EACTS European Association For Cardio-Thoracic Surgery

Daily News

The official newspaper of the 33rd EACTS Annual Meeting 2019

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In this issue

Jeopardy final held today!

There was fierce competition during Thursday's Jeopardy semi-finals, with Berlin, Maastricht, Budapest and Lisbon all battling it out to become this year's champions. Budapest took on locals Lisbon and won, and will now pitch against the victorious Berlin team in today's final, held 14:00 in Room 5B, Pav 5.

Leonardo da Vinci: 500 years of genius | Auditorium 1 | Saturday | 09:45

Celebrating the life of Leonardo da Vinci

A tribute to the genius of Leonardo da Vinci will take place on Saturday, with renowned experts stepping up to the podium to commemorate the 500-year anniversary of his death. Although famous for his artistic works such as *Mona Lisa* and the *Last Supper*, Leonardo da Vinci was a polymath whose interests spanned science, engineering, anatomy, inventions, astronomy, music, geology and beyond.

Leonardo had a unique talent for seeing and being able to demonstrate anatomical form through drawing. As perhaps the finest draughtsman of his or any era, his ability to investigate and then to represent the form of the human body, particularly the heart, was far beyond his time. In fact, it was Leonardo who produced the first known description of coronary artery disease when he performed an anatomy (an autopsy in today's terms), on a self-proclaimed centenarian who died in front of his eyes as Leonardo sat on his bed in the Florentine hospital Santa Maria Nuovo.

His thoughts and observations on many subjects were recorded on paper and in notebooks, many of which survive to this day. The royal collection held in Windsor Castle contains virtually all of his anatomical drawings. These sheets are thought to have been in preparation for a textbook on anatomy which Leonardo proclaimed his intention to publish. Sadly, this did not materialise. These sheets are covered in wonderful drawings of the anatomy he had dissected and are accompanied by detailed descriptions of the forms observed and explanations of his understanding of function of how he thought the human body worked, many of which proved to be correct.

Francis Wells, a consultant cardiothoracic surgeon at Papworth Hospital, a part of Cambridge University,

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Celebrating the life of Leonardo da Vinci

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UK, has studied the works of Leonardo da Vinci for more than 30 years. He has authored a book, The Heart of Leonardo (*Springer*, 2013), which explores all of the artist's drawings of the heart and the accompanying in-depth scientific theories he recorded in notebooks.

"The accuracy of Leonardo's anatomical drawings of the heart are really quite astounding," Mr Wells told *EACTS Daily News* ahead of the meeting. "I have redone all the dissections he carried out on the ox heart and the results were stunning: they were uncannily accurate. Leonardo describes dissecting 30 bodies and he probably witnessed many others in the hospitals of Florence, Milan and Rome where he cultivated relations with physicians and anatomists of the time. In the absence of human material – as when he resided with the family of his pupil Melzi in Vapprio d'Adda after leaving Milan in 1513 – Leonardo pursued his anatomical interests with domestic animals, in particular the ox. This direction of investigation was also driven by his realisation of the importance of comparative anatomy.

"Leonardo's ability to combine intense scrutiny and observation with sublime draughtsmanship allowed him to make cogent deductions that remain apposite today. He had the capacity to really see things as they were; the combination of his inquiring mind, asking the right questions and his intense powers as an observer with his ability to record what he saw give you the end result of what are incredibly accurate dissection notes."

Mr Wells, who wanted to be an artist himself when he was at school, but later switched to medicine and cardiac surgery, has kept up a parallel academic interest in art and the work of Leonardo da Vinci ever since.

"On one level you could say that Leonardo wasn't important at all, as he made no contribution in his time," said Mr Wells. "He didn't publish his work. It wasn't until two and a half centuries later when his drawings were seen by the great London anatomist William Hunter that the magnitude of his achievements was recognised. The rediscovery of his work in the modern world has fascinated artists, scientists, doctors, philosophers and engineers alike. Because he was so accurate in the work he did, many of his ideas resonate today."

Mr Wells believes Leonardo was a role model for how education should be structured, relying on challenge, questioning and enquiry rather than accepted wisdom. "It's as though we are talking about someone who had a modern attitude towards science understanding – the idea of hypothesising, asking the right questions and then conducting experiments to prove it," he said. "For instance, he looked at the actions of heart valves, describing how arterial valves open and close to let blood flow around the heart. Even some cardiologists get this wrong now. Only with the use of MRI scans has knowledge of this subject been revisited."

"The accuracy of Leonardo's anatomical drawings of the heart are really quite astounding."

Francis Wells

During Saturday's Plenary Session, three other leading experts will speak on the genius of Leonardo da Vinci. These include Emeritus professor Martin Kemp from Oxford University – probably the world's foremost contemporary authority on Leonardo – who will talk about the philosophy of his work on anatomy, particularly his heart and circulation drawings under the intriguing title of 'Lisa's Lungs' and the transmission of fluids.

Two further recognised experts in the Renaissance and Leonardo in particular will give presentations on different aspects of the great man. You can expect riveting presentations from Domenico Laurenza (Rome), who will talk about Leonardo's time spent working in Rome and Milan, and Sara Taglialagamba from Vinci, who will speak about da Vinci's visionary perspective of the human body as a machine. "This led to many of his drawings reducing the muscles and tendons to a robotic-like form," said Mr Wells in closing.

Don't miss the collection of facsimile reproductions of Leonardo's anatomical drawings that are on display in a specially-curated exhibition here at this year's Annual Meeting, along with pictures of his handwritten notes, explaining how he thought the body worked. These have been combined with 12 anatomical paintings by artists from the Venice Academy's Department of Anatomical Art.

EACTS Daily News

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EACTS

EACTS appoints Sarah Johnson

The European Association for Cardio-Thoracic Surgery (EACTS) has appointed Sarah Johnson to the new role of Executive Director and Chief Operating Officer.

Sarah will be responsible for leading the EACTS team through an exciting period of change as the Association aims to expand its international collaborations with other stakeholders, diversify its educational programme and increase its membership base.

Her role includes providing first-class operational and strategic support to the EACTS Council and supporting the Association's well-established reputation on the international stage. As well as being COO, Sarah will serve as Executive Director, replacing Kathy McGree who retired earlier this year after holding the position for many years.

Professor Domenico Pagano, Secretary General of EACTS, said: "Sarah has a successful track record of delivering positive change across a global health organisation. She brings a wealth of knowledge and experience that will help us meet the challenges of our ambitions; enabling us to deliver our vision of a leading international agent for change and ultimately, improving patient care across the world."

"I am delighted to take on such an important role and drive forward the plans for the future."

Sarah Johnson

Commenting on her appointment, Sarah Johnson said: "This is an exciting time to join the dedicated team at EACTS and it's wonderful that my first few days in the job are here in Lisbon at the Annual Meeting. The Association is already a recognised world leader in the field but it remains ambitious and forward thinking. I am delighted to take on such an important role and drive forward the plans for the future. I'm looking forward to speaking to you while we are in Lisbon and listening to people's observations about how the Association can best meet the needs of the cardio-thoracic community."

Most recently, Sarah was the Chief Executive Officer at the International Society of Ultrasound in Obstetrics and Gynecology. She led ISUOG through from its early years to its current position as the leading international

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1. Eto M et al. Elastomeric surgical sealant for hemostasis of cardiovascular anastomosis under full heparinization. Europ. J. Cardio Surg. 2007; 730-734.
2. Oda S. et al. Experimental use of an elastomeric surgical sealant for arterial hemostasis and its long-term tissue response. Interac. Cardiov. and Thor. Surgery. 2010; 258-261

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The EACTS Endovascular Skills Course

Equipping the surgeon with endovascular skills

The EACTS Endovascular Skills Course offers surgeons the chance to learn in-depth endovascular skills via expert-driven presentations, simulator training and guidance. Spanning three parts – each lasting two days – the first two courses will be held in Windsor, UK in May/July, 2020, followed in December by Part 3, held in Geneva, Switzerland.

Previous incursions of the Course have been met with very positive response, noted Konstantinos Tsagakis, a cardiac surgeon at University Hospital, Essen, Germany, and Co-Director of the Course alongside Davide Pacini (Department of Cardiac Surgery, S. Orsola-Malpighi Hospital, University of Bologna-Alma Mater Studiorum, Bologna, Italy).

Speaking to *EACTS Daily News*, Dr Tsagakis noted that the upcoming 2020 Course has been further streamlined to reduce maximum attendance from 50 to 20, thereby offering all who participate with a closer-knit environment conducive with more in-depth practical training. "These will be very detailed courses – the first will tell surgeons about endovascular techniques, the second will show them how to perform some of them and in the third they will perform the techniques themselves on cadavers and animals," he said.

The Course is in response to the growing demand from surgeons to learn endovascular skills. As Dr Tsagakis described, a survey conducted at last year's Annual Meeting in Milan found that

"We want surgeons to be able to perform endovascular techniques in addition to open surgery."

Konstantinos Tsagakis

89% of respondents said they wanted the opportunity to learn endovascular techniques. "Endovascular procedures are very attractive and safe these days," said Dr Tsagakis. "They are also very popular with patients because they are less traumatic, and obviously preferred over open surgery.

"We want surgeons to be able to perform endovascular techniques in addition to open surgery. That way, they can continue to treat patients as they do now but also harness the skills and knowledge required to perform endovascular procedures if the patient is a suitable candidate."

As Dr Tsagakis went on, complex endovascular procedures can be performed by many different specialities including cardiac surgeons, vascular surgeons, radiologists, cardiologists and beyond. Afterall, the techniques have been around for years, but the trouble lies in making sure surgeons assimilate the techniques into their practice.

He predicted that in 10 years all cardiac surgeons will need endovascular skills, not least in the aortic-valve and mitral valve arenas, where a great influx of transcatheter procedures has already taken place. "Cardiac surgeons have to expand their interest and knowledge base," said Dr Tsagakis.

Konstantinos Tsagakis

"To be honest, I think we are late on this and should have done this at least eight years ago – probably earlier. We have to deal with thoracic and aortic problems and endovascular treatments are a substantial part of that.

"There are very few surgeons doing this at the moment and it is not the main focus of education for young cardiac surgeons either. This is why we believe the EACTS Endovascular Skills Course will be useful."

Dr Tsagakis, who has been using endovascular techniques in his clinical practice since 2004, said if cardiac surgeons didn't learn about endovascular procedures they could run the risk of losing patients to other specialities. However, he stressed that open surgery should not be neglected. "Endovascular procedures will not be able to replace open surgery; we will carry on performing surgery as we do it today and I'm sure it will still exist in the future.

"Open surgery produces very good results, but in many cases endovascular techniques offer better results, for example for stent grafts and treatment of the descending aorta. Nowadays, there is also a trend to extend endovascular treatments to aortic arch patients and in the future the ascending aorta may also be treated in this way – i.e. procedures we currently perform surgically."

More details of the Endovascular Skills Course can be found on the EACTS website: www.eacts.org.

Training Village

EACTS Training Village

Congenital: Ross, Ross-Konno and reinforced Ross

Mark Hazekamp on behalf of the moderators

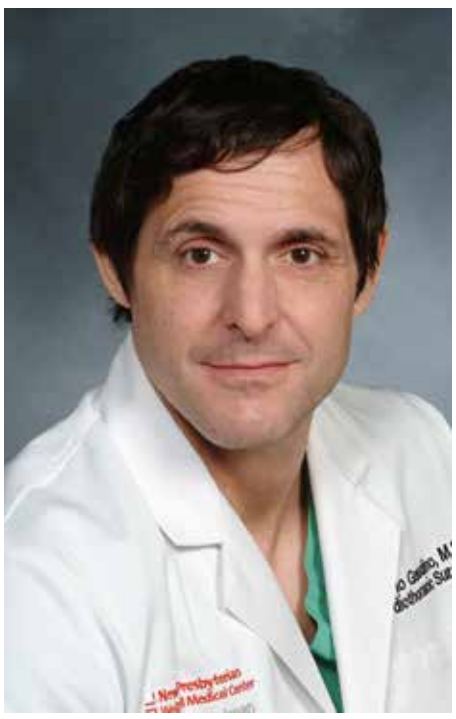
Donald Ross first did the smart procedure that was named after him in 1967. The Ross operation provides for a natural, zero-gradient aortic valve replacement that is virtually free of endocarditis. Since 1967 the Ross operation saw several modifications, thereby expanding its applications from neonates to elderly patients. In children and in younger adults the Ross operation is the best way to do an aortic valve replacement.

The aim of this hands-on training is to practice the basics of the Ross operation. You will learn how to harvest the pulmonary autograft, while avoiding damage to the first septal artery. In case of Ross-Konno, you will learn how to do the Konno septal enlargement thereby widely opening the left ventricular outflow tract. After this you can practice the implantation of the autograft root in the aortic position and reimplantation of the coronary arteries into the new aortic root.

When we teach you how to do a reinforced Ross you will apply the basics of the David reimplantation technique when you insert the pulmonary autograft in a vascular prosthesis.

In short, in this workshop you can practice many different techniques that will expand your surgical capabilities greatly. We hope that you will be there, enjoy the workshop and learn a lot!

Teresa M Kieser



Mario Gaudino

Antonio M Calafiore

Goals in Coronary Surgery: EACTS Training Village Wetblab

Teresa M Kieser[1], Mario Gaudino[2], Antonio M Calafiore[3] 1. University of Calgary, Canada; 2. Weill Cornell Medical College, New York, USA; 3. Fondazione Giovanni Paolo II Campobasso, Italy

The coronary artery bypass graft (CABG) has been the unsung hero operation of cardiac surgery for too long. It is time that this 'bread and butter' operation is taught as the highly technical procedure that it is, and not thought of as 'just a bypass operation'.

CABG is a procedure where the complexity is not only in the pure surgical technique but in the strategy as well. The basic operation (LITA + SVGs) in general does not imply a particular skill, but multiple arterial grafting, *in situ* or as a composite or elongated graft, and sequential grafting need a longer training period.

Nowadays we have diffuse disease and small-vessel disease (grafting a 1-mm vessel is not the same than grafting a 1.5-mm vessel). We need to use in the best possible procedure for our grafts, possibly arterial, using proper magnification (x4.5 at least). All the technical details, the philosophy and the strategy have already been in the literature for 25 years or more. Today we need to be more competitive; cardiologists have made impressive progress, but we haven't. It is time to learn how to perform complete revascularisation with as many arterial conduits as possible (at least in the most important territories), using sequential anastomoses when indicated. Reaching the skill necessary for this task is not easy, as surgical coronary revascularisation is a difficult procedure, not easy to standardise.

The Coronary Surgery Wetlab in the EACTS Training Village, held today at 14:00–17:15, aims to teach the basics of coronary anastomoses, composite conduits and sequential anastomoses. Fifty delegates will learn the many permutations and combinations of arterial and saphenous venous grafting with one-on-one teaching from master coronary surgeons. Practice with ancillary techniques will be available such as: intraoperative bypass graft assessment with transit-time flow measurement and epicardial ultrasound, skeletonisation of the internal mammary arteries with the cautery tip as a dissector, and practice using the Heart String III for aortic proximal anastomoses in off-pump surgery.

The Coronary Task Force Leader is Mario FL Gaudino, Professor of Cardiothoracic Surgery, Weill Cornell Medical College, New York, USA; and Coronary Wetlab Directors are Teresa M Kieser, Professor of Cardiovascular and Thoracic Surgery, University of Calgary, Canada and Antonio M Calafiore, Professor of Cardiac Surgery at Fondazione Giovanni Paolo II Campobasso, Italy. They will be helped by Drs Amadeo Anselmi, Piero Farina, David Glineur, Sigrid Sandner, and Daniel Thuijs.

The purpose of the wetlab is to stimulate a need in young surgeons to analyse each patient as a separate entity and to apply the correct strategy and proper surgical technique. In common practice, complete revascularisation is performed in 2/3 of patients, more than one arterial conduit is used in 10% or less of the patients, and sequential anastomoses are unknown to too many surgeons. It is time to change this and claim back our role in myocardial revascularisation. It is time to recover the time we lost making the banal a difficult procedure.

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SVD data on INSPIRIS promising and potentially game changing for AVR

With over 30,000 patients having received the Edwards Lifesciences' INSPIRIS Aortic Valve worldwide, and recent data showing no structural valve deterioration (SVD) at five years, INSPIRIS is shifting the paradigm in aortic valve replacement (AVR) with ever younger patients starting to reap the benefits.

The Edwards Lifesciences'-sponsored symposium at lunchtime today will address 5-year durability data of RESILIA tissue; a critical review of the safety and performance of various valves including INSPIRIS; advice on making the guidelines more pragmatic; and real-world data. Speaking will by Krzysztof Bartus (Poland), Sunil Ohri (UK), Christopher Young (UK) and Thierry Bourguignon (France) respectively.

Professor Bartus (Jagiellonian University, and John Paul II Hospital, Krakow, Poland) works in a team of more than 20 surgeons, at one of the largest institutions for AVR in Europe. They conduct around 2,000 open-heart procedures per year, including 350 AVR procedures. He is well-placed to discuss experience with RESILIA tissue from which the Edwards Lifesciences INSPIRIS aortic valve is made.

The novel design of the INSPIRIS RESILIA aortic valve has recently been recognised with a nomination for the prestigious 2019 Annual Prix Galien prize from the US Galien Foundation. Of note, the design leverages features of the trusted Carpentier-Edwards PERIMOUNT Magna Ease valve and is built on the proven performance of the Carpentier-Edwards PERIMOUNT valve including being mathematically modelled and bioengineered with three independent leaflets matched for thickness and elasticity mounted on a flexible, radiopaque cobalt chromium alloy wireform.

Professor Bartus will take the audience through the five-year outcomes of an AVR study using bioprosthetic valves constructed from novel RESILIA tissue. The cases were all treated in Institute of Cardiology in Warsaw and at John Paul II Hospital where the team have a long history of clinical trial work (80 clinical studies over the last 15 years) and has used Edwards Lifesciences' valves extensively. "It was somehow natural to try the RESILIA tissue valve," said Professor Bartus. "To date, we have evaluated more than 20 new devices in first-in-man trials, which is why the RESILIA tissue was of significant interest to us."

The study represents the longest-running evaluation of bioprostheses with RESILIA tissue, noted the surgeon. "We are very encouraged by the clinical outcomes," he said in an interview with *EACTS Daily News*. Through the five years of follow up, the study showed favourable and sustained mean gradients and effective orifice areas [EOAs]. "We also saw an excellent safety profile, including no cases of SVD."

RESILIA tissue is bovine pericardial tissue transformed by a novel integrity preservation technology that permanently blocks and eliminates exposure to free aldehydes (due to the technology incorporating tissue preservation with glycerol), which are a major source of tissue calcification. Moreover, this technology allows the valve to be stored under dry packaging conditions meaning that there is no need to rinse it prior to implantation.

"The fact that the valve is dry is more convenient for the surgeons because we don't have to wait a few minutes for the valve to be rinsed by the nurse, but can implant immediately," said Professor Bartus.

Together with his colleagues including Professors Jerzy Sadowski, Boguslaw Kapelak, Jacek Rozanski and Mariusz Kusmierczyk, Professor Bartus lead the five-year follow-up study of RESILIA tissue, the final outcomes of which he will present here at EACTS 2019 today. The prospective, single-arm, observational clinical trial aimed to confirm the safety and performance of novel bioprosthetic valves made using RESILIA tissue. A total of 133 adult patients diagnosed with aortic valve disease requiring AVR were enrolled. Some participants underwent concomitant procedures such as coronary artery bypass grafting (CABG), but all were due to be implanted with the Edwards Lifesciences Pericardial Aortic Bioprosthesis, Model 11000. Patients were followed for six months and annually up to five years.

"Guidelines are perceived as almost being written on tablets of stone, but in my view guidelines are there to help, yet they are treated like the law and people are thinking outside of the box less and less, to the detriment of the patient."

Christopher Young

Commenting on the patients who were involved in the study, Professor Bartus explained that the first patients implanted were over 65 years old, but upon seeing good, complication-free results in this age group, they moved quickly to use in younger patients. "The youngest patient was a 23-year-old man," he highlighted. "We discussed the pros and cons of mechanical versus tissue valves for this case. Finally, he decided to go for a RESILIA tissue valve because he lived far from the hospital where he would be required to have regular checks if he had received a mechanical valve," drawing attention to the multi-faceted elements of decision-making. "Today, five years post-surgery he is doing very well, and now we use it across most of the patient groups. Almost every patient who needs an aortic valve replacement is a good candidate for an INSPIRIS RESILIA valve."

Multiple safety and effectiveness endpoints were assessed in the study including haemodynamics (orifice area and mean gradient); safety (adjudicated by an independent Clinical Events Committee) and procedural outcomes.

Regarding the results, Professor Bartus will report that all 133 patients were implanted with the test valve in the first attempt with 100% technical success, while 86% received isolated AVR, 44% were valve size 19-21 mm, and 88% received a full sternotomy.

In terms of haemodynamic outcomes, performance was good at five years with a low mean gradient (baseline 49.4 mmHg compared to 14.8 mmHg at five years). Also, at five years, the orifice area with this valve was acceptable (with 44% of valves being 19 and 21 mm), and there were no major paravalvular leaks at five years. Also, the New York Heart Association (NYHA) Class positively changed over the five years with 100% of class III improving, and 51% of class II improving.

"The INSPIRIS may be a game-changer because if you have a valve with no SVD at five years, then our whole approach to how we inform our patients about long term outcomes with bioprosthetic valves will change."

Sunil Ohri

"We found that RESILIA tissue, which is now mounted on the INSPIRIS valve, brings a very low rate of complications, as well as having a very good safety profile,"

highlighted Professor Bartus. "The technology eliminates further degeneration in the tissue and it should last much longer meaning that there will be a delay for any re-intervention."

This durability benefit facilitates the use of longer-lasting valves in younger patients, as opposed to mechanical valves, noted the professor. "Patients don't need anti-coagulants and the associated complications of bleeding and thrombolic events common with mechanical valves, so the quality of life for younger patients could be so much better with a bioprosthetic valve."

Professor Bartus explained how bioprosthetic valves, in particular INSPIRIS with RESILIA tissue, were changing practice. "Previously, in our practice, about 80% of patients received a mechanical valve but over the last ten years, this has changed significantly," he remarked.

He said that this transformation is partially explained by the fact that patients are living longer and wish to have a good quality of life. "Also, in our institution, every year we have more and more AVRs to do. This RESILIA tissue technology might extend the longevity of this generation of valve."

In reviewing safety and performance of prosthetic valves, cardiac surgeon, Sunil Ohri (University of Southampton NHS Foundation Trust, Southampton, UK) will take the audience through data from the combined experience of his group at Southampton with five-year of follow up that compared 2,800 implanted bioprosthetic valves of various brands. Of these, 1,030 were Edwards Lifesciences PERIMOUNT valves, 449 were the next generation Edwards Lifesciences' Magna Ease, and a total of 837 patients received the Trifecta (Abbott) valve.

At today's presentation, Mr Ohri will share interesting data that could potentially have a big impact on AVR practice going forward.

"The INSPIRIS may be a game-changer because if you have a valve with no SVD at five years, then our whole approach to how we inform our patients about long term outcomes with bioprosthetic valves will change," Mr Ohri asserted.

Mr Ohri and his colleagues looked at the outcomes overall, and in particular, looked at the Magna Ease, and the Trifecta valves because they are both pericardial valves and both implanted in the super-annular position. In contrast, the Edwards Lifesciences' PERIMOUNT is implanted in the annular position. "Supra-annular valves are preferred because they provide a large effective orifice area and this means there's a larger area for the flow of blood generating greater cardiac output. This is especially good for a larger patient because it overcomes patient-prosthesis mismatch," explained the surgeon.

"Of our patients, 992 received isolated AVR, and our mortality for that was 0.45%, which is one of the lowest mortality rates for isolated AVR," emphasised the surgeon and researcher.

"With the Edwards' valves - the PERIMOUNT or Magna Ease, we had 0% re-intervention rate/SVD rate," he pointed out.

The INSPIRIS valve is TAVI-ready meaning a balloon can be inserted into the valve and it clicks open, said Mr Ohri, noting a benefit with INSPIRIS. "With the Magna Ease it can be fractured so it can be made a size bigger to allow a valve to be implanted inside it."

Mr Ohri pointed out the importance of having an option for AVR patients, if they do return. For patients with the Magna Ease there is an option where the valve can be fractured and the area made bigger to implant a TAVI valve.

Looking ahead, Mr Ohri suggested that with longer lasting bioprosthetic valves, "our whole approach to the way we inform our patients about long term outcomes with bioprosthetic valves will change." He identified that there was a grey zone with patients aged 60-65 years, with European guidelines noting that placing a bioprosthetic valve into a 60 year old is reasonable

"We are very encouraged by the clinical outcomes and also saw an excellent safety profile, including no cases of SVD."

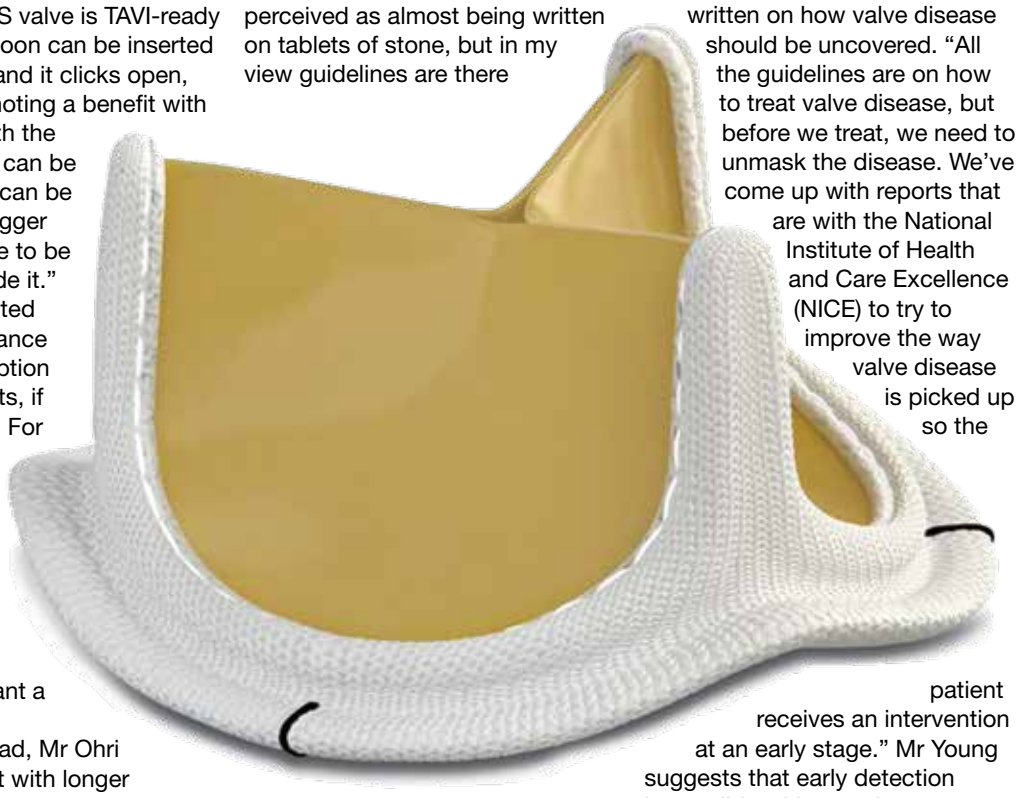
Krzysztof Bartus

if the patient agrees but that a mechanical valve should be considered in someone less than 60 years, if, again, the patient agrees, he explained.1 "The US guidelines say a mechanical valve is reasonable if the patient is less than 60 years with no contraindications to anti-coagulant therapy."2

However, he insisted that in 2019, the priority should be informed patient choice. "We provide the latest information from the literature and then the patient makes up their own mind based largely on their lifestyle choice. Patients under 60 years, who want to avoid lifelong medication might still want a bioprosthesis, and in this case then the INSPIRIS would be my first choice. I'm persuaded by both the animal data on INSPIRIS, and the reduction in calcification, as well as the evidence coming through in terms of clinical experience," Mr Ohri added.

Guidelines – a guide not a rule

Picking up on Mr Ohri's point about guidelines determining in which patients different valves should be used, cardiac surgeon, Christopher Young, (Guy's and St. Thomas's NHS Foundation Trust, London, UK) said: "Guidelines are perceived as almost being written on tablets of stone, but in my view guidelines are there



to help, yet they are treated like the law and people are thinking outside of the box less and less, to the detriment of the patient."

Talking to *EACTS Daily News* prior to the meeting, he described a typical scenario where on an arbitrary scale from 1-10 with 10 being fatal, the guideline says you should operate at 7, but the patient sees you at 5.5. "So you have to wait and send the patient away, but by the time the patient returns they're 9, and you're asked why did you wait so long? "Patients are on a spectrum of disease, getting increasingly worse. Trying to treat the patient at the exact point suggested by the guideline is unachievable so we should treat guidelines as guidance not as rules."

Regarding guidelines around when to use a mechanical valve versus a bioprosthetic valve, Mr Young asserted that he totally disagrees with them. "European guidelines say mechanical up to 60 years and tissue over 70 years, and in between, we argue about it. In reality, patients want tissue valves not mechanical, so in our practice, we put tissue valves in 30 and 40-year olds."

He added that he sees a handful of patients referred from other clinics every year because they have made a careful decision about the type of valve they want, but elsewhere, have been told they cannot have. "I believe in patient choice," he asserted.

Asked about what the guidelines do not include that he believes they should, Mr Young referred to a need for guidelines on how to detect heart valve disease. As chairman of a heart valve charity called Heart Valve Voice, he advocates to have guidelines written on how valve disease should be uncovered. "All the guidelines are on how to treat valve disease, but before we treat, we need to unmask the disease. We've come up with reports that are with the National Institute of Health and Care Excellence (NICE) to try to improve the way valve disease is picked up so the patient receives an intervention at an early stage." Mr Young suggests that early detection is possible with a stethoscope alone and could be carried out at regular checks at the GP surgery by nurses.

COMMENCe: four-year follow-up real-world data

Cardiac surgeon Thierry Bourguignon, (Tours University Hospital, Tours, France) will discuss real world evidence for the use of RESILIA tissue, namely the four-year follow-up of the ProspeCtive, nOn-randoMized, MulticENter Clinical Evaluation of Edwards Pericardial Bioprostheses With a New Tissue Treatment Platform (COMMENCe) trial. This trial is a prospective cohort study of RESILIA tissue mounted in a Magna Ease bioprosthesis valve. Dr Bourguignon will present data on around 800 people.

"There were no cases of early SVD, which is good, and secondly, the haemodynamics are very satisfying especially in comparison to the PERIMOUNT valve. Together, these results are very promising," he said.

Dr Bourguignon will then discuss results of real-world experience with use of INSPIRIS valve for most of Europe and for France. "In Tours University Hospital we have implanted over 250 patients with the INSPIRIS valve since June 2017 and confirm excellent short-term outcomes."

"In Tours University Hospital we have implanted over 250 patients with the INSPIRIS valve since June 2017 and confirm excellent short-term outcomes."

Thierry Bourguignon

The INSPIRIS has a ring that allows for expansion. "If a valve deteriorates, we can eventually do valve-in-valve transcatheter aortic valve implantation (VinV-TAVI) with a balloon that can be inflated inside the INSPIRIS valve. This has previously been demonstrated in animals, but we had a case of a frail patient with fragile tissues, who developed a severe paravalvular leak after AVR with a 23 mm INSPIRIS valve. We were able to treat this leak by performing VinV with a 23 mm SAPIEN3, demonstrating the efficiency of the Vfit design and the expansion zone."

Dr Bourguignon will conclude by briefly discussing two registries of clinical data on the INSPIRIS valve – the INSPIRIS Resilia Durability registry that is supported by Edwards Lifesciences, and the LEOPARD registry supported by the Heart Valve Society due to start very soon. These will provide a fair evaluation of the INSPIRIS valve in the future, noted Dr Bourguignon.

Edwards Lunch Symposium: 'Shifting into the New Paradigm for the Aortic Valve Replacement', held Friday, 4 October 2019 at 12:30–13:45 in Auditorium 8 (level 1). Expert opinion, advice and all other information expressed represent contributors' views and not necessarily those of Edwards Lifesciences.

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INSIDE LISBON

Where to go? What to do?

TRADITIONAL EATS

BACALHAU

Cured salt cod (bacalhau) is a delicacy here in Lisbon, coming in many shapes and sizes. Whether flaked and pan-fried with potatoes (bacalhau à Brás), served as fritters (pataniscas de bacalhau) or as one of the remaining 360 variations it is said to have, you'll find it served in some form across the city.

Head to: Zapata, As Salgadeiras (Old Town).

SARDINES (SARDINHAS)

Saint Anthony, Lisbon's patron saint, is credited with starting the craze for sardinhas (apparently the fish were very keen on listening to his sermons). Nevertheless, these small delicacies play a big part in festivities and celebrations in Lisbon.

Recommended: Farol de Santa Luzia (Alfama district).

PESTICOS

"No, these aren't Portuguese tapas," is the response you'll get if you suggest as much to a local. And in truth, they're right: Pesticos – from the verb petiscar ('to savour') – are small plates that are as much an experience as they are nourishment. They are made to be shared with friends, so grab a plate and tuck in.

Try: Salada de polvo (octopus salad), carne de Porco à Alentejana (pork with clams) or the oddly named peixinhos (little fish), which are actually fried green beans.

Where: Sol e Pesca, Tapa Bucho, Ramiro, Atalho Real

ALTERNATIVELY...

AO 26

This vegan powerhouse is a strong favourite with the locals, offering a great lunch menu and fantastic (albeit slightly more pricey) evening menu. They are famous for their desserts, especially the Oreo, peanut butter and chocolate cake.

DRINKS

GINJINHA (GINJA)

This Portuguese liqueur, made from infusing sour cherries (ginja) in alcohol, is a typical Lisbon drink invented by a Friar from the Church of Santo António. Its sweet, dark-red allure can be seen on the tables of many a bar after (and probably throughout) dinner.

Try it at: Ginginha sem Rival and Á Ginjinha – two traditional street bars in the centre that are definitely worth visiting.

SAMPLE GREAT WINES

If you want to try some excellent Portuguese wines, there are many places on offer: **BA Wine Bar do Bairro Alto** has more than 200 local wines, overlooked by a beautiful mural on the ceiling; **Wine Bar do Castelo** prides itself on offering a true masterclass in vinho português; or head to **By the Wine** for a more modern, vibrant feel.

A CRAFTY BEER

Portugal will always have a place in its heart for Sagres and Super Bock, but if you prefer to try Lisbon's exploding craft beer scene, head to **Cerveteca Lisboa**, the first craft bar in the city. Or, for something a little more central, try **Duque Brewpub**.

The European Board of Cardiothoracic Surgery (EBCTS)

The EBCTS examination: on route to become the most comprehensive, complete and challenging examination of cardiothoracic surgery and specific critical-care management

Patrick Myers, Eduard Quintana, Pietro Bajona and Stephen Clark on behalf of the EBCTS.

Francesco Onorati (left) and Andrew Parry, newly nominated members of the EBCTS board

An expert panel of surgeons performs standard-setting for the EBCTS Level 1 exam (23 September, 2019).

The development of a modern examination to assess professional knowledge, skills and competences remains a priority of EACTS, and is a deep-seated need for our profession. The European Board of Cardiothoracic Surgery (EBCTS) has divided certification into two levels since 2017: EBCTS Level 1 for Membership (MEBCTS) and Level 2 for Fellowship (FEBCTS). The level 1 MCQ exam was delivered in Lisbon on Wednesday 2 October, right before the Annual Meeting. For the third year running we've seen the number of candidates growing exponentially.

The exam is open to any surgeon worldwide willing to test their professional competence and reach for a badge of honour. The ongoing evolution of this high-stakes examination is evident, thanks to an expanding engagement of surgeons from around 20 different countries. In the last intake, 75 candidates were examined. The names of the successful candidates who achieved the EBCTS Membership will be published on the EBCTS website.

It is important to note that for certain countries, such as Switzerland, this represents a turning point in a surgeon's career, as MEBTCS has been established as a step in the permissive certification for independent practice. Surgeons starting their training now in the Netherlands are required to pass the EBCTS Level 1 examination as part of their national certification. As such, the potential for progressive adoption of the EBCTS examination as a permissive certification may be spreading throughout Europe.

The 180-question, paper-based examination on the generality of cardiothoracic surgery covers the EBCTS Syllabus. It represents an examination with top-grade contemporary standards produced through a delicate methodology, with a final pass mark that was set using the Angoff methodology. A thorough objective analysis of the entire exam was undertaken by an expert educationalist and a panel of senior surgeons on 23 September this year in Windsor, UK (pictured). Every question was scrutinised, overall performance analysed, and measurements of stability and accuracy were obtained. Several statistical items (point biserial, discrimination power, quintile distribution, percentage of correct candidates) were looked at to ensure the appropriateness and quality of each question. The analysis for this year's examination is ongoing, and participants of previous intakes demonstrated that the MEBCTS examination was reassuringly considered a very robust and high-quality tool for assessment, thereby justifying the substantial efforts that have been made in its development. Using psychometric assessment, any flawed question will be identified and removed from the exam if needed in favour of the candidates. Also, a detailed summary of feedback from the candidates will be performed and disclosed.

The Level 2 viva examination on subspecialties – adult cardiac, congenital and thoracic – was successfully delivered for the first time in December 2018. For candidates who passed the Level 1 in 2018 or earlier, it will be delivered 11–12 December 2019 in Windsor.

Great effort continues in creating and delivering EBCTS exams, and there are a significant number of surgeons being trained and engaging in question writing, assessment and peer-reviewing. If you are interested, there is a continued open process of application that can be found at www.ebcts.org/examiners/

For 2020, the EBCTS will feature several new initiatives. Following the feedback from past candidates and national specialist boards, the Level 1 examination will be divided into two separate examinations: one for cardiac (adult and congenital), and one for thoracic surgery. Candidates can take either or both examinations, depending on whether they wish to be certified in cardiac, thoracic or cardio-thoracic surgery. Furthermore, we are in discussions to transition from paper-based examinations to computer-based examinations. This will allow the EBCTS to administer the Level 1 examination world-wide at a predefined date and time in dedicated testing centres. This new platform will allow further use of imaging to support assessment as in daily clinical practice (e.g. radiology, ultrasonography and surgical images).

The Board is renewing its members and is in the process of recruiting a new Chair following an open process. We have received many excellent applications which are now being reviewed by a nominating committee using a standardised approach. Furthermore, to ensure representation of each EACTS domain within the Board, Francesco Onorati and Andrew Parry (pictured) were nominated to represent the Vascular Domain and Congenital Domain, respectively.

The examination will continue to put the highest quality and patient safety at the frontline. It is our intention to clearly demonstrate that successful candidates are safe, skilled surgeons early after their training.

Rapid Response | Thoracic | Transplant and Mediastinum

Is thoracoscopic thymectomy cost-effective in a developing country? A single-centre experience of 87 cases

Amr Abdellateef [1], Mohamed Gabr[1], Hossam Egila[2] 1. Department of Cardiothoracic Surgery; 2. Department of Neurology, Mansoura University Hospital, Mansoura School of Medicine, Mansoura University, Mansoura, Egypt.

Introduction

Cost-effectiveness of video assisted thoracoscopic surgery (VATS) extended thymectomy is questionable, particularly in developing countries, mostly due to the increasing intraoperative costs associated with the use of energy-based sealing devices.

The aim of our work is to evaluate the cost-effectiveness of VATS extended thymectomy compared to the trans-sternal approach in relation to cost, achievement of a safe technique and favourable postoperative results for patients with myasthenia gravis (MG).

Methods

We conducted our study on 87 MG patients who underwent extended thymectomy. Patients were divided into two groups according to the surgical approach. The first group comprised of 47 patients operated through a VATS right-sided 3-port approach. The second group comprised of 40 patients operated through a trans-sternal (full sternotomy) approach. Our surgical target in both approaches was to remove the thymus gland from the right phrenic to left phrenic nerve in addition to removal of all mediastinal fat (Figures, 1, 2, and 3). Energy-sealing devices were used in all VATS procedures.

Amr Abdellateef

Clinical, operative and postoperative data were collected, statistically analysed and compared in both groups, including the preoperative disease severity, operative time, intraoperative amount of bleeding, postoperative pain score, length of stay, need for plasmapheresis, clinical improvement, adjustment of medication and complications (follow-up: three months).

Data regarding the time required for a patient to return to a normal life, the duration of time spent out of work and their average monthly income were also collected through OPC follow-up notes, scheduled personal interviews and telephone calls.

Operative- and post-operative costs were collected and calculated by the hospital's financial administration accountants. The cost of staying out of work before return to normal life was also calculated. All costs were expressed in Egyptian pounds (LE).

Results

- Postoperative clinical response assessed by Defillipi classification showed no statistically significant difference after two weeks between both groups. However, there was a statistically significant difference in favour of the VATS group after three months (p = 0.016). There was no statistically significant difference between the two groups regarding rate of postoperative complications.
- There was a statistically significant reduction of postoperative pyridostigmine dose in the VATS group after three months of evaluation (p = 0.001).
- Patients in the VATS group had statistically significant lower postoperative pain scores at postoperative day (POD) zero, POD1 and after two-week assessment (p < 0.001). They also returned faster to normal life (p < 0.001).
- Operative cost was significantly higher in VATS group due to use of energy-sealing devices (p < 0.001).
- Costs of post-operative hospital stay, postoperative plasmapheresis (where required) and cost of being out work were significantly higher in the trans-sternal group (p < 0.001).
- After summation of all aforementioned costs, the net result of the total final cost in both groups was not statistically different (p = 0.16).

Conclusion

VATS extended thymectomy is a safe and feasible minimally invasive approach with acceptable results and good outcome. Its total cost has no statistical difference compared to the trans-sternal approach. Therefore, VATS thymectomy should be considered as a cost-effective procedure in developing countries.

Figure 1. Right thoracoscopic view shows complete removal of thymus gland starting from right phrenic nerve along with clearance of all mediastinal fat.

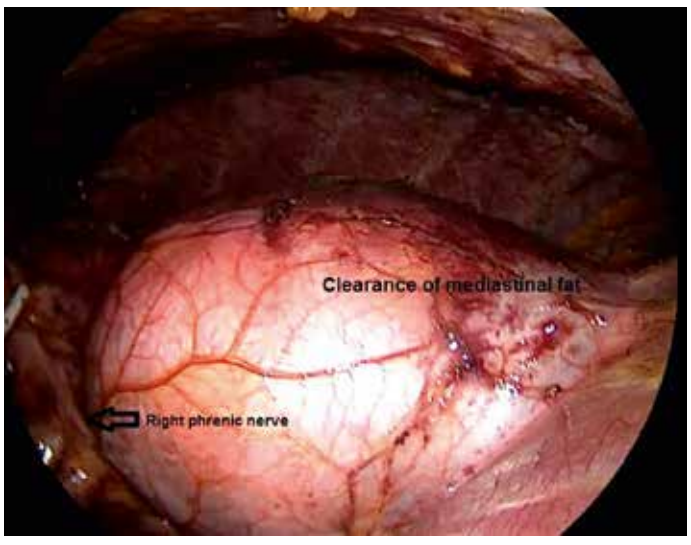


Figure 2. Right thoracoscopic view shows complete removal of the thymus gland till the left phrenic nerve.

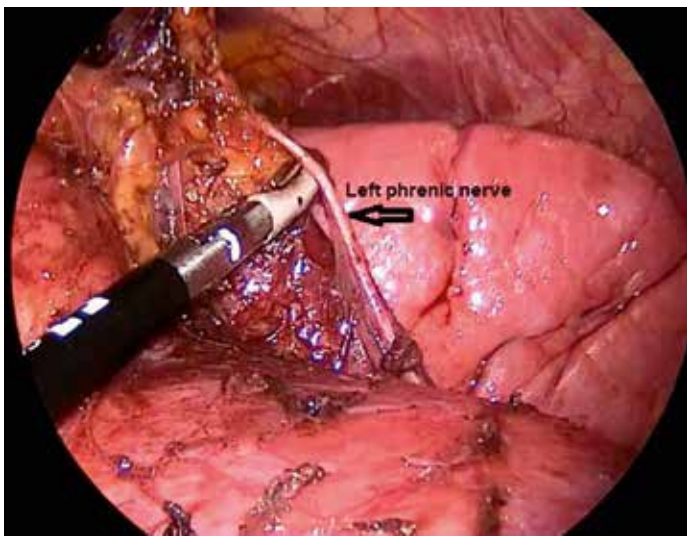
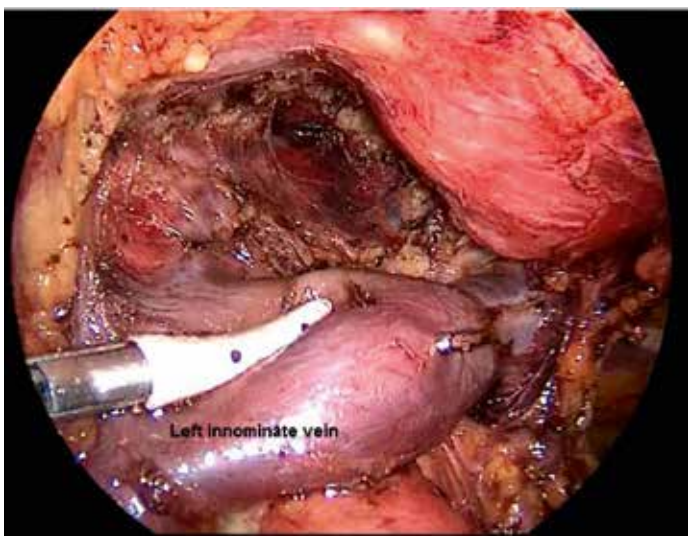


Figure 3. Right thoracoscopic view, complete removal of thymic horns at suprasternal notch.



Rapid Response | Cardiac | Dilemmas in mitral repair, tricuspid surgery and endocarditis

Surgical edge-to-edge repair for P2 prolapse: is there a role?

Nicolò Peluso, Cinzia Trumello, Ilaria Giambuzzi, Alessandra Sala, Stefania Ruggeri, Alessandro Castiglioni, Ottavio Alfieri, Michele De Bonis Department of Cardiac Surgery, IRCCS San Raffaele Hospital, Vita-Salute San Raffaele University, Milan, Italy

Mitral valve regurgitation is the second most common valve disease requiring surgical treatment. Its main cause is the prolapse of the central scallop of the posterior leaflet. Resection techniques or artificial chordae implantation are commonly used to treat this lesion with excellent results.

In our centre, these methods of repair are routinely used, however in some patients, the use of these techniques might be more challenging – or not even feasible – for a number of reasons, including suboptimal exposure leading to poor visibility of the mitral valve, extensive calcification of the mitral annulus, high risk of postoperative systolic anterior motion (SAM) or multiple concomitant procedures. Under these circumstances the edge-to-edge technique is preferred.

In this study, we retrospectively evaluate the long-term clinical and echocardiographic results of the application of the edge-to-edge technique in selected patients from 2000 to 2017. The study population includes 138 patients, corresponding to 2% of the 6,570 patients submitted for mitral repair in this period. Clinical and echocardiographic follow-ups were 95% complete (mean 5.6 ± 4.59%; max 18.5 years). Kaplan-Meier estimates were used for analysing long-term survival. Competing risk analysis for time to cardiac death, with non-cardiac death as competing risk, time to reoperation and time to recurrence of MR with death as competing risk were adopted.

Michele De Bonis (left) and Nicolò Peluso

Hospital mortality was 1.4% (2 patients). The cumulative incidence function (CIF) of cardiac mortality with non-cardiac mortality as a competitive event at 14 years was 5.4 ± 3.3% (95% CI 1.21–14.40; Figure 1). The CIF for reoperation, with death as a competitive event was 5.1 ± 3.05% (95% CI 1.21–13.45) at 8 years and 13.0 ± 8.07% (95% CI 2.46–32.51) at 14 years. At 10 years the CIF for recurrence of mitral regurgitation ≥ 3+ with mortality as a competitive event was 7.9 ± 4.8% (95% CI 1.72–20.43; Figure 2).

A Fine & Gray model was performed to look for predictors of recurrence of mitral regurgitation ≥ 3+ but no significant risk factors were identified. When the model was applied to the recurrence of mitral insufficiency ≥ 2+, we found that the implantation of a partial ring had a 9-times higher risk for this event compared to complete rings (HR = 9.18, 95% CI [2.28–37.00], p = 0.002). The edge-to-edge technique can be used as an alternative approach to treat P2 prolapse in a small proportion of patients in whom anatomical reconstruction would be more challenging or contraindicated because of clinical or anatomical reasons. In our experience this approach was adopted in around 2% of the patients undergoing mitral repair.

Our clinical and echocardiographic data show that the edge-to-edge technique provides satisfactory long-term results for P2 prolapse or flail, even in the presence of relatively unfavourable anatomical conditions. The competing risk analysis of our series further reinforces the reliability of these results. Complete rings should be favoured to perform concomitant annuloplasty since partial rings are associated with a higher rate of recurrent moderate mitral regurgitation.

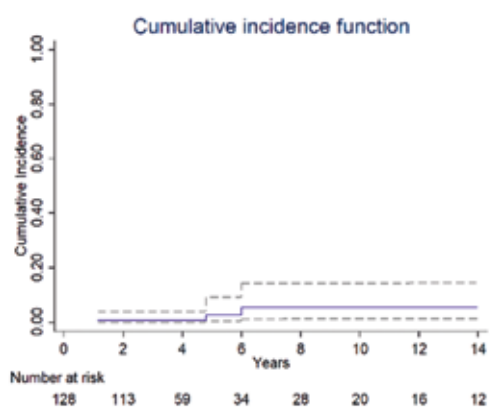


Figure 1: Cumulative incidence function of cardiac death with non-cardiac death as competing risk.

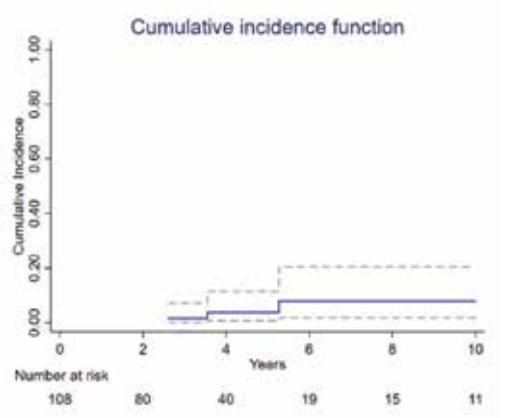


Figure 2. Cumulative incidence function of mitral valve regurgitation ≥ 3+ with death as competing risk.

Multimedia Manual of Cardio-Thoracic Surgery

MMCTS: From Core Skills to complexity

The *Multimedia Manual of Cardio-Thoracic Surgery* (*MMCTS*) was relaunched three years ago with a renewed focus on teaching, and a tutorial structure centered entirely on narrated surgical videos. Tutorial content was organised into five easy-to-navigate main sections: Core Skills, Cardiac, Congenital, Thoracic, and Vascular. Editors-in-Chief Roberto Lorusso and René Prêtre and their editorial board colleagues now work tirelessly to commission new material and ensure that each of these sections offers comprehensive coverage.

Three years of hands-on management of *MMCTS* have taught us a lot about what our surgeon users need when it comes to online learning, and one of the most striking revelations is the consistent popularity of Core Skills tutorials. Half – or sometimes more – of our Top 10 Most Viewed videos come from Core Skills.

The Essentials: Core Skills

MMCTS's Core Skills section includes tutorials on topics like surgical access, cannulation, cardiopulmonary bypass and perioperative care, most of which are relevant to every subspecialty area of cardiothoracic surgery, so perhaps their impressive stats shouldn't be surprising. However, it is clear that these tutorials fill a real need for fundamental surgical education which isn't freely available elsewhere. This has been a principle focus of *MMCTS* since it was first published more than 15 years ago under the editorship of Marko Turina.

Consistent Core Skills winners in the *MMCTS* usage Top 10 include **Median Sternotomy** (Diana Reser et al.), **Open Harvesting of the Great Saphenous Vein** (AP Durko et al.), and Skeletonized Internal **Mammary Harvest with Diathermy and Cold Dissection** (also by AP Durko et al.), but there are many more that make the Top 10 on a regular basis. We would like to take the opportunity here to thank all of our Core Skills authors and to say please send more!

Complexity: Advanced Procedures

On the opposite end of the scale are tutorials that demonstrate the complex surgeries that every expert cardiothoracic surgeon faces from time to time. There are video demonstrations of congenital procedures in newborns and young children (e.g. **Aortic Re-implantation in Anomalous Origin of the Left Coronary Artery from the Right Pulmonary Artery in a Toddler**, by Vladlen Bazylev et al.); high-risk patients with concomitant problems (e.g. **Awake Extracorporeal Life Support Implantation in Profound Cardiogenic Shock**, by Thomas Haberl et al.); and rarely seen disorders that may be hard to diagnose (e.g. **Intraoperative Identification and Treatment of a Giant Right Coronary Artery Aneurysm**, by Joel Ramirez et al.). Procedures like these are labelled as 'Advanced' in *MMCTS* and have a steady and reliable stream of viewers.

One of our all-time most popular tutorials is **Heart echinococcosis**, by Nikolay Travin et al., which demonstrates the removal of more than 200 heart and lung hydatid cysts. Its consistently high usage is undoubtedly a reflection of its clinical relevance and the skill with which the procedure is demonstrated; however, heart echinococcosis is relatively rare and we can see that many of our viewers are non-surgeons who have found the video on YouTube and are morbidly fascinated by it. And justifiably so. Heart echinococcsis is our only tutorial that can boast of having both a professional and a consumer audience!

Please visit *MMCTS* (mmcts.org) to see video demonstrations of a full range of cardiothoracic surgery procedures, from the most fundamental to the most challenging. And please submit your own proposals: we are always looking for new material and we promise speedy turn-around of proposals and a PubMed citation for published tutorials. See our 'Contributing to *MMCTS*' page on the website to learn more.

Rapid Response | Cardiac | Dilemmas in mitral repair, tricuspid surgery and endocarditis

Off-pump tricuspid valve repair by automated sutured tricuspid annular plication via transatrial cannulation: preclinical *ex-vivo* and *in-vivo* results

Martin Andreas[1], Jude Sauer[2], Paul Werner[1], Marco Russo[1], Robert Zilberszac[3], Claus Rath[4], Zachary Fitch[5], Guenther Laufer[1] 1. Division of Cardiac Surgery, Department of Surgery, Medical University of Vienna, Vienna, Austria; 2. Department of Cardiac Surgery, University of Rochester, New York, USA; 3. Division of Cardiology, Department of Internal Medicine II, Medical University of Vienna, Vienna, Austria; 4. Center for Anatomy and Cell Biology, Medical University of Vienna, Vienna, Austria; 5. Department of surgery, Duke University, North Carolina, USA

Patients undergoing isolated surgical tricuspid repair present with a high perioperative mortality. Several different interventional treatment options are currently in clinical use or under investigation. Besides the standard surgical approach, an alternative surgical technique is the Hetzer repair, which was adapted for this novel approach. It achieves valve repair through sutured plication of the annulus and creation of a double orifice tricuspid valve (TV). We investigated a novel, micro-invasive approach for trans-atrial off-pump beating-heart tricuspid annular plication based on the surgical Hetzer repair.

TV annular plication in the mid-anterior and septal position for creation of a double-orifice valve was performed in 10 human heart specimens in an ex vivo perfusion model. Additionally, the technique was applied in an *in vivo* porcine model using a trans-atrial access under echocardiographic and fluoroscopic guidance. In both models, a specific cannula with an integrated haemostatic valve was inserted in the right atrium, providing access to the TV through circulating blood. Following cannulation and introduction of the suturing device, automated suturing was performed in the mid-anterior and septal position of the tricuspid annulus (Figure 1).

Martin Andreas

Subsequently, sutures were tightened for annular plication and knots were fixated with an automated knot-fastening device.

In the ex vivo model, the plication technique was feasible with a significant reduction of the TV septal-lateral diameter (50.9 ± 7.3 mm vs 42.6 ± 7.9 mm; p = 0.015) and the TV area (1208.4 ± 398.6 mm^2 vs 193.4 ± 121.7 mm^2; p < 0.0001). Only one suture tear was recorded (1.6%). In the *in vivo* experiments, TV plication using device-embedded intracardiac echocardiography, epicardial echocardiography and fluoroscopy was feasible in both animals. No device-related adverse events or sudden death were observed in the *in vivo* experiments, post-procedural echocardiography revealed no tricuspid regurgitation.

The performance of this new technique with novel automated annular suturing devices was successful in two pigs without device-related adverse events. Micro-invasive tricuspid annular plication for creation of a double-orifice TV is a potential therapeutic approach, whose early results encourage further research. More, the cannulation technology provides a safe access to the right atrium in an off-pump setting, opening up new opportunities for surgical therapies.

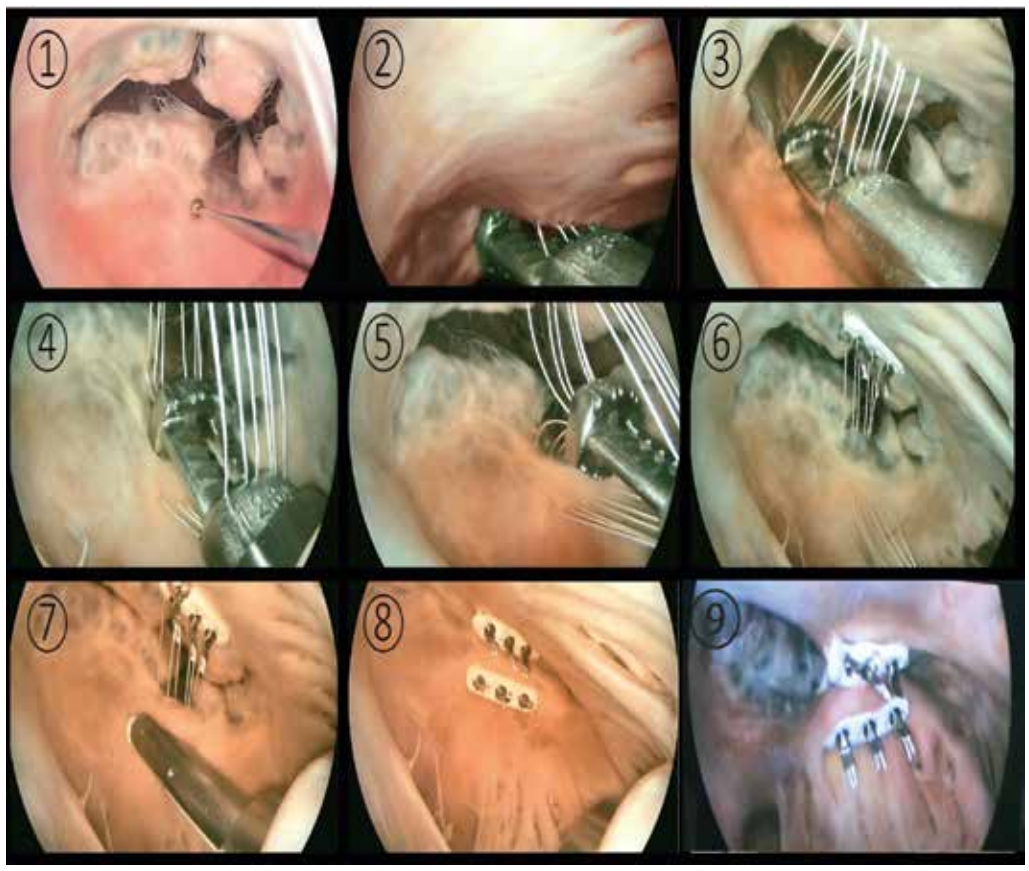


Figure 1. Procedural steps of the fTAP procedure (ex vivo model): 1) Visualisation of the tricuspid valve (TV); 2) anterior bite located in the middle portion of the anterior annulus; 3) six 3-0 Polytetrafluoroethylene (ePTFE) sutures positioned within annular tissue; 4) positioning of the posterior device jaws at the opposite septal annulus; 5) septal bite and retraction of the suturing apparatus; 6) completed fastening of the anterior sutures with a single pledget incorporating all six sutures; 7) fastening of septal sutures; 8-9) final result after plication.

Abstract | Congenital | Coronary arteries in CHD

Early presentation of myocardial dysfunction in patients with abnormal origin of left coronary artery from the pulmonary artery is a predictor of poor mid-term outcomes

Fedoua El-Louali[1], Virginie Fouilloux[2,3], Edouard Aries[1,3], Marien Lenoir[2], Stéphane Le Bel[4], Célia Gran[2], Caroline Ovaert [1,3] 1. Department of Paediatric Cardiology, Aix-Marseille University, Marseille, France; 2. Department of Paediatric Cardiac Surgery, Aix-Marseille University, Marseille, France; 3. Faculty of medicine, Aix-Marseille University, France; Department of Anaesthesia and Intensive Care, Timone Children's Hospital, Marseille, France

Fedoua El-Louali

Introduction

Abnormal origin of coronary artery from the pulmonary artery (ALCAPA), also known as Bland-White-Garland syndrome, is one of the most common causes of myocardial ischaemia and infarction in childhood. This rare congenital abnormality accounts for 0.25%–0.5% of all congenital heart diseases[1].

The abnormal connection of left coronary artery to pulmonary artery leads to left-to-right shunt with abnormal myocardial perfusion. This phenomenon is classically referred as "coronary steal". Mortality exceeds 90% within the first year of life if left untreated[2]. Patients who reach adulthood can present with myocardial infarction, left ventricular dysfunction and mitral regurgitation, or silent myocardial ischaemia, carrying a risk of sudden cardiac death[3].

Therefore, early diagnosis and immediate surgical correction with restoring a two-coronary-artery circulatory system can provide excellent results and lead to progressive myocardial recovery.

To categorise clinical differences, some authors refer to infant- and adult type[3]. Rather, we suggest distinguishing between early- and late forms according to physiopathology, presentation and outcomes.

This study aimed to determine the correlation between age at clinical presentation, level of ventricular dysfunction and post-repair outcomes.

Methods

From 1993 to 2018, 31 consecutive patients underwent coronary re-implantation. The study cohort was divided into two groups according to age (Group 1, < 6 months and Group 2, > 6 months). The median follow-up time was 72 (24–168) months.

Results

Median age was 4.7 (2.3–16) months. Median weight was 6.2 (4.3–9) kg. Preoperative echocardiography showed severe left ventricular (LV) dysfunction (ejection fraction < 35%) in 64.5% of patients. Mitral regurgitation (MR) was moderate to severe in 13 patients (41.9%). Two patients (6.4%) required extracorporeal membrane oxygenation (ECMO) support before surgery and 6 (19.4%) after correction. Age < 6 months was significantly associated with severe clinical presentation, severe LV dysfunction, delayed sternal closure, prolonged respiratory mechanical support and prolonged length of ICU stay (p = 0.024, p = 0.042, p = 0.002, p = 0.042 and p = 0.022, respectively). Six months after surgery, ejection fraction improved to a median of 57% (50.7–60.5). MR regressed in 12 patients (92.3%). Mortality rate after surgery was 9.7%. All patients were free from reoperation at the last follow-up.

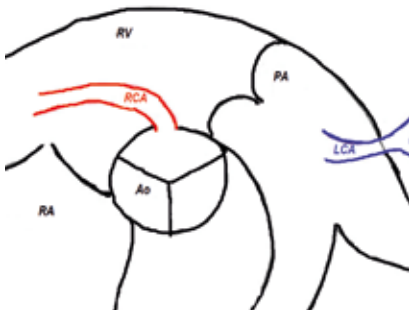


Figure 1. Abnormal origin of left coronary artery from the pulmonary artery.

Conclusions

Young age at the time of diagnosis was significantly associated with a more severe clinical presentation and poorer outcomes. After re-establishment of a two-coronary circulation, both ventricular function and MR tend to normalise over time regardless of age at repair.

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3. Peña E, Nguyen E.T, Merchant N, Dennie C. ALCAPA Syndrome: Not Just a Pediatric Disease. Radiographics. 2009; 29: 553-65

Figure 2. Kaplan-Meier Survival curve comparing Group 1 and Group 2.

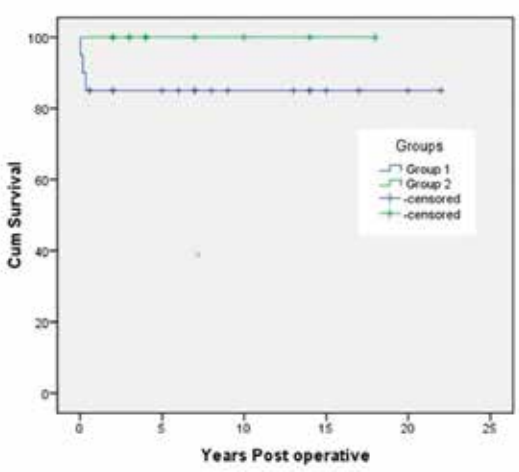
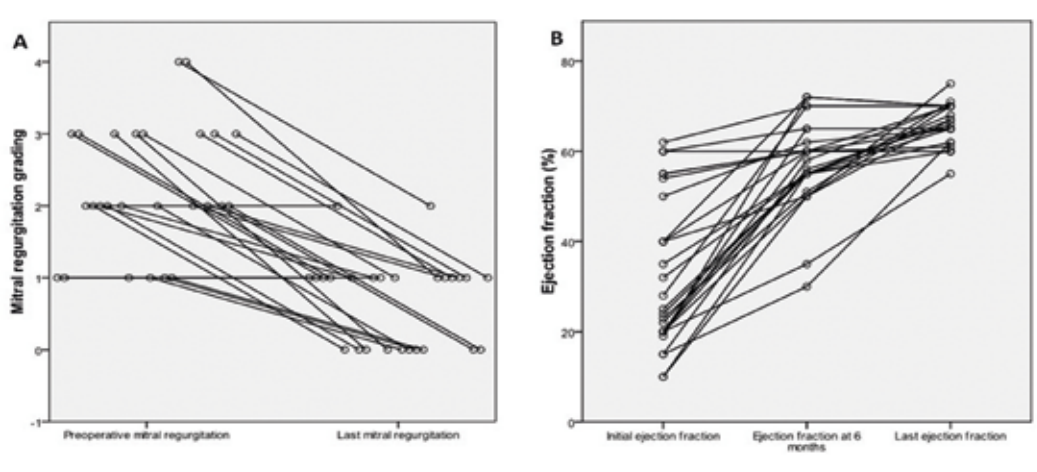
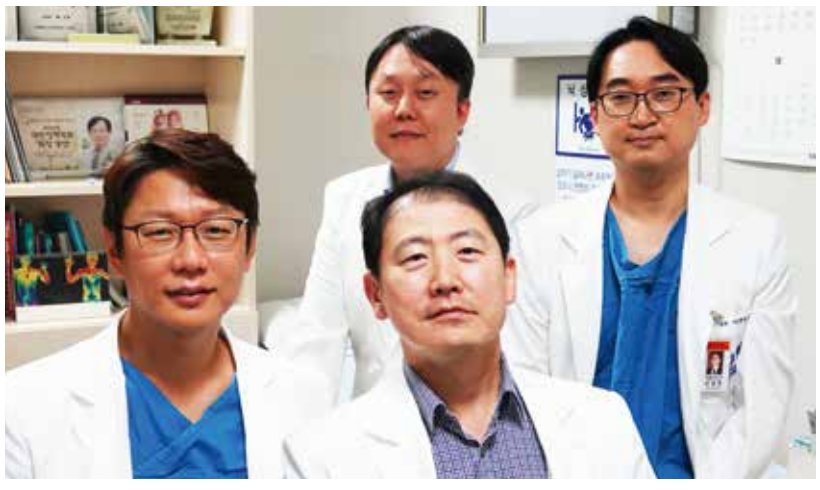


Figure 3. Evolution of echocardiographic parameters during follow-up: A) Mitral regurgitation grading; B) ejection fraction.



Rapid Response | Thoracic | Miscellaneous

Application of continuous vagal intraoperative neuromonitoring during video-assisted thoracoscopic surgery lobectomy for left lung cancer to prevent recurrent laryngeal nerve injury



Yong Won Seong (top left), Jung-Man Lee (top right), Young Jun Chai (bottom left) and Hyeon Jong Moon (bottom right)

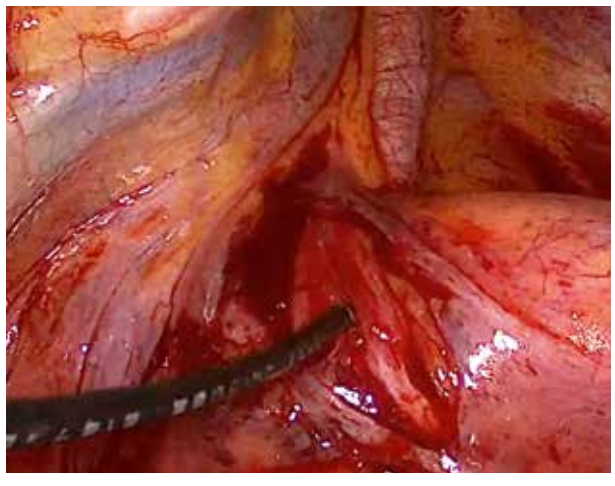


Figure 1. Left vagus nerve identification using stimulating probe.

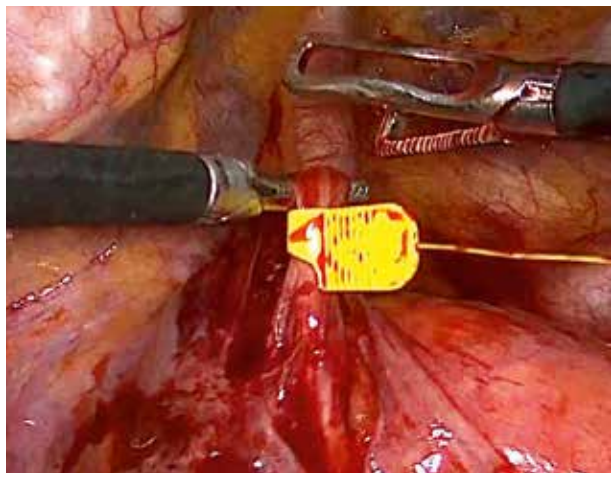


Figure 2. Application of automatic periodic stimulation (APS) probe on the left vagus nerve.

Young Jun Chai[1], Jung-Man Lee[2], Yong Won Seong,[3] Hyeon Jong Moon[3] 1. Department of Surgery; 2. Department of Anesthesiology and Pain Medicine; 3. Department of Thoracic and Cardiovascular Surgery, Seoul Metropolitan Government Seoul National University Boramae Medical Center, Dongjak-gu, Seoul, Korea

Injury to the left recurrent laryngeal nerve (RLN) is one of the most common complications associated with left lung cancer surgery. In particular, for patients requiring 4L lymph node dissection, the risk of RLN injury is increased because the RLN passes through the 4L lymph node compartment.

Intraoperative neuromonitoring (IONM) was originally developed to prevent RLN injury during thyroid surgery. The surgeon stimulates RLN or the vagus nerve (VN) using a stimulation probe, the electric current arrives at the vocal cords, and then electrodes on the endotracheal tube detect the electromyography generated by the vocal cords. Continuous IONM (CIONM) is a technique where a probe stimulates the VN constantly to provide continuous feedback about the RLN and VN function. Continuous IONM is superior to intermittent IONM because it alerts the surgeon of imminent nerve injury in real time, allowing the surgeon to immediately cease the injurious manoeuvre and prevent further nerve injury. In this study, we applied CIONM during video-assisted thoracoscopic surgery (VATS) lobectomy for early-stage left lung cancer.

From May 2018 to March 2019, 10 patients (6 males and 4 females) diagnosed with early-stage left-sided non-small cell lung cancer requiring VATS left lobectomy were enrolled. A four-channel adhesive electrode was attached on a left-sided double-lumen endobronchial tube so that the electrode is located at the vocal cord level to monitor electromyography at the vocal cords. The final location of the electrode was confirmed using a fibreoptic bronchoscope. We used the NIM Response 3.0 system (Medtronic, USA) and automatic periodic stimulation (APS) electrodes.

A decrease in amplitude or increase in latency beyond threshold indicates imminent RLN risk of injury and thus is considered to be an adverse event. We set the threshold at 20% decrease of amplitude from baseline or 10% increase of latency, and the visual and acoustic alarm was triggered when an adverse event occurred.

CIONM was successfully performed on all patients. There was no case of hemodynamic instability during CIONM. The median duration from vagus dissection to APS application was six minutes and the median baseline amplitude was 981 µV. The mean CIONM duration was 27 minutes. There were adverse events (amplitude decrease) in four patients, but vocal-cord palsy occurred in the first patient only.

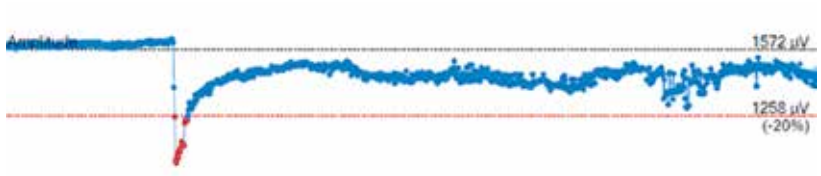


Figure 3. Threshold for amplitude decrease is set at 20% of the baseline amplitude, and an amplitude decrease of about 30% is observed but immediately recovers to more than 80% from baseline when surgery is suspended.

For the patient who developed vocal-cord palsy, initial baseline amplitude was set at 2700 µV. During 4L lymph node dissection, there were abrupt amplitude decreases twice, and the final amplitude was 254 µV. Postoperative laryngoscopic examination revealed left vocal- cord palsy, which fully resolved in five months. In the other three patients who had adverse events but no vocal-cord palsy, amplitude decreased about 30%, but recovered immediately when surgery was suspended.

To conclude, CIONM could be applied safely to VATS lobectomy for left lung cancer. Our results offer a better understanding of the injury mechanisms of RLN, and how to help preserve the RLN during VATS lobectomy.

Abstract | Cardiac | The evolving challenges of coronary surgery

'The chicken or the egg:' surgery vs stenting first in hybrid coronary revascularisation

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Nirav Patel

Hybrid coronary revascularisation (HCR) is a viable option for patients with multi-vessel coronary disease, incorporating a minimally-invasive direct coronary artery bypass (MIDCAB) graft to the left anterior descending (LAD) with an in-situ left internal mammary artery (LIMA), coupled with PCI to the other coronary territories. The advantages of HCR as compared with sternotomy CABG have been well demonstrated, especially if complete revascularisation, as quantified by a low (post-revascularisation) 'residual SYNTAX score' can be achieved. Despite this, however, there is still a paucity of evidence assessing the efficacy of HCR with specific reference to the timing of the MIDCAB component relative to that of the PCI.

We prefer a MIDCAB-first approach in the majority of HCR cases, as, most importantly, this allows the integrity of the LIMA-LAD graft to be interrogated during the subsequent PCI procedure. It also enables the surgery to be performed without concern for excess bleeding which may be associated with dual antiplatelet therapy. By contrast, we pursue a PCI-first strategy primarily in those patients who present with an acute coronary syndrome in which the non-LAD vessel is deemed to be the culprit lesion, or in those in whom the severity of the non-LAD lesion is thought to be greater than that of the LAD itself.

Although a few centres have reported satisfactory results with the simultaneous execution of both the surgical and PCI components of HCR, we do not favour this approach. Concurrent MIDCAB and PCI necessitates the use of a hybrid operating suite, a luxury not available at all institutions. Performing both procedures at the same time can also complicate the use of dual antiplatelet therapy, and not all surgeons would be comfortable administering a loading dose of a potent P2Y12 antagonist immediately upon completion of a robotic MIDCAB. In addition, interrogating the LIMA-LAD graft by angiography minutes after it has been constructed is not always truly representative of its patency due to local tissue oedema and vasospasm; a fresh, immature anastomosis may indeed appear to be imperfect, only to be seen to be widely patent when re-imaged 4 to 6 weeks postoperatively.

Of 345 patients who underwent HCR between 2009 and 2018, we compared outcomes between those patients who underwent LIMA-LAD revascularisation via MIDCAB first, followed by subsequent PCI ('MIDCAB-first' group, n = 251), and those remaining individuals who had PCI of their non-LAD vessel(s) prior to surgery ('PCI-first' group, n = 94). This is the largest such study to date, with the longest reported follow-up.

Thirty-day mortality for the entire study cohort was 0.3% (1 death). Stroke was also infrequent (0.3%, 1 case). There was a trend towards a greater perioperative transfusion requirement in the PCI-first group (11.7% vs 6.4%), although this difference did not reach statistical significance, nor did it translate into a significantly higher reoperation rate for postoperative bleeding. Overall, 10-year mortality was 7.2% (25 deaths), not significantly different between patient groups (Figure 1). Long-term incidence of major adverse cardiovascular and cerebrovascular events (MACCE) and repeat revascularisation was also comparable between cohorts. Of the 251 patients who had MIDCAB first, 240 (95.6%) underwent selective LIMA angiography during their interval PCI procedure; patency of the LIMA-LAD graft (Fitzgibbon A) was 97.9%.

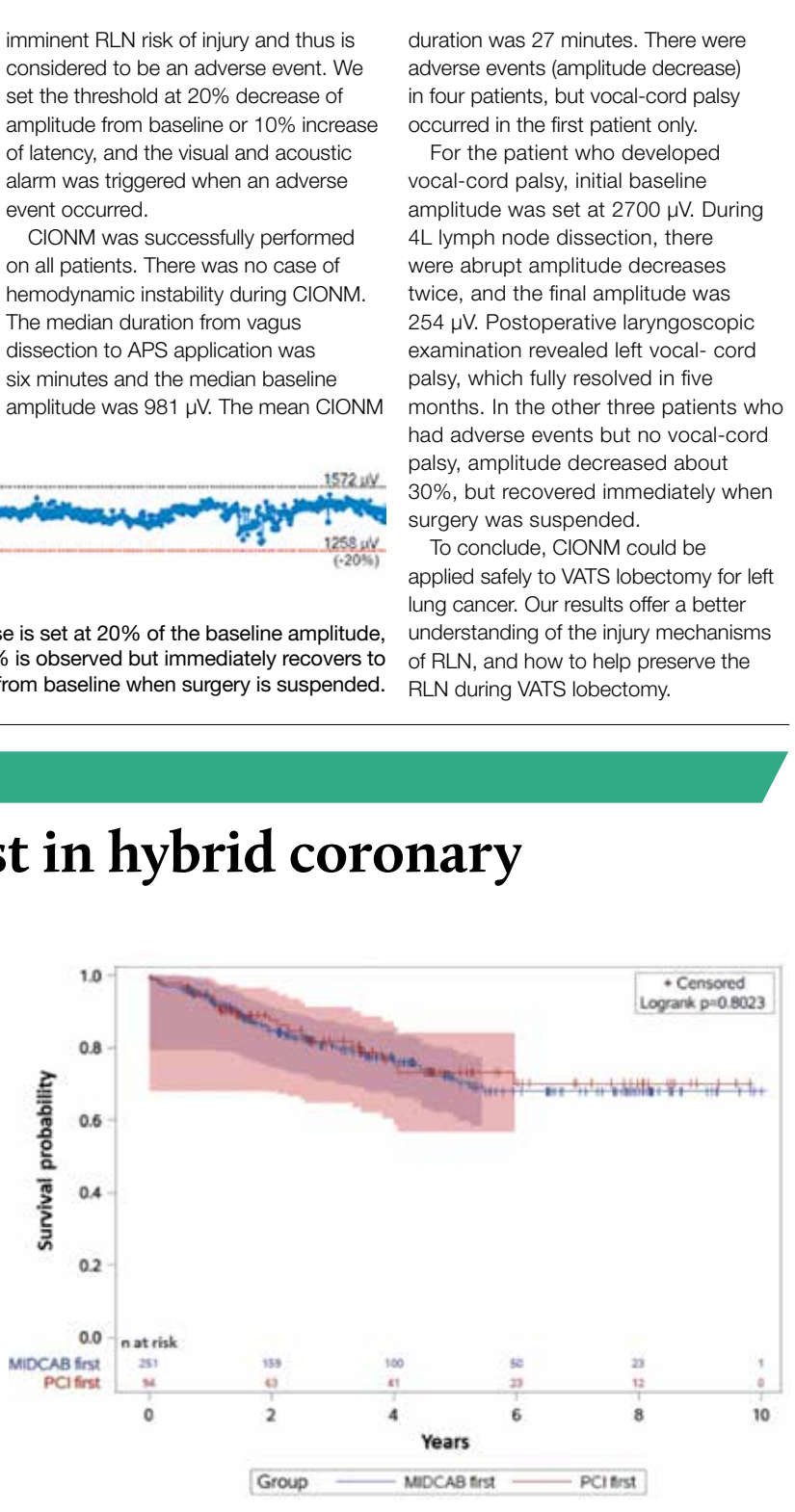

Figure 1. 10-year long-term mortality was not significantly different between MIDCAB-first and PCI-first patient groups.

Our results confirm that HCR is associated with excellent short- and long-term results, in appropriately selected patients, irrespective of whether the MIDCAB or PCI component is completed first. The decision as to which type of revascularisation to perform first should be based on the patient's clinical presentation and on the specifics of their coronary anatomy, and in consultation with a multidisciplinary heart team.

Abstract | Congenital | AVV Regurgitation in Single Ventricle Reconstruction Pathway

Tricuspid valvuloplasty for hypoplastic left heart syndrome

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Tricuspid regurgitation (TR) has been reported as an independent factor of poor prognosis in hypoplastic left heart syndrome (HLHS). Numerous reports have shown that tricuspid valvuloplasty (TVP) led to an improvement of prognosis. As for the mechanism of TR, an association between volume overload and right ventricular enlargement has been noted, and a report pointed out aggravation of TR after the Norwood procedure.

Regarding the timing of the onset of TR, a previous study has shown that the prognosis was poorer when TR develops at the time of the Norwood procedure than when it develops after the Glenn procedure. Our facility's therapeutic approach consists of performing TVP aggressively in order to prevent any moderate or severe TR as well as any tricuspid valve conditions that are likely to cause advanced regurgitation, regardless of the timing or disease stage.

Additionally, we have developed the inter-annular bridge technique, and have been actively using it. As a surgical procedure with less manipulation of the valve leaflets and the subvalvular structures, this technique could be useful for performing atrioventricular valvuloplasty in neonates.

This study aimed to determine whether outcomes of the treatment of HLHS can be improved by performing TVP. Fifty patients with classic hypoplastic left heart syndrome born between 2001 and 2016 were treated with multistage univentricular repair at our institution. In 23 of them, TVP was performed at various stages of the treatment. We evaluated outcomes of the TVP group (n = 23) compared to the non-TVP group (n=27) by surgical procedure and timing of surgery using the Kaplan-Meier method and log-rank test.

Among patients who underwent TVP, seven died during hospitalisation. The five-year survival rate was not different between the TVP and non-TVP groups (69.6% and 66.7%, respectively, p = 0.774). In the TVP group, initial TVP was performed before the bidirectional Glenn (BDG) procedure in 15 patients, and initial TVP was performed at and after the BDG procedure in 8. In all patients, TR improved after TVP. Five patients had to undergo re-TVP. The survival rates upon avoiding repeat TVP did not differ depending on the timing of TVP (before BDG and at/after BDG, respectively: 60.0% and 62.5% at 1 year; 53.3% and 50.0% at 5 years, p = 0.969).

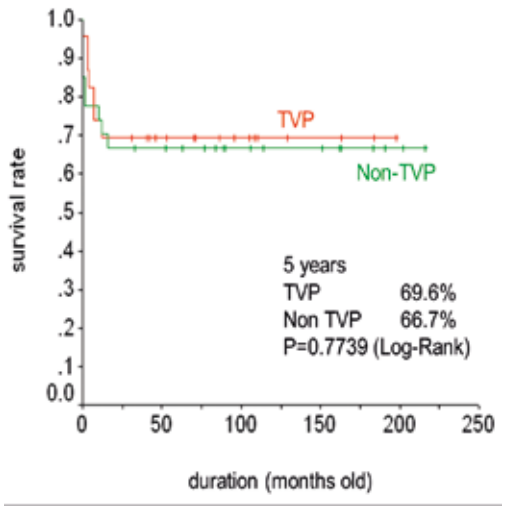

Figure 1. Survival rate versus age (months) in the tricuspid valvuloplasty (TVP) and non-TVP groups.

	Timing of valvuloplasty				
	Pre-Norwood n=2	Norwood or post-Norwood n=13	Glenn or post-Glenn n=6	Fontan or post- Fontan n=2	All patients n=23
Main cause of regurgitation					
Annular dilatation		5	2		7
Structural abnormalities	2	8	4	2	16
Techniques of valvuloplasty					
Commissuroplasty	2	9	2	2	15
Annuloplasty		1			1
Edge-to-edge		1	3		4
Cleft or fenestration close	1	4	2	1	8
Inter-annular bridge	1	6	3	1	11
other		1	2	1	4

Figure 2. Details from the study.

In most cases, TVP was performed in combination with multiple procedures. Most combinations consisted of commissuroplasty performed concomitantly with our newly developed inter-annular bridge technique. An inter-annular bridge was used in 11 surgical operations. In cases where re-TVP was avoided, the survival rate showed no difference between those with and without an inter-annular bridge (81.8% and 41.7%, respectively, at 1 year; 63.6% and 41.7%, respectively, at 3 years; p = 0.200), but there seemed to be a large difference in numbers.

The survival rate among patients who underwent TVP was comparable to that of those who did not undergo TVP. There was no difference in outcomes depending on the timing of TVP. Thus, our finding supports the premise of active intervention against TR. Regarding the inter-annular bridge technique, our findings showed neither statistical superiority nor inferiority, but in most cases, this technique was performed in combination with other procedures at the Norwood stage. Follow-up studies examining the long-term outcomes will need to be conducted through the accumulation of patients treated with the procedure and through continuous follow-up.

Abstract | Cardiac | The evolution of cardiopulmonary bypass strategies in modern cardiac surgery

The impact of minimal compared to conventional extracorporeal circulation on thrombin generation and bleeding endpoints – a randomised, controlled trial

Ivy Susanne Modrau[1],[4], Debbie Richards Halle[1], Per Hostrup Nielsen[1], Hans Henrik Kimose[1],[4], Jacob R Greisen[3],[4], Michael Kremke[3], Anne-Mette Hvas[2],[4] 1. Department of Cardiothoracic and Vascular Surgery; 2. Department of Anaesthesiology and Intensive Care; 3. Department of Clinical Biochemistry, Aarhus University Hospital, Denmark; 4. Department of Clinical Medicine, Aarhus University, Denmark

Ivy Susanne Modrau

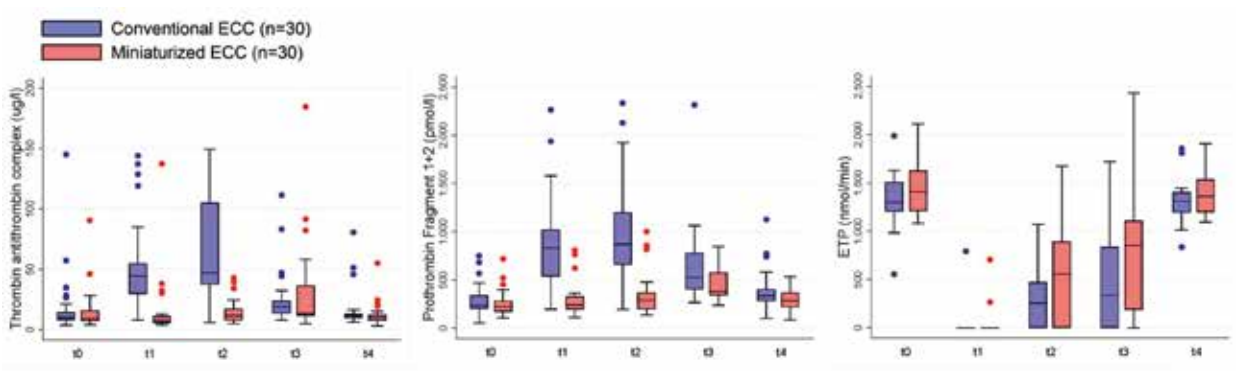

Figure 2. Centre line indicates median; box, interquartile range; and error bars, upper/lower adjacent values; dots, outside value. Time points: t0 = baseline; t1 = after weaning on heparin, t2 = post protamine, t3 = 6 hours after surgery, t4 = Day 1. ECC = Extracorporeal Circulation; ETP = Endogenous thrombin-generating potential

Minimal extracorporeal circulation (MECC) is suggested to have favourable impact on blood loss compared to conventional extracorporeal circulation (CECC). Reduced need for transfusion has mainly been attributed to reduced haemodilution but aetiology is poorly understood[1]. Blood transfusions following coronary artery bypass grafting are associated with increased mortality. The aim of our study was to investigate the impact of MECC compared to CECC on thrombin generation and bleeding endpoints in a randomised controlled trial.

From September 2017 to October 2018, 60 patients undergoing elective coronary artery bypass grafting were randomised to either MECC or CECC. Patients with known coagulopathy, abnormal platelet count, ongoing anticoagulant treatment, severe renal dysfunction or heart failure were excluded.

The MECC system (Figure 1) comprised a closed coated circuit to prevent blood-air contact, and a centrifugal pump to reduce mechanical stress. Haemodilution was minimised by low priming volume and low-volume Calafiore cardioplegia solution. Blood shed from the operative field was removed by means of cell saver. A soft-shell reservoir bag was used to collect blood and to regulate volume. An automatic venous bubble trap was included to prevent the risk of air lock.

We measured endogenous thrombin-generating potential which is suggested to reflect the overall plasmatic haemostatic capacity, and coagulation factors that reflect in-vivo thrombin generation (thrombin-antithrombin complex and prothrombin fragment 1+2). In addition, we compared postoperative transfusion requirements, blood loss (24-hour chest tube output), other conventional markers of coagulation and fibrinolysis, morbidity and mortality up to 30-day follow-up.

The results of thrombin generation markers are depicted in Figure 2. In the MECC group (n = 30), early postoperative endogenous thrombin-generating potential was higher, though not statistically significant (p = 0.06). Half as many patients required blood transfusion during follow-up compared to the CECC group (17% versus 37%, p = 0.14) although postoperative blood loss was comparable between groups

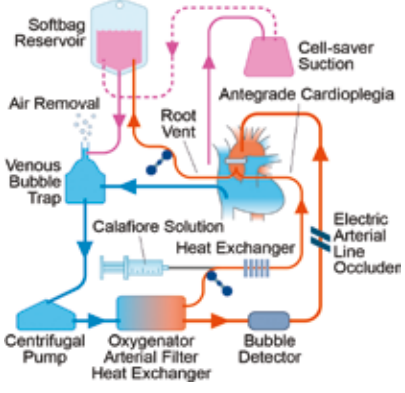

Figure 1. Simplified diagram of minimal extracorporeal circulation.

(MECC, 448 ml versus CECC, 468 ml, p = 0.84). Intraoperative thrombin-antithrombin complex and prothrombin fragment 1+2 were significantly lower in the MECC group compared to the CECC group (p < 0.000) with significant correlation to transfusion requirements (both Spearman's correlation coefficients > 0.36, p < 0.005).

In accordance to others, we observed reduced haemodilution until first postoperative day in the MECC group as measured by significantly higher haematocrit levels and significantly lower weight gain. Our results disprove the theory of haemodilution as main factor of impaired haemostasis as we found no correlation between haematocrit levels and individual coagulation analyses.

The MECC-group demonstrated significantly reduced levels of creatinkinase-MB and lactate dehydrogenase, indicating superior myocardial protection and reduced haemolysis. Conventional markers of coagulation, perioperative morbidity and 30-day mortality did not differ between groups.

MECC was implemented at our institution two months prior to study start. All patients received the allocated intervention. Quality indices of perfusion and surgery were comparable between groups. All members of the operating team assessed MECC as feasible and easy to handle. We encountered three cases of bubble alarm during MECC (one accidental disconnection of central venous catheter, one displacement of venous cannula, one without obvious finding). In all cases, air was effectively removed by the venous bubble trap with no resulting air lock or subsequent neurologic dysfunction.

Our randomised study calls attention to a striking difference between minimal and conventional extracorporeal circulation: significantly lower *in vivo* thrombin generation is observed during minimal extracorporeal circulation with significant correlation to reduced postoperative transfusion requirements.

We hope that our results will contribute to the understanding of coagulopathy following cardiac surgery with extracorporeal circulation.

Disclosures: This study was supported by Medtronic External Research Program (Grant Number ERP-2018-11272), and NIH/ NCRR Colorado CTSI Grant Number UL1 RR025780 (REDCap).

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Three-year aprotinin registry data show encouraging safety findings

Three-year, real-life data on the anti-bleeding medication aprotinin from the European Union (EU) Nordic Aprotinin Patient Registry (NAPaR) was the centrepiece of this year's Nordic Pharma-sponsored symposium, held yesterday afternoon.

Aprotinin (Trasylol®) is a drug used to reduce bleeding during cardiopulmonary bypass due to its ability to slow down fibrinolysis. According to its licence, aprotinin is for 'prophylactic use to reduce blood loss and blood transfusion in adult patients who are at high risk of major blood loss undergoing isolated coronary artery bypass graft surgery (i.e. CABG that is not combined with other cardiovascular surgery)'.

Sharing their expertise with registry safety data and best clinical practice during the session were Kai Zacharowski (Germany), Jan van der Linden (Sweden) and Dumbor Ngaage (UK), all of whom have extensive experience with aprotinin.

Professor van der Linden referred to the 36-month interim data analysis, pointing out that registry findings show that mortality is not higher than prior publications and current national database. The mortality findings are encouraging both for isolated CABG and for complex cardiac surgery if compared to published data. This indicates the findings are moving in the right direction.

"One of the aims of the registry is to determine how aprotinin is used in the real world," said Professor van der Linden, adding: "We now know that 70% of aprotinin use is in patients other than those undergoing isolated CABG. Such patients have a high risk of bleeding, for example, those with endocarditis or aortic dissection."

Mr Dumbor Ngaage, Consultant Cardiac Surgeon at Castle Hill Hospital, Hull University Teaching Hospitals NHS Trust, East Riding of Yorkshire, UK, asserted that aprotinin had a definite place in the drug armamentarium on two counts. "It reduces bleeding and inflammation, and even though there are drugs that can perform similar actions to this, when we encounter patients at high-risk of bleeding – for example those on anti-platelet medication who need emergency surgery, those with infective endocarditis or people in need of major aortic surgery – no other drug currently available has the potency of aprotinin."

Professor Zacharowski stressed that the registry was enabling them to answer lots of valuable questions. "Although it is not a prospective, randomised controlled trial, it is collecting data from real-life patients," he said. "Essentially, we want to know whether aprotinin is safe. The answer so far is yes, it is safe in all respects. We are unaware of any new risks, and nothing has popped up in terms of safety. Every drug has side effects, but we want to know if European patients are safe when taking the drug."

Aprotinin suitable in patients at high risk of bleeding – NAPaR data

Aprotinin should only be used after careful consideration of the benefits and risks, and the consideration that alternative treatments are available. Bringing the audience up to speed, Professor Kai Zacharowski (University Hospital Frankfurt, Germany) provided a short recapitulation of aprotinin's history, a drug that has been around since its initial launch in 1959 by Bayer in Germany for pancreatitis. It was later approved by the US Food and Drug Administration (FDA) in 1993 for use in CABG surgery.

> *"We now know that 70% of aprotinin use is in patients other than those undergoing isolated CABG. Such patients have a high risk of bleeding, for example, those with endocarditis or aortic dissection."*
>
> Jan van der Linden

But this marketing authorisation was shortened, and in 2007, use of the drug was suspended based upon the results of the BART (Blood Conservation Using Antifibrinolytics in a Randomized Trial) study, a major evaluative study into bleeding outcomes of aprotinin compared to tranexamic acid and aminocaproic acid.[1] The results showed an increased 30-day mortality with use of aprotinin compared with those given other medicines. Queries around study design included that some patients given aprotinin had reduced levels of heparin, increasing the likelihood of thrombosis. "The study design was inappropriate to answer the question posed," said Professor Zacharowski, speaking to *EACTS Daily News*.

Subsequently, in 2012 the drug was reinstated after an official European Medicines Agency (EMA) re-assessment of the BART study found that it was methodologically flawed. In 2016, Nordic Pharma relaunched the drug. There were three conditions to this EU re-launch that were encapsulated in a Risk Management Plan for isolated CABG under CPB: the plan had to refer to the agreed product's safety concerns and their risk minimisation which included a direct healthcare professional communication; a registry (NAPaR) had to be conducted; and restricted distribution of aprotinin would have to be enforced, making sure it was available only to centres that perform cardiac surgery and that commit to participate in the registry.

Professor Zacharowski explained that NAPaR was originally destined for a duration of three years or 12,000 patients, however "due to a slow start with various countries seeking approvals and drug availability, we are extending it for an unknown period of time," he said. The decision to terminate the registry will be taken based on agreement with the PRAC (Pharmacovigilance Risk Assessment Committee) of the EMA.

The registry is designed to monitor the pattern of use of aprotinin and includes the number of patients treated with aprotinin, indications it is used for (on and off-label), patient characteristics and risk factors, and the conditions of use including data on concomitant use of drugs that affect haemostasis, namely heparin, antiplatelet therapy, and oral anticoagulants. "Essentially, using the data gathered by the registry, we want to describe the pattern of aprotinin use," said Professor Zacharowski.

The registry also aims to provide a description of the safety profile. "We want to minimise risks associated with its use. To this end, we are collecting data on use of ACT (Activated Clotting Time), heparinisation, concomitant use of aprotinin with aminoglycosides, use in pregnancy and lactation, adverse drug reactions, anaphylaxis, renal dysfunction and thrombo-embolic events," said Professor Zacharowski.

In 2016, Sweden, Denmark, the UK (although the UK never stopped using it in some centres), the Netherlands, Switzerland and Austria all re-launched aprotinin, joined by Germany in 2017 (although only for iCABG), Finland, Greece, Ireland, Belgium, and France in 2018. "In the UK, clinicians have always used aprotinin in children, and in all sorts of surgery. Despite the EMA not permitting this, the data support this extended use [other than iCABG]," said Professor Zacharowski.

Step by step guide to the online registry

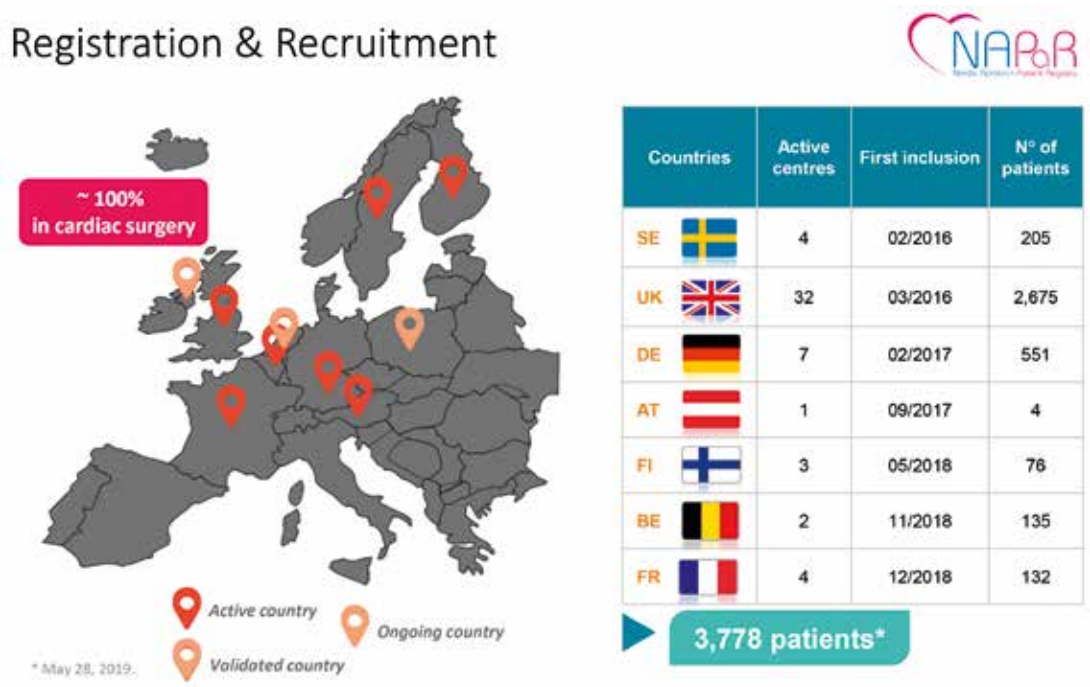
The web-based registry is easy to use, said Professor Zacharowski, as he guided the audience through the eight online pages, step by step, including patient demographics, initial data, antiplatelet and anticoagulant therapy considered to be active at the time of surgery, data on the operation, on aprotinin use, on intra-operative coagulation and blood-loss monitoring in the operating room, transfusion both intra-operative and post-operative up to 48 hours only, and the post-operative period up until patient discharge. There are also a series of optional pages that request information on cardiac history, previous interventions, pre-operative risk factors (two pages), pre-operative haemodynamics and circulation, pre-operative status and support, and myocardial protection.

"We know aprotinin has been used for other indications that are far more suitable, important and relevant [than iCABG], but for all these indications we need to monitor risk with aprotinin," Professor Zacharowski noted.

The registry protocol implies that data are all sent to the Data Safety Monitoring Committee (DSMC), which is comprised of five members who meet every six months to conduct an interim statistical analysis and submit a Post-Authorisation Safety Study report upon request. "Our role is to safeguard the interests of patients involved in the study, assess the safety of the interventions, monitor the overall conduct of the NAPaR study and make recommendations to Nordic Pharma accordingly," explained Professor Zacharowski, who sits on the committee.

By May 2019 there were a total of 3,778 patients enrolled in the registry, with 2,675 in the UK alone, said Professor Zacharowski. "This large number is because unlike other countries, the UK had continued using it and didn't need to seek new ethical approval and drug distribution. The UK started on the first day."

At the 36-month analysis there were 535 children (under 15 years) and 2,469 adults in the NAPaR registry. Most countries except for Belgium and the UK have put at least 80% of key data into the registry. A proportion of 71% of registry patients come from the UK with 15% from Germany, and 6.3% from Sweden. "The analysis is obviously weighted towards



"It reduces bleeding and inflammation, and even though there are drugs that can perform similar actions to this, when we encounter patients at high-risk of bleeding... no other drug currently available has the potency of aprotinin."

Dumbor Ngaage

UK data."

"Cardiac patients are at high risk of bleeding and therefore of transfusion which brings a high risk of complications," Professor Zacharowski told *EACTS Daily News*. "This is aggravated nowadays because many cardiac patients are on various anticoagulant medications, and 30–40% have iron-deficiency anaemia. These patients start at low haemoglobin, then they have major surgery with high risk of bleeding which together can precipitate a very poor outcome."

According to the website Patientbloodmanagement.eu, a patient safety resource recommended by Professor Zacharowski, between 11 and 48% of surgical patients suffer from anaemia prior to surgery, and if undiagnosed and untreated, preoperative anaemia is likely to dramatically affect patient outcome. Indeed, preoperative anaemia is an independent risk factor for increased morbidity, mortality and length of hospital stay.

"We need to improve outcomes by reducing the risk of death, myocardial infarction, and stroke among other things," he went on, advocating three steps to minimise complications during major heart surgery. "Firstly, treat anaemia prior to surgery so that patients have a very good chance of entering surgery with a normal haemoglobin level. Studies have shown that if a patient enters surgery with mild anaemia then they have a five-fold increased risk of death, and if they have severe anaemia then this increases to a 13-fold higher risk of death."

Secondly, Professor Zacharowski stressed it is important to be aware of a patient's anticoagulant therapy and when to stop this; thirdly, the team needs to follow a blood transfusion algorithm including ways to reduce the need for transfusion. Identifying the unmet medical need, he highlighted that, "We need to put all these measures together to improve outcome. This is the solution, but it is not happening in practice often enough, with only a few hospitals in Europe introducing all these measures together."

Professor Zacharowski estimates that by implementing all the measures together, mortality would be reduced by approximately 10%, although official figures are currently unavailable.

"We also need to reduce the amount of blood being taken during the hospital stay," he said, adding that studies show if a cardiac surgery patient stays in hospital for 50 days, then the patients loses approximately five litres of blood via venopuncture.[2]

Turning to aprotinin, he explained that this is administered during the operation, in those patients who still have a high risk for bleeding, even after other measures have been put in place. "There are many patients with high-risk bleeding, and in these, we use aprotinin," said Professor Zacharowski, adding that, "It has been shown in thousands of patients that bleeding can be reduced by administering aprotinin which is associated with better patient outcomes."

To date, details of 2,469 adult patients have been entered in the registry with at least one dose of aprotinin. "Of these, 748 patients (30%) had an indication of iCABG and 1,721 patients (70%) received other procedures. The majority of aprotinin data are from the UK (71.1%), with mortality, thromboembolic events and renal dysfunction all covered in the published data. There have been 21 expected adverse drug reactions (13 renal impairments, four anaphylactic reactions, two venous thromboembolisms (VTE) and 2 in pregnancy/lactation) reported in the NAPaR."

Mortality, VTE and re-operation rates were found to be similar in patients over 75 years and those between 15–75 years. Renal dysfunction was higher in younger patients (10.5%) than in patients of 75 years and over (6.1%). "The safety results reveal that aprotinin in adult patients is good, and there is no new relevant information regarding the safety profile of aprotinin in adult patients," reported Professor Zacharowski.

Both the Summary of Product Characteristics (SmPC) and risk minimisation measures were generally followed by the investigators, with 52% of adult patients receiving anticoagulation monitoring as recommended in the SmPC (minimal kaolin-ACT of 480 sec or minimal celite-ACT of 750 sec); 94% of adult patients received an aprotinin test dose; and approximately 73% of adult patients received a total aprotinin dose < 7.0 million KIU (maximal dose recommended by the SmPC), continued Professor Zacharowski.

"Essentially, we want to know whether aprotinin is safe. The answer so far is yes, it is safe in all respects."

Kai Zacharowski.

Safety outcomes	iCABG	Other	All
Mortality rates (before discharge)	**0.87%** (6/687)	6.79% (106/1560)	4.98% (112/2247)
Incidence of thromboembolic events	**1.88%** (13/692)	6.73% (105/1561)	5.24% (118/2253)
Incidence of renal dysfunction	**2.46%** (17/692)	12.87% (200/1554)	9.66% (217/2246)

Clinical cases illustrate registry data

Mr Ngaage turned to clinical cases studies, exemplifying certain cases that are typical for the use of aprotinin. The surgeon and his colleagues have used it extensively and have published results showing no adverse effects with the drug. "Part of the reason for the drug's suspension a few years ago was that people were unfamiliar with how to use it properly. Our rates of myocardial infarction and mortality with aprotinin were not affected with its use in over 8,000 patients at Castle Hill Hospital."

There are alternative drugs available, but they are not as potent as aprotinin, Mr Ngaage pointed out. "Most people would use aprotinin in cases with a high risk of bleeding, for example, infective endocarditis where there is an infection on the valve. Such patients are sicker, more likely to bleed, and have a very active inflammatory process due to the infection. Due to this drug's mode of action, it is particularly suitable for these cases because it reduces both bleeding and inflammation."

Mr Ngaage discussed the case of a patient he treated who had a massive heart attack, a leaky valve, and heart failure, requiring emergency surgery to fix the valve and carry out bypass surgery. "If we operated on the patient without any anti-bleeding measures we would have run the risk of him needing a blood transfusion which brings its own complications," he said. "I gave him aprotinin, fixed the valve, did a bypass on the narrowed arteries, and he did not bleed at all. The patient woke up in 3-4 hours and went home in less than a week.

"This is a case where aprotinin made a real difference. If this drug is used in the right manner and for the right patients, it has a major role in cardiac surgery."

Professor van der Linden focussed on results of the interim analysis. He underlined that these early data would benefit from follow-up presentation of final results in the future. "The 36-month analysis includes around 2,500 adult patients who have undergone cardiac surgery, the vast majority of which are from the UK. Also, only 30% are isolated CABG patients with most adults (~80%) aged 75 years or under, and most were men," he said.

He explained that results of renal dysfunction needed to be interpreted with caution. "These can be slightly ambiguous depending on the definition used for renal dysfunction. In our centre we use dialysis to get rid of fluid overload because this is correlated with mortality," he commented. "Those who are unfamiliar with this use of dialysis see this as a negative outcome."

In using aprotinin there is selection of high-risk patients, he added. Professor van der Linden explained that the EUROSCORE II was used to estimate a patient's risk in-hospital death after cardiac surgery and that it was based on variables such as history of cardiac surgery, ventricle function, and age for example. "This is a well validated way of assessing mortality risk for a patient. Not all patients have their EUROSCORE II entered into the registry because this is not mandatory, but in Sweden it is often complete.

"We've found that at our centre, patients selected by EUROSCORE II who receive aprotinin have a higher risk, but our mortality rate is the same as the published score. It might be that we are being more selective with patients in whom we use the drug. This supports our conclusion of a favourable outcome."

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Rapid Response | Congenital | Congenital Rapid Response 2

Melody valve as a mitral substitute in small infants: a significant modification of the implantation technique

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Manuel Melo

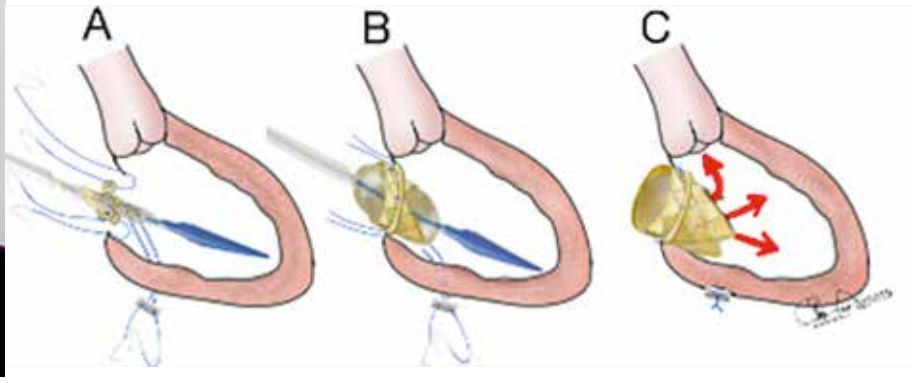


Figure 1. After passing the prostheses through the mitral annulus, the balloon is inflated and the knots are tied

Paediatric patients with mitral valve (MV) disease are a great challenge when the valve cannot be repaired and its size is < 15 mm. Here, the options for replacement are limited due to the unavailability of adequately sized "conventional" prostheses.

We present our experience with the Melody valve in the mitral position, with emphasis on a technical modification that we made in positioning the prosthesis. Four patients under 6 kg and less than five months of age needed MV replacement with the Melody valve at our institution during the last four years.

At the beginning we bended both the edges of the graft to shorten the length and fixed it to the annulus with 5/0 polypropylene interrupted stitches (from 4 to 8). In the remaining four patients we used a ring of bovine pericardial patch sutured around the circumference of the valve, and then we sutured this to the mitral annulus with 5/0 polypropylene interrupted stitches in order to reduce the risk of paravalvular leaks. In these patients, the prosthesis was bended in the mitral edge and cut in a V-shape fashion in the ventricular edge to avoid Left ventricular tract obstruction (LVOTO).

With the same purpose, we used a transmural stitch that anchors the distal end of the stent to the lateroposterior wall of the left ventricle, which is tied on the external aspect of the ventricle. This avoids tearing of the fragile neonatal muscle and allows the prosthesis to stay away from the left ventricle outflow tract (Figure 1).

One patient experienced prosthesis displacement to the left ventricle in the early postoperative period causing severe LVOTO and moderate-to-severe Melody regurgitation, needing early reoperation for prosthesis replacement. In this patient we fixed the graft only to the left ventricle with the conventional stich to the endocardium/myocardium (not transmural).

The other patients in which we used the transmural stitch had no complications regarding prosthesis migrations, and at discharge they had a mild-to moderate left ventricle dysfunction and mean melody gradient of 4.5 mmHg.

The prophylaxis for thromboembolism was done only with antiaggregation (acetylsalicylic acid at 5 ml/kg/day); there were no cases of prosthesis thrombosis. At four-months follow-up, after a percutaneous dilatation of the stent, the mean prosthesis gradient was 6 mmHg with mild regurgitation. Moreover, four years after Melody implantation in the first patient, his mitral annulus had grown enough in order to perform a classical mitral replacement with a 19 mm mechanical valve, with no difficulties experienced when removing the prosthesis.

We believe that this significant modification of the Melody graft implantation technique in the mitral position can improve the function of the prosthesis and reduce the risk of postoperative complications and early reoperations. In fact, the fixation of the graft with a transmural stitch is important in avoiding its displacement to the LVOT, in adding stability to the prosthesis and in reducing the risk of migration during the percutaneous dilatations of the stent.

Aortic Valve Repair Summit

The Aortic Valve Repair Summit
8–9 June, 2020; Rome, Italy

Ruggero De Paulis Local Course Director, on behalf of the Task Force on Aortic Valve Repair

Dear Colleagues and Friends,

Next year, June 8–9, 2020, EACTS is organising the sixth edition of the Aortic Valve Repair Summit, and for the first time the venue will be in Rome, Italy. This meeting, originally organised in Brussels, has become an important part of the educational programme of our Association. Recognised pioneers and experts in this fascinating field form the Programme- and Organising Committee.

The approach to pure aortic valve insufficiency has radically changed in the last years and nowadays it is possible to offer a good chance of repair in the majority of these patients, avoiding the need for valvular prostheses. In some aspects, it reminds us of a process we already lived years ago with the mitral valve. Today, mitral valve repair is certainly the gold standard treatment for mitral valve insufficiency, independent of age, anatomical presentation and cardiac function. It can be easily performed in the great majority of cardiac centres across the globe and it is increasingly implemented through a minimally invasive access.

We hope that educational efforts and the continuous improvement in the knowledge of the aortic root complex will also make it possible to increase the frequency and the diffusion of aortic valve repair. Certainly, the experience accumulated with aortic-valve sparing surgery has contributed enormously to the understanding of the intimate relationship between the aortic valve leaflets and the surrounding tissues. It is now evident that aortic valve repair is founded on proper reconstruction of the aortic skeleton and the aortic root.

Years of cumulative experience are now being transferred into various anatomical classifications that would greatly help in the standardisation and execution of aortic valve repair. At the same time, long-term follow-up data are also piling up to indicate which approach or technique holds up better to the test of time or, vice versa, which procedures should be definitely abandoned.

Following an established and well-tested format, we plan to review the basics of all techniques within valve-sparing surgery, clarify the anatomical relationship of the aortic root with the aortic valve as the basis of normal valve function, and focus on the principal steps necessary for surgical treatment of the leaflet, from cusp plication to cusp extension. The addition of live surgery – both standard and more complex cases – will add fuel to the discussion.

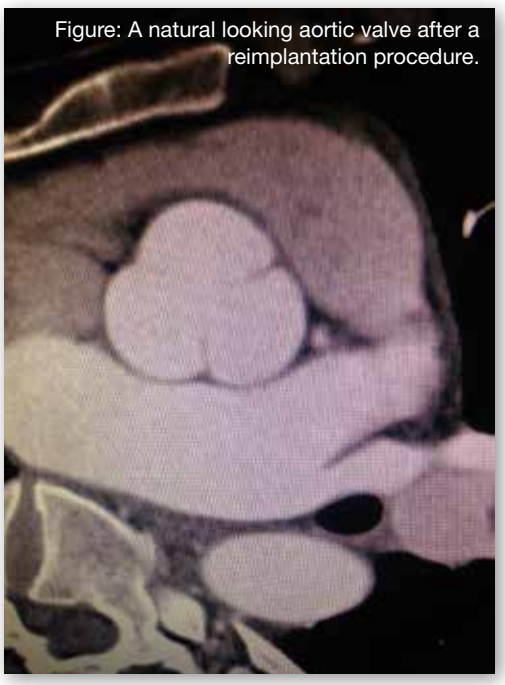
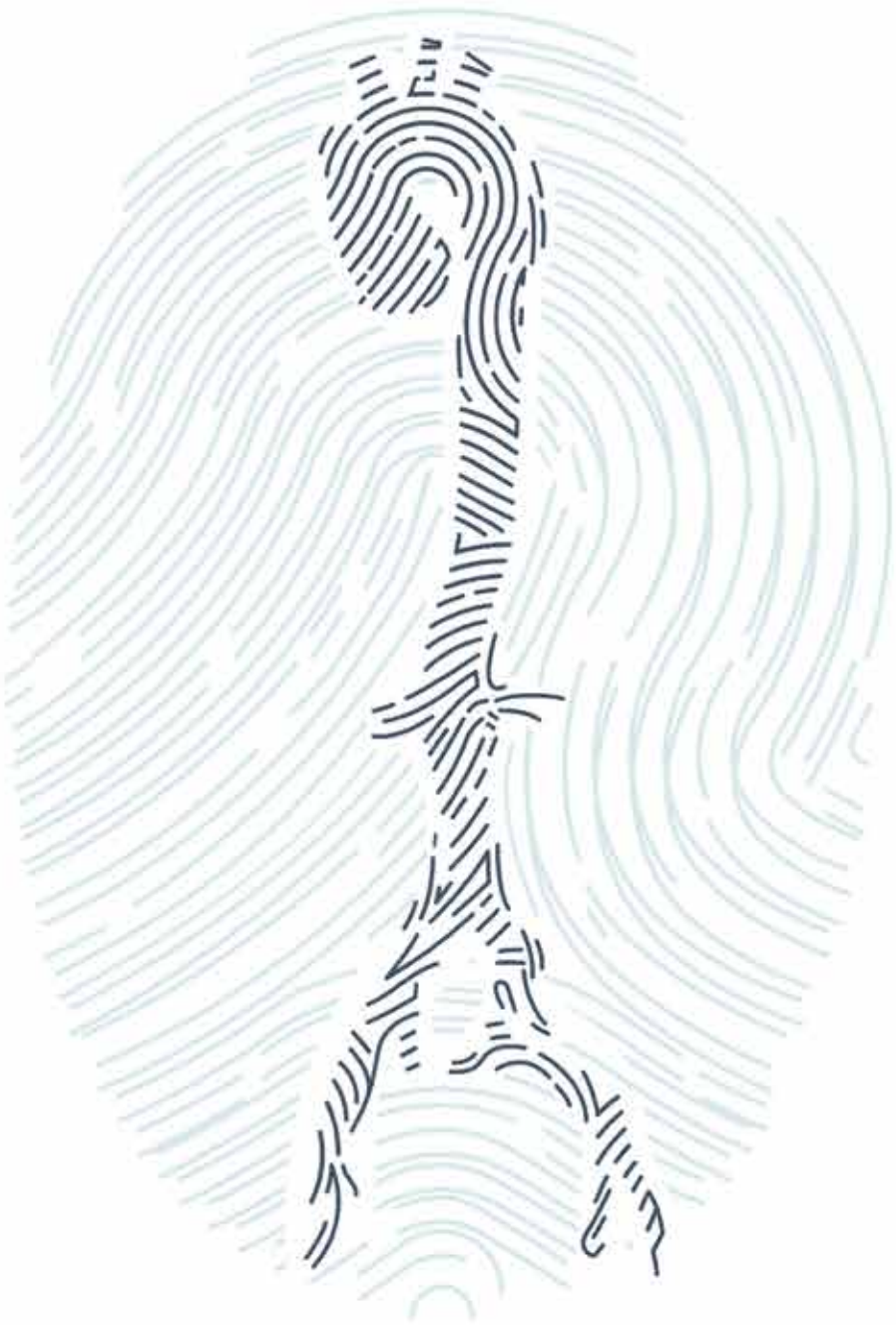


Figure: A natural looking aortic valve after a reimplantation procedure.

Often, regurgitant aortic valves, whether bicuspid or tricuspid, are associated with aortic root aneurysms. And sometimes sinus dilatation is asymmetric. In these contexts, echocardiographic evaluation of the leaflet dynamics might be more challenging. Therefore, a step-by-step approach along with videos of specific case studies will guide you in planning the most appropriate surgical strategy.

Invited speakers with recognised experience will help shape the backbone of the scientific programme, which spans from root anatomy to physiology, from the last classification of the bicuspid valve lesions to imaging modalities, to tips and tricks for achieving optimal valve competence. The best abstracts will be also presented during the meeting.

We are looking forward to seeing you in Rome. Join the group, learn and have fun!



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Abstract | Cardiac | Potentially modifiable preoperative factors to improve outcomes in cardiac surgery

Preoperative sarcopenia is associated with late mortality after coronary artery bypass grafting

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Homare Okamura

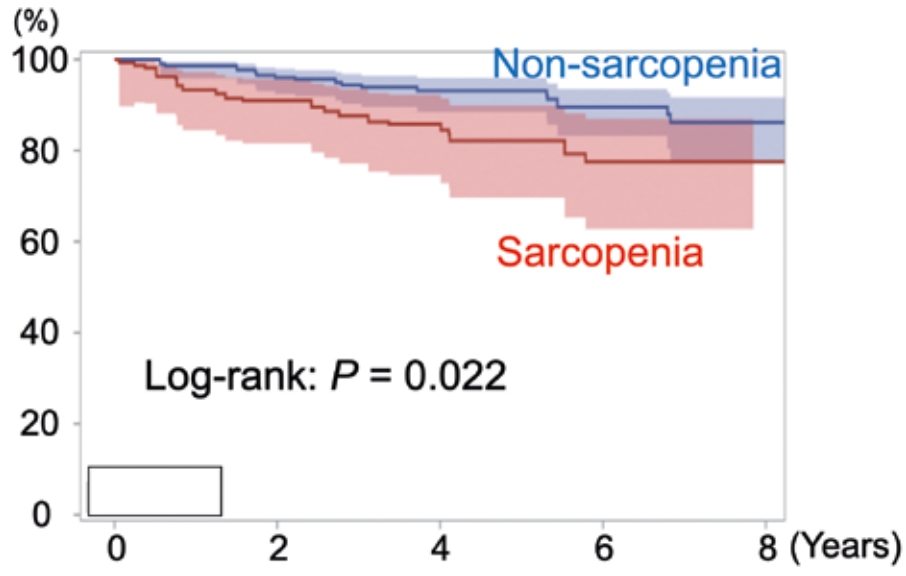

Figure 1: Late survival after inverse probability weighting.

Frailty is a geriatric syndrome characterised by diminished physiological reserve and resilience in response to stressors. Estimation of preoperative physiological reserve is essential to determine a patient's suitability for surgery. In connection to frailty, sarcopenia is age-related loss of skeletal muscle mass and function. Several researchers have reported that sarcopenia is associated with a higher risk of late mortality after valvular or thoracic aortic surgery. However, the association between sarcopenia and clinical outcomes after coronary artery bypass grafting (CABG) remains unclear.

Measurement of the psoas muscle area or volume using computed tomography (CT) scans is commonly used as a simple validated tool for sarcopenia assessment. The lack of evidence regarding sarcopenia in patients undergoing CABG is attributable to the fact that only a limited number of hospitals perform preoperative CT in patients undergoing CABG. Per our hospital policy, preoperative CT screening is routinely performed in all patients; therefore, we could measure the psoas muscle area and assess preoperative sarcopenia. This study investigated the association between preoperative sarcopenia (based on measurement of psoas muscle area) and clinical outcomes after CABG.

Between October 2008 and August 2013, 444 patients underwent isolated CABG at Saitama Medical Center, Jichi Medical University, Japan. During this study period, all cases of isolated CABG performed at our hospital included off-pump operations. We excluded urgent/emergency cases and patients in whom preoperative abdominal CT data used for sarcopenia assessment were missing. Eventually, 304 patients were included in this study.

The psoas muscle area was measured on preoperative abdominal CT scans and was normalised for height to calculate the psoas muscle area index (PMI). Sarcopenia was defined as the lowest sex-specific quartile of the PMI. Patients were categorised into a sarcopenia group (76 patients) and a non-sarcopenia group (228 patients). The cut-off values for sarcopenia were a PMI of 215 mm^2/m^2 and 142 mm^2/m^2 in men and women, respectively. The mean follow-up period was 4.5 ± 2.3 years.

After risk adjustment using inverse probability weighting analysis, late mortality rates were significantly higher in the sarcopenia group than in the non-sarcopenia group ($p = 0.022$; Figure 1). Multivariable analysis showed that preoperative sarcopenia was an independent predictor of late mortality (hazard ratio 4.25, 95% confidence interval 2.18–8.28, $p < 0.001$). However, preoperative sarcopenia was not associated with early outcomes or major adverse cardiac and cerebrovascular events during follow-up.

We also investigated differences in the causes of late mortality. The non-cardiac or non-cerebrovascular mortality rates (particularly infection-related mortality), were higher in the sarcopenia group than in the non-sarcopenia group suggesting that the higher late mortality rates in the sarcopenia group were not associated with cardiovascular events but were secondary to other causes affecting systemic vulnerability.

Identifying at-risk patients enables preoperative patient optimisation. Preoperative physical training and nutritional interventions might reverse frailty. Considering that preoperative sarcopenia was only associated with late mortality, it might be not too late to introduce postoperative interventions such as aggressive rehabilitation to improve physical functions and clinical outcomes.

Preoperative sarcopenia assessment in combination with conventional risk stratification can be a useful objective measure to identify at-risk patients.

Rapid Response | Cardiac | Coronary outcomes: Did you know this?

RARAY: A novel coronary bypass operation

Alistair Royse, Stuart Boggett, Viju Abraham, Lynda Tivendale, Jaishankar Raman, David Canty, Colin Royse Department of Surgery, The University of Melbourne and Royal Melbourne Hospital, Australia

Alistair Royse

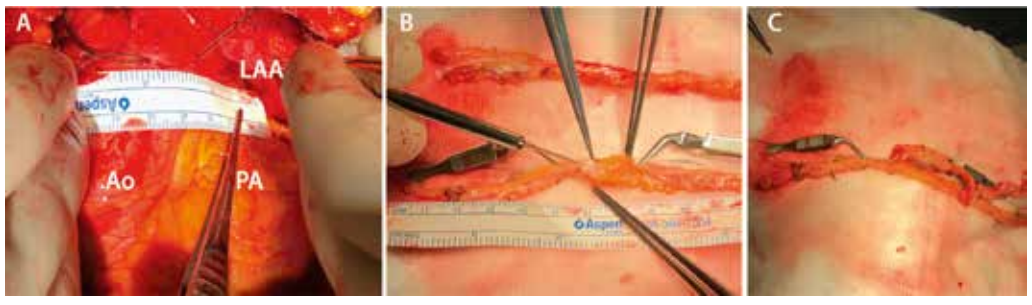

Figure 1. RARAY graft construction. A) Ascending aorta to left atrial appendage 6 cm. B) Construction of Y graft. C) Completion of Y graft.

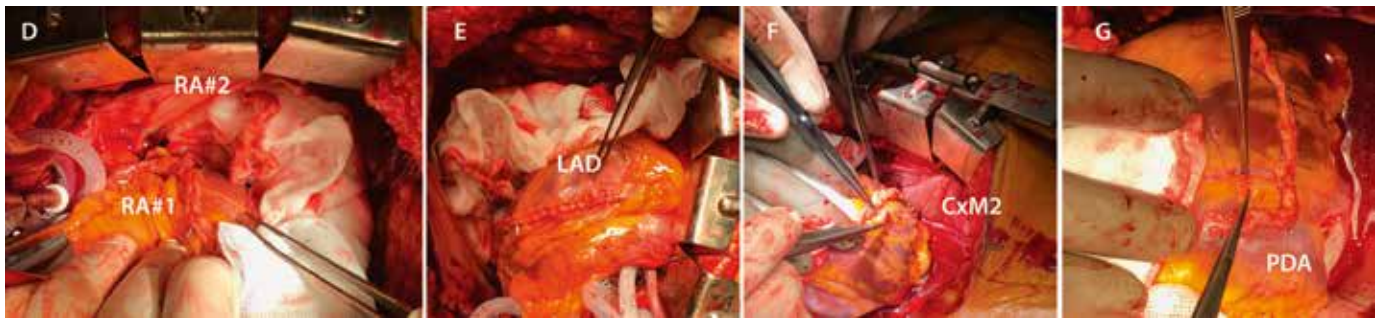

Figure 2. RARAY grafting to three coronary territories. D&E) RA#1 to LAD. F&G) RA#2 to circumflex and PDA.

Our previous experience found that total arterial coronary revascularisation (TAR) conferred a survival benefit over the use of any saphenous vein graft (SVG).[1] Achieving TAR for at least half of patients is possible by substituting an arterial conduit in place of an SVG. For example, one mammary artery and two radial arteries (RA) will allow at least one graft per coronary territory. With use of sequential grafting, even more patients may receive TAR, since each RA originating from the aorta, is long enough to revascularise one of the coronary territories.

However, to achieve near universal TAR some reliance on complex arterial reconstructions is necessary. Two popular configurations of the Y graft configuration use the left internal mammary artery (LIMA) with either second mammary (BIMAY) or RA (RAY) as the second conduit. We previously found that the RAY had the same survival as for TAR constructed with alternative configurations, and superior to the conventional operation of LIMA+SVG.[2]

To achieve both TAR and three-coronary-territory CABG, a novel reconstruction technique was developed whereby one RA is joined as a Y graft to the second RA approximately 6 cm from one end. The RA that is anastomosed to the ascending aorta is then used to revascularise the LAD territory, and the second RA used to revascularise the circumflex and right coronary territories as with the BIMAY or RAY techniques. The Y graft is positioned similarly to BIMAY or RAY being lateral to the pulmonary artery and adjacent to the left atrial appendage.

Each patient had bespoke indications for attempting this reconstruction related mostly to prior use of, or damage to, the LIMA, or an attempt to reduce the respiratory complications related to LIMA harvest. The mean age was 71 (range 51–88) years, there were 4.1 (range 3–7) grafts per patient and a EuroSCORE II of 5.3 (range 1–20).

Twenty-eight patients were operated on between 2002 and early 2019, with no in-hospital or 30-day mortality. No patient has returned due to recurrence of angina. All patients received perioperative vasoconstrictors.

The novel RARAY technique achieves total arterial revascularisation and is relatively simple to perform with satisfactory early results.

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Rapid Response | Cardiac | Coronary outcomes: Did you know this?

Limitations of transit time flow measurement in verification of infero-lateral grafts in patients undergoing coronary artery bypass surgery

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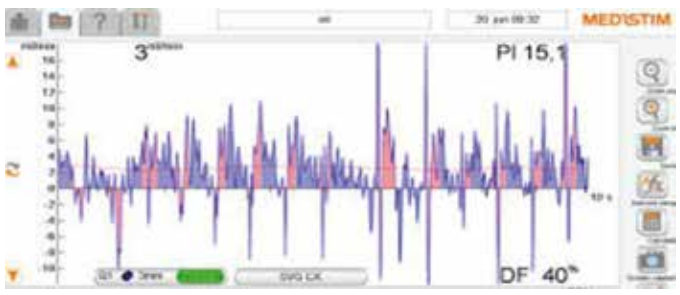

Figure 1. TTFM flow measurement: Unsatisfactory graft flow.

Figure 2. TTFM flow probes.

Cardiac surgery continues to grow and flourish in India. With an annual case load of 300,000, India is the second biggest operator in this sector after the United States. Sixty percent of this caseload is comprised of coronary surgeries. The annual coronary procedural turnover in India is 1 million cases, made up of 800,000 percutaneous coronary interventions (PCI) and 200,000 coronary artery bypass grafts (CABG). However, this is still less than a third of what needs to be done.

With the advent of national health insurance in India, it is anticipated that in the next three years these numbers will double. In this context, we looked at two aspects of coronary surgery.

Limitations of TTFM (transit time flow measurement)

Intraoperative graft verification has been strongly advocated over the past few years. Though CABG continues to be performed with low mortality and morbidity, various recent studies have underlined an early graft failure rate of 10–12%. TTFM-based graft verification techniques were found to be most convenient, and this may or may not be combined with ultrasonic image verification. TTFM though convenient has been noted to have low sensitivity and moderate specificity. This is based on studies which compared TTFM with intraoperative fluorescein and conventional angiography.

Most of the data validating the usefulness of TTFM is derived from assessment of the more accessible grafts, namely the LAD and RCA territories. Flow measurement depends on a rigid probe, which needs to be placed as close to the distal anastomosis as possible. For grafts in the obtuse marginal and posterior descending regions, this requires significant cardiac displacement, which in turn compromises the systolic/mean pressure at the time of flow assessment.

This is an important impediment in proper assessment of grafts in the inferolateral regions.

To overcome this problem most series have measured the flow in the proximal end of these grafts, which are prone to be erroneous conclusions. Our data substantiates the difficulty in accurate TTFM of the inferolateral grafts. We suggest changes in the probe design, from a rigid handle to a flexible cable-based system which may reduce the inaccuracies.

Impact of timing of post-operative angiography on CABG outcomes

It has been our practice to resort to postoperative coronary angiography in the presence of ECG changes, haemodynamic instability, increase in troponin I, and the appearance of new wall motion abnormalities. Of more than 4000 cases of isolated CABG, 2.5% underwent postoperative angiography. Most of them had one or more graft problems which were revised.

Two patients had PCI. Outcomes in this cohort were analysed in terms of mortality, ITU stay and the appearance of new wall motion abnormality. Results were favourable if the angiography was undertaken within 24 hours. Patients were further sub analysed as to whether postoperative angiography was done before or after 12 hours. Earlier detection of graft issues had markedly better outcomes. This emphasises the need for early detection of coronary-graft problems to reduce postoperative mortality, morbidity and subsequent MACCE.

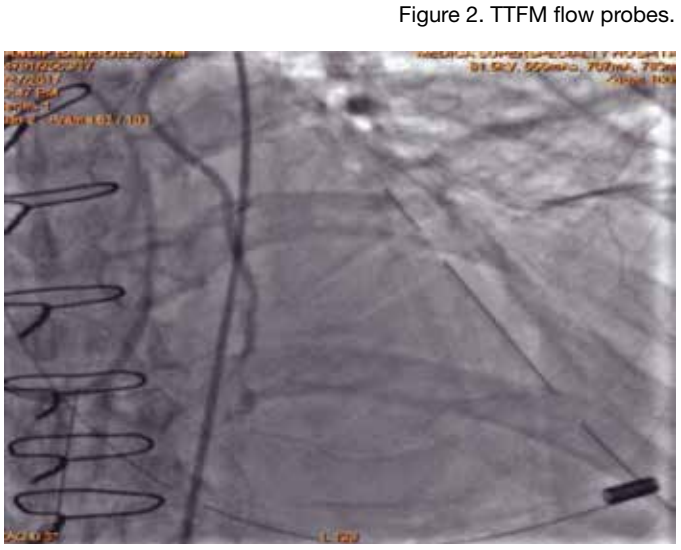

Figure 3. Occluded LIMA graft.

Techno-College | Thoracic | Update Thymic Surgery

Prospective randomised trial comparing extended thymectomy for nonthymomatous myasthenia gravis performed through subxiphoid approach combined with intercostal or subcostal videothoracoscopic ports

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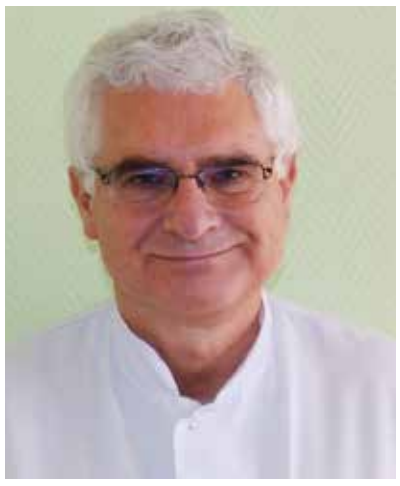
At present, extended thymectomy is regarded as a standard-of-care surgical treatment of myasthenia gravis (MG). However, there are several technical issues that have not yet been resolved. The most important one is how to balance the maximal extent of resection of the mediastinal tissue surrounding the thymus (to achieve the highest complete remission rate of MG) while performing surgery in a minimally invasive way to reduce the amount of postoperative pain. The search for less painful thymectomy approaches in the treatment of MG have included attempts to replace intercostal ports with subcostal ones.

The aim of this prospective randomised study was to compare pain intensity and spirometry outcomes in patients undergoing extended thymectomy for MG with videothoracoscopic (VATS) extended thymectomy performed through a subxiphoid approach – with elevation of the sternum – combined with bilateral single intercostal ports (group 1) or bilateral single subcostal ports (group 2).

Sixty-two patients were operated on from 1 October 2014 to 1 February 2019. Group 1 consisted of 19 women and 11 men aged 21–66 years (mean 36.8). In group 2 there were 18 women and 14 men aged 18–68 years (mean 36.8). Postoperative pain was measured with the Visual Analog Scale (VAS),



Marcin Zielinski

consumption of morphine (in mg) and non-steroidal anti-inflammatory drugs, Forced Vital Capacity (FVC) and forced expiratory volume in 1 second (FEV1). Pain and spirometry measurements were undertaken from 1 to 48 hours postoperatively.

The operative time was 105–230 minutes (mean 165.7) in group 1 and 105–230 minutes (mean 158.4) in group 2 (p = 0.37). There were no postoperative deaths. One patient from group 1 (a 61-year-old male) was intubated in the 36th postoperative hour for respiratory insufficiency. He was extubated three days later. There were no other complications for any other patient. Four patients from group 1 were excluded from the study for violation of the study protocol.

There were no statistical differences between both groups regarding age (p = 0.33) , sex, time of drainage (p = 0.31), VAS scale, and consumption of morphine. There was a decrease of FVC on the first postoperative day to 48.4% and 45.5% for groups 1 and 2, respectively (p = 0.44). On day two, the decrease of FVS was 48.5% and 54.5%, respectively (p = 0.52).

For FEV1, the decrease on the first postoperative day was 44.6% and 42.4% for group 1 and 2, respectively (p = 0.55). On day two the decrease of FEV1 was 45.5% and 50%, respectively (p = 0.44).

Conclusions

1. There were no significant differences between groups 1 and 2 with regards to the amount of postoperative pain and decrease of spirometric values; 2. A subcostal approach for introduction of VATS ports for thymectomy provides no advantages when compared to standard intercostal ports; 3. There was a deep decrease of FVC and FEV1 on the first and second postoperative day.

Rapid Response | Thoracic | Transplant and Mediastinum

Day case tubeless needlescopic non-intubated bilateral uniportal video assisted thoracoscopic (NIUVATS) sympathectomy for hyperhidrosis

Mohammed Sanad[1], Hatem Beshir[1,2] 1. Department of Cardiothoracic Surgery, Faculty of Medicine, Mansoura University, Egypt; 2. Ministry of Health of Egypt

Hyperhidrosis is a common incapacitating condition characterised by excessive sweating that can be embarrassing and career restricting. We demonstrate the technique of fully awake bilateral tubeless uniportal needlescopic video-assisted thoracoscopic surgery (NIUVATS) sympathectomy through a single 5 mm incision in a tertiary care public hospital.

This study's primary outcome was length of postoperative stay following day-care sympathectomy with a fast-track approach. Secondary outcomes concerned the feasibility of this technique, procedural refinements, patient satisfaction, postoperative complications and three-month postoperative morbidity and mortality.

We included a series of 220 nationwide consecutive adult post-pubertal cases with palmar or palmoplanter hyperhidrosis, with or without Raynaud's phenomenon, who underwent bilateral (NIUVATS) sympathectomy by a single surgical team between July 2016 and April 2019.

The technique (Figure 1) includes standard monitorisation, including a temperature sensor in both hands. Semi-Fowler's position was used, with both arms abducted and a 30° tilt of the table towards the contralateral side. Bilateral regional analgesia was attained with single-shot epidural bupivacaine and lidocaine in 194 cases, Conscious sedation, paravertebral block in 7 cases, and 19 cases with supraglottic device.

A single 5 mm skin incision was made and a 5 mm trocar was inserted in the fourth intercostal space in the anterior axillary line just posterior to the axillary tail of Spence of the breast in females. Following CO_2 insufflation, the trocar was withdrawn. We used a 2.9 mm 30° thoracoscope medial to a 3 mm with diathermy hook or Maryland forceps to dissect the sympathetic chain from the endothoracic facia, T3–T4 ganglia were cauterised and the lateral 3 cm of the ribs cauterised for the nerve of Kuntz. Then, inflation under water seal was performed without chest drain. Closure was done using single simple suture for the intercostal muscle and another for the skin incision.

Afterwards, the patients experienced dry warm hands on the operating table and were ambulated directly following the end of the procedure. A chest radiograph is performed one-hour postoperatively to ensure adequate pleural drainage and the patient is discharged home instantly.

Procedural modifications before starting our series included conversion from a two-port to single port procedure using a 10 mm incision. Anaesthesia

Hatem Beshir

evolved many times, from conventional general anaesthesia to supraglottic airway device with general anaesthesia, to spontaneous ventilation down to regional anaesthesia with sedation and face mask ventilation, down to epidural analgesia alone. Positioning evolved from lateral decubitus to supine to modified semi-Fowler that resulted in better exposure. Trocar positioning went from the third to the fourth space, and single simple suture instead of subcuticular suture was utilised.

The technique was standardised after the sixth case and performed independently by the supervised surgical residents with confidence after performing their third case.

Our series of 220 patients underwent an effective operation with complete immediate resolution of hyperhidrosis and rise of skin temperature. Mean operative time was 32 ± 8.4 minutes. Operative bleeding was negligible (< 1 mL). One patient had bleeding from the intercostal artery, controlled by conversion to a 3 cm port and suturing. The patients' wounds did not scar, and no patients had a postoperative large pneumothorax or haemothorax. Mild pneumothorax was aspirated percutaneously. No wound pain was reported. Most patients who had conscious sedation and supraglottic device reported back pain for three days that was relieved by analgesics.

All patients were discharged within 1.5 ± 0.3 hours of surgery upon follow-up X-ray of the chest, confirming full lung expansion. No patients experienced Horner's syndrome. After three-month follow-up of all cases, there we no reported recurrences, improved planter hyperdydrosis (82%), and compensatory hyperhidrosis in five patients (2.3%) in the back and thighs.

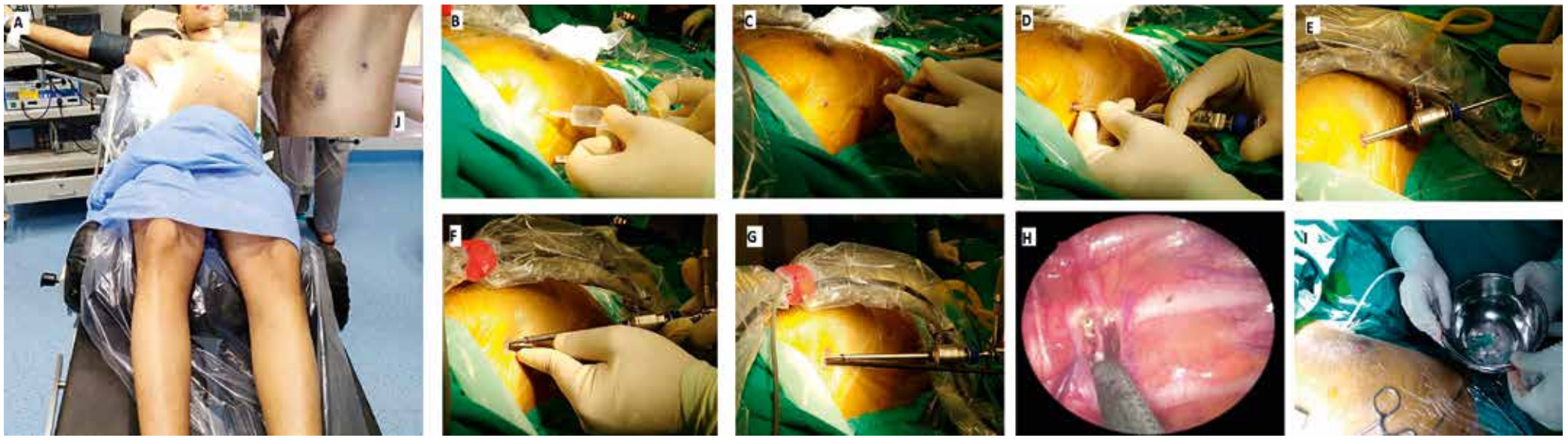


Figure 1. Technique of tubeless awake uniportal VATS sympathectomy: A) modified semi-Fowler's position; B) local analgesia; C) 0.5 cm incision in the fourth intercostal space; D) 5 mm trocar is inserted; E) CO_2 insufflation is started and a 2.9 mm scope is used; F) trocar is withdrawn and instruments are inserted inferior and lateral to the scope; G) the camera and the instrument is held using both hands of the surgeon; H) the sympathetic chain is dissected from the endothoracic facia, T3–T4 ganglia are cauterised and the lateral 3 cm of the ribs are cauterised for the nerve of Kuntz; I) de-airing is performed using a CPAP mask and coughing of the patient to a catheter under water seal; J) wound of the patient on post-operative day five.

Focus Session | Vascular | Thoracoabdominal aortic disease – patient tailored approaches

Segmental artery embolisation – Evidence and black shadow

Christian D Etz University Department for Cardiac Surgery, Heart Center Leipzig, Germany

Ischaemic spinal cord injury (SCI) leads to the most devastating complication known in open and endovascular descending thoracic/thoracoabdominal aortic aneurysm (TAA/A) repair: permanent paraplegia – an individual disaster with profound impact on long-term outcome and healthcare cost. Various adjunctive perioperative neuroprotective strategies have been introduced to minimise ischaemic SCI, which have achieved a remarkable decrease in the incidence of paraplegia and paraparesis, yet it remains high at 10 to 20%[1].

In 2002, Jacobs et al. suggested the existence of alternative pathways[2] which led to intense translational research to obtain further insight into the anatomy of spinal cord blood supply[3]. Extensive experimental work resulted in an entirely new understanding of the complexity and dynamic physiological pliability of the arteriolar system surrounding the spinal cord, warranting steady arterial perfusion and oxygenation – given sufficient collateral inflow – and fostered 'The Collateral Network Concept'[3].

Meanwhile, established large animal models to investigate blood flow and perfusion pressure to the cord during and after experimental segmental artery sacrifice revealed the ability of the collateral network to regenerate and fully recover blood supply within 5–7 days [3]. The remodelling process within the paraspinous arterial collateral network, driven by pressure differences across the collaterals triggering arteriogenesis, suggested a staged approach to potentially reduce paraplegia by 'arteriogenic priming'. When experimental research revealed the warranted timeframe to be clinically adoptable, there was arrival at the 'staged repair concept': the iatrogenic occlusion of segmental arteries in several steps with sufficient time intervals to allow for structural changes within the arterial collateral network to secure spinal cord perfusion after total segmental artery occlusion to prevent irreversible SCI. Eventually, the catheter-based 'minimally invasive segmental artery coil embolisation' (MIS2ACE) concept was clinically developed to implement a minimally invasive 'priming procedure' to 'stage' segmental artery occlusion prior to definite TAAA repair – confirmed in large animal models, and first-in-man experience [4].

The on-going randomised controlled trial PAPAartis – Paraplegia Prevention in Aortic Aneurysm Repair by Thoracoabdominal Staging with 'Minimally-Invasive Staged Segmental Artery Coil-Embolisation' uses a multi-centre, multinational, parallel group design, where 500 patients will be randomised in a 1:1 ratio to standard aneurysm repair or to MIS2ACE over 1–3 sessions, followed by repair. The primary endpoint is successful aneurysm repair without substantial SCI 30 days after aneurysm repair. Secondary endpoints include any form of SCI, one-year mortality, length and costs of ICU stay and quality-of-life adjusted years.

Christian D Etz

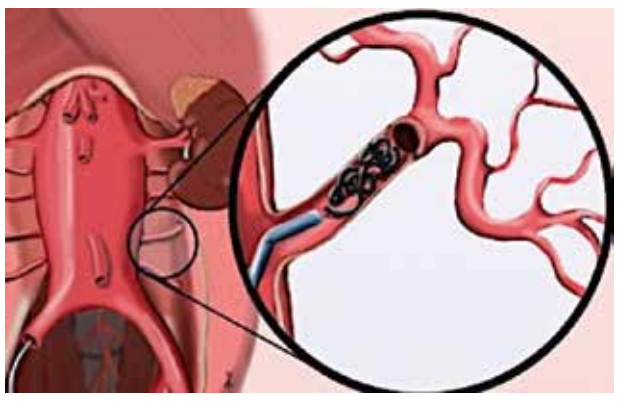


Figure 1. Schematic drawing of minimally invasive staged segmental artery coil embolization to initiate collateral network priming prior to endovascular or open treatment of extensive aortic pathologies

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3. Etz CD, Kari FA, Mueller CS, Brenner RM, Lin HM, Griepp RB. The collateral network concept: remodeling of the arterial collateral network after experimental segmental artery sacrifice. J Thorac Cardiovasc Surg. 2011;141(4):1029–36.
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Abstract | Vascular | Doubt and controversies in managing acute type A aortic dissection

Wait-and-watch strategy for type A intramural haematoma and acute aortic dissection with thrombosed false lumen of the ascending aorta: 50 mm or less, pain under control and no ulcer-like projection

Tadashi Kitamura, Shinzo Torii, Takashi Miyamoto, Toshiaki Mishima, Hirotoki Ohkubo, Shunichiro Fujioka, Kazutaka Yakuwa, Haruna Araki, Shin Kondo, Yoshimi Tamura, Yuki Tadokoro, Yoshihiko Onishi and Kagami Miyaji Department of Cardiovascular Surgery, Kitasato University School of Medicine, Kanagawa, Japan

Intramural haematoma (IMH) originally indicated a diagnosis defined as a haematoma within the media of the aortic wall in the absence of an intimal tear, but recently it often includes acute aortic dissection (AAD) with a thrombosed false lumen even if there is an ulcer-like projection (ULP). Urgent aortic repair is usually indicated for type A IMH because of high early risk of complications.[1] However, favourable outcomes with the medical treatment for type A IMH have been reported from Japan and Korea, and initial medical treatment in selected cases is classified as recommendation class IIa in Japanese guidelines.[2]

This study analysed the early and midterm outcomes of initial optimal medical treatment for type A IMH and AAD with a thrombosed false lumen of the ascending aorta in patients with maximum aortic diameter of ≤ 50 mm, pain score of ≤ 3/10 on the numerical rating scale and no ULP in the ascending aorta – regardless of the patency of the false lumen of the descending aorta or the thickness of the thrombosed false lumen of the ascending aorta. Patients who underwent initial medical therapy received computed tomography with or without contrast enhancement on days 1, 3, 7 and 14, and emergency aortic repair was performed if the false lumen of the ascending aorta recanalised, the ascending aorta expanded or if a new ULP developed within the ascending aorta.

Among 81 patients with type A IMH and AAD with a thrombosed false lumen of the ascending aorta between April 2011 and April 2019, initial medical treatment was indicated in 46 patients. The mean age was 68 years. Ten patients underwent emergency pericardial drainage for cardiac tamponade at the time of presentation and 8 patients underwent aortic repair during hospitalisation for new ULP, redissection or rupture. In-hospital mortality occurred in 2 (4%) patients. During follow-up, survival at 1 and 2 years was 95% and 92%, respectively. There was no significant difference in survival, aorta-related death or aortic events between patients in whom optimal medical treatment and surgical treatment were indicated.

Initial optimal medical therapy with or without pericardial drainage may be justified for type A IMH and AAD with a thrombosed false lumen of the ascending aorta in patients with maximum aortic diameter of ≤ 50 mm, pain score of ≤ 3/10 and no ULP. Frequent CT exams and timely aortic intervention in response to disease progression were considered important in improving outcomes.

Tadashi Kitamura

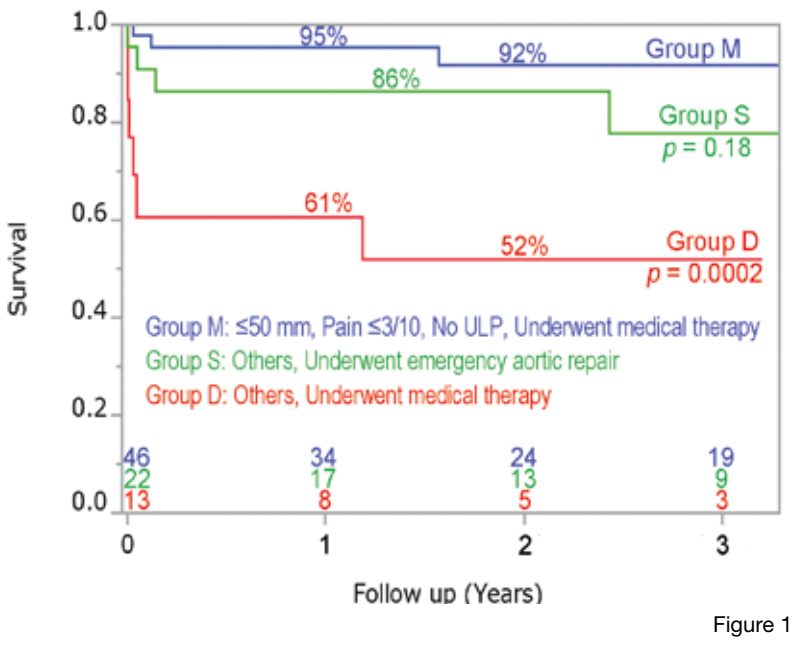

Figure 1

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2. JCS Joint Working Group. Guidelines for diagnosis and treatment of aortic aneurysm and aortic dissection (JCS 2011). Circ J. 2013;77:789–828.

EACTS 2019 **Agenda**

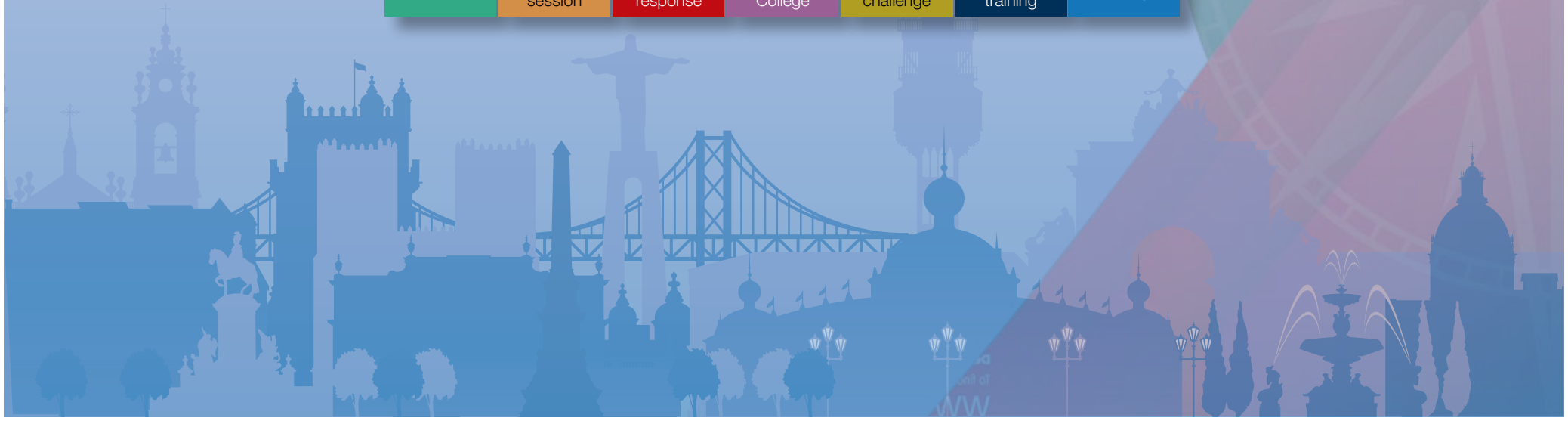
Thursday 3 October

08:30	Does the coronary outcome data speak for itself?	Room 3C, Pav 3	Adult Cardiac
08:30	Re-directing blood flow with mechanical circulatory support	Room 3A, Pav 3	Adult Cardiac
08:30	TAVI – New approaches and data from the real world.	Auditorium 8	Adult Cardiac
08:30	Using data management to further improve cardiac surgery outcomes	Room 3B, Pav 3	Adult Cardiac
08:30	What's new in endocarditis?	Auditorium 7	Adult Cardiac
08:30	Mechanical Circulatory Support	Auditorium 2	Congenital Disease
08:30	Doubt and controversies in managing acute type A aortic dissection	Auditorium 6	Vascular Disease
08:30	Innovations	Room 5A, Pav 5	Thoracic Disease
08:30	MMCTS video session– Challenging aortic cases	Room 108	Vascular Disease
	Break		
09:45	Non Oncology	Room 3B, Pav 3	Thoracic Disease
09:45	Complex resections	Room 5A, Pav 5	Thoracic Disease
09:45	Surgery on the left ventricle – resect, repair and support	Auditorium 3+4	Adult Cardiac
09:45	Congenital Rapid Response 1	Room 5B, Pav 5	Congenital Disease
09:45	3rd International EACTS VAD Coordinator Symposium – Long-term management of VAD patients	Room 3C, Pav 3	Adult Cardiac
09:45	Techno-College	Auditorium 1	Adult Cardiac
11:15	Mediastinum and oesophagus	Room 3B, Pav 3	Thoracic Disease
11:15	Outside the Box of Cardiothoracic Surgery	Room 108	Annual Meeting
11:15	Observational studies in the practice	Auditorium 6	Adult Cardiac
11:15	Knowledge Generation in Congenital Heart Surgery	Auditorium 2	Congenital Disease
11:15	SAVR-new concepts and ideas you have not heard about before ...	Auditorium 3+4	Adult Cardiac
11:15	Embracing the aortic arch	Room 5B, Pav 5	Vascular Disease
11:15	Sleeve resections	Room 5A, Pav 5	Thoracic Disease
	Break		
13:00	Jeopardy – Semi Finals	Room 5B, Pav 5	Annual Meeting
14:30	Current challenges in heart transplantation	Auditorium 8	Adult Cardiac
14:30	Outcomes and controversies in mitral repair	Room 3B, Pav 3	Adult Cardiac
14:30	Management of ACHD	Auditorium 2	Congenital Disease
14:30	Transplant abstract and focus session	Room 5B, Pav 5	Thoracic Disease
14:30	The Team is the Key	Room 5C, Pav 5	Annual Meeting
14:30	EU Medical Device Directive: consequences for novel device application	Room 108	Adult Cardiac
14:30	MiECC	Room 3C, Pav 3	Adult Cardiac
14:30	Practical approach to challenging aortic valve surgery	Auditorium 1	Adult Cardiac
14:30	Visualizing the heart – future aspects	Room 3A, Pav 3	Adult Cardiac
14:30	Value in thoracic Surgery	Room 5A, Pav 5	Thoracic Disease
14:30	EACTS-STS: Acute type A aortic dissection: can we bring mortality down to single digits? Part 1	Auditorium 6	Vascular Disease
14:30	Review of the latest tendencies and improvements in cardiac surgery	Auditorium 3+4	Adult Cardiac
14:30	Training Suite- TAVI Training	Training Village	Annual Meeting
14:30	How to build a specialized coronary program	Auditorium 7	Adult Cardiac
	Break		
16:15	Minimally invasive and transcatheter approaches to the mitral valve	Room 3B, Pav 3	Adult Cardiac
16:15	Tissue is the issue: collaborative insights from translational science	Room 108	Adult Cardiac
16:15	Management of ACHD 2	Auditorium 2	Congenital Disease
16:15	Aortic Valve Stenosis: not just a wear and tear issue; The Valve, the Heart and the Organs	Room 3A, Pav 3	Adult Cardiac
16:15	EACTS-ESC Joint Session – Valvular heart disease in the 21st Century: a team approach	Room 5C, Pav 5	Adult Cardiac
16:15	ECMO/ ECLS	Room 3C, Pav 3	Adult Cardiac
16:15	The difficult choice of a prosthetic valve in the 21st century	Auditorium 1	Adult Cardiac
16:15	The transseptal approach to the mitral valve	Auditorium 8	Adult Cardiac
16:15	Joint session ERS: Mesothelioma guidelines	Room 5A, Pav 5	Thoracic Disease
16:15	EACTS-STS: Acute type A aortic dissection: can we bring mortality down to single digits? Part 2	Auditorium 6	Vascular Disease
16:15	Outcome prediction in patients treated by endovascular, minimally invasive and conventional aortic valve surgery	Auditorium 3+4	Adult Cardiac
16:15	Non oncology	Room 5B, Pav 5	Thoracic

Friday 4 October

08:00	Late Breaking Clinical Trials – Part 1	Auditorium 7	Adult Cardiac
08:00	Techno-College	Auditorium 1	Techo College
08:00	Coronary arteries in CHD	Auditorium 2	Congenital Disease
08:00	Clinical Trials in the practice. Focus on TAVI versus SAVR RCT	Room 3C, Pav 3	Adult Cardiac
08:00	TB and friends	Room 108	Thoracic Disease
08:00	Complexity in Brief: Translational Research in Cardiac Surgery	Auditorium 3+4	Adult Cardiac
08:00	TEVAR: Guns and Roses	Room 5B, Pav 5	Vascular Disease
08:00	Update Thymic Surgery	Room 5A, Pav 5	Thoracic Disease
08:00	Training Suite: Congenital – Ross and the Reinforced Ross	Training Village	Congenital Disease
	Break		
09:45	Late Breaking Clinical Trials – Part 2	Auditorium 7	Adult Cardiac
09:45	Oncology	Room 108	Thoracic Disease
09:45	Thoracoabdominal surgery: Spying on the spinal chord	Auditorium 6	Vascular Disease
09:45	Controversies in valve repair vs replacement for congenital and rheumatic heart diseases in LMICs.	Room 3C, Pav 3	Adult Cardiac
09:45	Esophageal Surgery	Room 5A, Pav 5	Thoracic Disease
09:45	EUROMACS	Room 3B, Pav 3	Annual Meeting
09:45	Dilemmas in mitral repair, tricuspid surgery and endocarditis	Auditorium 3+4	Adult Cardiac
09:45	Congenital Rapid Response 2	Room 5B, Pav 5	Congenital Disease
	Break		
14:00	Potentially modifiable preoperative factors to improve outcomes in cardiac surgery	Room 3C, Pav 3	Adult Cardiac
14:00	SAVR and TAVI – are we comparing apples to oranges?	Room 3A, Pav 3	Adult Cardiac
14:00	The evolving challenges of coronary surgery	Auditorium 8	Adult Cardiac
14:00	The evolution of cardiopulmonary bypass strategies in modern cardiac surgery	Room 3B, Pav 3	Adult Cardiac

Abstract | Focus session | Rapid response | Techno College | Professional challenge | Hands-on training | Plenary



14:00	Management of HLHS	Auditorium 2	Congenital Disease
14:00	Nightmares in CT	Room 108	Annual Meeting
14:00	Controversies and new findings in the treatment of tricuspid regugitation	Auditorium 7	Adult Cardiac
14:00	Guidelines	Auditorium 1	Adult Cardiac
14:00	Thoracic surgery and basic science	Room 5A, Pav 5	Thoracic Disease
14:00	Acute Type B Dissection	Auditorium 6	Vascular Disease
14:00	Jeopardy – Final	Room 5B, Pav 5	Annual Meeting
14:00	Thoracic Miscellaneous	Auditorium 3+4	Thoracic Disease
14:00	Controversies and catastrophes in adult cardiac surgery	Room 5C, Pav 5	Adult Cardiac
14:00	Training Suite – Coronary	Training Village	Adult Cardiac
	Break		
15:45	AVV Regurgitation in Single Ventricle Reconstruction Pathway	Auditorium 2	Congenital Disease
15:45	How to do it – Live in a box	Room 108	Annual Meeting
15:45	New evidence for secondary MR: really game changer?	Room 3A, Pav 3	Adult Cardiac
15:45	TAVI Basics	Auditorium 7	Adult Cardiac
15:45	The developing and changing field of surgical and hybrid treatment of atrial fibrillation	Room 3C, Pav 3	Adult Cardiac
15:45	The evidence that every CABG surgeon should know	Auditorium 8	Adult Cardiac
15:45	VAD surgery – state of the art	Room 3B, Pav 3	Adult Cardiac
15:45	Joint EACTS-STS-ASCVTS session: International perspectives on lung cancer screening	Room 5A, Pav 5	Thoracic Disease
15:45	Thoracoabdominal aortic disease – patient tailored approaches	Auditorium 6	Vascular Disease
15:45	Coronary outcomes: Did you know this?	Auditorium 3+4	Adult Cardiac
15:45	Transplant and Mediastinum	Room 5B, Pav 5	Thoracic Disease

Saturday 5 October

08:00	Congenital Videos	Auditorium 2	Congenital Disease
08:00	Work in Progress	Room 108	Annual Meeting
08:00	Aviation medicine and high hazard occupational medicine	Room 3C, Pav 3	Adult Cardiac
08:00	Minimally Invasive Mitral Valve Surgery parade.	Auditorium 8	Adult Cardiac
08:00	Physiology for the cardiac surgeon	Room 3A, Pav 3	Adult Cardiac
08:00	Stroke in TAVI; Prediction, Prevention and Treatment	Auditorium 1	Adult Cardiac
08:00	Systematic Reviews and Meta-Analyses: at the top of the evidence?	Room 3B, Pav 3	Adult Cardiac
08:00	Nurses & Allied Health Professionals	Room 5C, Pav 5	Allied Health
08:00	Lung Failure (Transplantation, ECMO and pulmonary endartarectomy)	Room 5A, Pav 5	Thoracic Disease
08:00	Thoracic aortic surgery in the young (DA VINCI SESSION)	Auditorium 6	Vascular Disease
08:00	Approaches to minimise stroke and improve survival in atrial fibrillation patients	Auditorium 3+4	Adult Cardiac
08:00	Thoracic Mixed	Room 5B, Pav 5	Thoracic Disease
	Break		
09:45	Leonardo Da Vinci: 500 years of genius	Auditorium 1	Annual Meeting
	Break		
11:45	Career Development	Room 108	Annual Meeting
11:45	A further step ahead: minimally invasive and Hybrid CABG	Room 3B, Pav 3	Adult Cardiac
11:45	BAV Repair	Auditorium 8	Adult Cardiac
11:45	Heart transplantation in 2019	Room 3A, Pav 3	Adult Cardiac
11:45	ERAS Cardiac Surgery: First International Presentation of Guidelines	Room 5C, Pav 5	Allied Health
11:45	Ebstein Disease	Auditorium 2	Congenital Disease
11:45	Joint session ERS: MDT COPD and transplant	Room 5A, Pav 5	Thoracic Disease
11:45	Cerebral protection in aortic arch treatment	Auditorium 6	Vascular Disease
11:45	Optimising outcomes in mitral surgery	Auditorium 3+4	Adult Cardiac
11:45	Oncology	Room 5B, Pav 5	Thoracic
11:45	Trial Update and Evidence Review	Auditorium 1	Adult Cardiac
11:45	Training suite: Introduction to mitral and tricuspid valve repair	Training Village	Adult Cardiac
12:00	Residents Luncheon	Terrace	Annual Meeting
	Break		
13:30	Congenital Valve	Auditorium 2	Congenital Disease
13:30	Strategy and long-term results in aortic valve repair	Room 3C, Pav 3	Vascular Disease
13:30	Cardiac Surgery and translational basic science	Room 108	Adult Cardiac
13:30	Choosing conduits for CABG: strategy is the secret for success	Room 3B, Pav 3	Adult Cardiac
13:30	Heart failure surgeon at the cutting edge	Room 3A, Pav 3	Adult Cardiac
13:30	TAVI vs. SAVR in low-risk patients	Auditorium 1	Adult Cardiac
13:30	Lung Ultrasound workshop	Room 5C, Pav 5	Allied Health
13:30	Advances in management of thoracic malignancies	Room 5A, Pav 5	Thoracic Disease
13:30	Late complications of TEVAR	Auditorium 6	Vascular Disease
13:30	TAVI – interesting new data will influence your practice ...	Auditorium 3+4	Adult Cardiac
13:30	Dissecting aortic dissection	Room 5B, Pav 5	Vascular Disease
13:30	EACTS-EACTA Joint Session: Repair of a regurgitant aortic valve	Auditorium 8	Adult Cardiac
	Break		
15:15	Improving outcomes by a perioperative personalized blood management	Room 3B, Pav 3	Adult Cardiac
15:15	SAVR – long-term results, emphasis on particular sub-groups	Room 3A, Pav 3	Adult Cardiac
15:15	Congenital Miscellaneous	Auditorium 2	Congenital Disease
15:15	Help! Trainee in Trouble	Room 108	Annual Meeting
15:15	Technical pearls in mitral valve repair: artificial chordae adjustment	Auditorium 1	Adult Cardiac
15:15	Multidisciplinary tumour board	Room 5A, Pav 5	Thoracic Disease
15:15	“Here we go again!” – Strategies in re-do thoracic aortic surgery	Auditorium 6	Vascular Disease
15:15	Nurses & Allied Health Professionals	Room 5C, Pav 5	Allied Health
15:15	Predicting and managing Mechanical Circulatory Support -related complications	Auditorium 3+4	Adult Cardiac
15:15	Do you like the elephant frozen?	Room 5B, Pav 5	Vascular Disease

Abstract | Focus session | Rapid response | Techno College | Professional challenge | Hands-on training | Plenary

Abstract | Vascular | Thoracoabdominal surgery: Spying on the spinal cord

Mapping the collateral network: optimal near-infrared spectroscopy optode placement

Konstantin von Aspern[1,2], Josephina Haunschild[1,2], Zara Khachatryan[2], Urszula Simoniuk[2], Susann Ossmann[1], Daniela Branzan[3], Andrej Schmidt[4], Michael A Borger[1], Christian D Etz[1,2] 1. University Department of Cardiac Surgery, Heart Center Leipzig, Germany; 2. University of Leipzig, Saxonian Incubator for Clinical Translation (SIKT), Germany; 3. University Department of Vascular Surgery, University Clinic Leipzig, Germany; 4. University Department of Angiology, University Clinic Leipzig, Germany

Konstantin von Aspern

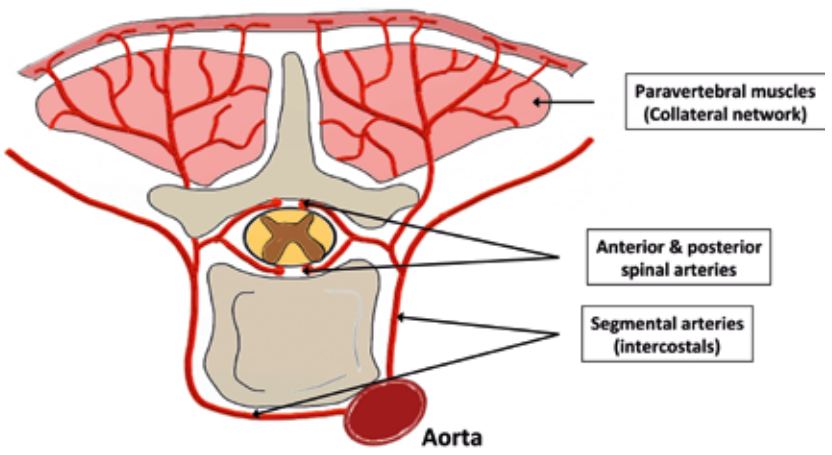


Figure 1. Schematic of the paraspinal collateral network (CN) and its relation to spinal cord tissue perfusion.

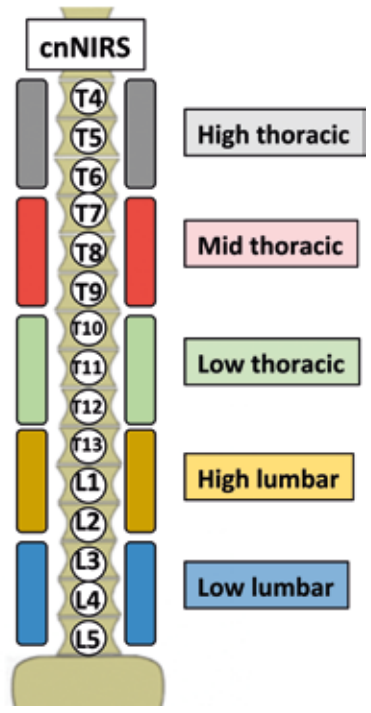


Figure 2. Illustration of the collateral network near-infrared spectroscopy (cnNIRS) optode placement in relation to the spinal segments.

Paraplegia due to ischaemic spinal cord injury (SCI) after repair of extensive descending thoracic and thoracoabdominal aortic aneurysms (TAAA) of any modality (open surgery, endovascular aortic repair or hybrid) remains unresolved with an incidence reported at up to 18% (Crawford type II)[1,2]. Maintenance of adequate spinal cord perfusion and oxygenation is paramount to avoid this disastrous complication.

Spinal cord perfusion is provided by segmental arteries originating directly from the aorta, augmented cranially by the subclavian/internal thoracic arteries via the intercostals, and caudally the hypogastric arteries. Additional inflow by an extensive intra- and paraspinal anastomotic arterial collateral network (CN), embedded in the muscles, provides longitudinal collateral circulation (Figure 1). However, in acute interruption – e.g. after extensive occlusion or sacrifice of the segmental arteries – this anastomotic network might not be capable of immediately maintaining adequate spinal cord perfusion[3].

Based on this concept, monitoring perfusion and oxygenation of the CN provides a new (indirect) evaluation of the spinal cord tissue. Through extensive clinical and experimental studies, cnNIRS has been proven feasible to indirectly measure the paraspinal CN and has subsequently emerged as a promising 'easy-to-use' new monitoring tool for non-invasive, real-time spinal cord oxygenation measurements[4,5]. The correlation of lumbar cnNIRS with the degree of spinal ischaemia and neurologic outcomes has been demonstrated[2]. Furthermore, previous clinical and experimental studies have highlighted its efficacy for measuring the lumbar portion of the paraspinal CN (L2–L4) and demonstrated that high thoracic (T4–T6) cnNIRS measurements may be of limited clinical use. Currently, no experience with cnNIRS measurements of the remaining paraspinal portion – hence, the entire CN – is available.

We investigated cnNIRS for real-time CN mapping in order to compare segmental cnNIRS measurements to corresponding direct CN- and spinal cord regional perfusion, thereby identifying the optimal cnNIRS optode placement pattern.

In an acute animal experiment the paraspinal CN from the high thoracic to the low lumbar region (T4–L5) was measured using cnNIRS (n = 17, comprising 10 juvenile pigs plus reference data from an additional seven animals) during aortic ischaemia and reperfusion (Figure 2). Data were compared to direct regional tissue perfusion of the CN and the spinal cord.

After aortic cross-clamping, cnNIRS measurements at the mid-thoracic to the low-lumbar level rapidly decreased to a nadir at 10 minutes of distal ischaemia, with more pronounced changes in the caudal regions. High-thoracic cnNIRS remained stable (Figure 3).

Measurements for cnNIRS, CN (muscle) and spinal cord regional perfusion were significantly correlated for the mid-thoracic region downward, while high-thoracic cnNIRS and regional CN/spinal cord perfusion measurements were not.

The results showed that cnNIRS is capable of detecting relevant changes during ischaemia and reperfusion from the mid-thoracic level downwards with characteristic oxygenation patterns corresponding to CN and spinal cord regional perfusion. For clinical practice during and after extensive aortic procedures, non-invasive cnNIRS placement seems useful from the mid-thoracic (T7–T9) to the lower lumbar (L3–L5) level.

Based on these and current clinical and experimental results, the use of cnNIRS as a non-invasive indirect perfusion and oxygenation monitoring method during and after extensive aortic procedures is highly promising. Clinical trials in larger cohorts are in progress[6] and the utilisation of spinal cord monitoring is already increasing.

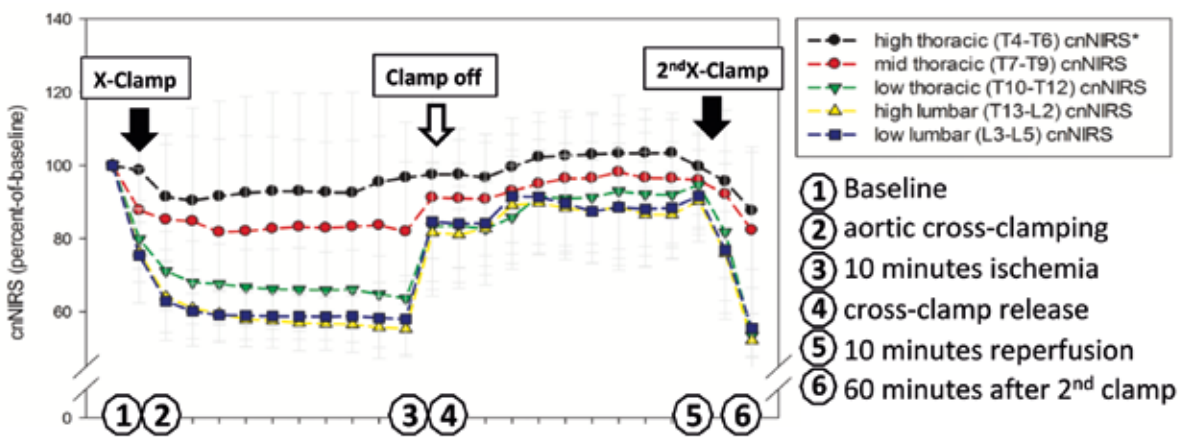


Figure 3: Graph for cnNIRS measurements prior to, during and after aortic cross-clamping, showing specific oxygenation progression throughout the experiment. Noticeable is the decrease in cnNIRS during ischaemia, which becomes more pronounced caudally.

Funded by the German Research Foundation (DFG). The authors declare no conflict of interest with regard to this study.

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Rapid Response | Cardiac | SAVR-new concepts and ideas you have not heard about before ...

Aortic valve replacement using stented or sutureless prosthesis via either full-sternotomy or a minimally invasive approach: A network meta-analysis

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In the era of transcatheter aortic valve replacement, new technologies such as sutureless prosthetic valves and surgical access via minimally invasive incisions offer a reduction in surgical trauma and/or shorter operating times for patients undergoing surgical aortic valve replacement (SAVR). However, whether these reductions in cardiopulmonary bypass (CPB) and aortic cross-clamp times, and/or the avoidance of complete sternotomy offer improved early postoperative outcomes is unknown.

We searched three electronic databases for studies comparing outcomes for full-sternotomy AVR (SAVR), minimally-invasive AVR (MiAVR), sutureless AVR (SuAVR) via full-sternotomy, and minimally-invasive SuAVR (MiSuAVR) from inception up until September 2018. Early postoperative outcomes and follow-up data were included in a Bayesian network meta-analysis using Markov chain Monte Carlo stimulation. Long-term valve reoperation data were not present in sufficient comparative studies to be directly included in the network meta-analysis, but were separately compared.

In total, 23 studies with 8,718 patients were identified, of which 4,717 patients had SAVR (4,421 were stented and 296 received sutureless prostheses) and 4,088 patients had a MiAVR (2,985 stented, 1,016 sutureless prostheses). Patients undergoing procedures via a full sternotomy were less likely to be female (41.0% vs 44.6%, $p < 0.001$), marginally but statistically significantly younger (70.4 ± 11.4 vs 70.9 ± 11.8 years, $p < 0.044$), and significantly more likely to have New York Heart Association (NYHA) Class III/IV symptoms (52.1% [877/1677] vs 43.6% (724/1661), $p < 0.0001$) compared to minimally-invasive procedures. Left ventricular ejection fraction (LVEF) was similar between the two groups (59.0 ± 10.4% [2,433] vs 59.1 ± 8.8% [3,460], $p < 0.69$).

A signal towards reduced early mortality, stroke, bleeding complications, sternal infections, and acute kidney injury was noted in both sutureless and minimally invasive techniques but did not achieve significance. CPB and cross-clamp times were significantly shorter for all sutureless procedures regardless of whether a minimally invasive or full sternotomy approach was used. The right anterior thoracotomy group demonstrated the largest reduction compared to SAVR (mean difference -31 mins for CPB and -29 mins for aortic cross-clamp).

Postoperative ventilation time was also significantly shorter for sutureless procedures, with hemi-sternotomy showing the greatest reduction compared to SAVR (mean difference -7.1 hours). Minimally invasive and sutureless procedures had significantly lower rates of new postoperative atrial fibrillation (MiSuAVR vs SAVR, OR 0.52, 95% CI 0.32–0.85 and MiAVR vs SAVR, OR 0.74, 95% CI 0.61–0.89), and demonstrated a trend towards shorter ICU length of stay, for which statistical significance was only noted with MiSuAVR (mean difference -0.6 days, 95% CI [-]0.75–[-]0.16).

Late mortality data was present for 1,859 patients (384 full sternotomy [328 stented, 56 sutureless] and 1,485 minimally invasive procedure [703 stented, 782 sutureless]. In total there were 49 late deaths (12.8%) in the full-sternotomy group and 67 (4.5%) in the minimally invasive cohort. During a mean follow-up time of 27.5 ± 19.0 months, valve related reoperations occurred in 2.7% of patients who had a stented prosthesis via minimal access surgery (15 of 546) and 0.9% who received a sutureless prosthesis (5 of 555). Although not achieving statistical significance, this signal towards lower valve-related reoperations for sutureless prostheses may provide some reassurance that new valve technologies are at least as robust as traditional stented prostheses.

In summary, we find that minimally invasive and sutureless techniques are safe alternatives to full-sternotomy AVR, while providing shorter operative times. Furthermore, these approaches demonstrate at least equivalent early postoperative outcomes to full sternotomy AVR and may reduce ventilation time, ICU length of stay and postoperative AF burden while still providing long-term survival benefits and valve durability.

Focus Session | Thoracic | TB and friends

VATS decortication for stage 3 empyema

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Stage 3 empyema is still a problem which thoracic surgeons deal with in daily practice. Traditionally, the surgical option for management of advanced stage empyema was open thoracotomy for decortication with posterolateral thoracotomy to access the chest cavity. Mini-thoracotomy and muscle sparing techniques then developed aiming to decrease post-operative pain and hospital stay.

The uniportal video-assisted thoracic surgery (VATS) approach is now taking the lead in thoracic surgery practice, transforming the way in which we operate. In order to reduce the postoperative pain and hospital stay for patients with stage 3 empyema, VATS decortication starts to become a feasible option, despite the fact that surgeons can anticipate entering a rib cage with crowded ribs, working in a narrow space and coming across extensive fibrosis and being presented with an unhealthy underlying lung. In this presentation I describe our technique on how to perform uniportal VATS decortication with special focus on tips and tricks to get inside an empyema pouch, and how to develop the right plan for your decortication.

One of the most important tricks is to start the procedure from an area away from the empyema space, and use the suction tip and a small sponge on a stick to sweep the lung away to create a space to work in. Then, as the lung peels away from the pouch, open the empyema space, remove all debris and thick pus and start to remove the visceral peel from the lung surface using the tip of the suction. We do not remove the thick partial peel as it does not interfere with lung expansion nor removal of all infected material.

This technique was that of Olgac et al., who recommend decorticating the visceral peel and leaving the parietal peel.

This theoretically led to reduced blood loss while achieving the same degree of lung inflation. Although one can argue that it can lead to late fibrothorax, we did not notice this in any of our patients. We believe that after evacuation of the irritant pus, this peel starts to improve with time: we noticed haziness on the immediate postoperative X-ray at the site of the loculation that improved in the follow-up period of 3–4 weeks.

Entering the chest from the site of a previous chest tube is sometimes needed to avoid adding more scarring. From this entry, the surgeon can go directly inside the empyema space, but care must be taken as you will need to protect the lung – you can't see any part of it until you get some peel-off. The use of a soft-tissue retractor in obese patients can help in obtaining good visibility without frequent cleaning of the lens. This is another trick that can help reduce operative time and the number of instruments needed (2 or 3) inside such a narrow space.

Complete evacuation of the space is desirable whenever possible before starting decortication as you don't want pus to be in contact with a raw surface (i.e. avoiding systemic absorption and subsequent sepsis). Good lung expansion is the best haemostasis after decortication – you can use a large gauze to have a tamponade effect until decortication is finished. We also irrigate the chest with dissolved oxygen water diluted with normal saline to achieve sterilisation and haemostasis in difficult cases.

In cases of infected malignant effusion, surgery is rarely needed but, in some patients, it can be performed if pus is organised and can't be drained by other means. It is very tough surgery and results are questionable on long-term follow-up.

Stage 3 empyema is no longer an absolute contraindication for VATS. We need to encourage a trial of VATS decortication for empyema despite the delay in presentation or radiological findings, considering that the results in most recent reports are comparable with open decortication with the benefits of reasonable operative time, hospital stay and postoperative morbidities and mortalities.

Further reading

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Abstract | Cardiac | The evolution of cardiopulmonary bypass strategies in modern cardiac surgery

Mean arterial pressure and haematocrit during cardiac surgery: is higher really better?

Tiago R. Velho, Rafael Maniés Pereira, Nuno Carvalho Guerra, Hugo Ferreira, André Sena, Ricardo Ferreira, Ângelo Nobre Cardiothoracic Surgery Department, Hospital de Santa Maria – CHLN, Lisbon, Portugal

Tiago R Velho Rafael Maniés Pereira

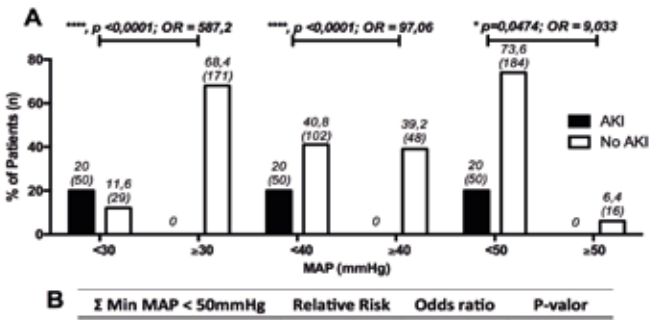
Despite all of the technological developments in cardiac surgery seen in the past years, cardiopulmonary bypass (CPB) remains an important cause of morbidity. It is an independent risk factor for acute kidney injury (AKI) and other post-operative morbidities, prolonging hospital length of stay and increasing costs. Many authors suggest that variables such as haematocrit, flow and mean arterial pressure (MAP) during CPB are still based on experience or historical practices, instead of evidence.

The aim of our study was to evaluate the influence of MAP and haematocrit during CPB on post-operative outcomes such as AKI and neurologic complications. Our study included 333 patients submitted to non-emergent aortic valve replacement between January 2016 and January 2018 and MAP values were automatically recorded during the surgery.

Analysis of the results showed that patients with at least 5 minutes of MAP under 50 mmHg had a higher incidence of post-operative AKI. The risk was even higher with periods of MAP under 40 mmHg or 30 mmHg (Figure 1A). We also observed that the risk is not only MAP dependent, but also time dependent, since longer periods with MAP under 50 mmHg had higher risk of AKI (Figure 1B). Despite our observation that all patients – including those without post-operative AKI – had a decreased glomerular filtration rate (GFR) at 24 hours, patients with periods of MAP under 30, 40 or 50 mmHg had a higher and significant reduction in GFR. On the other hand, low pre- and post-operative haematocrit levels were associated with an increased risk of neurologic complications: pre-op haematocrit ≤ 40% and post-op haematocrit ≤ 30.5% had an OR of 5.4 and 12.5, respectively. Low post-operative haematocrit was also associated with an increased risk of AKI (**, $p = 0.008$; OR 2.98).

Interestingly, our results suggest that the occurrence of AKI was more related to changes in MAP, while the occurrence of neurologic complications were more associated with low haematocrit levels.

In our work we argue that MAP and haematocrit are two essential factors that must be cautiously managed during CPB to reduce the incidence of AKI and neurologic complications. Moreover, it is not yet been established if alterations in MAP and haematocrit have long-term and definitive consequences. More studies must be initiated to establish this correlation.



B

Σ Min MAP < 50mmHg	Relative Risk	Odds ratio	P-valor
15 min	2,217	2,718	** 0,0038
20 min	2,573	3,593	*** 0,0002
25 min	2,914	4,829	*** 0,0002
30 min	3,205	6,512	*** 0,0009
35 min	4,422	24,95	*** 0,0004

Figure 1: A) Proportion of patients developing post-operative AKI with periods of MAP under 30, 40 and 50 mmHg; B) risk of post-operative AKI with cumulative periods of MAP below 50 mmHg.
OR: odds ratio, MAP: mean arterial pressure; AKI: acute kidney injury.

New EACTS Members 2019

We are pleased to confirm that we have received 301 complete EACTS Membership Applications for 2019. Please find below the list of new members elected at the General Assembly.

From now on, we are happy to receive new EACTS Membership Applications for the year 2020. Please, spread the word amongst your colleagues: **www.eacts.org/membership**

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Alam Ruhina	*United Kingdom*
Alba Alifonso Rafael	*Dominican Republic*
Alldritt Rachel	*United Kingdom*
Almeida Mussons Hedylamar	*Germany*
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Ghibu Philippe	*Switzerland*
Giritharan Suresh	*United Kingdom*
Gkikas Andreas	*United Kingdom*
Granov Nermir	*Bosnia and Herzegovina*
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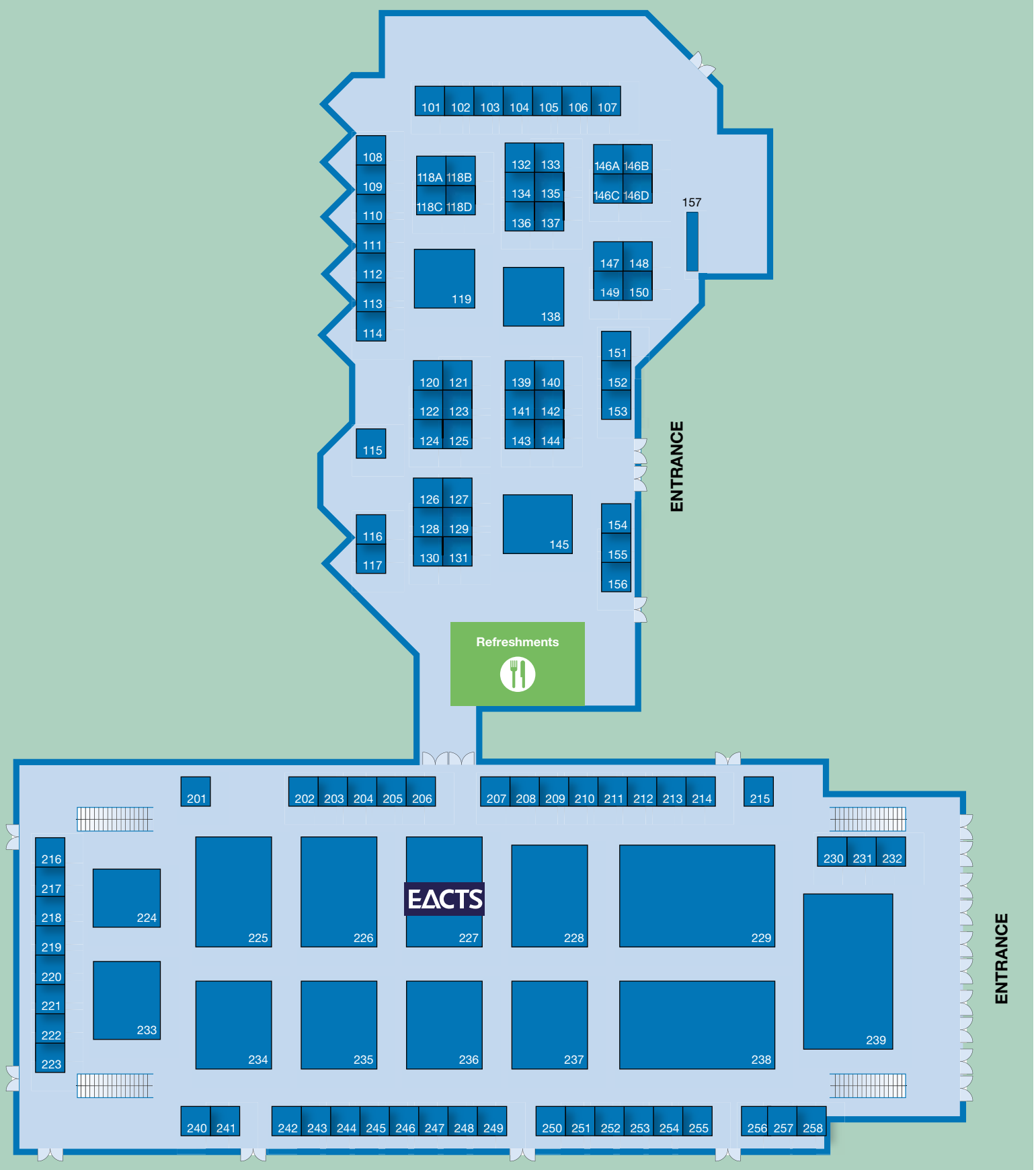
Winkler Andreas	*Austria*
Yin Kanhua	*United States*
Zerdzitzki Matthäus	*Germany*
Zevallos Andy	*Peru*
Zhou Zizi	*Germany*

Exhibition Floor Plan 2019

Exhibition opening times:

Thursday 3 October	**14:00–19:00**
Friday 4 October	**09:00–17:00**
Saturday 5 October	**09:00–17:00**



101	3-D Matrix UK Limited
121 & 123	A&E Medical Corporation
225	Abbott
106 & 107	ABIOMED Europe GmbH
111	Admedus
253	Advancis Surgical
218	American Association for Thoracic Surgery (AATS)
230	Andocor NV
248	AngioDynamics
118b	Ansabere Surgical, S.L.
244	Ascyrus Medical LLC
237	AtriCure BV
148	Aziyo Biologics, Inc.
235	B Braun Aesculap
138	Berlin Heart GmbH
142	BFW, Inc.
131	BioCer Entwicklungs-GmbH
246	Biointegral Surgical, Inc
132	Biom'up SA
110	BIOMED
252	BioStable Science & Engineering, Inc
245	Cardia Innovation AB
116 & 117	CardiaMed B.V.
120	Cardio Medical GmbH
220 & 221 & 222 & 223	Chalice Medical Ltd
103	ClearFlow, Inc.
211	CORONEO Inc
233	Cryolife Inc. / Jotec GmbH
109	Cardiac Surgery Intersociety Alliance (CSIA)
217	CTSNet
212 & 213 & 214	CytoSorbents Europe GmbH
136	De Soutter Medical Limited
143 & 144	Delacroix-Chevalier
247	Dendrite Clinical Systems Ltd
126 & 128	Dr. Franz Koehler Chemie GmbH
227	The European Association For Cardio-Thoracic Surgery (EACTS)
238	Edwards Lifesciences
122	em-tec GmbH
202 & 203	Ethicon, Johnson & Johnson Medical Devices Companies
234	Eurosets s.r.l.
215	Exstent Limited
231 & 232	Fehling Instruments GmbH & Co KG
140	Fuji Systems
145	GEISTER Medizintechnik GmbH
125	General Cardiac Technology/Heart Hugger
255	Genesee BioMedical Inc
239	Getinge
146d	Heart Valve Society
137	HeProCalc AB
135	International Society for Minimally Invasive Cardiothoracic Surgery (ISMICS)
133	Jarvik Heart Inc
118a	JOMDD Inc – Japanese Organization for Medical Device Development
240	Karl Storz SE & Co. KG
113 & 114	KLS Martin Group
236	LSI Solutions
250&251	Medela AG
224	Medistim ASA
229	Medtronic International Trading SÁRL
104 & 105	Meril Life Sciences Pvt Ltd
256	NeoChord, Inc.
146c	New Valve Technology (NVT)
124	Nordic Pharma
139	NSE North-Southern Electronics Limited
241	OmniGuide Surgical
209 & 210	OpInstruments GmbH
112	Osypka AG
219	Oxford University Press
134	Paragonix Technologies, Inc.
207 & 208	Peters Surgical
249	Qualiteam Group Ltd.
149 & 150	Redax Spa
141	Rumex International Co.
151 & 152 & 153	Scanlan International Inc
119	Siemens Healthcare GmbH
204	Portuguese Society of Cardiothoracic and Vascular Surgery (SPCCTV)
228	Spectrum Medical
115	Stille AB
216	The Society Of Thoracic Surgeons (STS)
147	Sunoptic Technologies
257 & 258	SynCardia Systems LLC
226	Terumo Aortic + Terumo Europe NV
118c & 118d	Tianjin Plastics Research Institute Co Ltd (TPRI)
201	Tianjin Welcome Medical Equipment Co., Ltd.
127 & 129	Transonic Europe B.V.
205 & 206	Vascular Graft Solutions
130	Vygon
254	Waston Medical Appliance Co., Ltd
154 & 155 & 156	Wexler Surgical, Inc. & TeDan Surgical Innovations & Designs for Vision
157	Wisepress Online Bookshop
242 & 243	Xenosys Co Ltd
108	Zeon Medical Inc
146a & 146b	Zimmer Biomet

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**Bio-Medicus™ Life Support is an investigational device that has not been approved for commercial use by regulatory agencies.

† Not available for sale in the U.S.

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