall survival rates for maximum size of solid part (MSP), size of the largest island solid part (LSP) and the sum of each solid part (SSP) on mediastinal window were shown in Figure.2e, 2f and 2g.

Figure 3

Figure 3. Overall survival rates for size of the largest island solid part (LSP) on mediastinal window in adenocarcinoma and non-adenocarcinoma were shown in Figure 3a and 3b.

Conclusions

The size of the largest island in the mediastinal window is a more suitable prognostic predictor in clinical stage IA lung adenocarcinoma.

TABLE 1-1. Patients clinical and surgical characteristics

Patient characteristics	Number of patients (%) (N = 853)
Gender	
Male	410 (48)
Female	443 (52)
Age (years) <range>	71 <22-89>
Smoking history	
Never	389 (46)
Current / former smoker	464 (54)
Preoperative serum CEA level (ng/ml) <range>	2.6 <0.2-80.5>
Ischemic heart disease	
Absent	781 (92)
Present	72 (8)
Emphysema	
Absent	790 (93)
Present	63 (7)
Fibrosis	
Absent	797 (93)
Present	56 (7)
Diabetes Mellitus	
Absent	745 (87)
Present	108 (13)
GGO	
Absent	308 (36)
Present	545 (64)
Maximum tumor diameter on lung window (mm)	
median <range>	17 <5-30>
Maximum tumor diameter on mediastinal window (mm)	
median <range>	10 <0-30>
The size of largest island solid part on mediastinal window (mm)	
median <range>	8 <0-30>
Procedures	
lobectomy	497 (58)
segmentectomy	220 (26)
wide wedge resection	133 (16)
Lymph node dissection	
ND0	133 (16)
ND1	237 (28)
ND2	483 (57)
Operative time median <range>	123 <28-384>
Blood loss median <range>	15 <1-700>

CEA, carcinoembryonic antigen; GGO, ground glass opacity.

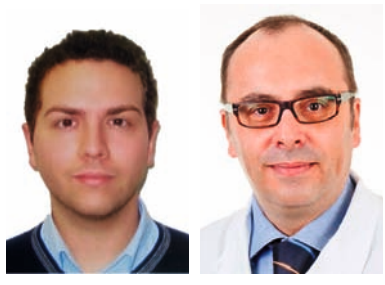
TABLE 1-2. Patients pathological characteristics

Patient characteristics	Number of patients (%) (N = 853)
Histology	
Adenocarcinoma	748 (88)
Squamous cell carcinoma	85 (10)
others	20 (2)
Pathological T factor	
pT1	740 (87)
pT2	99 (12)
pT3	12 (1)
pT4	2 (0)
Pathological lymph node metastasis	
pN0	785 (92)
pN1	31 (4)
pN2	36 (4)
pN3	1 (0)
Pathological stage	
pIA	702 (82)
pIB	73 (9)
pIIA	28 (3)
pIIB	10 (1)
pIIIA	39 (5)
pIIIB	1 (0)
Vascular invasion	
Absent	711 (83)
Present	142 (17)
Lymphatic permeation	
Absent	729 (85)
Present	124 (15)
Pleural invasion	
Absent	717 (84)
Present	136 (16)

Cardiac | Abstract Session | Coronary artery bypass graft: From start to finish

Preoperative atorvastatin reduces the risk of bleeding and blood products use in patients undergoing on-pump coronary artery bypass grafting: results from a large retrospective study

Antonio Nenna and Massimo Chello Università Campus Bio-Medico di Roma, Rome, Italy



Statins are a widely recognised weapon in the primary and secondary prevention of coronary artery disease (CAD) for their pleiotropic effects. Their properties bestow a reduced progression of CAD, decreasing adverse cardiovascular events and mortality in patients undergoing coronary artery bypass grafting (CABG). Therefore, statins are a fundamental part of the preoperative medical treatment in patients undergoing cardiac surgery for CAD, despite being underused or underdosed in many centres. However, recent reports from the cerebrovascular and pharmacological literature are insinuating concerns about a potential increase in the haemorrhagic risk among statin users, evaluated considering the risk of intracranial haemorrhage, and supported by a caspase-dependent platelet apoptosis exerted by statins. The widespread use of statins in major cardiac surgery, which exposes per se to risk of bleeding, imposes further investigation. The aim of the present study was to analyse postoperative bleeding and complications in patients scheduled for elective primary isolated on-pump CABG, depending on preoperative statin treatment.

In this retrospective cohort study, we evaluated 441 patients who received atorvastatin until surgery and 213 patients who had never been treated with statins, undergoing elective primary isolated on-pump CABG, using a single-centre single-surgeon method (Department of Cardiovascular Surgery, Università Campus Bio-Medico di Roma, Rome, Italy). Postoperative bleedings, blood products use and complications were monitored during hospitalisation.

Preoperative and intraoperative variables were similar between groups. Early and overall postoperative bleedings were reduced among statin users, who had lower C-reactive protein values in the first postoperative day. Atorvastatin carries a strong protective effect against major bleedings, with a propensity score adjusted odds ratio of 0.28 ($p<0.01$). Also, blood products use for statin-treated patients was lower compared to controls, with fewer transfused patients and less red packed cells units per transfused patient. Moreover, patients receiving statins had a lower rate of postoperative atrial fibrillation ($p=0.01$).

Table 1. Postoperative bleeding and bleeding-related complications.

	Atorvastatin group N=441	Control group N=213	P value
1st hour	59.8±38.7	74.6±54.4	<0.001
2nd hour	35.4±32.7	48.2±38.8	<0.001
Operative day	298.8±155.8	378.6±222.0	<0.001
1st postoperative day	300.8±154.0	342.7±187.5	0.002
Overall bleeding	705.6±329.3	834.0±408.8	<0.001
Major postoperative bleedings	5.7%	19.7%	<0.001
Reoperation for bleeding	1.1%	0.9%	0.821
Blood loss >600 mL in the operative day	2.3%	14.6%	0.010
Chest tube output >2 litres within a 24-hours period	1.8%	1.4%	0.705
Transfusion of ≥5 units of red packed cells within a 48-hours period	0.5%	2.8%	<0.001

This results support our hypothesis of a strong link between inflammation and bleeding in the early postoperative period after on-pump surgery, which can be considered as an 'inflammatory bleeding'. Despite no randomisation, results of the overall bleeding and of the logistic regression model calculated before and after propensity score adjustment are similar; this allows us to reliably speculate that patient selection in this study was unbiased, and the populations were actually comparable. Also, the deliberate non-use of statins in patients with a known CAD is not acceptable and therefore prior randomisation was not possible.

Preoperative atorvastatin use is associated with a reduced risk of bleeding and blood products use after CABG, likely due to a reduction in the postoperative inflammatory response. This hypothesis is supported by the protective effect on atrial fibrillation, which has an inflammatory-based pathogenesis. Unlike reports in the neurological literature, statins do not enhance the bleeding risk and remain a safe and multiuse pharmacologic approach in cardiac surgery. The evaluation of neutrophil adhesion molecules and their activation patterns, platelet function through thromboelastography and the quantitative analysis of other inflammatory markers might be evaluated in future studies to strengthen or disprove our results.

Cardiac | Rapid Response | Risk modelling and scoring systems in cardiac surgery

A novel risk score to predict the need for nutrition support after cardiac surgery

Rika E Ohkuma[1], Todd C Crawford[1], Patricia M Brown[1], Joshua C Grimm[1], J. Trent Magruder[1], Arman Kilic[1], Alejandro Suarez-Pierre[1], Sukyee Snyder[1], Justin D Wood1, Eric Schneider[1,2], Marc S Sussman[1], Glenn JR Whitman[1] 1. Department of Surgery, Division of Cardiac Surgery, Johns Hopkins Medical Institutions, Baltimore, Maryland, USA . 2. Department of Surgery, Center for Surgery and Public Health, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, USA

Background

In specific patients, early postoperative nutrition mitigates malnutrition-related morbidity and mortality. The goal of this study was to develop and validate a prediction score designed to stratify patients immediately after cardiac surgery according to risk for nutrition support

Methods

We identified adult cardiac surgery patients at our institution in 2012 who required postoperative nutrition support, either enteral or parenteral. Using multivariable logistic regression modelling, we developed a JHH Nutrition Score (JHH NS) from relative odds ratios generated by variables that independently predicted the need for nutrition support. The JHH NS was then prospectively validated using all patients undergoing cardiac surgery in 2015.

Results

Among 1056 patients in the derivation cohort, 86 (8%) required postoperative nutrition support. Seven variables were identified on multivariable analysis as independent predictors of nutrition support need and were used to create the JHH NS. Scores ranged from 0-36. Higher risk scores were highly predictive of nutrition support need (OR 1.20, $p<0.001$). The c-statistic of the regression model for nutrition support was 0.85. In the validation cohort, observed rates of nutrition support correlated positively with predicted rates ($R=0.89$).

Conclusions

The JHH NS reliably stratified patients at risk for the need for postoperative nutrition support. This easily-calculable and highly predictive screening tool, applicable at the time of ICU admission, will enable timely initiation of postoperative nutrition support in patients who will not be capable of taking in adequate nutrition orally. In so doing, we may be able to reduce morbidity and mortality in this at risk population.

Thoracic | Abstract session | Chest wall and mediastinum

Robot-assisted thymectomy in Miastenia Gravis: surgical and neurological outcomes

Ilenia Cavaliere, Franca Melfi, Vittorio Aprile, Roberta Ricciardi, Claudia Cariello, Michelangelo Maestri, Marco Lucchi and Alfredo Mussi University Hospital of Pisa, Pisa, Italy

Myasthenia Gravis (MG) is a neuromuscular disease characterised in most cases by the presence of antibodies interacting with the neuromuscular junction, resulting in a loss of strength and exhaustibility of striated muscles. The abnormal antibody production is triggered mainly in the thymus and it presents several morphological abnormalities.

Thymectomy in MG is a recommended procedure, especially in MG with positive anti-acetylcholine receptor antibodies (AchRAb) to improve symptoms and, if possible, to achieve the remission of MG.

Minimally invasive thymectomy using the Da Vinci robot system (Intuitive Surgical, USA) is one of the most innovative techniques performed as a therapeutic approach for MG.

We collected retrospective data pertaining to 50 patients affected by AChRAb-positive MG, who had responded poorly to medical therapy and had undergone radical thymectomy for hyperplasia and/or thymoma with the da Vinci Surgical System during the period from January 2011 until September 2015.

The principal elements used by the neurologist to select patients to undergo the minimally invasive approach include: the type of thymic pathology, comorbidities, the ongoing medical therapy, and symptom severity according to Myasthenia Foundation of American Clinical Classification (MGFA).

All patientsv underwent radical robot-assisted thymectomy under general anaesthesia with double-lumen intubation and left-side approach. The study population comprised 16 male and 34 female; median age was 38 years (range 11-79 years). Median operating time was 110 minutes (range 55-260 minutes), and conversion rate was nil.

No intraoperative complications occurred, and all patients were extubated at the end of surgery. No patient recovered in an intensive care unit, and no neurological postoperative complications was observed. Median chest drainage duration was two days (range 1-5 days); median hospital stay was three days (range 3-6 days). Postoperative mortality at 30 days and 90 days was nil.

Postoperative complications were recorded in three patients: 1 (2%) postoperative pneumothorax treated by conservative intervention; 1 (2%) postoperative anaemia that did not required blood transfusion; and 1 (2%) postoperative left arm hematoma due to traumatism of robotic left arm (via the da Vinci Si system).

In all cases, thymus excision was complete with perithymic adipose tissue removal. Histologically, 45 patients showed thymic hyperplasia and 5 thymoma (2 thymoma B1, 2 thymoma B2 and 1 thymoma B3).

Neurological follow-up was of a minimum six months after surgery. Complete stable remission (CSR) from the disease were observed in 20 patients (40%) after a median period of 10.5 months (range 5-20 months). pharmacologic remission (PR) was observed in 12 patients after a median period of 6.5 months (range 3-11 months). 13 patients presented significant clinical improvement with minimal signs of the disease. Five patients did not show any significant clinical changes. None of the patients had worsened of MG.

Our study presents a short minimum follow-up time, but we expect an increase in CSR with a longer follow-up period. Based on our data, robot-assisted thymectomy is a safe alternative to the open surgical approach in those forms of MG associated with thymic hyperplasia or noninvasive thymoma. Our results also derive evidence for a multidisciplinary approach, personalised preoperative therapy, and accurate patient selection.

Thoracic | Rapid Response | Thoracic

Long segment pulmonary artery resection to avoid pneumonectomy: long-term results after prosthetic replacement

Antonio D'Andrilli Sant'Andrea Hospital, Sapienza University, Rome, Italy

Resection and reconstruction of the pulmonary artery (PA) is a reliable therapeutic option to avoid pneumonectomy for patients with centrally located lung cancer who cannot be radically treated by a standard lobectomy. Indication for parenchymal sparing operation is generally considered in the case of limited vascular infiltration, while in the presence of extended arterial involvement a pnemonectomy is usually required.

Technical difficulties of PA reconstruction increase when the tumour infiltration involves a long segment requiring an extended vessel resection. In such cases circumferential (sleeve) resection of the PA always produces a wide distance between the two vascular stumps with consequent high tension on direct anastomosis. This technical situation may occur, usually on the left side, especially in patients without associated bronchial sleeve resection, because the lobar bronchus is not involved. Reconstruction after extended partial resection of the arterial wall for tumour invading only one aspect of the vessel may be also demanding.

We report the long-term results of a series of patients undergoing conduit reconstruction after sleeve resection of a long PA segment or wide patch reconstruction after extended resection (>2.5 cm) of one aspect of the circumference of the vessel associated with lobectomy for centrally located lung cancer.

Between 1991 and 2015, 24 patients underwent sleeve resection of a long PA segment or extended resection (>2.5 cm) of one aspect of the circumference of the PA associated with lobectomy for centrally located lung cancer. Materials used for conduit reconstruction after sleeve resection (20) were all biological and included: pulmonary vein in 12 patients, autologous pericardium in 4, porcine pericardium in 3, and bovine pericardium in 1. Patches employed in 4 patients consisted of porcine pericardium (2) and pulmonary vein (2). Eight patients had undergone induction chemotherapy.

23 patients underwent left upper lobectomy without associated bronchoplasty. One patient underwent broncho-vascular left upper sleeve lobectomy. Postoperative morbidity rate was 29.1% (1 chilothorax, 3 atrial fibrillation, 1 parenchymal atelectasis, 1 pericarditis and 1 bleeding requiring rethoracotomy). No complications related to the reconstructive procedure occurred. There was no postoperative mortality. Complete patency of the reconstructed PA was shown in all patients by postoperative contrast CT, performed every six months. Pathological tumour stage ranged from I to IIIA. Five-year overall survival and disease-free survival rates were 69.9% and 52.7%, respectively, at a median follow-up of 41 months (range 6-72). Tumour recurrence has been observed in 8 (33.3%) patients (3 local, 5 systemic).

We conclude that resection of long PA segment followed by conduit or wide patch reconstruction is a feasible, safe and effective option to avoid pneumonectomy. Different biological materials can be used to provide adequate tissue characteristics; the choice is made on a case-by-case basis. Long-term results confirm the oncological reliability of this operation.

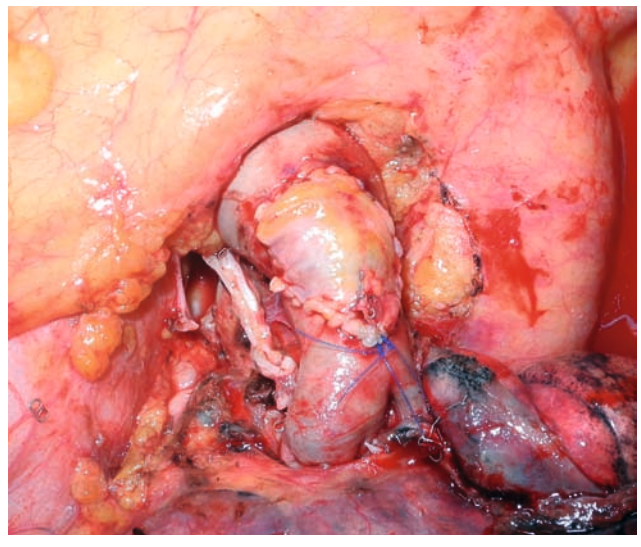


Figure 1. PA reconstruction with wide patch of pulmonary vein

Cardiac | Focus Session | Atrial fibrillation and management of the left atrial appendage

Combined endoscopic epicardial and percutaneous endocardial ablation versus repeated catheter ablation in persistent and longstanding persistent atrial fibrillation (CEASE-AF Trial)

Nicolas Doll Sana Heart Surgery Stuttgart, Germany

Atrial fibrillation (AF) is the most common cardiac arrhythmia with a lifetime risk of developing AF of 1 in 4 people. Besides hemodynamic compromises, AF increases the risk of stroke 5-fold, and is associated with an odds ratio of death of 1.5 to 1.9.

Antiarrhythmic drug (AAD) therapies used for AF treatment have significant side effects and they are of marginal effectiveness in nearly all patient populations. Atrioventricular node ablation and pacing do not cure the arrhythmia and may not result in better quality of life.

Catheter ablation has evolved as a standardised treatment option in paroxysmal AF supported by the current guidelines. Although pulmonary vein isolation is the cornerstone of all interventional approaches for AF-treatment, no uniform concept in the setting of the non-paroxysmal forms currently exists. Especially in the setting of long-standing persistent AF, additional strategies apart from sole pulmonary vein isolation are required and still achieve only disappointing results regarding rhythm control. Thus, repeated endocardial procedures are required in many patients.

With the development of endoscopic ablation instruments and the use of videoscopic assisted techniques (VAT), the cardiac surgeon nowadays has the option to perform an extended left and right atrial lesion set off bypass on the beating heart.

These procedures have gained attention with good results, especially in this difficult to treat patient population of longstanding persistent AF or persistent AF with an enlarged atrium. However, although new surgical ablation systems are highly effective in creating reliable transmural ablation lines, the success rates for minimally invasive endoscopic ablation are challenged by sub-optimal mapping techniques and technologies for verification of conduction block and the limitation of the surgeon to efficaciously perform the isthmus lesions known from the original Cox-Maze IV procedure. A minimally invasive endoscopic ablation procedure combined with conventional catheter mapping and ablation techniques and technologies enables a team of surgeons and electrophysiologists (EPs) to replicate most of the Cox-Maze IV lesions through a minimally invasive off-pump approach.

The combination of an initial epicardial (surgical) ablation followed by endocardial (catheter) ablation (collectively referred to as staged hybrid ablation) is expected to be most efficacious in avoiding lesion gaps and providing the most complete lesion set for effective treatment of the arrhythmia. Currently, no robust clinical data are available comparing interventional ablation strategies in the setting of difficult-to-treat patient subgroups. Also we lack data on cost-effectiveness of different treatment strategies in the mid-term.

Thus, it is the aim of the international, prospective, randomised multicentre CEASE-AF trial to compare the effects of combined epicardial endoscopic surgical and endocardial catheter techniques (Hybrid ablation arm; 140 patients) versus standard endocardial catheter ablation strategies (Catheter ablation arm; 70 patients) with regard to safety, efficacy and quality of life. In addition, effects on health economics of the two treatment strategies will be evaluated. The patient population comprises patients with persistent AF with enlarged left atrium (LA) >4 cm or longstanding persistent AF.

The study hypothesises that the Hybrid approach provides superior clinical effectiveness compared with repeated catheter ablation. This is supported by recent prospective studies, indicating that Hybrid ablation has high success rates without the need for further interventions. The advantages of the Hybrid ablation procedures lie in the fact that this approach offers the EP the chance to assess integrity of the Box lesion, eliminate gaps in the surgical lesions (when found), complete the lesion set according to the Maze principle, including lesions to eliminate perimitral and peritricuspid flutter, and terminate fragmented potentials.

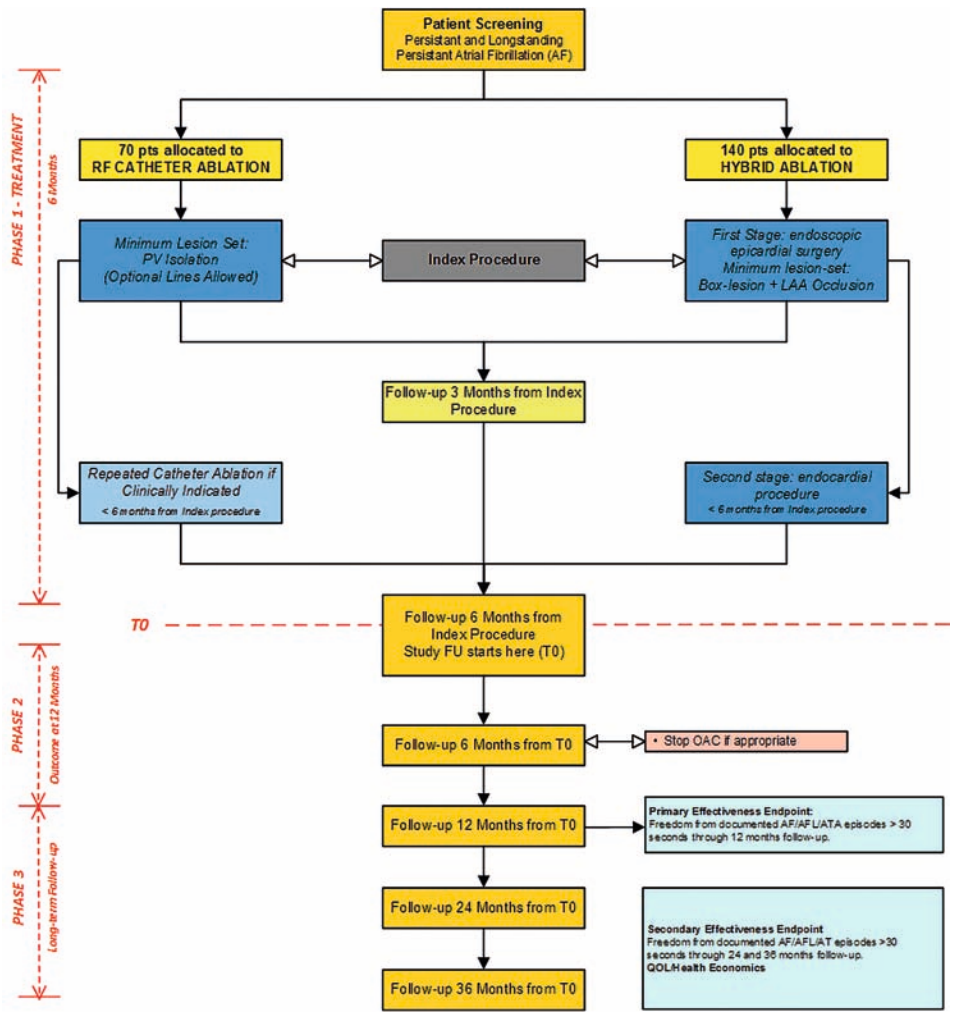


Figure 1. Timeline of the CEASE-AF trial.

Unique in this study is the meticulous long-term follow up of patients through 36 months after the initial procedure, which is divided into 3 phases:

Phase 1 – Ablation Treatment, including the period between the index procedure and 6 months. During these 6 months, patients will complete the hybrid ablation or receive repeated catheter ablation if indicated.

Phase 2 – Outcomes through 12 months. The follow-up period starts at 6 months from the index procedure (T0) and lasts for 3 years. Therefore, patients will be followed up at 3, 6 and 12 months from T0. Comparative and descriptive statistics will be used to summarise patient outcomes for the specified study endpoints. During this phase, cross-over or further catheter ablations are allowed if indicated.

Phase 3 – Long-term outcomes. Patients will be followed for an additional 24 months for a total of 36 months. During this phase, cross-over or further catheter ablations are also allowed if indicated.

Primary and secondary endpoints in the study are (in short) freedom from documented atrial fibrillation/flutter/tachycardia (AF/AFL/AT) episodes >30 seconds through 12, 24 and 36-months follow-up, in the absence of Class I or III AADs (with the exception of previously failed AADs at doses not exceeding those previously failed).

Definitions and endpoints in the CEASE-AF trial are derived from the 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation. So far, 13 sites have been initiated throughout Europe, and a total of 26 patients have been enrolled. Last patient enrolment is predicted for the end of 2017, and first results of the study are expected to be published early 2019.

Cardiac | Abstract Session | Coronary artery bypass graft: From start to finish

Does the use of a free internal mammary artery graft on the left anterior descending artery compromises long-term survival? A 23-year follow-up using propensity scores

Nicola Vistarini,[1,2] Dimitri Kalavrouziotis[1], Francois Dagenais[1], Pierre Voisine1, Eric Dumont[1], Jean Perron[1], Siamak Mohammadi[1] 1. Quebec Heart and Lung University Institute, University Laval, Québec, Canada; 2. Pavia University School of Medicine, Italy

Graft choice is of key importance for long-term patency and survival in coronary artery bypass grafting surgery (CABG). The left internal mammary artery (LIMA) has a greater long-term patency compared to the saphenous vein, and it significantly improves patients' long-term outcomes when it is anastomosed on to the left anterior descending artery (LAD). However, in some cases, the LIMA pedicle can be too short to reach the target lesion due to technical issues, it can be accidentally damaged during its harvesting, or it may not have adequate flow due to a stenosis of the subclavian artery. The aim of this study was to evaluate our experience with the free IMA (f-IMA) on the LAD, in order to determine if there are any early- and long-term outcome disadvantages in terms of survival, repeat revascularisation and hospital re-admissions, associated with this surgical strategy compared to the in-situ IMA (s-IMA).

Between 1991 and 2014, 21,876 consecutive patients underwent isolated primary CABG at our Institution. Among these patients, 238 underwent a free IMA graft to bypass the LAD. The reasons for using a f-IMA were: proximal LIMA injury at harvesting, left subclavian artery stenosis, and too-short in-situ LIMA pedicle to reach the target lesion on the LAD. The proximal anastomosis of the f-IMA has been performed, based on individual surgeon preference, to the ascending aorta and under aortic cross-clamp, or to a saphenous hood after aortic declamping, always using a 7-0 Prolene suture. Propensity score matching with bootstrap analysis was performed to produce a cohort of 222 f-IMA patients matched to 222 patients with s-IMA grafting to the LAD. Early and long-term outcomes including survival, readmission for cardiovascular causes and repeat revascularisation up to a maximum of 23 years post-CABG were compared. Administrative provincial vital statistics and hospital readmission data has been used to analyse long-term outcomes.

Hospital mortality was slightly higher among the matched patients who underwent f-IMA grafting, although this was not statistically significant (3.2% f-IMA vs. 1.9% s-IMA; OR=1.79; 95%IC=0.91-3.52). The risk of late death was not significantly different (HR=1.14; 95%CI=0.92-1.41) between the two matched groups calculated by propensity score analysis. The risk of re-admission to hospital during follow-up for cardiac reasons was higher in the f-IMA group (45.1% vs. 39.9%; HR=1.28; 95%CI=1.00-1.65), while repeat revascularisation (18.4% vs. 13.5%; HR=1.53; 95%CI=0.96-2.44) was not significantly different between matched patients.

Survival following CABG does not seem to be negatively influenced by using the IMA as a free graft to bypass the LAD. The long-term survival benefit associated with the standard in-situ LIMA to LAD graft is not compromised when the proximal connection of the LIMA to the subclavian artery is disrupted. Hospital readmissions for cardiac reasons were higher in the f-IMA group, but this did not translate into significantly higher rates of repeat revascularisation. In conclusion, when the LIMA pedicle cannot be anastomosed in-situ to the LAD, the use of a f-IMA graft should be encouraged.

Vascular | Wetlab | Aortic valve repair

How to start an aortic valve repair programme: innovation and team learning

J Rafael Sádaba
CH de Navarra, Pamplona, Spain

In general terms, adopting new techniques is essential to sustained competitiveness for many organisations. In healthcare, new techniques can lead to process improvements that produce tangible benefits for patients.

Aortic valve repair and valve sparing aortic root replacement are considered valuable alternatives to replacement with mechanical prosthesis, particularly in younger patients, mainly because they avoid the need for oral anticoagulation. Mid- and long-term results in the published series are favourable in this regard. Nevertheless, aortic valve sparing operations are complex operative procedures because the surgeon must possess the following: a sound knowledge of functional anatomy of the aortic valve; the ability to recognise anatomically abnormal components of the aortic root; judgment to select appropriate surgical techniques; and technical skills to execute the operation. Probably because of this, the adoption of these techniques is progressing at slower pace than others.

Because the institutional context and the technology in conventional cardiac surgery are mutually supportive and reinforcing, this context – especially its status structures – can represent a powerful barrier to the introduction of a new technique that requires more interdependence. It is possible that this barrier is more difficult to overcome in some hospitals than in others, due to organisational or team characteristics. Organisational factors, such as past experience with innovation in an organisation and seniority of those introducing a new technique, can influence adoption outcomes. As suggested above, the technical issues associated with these procedures (aortic valve repair and valve sparing aortic root replacement) can also affect adoption of the technique. Dissemination of new techniques often requires training in new skills. Performance changes with experience over time, with rapid improvement seen during early learning, during which time poorer outcomes may be seen. A body of literature is emerging on the learning curves associated with the adoption of new techniques. The existence of a learning curve clearly has implications for training and adoption of new procedures and devices. In addition, learning curves impact on, and have been noted as a stumbling block to, rigorous evaluation of new procedures.

Team work and a structured learning process are proposed to overcome the difficulties affecting the adoption of a new technique. These can be easily applicable to aortic valve repair.

A model of team learning for the implantation of a new technique involves a number of factors such as team leader behaviour and team psychological safety, stability, and training behaviour. In this regard, team reflexivity, the extent to which teams collectively reflect upon and adapt their working methods and functioning, has been shown to be an important predictor of team outcomes, notably innovation.

Structured learning has three main components:

1. The learning process, which includes theoretical knowledge and a stepwise approach to acquiring the required technical skills, including simulation. Simulation should be based on deliberate practice, which implies engaging in practice activities with the primary goal of improving particular aspects of performance.
2. Coaching from an expert, first visiting their centre and then inviting the expert to one's centre in order to oversee the first few procedures.
3. Progress assessment by quality control processes.

ISMICS

ISMICS – the International Society for Minimally Invasive Cardiothoracic Surgery

Are you an Innovator and Early Adopter? Want to discuss what's new in CT/CV surgery in an open and open-minded forum rather than review the same old studies with slightly different cohorts of patients? Are you looking for a place where healthy debate on issues is embraced and the atmosphere is inclusive? Then you should be a part of ISMICS.

How often have you attended a scientific meeting and listened to presentations and thought – I've heard this before, I've seen this before. Where can I learn about what's new? What's cool? What is the next thing in innovative cardiac, thoracic and cardiovascular surgery? If you want to be part of the Society that embraces what's new, what's cool, and wants to have open and healthy debate on everything that's innovative in our specialty – then you should be a part of ISMICS.

ISMICS was created 20 years ago by a group of first adopters, pioneers in minimally invasive cardiac surgery, literally the "cowboys" of their era in the new frontier of innovative and minimally invasive surgery. Many who watched ISMICS' birth believed that the innovation would fade and the traditional ways would triumph. But the fact is – ISMICS has not only lasted, but has grown, and embraces an international membership around the world, welcoming innovators and early adopters in cardiac, thoracic and cardiovascular surgery. And ISMICS remains the true forum for the latest, the newest, and the "out there on the edge" of what is happening, always willing to ask "what's next?" in our specialty.

The ISMICS Montreal Meeting in June featured an amazing keynote address about "the Rise of Superman," presented by author Steven Kotler, who talked about how today's extreme athletes live in a zone on the edge, where the possibility of death from their sport propels them to literally, superhuman achievements. He compared it to what today's leading innovative surgeons are doing – the ramifications of what they do are real – and they embrace the challenge to make superhuman strides to improve the care and health of their patients. ISMICS Montreal also featured an outstanding Presidential Address by Dr. Greg Fontana, who spoke on (R)Evolution: Leading the Charge. He compared the concepts of both evolution and revolution and how they applied to the world of minimally invasive surgery. He noted that early ISMICS leaders were called "crazy, reckless" individuals – but what they started 20 years ago has now entered the mainstream, and ISMICS rather than resting on its laurels continues to bear the standard for innovation and discovery. ISMICS members don't talk about what they did in the past, they talk about what they plan to do tomorrow.

ISMICS embraces its partnership with industry in seeking the newest technologies and treatments. ISMICS is an inclusive society – welcoming members from all areas of the world and inviting them to attend our Annual Meetings, as well as our Winter Workshops, and to publish their work in our indexed and citable journal, INNOVATIONS.

ISMICS 2017 – our 20th Anniversary – will be held 7 to 10 June 2017 at the Rome Cavalieri. The Abstract Submission site is open now. Submit your work, come to Rome and be part of the society that started innovation, and continues to push the envelope forward in a welcoming atmosphere.

ISMICS will be at EACTS! Please visit us at Booth 12 - and learn more about this young, growing, and dynamic society that continues to shape the future of cardiac, thoracic and cardiovascular surgery. Don't miss being a part of your surgical specialty's future. Join ISMICS today!

ISMICS – be a part of the world's leading society on innovative cardiac, thoracic and cardiovascular surgery. Visit us today and apply!

Thoracic | Focus Session | Video & Case Study 1

Tracheal resection simulation using a 3D printed trachea

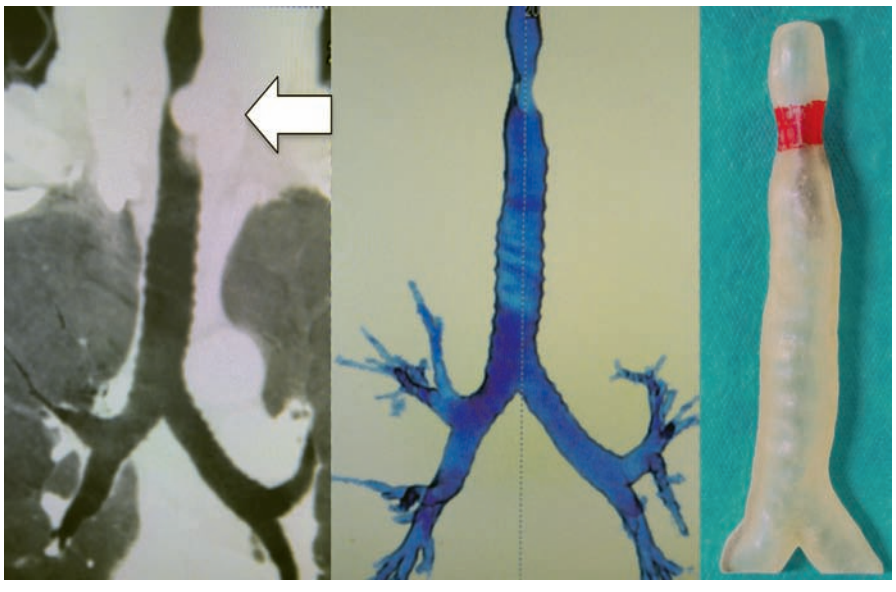


Figure 1. ; 53yrs old female had adenoid cystic carcinoma at the upper trachea. Arrow indicates tumor and red part of the 3D model is cricoid cartilage.

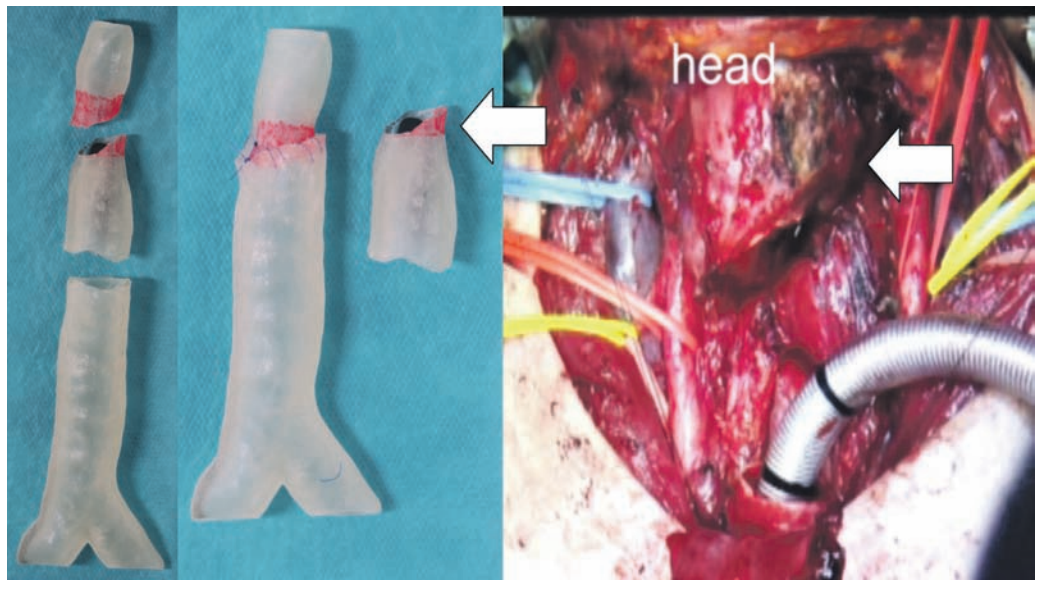


Figure 2. ; Simulation using 3D model and surgical field during operation. In the simulation, left cricoid cartilage and left recurrent laryngeal nerve were expected to be resected. Arrows indicate cricoid cartilage

Keitaro Matsumoto[1,2], Naoya Yamasaki[1,2], Daisuke Taniguchi[1,2], Tomoshi Tsuchiya[1], Takuro Miyazaki[1], Ryotaro Kamohara[1], Go Hatachi[1], Naoto Matsuo[2], Murray J Lawn[2] and Takeshi Nagayasu[1,2] Department of Surgical Oncology: 1 and Medical-engineering hybrid professional development center. 2, Nagasaki University, Japan

Recently, 3D printers are increasingly being used for a wide variety of applications. In the medical field the 3D printer has revolutionary potential. The medical application of 3D printers is expected to include the creation of, for example, artificial organs, customised prosthetics, implants, patient specific anatomical models, and customised drug delivery systems. With regard to surgery, this technology is ideally suited to the creation of anatomical models for surgical training in general. Furthermore the ability to create patient specific models will facilitate simulation, practice and preparation for patient specific complex procedures, thus significantly increasing their efficacy.

Currently, resident surgeons use 3D anatomical models to gain an understanding of the human body. 3D digital software can be used to some degree, but it tends to be limited to providing only an introductory level of understanding. Regarding 3D printing, while most 3D printers are very limited in the material that they can print, some have been used to produce customised prostheses and implants. Some researchers have, for example, successfully 3D printed patient specific prostheses and implants from titanium and polyetherketoneketone for mandibular and skull sections.

In the field of thoracic surgery, 3D printing is most useful for the simulation of surgical procedures, particularly surgery that involves anatomical or technical complexity. Currently we use 3D models for tracheal, carinal resection, lung segmentectomy, funnel chest and bronchial stenting procedures. In our presentation today, we explain the use of 3D models for tracheal resection.

Tracheal resection is one of the most technically challenging operations for thoracic surgeons. Furthermore, the decrease of proximal airway malignancy has reduced the frequency of such resections, and as such the need to be able to share procedural techniques and data is important.

There are three key points critical to the success of tracheal resection using patient specific 3D models, which are: (I) Ventilation during and after the operation; (II) Preservation of recurrent laryngeal nerves; and (III) Mobilisation and release of residual trachea. We simulated each patient's resection on a 3D model prior to the actual operation. This facilitated an understanding of aspects to be cautious of.

The use of 3D printed models for simulation of surgical procedures potentially increases procedural safety, reduces operating time and increases surgical precision. In the near future, in the field of surgery, procedural simulation using patient specific 3D printed models may become standard practice for technically complex and/or infrequent operations.

Cardiac | Focus Session | TAVR versus SAVR: David and Goliath

TAVR versus SAVR: David and Goliath

The debate over whether SAVR or TAVR is superior in the treatment of aortic stenosis in intermediate risk patients took centre stage on Sunday. Cardiologists, surgeons, academic authors of influential papers and statisticians argued for and against the superiority of TAVR, carefully evaluating the latest evidence.

Two controversial papers were published in May this year – the first in the *New England Journal of Medicine* and the second in *Lancet*, both reporting good results in using TAVR in intermediate risk patients – causing a big reaction from clinicians. The meeting heard that some academics wrote letters and emails to editors of journals and to the boards of the ATS and the STS because they were concerned the data might be misinterpreted.

The *NEJM*'s paper 'Transcatheter or Surgical Aortic Valve Replacement in Intermediate-Risk Patients' by the PARTNER 2 investigators found the rates of death from any cause, or disabling stroke, were similar in the TAVR group and the surgery group (p=0.001 for non-inferiority). In the transfemoral access group, TAVR actually resulted in lower rate of death or disabling stroke than surgery (hazard ratio, 0.79; 95% CI 0.62 to 1.000; p=0.005), but in the trans-thoracic cohort outcomes were similar for the two groups. However, the TAVR group had larger aortic valve areas than the surgical group, and also resulted in lower rates of acute kidney injury, severe bleeding and new onset atrial fibrillation. Surgery resulted in fewer major vascular complications and less paravalvular aortic regurgitation.

The *Lancet* paper 'Transcatheter valve replacement versus surgical valve replacement in intermediate risk patients a propensity score analysis' found that TAVR with the SAPIEN 3 valve [Edwards Lifesciences, USA] demonstrated good 30-day clinical outcomes in patients with severe aortic stenosis. TAVR with SAPIEN 3 was associated with low mortality, strokes and regurgitation at one year. Propensity score analysis indicated a significant superiority for composite outcomes with TAVR compared to surgery. The article concluded TAVR might be the "preferred treatment alternative in intermediate risk patients."

Presentations were made by researchers involved in some of the trials and from critics of the new papers, with detailed appraisals of the research – particularly the use of propensity scoring which many regarded as controversial. Clinicians also spoke of their experiences of TAVR versus SAVR in the US and across Europe, giving a broad sweep of experiences and opinions to inform the debate.

Dr David Brown, interventional cardiologist from The Heart Hospital (Plano, Texas, USA) and co-author of the *NEJM* article told the meeting he was the "Christian to the Lion's Den", "the token cardiologist" who'd been asked to tell the audience a little bit about the statistics.

"There are Mark Twain's lies, damn lies and statistics," Dr Brown concluded, "But there are fundamental clinical implications that TAVR may be a good alternative to surgery, even in intermediate risk patients, similar to those included in the trial. Likewise, transfemoral access may lead to additional clinical advantages."

However, Dr Andreas Boening from the Department of Cardiovascular Surgery at University Hospital, Giessen (Germany) made some criticisms of the *NEJM* research in his presentation, 'TAVR or SAVR; comparing apples with oranges in the *New England Journal of Medicine*.'

He said that the main finding of the study was that TAVR and SAVR are not different. "That's it – that's the message from the study – that there's no difference. But if that had been all, I wouldn't have written a letter to the *New England Journal of Medicine* about it." Dr Boening remarked how the paper had been rejected for two reasons: it was too late (outside a three-week time frame), and too long.

He said the PARTNER 2 trial will have enormous influence on new guidelines, and he took issue with this: "These [problems] include the allocation process to TAVR, the surgical results and also the involvement of the sponsor."

Dr Boening concluded that in the future he'd like to see a comparison of TAVR and isolated surgery, which may give much better results in the surgical group. "I would also like to see more investigator-initiated trials and no involvement of valve companies. I would like to see no involvement of retrospective sub-analyses where studies are not powered to the surgical group."

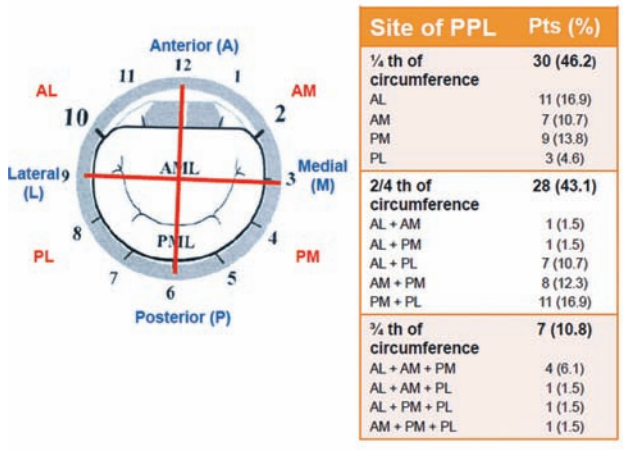
Other speakers discussed their rejected letter to *Lancet*, the effects of propensity matching and propensity-matched analysis versus randomised trials, and whether these data justify the expansion of TAVR in Europe and the US.

Cardiac | Abstract Session | Complications in mitral valve surgery

Mitral peri-prosthetic leakage: contemporary results of surgical correction in the era of trans-catheter therapy

Luca Botta, Benedetta De Chiara, Salvina Quattrocchi, Francesca Nicolo, Antonella Moreo, Cristina Giannattasio and Claudio Francesco Russo Cardio-thoracic-vascular department, ASST Grande Ospedale Metropolitano Niguarda, Milan, Italy

From left to right: Dr. Claudio F. Russo (Chief, Cardiac Surgery Unit), Dr. Antonella Moreo and Benedetta De Chiara (Echo lab, Cardiology IV Unit) and Dr. Luca Botta (Cardiac Surgery Unit); Cardio-thoraco-vascular Dept., Niguarda Hospital, Milano, Italy.



Site of PPL	Pts (%)
¼ th of circumference	30 (46.2)
AL	11 (16.9)
AM	7 (10.7)
PM	9 (13.8)
PL	3 (4.6)
2/4 th of circumference	28 (43.1)
AL + AM	1 (1.5)
AL + PM	1 (1.5)
AL + PL	7 (10.7)
AM + PM	8 (12.3)
PM + PL	11 (16.9)
¾ th of circumference	7 (10.8)
AL + AM + PM	4 (6.1)
AL + AM + PL	1 (1.5)
AL + PM + PL	1 (1.5)
AM + PM + PL	1 (1.5)

Figure 1. Mitral PPL involved one, two or three/quarter of mitral perimeter in 46, 43 and 11% of cases. Specific anatomical details are described in the table on the right.

Significant advances in materials and design have led to more haemodynamically efficient and durable artificial heart valves. Nevertheless, both early and late complications can occur, caused by a variety of factors. Peri-prosthetic leakage (PPL) refers to an abnormal communication between the cardiovascular chambers adjacent to a prosthetic valve, occurring in patients who have undergone surgical valve replacement, with an incidence of 7–17% in the mitral position.

The morphology and location of PPL can be extremely variable, as well as their number and size. As such, they require very careful imaging evaluation. Compared with 2D TEE, real time 3D TEE can provide detailed descriptions of the leakage, which is essential for planning and guiding the potential corrective technique. Until recently, conventional re-operation (re-fixation or prosthetic replacement) has been the only available therapy for very complex patients developing heart failure symptoms despite maximal medical therapy or severe haemolysis. The development of transcatheter procedures has tremendously increased in the last years, particularly in the field of aortic valve disease. Mitral valve diseases are the new frontier for these approaches. Percutaneous transcatheter closure has been utilised for the treatment of PPLs using a variety of techniques. This study aimed to evaluate the anatomy of mitral PPLs and its impact on surgical choices and outcomes, to analyse the single centre and contemporary outcomes of conventional surgery and potential predictors of death, leakage recurrence, and reoperation.

We performed a single-centre, retrospective, non-randomised study of 65 consecutive patients (28 males; mean age 64.8 years) who were referred to our department between 2006 and 2015 for the surgical correction of a mitral PPL. Mitral PPL was the leading surgical indication, although associated procedures were included in the study. Previous transcatheter procedures and leaks involving multiple prostheses were excluded. Endocarditis was the cause of leak in 13 patients. The median number of mitral operation was 2 (range 1-5). A previous operation on the aortic or tricuspid valve was performed in 31 patients. Mitral PPL involved one-, two- or three-quarters of the mitral perimeter in 46, 43 and 11% of cases (Figure 1). Prosthetic refixation or replacement was performed in 24 and 41 patients respectively. Annular reconstruction was performed in 17% of cases. Associated procedures were performed in 19 patients. In 20 patients, the operation was executed through a right mini-thoracotomy with an unclamped aorta. In-hospital mortality was 3.1%. Freedom from all-cause mortality was 96.8% at 1 year, 91.5% at 3 years, and 88.8% at 5 years. At follow-up (median 60 months), 4 patients had grade >2+ recurrent leaks and 2 of these were re-operated. In our experience, mitral PPL occurred more frequently in females with a 27-29mm mechanical valve, presenting with a grade 3+ regurgitation and requiring a long hospital stay (median 21 days). PPL location did not affect outcomes. A customised conventional mitral surgery (with or without annular reconstruction) still represents a satisfactory and effective treatment option in very complex patients with PPL (no difference between prosthetic refixation and replacement) and should be considered a benchmark even in the era of transcatheter procedures. Postoperative relapse of leakage can be early or late but rarely requires reoperation. The use of transcatheter devices should be reserved to extremely high risk patients, or when surgery is contraindicated.

We are extremely grateful to every single person who contributed to reach these results and who will follow them in the near future.

Cardiac | Abstract Session | Transcatheter aortic valve implantation 2

Transcatheter aortic valve implantation versus standard aortic valve replacement in over-85-year-old patients

Sandro Sponga[1], Miriam Isola2, Leonardo Torracchi[1], Andrea Lechiancole[1], Enzo Mazzaro[1], Esmeralda Pompei[1], Maria Teresa Grillo[1], Ilaria Armellini[1], Ugolino Livi[1] 1 Cardiothoracic Department, University Hospital of Udine – Italy, 2 Depatment of Biolgical and Medical Sciences, University of Udine - Italy

Objectives

Surgery for aortic stenosis in the aging population is considered a high risk for mortality and morbidity. Very old patients are referred with reluctance, the option of transcatheter aortic valve implantation (TAVI) generally being preferred.

The difference in mid-term outcomes in very old patients treated with standard aortic valve replacement (SAVR) versus TAVI is not well studied.

Methods

Since 2007, 187 consecutive patients of 85 years and older underwent TAVI ± PTCA (68 patients) or standard aortic valve replacement SAVR ± CABG (119 patients). A propensity score adjustment was employed to compare outcomes, including cost analysis.

Results

TAVI patients were older (87.9±2.0 vs 86.1±1.4, p<0.01), more symptomatic (NYHA class 2.9±0.5 vs 2.4±0.7, p<0.01), more frequently affected by atrial fibrillation (52.9% vs 27.5%, p<0.01) and with previous PTCA 30.3% vs 4.2%, p<0.01) cardiac surgery (16.2% vs 1%, p<0.01) and with a higher Logistic Euroscore (26.2±12.8 vs 19.1 vs 11.2, p<0.01). The propensity scoring generated 42 pairs of patients with similar baseline characteristics. In the TAVI group, there were more frequent atrioventricular block (38.1% vs 5.3%, p<0.01), the presence of paravalvular leak ≥ moderate (13.7% vs 0%, p=0.03), longer ICU stay (6.2±6.0 vs 2.2±1.4 days, p<0.01), and lower rates of renal failure (7.4% vs 23.9%, p<0.01) and atrial fibrillation (19.5% vs 53.8%, p<0.01).

One-, three- and five-year overall survival (78.5% vs 90.4%, 44.6% vs 79.2%, 35.03% vs 65.2%, p<0.01) and freedom from major adverse cardiac and cardiovascular events (MACCE) (70.8% vs 88.0%, 32.2% vs 77.05%, 18.4% vs 68.0%, p<0.01) were lower in TAVI group. Cardiac causes of long term mortality was more frequent with TAVI (40% vs 20% p<0.01). Univariate Cox regression showed that risk factors for mortality were TAVI group (HR 2.496, 1.267-4.918), and presence of paravalvular leak ≥ moderate (HR 1.661, 1.129-3.122). Risk factors at multivariate analysis resulted TAVI group (HR 2.241, 1.123-4.473).

Risk factors for MACCE in univariate proportional hazards model were: TAVI group (HR 3.214, 1.647-6.272), atrial fibrillation (HR 1.881 1.002-3.530), presence of paravalvular leak ≥ moderate (HR 1.861, 1.128-3.071), COPD (HR 2.095, 1.092-4.017). Risk factors in multivariate analysis resulted in TAVI group (HR 3.078, 1.533-6.177), atrial fibrillation (HR 2.463 1.247- 4.864).

Concerning cost analysis, the mean cost in the TAVI group was much higher than in SARV (42084 vs 19891 Euro). This was due to the more complex preoperative patient screening in TAVI, needing hospital stay for coronary angiography and cardioTC, and a higher rate of postoperative complications including PM implantation (1034 vs 155 Euro), besides the higher cost of TAVI prostheses.

Conclusions

SAVR and TAVI offer good short- and mid-term results in patients older than 85 years. Even if additional studies with more numerous series are needed, in these very old patients SAVR, despite a halved cost compared to TAVI, seems to be superior in terms of mid-term survival and MACCE – even after multivariate analysis, propensity adjusted analysis, or propensity score matching. The reasons for inferior results in TAVI could be related to postoperative paravalvular leaks, incomplete revascularisations and untreated mitral regurgitation, which explain its higher mortality and MACCE for cardiovascular causes. For this reason an age of >85 years should not be considered a clear-cut indication for TAVI, but a more complete evaluation of comorbidities is necessary.

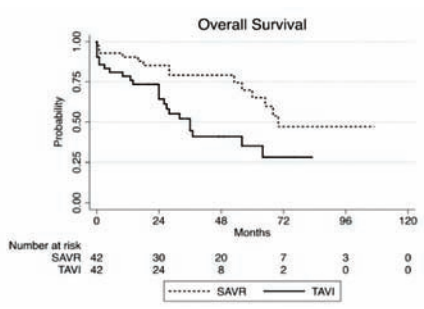


Figure 1. Overall survival after propensity matching.

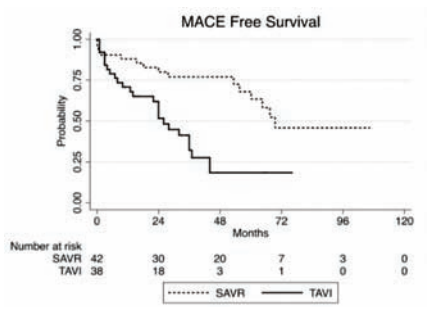


Figure 2. MACE free survival after propensity matching

Table I. The propensity matched population.

	TAVI (n=42)	SAVR (n=42)	p
Age (years)	87.15±1.5	86.5 ±1.5	0.25
Female sex	21 (50%)	28 (66.67%)	0.12
NYHA	2.9±0.5	2.4±0.7	0.14
Diabetes	11 (26.19%)	6 (14.29%)	0.17
COPD	13 (30.95%)	10 (23.81%)	0.46
Renal failure (GFR <30)	7 (16.67 %)	7 (16.67%)	1.00
Hypertension	30 (71.43%)	34 (80.95%)	0.31
Peripheral vascular disease	11 (26.19%)	7 (16.67%)	0.29
Cerebrovascular disease	3 (7.14%)	0 (0%)	0.08
Atrial fibrillation	22 (52.3%)	17 (40.5%)	0.27
Logistic Euroscore	24.4 ±12.9	20.2±11.2	0.11
Euroscore II	4.8±4.8	3.4±2.9	0.33
LVEF (%)	56.55 ±11.49	59.46 ± 12	0.26
Aortic valve area (cm2)	0.63±0.49	0.70 ± 0.21	0.44
Mean gradient (mmHg)	43.8 ± 14.7	46.9 ± 19	0.46
Preop MI	9 (21.4%)	6 (14.3%)	0.39
Prev PTCA	6 (14.3%)	4 (9.5%)	0.50
Prev cardiac surgery	4 (9.5%)	1 (2.4%)	0.17
Pulmonary HTN	12 (28.6%)	13 (30.9%)	0.81

Table II. Perioperative outcomes of Propensity matched population.

	TAVI (n=42)	SAVR (n=42)	p
30-day mortality	4 (9.5%)	3 (7.1%)	1.00
Renal failure (GFR <30)	5 (7.4%)	22 (23.9)	< 0.01
Bleeding	0 (0%)	3 (11.54%)	0.03
Stroke	0 (0%)	0 (0%)	1.00
Wound infection	1 (2.4%)	1 (2.4%)	1.00
Atrioventricular block	16 (38.10%)	2 (5.26%)	< 0.01
Atrial fibrillation	8 (19.05%)	21 (53.85%)	< 0.01
Major vascular compliations	2 (5%)	0 (0%)	0.49
LVEF (%)	58 ± 11	63 ± 10	0.04
Peak Gradient (mmHg)	17 ± 7	13 ± 11	0.15
Mean gradient (mmHg)	11 ± 5	8 ± 4	0.27
Paravalvular leak ≥ 2	2 (13.7%)	0 (0%)	0.03
ICU stay (days)	6.18 ± 6.02	2.25 ± 1.41	< 0.01
Hospital stay (days)	17.71 ±16.55	12.73 ± 3.80	0.33

Cardiac | Abstract Session | Tricuspid valve - repair and replacement

Physiological growth potential of a tricuspid valve extracellular matrix tube graft in a chronic pig model

Diana M. Røpcke Aarhus University Hospital, Denmark

Tricuspid valve reconstruction using small intestinal submucosal extracellular matrix (ECM) or CorMatrix designed as a tube graft is possible. Using cardiac magnetic resonance imaging (MRI) and digital photograph imaging, valves were evaluated after six months of implantation in a porcine model.

Ten 60 kg pigs received a tricuspid valve tube graft. A baseline MRI was performed after 2 weeks (n=8). A follow up MRI was performed in three of five 6 months' survivors to assess function and hemodynamics of the tricuspid tube graft. Valves were explanted in all five animals for gross examination.

Compared to the original tube graft, leaflet area and leaflet height decreased after six months (320 vs. 14.7 cm2 and 3.2 vs. 1.7 cm, respectively). Both imaging modalities showed septal dehiscence in all tube grafts after six months, causing hemodynamically severe paravalvular regurgitation. On the other hand, no central insufficiency was seen and coaptation was adequate. Cardiac MRI showed a significant remodelling of the right ventricular and annular dimensions. The cardiac output decreased (6716 vs. 345 ml/min/kg), while right ventricular stroke volume increased from 64.4 14.6 to 107 63.9 ml. This correlated to a paravalvular regurgitant volume increasing from 7.27.3 to 71.769.6 ml.

The ECM tube grafts seemed to remodel over time with loss of redundant ECM material. However, tube graft dehiscence caused severe tricuspid paravalvular regurgitation and heart failure while leaflet coaptation was intact. These data suggest that adjunct annuloplasty to reinforce the annular attachment should be considered to improve durability after tricuspid tube graft implantation.

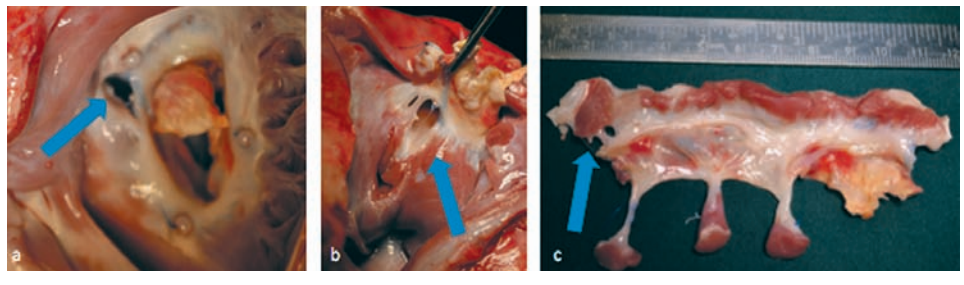


Figure 1. ECM valve after six months of implantation. The arrow points at the septal dehiscence site. (a) The valve seen from the right atrium with the septal dehiscence to the left, a stiff and fibrotic septal leaflet and the three MRI beads in situ. (b) The septal dehiscence seen from the ventricular view. (c) The whole valve after explantation. The tube graft has integrated well into the endocardium at the annular and papillary muscle level, and two out of three leaflets show signs of cellular infiltration and remodelling

Thoracic | Abstract Session | Oncology 2

Effectiveness and safety of lymphadenectomy during video-assisted thoracic surgery lobectomy: analysis from national database

Domenico Viggiano Thoracic Surgery Unit, AOU Careggi, Firenze, Italy

The path of the Italian VATS Group began long ago, in October 2013 (Pescantina, Verona, Italy), thanks to the vision of Prof. Roberto Crisci (University of L'Aquila, Teramo, Italy). He has been able to interpret the shift to a minimally invasive approach in lung cancer treatment, already in place for some years, conveying in this ambitious project the enthusiasm of the vast majority of Italian thoracic surgeons.

The Italian VATS group is synonymous with the VATS lobectomy registry and database: a web-based database, prospective and multicentre. Since its first patient (1st January 2014), the registry has aimed to collect data in a complete and organised manner from individual centres accredited according to stringent regulation. To date, 65 centres are accredited to include their patients treated with a minimally invasive technique, and more than 3,500 patients have been enrolled.

Our EACTS 2016 presentation entitled 'Effectiveness and Safety of lymphadenectomy during video-assisted thoracic surgery lobectomy: analysis from national database,' given on behalf of the Italian VATS Group, is a wide work of review and analysis of these data, collected from inception to 14 April 2016. The presentation explores the value of the project, the seriousness of the work done in each Italian centre, as well as the quality of the database.

Our work hypothesises that video-assisted thoracic surgery lobectomy (VATS-L), compared with lobectomy by thoracotomy, is associated with superior postoperative outcomes and fewer postoperative complications. We also investigate the safety and effectiveness of VATS lymphadenectomy (LA) outside specialty centres or during the learning curve period. With these questions in mind, we analysed the Italian VATS-L database (www.vatsgroup.org) to evaluate on a large scale which factors may influence safety and effectiveness of LA performed during VATS-L for clinical N0 and N1 non-small cell lung cancer (NSCLC).

The study population consists of patients who received VATS-L as the primary procedure for a clinical N0/N1 NSCLC at VATS Group participating centres. We analysed LA performed during VATS-L, evaluating which pre- or intra-operative can factors affect LA effectiveness and safety. Effectiveness was evaluated by the number of sampled/dissected lymph nodes (LN) (by total number, N1 nodes, N2 nodes) and rate of nodal upstaging (NU) (cN0 vs pN1/N2; cN1 vs pN2). Factors associated with VATS LA effectiveness were preoperative (age; sex; tumour location; clinical T N M stage (cTNM); invasive mediastinal staging procedure) and intraoperative (VATS approach technique; LN dissection (LND) vs LN sampling (LNS), volume of the institution (< or ≥50 cases); type of lobectomy; histology; pathological T N M stage (pTNM)). The safety of VATS LA was evaluated by post-operative morbidity and mortality (30 days) related with effectiveness of LA as previously defined.

The analysis and interpretation of the results led us to conclude that, based on the Italian VATS Group database, the choice of a more extended lymph node dissection assured the best intraoperative staging regardless of the VATS technique. Analysis of adenocarcinoma confirmed a tendency for nodal upstaging, and consequently we confirm the need for accurate intraoperative staging in this tumour type. Importantly, the volume of a participating centre does not affect the safety and effectiveness of VATS lymphadenectomy.

Cardiac | Focus Session | People skills for surgeons

Work-life balance makes us better doctors

Douglas E. Wood Professor and Interim Chair, Department of Surgery / Chief, Division of Cardiothoracic Surgery / Endowed Chair in Lung Cancer Research at the University of Washington, USA

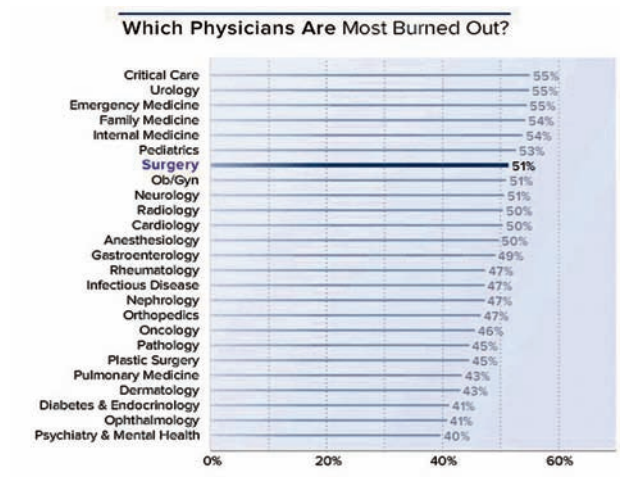
"If physicians aren't happy, they can't heal others": That was a headline of an article earlier this year expressing concern about the emotional well-being of physicians and their ability to provide quality care for their patients. United States Surgeon General Vivek Murthy, MD, MBA decried the very high suicide and burnout rate amongst US physicians and noted: "I am particularly interested in how to cultivate emotional well-being for healthcare providers. If healthcare providers aren't well, it's hard for them to heal the people for whom they are caring."

Physicians are well known for being over-achievers and for working long hours in a high intensity profession. Surgeons often take this further, with long operative days, a burdensome call schedule, and emergency procedures that often disrupt the normal activities of daily life. Cardiothoracic surgeons are usually at the extreme and of this spectrum. As Dr Murthy pointed out earlier this year, recent reviews of burnout rates in surgeons is very concerning and is an increasing threat to physician-patient relationships, safety, and quality outcomes in surgery.

Burnout syndrome is characterised by losing enthusiasm for work (emotional exhaustion), treating people as if they were objects (depersonalisation), and having a sense that work is no longer meaningful (low personal accomplishment). Multiple recent studies have now demonstrated that 30 to 40% of nearly every medical and surgical specialty display the symptoms of burnout. A survey of American surgeons noted burnout symptoms in approximate 40%, and depressive symptoms in 30%. Factors implicated in a multivariate analysis were work-home conflicts, hours worked per week, and recent resolution of work-home conflict in favour of work.

Unfortunately, these high rates of physician burnout have broad implications that reach far beyond the physicians and surgeons themselves. Burnout alters the physician-patient relationship and the quality of care that physicians provide. Dissatisfied and emotionally exhausted physicians have a higher likelihood of making medical errors, demonstrating lapses in professionalism, showing changes in referral practices and prescribing habits, and demonstrating diminished empathy and compassion that weakens the degree of trust and confidence of patients as well as patient satisfaction. Burnout is been found to have further consequences for physicians that include substance abuse, career dissatisfaction, the desire to leave medical practice, and suicide.

Multiple studies indicate factors contribute to physician burnout including loss of autonomy, workload, sleep deprivation, and poor work-life balance. Fewer studies have evaluated interventions to address the problem. Wellness programs, mindfulness training, and stress reduction programs do demonstrate evidence of benefit, with one large study demonstrating a 70% reduction in malpractice claims in a controlled trial of stress reduction interventions.



What can we control as busy cardiothoracic surgeons? In the University of Washington Department of Surgery, we are implementing a formalised wellness program to improve the health, career satisfaction, and quality of life for our teams. Work-life balance means different things to different people. For some, it is getting time to exercise and spend time in nature. For others, it is time with family, dinners at home, or re-energising a former hobby. Whatever is valuable for each one of us as individuals, embracing it with the same dedication and enthusiasm that we demonstrate in our work will help us have better lives, better relationships, help us avoid burnout and have satisfying careers, and ultimately allow us to take the best care of our patients.

Thoracic | Abstract Session | Oncology 2

Effectiveness and safety of lymphadenectomy during video-assisted thoracic surgery lobectomy: analysis from national database

Domenico Viggiano
Thoracic Surgery Unit,
AOU Careggi, Firenze, Italy

The path of the Italian VATS Group began long ago, in October 2013 (Pescantina, Verona, Italy), thanks to the vision of Prof. Roberto Crisci (University of L'Aquila, Teramo, Italy). He has been able to interpret the shift to a minimally invasive approach in lung cancer treatment, already in place for some years, conveying in this ambitious project the enthusiasm of the vast majority of Italian thoracic surgeons.

The Italian VATS group is synonymous with the VATS lobectomy registry and database: a web-based database, prospective and multicentre. Since its first patient (1st January 2014), the registry has aimed to collect data in a complete and organised manner from individual centres accredited according to stringent regulation. To date, 65 centres are accredited to include their patients treated with a minimally invasive technique, and more than 3,500 patients have been enrolled.

Our EACTS 2016 presentation entitled 'Effectiveness and Safety of lymphadenectomy during video-assisted thoracic surgery lobectomy: analysis from national database,' given on behalf of the Italian VATS Group, is a wide work of review and analysis of these data, collected from inception to 14 April 2016. The presentation explores the value of the project, the seriousness of the work done in each Italian centre, as well as the quality of the database.

Our work hypothesises that video-assisted thoracic surgery lobectomy (VATS-L), compared with lobectomy by thoracotomy, is associated with superior postoperative outcomes and fewer postoperative complications. We also investigate the safety and effectiveness of VATS lymphadenectomy (LA) outside specialty centres or during the learning curve period. With these questions in mind, we analysed the Italian VATS-L database (www.vatsgroup.org) to evaluate on a large scale which factors may influence safety and effectiveness of LA performed during VATS-L for clinical N0 and N1 non-small cell lung cancer (NSCLC).

The study population consists of patients who received VATS-L as the primary procedure for a clinical N0/N1 NSCLC at VATS Group participating centres. We analysed LA performed during VATS-L, evaluating which pre- or intra-operative can factors affect LA effectiveness and safety. Effectiveness was evaluated by the number of sampled/dissected lymph nodes (LN) (by total number, N1 nodes, N2 nodes) and rate of nodal upstaging (NU) (cN0 vs pN1/N2; cN1 vs pN2). Factors associated with VATS LA effectiveness were preoperative (age; sex; tumour location; clinical T N M stage (cTNM); invasive mediastinal staging procedure) and intraoperative (VATS approach technique; LN dissection (LND) vs LN sampling (LNS), volum0- e of the institution (< or ≥50 cases); type of lobectomy; histology; pathological T N M stage (pTNM)). The safety of VATS LA was evaluated by post-operative morbidity and mortality (30 days) related with effectiveness of LA as previously defined.

The analysis and interpretation of the results led us to conclude that, based on the Italian VATS Group database, the choice of a more extended lymph node dissection assured the best intraoperative staging regardless of the VATS technique. Analysis of adenocarcinoma confirmed a tendency for nodal upstaging, and consequently we confirm the need for accurate intraoperative staging in this tumour type. Importantly, the volume of a participating centre does not affect the safety and effectiveness of VATS lymphadenectomy.

Congenital | Professional Challenge | Management of coarctation in newborn and infants

The modified Amato procedure revisited: Mid-term results in neonates with aortic coarctation and distal transverse arch hypoplasia

Enrico Cetrano Bambino Gesù Children Hospital, Rome, Italy

Distal transverse aortic arch (DTA) hypoplasia associated with coarctation of the aorta has been historically addressed with several surgical approaches, although there is no consensus about the optimal technique. The modified Amato procedure allows an advantageous approach to DTA reconstruction through a posterolateral left thoracotomy, while preserving lower body perfusion through the patent arterial duct. When combined with extended end-to-end anastomosis (EEEA), it virtually eliminates the risk of both early and late aortic arch obstruction.

Forty-four neonates (23 patients ≤3 kg) with aortic coarctation and DTA (defined as DTA diameter in mm less than body weight in kg +1) underwent surgery at our institution. The anterior to distal transverse arch ratio (ATA/DTA) was utilised to assess arch growth over time. Median age and weight at surgery were 7 days (range, 1-25) and 3.1 kg (range, 1.2-4.0), respectively. Concomitant diagnosis included atrial septal defect, present in 11 patients (25%), ventricular septal defect (VSD) in 16 patients (36.3%), multiple VSD in 2 patients (4.5%), bicuspid aortic valve in 12 patients (27.2%), 1 patient (2.2%) with scimitar syndrome, 1 patient (2.2%) with complete atrioventricular canal defect, 5 patients (11.3%) with Shone syndrome, 5 patients (11.3%) with isolated vertebral artery, 1 patient (2.2%) with double outlet right ventricle with straddling of the tricuspid valve, and 1 (2.2%) with single coronary artery.

DTA diameter increased from 2.7±0.1 mm to 5.6±0.2 mm in the immediate postoperative period. ATA/DTA ratio steadily decreased over time (1.0±0.2 mm vs. 0.8±0.1 mm, p<0.001) with a consensual decrement in the mean pressure gradient across the anastomosis (8.6±1.0 mmHg vs. 5.3±1.4 mmHg, p=0.019). Operative mortality was nil. At a median follow-up of 28 months (range, 1.2-67.0), two late deaths occurred, both unrelated to the surgical procedure. At a median interval of 2.8 months from surgery (range, 0.7-12.5), seven patients (15.9%) required arch re-interventions (5 catheter-based balloon angioplasties for isthmic re-coarctation and 2 surgical repairs for residual DTA hypoplasia). No significant differences in re-intervention rate, arch growth and gradient across the anastomosis were appreciated in those with a body weight ≤3 kg at the time of surgery.

Figure 1. Post-operative CT Scan.

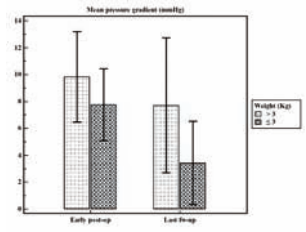


Figure 2. Consensual decrement in the mean pressure gradient across the anastomosis.

Extended aortoplasty by the Amato procedure with EEEA is effective and associated with consistent growth of the repaired aortic segments. Mid-term follow-up shows persistent relief of the arch gradient, with a very low reintervention rate. Its main advantages include the avoidance of cardiopulmonary bypass and freedom from left mainstem bronchus compression. An isolated origin of the left vertebral artery does not add complexity to the surgical procedure. Body weight ≤3 kg does not preclude the achievement of harmonic arch growth.

Based on such results, the modified Amato procedure is our choice for neonates with aortic coarctation and DTA unsuitable for coarctation repair alone. The impact of this more extensive repair on occurrence of late systemic hypertension is yet to be determined and warrants further investigation.

Vascular | Focus session | Thoracic and thoraco-abdominal aneurysms treatment…

Proximal failure after thoracic endovascular aortic repair: incidence, mechanism and treatment

Martin Czerny University Medical Centre Freiburg, Germany

Thoracic endovascular aortic repair (TEVAR) has been rapidly embraced by the surgical community as a novel means to treat patients with acute and chronic thoracic aortic pathology. After an initial hype, several limitations of the technique became evident. In particular, endoleak formation – in its most pronounced form being persistent or recurrent perfusion of the aneurysmal sac – has to be regarded as a treatment failure for which correction is warranted, either by additional endotherapy or open surgical conversion.

The most important component in this area is exact planning, as the majority of failures could have been anticipated. Reasons are manifold, but the length of the landing zone is likely the most important component, followed by respecting anatomy and angulations. However, the choice of the right prosthesis will also contribute to success.

This lecture is not meant as a recommendation for one product or another, but shall guide the interested physician through the growing field of technology available. Hence, this will create an understanding of, in particular, introduction devices, deployment mechanisms, and the associated exactness of having the prosthesis at the desired position.

Thoracic | Abstract Session | Non-oncology

Efficacy of segmental resection in patients with prenatally diagnosed congenital lung malformations

Do Hyung Kim, Sungkwang Lee and Sang Kwon Lee Pusan National University Yangsan Hospital, Yangsan, Gyoungnam, South Korea

The numbers of prenatal congenital lung malformations (CLM) diagnoses have been increasing in line with improvements in prenatal diagnostic techniques. In patients with CLMs, early surgical resection is recommended to mitigate risk factors. In this study, we determined whether segmentectomy is feasible in patients with CLM.

We retrospectively analysed data from 27 patients between March 2011 and September 2015. We included 16 male at a mean age of 118.2±69.4 days at the time of surgery. All of the patients were prenatally diagnosed via ultrasonography, and chest computed tomography (CT) was performed after birth.

Surgical timing was determined by repeat chest CT collected until 3 months after birth, except in cases with recurrent pneumonia or unstable vital signs. Generally, surgery was planned in the interval of 3–6 months after birth. The extent of resection was first evaluated visually. As these segments exhibited high-level anatomical variation, we initially performed parenchymal dissection of the cystic lesion, commencing at the periphery. Next, if the segmental vessel and bronchus were discovered during parenchymal dissection. After selective resection of the segmental bronchus, the lung was expanded, and the residual lung parenchyma of the non-ventilated portion was additionally resected. Conventional segmentectomy was performed with the aid of electrocautery; we used a harmonic scalpel (Ethicon, Cincinnati, OH) or Ligasure (Covidien, Boulder, CO, USA) to reduce damage to the lung parenchyma. Next, the resected sites were enveloped with polyglycolic acid patches and fibrin glue to prevent air leakage. Air leakage developed in only three cases.

The surgical method and extent were based on the extent of the segmental lesions. Lobectomies were performed in seven patients in whom the cystic lesion had invaded all of the lobar segments. In 20 cases, the lesions were limited to particular segments.

The average operation times were 92.9±32.0 minutes in the lobectomy group and 126.5±37.5 minutes in the segmentectomy group (p=0.041). The average chest tube drainage duration and length of hospital stay were 6.3±3.3 days and 10.9±3.7 days, respectively, for the lobectomy group, and 6.9±4.1 days and 10.8±4.9 days, respectively, for the segmentectomy group (p=0.699, 0.975). No post-operative mortality was noted. Complications developed in five cases (18.5%), including >7 days of air leakage in four cases and wound dehiscence in one case. The mean outpatient follow-up duration was 24.8±12.7 months.

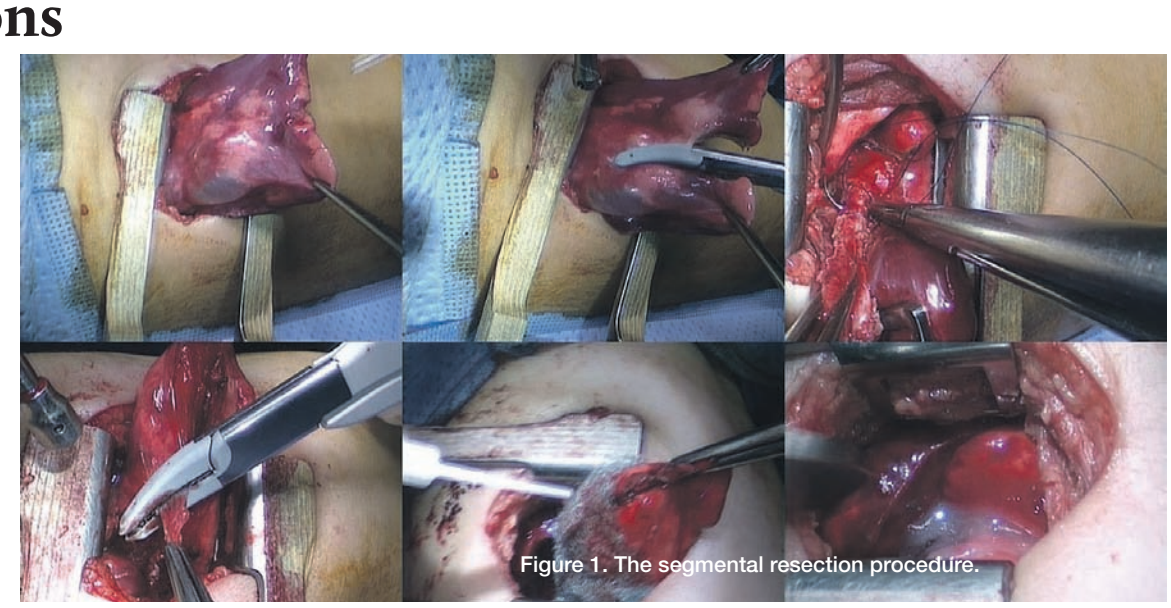


Figure 1. The segmental resection procedure.

Lobectomy is treatment of choice of CLM. However, lobectomy frequently resects an excessive amount of normal lung tissue. Therefore, segmentectomy may be a better option; such surgery reduces resection of normal lung tissue and preserves pre-surgical function.

Three issues should be considered before a decision is made to perform segmentectomy on CLM patients. Firstly, segmentectomy does not prevent the development of malignant disease as effectively as lobectomy. However, segmentectomy reduces the risk of malignant degeneration because most cystic lesions do not in fact undergo malignant degeneration (only ~2%). The second relevant consideration is the extent of remnant cystic lesions after surgery. However, one analysis of the outcomes of segmentectomy indicated that the incidence of remnant lesions was as low as 6%. The third consideration is the timing of segmental resection.

In conclusion, segmentectomy is relatively safe and is associated with minimal complications. Furthermore, the incidence of remnant lung lesions is not high. Therefore, elective segmentectomy performed after precise identification of the lesions' locations may be highly beneficial for CLM patients.

Vascular | Rapid Response | The old, the new, the evident in aortic surgery

The effect of false lumen procedures during thoracic endovascular aortic repair in patients with chronic DeBakey IIIb aneurysm

Tae-Hoon Kim, Suk-Won Song, Kwang-Hun Lee, Kyung-Jong Yoo and Bum-Koo Cho Yonsei University College of Medicine, Seoul, Republic of Korea

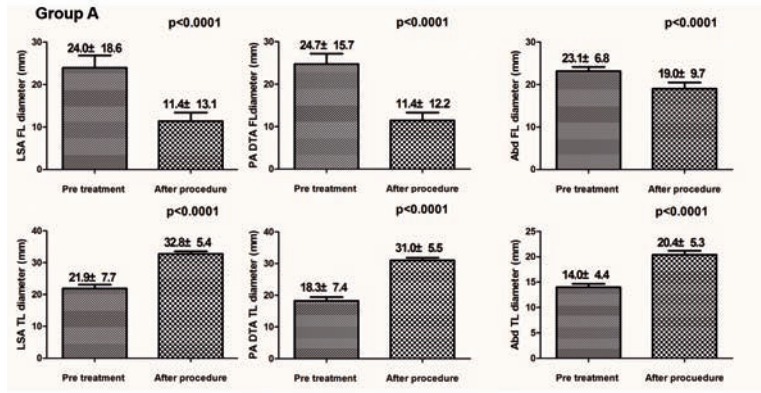
Although thoracic endovascular aortic repair (TEVAR) is commonly used for Chronic DeBakey IIIb (CDIIIb) aneurysms, aortic remodelling after TEVAR in CDIIIb aneurysms is not yet satisfactory.[1-3] False lumen (FL) complete thrombosis rates after TEVAR have been reported as up to 90% in CDIIIa, and in CDIIIb patients as 30-60%.[4-6] Although stent graft deployment down to the celiac level has improved the results of TEVAR in CDIIIb patients, complete thrombosis rate remains at 65%.[7] Persistent retrograde flow to the FL through reentry tears is a common cause of failure. Mobile intima flap distal to the stent graft is another factor disturbing FL thrombosis in CDIIIb patients.

As false lumen procedure (FLP) blocks the retrograde FL flow, aorta remodelling after TEVAR seems to be improved with additional FLP in CDIIIb patients. Currently, FLP is done with commercialised materials such as the vascular plug (Amplatzer Vascular plug, AVP), stent graft (Viabahn stent graft), coil, or glue. Inserting these materials into the FL has the effect of blocking retrograde FL flow via intima tears, visceral branches, or Intercostal arteries (ICAs).

Our previous study preliminarily reported that FLP seemed to be safe and effective.[8] However, there is no study comparing the effect of TEVAR and FLP. In this study we compared two groups: TEVAR, and TEVAR with additional FLP. We sought to clarify the safety and the effect of false lumen procedure (FLP) upon aortic remodelling in CDIIIb patients.

From 2012 to 2016, 73 patients underwent TEVAR for CDIIIb aneurysm. TEVAR with FLP was performed in 41 patients (group A, 56%). 32 patients (group B, 44%) underwent simple TEVAR. Outcomes included whole thoracic aorta FL thrombosis and diameter change in the true lumen (TL) and FL. Diameters were measured at 3 levels (left subclavian artery, pulmonary artery bifurcation, and celiac axis). No in-hospital mortality and procedure-related complication was observed. There was one case of paraplegia and one stroke after the procedure. The whole thoracic aorta FL thrombosis rate was significantly higher in group A (83% vs. 56%, p=0.03). Significant aortic remodelling (TL expansion and FL regression after procedure) was observed in both groups (Figure 1-(A), 1-(B)). In multivariate logistic regression, FLP was an independent favourable factor, and intimal tears below the celiac axis was a poor prognostic factor for FL thrombosis (p=0.005 and p=0.007, respectively).

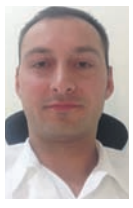
In CDIIIb aneurysms, unfavourable aortic remodelling after TEVAR is inevitable, despite extensive and multiple TEVAR for full coverage above the celiac axis. Introducing an adjunctive FLP has the potential to improve the number of patients with successful FL thrombosis and favourable aortic remodelling.



Cardiac | Rapid Response | Beyond lines and clips

Epicardial clip occlusion of left atrial appendage during cardiac surgery provides optimal surgical results and long term stability

Vojtěch Kurfirst Hospital of České Budějovice, Czech Republic



Different techniques of surgical left atrial appendage (LAA) occlusion are routinely used during cardiac surgery procedures. The most common techniques are ligation, resection, suture closure, stapler resection, and epicardial clip occlusion. Criteria for complete LAA occlusion are usually lack of communication (flow) between the LAA and left atrium proper as well as no residual LAA stump greater than 1 cm. Besides the surgical methods of LAA occlusion, different types of catheter devices are available in clinical practice. The Watchman LAA occlusion device (Boston Scientific) is perhaps the most frequently implanted and clinically tested device of the percutaneous closure devices commercially available. Experience and trials (such as PROTECT-AF, PREVAIL) suggest that Watchman is not inferior to permanent anticoagulation in thrombembolic event prevention and is associated with less frequent bleeding complications than permanent anticoagulation. However, percutaneous devices are associated with a clinically significant rate of serious periprocedural complications and are suitable for only a well-defined group of patients with suitable anatomy.

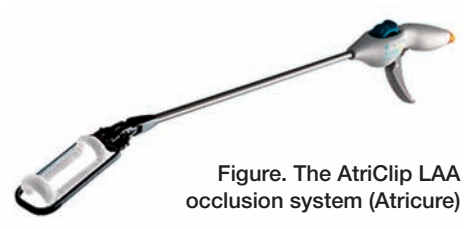


Figure. The AtriClip LAA occlusion system (Atricure)

The purpose of our study was to evaluate long-term results of epicardial clip occlusion in patients undergoing a cardiac procedure. 101 patients (mean age 65±6 years, 47 females) undergoing cardiac surgery procedures with epicardial clip occlusion of the left atrial appendage were enrolled in the study. The clip was placed from sternotomy, thoracotomy or from a thoracoscopic approach. For LAA occlusion the AtriClip or the second generation of the clip – the Atriclip Pro (Atricure, USA) was utilised. The implantable device is a self-closing external LAA occluder available in 4 sizes, from 35 mm to 50 mm. It consists of two nitinol springs joined with two titanium members covered with Dacron polyester fabric. The parallel compression planes symmetrically put pressure of 2–8 psi over the entire contact area. The clip is attached to a delivery system, from which it is released after transoesophageal echocardiography (TEE) confirmation of closure is complete.

Postoperative variables, such as thromboembolic events, clip stability, and endocardial leakage around the device were examined by TEE and/or computed tomography. Early mortality rate in this series was 8.9% due to non-device related reasons. Perioperative success of clip implantation was achieved in 98% of patients. No clip migration, leak around the device or clot formation near the remnant cul de sac was noted. Follow-up consisted of 1,873 patient-months with a mean duration of 18±11 months. Throughout the follow-up period, 4 patients experienced transitory ischemic attacks and no patient experienced a cardioembolic ischemic cerebrovascular event.

Results of our study confirmed the long-term safety and stability of the epicardial clip occlusion of the LAA. Atriclip offers a wide sphere of activity in cardiac surgery, making its usage possible both during on-pump and off-pump surgery. The clip is suitable for implantation with different procedural approaches – sternotomy, thoracotomy or thoracoscopy. Minimally invasive clip implantation may represent an interesting therapeutic option for patients with lone atrial fibrillation, not candidates for catheter or surgical AF treatment, who also are contraindicated for chronic anticoagulation therapy.

Vascular | Rapid response | The old, the new, the evident in aortic surgery

A good quality of life for patients after surgery of the thoracic aorta with circulatory arrest and deep hypothermia

Juhani Akseli Stewart, Veera Ilkka, Janne Jokinen, Anne Vakkuri, and Ulla-Stina Salminen Helsinki University Hospital, Finland

Patient quality of life of and long-term outcome after surgical intervention has become increasingly important in recent years, especially in high-risk surgeries such as the management of diseases of the thoracic aorta. While aortic aneurysms and dissections are still considered deadly diseases, advancements in surgical techniques and postoperative intensive care have shifted interest from immediate to long-term survival and the quality of life of patients after surgery. This topic is also important on a national level, as treatment of these conditions incurs a notable fiscal investment. Within the present inclination towards lean projects and increasing cost-efficiency, all treatments must be weighed for a balance of investment and results.

In our study, we explored the long-term survival of patients for up to 8 years after elective or emergency surgery of aortic aneurysms or dissections, operated on with deep hypothermic circulatory arrest. All available patients were interviewed for health-related quality of life with the RAND 36-item health survey at the end of follow-up. Results were compared to a control group of elective coronary artery bypass graft surgery patients, and the results of an age- and sex-matched Finnish reference population of people with chronic illnesses.1 Similar studies have previously been published, but most are retrospective cohort studies, many with short follow-up durations of a couple of years.2

Our results show that patients undergoing operation of the thoracic aorta carry a notable risk of immediate mortality and neurological complications. However, survivors, including those who had neurological complications, go on to live without a high long-term mortality risk, and with a good health-related quality of life, comparable to patients undergoing elective CABG and to the reference population of chronically ill people.

It is reassuring to see that surgical treatment of aortic diseases, despite being high-risk surgery, is beneficial in the long run for both the individual in question and society at large. Patients enjoy a good quality of life, such as chronically ill patients with high blood pressure or diabetes experience.

References

1. Hays RD, Sherbourne CD, Mazel RM. The RAND 36-item health survey 1.0. Health Econ 1993;2:217-27.
2. Jarral OA, Kidder E, Patel VM, et al. Quality of life after intervention on the thoracic aorta. Eur J Cardiothorac Surg 2016;49:369-89.

Congenital | Abstract Session | Tetralogy of Fallot / pulmonary atresia

Outcomes of palliative right ventricle to pulmonary artery connection for pulmonary atresia with ventricular septal defect

Marien Lenoir, Régis Gaudin, Margaux Pontailler, Sébastien Gerelli, Daniel Tamisier, Damien Bonnet, Bari Murtuza, Pascal R Vouhé and Olivier Raisky Paris Descartes University and Sick Children Hospital, Paris, France

The management of patients with pulmonary atresia with ventricular septal defect (VSD) is manifold, as there is a very large abnormality of the pulmonary vascular bed spectrum. There is no consensus for the management of these patients. However, the common goal for all patients is the same: (a) the bi-ventricular repair (closure of the VSD); to have a right ventricular pressure / left ventricular pressure ratio as low as possible at the end of bi-ventricular repair; and (c) to minimise the number of interventions.

One technique is the 'rehabilitation of the pulmonary arteries'. This strategy is about the growth of native pulmonary arteries (NPA). The rehabilitation is done in multiple stages. The first step consists of increasing the blood flow through the pulmonary arteries; this palliation allows the pulmonary artery (PA) to grow. After this step, we can perform cardiac catheterisation to evaluate the growth of PA and to embolise the major aortopulmonary collateral arteries (MAPCA) that are communicating. Then, when the patient has pulmonary arteries of normal calibre, biventricular repair is performed by closing the VSD and restoring the right ventricle (RV)-PA connection without restriction. This first palliation step can be done in several ways: a systemic-pulmonary anastomosis (MBT shunt); a central systemic-pulmonary anastomosis (central shunt); an RV-PA connection; or a stent through the ductus arteriosus.

Each technique has its advantages and inconveniences: the RV-PA connection requires a CPB and a short ventriculotomy, but this technic has the advantage of having a pulsatile flow, venous blood, without coronary diastolic runoff and with a low risk of thrombosis of the RV-PA connection.

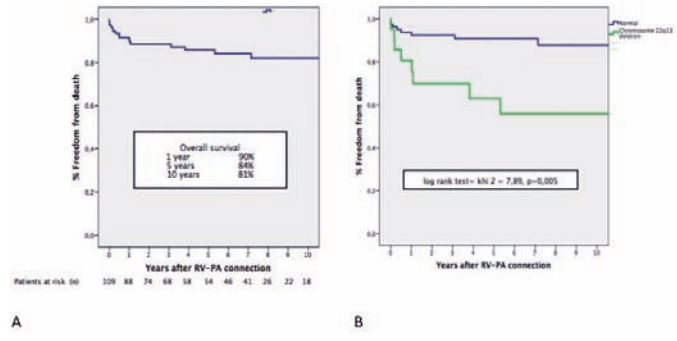


Figure 1: A: Actuarial survival for the overall population for RV-PA connection operation in 109 children with PA/VSD. B: Actuarial survival for the overall population for RV-PA connection operation comparing those with and without chromosome 22q11 deletion (green line). (PA/VSD, pulmonary atresia with ventricular septal defect; RV, right ventricular; PA, pulmonary artery)

We report our experience from 2000 to 2014 at Necker Enfants Malades in Paris, including 109 patients with PA/VSD who had undergone RVPA connections (Tetralogy of Fallot and PA/VSD without pulmonary arteries excluded). Early mortality of RV-PA connection was 2.7% (3/109). 84 (77%) patients had a biventricular repair and 8 patients (7%) are awaiting repair. The interstage mortality was 6.4% (7/109). Globally, the survival rate was 90% at 1 year and 81% at 10 years. The RV-PA connection allows significant growth of native pulmonary artery (NPA) with a Nakata index of 101 mm2/m2 before the RV-PA connection and 274 mm2/m2 after (p=0.001). 29 reinterventions were carried out for restrictive pulmonary blood flow (9 before 2 months and 20 after 2 months). Of the 84 patients repaired, 22 patients (26%) initially had right ventricular pressure over 40mmHg. 28(33%) of those repaired required late reoperation. The outcomes were negatively affected by chromosome 22q11 deletion (figure 1).

In conclusion, we believe that hospital mortality of the RV-PA connection is low and allows good growth of NPA. Biventricular repair is possible in a large number of cases. Late morbidity remains significant. Early reinterventions should be avoided by an appropriate calibration. This technique appears to be suitable for any type of PA/VSD with central pulmonary arteries.

References

1. Williams JA et al. Two thousand Blalock-Taussig shunts: a six-decade experience. Ann Thorac Surg. 2007 Dec;84(6):2070–5; discussion 2070–5.
2. Liava'a M et al. Pulmonary atresia, ventricular septal defect, and major aortopulmonary collaterals: neonatal pulmonary artery rehabilitation without unifocalization. Ann Thorac Surg. 2012 Jan;93(1):185–91.
3. Gerelli S et al. Neonatal right ventricle to pulmonary connection as a palliative procedure for pulmonary atresia with ventricular septal defect or severe tetralogy of Fallot. Eur J Cardio-Thorac Surg Off J Eur Assoc Cardio-Thorac Surg. 2014 Feb;45(2):278–88; discussion 288.

Cardiac | Abstract Session | Functional mitral insufficiency

The papillary muscle approximation provide stability of mitral valve repair for ischemic mitral regurgitation

Vladlen Bazylev, Evgeny Rosseikin, Artur Mikulyak, Fedor Bartosh, Ruslan Babucov and Vadim Karnahin Federal Center for Cardiovascular Surgery (Penza), Ministry of Health of the Russian Federation

Ischemic mitral regurgitation (IMR) develops in 10-50% of patients after myocardial infarction. Among several surgical procedures, mitral ring annuloplasty remains the method of choice. However, mitral regurgitation (MR) recurrence after surgery has a reported occurrence that ranges from 5% to 58%. Careful consideration of the mechanisms underlying recurrence of MR after annuloplasty might explain the unsatisfactory outcomes. The pathophysiology of IMR is complex and results from imbalance between closing and tethering forces acting on the mitral valve. Enlargement of the left ventricular (LV) chamber, and abnormal apical and lateral papillary muscle displacement increase the tethering forces. LV and papillary muscle dyssynchrony and reduced myocardial contractility decrease closing forces, which lead to impaired leaflet coaptation and appearance of MR. Thus, treatment of mitral insufficiency requires an integrated approach affecting all units of the pathogenesis of MR recurrence.

Recent publications show that an adjunctive subvalvular repair during mitral annuloplasty for secondary mitral regurgitation effective in preventing recurrent regurgitation. One of these procedures is papillary muscles approximation. However, the safety and the positive impact of this method are still in doubt. To identify the positive qualities and safety of this technique, we conducted this study.

During 2014 and 2015, 66 patients with ischemic cardiomyopathy and coexisting IMR were enrolled in this prospective, randomized, controlled clinical trial.

Patients were divided into two groups. The first group included 31 patients with ischemic cardiomyopathy and MR who underwent coronary artery bypass grafting, mitral annuloplasty and papillary muscles approximation. The second group included 35 patients with ischemic cardiomyopathy who underwent coronary artery bypass grafting and mitral valve annuloplasty.

The approximation of the papillary muscles were performed in patients with systolic interpapillary muscle distance >25 mm and diastolic interpapillary muscle distance >35 mm. Tips of papillary muscles were approximated through the mitral valve using polyester sutures with small felt pledgets. Endpoints were measured at time of hospital discharge, at 6 months, and every year thereafter with an outpatient visit. The period of follow-up was 18±5.79 months.

There was no mortality among patients during the observation period. Progressive LV enlargement was observed in both groups, with values quite similar to preoperative measurements. We have not revealed the essential improvement of myocardial contractility or reverse LV remodelling, but nevertheless, the rate of MR recurrence is significantly higher in the second group of patients (p=0.05).

Cardiac | Rapid Response | Coronary artery bypass graft: Decreasing complications and improving graft potency

How to reduce neurological complication during coronary revascularisation: A prospective single-centre study of 3,454 patients

Andrey Viktorovich Marchenko and Pavel Anatol'evich Mialiuk Federal Center of Cardiovascular Surgery N.A. S.G. Sukhanov, Perm, Russian Federation

The incidence of cerebrovascular complications after CABG remains high, ranging within 0.8-4.2%. Cardiac surgeons concede to interventional cardiologists by the incidence of stroke after coronary revascularisation; according to the Syntax trial, stroke was determined in 2.2% of patients after isolated CABG.

The purpose of this study was to evaluate neurological complications after different methods of coronary revascularisation. During the period from 1 January 2013 to 4 June 2015, 3,454 patients from our clinic underwent isolated coronary bypass grafting. Their mean

age was 61.2±12.2 years (range, 24 to 87 years). There were 2,346 men (67.9%) and 1,108 women (32.1%). Obesity was diagnosed in 1,090 (31.6%) patients, diabetes in 281 (8.1%), permanent atrial fibrillation in 82 (2.4%), left ventricular ejection fraction of less than 30% in 31 (0.9%), and unstable angina in 370 patients (10.7%).

We divided patients into two groups. In the first group of 765 patients, we applied a differentiated approach of coronary revascularisation based on epiaortic ultrasound scanning data (group I). The second, control group contained 2,689 patients upon whom we performed on-pump CABG with aorta clamping (group II).

We performed epiaortic ultrasound scanning before aorta cannulation in all patients of group I. Patients with normal aorta underwent standard coronary artery bypass grafting (on-pump CABG with aorta clamping) (n=585 (76.4%)). Atheromatosis, plaques protruding into the lumen more than 3 mm, or local calcinosis of aorta, was detected in 190 patients. For these patients we applied a differentiated approach of coronary revascularisation: on-pump CABG with change place of cannulation and aorta clamping in 92 patients (12%); 'single clamp' in 43 patients (5.6%); 'on-pump beating' in 27 patients (3.5%); and off-pump 'no-touch aorta' in 28 patients (3.5%).

Mortality in group I was 0.26% in comparison with 1.3% in group II (p<0.001). Postoperative stroke occurred in no patients in group I and in 33 patients (1.4%) in group II (p<0.001).

In conclusion, intraoperative epiaortic ultrasound scanning is an effective method for determining the aortic atheromatosis. A differentiated approach of coronary revascularisation based on epiaortic scanning data significantly decreases stroke rate and mortality.

Visit us to get your very own caricature!

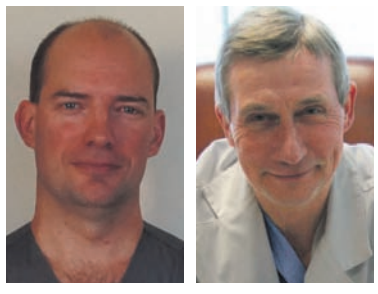
MAQUET
GETINGE GROUP

Cardiac | Abstract session | Coronary artery bypass graft: Minimally invasive and hybrid revascularisation

Hospital and mid-term results of prospective randomised controlled trial MICSREVS - Minimally Invasive Cardiac Surgery REVascularization Strategy

A.A. Ziankou[1], Y.P. Ostrovsky[2]; M.G. Laiko[1], K.S. Vykhrystsenka[1], V.A. Chuyashou[1], A. Zhyhalkovich[2] 1 Vitebsk regional clinical hospital, Vitebsk State Medical University, Belarus. 2National centre of cardiology, Minsk, Belarus

The invasiveness of coronary artery bypass grafting remains considerable and has not decreased in over 40 years. The development of new minimally invasive methods in coronary surgery builds on the aspiration to optimise the results of surgical treatment of patients with coronary heart disease, especially those with an increased risk of complications associated with extracorporeal circulation, sternotomy and aortic manipulations. Minimally invasive multi-vessel coronary revascularisation methods are still being developed and established, which is why basic comparative studies of immediate and, even more so, long-term results are a matter of present and future research. We evaluated hospital and mid-term results of the prospective randomised controlled trial (RCT) MICSREVS (Minimally Invasive Cardiac Surgery REVascularization Strategy), which compared the effectiveness of multivessel small thoracotomy coronary artery bypass grafting (MVST-CABG) versus off-pump (OPCABG) and on-pump coronary artery bypass grafting (ONCABG).



The RCT MICSREVS was started in January 2014. In accordance with the trial design, 150 patients were included, divided into 3 groups of 50 people. In group I, the MVST-CABG strategy was directed to perform multivessel arterial revascularisation via a left minithoracotomy on the beating heart, using the aortic no-touch technique. In control groups II (OPCABG) and III (ONCABG), conventional surgery was performed via median sternotomy. Inclusion criteria were comprised the following: multivessel coronary artery disease; II-IV Canadian Cardiovascular Society functional class of angina; patients at 1 month after acute myocardial infarction. Exclusion criteria comprised: previous CABG, single-vessel disease, need for emergency revascularisation. Randomisation was carried out by the blind method ('envelopes'). Primary outcome measures were accepted death from any cause and major adverse cardiac and cerebrovascular events (MACCE). During the hospitalisation period, as well as 12 and 36 months following primary myocardial revascularisation, were planned as the control points.

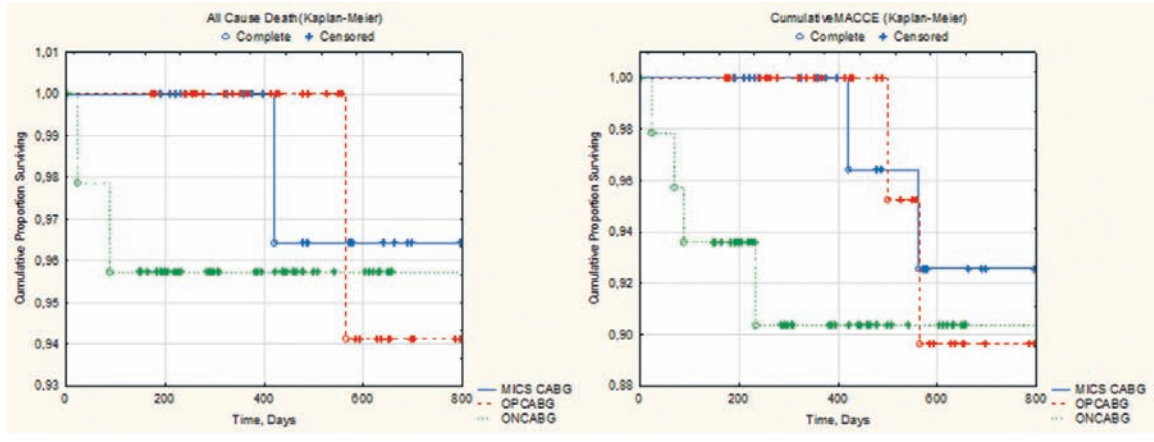


Figure. Comparison of mid-term outcomes in terms of all cause death and MACCE

Patients' clinical characteristics did not differ significantly between treatment groups. Intraoperative blood loss in the MVST-CABG group was less than that in the OPCABG group and ONCABG group (p<0.001) (Table). The mean blood loss within the first day was lower in the MVST-CABG group compared with OPCABG (p=0.003) and ONCABG groups (p=0.007). The number of blood transfusions was lower in the MVST-CABG group compared with group II (p=0.015) and group III (p<0.001). The postoperative ventilation time was lower in the MVST-CABG group compared with ONCABG group (p=0.007). On average, patients with MVST-CABG demonstrated an associative trend toward shorter intensive care unit stay (p=0.053), new onset atrial fibrillation (p=0.081) versus ONCABG patients, and fewer deep wound infections versus OPCABG patients (p=0.079). The postoperative length of hospital stay (surgical department) was shorter in the MVST-CABG group [6.5 (5.0; 8.5) days] versus OPCABG group [8.5 (8.0; 10.0) days] (p=0.003), and versus ONCABG group [8.5 (8.0; 10.5) days] (p=0.008). Median time to return to full physical activity was markedly shorter in the MVST-CABG group [14 (7; 21) days] than in the OPCABG group [56 (42; 77) days] and ONCABG group [56 (44; 79) days] (p<0.001). No significant differences were observed in rates of severe in-hospital events (p>0.05), cumulative midterm survival, and freedom from MACCE (p>0.05) (Figure).

In conclusion, the aortic no-touch technique in full arterial MVST-CABG was as safe as OPCABG and ONCABG, showing good results comparable with results of conventional surgery at in-hospital point of RCT MICSREVS. MVST-CABG is associated with fewer wound infections, less perioperative blood loss, shorter postoperative ventilation time and hospital length of stay, shorter time to return to full physical activity, and greater improvement in the physical health component of quality of life. MVST-CABG can be applied to the majority of multi-vessel patients saving the effectiveness during mid-term follow up.

Table. Operative Characteristics and Early Postoperative Results.

Characteristic	MICS-CABG (n=50)	OPCABG (n=50)	ONCABG (n=50)	P*	P†	P‡
Average number of distal anastomoses	2.7+0.5	2.9+0.6	3.1+0.6	0.070	<0.001	0.056
Operation time, min	351,7 + 97.5	286.7+57.2	303.8+81.5	<0.001	<0.001	0.227
Intraoperative blood loss, ml	250 (200; 300)	475 (350; 587.5)	400 (300; 500)	<0.001	<0.001	0.141
First twenty-four hours postoperative blood loss, ml	450 (252.5; 587.5)	575 (450; 800)	500 (400; 800)	0.003	0.007	0.666
Transfusion of blood and/or derivatives	9 (18.0)	20 (40.0)	33 (66.0)	0.015	<0.001	0.009
Postoperative ventilation time, hours	3.5 (2.6; 5.0)	4.3 (2.1; 6.0)	5.3 (3.5; 7.9)	0.426	0.007	0.109
Intensive care unit stay, hours	18 (16.0; 20.75)	18 (17.0; 27.75)	19.3 (16.1; 43.6)	0.458	0.053	0.243
New onset atrial fibrillation	2 (4.0)	4 (8.0)	7 (14.0)	0.400	0.081	0.338
Wound infection	1 (2.0)	5 (10.0)	2 (4.0)	0.092	0.558	0.240
- Superficial wound infection	1 (2.0)	2 (4.0)	2 (4.0)	0.558	0.558	1.000
- Deep wound infection	-	3 (6.0)	-	0.079	-	0.079
Postoperative pneumonia	2 (4.0)	6 (12.0)	6 (12.0)	0.140	0.140	1.000
Stroke	-	-	-	-	-	-
Myocardial infarction	-	-	-	-	-	-
Death	-	-	1 (2.0)	-	0.315	0.315
Postoperative length of stay (surgical department), days	6.5 (5.0; 8.5)	8.5 (8.0; 10.0)	8.5 (8.0; 10.5)	0.003	0.008	0.229
Length of hospital stay (rehabilitation department), days	5.5 (4.5; 6.5)	5.5 (4.5; 7.0)	5.5 (4.0; 7.5)	0.656	0.784	0.891
Median time to return to full physical activity, days	14 (7; 21)	56 (42; 77)	56 (44; 79)	<0.001	<0.001	0.872
Physical health component SF-36 Health Status Survey quality of life	50,9 (45,3; 52,8)	47,3 (44,9; 50,2)	48,3 (45,4; 50,5)	0.026	0.079	0.674
Mental health component SF-36 Health Status Survey quality of life	53,5 (41,5; 55,2)	50,1 (42,7; 53,5)	51,8 (40,9; 53,4)	0.231	0.476	0.673

Data are expressed as n (%), Me (LQ; UQ). *MVST-CABG group vs OPCABG group; †MVST-CABG group vs ONCABG group; ‡OPCABG group vs ONCABG group.

Vascular | Rapid Response | Type A Aortic dissection from research to clinical application

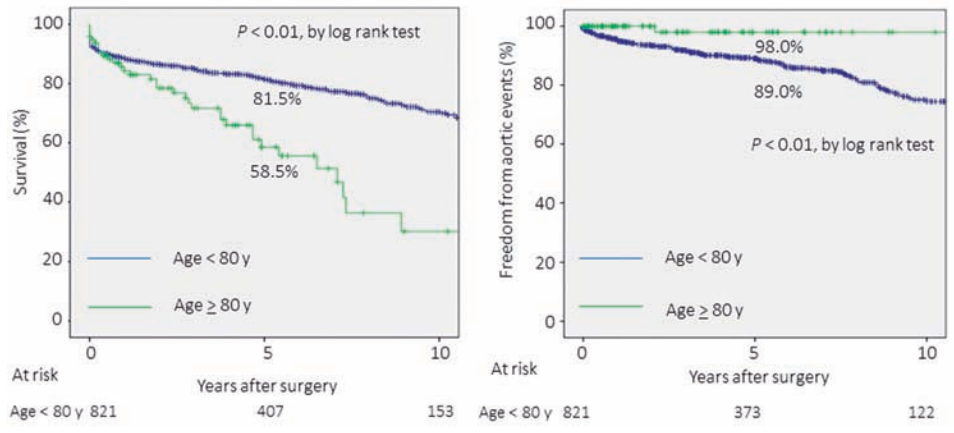
Surgical treatment of acute type A aortic dissection in octogenarians: early and late outcomes

Naoyuki Kimura,[1] Koji Kawahito,[2] Kei Aizawa,[2] Atsushi Yamaguchi,[1] Yoshio Misawa,[2] Hideo Adachi[1] 1Department of Cardiovascular Surgery, Saitama Medical Center, Jichi Medical University. 2 Division of Cardiovascular Surgery, Department of Surgery, Jichi Medical University

Recent International Registry of Acute Aortic Dissection (IRAD) study has shown that conservative treatment for acute type A aortic dissection (ATAAD) is more likely than surgical treatment to result in death, even in elderly patients. However, surgical risks are increased in the elderly, as evidenced by high complication and mortality rates associated with surgery for ATAAD in patients of advanced age. The surgical strategies we have used for elderly patients are similar to those we use for non-elderly patients: preservation of the aortic valve whenever possible and aortic arch replacement when the entry site is located in or extends into the aortic arch. We investigated early and late outcomes of surgery for ATAAD in patients aged 80 years or older, aiming to validate our strategy in these high-risk patients.

Included in our study were 935 consecutive ATAAD patients (mean age, 64.0 years) who underwent urgent aortic repair at Saitama Medical Center, Jichi Medical University (Saitama, Japan) or Jichi Medical University (Shimotsuke, Japan) between 1990 and 2015. The patients were grouped as those aged < 80 years (non-octogenarian group; n = 836, mean age, 61.8 years) and those aged 80 years or older (octogenarian group; n = 99, mean age, 83.0 years). Preoperative status, surgical variables, and early and late outcomes were compared between the groups. The mean follow-up period was 5.4 years, and the follow-up rate was 98.2%.

Patients in the octogenarian group were more likely than patients in the non-octogenarian group to be female (79.8% vs.44.1%, respectively; P < 0.01), less likely to be obese (BMI > 30 kg/m2; 0% vs. 7.7%, P < 0.01), and more likely to have DeBakey type II dissection (35.4% vs. 8.9%, P < 0.01) and cardiac tamponade (33.3% vs. 22.6%, P = 0.018). Although aortic root surgery was not performed in any patient in the octogenarian group (0% vs. 5.4%, P = 0.033), arch replacement was performed with similar frequency as in the non-octogenarian group (11.1% vs. 16.5%, P = 0.17). Surgery time was decreased in the octogenarian group (352 minutes vs. 380 minutes, P = 0.044). In-hospital mortality was 7.1% for the octogenarians and 8.1% for the non-octogenarians. Median ICU stay was 6.0 days for both groups. Although tracheostomy was performed more often in the octogenarian group (9.1% vs. 3.6%, P = 0.01), re-exploration for bleeding (4.8% vs. 5.1%, P = 1.0), new-onset stroke (11.1% vs. 6.9%, P = 0.13), and deep sternal wound infection (2.0% vs. 0.9%, P = 0.55) did not differ between the groups. Surgery time > 6 hours, cardiac tamponade, any organ ischemia, and BMI > 30 kg/m2 were shown by logistic regression analysis to be predictors of in-hospital death in the non-octogenarian group, whereas surgery time > 6 hours was shown to be the sole predictor of in-hospital death in the octogenarian group. Actuarial survival at 5 years was 58.5% in the octogenarian group and 81.5% in the non-octogenarian group (P < 0.01). Freedom from aortic events was 98.0% in the octogenarian group and 89.0% in the non-octogenarian group (P < 0.01). Under the assumption that patients are transported to a hospital in a timely fashion, we conclude that good surgical outcomes can be expected in octogenarian patients with ATAAD. (533 words)



Actuarial survival (left) and freedom from aortic events (right) in the octogenarian group and non-octogenarian group.

Cardiac | Focus session | Electrophysiology and the surgeon

Ventricular ablation: A case for the surgeon?

Bart Maesen Department of Cardio-Thoracic Surgery, Maastricht University Medical Center, the Netherlands

The rapid evolution of catheter-based ablation techniques has led to an increase in endocardial ablation of ventricular arrhythmias in adult patients by electrophysiologists. While radiofrequency catheter ablation of idiopathic ventricular tachycardia (VT) has evolved into a safe and successful procedure, VT ablation in patients with structural heart disease remains challenging and comes along with a high recurrence rate.[1,2] Even more complex are VTs originating in the subendocardium or the epicardium, areas that cannot be targeted with current endocardial ablation techniques. In such patients, epicardial VT ablation, or a combination of endo- and epicardial ablation might be needed.

Percutaneous access to the pericardial space obtained through 'dry' subxiphoidal needle puncture is increasingly performed, but still limited to selected patients at experienced centres with appropriate surgical backup.[3] This is due to some technical drawbacks and potential complications.[3,4] Next to diaphragmatic bleeding or liver puncture, myocardial perforation or laceration can occur, potentially resulting in tamponade or needing surgical repair. Ablation options might be hampered due to the presence of coronary arteries at the substrate site. When ablation is performed in close proximity to epicardial vessels, spasm or stenosis can happen, possibly resulting in myocardial infarction. Moreover, the anterior and anterolateral wall cannot always be easily reached when using a subxiphoidal approach. In post-cardiotomy patients, due to the presence of adhesions, not only access or mapping can be limited, but also right ventricular puncture or graft damage may occur.

Surgical ablation has the advantage that it is an anatomical approach with visualisation of relevant structures. However, surgeons are often limited in mapping the origin of the arrhythmia, while electrophysiologists have several sophisticated high-density 3D mapping systems at their disposal providing adequate mapping of arrhythmias with a minimal need for fluoroscopy. It seems therefore logical to combine the best of both worlds into one procedure for selected patients. For almost a decade, we perform hybrid atrial fibrillation (AF) ablation (a combination of thoracoscopic surgical and transvenous endocardial AF ablation) in Maastricht.[5] Consistent with the current guidelines,[6] patients with AF are discussed within our arrhythmia heart team. Next to AF patients, we also discuss patients with complex VTs in need of epicardial access. Recently, we started to explore VT ablation in a hybrid setting. This technique combines the advantages of high-density 3D mapping systems with those of a surgical access, which usually consists of a 3-port right or left sided thoracoscopy. If this new approach proves to be successful and goes hand in hand with a low complication rate, we believe that in selected patients ventricular ablation will be 'a case for the hybrid team, consisting of an EP and an arrhythmia surgeon'.

References

1. Tanawuttiwat T, Nazarian S and Calkins H. The role of catheter ablation in the management of ventricular tachycardia. European heart journal. 2016;37:594-609.
2. Priori SG et al. Task Force for the Management of Patients with Ventricular A and the Prevention of Sudden Cardiac Death of the European Society of C. 2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC)Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC). Europace. 2015;17:1601-87.
3. Sacher F et al. Epicardial ventricular tachycardia ablation a multicenter safety study. Journal of the American College of Cardiology. 2010;55:2366-72.
4. Lim HS et al. Safety and prevention of complications during percutaneous epicardial access for the ablation of cardiac arrhythmias. Heart Rhythm. 2014;11:1658-65.
5. Pison L et al. Hybrid thoracoscopic surgical and transvenous catheter ablation of atrial fibrillation. Journal of the American College of Cardiology. 2012;60:54-61.
6. Kirchhof P et al. Authors/Task Force M and Document R. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS: The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC)Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESCEndorsed by the European Stroke Organisation (ESO). Europace. 2016.

Cardiac | Rapid Response | Beyond lines and clips

Surgical ablation for persistent atrial fibrillation in concomitant cardiac surgery

Wenda Gu, Huiming Guo, Cong Lu, Huanlei Huang, Jing Liu, Jian Liu, Bin Xie, Ruobin Wu, Jimei Chen, Jian Zhuan Guangdong General Hospital, Guangdong Cardiovascular Institute, Guangdong Academic of Medical Science, Guangzhou, Guangdong, China

Atrial fibrillation (AF) is the most common supraventricular arrhythmia. Surgical ablation concomitant to other cardiac surgery for the AF patient may improve prognosis. The traditional cut-and-sew Maze III procedure was introduced in 1987 by James L Cox and continues to represent the gold standard in surgical treatment of AF. In the 21st century, ablation tools have replaced the traditional cut-and sew technique, which have simplified and shortened the Maze procedure dramatically.

This study included a total of 1,028 patients with persistent AF who underwent surgical ablation during concomitant cardiac surgery from October 2004 to April 2015. 927 (90.5%) of them were strictly followed up. The primary endpoint was a composite of all-cause mortality, recurrence of AF or atrial flutter (AFL), and implantation of a permanent pacemaker. Sixty-three recurrent patients received re-intervention. Predictors of ablation failure were identified using univariate analysis, logistic regression analysis and Kaplan-Meier survival analysis.

The mean follow-up length was 29.0±22.7 months. 580 patients (62.6%) were in sinus rhythm (SR) at follow-up (SR group). 347 (37.4%) patients reached the primary endpoint. The NYHA class (2.6±0.6 vs. 1.3±0.5, p<0.0001), ejection fraction (62.1±8.1 vs. 63.2±7.9, p<0.05), left atrium (LA) diameter (53.6±8.7 vs. 43.2±6.6, p<0.0001), right atrium (RA) diameter (58.1±9.8 vs. 47.4±6.9, p<0.0001), left ventricular end diastolic diameter(LVDd) (50.0±8.1 vs. 45.3±5.4, p<0.0001) of all patients were improved at follow-up compared to the preoperative status. During follow-up, NYHA (1.3±0.5 vs. 1.4±0.6, p<0.05), LA (42.0±5.8 vs. 45.3±7.2, p<0.0001), RA (45.7±5.4 vs. 50.1±8.1, p<0.0001) improved significantly in the SR group than primary endpoint group. The rate of freedom from primary endpoint at 1, 2, and 3 years was 88.6%, 81.2%, and 71.2%, respectively, with a median follow-up time of 29.0±22.7 months. Independent predictors of ablation failure were AF or AFL at discharge (HR 8.06, 95% CI 5.79~11.23, p<0.001), preoperative LA diameter≥55mm (HR 1.72, 95% CI 1.23~2.04, p<0.01), preoperative RA diameter≥55mm (HR 1.60, 95% CI 1.24~2.07, p<0.01), age≥60 (HR 1.72, 95% CI 1.19~2.48, p<0.01).

Surgical ablation has a high success rate and may improve cardiac function postoperatively. AF or AFL at discharge, preoperative left atrium diameter ≥55 mm, preoperative RA diameter ≥55 mm and age ≥60 years are the major independent predictors of ablation failure. Re-intervention in AF/AFL recurrent patients can achieve a favourable clinical outcome.

Vascular | Rapid Response | Type A Aortic dissection from research to clinical application

Surgical results of reoperation after primary repair for type A aortic dissection

Naonori Kawamoto and Kenji Minatoya √National Cerebral and Cardiovascular Center, Osaka, Japan

Background

Recently, the results of surgical intervention for acute type A aortic dissection have been improved.

However, the risk of reoperation after primary repair for type A aortic dissection remains high, thus the objective of our study was to analyse surgical results of reoperation after primary repair in this patient population.

Methods

From 1997 to 2015, we analysed 130 reoperations in 103 patients following primary type A aortic dissection repair. The primary surgery for type A acute aortic dissection was hemiarch replacement in 55 patients, and total arch replacement in 47. The indication for the reoperations were progressive enlargement of the aorta in 95 patients, pseudo-aneurysm in 13, dissection in 11 and rupture in 5. A redo hemiarch replacement was performed in 7 patients, isolated total arch replacement in 16 (Group A), total arch replacement with root replacement in 6 (Group B), isolated root replacement in 21 (Group C), descending and thoracoabdominal aortic replacement in 78 (Group D), and descending and thoracoabdominal aortic replacement with total arch replacement in 6 (Group E). The median follow-up was 5.1 years, and the average time interval from the initial repair to the second procedure was 5.7 +/- 5.3 years.

Results

The overall hospital mortality after the reoperations was 3% (3 patients). The hospital cause-specific mortality was 2.1% (2 patients) in enlargement of aorta group, and 20% (1) in the rupture group. The hospital mortality in re-sternotomy case (Group A+B+C) and thoracoabdominal case (Group D+E) were 2.4% and 2.5% with no significant difference. The overall survival rate at 1, 5, and 10 years was 95.7%, 91.5%, and 69.7%, respectively. The survival rate in re-sternotomy case (Group A+B+C) showed significantly lower than in thoracoabdominal case (Group D+E) (Fig.1). In patients with progressive enlargement of distal site, the interval from the initial repair to the second procedure in patients with patent false lumen was significantly shorter than in patients with complete thrombosed false lumen (3.9±4.3 years vs 6.3±2.8 years, p=0.029).

Conclusion

Surgical results of reoperation after primary repair for type A acute aortic dissection were acceptable. However, the survival rate in re-sternotomy case showed lower than in thoracoabdominal aortic replacement. Thrombosis of the false lumen reduced the risk of dilatation at descending and thoracoabdominal aorta. These findings should be taken into account in proposing a more extensive primary surgery for type A acute aortic dissection.

Thoracic | Abstract Session | Oncology I

Modifiable factors may be key to improving early readmissions and deaths following lung cancer resection

Oswald N, Halle-Smith J, Kerr A, Webb J, Agostini P, Bishay E, Kalkat M, Steyn R, Rajesh P and Naidu B University of Birmingham, UK

Postoperative mortality has traditionally been considered to be death within 30 days of surgery, or within the same hospital admission as the surgical procedure. However, mortality following lung cancer resection has been shown to double between 30 and 90 days and readmission following surgery is associated with an increased risk of mortality – although the reasons for these phenomena are not fully understood. It has been proposed that the patient population is intrinsically fragile and these deaths are inevitable. The aim of this study was to describe the causes of readmission within 30 days of surgery and mortality within 90 days of surgery. With this information we sought to identify potentially modifiable factors contributing towards postoperative mortality.

A prospective cohort study of 932 patients was performed at Heart of England NHS Foundation Trust, Birmingham, United Kingdom. The 30 day and 90 day mortality rates were 1.6% and 3.9% respectively. Potentially modifiable risk factors for death identified were: inpatient postoperative pulmonary complications (PPC)1, low preoperative lymphocyte count, readmission within 30 days and type of postoperative analgesia. The risk of death was found to be six times higher in those affected by a PPC. Established techniques to reduce PPC include smoking cessation, optimal medical management of existing respiratory disease, a well-structured physiotherapy plan for the patient and prophylactic mini tracheostomy insertion in patients perceived to be at risk of sputum retention.

Readmission was shown to be associated with a fourfold increased risk of mortality. Respiratory and surgical causes accounted for three quarters of readmissions in this study. Of the patients who died 58% suffered a postoperative problem that could be linked to the cause of death. Two examples are detailed below.

Patient 1: Cardiovascular comorbidity but no respiratory comorbidity before surgery, suffered from an episode of pneumonia as an inpatient, was readmitted with shortness of breath, died from pneumonia.

Patient 2: Cardiovascular and gastrointestinal comorbidity before surgery, was readmitted with constipation, died from bowel perforation.

Anaesthetic techniques are readily modifiable and further information on the influence of analgesic regimes on outcomes of patients beyond the immediate perioperative period is desirable. Our finding of increased mortality depending on postoperative analgesia may be marker of the adequacy of pain control and certainly effective pain control to facilitate physiotherapy regimes is paramount. Intrathecal morphine or patient controlled analgesia in isolation were associated with an increased mortality. If effective alternatives to systemic or intrathecal opioids can be employed it is reasonable to aim to reduce the administration of opioids with the intention of reducing the incidence of their well-established side effects. Low preoperative lymphocyte count is not immediately modifiable but immunomodulation in the perioperative setting may be possible in the future.

In conclusion, postoperative mortality is not simply due to fixed factors; the impacts of age, gender and surgical procedure on postoperative survival are reduced when more clinical details are examined. Mortality in the first 90 days following surgery is the result of both the baseline health and postoperative recovery of the patient. There is hope to reduce postoperative mortality through interventions to reduce postoperative pneumonia.

Cardiac | Abstract Session | Aortic valve replacement - rapid deployment valves

Surgical treatment of aortic stenosis with rapid deployment aortic valve replacement: one-year clinical outcomes in 150 patients

Alexis Theron1, Eleonore Ravis1, Dominique Grisoli1, Nicolas Jaussaud1, Pierre Morera1, Pascal Candolfi2, Jana Boleckova2, David Lagier1, Cecile Amanatiou1, Lyna Messous1, Vlad Gariboldi1, Frederic Collart1 1. La Timone Hospital, Marseille, France. 2. Edwards Lifesciences, Nyon, Switzerland

With the aging of the population, indications of aortic valve replacement (AVR) for severe aortic stenosis are increasing, and new therapeutic options are needed to reduce surgical morbidity and mortality.

In this context, rapid deployment aortic valves emerge as a very attractive option. Offering reduced cross-clamp and cardiopulmonary bypass times, they are particularly interesting for elderly patients, and for combined surgery.

The INTUITY valve system (Edwards Lifesciences), is a new tri-leaflet pericardial bioprosthesis requiring only three sutures with the inflation of a balloon expandable stent frame. It presents both the advantages of conventional AVR, totally removing the native valve, and of transcatheter AVR, with its rapid deployment.

We aimed to study the one-year outcomes of INTUITY valve system in a prospective monocentric study.

We included all consecutive patients implanted with the INTUITY valve system for severe aortic stenosis, from July 2012 to April 2015 in la Timone Hospital, Marseille. Clinical examination and transthoracic echocardiography were performed preoperatively, at one month and one year of follow-up.

150 patients (mean age 76.8±6.2 years, 68.7% men) were included. Mean Euroscore II was 3.4±3.7%. Implantation was successful for all patients. 46 (30.7%) patients had concomitant procedures (including 42 coronary artery bypass grafts). For isolated AVR, mean crossclamp and cardiopulmonary bypass times were 37.6±13.3 and 59.9±20.4 minutes, respectively. One-year overall mortality was 2.7%. We reported 6 strokes (4%), one myocardial infarction (0.6%), one endocarditis (0.6%), one early explantation (0.6%) and 8 pacemaker implantations (5.3%). 4 patients (2.7%) had grade 2 peri-prosthetic regurgitation (PPR). No grade 3/4 PPR occurred. Functional and hemodynamic parameters significantly improved ($p<0.001$ in all): 5 patients (3.3%) were NYHA III/IV versus 53 patients (35.3%) pre-operatively; mean gradient decreased from 54.9±17.3 mmHg to 11.3±4.8 mmHg, and mean iEOA was 1.02±0.37cm²/m². Only 10 patients (6.6%) had severe mismatch. LV mass index decreased from 160.3±44.8 g/m2 to 118.5±39.4 g/m².

-INTUITY bioprosthesis provides satisfactory hemodynamic performance and very favourable outcomes at one year of follow-up. It can be a good alternative between conventional AVR and transcatheter AVR in reducing the drawbacks of each, offering shorter surgical times and low rates of pacemaker implantations and PPR. Further studies are needed to assess its long-term durability.

2016 Programme

Course	Dates/Location
Fundamentals in Cardiac Surgery: Part III	24-28 October, Windsor, UK
11th European Mechanical Circulatory Support Summit (EUMS)	3-5 November, Berlin, Germany
Mitral Valve Surgery	7-9 November, Leiden, The Netherlands
Congenital Heart Disease	15-18 November, Windsor, UK
Aortic Valve Surgery	24-25 November, Nancy, France
Modern Perspectives on Atrial Fibrillation Surgery	24-25 November, Windsor, UK
Hospital Leadership: Head, Heart and Values	28-29 November, Windsor, UK
Endoscopic Port-Access Mitral Valve Repair Drylab Training	15-16 December, Maastricht, The Netherlands

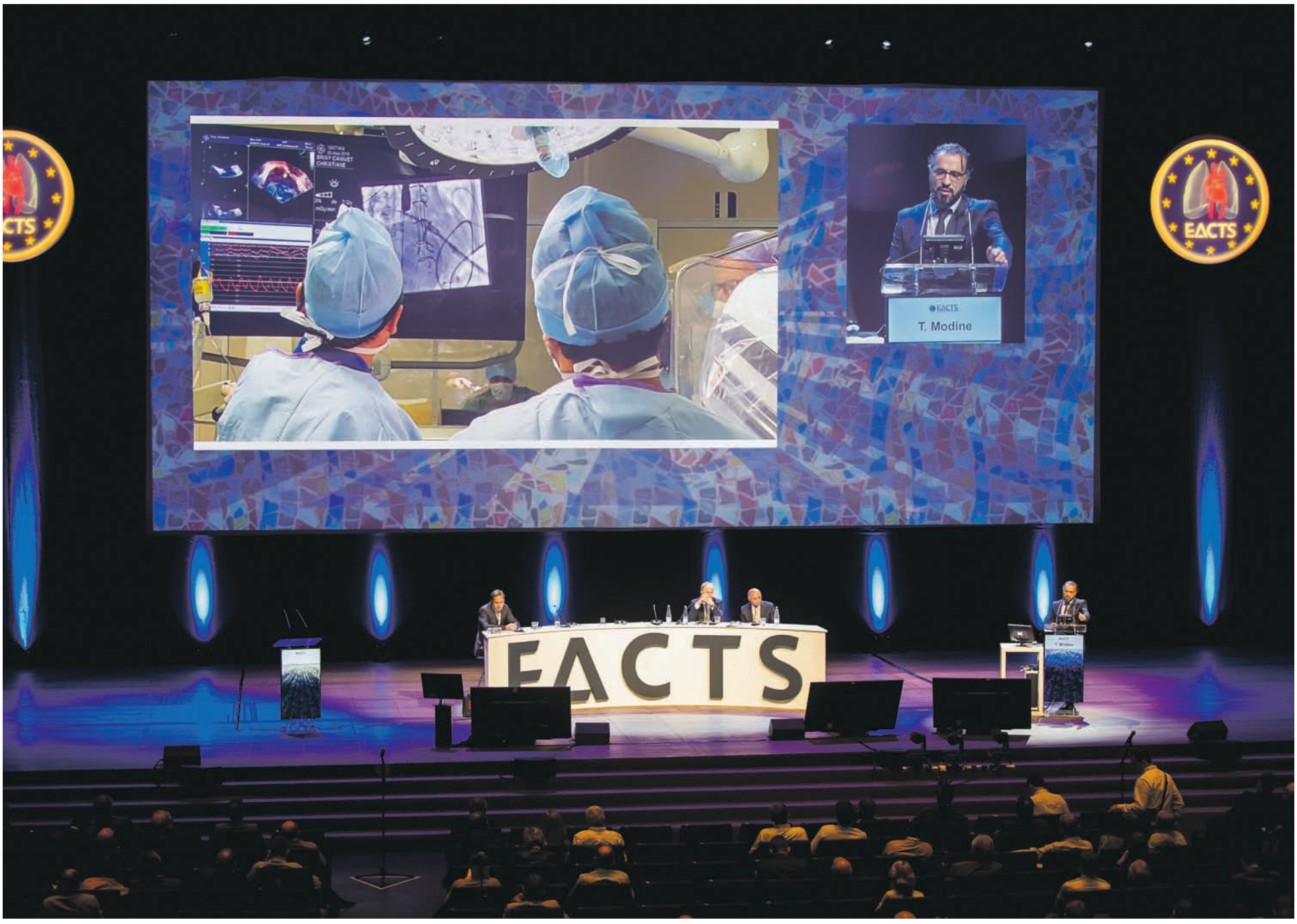
Skills Module 2
Skills Module 3

2017 Programme

Course	Dates/Location
Fundamentals in Cardiac Surgery: Part I	6-10 February, Windsor, UK
Endoscopic Port-Access Mitral Valve Repair Drylab Training	23-24 February, Maastricht, The Netherlands
Introduction to Aortic Surgery	16-18 March, Windsor, UK
Master Class on Aortic Valve Repair	22-24 March, Paris, France
Thoracic Surgery: Part I	27-31 March, Windsor, UK
Endoscopic Port-Access Mitral Valve Repair Drylab Training	27-28 April, Maastricht, The Netherlands
Video-Assisted Thoracoscopic Surgery (VATS)	18-19 May, Berlin, Germany
Fundamentals in Cardiac Surgery: Part II	5-9 June, Windsor, UK
Thoracic Surgery: Part II	12-14 June, Windsor, UK
Ventricular Assist Device Co-ordinators Training Course	15-17 June, Berlin, Germany
Minimally Invasive Techniques in Adult Cardiac Surgery	20-22 June, Warsaw, Poland
Basic Science	30 June-1 July, Windsor, UK
Endoscopic Port-Access Mitral Valve Repair Drylab Training	7-8 September, Maastricht, The Netherlands
Fundamentals in Cardiac Surgery: Part III	23-27 October, Windsor, UK
Mitral Valve Surgery	November
Congenital Heart Disease	November, Windsor, UK
12th European Mechanical Circulatory Support Summit (EUMS)	29 November-2 December, Bad Oeynhausen, Germany
Thoracic Surgery: Part III	4-6 December, Windsor, UK
Endoscopic Port-Access Mitral Valve Repair Drylab Training	14-15 December, Maastricht, The Netherlands

www.eacts.org

Raising Standards through Education and Training



EACTS Academy Skills Programme

The EACTS Skills Programme consists of five learning modules. The first three modules can be taken in any order, but a progressive order is best.

Module 1	A "professional challenge session" at the Annual Meeting.This module will offer keynote lectures on the state of the art of the specific technique with experts, followed by a demonstration of the technique by video or live surgery and a discussion on complications that may arise when applying this technique. Competency to be acquired: critical thinking, decision-making, principles of quality and safety improvement.
Module 2	A course on surgical anatomy, physiology and principles of surgical and non-surgical treatment in the specific area at the EACTS House in Windsor. Competency to be acquired: knowledge and comprehension, decision-making, medical professionalism, evidence and guidelines, principles of quality and safety improvement.
Module 3	A course of 2 - 3 days "on site" in a hospital with a large experience of the technique. This module will offer interactive discussions with experts in the field and demonstration by live surgery on how the technique can be applied. The module may also include a "hands-on" aspect in a simulated environment. Competency to be acquired: knowledge, medical expertise.
Module 4	The opportunity to visit an EACTS accredited centre for a certain period of time to participate in the operating room as an observer or with a "hands-on" aspect in a real-world environment. Competency to be acquired: technical skills, medical expertise, principles of quality and safety improvement.
Module 5	Clinical proctoring in the trainee's own centre; today a surgeon is obliged to receive proctoring before obtaining unrestricted hospital privileges to perform the new procedure, the trainee should demonstrate the awareness of competencies. Competency to be acquired: technical skills, medical expertise, principles of quality and safety improvement.

www.eacts.org

Raising Standards through Education and Training

The EACTS Academy

EACTS
European Association For Cardio-Thoracic Surgery

The EACTS Academy was established to contribute to improving standards of practice by providing high level educational courses. Each of our four domains offer a range of courses. Whether an experienced surgeon or still in training, our courses are designed to expand your specialist knowledge in a friendly, interactive environment. Many of our courses offer hands-on training.

In addition to an extensive programme of courses held at EACTS House in Windsor, UK, we also organise training throughout Europe, and indeed, worldwide, in our accredited hospitals and training facilities.

Finding and booking courses through the EACTS Academy has never been easier.

Registration for all courses is at: www.eacts.org

To register for a course please visit www.eacts.org

EACTS – **New membership applications approved by the General Assembly 2016**

New Active Members List 2016

We are pleased to confirm that we have received 378 complete EACTS membership applications for 2016. Please find below the list of the new members elected at the General Assembly.

From now on, we are happy to receive new EACTS Membership Applications for the year 2017. Please, spread the word amongst your colleagues. www.eacts.org/membership

Last Name First Name	*Country*
Abdelsayed Amir	*Egypt*
Abraham Vineeth	*India*
Accord Ryan	*Netherlands*
Achouh Paul	*France*
Actis Dato Guglielmo Mario	*Italy*
Aidamirov Iashar	*Russian Federation*
Albarakati Mohammed	*Saudi Arabia*
Aldea Gabriel	*USA*
Algebaly Ahmed	*Egypt*
Almourgi Majed	*Saudi Arabia*
Altarazi Riyad	*Kuwait*
Alwan Ala	*Iraq*
Announe Tarek	*France*
Argano Vincenzo	*Italy*
Arkhipov Alexey	*Russian Federation*
Arlati Francesco	*Italy*
Asdaghpour Esmail	*Iran*
Aysola Nagesh	*India*
Aziz Mohamed	*UAE*
Baddour Andony	*Greece*
Baharestani Bahador	*Iran*
Bakhsoliani Giorgi	*Georgia*
Baraki Hassina	*Germany*
Batrakov Pavel	*Russian Federation*
Baumgartner Eva	*Germany*
Bayram Muhammed	*Turkey*
Beran Elisabeth	*Germany*
Boehm Johannes	*Germany*
Bongiolatti Stefano	*Italy*
Botman Cornelis	*Netherlands*
Bourguignon Thierry	*France*
Bowdish Michael	*USA*
Brann Stacey	*USA*
Braulio Renato	*Brazil*
Braun Chrstian	*Germany*
Brik Alaa	*Egypt*
Bronstein Eric	*USA*
Cahill Kevin	*United Kingdom*
Camerin Lorenzo	*Italy*
Cardarelli Marcelo	*USA*
Carpacean Alexandru	*Romania*
Catalan Gisel	*Philippines*
Cesnjevar Robert	*Germany*
Chaiseri Pradistchai	*Thailand*
Chang Jui-Chih	*Taiwan*
Chauke Risenge Frank	*South Africa*
Chavanon Olivier	*France*
Chavoin Jean-Pierre	*France*
Chiba Kiyoshi	*Japan*
Chittithavorn Voravit	*Thailand*
Chittora Rakesh	*India*
Choi Soohwan	*Korea, Republic of*
Chomsiri Worapod	*Thailand*
Cianci Vincenzo	*United Kingdom*
Coolen Hans	*Netherlands*
Costa Nuno	*Portugal*
Cvetkovic Dragan	*Serbia, Republic of*
De La Cerda Belmont Gustavo Armando	*Mexico*
De Lind Van Wijngaarden Robert	*Netherlands*
Deboer David	*USA*
Desai Rajesh	*India*
Detroux Marc	*Belgium*
Deveja Rezar	*Greece*
Dewald Oliver	*Germany*
Di Chiara Francesco	*United Kingdom*
Di Salvo Carmelo	*United Kingdom*
Diaz Andres	*Chile*
Dikshit Vijay	*India*
Dorobantu Lucian	*Romania*
Dumsch De Aragon Ferreira Andrea	*Brazil*
Durairaj Manoj	*India*
Dushaj Stak	*Switzerland*
Duwederi Basem	*Germany*
Eaton Donna	*Ireland*
Elamurugan Elamaran	*India*
El-Minshawy Ahmed	*Egypt*
El-Saied Hayes Yousry	*Egypt*
Emmel Eric	*Germany*
Fabrin Anja	*Denmark*
Faqe-Mahmood Darya	*Iraq*
Farkas Emily	*USA*
Farto Viana Fabiano	*Australia*
Fawzy Hosam	*Egypt*
Filippone Gianfranco	*Italy*
Foroughi Mahnoosh	*Iran*
Fouad Ahmed	*Egypt*
Francisco Margarida	*Portugal*
Gallo Alina	*Italy*
Ghazy Tamer	*Germany*
Ghotkar Sanjay	*United Kingdom*
Gibson George	*United Kingdom*
Goel Mukesh	*India*
Goleanu Viorel	*Romania*
Gomibuchi Toshihito	*Japan*
Gonzalez Garcia Jose	*Mexico*
Gonzalez Rivas Diego	*Spain*
Gorski Armin	*Germany*
Gutierrez Diez José Francisco	*Spain*
Haeussler Achim	*Switzerland*
Haldenwang Peter	*Germany*
Hanyu Michiya	*Japan*
Hassanein Magdy	*Egypt*
Hata Hiroki	*Japan*
Heikkinen Jouni	*Finland*
Hermann Kassal	*Austria*
Hoffman Andras	*Germany*
Horke Alexander	*Germany*
Hübler Michael	*Switzerland*
Hussain Imran	*Saudi Arabia*
Iliadis Kosmas	*Greece*
Induni Eduardo	*Costa Rica*
Ito Toshiaki	*Japan*
Iwakura Tomohiro	*Japan*
Jablonski Jacek	*United Kingdom*
Jabur Ghaz	*New Zealand*
Jalal Anjum	*Pakistan*
Joubert-Huebner Elrina	*Germany*
Judas Gustavo	*Brazil*
Kaláb Martin	*Czech Republic*
Kamalapurkar Giridhar	*India*
Kantidakis George	*Greece*
Karne Swapneel	*India*
Kaushik Ramesh	*India*
Khalili Sadrabad Ahmad Ali	*Iran*
Khan M.Rafeeque	*Pakistan*
Khokhlunov Sergei	*Russian Federation*
Kim Eung Re	*Korea, Republic of*
Kim Wan Kee	*Korea, Republic of*
Komiya Tatsuhiko	*Japan*
Komuttarin Dr.Komkrit	*Thailand*
Kostromin Artem	*Russian Federation*
Kozmin Dmitry	*Russian Federation*
Kramer Robert	*USA*
Kumar Jateendar	*India*
Kume Yuta	*Japan*
Kwok Wai Ting	*Hong Kong*
Lavreshin Aleksei	*Russian Federation*
Leone Alessandro	*Italy*
Leprince Pascal	*France*
Levchenko Evgeny	*Russian Federation*
Li Yijiang	*Germany*
Liebenberg Lindy	*Netherlands*
Lobo Roberto	*Brazil*
Lozos Vasileios	*Greece*
Lozovskiy Andrey	*Russian Federation*
Luu David	*Martinique*
Lux Marco	*Germany*
Madesis Athanasios	*Greece*
Mamontov Oleg	*Russian Federation*
Mansourian Soheil	*Iran*
Markin Michael	*Bosnia and Herzegovina*
Markova Margaita	*Russian Federation*
Masala Nicola	*United Kingdom*
Mathur Ankit	*India*
Matta Rekha	*India*
Mccarthy Jim	*Ireland*
Mehta Sukumar	*India*
Mihalcescu Dan	*Romania*
Mikos George	*USA*
Mitprachapranee Chalach	*Thailand*
Möbius Andreas	*Germany*
Mohapatra Raghunath	*India*
Molli Daniella	*Italy*
Muhinga Morris	*Kenya*
Müller Hannes	*Austria*
Munguia Daniel	*Mexico*
Muthukumar Siva	*India*
N Rau Ravi	*India*
Nasr Ali	*USA*
Natour Ehsan	*Netherlands*
Navarra Emiliano	*Belgium*
Nykanen Antti	*Finland*
Odavic Dragan	*Switzerland*
Okada Takayuki	*Japan*
Okten Eyup Murat	*Turkey*
Oudeman Maurice	*Netherlands*
Pandey Ragini	*United Kingdom*
Papadatos Spiridon	*Belgium*
Paramonova Tatiana	*Russian Federation*
Patel Nirav	*USA*
Peeceeyen Sheen	*Australia*
Pick Adrian	*Australia*
Pirelli Luigi	*USA*

EACTS – New membership applications approved by the General Assembly 2016

Last Name First Name	Country
Popa Cherecheanu Matei	*Romania*
Potapov Evgenij	*Germany*
Prakash Neeraj	*India*
Prieto Ignacio	*Canada*
Pyo Wonkyung	*Korea, Republic of*
Rajan Balasubramani	*India*
Raksasap Saka	*Thailand*
Raposo Nuno	*UAE*
Rashed Aref	*Hungary*
Rausch John	*USA*
Rebel Marc	*Australia*
Redzek Aleksandar	*Serbia, Republic of*
Rivetti Luiz	*Brazil*
Roessner Eric	*Germany*
Rosa Flavio	*Brazil*
Ruvolo Giovanni	*Italy*
Safaie Nasser	*Iran*
Sakiyalak Dr.Pranya	*Thailand*
Salama Sameh	*Egypt*
Saltykov Andrey	*Russian Federation*
Sanchez Valenzuela Diego	*Spain*
Sandner Sigrid	*Austria*
Serazhitdinov Alik	*Russian Federation*
Shalaby Amr	*Egypt*
Sharba Laith	*Iraq*
Siegmund Svenja	*Switzerland*
Silva Felipe	*Brazil*
Smeenk Henri	*Netherlands*
Soliman Ali Mohamed Ali	*Egypt*
Sonneveld Corstiaan	*Netherlands*
Soo Alan	*Ireland*
Souza E Silva Renato	*Brazil*
Stan Liviu	*Romania*
Stock Ulrich	*Germany*
Stoicescu Carla	*United Kingdom*
Stolf Noedir	*Brazil*
Stompel Dinara	*Russian Federation*
Suen Wai Sing	*Hong Kong*
Sukumaran Shiju	*India*
Susak Stamenko	*Serbia, Republic of*
Swain Sunil	*India*
Swamy Sateesh	*India*
Symersky Petr	*Netherlands*
Tanasescu Dragos	*Romania*
Testa Nicola	*Italy*
Timorian Manochihr	*Afghanistan*
Toema Ahmed	*Egypt*
Tsuda Kazumasa	*Japan*
Tudorache Igor	*Germany*
Tungusova Margaita	*Russian Federation*
Vashakmadze Nikolozi	*Georgia*
Vasylyev Dmytro	*Ukraine*
Velasco Garcia De Sierra Carlos	*Spain*
Vidolov Plamen	*Bulgaria*
Vijayasekharan Srinath	*India*
Vincentelli Andre	*France*
Viola Laura	*Ireland*
Watanabe Takashi	*Japan*
Wheatley Iii Grayson	*USA*
Yamauchi Haruo	*Japan*
Yamazaki Kenji	*Japan*
Yoo Dong-Gon	*Korea, Republic of*
Young Christopher	*United Kingdom*
Zairi Sarra	*Tunisia*

Last Name First Name	Country
NEW TRAINEE MEMBERS 2016	
Abdelaziz Mahmoud	*United Kingdom*
Abdullah Jarrah	*France*
Abi Akar Ramzi	*France*
Ag-Rejuan Yael	*Israel*
Al Amri Abdulaziz	*Oman*
Alacki Khaled	*Malaysia*
Alashgar Omniyah	*Saudi Arabia*
Albaladejo Da Silva Paula	*Spain*
Alban Yanez Pablo	*Ecuador*
Alorainy Saleh	*France*
Alqoqa Mohammed	*Germany*
Altiparmak Murat	*Iraq*
Alwaheidi Dina	*Qatar*
Andrade Marta	*Portugal*
Andrei Tarus	*Romania*
Antunes André	*Portugal*
Aprile Vittorio	*Italy*
Arabkhani Bardia	*Netherlands*
Arif Mohammed	*India*
Ariyaratnam Priyadharshanan	*United Kingdom*
Awad George	*Germany*
Ayudika Maulidya	*Indonesia*
Benhassen Leila	*Denmark*
Beshir Hatem	*Egypt*
Bivona Antonio	*United Kingdom*
Bond Chris	*United Kingdom*
Bulescu Cristian	*Romania*
Caruso Vincenzo Domenico	*United Kingdom*
Cattoni Maria	*USA*
Cavaliere Ilenia	*Italy*
Cerqueira Rui	*Portugal*
Chadikovski Vladimir	*Macedonia*
Chernigov Nikolay	*Germany*
Corici Oana	*Romania*
Correia Pedro	*Portugal*
Das De Sudeep	*United Kingdom*
Demirbas Elif	*Turkey*
Donuru Srinath	*Bulgaria*
Durnez Joke	*Belgium*
Egbulonu Samson	*United Kingdom*
El Gaoud Saad	*Canada*
Emrich Fabian	*Germany*
Escobar Matallana Jose	*Colombia*
Eulert-Grehn Jaime-Jürgen	*Germany*
Farina Piero	*Spain*
Ferreira Hugo Duarte	*Portugal*
Gallo Michele	*Italy*
Gomes Rodolfo	*Brazil*
Gwyly Eman	*Egypt*
Hajiyev Vusal	*Germany*
Hamid Oudjana Ahmed	*France*
Heinen Stephanie	*Luxembourg*
Heuts Sam	*Netherlands*
Hjortnaes Jesper	*Netherlands*
Hoda Mir Ali Reza	*Austria*
Hristova Ralitsa	*United Kingdom*
Husso Annastiina	*Finland*
Ishigami Shuta	*Japan*
Jeon Chang-Seok	*Korea, Republic of*
Jørgensen Geir Torvik	*Norway*
Juarez Humberto	*Colombia*
Karupiah Saravana	*Malaysia*
Kashani Alireza	*New Zealand*
Krishnasamy Sivakumar	*United Kingdom*
Kunišek Leon	*Croatia*
Kushta Orest	*Ukraine*

Last Name First Name	Country
Labuzek Marta	*Poland*
Lehtinen Miia	*Finland*
Litwinowicz Radoslaw	*Poland*
Lobenwein Daniela	*Austria*
Mansour Sherif	*Egypt*
Mărgărint Irina	*Romania*
Martina Bryan	*Netherlands*
Matyash Aleksandr	*Ukraine*
Mofeejuddy Irfaan	*Belarus*
Mohammed Hasnain Saiyed	*Germany*
Molina Daniel	*Spain*
Mukherjee Tamashis	*India*
Munneke Anita	*Germany*
Naase Hatam	*United Kingdom*
Nanjaiah Prakash	*United Kingdom*
Ni Hici Tamara	*United Kingdom*
Omar Mohammad	*Palestine*
Ortega Loubon Christian	*Spain*
Ozturk Sabri	*Netherlands*
Patel Nishith	*United Kingdom*
Pattakos Gregory	*USA*
Peens-Hough Hyla	*South Africa*
Pelella Giuseppe	*United Kingdom*
Perikleous Periklis	*United Kingdom*
Pieraets Michiel	*Netherlands*
Pingel Cinthia	*Spain*
Pinho-Gomes Ana-Catarina	*United Kingdom*
Popescu Vlad	*Romania*
Raviola Eliana	*Italy*
Resta Bond Paula	*Spain*
Ricci Luis	*Spain*
Ricciardi Sara	*Italy*
Rings Laura	*Switzerland*
Rodriguez Hector	*Switzerland*
Roubelakis Apostolos	*United Kingdom*
Saldaña Morales Lizeth	*Colombia*
Schäfer Andreas	*Germany*
Selten Koen	*Germany*
Siliato Robles Maria	*Spain*
Siregar Sabrina	*Netherlands*
Sisli Emrah	*Turkey*
Smorto Vincenzo	*Italy*
Sobieraj Michał	*Poland*
Soknes Maria	*Norway*
Søndergaard Eva	*Denmark*
Sorensen Erik	*Norway*
Stecher David	*Netherlands*
Steffen Henning Johann	*Germany*
Teh Elaine	*United Kingdom*
Tepeköylü Can	*Austria*
Timisescu Alina	*Romania*
Toledo Jayro	*Ecuador*
Tomas Antonio	*Portugal*
Van Der Pijl Leonardus	*Netherlands*
Van Linden Arnaud	*Germany*
Varela Laura	*Spain*
Velho Tiago	*Portugal*
Viola Cristina	*Italy*
Wahba Mina	*Egypt*
Wamala Isaac	*USA*
Wickbom Anders	*Sweden*
Wollersheim Laurens	*Netherlands*
Xie Dong	*China*
Yancheva Velina	*Bulgaria*
Zakkar Mustafa	*United Kingdom*

EACTS 2016 Floor Plan

Exhibition opening times:
Sunday 2 October 15.00 – 19.00
Monday 3 October 09.00 – 17.00
Tuesday 4 October 09.00 – 17.00

047	3-D Matrix Ltd
094	A&E Medical Corporation
013	AATS-American Association for Thoracic Surgery
074-075	Admedus
059	Advancis Surgical
098	Andocor NV
035	AngioDynamics
014-015	Asanus Medizintechnik GmbH
095	ATMOS MedizinTechnik GmbH & Co. KG
117 & Training Village Unit 3	AtriCure Europe BV
122 & Training Village Unit 6	B Braun Aesculap
124	Berlin Heart GmbH
085	BioCer Entwicklungs-GmbH
064	BioIntegral Surgical, Inc
088	BioStable Science & Engineering, Inc
069	Bolton Medical
076	Cardia Innovation AB
104-105	CardiaMed BV
061	Cardio Medical GmbH
126	Carmat
131	Chalice Medical Ltd
072	ClearFlow Inc
056	Comed BV
067-068	CorMatrix Cardiovascular Inc
073	CORONEO Inc
123	Cryolife Europa
011	CTSNet
036-037	CytoSorbents Europe GmbH
077	De Soutter Medical Limited
090-091	Delacroix-Chevalier
092	Dendrite Clinical Systems Ltd
009	EACTS-Euromacs and QUIP Programme
113	EACTS-The European Association For Cardio-Thoracic Surgery
114 & Training Village Unit 8	Edwards Lifesciences
120	Eurosets SRL
016-017	Fehling Instruments GmbH & Co. KG
028	Genesee BioMedical Inc
110	Getinge Group
008	Hamamatsu Photonics Deutschland GmbH
065	Heart and Health Foundation of Turkey
063	Heart Hugger / General Cardiac Technology
018	Heart Valve Society
119 & Training Village Unit 2	HeartWare Inc
038	HMT Medizintechnik GmbH
081	Integra
004-005	Inter Medical Services Ltd
012	ISMICS-International Society for Minimally Invasive Cardiothoracic Surgery
006	Japan Lifeline Co., Ltd.
003	Jarvik Heart Inc
099-101 & Training Village Unit 1	Johnson & Johnson Medical Ltd
116D	JOMDD Inc
116C	JOTEC GmbH
096-097	KLS Martin Group – Gebrueder Martin GmbH & Co KG
032	Labcor Laboratorios Ltda
111 & Training Village Unit 9	LivaNova
030-031 & Training Village Unit 10	LSI Solutions
102	Medela AG
132	Medistim ASA
112 & Training Village Unit 7	Medtronic International Trading SÁRL
001-002	Meril Life Sciences Pvt. Ltd
078	Mitral Academy
125 & Training Village Unit 11	NeoChord
062	NORDIC PHARMA
019	OpInstruments GmbH
007	Oxford University Press
070-071	Peters Surgical
043	POSTHORAX
093	Qualiteam SRL
089	ReliantHeart
058	RTI Surgical
052-055	Scanlan International Inc
129	Siemens Healthcare GmbH
029	Smartcanula LLC
083-084	Somahlution
121	Spectrum Medical
115 & Training Village Unit 4	St Jude Medical
082	stroke2prevent
010	STS-The Society Of Thoracic Surgeons
051	Sunoptic Technologies
127	Symetis SA
057	SynCardia Systems, Inc.
118 & Training Village Unit 5	Terumo & Vascutek
039	Tianjin Plastics Research Institute Co Ltd (TPRI)
107	Tianjin Welcome Medical Equipment Co Ltd
066	Transonic Europe
116A	VGS-Vascular Graft Solutions Ltd
086	Wexler Surgical Inc
046-050	Wisepress Online Bookshop
106	WL Gore & Associates GmbH
128	Xenios AG
060	Xenosys Co Ltd
087	Zimmer Biomet

AtriCure®

Innovation.
It's at the heart of what we do.

Join the discussion at **Booth 3** in the Training Village

A Simplified Approach to LAA Exclusion

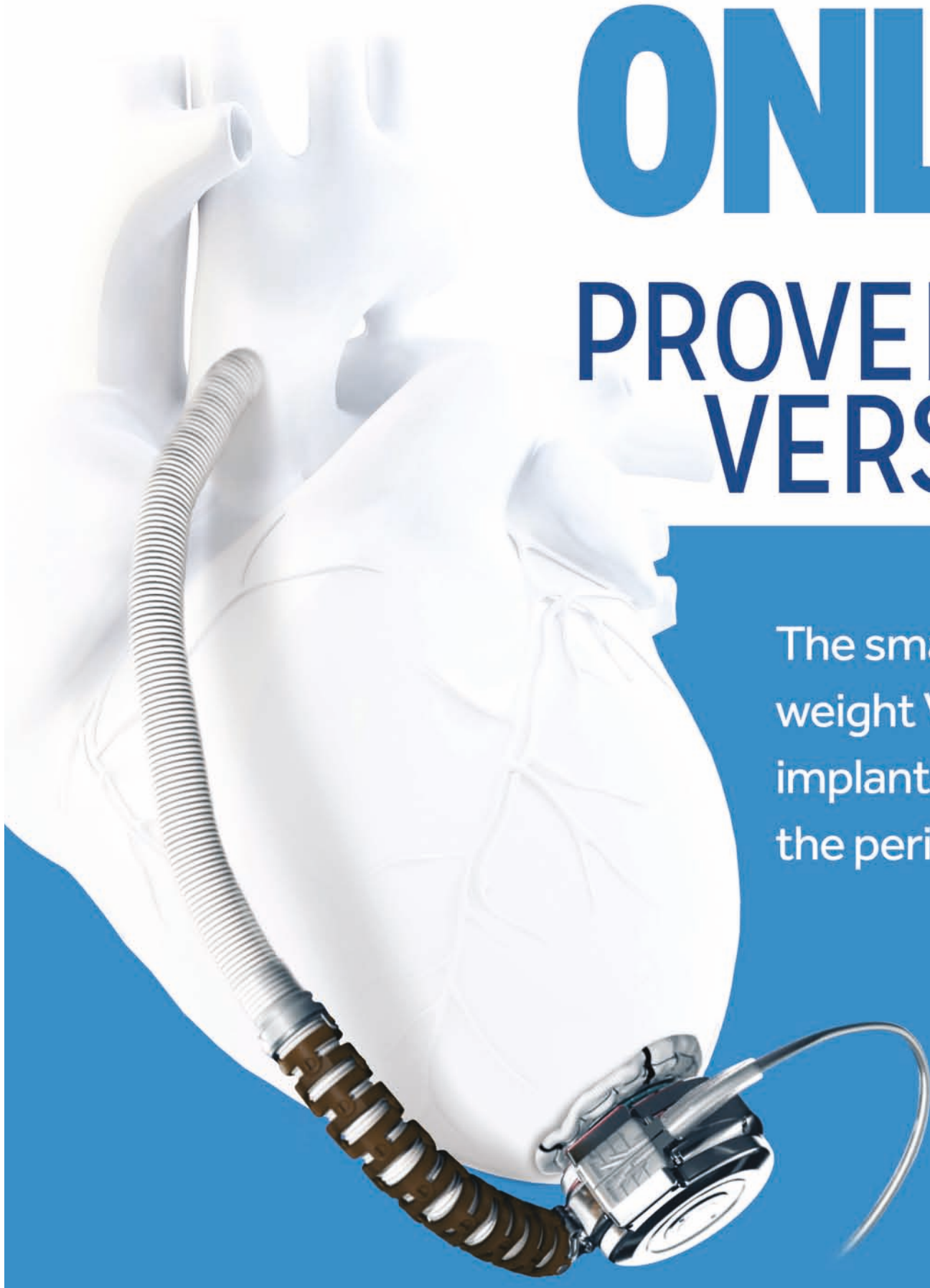
AtriClip PRO2™ Device

Hoopless End Effector
Small Diameter End Effector (12 mm)
Active Articulation Levers

Flexibility Desired, Consistency Needed

*cryo*FORM™ Probe

Active Defrost
Enhanced Flexibility
Uniform Lesion



ONLY hVAD® System

PROVEN VERSATILITY.

The smallest and lightest weight VAD designed to be implanted completely within the pericardial space.

VISIT US AT BOOTH 119 TO LEARN MORE.

CONGRATULATIONS TO EACTS FOR 30 YEARS

HEARTWARE, HVAD, and the HEARTWARE logo are trademarks of HeartWare, Inc.
© 2016 HeartWare, Inc. INTL1073 Rev01 07/16

CE 0086

HeartWare®