EACTS European Association For Cardio-Thoracic Surgery

Daily News

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In this issue

‘We must live in a house of glass’

On Friday, EACTS President Ruggero De Paulis stepped up to the podium to give his presidential address to a packed auditorium. After being welcomed on stage by EACTS Secretary General Domenico Pagano and Gino Gerosa, Professor De Paulis began by relaying his honour and pleasure to have served as President of the Association for the past year. “In moments like this I have a duty to thank all those who, in different ways, have worked closely with me and have contributed directly or indirectly to this achievement,” he said.

He began with an air of gratitude to the Past-Presidents of EACTS, before thanking Pieter Kappetein and Domenico Pagano for their hard work and guidance as Secretary Generals of EACTS. He then paid tribute to leading figures throughout his professional career, including Mario Morea and Jimmy Ottino from Turin, mentors during his residency, and Willem Kolff at the University of Utah. “Perhaps some of you won’t be aware, but Dr Kolff is a father of renal dialysis, the intra-aortic balloon pump, the artificial heart and many other achievements that are stamped in the history of modern medicine,” said Professor De Paulis. “He was always pushing us to think outside the box. Both he and his legacy are impossible to forget.”

From his experience in France, Professor De Paulis thanked Phillipe Deleuze and Gerard Block, who helped shape his case experience in the early days of his career. And to Rome, he honoured his former chief Luigi Chiarello for his lessons in perseverance and hard work in the face of challenging situations, as he did his current colleagues at the European Hospital. “It is because of them that I am here in front of you today,” he said. Finally, he thanked his family for their unending support.

Turning to EACTS, Professor De Paulis commented: “The passion for our work binds us together and makes it possible for an Association like this to continually grow, flourish and be cemented and nourished by our diversity – a diversity that resides in our cultures and in our stories, and in how we observe and solve problems. Different environments and different professional formations are our strength, not our weakness, and underpin our ability to innovate and improve.

> *“In the house of glass where we are all called to enter, there is no room for omissions or secrets.”*
>
> Ruggero De Paulis

“Today we are a great Association made up of a group of people who have a lot in common – much more than it seems at first sight. Even in an era of increasing inequality, we can all still share in the importance of health systems that offer free access to all citizens, giving them the right to the best available treatment.

“We are a group of surgeons selected on the basis of certain key characteristics. First, we have the ability to endure a long and demanding course of training. Second, we can tolerate long and heavy hours of work, and we can endure bitter defeats – lessons that often touch us deeply, and yet give us the ability to analyse, metabolise and overcome failures to regain our spirit and strength the very next day. Furthermore, and very importantly, we have the ability to tread that thin line between the life of the patient and our abilities to complete our task.”

Continuing a legacy

How many times did the pioneers and founders of our profession experiment with new tools? What were the ethics that guided them? What is the right state of mind to adopt when testing a new instrument or idea? These were just some of the questions Professor De Paulis posed as he looked back on the work of visionaries of the past who helped shaped what cardiothoracic surgery is today.

As he stressed, the journey from surgery’s humble beginnings at the hands of barbers to where it is now has required incredible effort, challenge and sacrifice – not least for patients – as medical professionals have striven to innovate and improve techniques, technologies and training.

With this in mind, Professor De Paulis went on to take a journey through three components of cardiothoracic surgery – the profession, innovation and ethics – with an overarching message that future practices in cardiothoracic surgery must be open and transparent.

The Profession

“When applied to medicine, ‘profession’ assumes an intrinsic and implicit meaning of vocation. And it is precisely for this reason that the medical profession has always been given a role of complete autonomy,” said Professor De Paulis.

Within society, this led to the belief that only those with medical training could make proper judgements, especially in the face of scientific and technological advances, and the patient was thus considered not competent enough to understand or participate in the medical decisions that lay ahead.

Then again, he continued, patients did not question the work of the doctor either, and this separation of ‘them and us’ was at least rooted in good intentions. “Over the years, improvement of knowledge and an increased general awareness has seen this paternalism replaced with patient autonomy and the sharing of therapeutic choices,” said Professor De Paulis.

He added: “When situations are complex, when the patient’s condition is severe, or when the risk of surgery is high, the special relationship between surgeon and patient is never more important. Patients are completely relying on their surgeon, thus are best comforted when the surgeon’s capacity, trustworthiness and integrity are clear to see.”

Unfortunately, however, over the

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Plenary | Presidential Address

‘We must live in a house of glass’

Continued from page 1

years the medical profession has been accused of having somehow abused this privilege, with outside influences creeping in to dictate regulation, and in some cases investigate possible misconduct. “In these kinds of circumstances, our Association has an opportunity to remodel dialogue with society, to step outside the operating room and invest in a clear, honest and bright relationship,” he said. “In the house of glass where we are all called to enter, there is no room for omissions or secrets.”

Innovation

Innovation has an increasingly important role to play in our wellbeing, continued Professor De Paulis. The more disruptive or ground-breaking the innovation, the faster it appears to be welcomed into practice, he added: “Just think of smartphone technology or TAVI, for example.”

As he went on, innovation often derives from a careful and constant observation of the world around us. This was definitely true of this year’s honoured polymath, Leonardo da Vinci, whose genius – just like the pioneers of surgery – relied on the ability to ask questions, observe things in a systematic and even obsessive way, absorb ideas from outside the discipline, and verify and experiment with ideas.

“However, innovation is not always successful: think of the use of lasers in ischaemic heart disease, or the advent of stentless prostheses for aortic valve replacement,” said Professor De Paulis. “Therefore it is perhaps more accurate to say that innovation is ‘a change with the potential to have an impact’.”

Ethics

“Ethics in a general sense has an independent and self-sufficient value, belonging to subjects not to a profession,” said Professor De Paulis. However, he added that the ethics of the surgeon – even more so the cardiac surgeon – differ from other medical professionals. Surgeons face immediate, palpable evidence of whether the right path has been followed, and there is no room to ponder possible considerations or to mull over personal interpretations.

Crucially, we must all remember that lying between an idea and an innovation is a patient on whom a theory must be tested, be they new surgeries, new devices or controversial therapies. As such, the ethics of advancement can be very difficult when faced first-hand.

“I faced such a situation approximately 20 years ago,” said Professor De Paulis. “I had recently created a new graft for aortic root surgery which, although it could be used in any type of aortic operation, was mainly designed to optimise valve reimplantation as described by Tirone David. After having obtained the CE mark and having performed the first clinical tests with Bentall and Remodelling interventions, I found myself one evening in front of a young Marfan patient with an acute dissection.

“Two of the three sinuses were dissected and the valve was perfect. It was a tempting opportunity to show that this was the right setting where the advantages of an anatomical reconstruction were well suited to both the age and the pathology of the patient. Unfortunately, however, both direct experience with the technique of reimplantation and the use of the new graft in this specific circumstance were minimal or absent. Yes, the surgical steps were all well clear and designed in my mind, but I lacked the confidence that is typical of an everyday practice.

“I can vividly remember the long time I remained silent and motionless thinking about whether to go ahead in the direction of what I perceived as a personal but potentially more risky scientific interest, or to follow the traditional path that seemed safer for the patient but one which would have involved the replacement of the valve with a mechanical prosthesis. In the end, and not without a great internal torment, I overcame my fears and followed the instinct that told me that, if there were no problems, it would be the most favourable choice for the patient. I’m delighted to say that things went well and, 19 years later, the valve continues to work well and the patient leads a normal life.”

At its core, Professor De Paulis’ message was that surgeons face life-and-death decisions in everyday practice, and must be prepared to carry the weight and responsbility for them if advancements are to be made. While the rules of ethics tell us that the primary interest should be the wellbeing of the patient, innovation inevitably has to include secondary interests in order to thrive.

These include the role of industry – after all, industry is instrumental in driving new generations of devices and technologies, and their relationship with doctors continues to be important in order to make sure innovation benefits from, and is nourished by, mutual competences.

Nevertheless, industry needs to generate business, and at some stage this is how the good relationship between doctors and industry was somehow infiltrated by suspicion, noted Professor De Paulis. “If it is perceived that there are intentions existing beyond the primary interest of the patient, society loses confidence in medicine, and the result is constant pressure to control the economic relationship between doctors and companies from the outside.”

“We are Europe: it is our duty to call out inequality in health systems and eradicate injustice.”

Ruggero De Paulis

For instance, support of research by industry has been a great boon wherever academic finances are limited, but it is rare that industry sponsors studies that do not feature their drugs or products. As such, there are ethical dilemmas in pursuing this kind of research in a wider manner.

“But the reverse is also true,” continued Professor De Paulis. “Too strict a regulation of these relationships can interrupt vital collaborations that were based on solid ethical ground. What is the solution? Once again it is the so-called house of glass. Relationships between industry and medicine should be transparent, free to enter, and with no shady corners.”

Professor De Paulis added that, in this context, EACTS could play a supporting and guiding role in the future, particularly in terms of helping individuals to learn how to analyse studies with a critical eye and, when the data influences our daily practice , how not to dwell on superficial readings. “We must be proficient in the study methodologies, in the statistical analyses and in the critical analysis of results,” he said.

The Association could also have an important role in conflicts of interest, he said: “What we need to improve is the manner in which we effectively manage our conflicts of interest. Managing them in a prospective way avoids restrictive practices, which can undermine the relationship between industry and cardiac surgery. If indeed there are no conclusive data to show that patients can suffer damage from conflict of interest, from studies sponsored by industry or from greater incidence of misconduct, it is also true that we must at all costs avert the public perception of unorthodox practic in the medical-industrial relationship. C again, we must live in a house of glass.

Final word

In his closing remarks, Professor De Paulis took a step back to emphasise that innovation is all well and good, but the biggest progress in cardiothoracic surgery might still have to come from addressing the huge healthcare discrepancies seen throughout the world.

“In the last few years I have had the good fortune of being involved in a commendable initiative of the Cape Town Declaration which has clearly demonstrated the need for improved access to cardiac surgery in countries where rheumatism is endemic,” said Professor De Paulis.

“Today we have talked about innovation, defining it as having impactful change, but in this case it simply shows that the use of existing standard-of-care procedures would have a profound impact. And, since it immediately improves the conditions of millions of people, it certainly can be defined as progress.

“We are Europe: it is our duty to call out inequality in health systems and eradicate injustice. Across the globe, there is no example of universality, access to care, equity and solidarity better than Europe. In our house of glass, it is necessary that each of us – at least for a few moments – turns our attention to a part of the world that could gain significant advantages from simple yet codified gestures.”

EACTS Daily News

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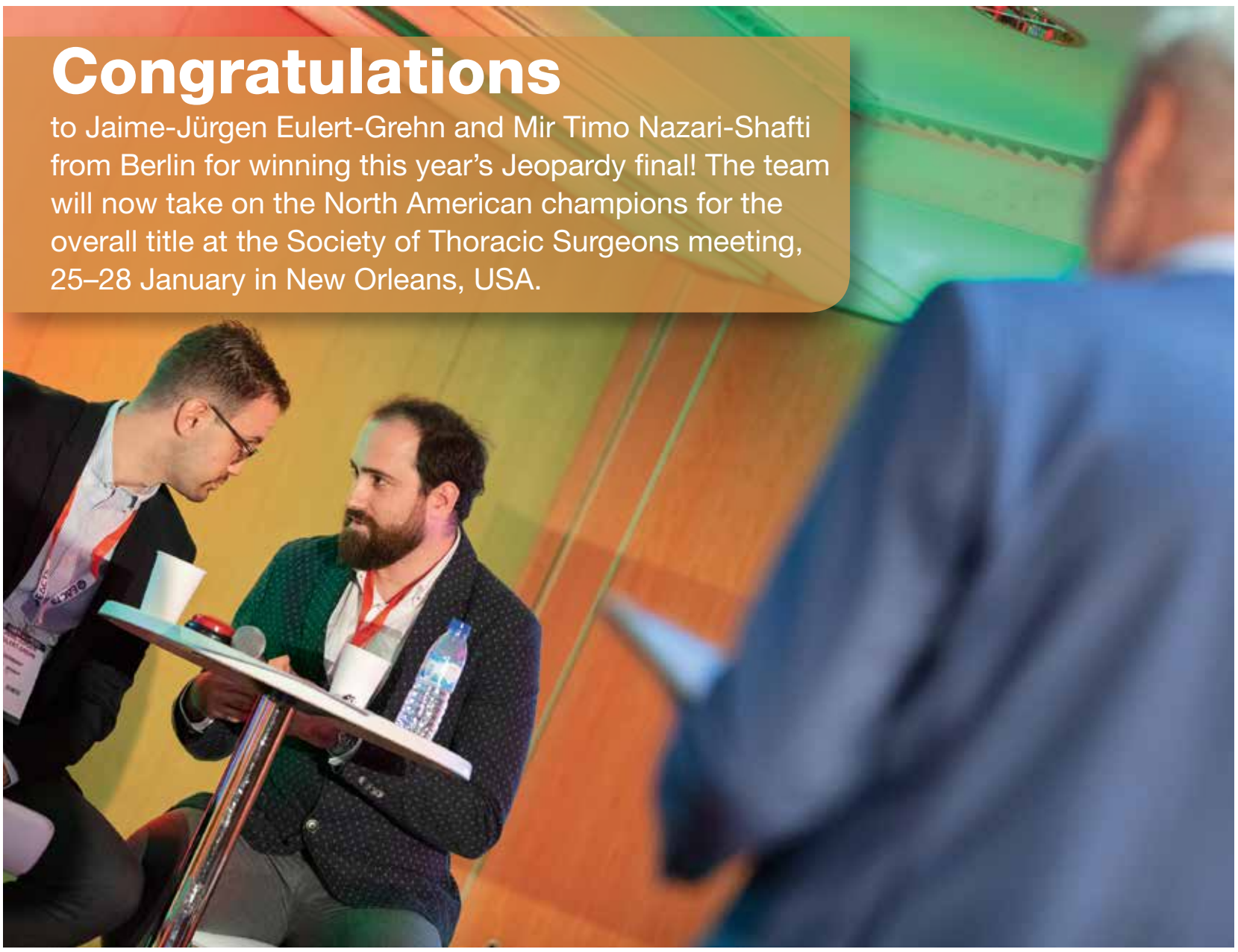
Congratulations

to Jaime-Jürgen Eulert-Grehn and Mir Timo Nazari-Shafti from Berlin for winning this year’s Jeopardy final! The team will now take on the North American champions for the overall title at the Society of Thoracic Surgeons meeting, 25–28 January in New Orleans, USA.



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Training Village

Introduction to mitral and tricuspid valve repair

Michele De Bonis San Raffaele University Hospital, Milan, Italy

The Mitral and Tricuspid Wetlab has, over the years, become a traditional appointment at the EACTS Annual Meeting. It represents a fantastic opportunity to increase knowledge and expertise in the field of mitral and tricuspid repair with a very pragmatic 'hands-on' approach.

The platform is very similar to the one which is held during the EACTS Academy 'Fundamentals' course on mitral and tricuspid surgery in Windsor. In both cases deer hearts are used because of their particularly favourable size which allows easy handling of the atrio-ventricular valves.

A very informal approach is adopted to reach a very strict interaction between the limited number of participants and the teachers. Surgical exposures of the mitral and tricuspid valves, intraoperative analysis, principals of valve repair, common as well as innovative techniques and ring annuloplasty are first demonstrated and then directly performed by the participants. The most important anatomical pitfalls during mitral and tricuspid repair are also outlined and discussed.

Trans-oesophageal echocardiography is of course essential to assess the likelihood of repair and the risk of SAM, to choose the surgical technique and to evaluate the final result. Therefore a short but intensive discussion about this tool with a 'surgical perspective' is always very well received by the attendees.

What makes this hands-on training really unique is the incredible exchange of tips and tricks coming from the individual experiences of each participant, all the while in an extremely friendly environment that leaves nothing but smiling faces.

With this spirit let us wish you an unforgettable Mitral and Tricuspid 2019 Wetlab!

The EACTS Training Village session 'Introduction to mitral and tricuspid valve repair' will take place at 11:45–15:00 today in the Training Village.

Abstract | Cardiac | SAVR - long term results, emphasis on particular sub-groups

Valve prosthesis choice in patients with end-stage renal disease dependent on dialysis: A systematic review and meta-analysis

Kevin S. Kim[1,2], Emilie P. Belley-Côté[2,3,4], Saurabh Gupta[2,5], Ali Alsagheir[2,5], Ahmad Mahkdoum[2,6], Graham McClure[7], Arjun Pandey[8], Brooke Newsome[8], Sophie W. Gao,[5], Matthias Bossard[3], Tetsuya Isayama[9], Yasuhisa Ikuta[9], Mike Walsh[2,3,4], Amit Garg[2,10], Gordon H Guyatt[2,3], Richard P. Whitlock[2,4,5] 1. Michael G. DeGroote School of Medicine, McMaster University, Hamilton, Ontario, Canada; 2. Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada; 3. Department of Medicine, McMaster University, Hamilton, Ontario, Canada; 4. Population Health Research Institute, Hamilton, Ontario, Canada; 5. Division of Cardiac Surgery, McMaster University, Hamilton, Ontario, Canada; 6. Division of Cardiac Surgery, The University of Toronto, Toronto Ontario Canada; 7. Division of Vascular Surgery, McMaster University, Hamilton, Ontario, Canada; 8. Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada; 9. Division of Neonatology, National Center for Child Health and Development, Tokyo, Japan; 10. Department of Medicine, University of Western Ontario, London, ON, Canada

Kevin S Kim

Valvular heart disease is found in 30 to 45% in patients with end-stage renal disease (ESRD) receiving chronic hemodialysis[1]. Additionally, it is diagnosed at a rate of four to five times higher, and progresses twice as fast in comparison to the general population[1,2]. Surgical valve replacement is required to avoid permanent damage from untreated valve disease, but controversy exists when choosing a prosthetic valve for these patients. No society guidelines for management of valvular heart disease provide recommendations for these patients[3-6]. We performed a systematic review and meta-analysis of outcomes of patients with ESRD who received mechanical or bioprosthetic valves.

We searched Cochrane CENTRAL, MEDLINE, and EMBASE from inception to January 2019 for studies evaluating bioprosthetic versus mechanical valves in patients with dialysis dependent ESRD. We performed screening, full-text assessment, risk of bias evaluation, and data collection independently and in duplicate. We evaluated risk of bias using the ROBINS-I tool and quality of evidence with the GRADE framework. Data were pooled using a random-effects model.

We identified no randomised controlled trials, while there were 24 observational studies (n = 9,421; 6,758 mechanical and 2,675 bioprosthetic valves) with a median follow-up of 3.5 years. Twenty studies were at high-risk of bias due to unadjusted confounding variables. We found no difference in 30-day mortality between the two prosthetic types (RR 0.80, 95% CI [0.64, 1.00], p = 0.06, I2 = 0%, reference = biological, very low quality). At latest follow-up, mechanical valves were associated with a lower risk of mortality (RR 0.80, 95% CI [0.67, 0.97], p = 0.02, I2 = 85%, very low quality evidence), but an increased risk of bleeding (RR 1.89, 95% CI [1.21, 2.96], p = 0.005, I2 = 40%, very low quality evidence) and stroke (RR 1.62, 95% CI [1.15, 2.29], p = 0.006, I2 = 0%, very low quality evidence). Valve-related complications did not differ significantly (RR 1.08, 95% CI [0.62, 1.88], p = 0.78, I2 = 0%, low quality evidence).

Outcome (reference: biological)	Number of studies	Number of Participants (N)	Effect Estimate RR (95%CI)	P-value	I^2	Quality of evidence (GRADE)
Mortality – 30 Day	12	2832	0.80 (0.64, 1.00)	0.06	0%	Very Low
Mortality – Latest Follow-up (≥6 years)	7	6369	0.80 (0.67, 0.97)	0.02	85%	Very Low
Bleeding	13	2786	1.83 (1.19, 2.84)	<0.01	36%	Very Low
Stroke	13	2870	1.62 (1.15, 2.29)	<0.01	0%	Very Low
Endocarditis	11	1006	1.59 (0.91, 2.77)	0.10	0%	Very Low
Myocardial Infarction	4	848	2.50 (0.99, 6.26)	0.05	0%	Very Low
Valve-related Complications*	11	997	1.19 (0.68, 2.11)	0.54	0%	Low

*Composite Outcome of: valve thrombosis, systemic thromboembolism, valve deterioration

Based on very low-quality evidence, mechanical valves in ESRD patients are associated with decreased risk of long-term mortality, but an increased risk of bleeding and stroke. No randomised studies inform the question. Most included studies did not address confounding or did not appropriately adjust for known confounding variables, preventing causal inference. Differences in outcome may be due to differences in baseline variables. Until higher quality evidence guides prosthesis choice in this population, physicians can discuss the results of this summary of evidence with patients to help guide the decision.

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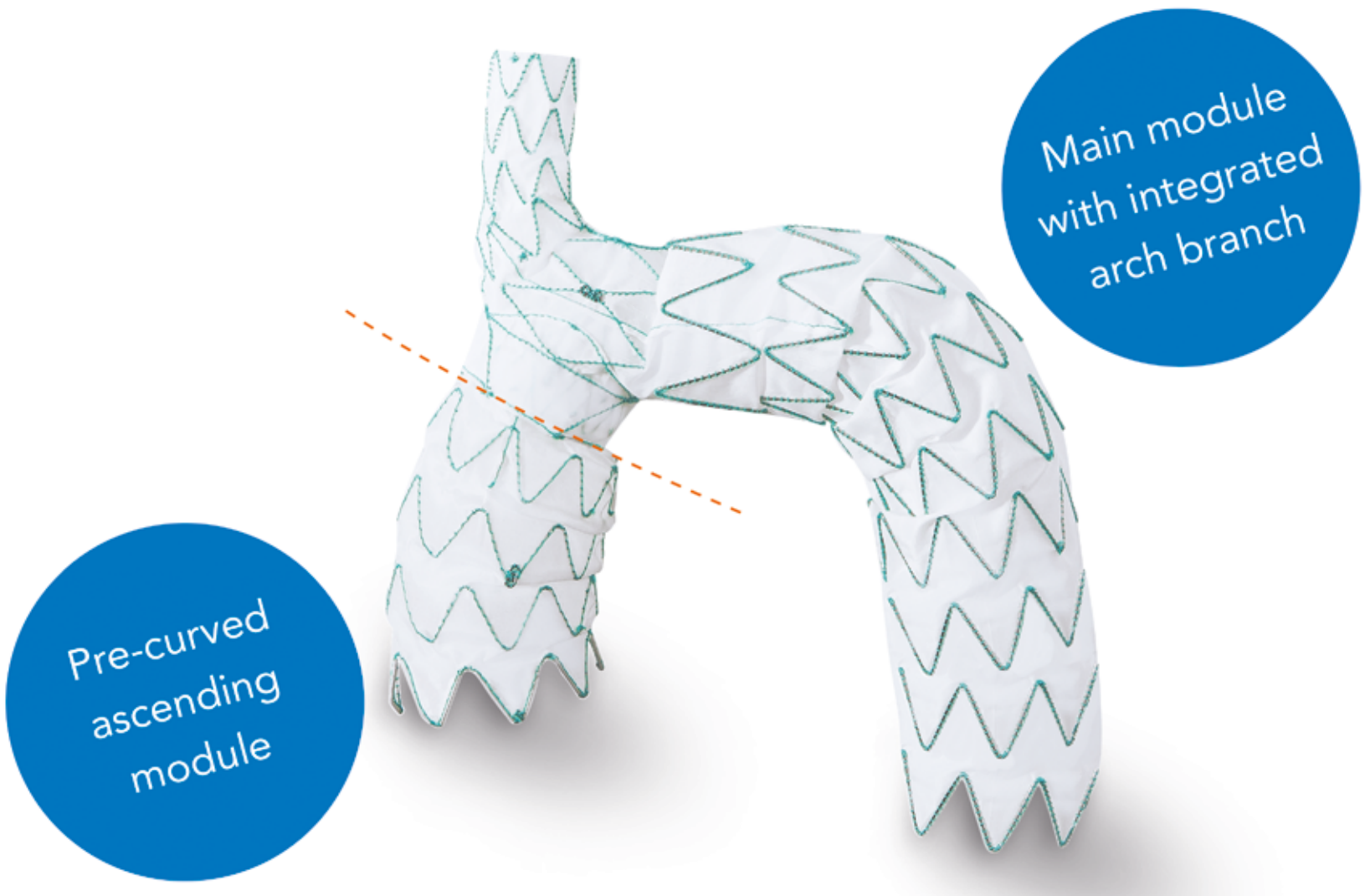

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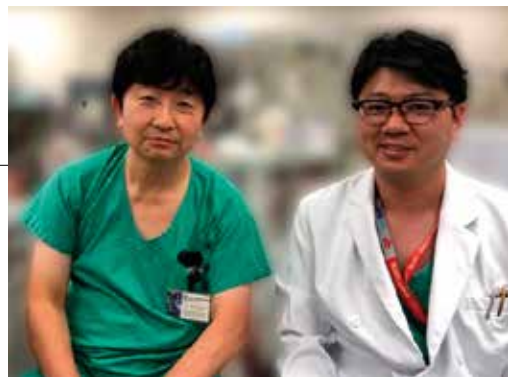
Abstract | Congenital | Congenital Videos

Closure of subpulmonary ventricular septal defect via right thoracotomy

Yasuhiro Kotani, Yosuke Kuroko, Naohiro Horio, Sachiko Kadowaki, Yasuyuki Kobayashi, Atsushi Tateishi, Shingo Kasahara Cardiovascular Surgery, Okayama University Hospital, Japan



Shingo Kasahara (left) and Yasuhiro Kotani

Figure 1

A minimally invasive approach by means of a right thoracotomy could be beneficial in terms of patients' quality of life (QOL). The purpose of this study is 1) to see the surgical outcome of congenital heart surgery performed by right thoracotomy, and 2) to show a surgical video of subpulmonary ventricular septal defect (VSD) closure via right thoracotomy.

Retrospective study was performed in 1,162 patients who underwent simple congenital heart surgery from 1991 to 2018. Of these patients, 101 (8.7%) patients had a right thoracotomy approach. Diagnosis included atrial septal defect in 90 patients, VSD in 8 patients, partial atrioventricular septal defect in 1 patient, mitral regurgitation in 1 patient, and cor triatrium in 1 patient.

Our operative technique is as follows: 1. Vertical right sub axiallary skin incision; 2. Enter through the 3rd or 4th intercostal space; 3. Use of the wound retractor to protect the skin; 4. Perfusion and drainage from chest (central cannulation). Consider femoral cannulation if patients weighing more than 30kg; 5. A catheter is placed at intercostal space at the end of operation for administration of pain medication.

There were no deaths, nor were there any cardiopulmonary bypass (CPB)-related complications. No patients required conversion to median sternotomy, and there were no blood transfusions required associated with the thoracotomy.

We present a case of four-year-old, girl with subpulmonary VSD. Briefly, the chest was entered via right 4th intercostal space (Figure 1). After establishment of CPB, the ascending aorta was cross-clamped, followed by administration of cardioplegia. The ascending aorta was opened at 1cm above the ST-junction. The VSD was confirmed just below the right coronary cusp (Figure 2) and then closed with two pairs of 5-0 sutures. Figure 3 shows the wound which is hidden under the arm. Technical tips and pitfalls will be shown in the presentation.

In conclusion, minimally invasive approach is now proposed as the first choice of surgery in most of simple congenital heart defects. Our result showed that right thoracotomy approach can be performed without having a longer myocardial ischemic time compared to median sternotomy. Extended anatomic indication, such as subpulmonary VSD should be considered, if surgery can be performed without any complications.

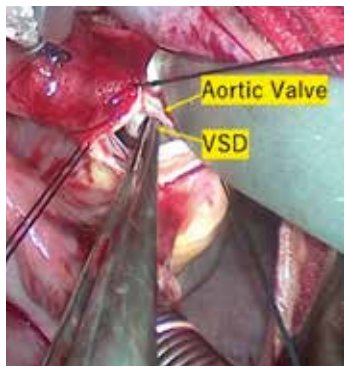
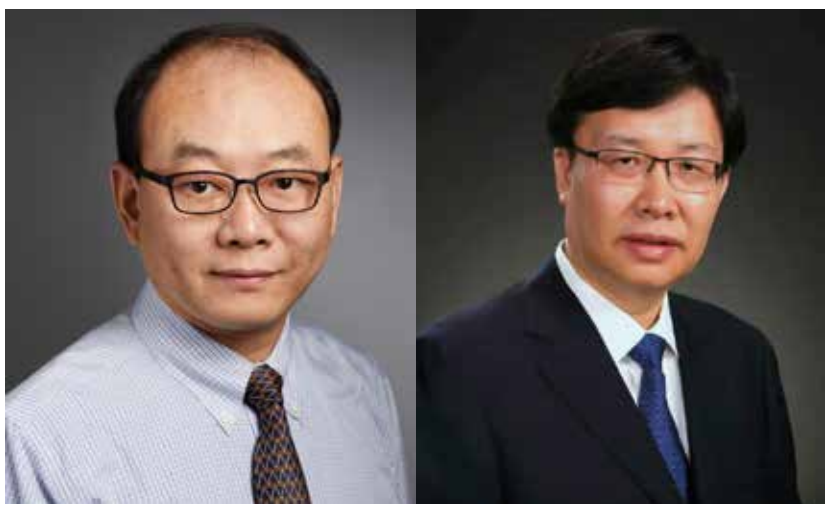


Figure 2

Figure 3

Focus Session | Vascular | MMCTS video session– Challenging aortic cases

Aortic dissection in pregnant women with Marfan syndrome: Clinical experience in 30 patients over two decades



Wei-Gup Ma (left) and Jun-Ming Zhu

Jun-Ming Zhu, Wei-Guo Ma, Yu Chen, Zhi-Yu Qiao, Yi-Peng Ge, Cheng-Nan Li, Jun Zheng, Yong-Min Liu, Li-Zhong Sun Department of Cardiovascular Surgery, Beijing Anzhen Hospital, Capital Medical University, Beijing, China

Despite its rarity, aortic dissection (AoD) in pregnancy is currently the third most frequent cause of maternal cardiovascular death, with Marfan syndrome (MFS) being the leading aetiology. However, the optimal management strategy for this rare but highly lethal catastrophe remains controversial due to the limited clinical experience. The report of Dr Zhu and associates from Beijing Anzhen Hospital represents the largest single-team experience with, and offers valuable insights into, the optimal management of AoD in pregnant MFS women.

Between 1998 and 2019, the authors managed 30 pregnant MFS women sustaining AoD (21 acute, 70%) at mean 28.3 ± 8.8 gestational weeks (GWs) aged 30.7 ± 4.3 years, including 24 type A AoDs (TAAD, 80%) and 6 type B AoDs (TBAD, 20%). Fourteen TAADs (58.3%) and 2 TBADs (33.3%) occurred in the 3rd trimester or postpartum. Mean diameter of aortic sinuses was 59.6 ± 17.5 mm and aortic size was < 45 mm in 12.5% of TAADs (3/24) and in 83.3% of TBADs (5/6), respectively.

Except for one patient treated medically who tragically died with her foetus, 23 patients with TAAD were managed surgically. Strategies included caesarean delivery at 35.4 ± 6.1 GWs, followed by aortic repair (at median delay 29 days) in 7 (29.2%); aortic repair at 18.0 ± 5.8 GWs, followed by delivery (median delay 20 days) in 6 (25%); and single-stage caesarean delivery and surgery in 10 (41.7%) at mean 32.0 ± 5.0 GWs. The respective maternal and foetal mortality rates were 28.6% (2/7) and 14.3% (1/7), 16.7% (1/6) and 83.3% (5/6), and 10.0% (1/10) and 20.0% (2/10). Of patients with TBADs, 5 was managed with delivery first (83.3%) followed by surgical repair in 2 and medical therapy in 3; respective mortality rates were 50% (1/2) and 100% (2/2) with surgery, 33.3% (1/3) and 33.3% (1/3) with medical therapy. Aortic repair was performed first in 1 patient with TBAD, followed by C-section, which resulted in mother survival and foetus death. Follow-up was available in 96.7% (range 0.1–9.3) for mean 3.0 ± 2.9 years. Survival were 75.4%, 69.6% and 62.6% at 1, 3 and 6 years for mothers, and 52.5% up to 6 years for children, respectively.

Their management decision is based on the types of AoD (surgical versus medical treatment) and gestational age (delivery or aortic repair first). For TAADs before 28 GWs, urgent surgery with close foetal monitoring (or, sometimes, abortion) is recommended. For TAADs after 28 GWs, urgent caesarean section is performed, followed by aortic repair. For TBADs, the approach is delivery first, followed by surgery or medical therapy. During the past two decades, their treatment algorithm has evolved towards the goal of saving two lives, even for pregnancies before 28 GWs. Specific intraoperative strategies include using HTK solution and normothermia or mild hypothermia, minimisng the duration of cardiopulmonary bypass (CPB), avoiding circulatory arrest before 28 GWs, and maintaining high flow rate (>2.4 L/m2 per minute) and mean arterial pressures (> 70 mm Hg). To save a foetus before 28 GWs, meticulous maintenance of haemostasis (by avoiding hypoglycaemia and hypomagnesaemia) and aggressive monitoring of foetus heart and movement are emphasised; and the HTK solution is aspirated away immediately away to prevent it from entering systemic circulation, minimising the impact of CPB on the foetus. The favourable outcomes in this cohort have proved the efficacy of the treatment algorithm of the Anzhen group, which is helpful to all physicians engaged in the care of pregnant women with MFS sustaining aortic dissection.

The game has changed – INSPIRIS valve paves way for bioprosthetics in younger patients

Five-year data on the RESILIA tissue valve in the aortic position did not show any structural valve deterioration (SVD), promising to shift the paradigm in aortic valve replacement (AVR) towards the use of bioprostheses in ever younger patients as well as offering more patient choice.

Yesterday's Edwards Lifesciences-sponsored symposium had a record turnout with nearly 400 attendees, all keen to hear the latest data on Edwards Lifesciences' valves. Experts presented the 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 issues. Speakers were Krzysztof Bartus (Poland), Sunil Ohri (UK), Christopher Young (UK) and Thierry Bourguignon (France) respectively.

Cardiac surgeon, Sunil Ohri (University of Southampton NHS Foundation Trust, Southampton, UK) took the audience through data from the combined experience of his group in Southampton with a five-year follow up that compared 2,800 implanted bioprosthetic valves of various brands. Based on these data, he said, "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," Professor Ohri asserted.

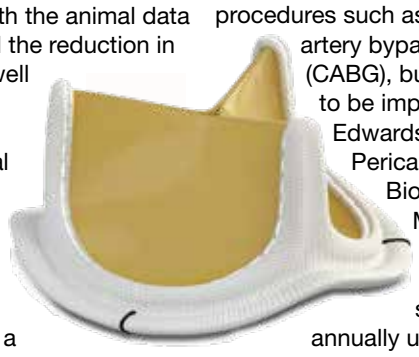
"Of our patients, 992 received isolated AVR, and our mortality for that was 0.45% which is one of the lowest mortality rates for isolated AVR," emphasised the surgeon and researcher.

"With the Edwards' valves – the PERIMOUNT or Magna Ease, we had 0% re-intervention rate/ SVD rate," he highlighted. Also, the INSPIRIS valve is TAVI-ready meaning a balloon can be inserted into the valve and it clicks open, said Professor Ohri, noting a distinct benefit with INSPIRIS.

Professor Ohri identified that there was a grey zone in choosing a bioprosthetic or mechanical valve with patients aged 60–65 years, with European guidelines noting that placing a bioprosthetic valve into a 60 year old was reasonable if the patient agreed, but that a mechanical valve should be considered in someone under 60 years, if the patient agreed.[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."

Professor Ohri asserted: "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. The ability of the INSPIRIS to be fractured and the area made bigger to implant a TAVI [transcatheter aortic valve implantation] valve is a huge advantage for patients that may return requiring TAVI intervention."



Valves with novel RESILIA tissue

Professor Bartus presented results of the 5-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, Krakow, where the professor and his colleagues have a long history of clinical trial work.

The study represents the longest-running evaluation of bioprostheses with RESILIA tissue. "We are very encouraged by the clinical outcomes," he remarked at the lunch symposium. "Through the five years of follow-up, the study showed favorable 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 avoiding the need to rinse it prior to implantation.

The prospective, single-arm, observational clinical trial lead by Professor Bartus 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.

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 reported 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.

Haemodynamic performance was good at five years with a low mean gradient (baseline 49.4 mmHg compared to 14.8 mmHg at five years), and an acceptable orifice area (with 44% of valves being 19 and 21 mm), and 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.

"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 any re-intervention will be delayed."

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 thrombotic 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. "This RESILIA tissue technology might extend the longevity of this generation of valve."

Mr Young (Guy's and St. Thomas's NHS Foundation Trust, London, UK) discussed the current guidelines and their role in determining which valves should be used in different patients. "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."

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."

Finally, Dr Bourguignon (Tours University Hospital, Tours, France) took to the podium to 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.

He also briefly discussed 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."

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.

Expert opinion, advice and all other information expressed represent contributors' views and not necessarily those of Edwards Lifesciences.

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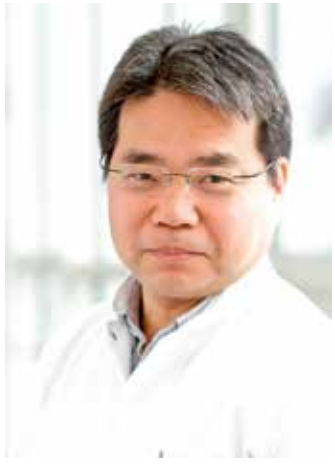
Abstract | Congenital | AVV Regurgitation in Single Ventricle Reconstruction Pathway

Tricuspid valve repair in children with hypoplastic left heart syndrome: Impact of timing and mechanism on outcome



Masamichi Ono

Nicole Piber

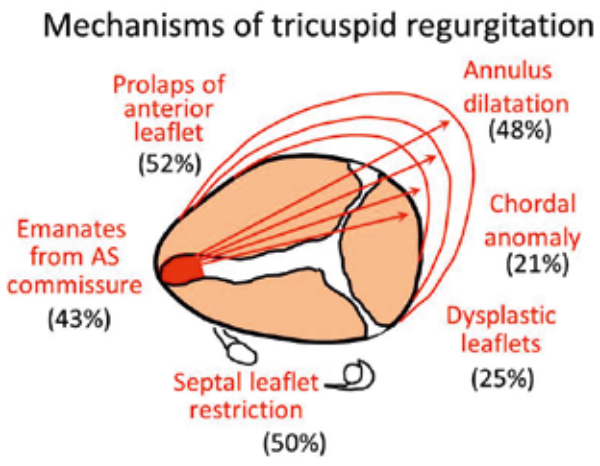


Figure 1: Mechanisms of tricuspid regurgitation in children with hypoplastic left heart syndrome.

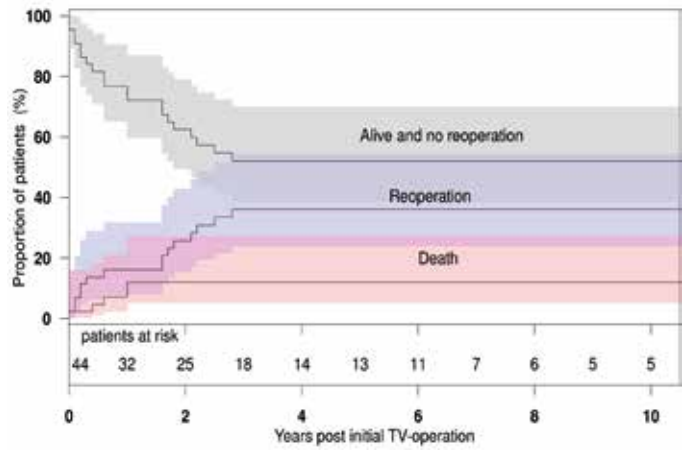


Figure 2: Competing risks of mortality and reoperation with the remaining being alive without reoperation following initial tricuspid valve repair in children with hypoplastic left heart syndrome.

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Introduction

Tricuspid regurgitation (TR) in children with hypoplastic left heart syndrome (HLHS) remains a risk for successful staged palliation. Significant TR may emerge at various points; at birth, after the Norwood procedure, after volume unloading by stage II palliation, and before or at the Fontan procedure. Previous studies have shown that mechanisms of TR in HLHS are complex and multifactorial [1], that changes in the geometry of the TV apparatus according to age have been implicated in the development of TR [2], and that tricuspid valve repair (TVr) ameliorates TR and contributes to improved outcomes in HLHS [3]. However, no standard guideline exists regarding indication, timing or surgical approach.

Objectives

Our aim was to evaluate the results of TVr in patients with HLHS during staged reconstruction focusing on the timing of the repair and the mechanisms of TR, and to analyse risk factors influencing survival, redo operation, and TV replacement.

Materials and Methods

We reviewed the medical records of 249 consecutive patients with classic HLHS who underwent a Norwood procedure at the German Heart Center Munich between 1999 and 2018, and 44 patients (18%) who underwent TVr during staged reconstruction were included in this study. Mechanisms of TR at the initial repair were enumerated based on operative records. Risk factors for death, redo operation and TV replacement following the initial repair were identified using Cox regression models.

Results

TVr was performed before stage II (BCPS) in 4 patients (9.1%), concomitant with stage II (BCPS) in 23 (52.3%), between stage II and stage III (Fontan) in 3 (6.8%), and concomitant with Fontan in 14 (31.8%). The median age at initial TVr was 5 (3 to 19) months. Preoperatively, 27 patients (61%) had moderate TR and 17 (39%) had severe TR.

Table 1: Mechanisms of tricuspid regurgitation at initial tricuspid valve repair.

Stage	Variable N (%)	Norwood or post	At BCPS	Post BCPS	Fontan
Number of patients	44	4 (9.1)	23 (52.3)	3 (6.8)	14 (31.8)
Site of regurgitation					
Central	16 (36.4)	2 (50)	6 (26.1)	3 (100)	5 (35,7)
AS commissure	21 (42.7)		14 (60.9)	1 (33.3)	6 (42.9)
AP commissure	9 (20.5)	1 (25)	6 (26.1)		2 (14.3)
SP commissure	8 (18.2)	1 (25)	4 (17.4)		3 (21.4)
Primary pathology					
Annulus dilation	**21 (47.7)**	**1 (25)**	**9 (39.1)**	**3 (11)**	**8 (57.1)**
Leaflet prolapse	**27 (61.4)**	**3 (75)**	**14 (60.9)**	**1 (33.3)**	**9 (64.3)**
Anterior	23 (52.3)	2 (50)	14 (60.9)		7 (50.0)
Septal	3 (6.8)		1 (4.3)		2 (14.3)
Posterior	5 (11.4)	1 (25)	1 (4.3)	1 (33.3)	2 (14.3)
Restrictive leaflet	**24 (54.5)**	**2 (50)**	**17 (73.9)**	**1 (33.3)**	**5 (35.3)**
Anterior					
Septal	22 (50.0)	1 (25)	17 (73.9)	1 (33.3)	3 (21.4)
Posterior	7 (15.9)	1 (25)	1 (17.4)		2 (14.3)
Cleft	10 (22.8)				
Anterior	9 (20.5)	1 (25)	6 (26.1)		2 (14.3)
Septal					
Posterior	1 (2.3)		1 (4.2)		
Dysplastic leaflet	**11 (25.0)**		**5 (21.7)**	**1 (33.3)**	**6 (42.9)**
Anterior	8 (18.2)		3 (13)		5 (35.7)
Septal	9 (20.5)		3 (13)	1 (33.3)	6 (42.9)
Posterior	10 (22.7)		4 (17.4)		6 (42.9)
Chordal anomalies	**9 (20.5)**		**5 (21.7)**	**1 (33.3)**	**3 (21.4)**
Anterior	4 (9.1)		1 (4.3)	1 (33.3)	2 (14.3)
Septal	4 (9.1)		3 (13)		1 (7.1)
Posterior	2 (4.5)		1 (4.3)	1 (33.3)	
Co-mechanisms	**35 (79.5)**	**3 (75)**	**18 (78.3)**	**2 (66.7)**	**12 (85.7)**

Table 2. Risk analysis for adverse outcome following tricuspid valve repair.

Variable	Univariate Model			Multivariate Model		
	HR	(95% CI)	p value	HR	(95% CI)	p value
Mortality						
Pre stage II (BCPS)	6.092	1.587-23.381	0.008			
Age at initial TV procedure	0.874	0.749-1.019	0.085			
Weight at initial TV procedure	0.738	0.550-0.992	0.044	0.738	0.550-0.992	0.044
Reoperation						
TR pre Norwood	1.490	0.941-2.360	0.089			
TAPSE pre Norwood	0.731	0.508-1.051	0.091			
Z score TAPSE pre Norwood	0.694	0.454/1.060	0.091			
Pre stage II (BCPS)	6.813	1.286-36.086	0.024	5.510	1.063-29.620	0.042
At stage II	3.043	0.962-9.625	0.058			
TR at initial TV OP	2.393	0.860-6.663	0.095			
Age at initial TV procedure	0.912	0.840-0.990	0.027			
Weight at initial TV procedure	0.768	0.626-0.944	0.012	0.769	0.623-0.950	0.015
Restrictive septal leaflet	4.723	1.326-16.814	0.017			
Pericard patch augumentation	3.558	1.120-11.304	0.031			
TV replacement						
TR pre Norwood	2.163	1.178-3.924	0.013			
Pre stage II (BCPS)	51.762	5.104-524.94	0.001	36.917	2.165-629.63	0.013
Anterior leaflet chordal anom.	4.382	1.095-17.541	0.037			
Posterior leaflet chordal anom.	7.371	1.473-36.877	0.015			

Most commonly, TR emanated along the antero-septal (AS) commissure (n = 21, 43%). Anterior leaflet prolapse was identified in 23 patients (52%) and posed the most common pathology of TR (Table 1 and Figure 1). The second most common cause was septal leaflet restriction which was observed in 22 patients (50%). The most common surgical technique was approximation of the AS commissure (n = 27; 61%), followed by leaflet adaptation in 20 (46%) and approximation of the SP commissure in 11 (25%). Eleven patients (25%) had annuloplasty. No patient had severe TR after the initial TV surgery.

The median follow-up period after the initial TVr was 4.8 years (IQR, 2.3 to 6.7). There were 11 deaths during a median follow-up of 7.7 months (IQR, 4.3 to 19) after the initial TV surgery, and there were 15 patients who required redo TV surgeries at a median interval of 1.7 years (IQR, 0.6 to 2.2) after the initial repair. Eight patients had redo repairs, 6 had TV replacement, and 1 needed a re-replacement of a prosthetic valve. The competing risk analysis showed a five-year reoperation-free survival rate of 52.1% (Figure 2).

Results of the risk factor analysis by Cox regression model for mortality, redo surgery and TVR are shown in Table 2. Lower weight at the initial TV procedure was identified as an independent risk factor for mortality following TV surgery (p = 0.044). The univariate model identified septal leaflet restriction as a significant morphological factor in reoperation risk (HR: 5.5, p = 0.042). Correspondingly, augmentation of the septal leaflet with pericardial patch was also identified as a risk (HR: 3.6, p = 0.031). On multivariate analysis, TV surgery before stage II (HR: 5.5, p = 0.042) and lower weight at TV surgery (HR: 0.77, p = 0.015) were significant risk factors for reoperation. Anterior and posterior leaflet chordal anomalies were significantly associated with a higher risk for TVR (HR: 4.4, p = 0.037 and HR: 7.4, p = 0.015) on univariate analysis, and pre-stage II operation was a significant risk on multivariate analysis (HR: 36.9, p = 0.013).

Conclusions

TV repair is most commonly performed as a concomitant procedure during stage II palliation. Most often TR emanates from the AS commissure. Anterior leaflet prolapse and restriction of the septal leaflet are the main mechanisms of TR. Early onset of significant TR before stage II palliation was a significant risk for worse outcomes. Among morphological variables, restricted septal leaflet was identified as a risk for TV reoperation and chordal anomalies are a risk for TV replacement. Development of a refined repair technique, especially for septal leaflet restriction and chordal anomalies, is mandatory to improve outcomes.

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INSIDE LISBON

Where to go? What to do?

ROOFTOP VIEWS

SKY BAR

Sitting atop the **Tivoli Avenida da Liberdade Hotel**, this stunning venue has one of the best views over the city. Cocktails and mocktails abound, and there's light menu if you're feeling peckish.

BAR PARK

A conversion of the top floor of a multi-storey car park, **Bar Park** doesn't sound that appealing on paper, but in reality it's a hidden gem. With potted trees and plants, it's a veritable garden paradise with a front seat at Lisbon's gorgeous vista.

SILK

A 360° panorama awaits you at this swanky, upmarket bar/Japanese-restaurant in the Chiado district. Joining you will be the resident DJ who takes the party late into the night.

OFF THE BEATEN TRACK

AJUDA

Just a few kilometres Northwest of the Centro de Congressos is Ajuda, one of Lisbon's oldest neighbourhoods. It's a lot quieter than the main tourist areas, and has some absolutely beautiful sights, including the **Jardim Botânico da Ajuda** (Portugal's oldest botanical garden), the **Palácio Nacional da Ajuda** (neoclassical architecture with a museum) and the more than 100-hectare **Tapada da Ajudo** parkland.

LIVRARIA BERTRAND

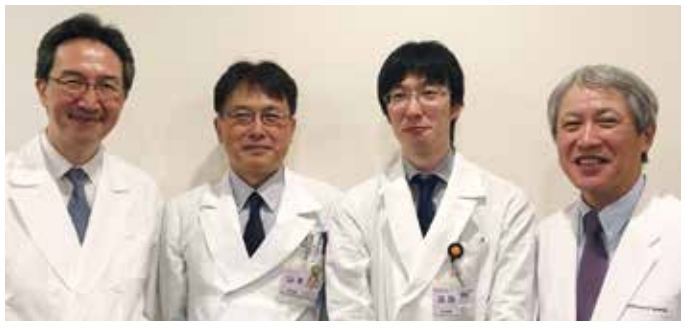
Opened in 1732, **Livraria Bertrand** is the oldest running bookshop in the world. It's open every day, so pop in, curl up on one of its cosy sofas and dust of a centuries-old classic.

FAMOUS FLEA MARKET

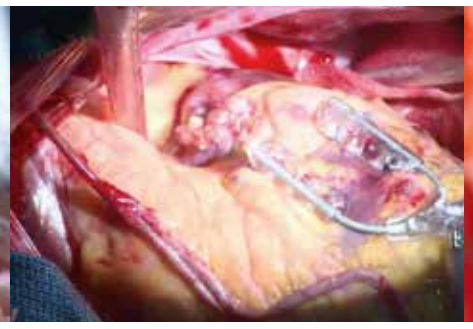
The 13th century **Feira da ladra** ('thieves market') is a must-do if you are staying a little longer in Lisbon. Open Saturdays and Tuesdays, you can be sure to pick up wonderful and weird bargains to take home.

Rapid Response | Cardiac | Approaches to minimise stroke and improve survival in atrial fibrillation patients

Five-year outcomes of surgical left atrial appendage amputation on stroke prevention in patients undergoing off-pump coronary artery bypass grafting



From left to right: Tohru Asai, Taira Yamamoto, Daisuke Endo and Atsushi Amano



Figures 1 (left) and 2: In our approach, a 4-0 polypropylene purse-string suture was placed on the neck of the left atrial appendage (LAA; Figure 1), and resected. A double-running suture was used to close the stump of the LAA (Figure 2), which was at low cost with no device used.

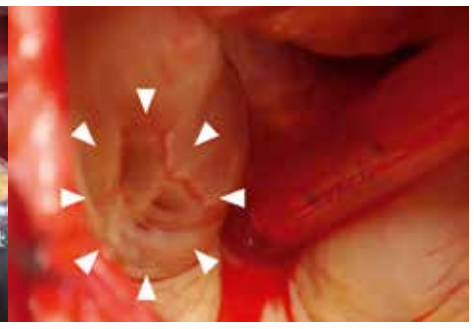


Figure 3. The endocardial scar after the surgical left atrial appendage amputation (LAAA) was smooth with no remnants.

Daisuke Endo, Taira Yamamoto, Satoshi Matsushita, Kan Kajimoto, Akie Shimada, Atsumi Oishi, Tohru Asai, Atsushi Amano Department of Cardiovascular Surgery, Juntendo University Hospital, Tokyo, Japan

Stroke is a major adverse event in patients developing atrial fibrillation (AF) after cardiac surgery. In nonvalvular AF, 90% of left atrial thrombus occurs in the left atrial appendage (LAA). Anticoagulation is a well-established treatment, but it was reported that 45% of patients who take it have difficulty continuing because of the risk of bleeding, and due to patient noncompliance within two years.[1] Percutaneous LAA occlusion has proven to be an effective alternative to oral anticoagulation in patients with nonvalvular AF. However, there are issues that have not been resolved such as device-related thrombus and peri-device leak. Among the several procedures available for surgical LAA closure, LAA amputation (LAAA) is the most reliable technique. The endocardium where the LAA is located is very smooth without a remnant (Figure 3).[2] We report five-year outcomes of surgical LAAA on stroke prevention in patients undergoing off-pump coronary artery bypass grafting (OPCAB) to confirm findings and short-term results.[3] This is the first demonstration of the effectiveness of prophylactic surgical LAAA in patients with preoperative sinus rhythm in whom 30% develop AF after OPCAB.

We analysed 1,018 consecutive patients (mean age 67 years, male 82%) undergoing OPCAB with or without concomitant LAAA from 2011 to 2017 at our institution in a prospective, observational manner. The safety and efficacy of the concomitant LAAA on preventing early (< 30 days) and overall postoperative stroke were examined. A total of 574 patients (56.4%) underwent LAAA. Preoperative characteristics, operative time, requirement of blood transfusion, and 30-day mortality were not significantly different between those with and without LAAA. The incidences of postoperative AF and early stroke were not significantly different between the groups. The incidence of overall stroke was higher in patients without LAAA than those with LAAA (4.5% vs 1.7%; p = 0.01).

In a subanalysis of patients without LAAA, early and overall stroke occurred more frequently in those developing postoperative AF than those without AF (3.0% vs 0%; p = 0.002, 9.0% vs.2.6%; p = 0.004, respectively), while in patients receiving LAAA, stroke incidences did not differ between those with and without AF. Multivariate cox proportional hazard models showed postoperative AF (Model 1) and postoperative AF without LAAA (Model 2) as the only independent positive predictor of overall stroke, respectively (OR 2.21, p = 0.03 and OR 3.11, p = 0.003). Model 1 used postoperative AF as a solitary covariable and model 2 used a combination of postoperative AF and LAAA as a covariable.

Postoperative AF was the independent risk factor of stroke. Concomitant LAAA at the time of OPCAB reduces the incidence of postoperative stroke in patients developing AF without incremental time, cost, or risk. Considering that AF is the most common arrhythmia and is frequent in the aging population, prophylactic LAAA as a routine procedure in OPCAB is beneficial.

References

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Thursday morning's packed Techno-College session

Academy

STS/EACTS Latin America Cardiovascular Surgery Conference

22–24 November 2019, Cancun, Mexico

José L Pomar Hospital Clinic and University of Barcelona, Spain; on behalf of the Programme Directors

EACTS, together with the Society of Thoracic Surgeons (STS) and our colleagues from Latin America are delighted to announce the third annual STS/EACTS Latin America Cardiovascular Surgery Conference, taking place in Cancun, Mexico this November.

Attendees can expect an outstanding educational programme spanning coronary artery disease, valvular heart disease, thoracic aortic disease, atrial fibrillation, the surgical management of heart failure and additional tracks covering congenital heart disease, research, databases, leadership and fellowships.

The conference is for young surgeons, residents and fellows from all over the world, with particularly strong links to Latin America. Cardiothoracic and cardiovascular surgeons, cardiologists, anaesthesiologists, perfusionists, physician assistants, nurses and other interested healthcare professionals are all more than welcome to attend.

Because we understand that skills are obtained not just by observing step-by-step techniques performed by masters in the field, this year we have organised wet labs and simulator training sessions led by some of the most prominent European and American specialists. These sessions will span topics including mitral, tricuspid and aortic valve operations as well as procedures of the aorta.

Throughout the proceedings we will feature smaller-format, intimate sessions (e.g. more nuanced topics for smaller audiences) alongside plenary sessions in larger auditoria where highly scientific lectures, abstract presentations and state-of-the-art keynote lectures will be showcased. Simultaneous translation will be offered during all lectures and a selected faculty will also provide the necessary translation during the hands-on sessions.

As in past years, Course Directors Joseph Bavaria and Vinod Thourani (STS), Juan Pablo Umaña and Nestor Sandoval (Colombia), Patrick Perier and myself from EACTS will head-up this important collaboration with current-, elect- and past presidents of the Mexican Society of Cardiac Surgery Alejandro Rey, José Antonio Heredia Delgado and Edgar Samuel Ramírez Marroquín, respectively.

The STS/EACTS Latin America Cardiovascular Surgery Conference is establishing itself as a very important event for our specialty around the world. Therefore, much care has been taken in selecting speakers, topics and moderators that will ensure the conference has the highest impact in the education of our young, up-and-coming colleagues.

We very much look forward to seeing you in Cancun in November!

Focus Session | Thoracic | Lung Failure (Transplantation, ECMO and pulmonary endartarectomy)

Bilateral lung transplant with cardiac repair vs combined heart-lung transplant in patients with Eisenmenger's syndrome

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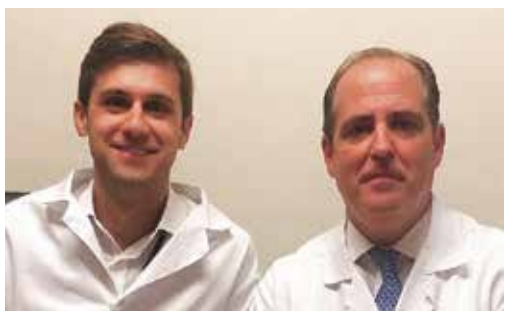

Federico Sertic (left) and Christian Bermudez

Unrepaired congenital shunts such as ventricular septal defect (VSD) and atrial septal defect (ASD) are the most frequent causes of Eisenmenger's Syndrome (ES). This condition is characterised by a reversal of flow in the shunt due to irreversible pulmonary hypertension leading to progressive symptoms. Heart-lung transplantation (HLT) and bilateral lung transplantation (BLT) with concomitant repair of the underlying cardiac defect have both been offered to patients with ES as effective curative therapies with 1-year survival ranging from 55-84%[1–5]. However, the most effective surgical approach remains controversial and the procedure may be influenced by anatomical considerations[6] and organ availability. Therefore, in this study we evaluated the outcomes of patients diagnosed with ES receiving HLT or BLT with repair of cardiac defects using a US national registry.

We queried the United Network for Organ Sharing (UNOS) registry for all adult patients with ES who underwent thoracic organ transplantation between 1987 and January 2018. We identified 316 patients who underwent HLT and 126 patients who underwent BLT with concomitant cardiac defect repair. These two groups were propensity score-matched with replacement by age, gender, BMI and type of cardiac defect.

The most common causes of ES undergoing transplantation were atrial septal defects (BLT: 44%, HLT: 25%) and ventricular septal defects (BLT: 33%, HLT: 38%). Overall survival, including all types of cardiac defects (ASD, VSD, PDA, multiple congenital abnormalities and other), was similar between the two groups undergoing BLT and HLT (p = 0.2). In the propensity-matched analysis, looking at ASD patients, we demonstrated that BLT with defect repair was associated with a better 1-year survival (BLT 88.3% vs HLT 63.3%, p < 0.01); 3-year survival (BLT 71.1% vs HLT 49.8%, p < 0.01), and 5-year survival (BLT 50.1% vs HLT 44.2%, p = 0.1; Figure 1). By contrast, matched patients with VSD have significantly better outcomes when treated with combined HLT (1-year survival: BLT 49.6% vs HLT 78.2%, p < 0.01; 3-year survival: BLT 41.2% vs HLT 63.3%, p < 0.01; 5-year survival: BLT 34.3% vs HLT 55.6%, p < 0.01; Figure 1).

As detection and management of pulmonary hypertension and congenital abnormalities have improved preventing the development of ES, few studies[2,5,7] have been able to study sizable cohorts of adult patients with unrepaired congenital heart disease. While HLT was initially the procedure of choice for all patients with pulmonary hypertension, there has a paradigm shift towards considering double or even a single LT as an alternative given lesser waiting time, fewer immunologic complications and most importantly improved resource allocation. In this study patients with ES secondary to ASD demonstrated superior outcomes after DLT alone, finding that not been clearly demonstrated previously in the limited literature available, suggesting that dual-organ transplantation (HLT) may come with additional risks in this population. On the contrary, more complex abnormalities (including VSDs) leading to ES may benefit from HLT as found in this and other studies [2]. Although considered a higher risk population, thoracic organ transplant in ES remains a viable treatment option.

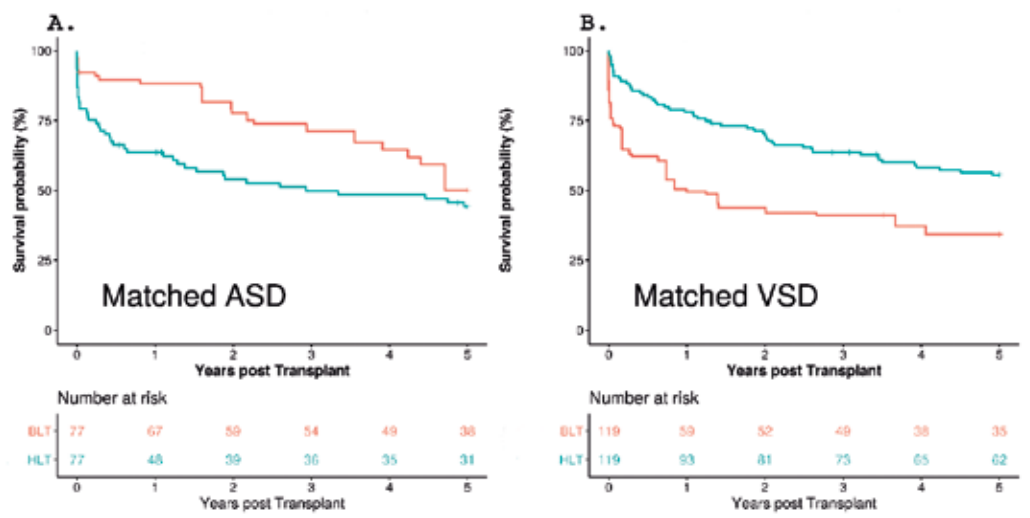

Figure 1. Five-year survival in patients (HLT vs BLT) matched by type of cardiac defect (ASD or VSD).

In patients with complex cardiac defects, including VSD, combined HLT has superior short and long-term outcomes compared to BLT with cardiac repair. In patients with simple cardiac defects, including ASD, BLT with concomitant cardiac defect repair should be considered as the first line treatment option given the organ shortage. This data may be useful when considering the major changes in organ allocation and their effect in the ES population.

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Rapid Response | Cardiac | Predicting and managing Mechanical Circulatory Support-related complications

Blood stream infection and outcomes in recipients of a left-ventricular assist device

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Philipp Angleitner

Left-ventricular assist devices (LVAD) are increasingly used for the treatment of patients with terminal heart failure. However, daily practice shows that this patient group frequently suffers serious complications, including infection, stroke, or pump thrombus.[1] A recent analysis from the International Society of Heart & Lung Transplantation (ISHLT) Registry for Mechanically Assisted Circulatory Support (IMACS) has shown that infection currently is the most frequent complication in LVAD recipients (37%).[2] The most common occurrences are non-LVAD related infections, specifically pneumonias, non-LVAD-related bloodstream infections and urinary tract infections.[2]

Our aim was to investigate the impact of ≥ 1 positive blood cultures (BC) on outcomes during LVAD support, including survival, stroke and pump thrombus rates, and the probability of receiving a heart transplant. Therefore, we performed a retrospective single centre analysis of patients receiving a continuous-flow LVAD between 2006 and 2016 at the Division of Cardiac Surgery, Medical University of Vienna (n = 257). The following three device types were implanted: Medtronic HeartWare® HVAD® (n = 156; 60.7%), Abbott (Thoratec®) Heartmate 2® (n = 63; 24.5%), and Abbott (Thoratec®) Heartmate 3™ (n = 38; 14.8%).

For statistical analysis, patients were stratified according to the presence or absence of ≥ 1 positive BC during LVAD support. Overall, 111 patients (43.2%) had ≥ 1 positive BC. The most commonly detected organisms were Staphylococcus epidermidis (14.7%), Staphylococcus aureus (13.2%), Candida parapsilosis (9.0%), Pseudomonas aeruginosa (7.8%), and Enterococcus faecalis (7.5%), among others.

Multivariable competing risks regression showed that the presence of ≥ 1 positive BC is associated with significantly reduced overall survival during LVAD support (hazard ratio [HR] 2.03, 95% confidence interval [CI] 1.35–3.05, p = 0.001). Covariates for this analysis were age, INTERMACS profile, peripheral arterial disease, bilirubin, and creatinine. Figure 1 shows the Kaplan-Meier survival curves of patients with and without ≥ 1 positive BC (Log-rank test, p = 0.004). We found no associations of positive BC with stroke (HR 1.5, 95% 0.83–2.68, p = 0.177) or pump thrombus (HR 0.84, 0.46–1.56, p = 0.586). Importantly, our analysis showed that patients with ≥ 1 positive BC had a significantly lower probability of receiving a heart transplant (HR 0.51, 95% CI 0.33–0.81, p = 0.004; adjusted for age).

Risk factor analysis demonstrated that patients with prolonged ICU stay (> 30 days) after LVAD implantation were at significantly increased risk for developing ≥ 1 positive BC (HR 2.43, 95% CI 1.58–3.73, p < 0.001). Higher preoperative levels of albumin (HR 0.97, 95% CI 0.94–1.00, p = 0.041) and haemoglobin (HR 0.88, 0.80–0.97, p = 0.009) were protective against developing a positive BC.

Our data show that the presence of ≥ 1 positive BC is associated with significantly decreased survival during LVAD support and lower probability of receiving a heart transplant. These findings are inline with an analysis from the IMACS registry, showing significantly increased mortality after two years in patients with early-onset bloodstream infection.[3] Therefore, we believe that aggressive treatment strategies should be considered in patients presenting with a positive BC, including early and effective antibiotic therapy and a low threshold towards surgical pump exchange in patients with systemic LVAD-related infections.

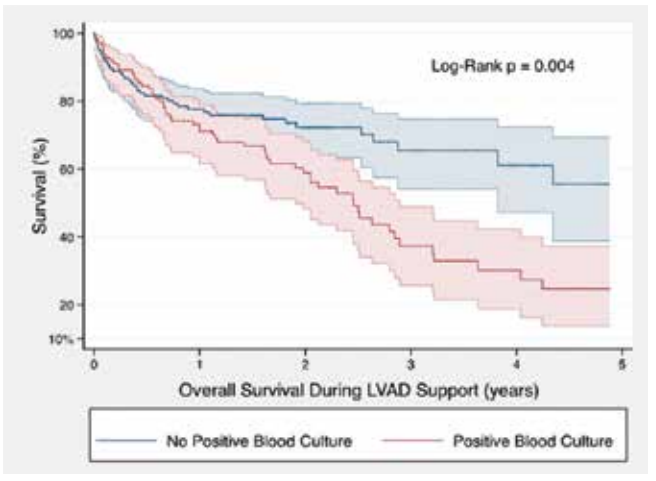

Figure 1. Kaplan-Meier survival curves of patients with and without ≥ 1 positive blood culture.

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Professional Challenge | Cardiac | EACTS-EACTA Joint Session: Repair of a regurgitant aortic valve

A direct correlation between commissural orientation and annular shape in aortic valves: a new anatomical and computed tomography classification

Ilaria Chirichilli (left) and Francesco Giosuè Irace

Ilaria Chirichilli[1], Francesco Giosuè Irace[1], Luca Paolo Weltert[1], Andrea Salica[1], Lorenzo Guerrieri Wolf[1], Samuel Fusca[2], Alessandro Ricci[1], and Ruggero De Paulis[1] 1. Department of Cardiac Surgery, European Hospital, Rome, Italy; 2. Department of Cardio-Thoracic and Vascular Sciences, University of Padua, Italy

The shape of the aortic annulus is still under debate[1-3]. Recent findings suggest a possible gradual spectrum of circularity from tricuspid aortic valves (TAVs) to Type 1 bicuspid aortic valves (BAVs) to Type 0 BAVs[4]. Commissural orientation (CO) in BAVs have been recently classified according to a symmetrical (Type A), asymmetrical (Type B) or very asymmetrical (Type C) aspect of the aortic valve depending on the angle of the non-fused cusp (160°–180°, 140°–159°, 120°–139°, respectively). This new anatomical and repair-oriented classification allows the prediction of valve repair techniques depending on the aortic valve phenotype.

The aim of our study is to verify the correlation between the phenotype of the aortic valve and the annular shape. In particular, its purpose is to demonstrate that there exists a gradual spectrum of circularity depending on the CO of the aortic valve.

We retrospectively selected 191 consecutive patients who underwent both ECG-gated contrast-enhanced computed tomography (CT) scans of the aortic root and transthoracic echocardiography between January 2016 and June 2019. We defined the CO as the angle measured on the non-fused cusp (n-FC) in BAVs and the major angle in TAVs on a short-axis view. The shape of the aortic annulus was considered "circular" or "elliptic" according to the ellipticity index (EI).

We performed statistical analysis both for overall patients and for BAV patients only, excluding patients with TAV. In both cases we intended to verify a possible correlation between the CO and the annular shape. Moreover, patients were divided in three groups according to the de Kerchove and Schäfers classification considering the amplitude of the CO: Group A (160°–180°, symmetric); Group B (140°–159°, asymmetric); and Group C (120°–139°, very asymmetric). Because of natural similarity in CO, TAVs were assimilated to 120°–139° BAVs and included in Group C. Hence, we studied the possible correlation between CO and annular shape considering the three different groups. The statistical analyses were conducted both with and without the inclusion of TAVs.

After univariate linear regression, both the analysis of overall patients (R = -0.538, R2 = 0.290, p < 0.0001) and BAV subset patients (R= -0.445, R2= 0.198, p = 0.001) showed a significant correlation between the CO and the EI. As the CO angle grows, the EI decreases and approaches a round shape. After grouping according to the CO, a mean EI of 1.10 ± 0.07 was found in Group A, 1.13 ± 0.08 in Group B, and 1.26 ± 0.09 in Group C (p < 0.0001), indicating a gradual spectrum of circularity with the increase of CO. When excluding TAV patients, in Group C the mean EI was 1.18 ± 0.07 vs 1.10 ± 0.07 in Group A and 1.13 ± 0.08 in Group B (p = 0.0097), confirming the direct correlation between CO and aortic annular shape.

In conclusion, this study confirms the expected linear correlation between the CO and the shape of the aortic annulus. In particular, the aortic annulus follows a continuous spectrum of circularity depending on the CO, starting from a perfectly circular shape for a CO of 160°–180° to an elliptical shape for a CO of 120°–139°, passing through an intermediate state for a CO of 140–159°. These findings lay the groundwork for a comprehensive new anatomical and geometric classification, while at the same time based on CO and annular shape.

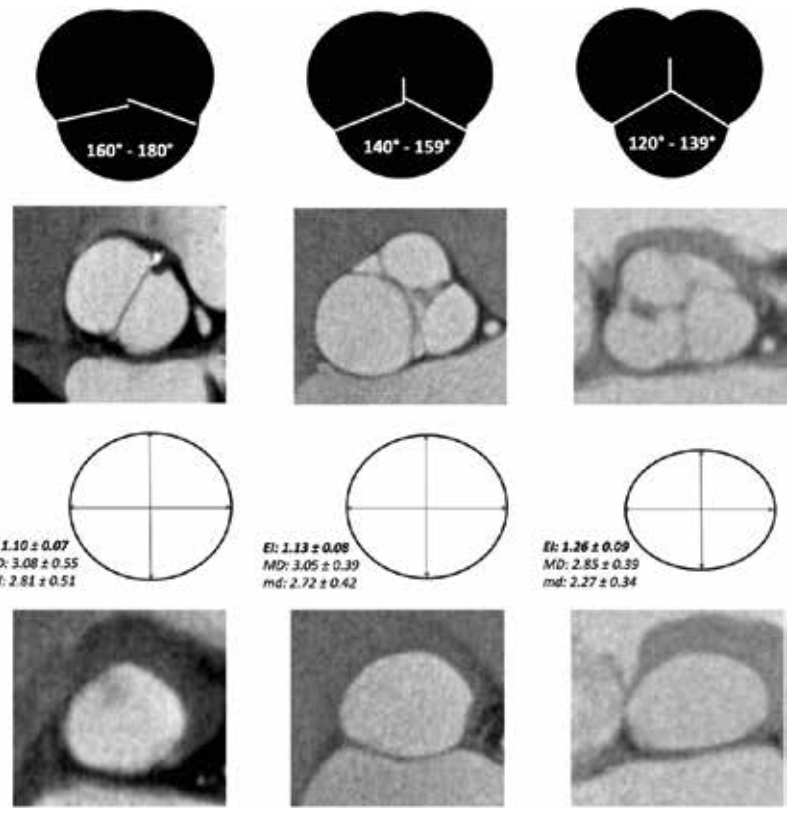

Figure 1. The new anatomical and computed tomography classification of aortic valve types, correlating the commissural orientation with the annular shape.

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Professional | Challenge Cardiac | EACTS-EACTA Joint Session: Repair of a regurgitant aortic valve

Aortic valve-sparing root replacement in patients with bicuspid aortic valve: long-term outcome with David I procedure over 20 years

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Malakh Lal Shrestha

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Aortic valve-sparing root replacement was introduced for the treatment of aortic root aneurysms in the early 1990s. Valve-sparing operations yield a sound outcome, offering the benefit of preserving the patient's native aortic valve and thereby avoiding prosthesis-associated complications. While the results are excellent in patients with tricuspid aortic valves, the long-term performance and durability of valve-sparing operations in patients with bicuspid aortic valves has been questioned and remains a subject of debate. The aim of this study was to analyse the short- and long-term outcomes in patients with bicuspid aortic valves over a time period of more than twenty years.

We retrospectively analysed a total of 582 patients who underwent aortic valve-sparing root replacement using the original reimplantation technique (David I) at our centre. Among these patients, fifty had a bicuspid aortic valve.

Bicuspid aortic valves were classified according to the Sievers classification, and we found that type 0 and type I were distributed equally. There was no perioperative death and only one patient had a permanent neurological deficit. Therefore, we feel that it is appropriate to say that aortic valve-sparing root replacement is safe and has satisfactory short-term outcome.

We also conducted a follow-up which was complete for all patients. The mean follow-up time was eleven years – a relatively long timespan which is adequate to analyse and assess long-term outcome. We compared the rate for freedom from aortic valve-related reoperation of bicuspid aortic valve patients to the reoperation rate of patients with a tricuspid aortic valve, seeing no significant difference. Therefore, we find that the long-term durability of a repaired bicuspid aortic valve is comparable to a preserved tricuspid aortic valve.

The benefit of preserving the bicuspid aortic valve has to be weighed against the risks and benefits of prosthetic graft replacement. While mechanical valve prostheses have the risk for thromboembolism, including stroke, biological valve prostheses deteriorate relatively quickly, especially in young patients. Previous studies (Chan and colleagues, Circulation, 2011) reported a 10-year rate for freedom from reoperation of 63% in middle-aged patients and 55% in patients aged 40 years or younger. This number is significantly lower than the rate of freedom from reoperation in our study, which is 82% percent. Therefore, we believe that aortic valve-sparing root replacement using David's reimplantation procedure is a useful technique especially in young patients and those with a bicuspid aortic valve.

We also performed a multivariate logistic regression analysis to identify risk factors for aortic valve-related reoperation. The only variable and risk factor for reoperation was commissure repair at the time of surgery. In our clinical practice, we have learned that this repair technique does not provide sufficient long-term durability, and therefore we have abandoned this technique.

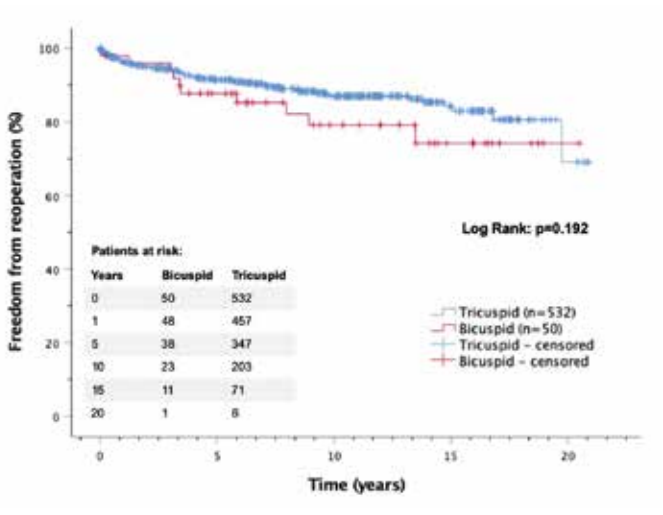


Figure 1. Freedom from aortic valve-related reoperation. Depicted are the Kaplan Meier curves for David patients with bicuspid aortic valved (red line) and tricuspid aortic valved (blue line). No significant difference was found (Log Rank test: p = 0.192).

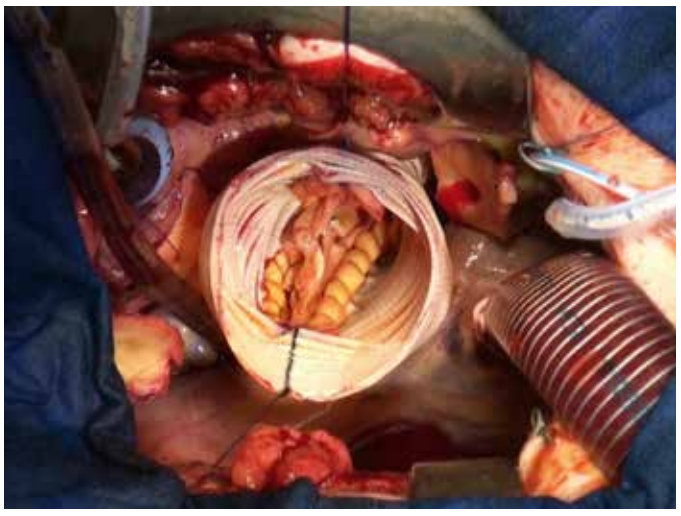
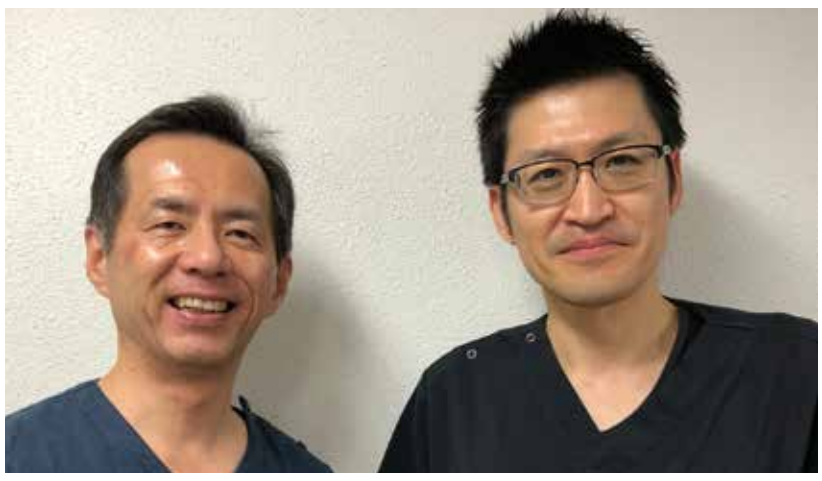


Figure 2. Operative images of David Procedure via mini-sternotomy. Bicuspid aortic valve after reimplantation into the Dacron graft, including a plication stitch to the free margin of the aortic cusp.

Rapid Response | Thoracic | Thoracic Mixed

Surgery or stereotactic body radiotherapy for metachronous lung cancer?: A propensity score matching analysis



Takeshi Nagayasu (left) and Takuro Miyazaki

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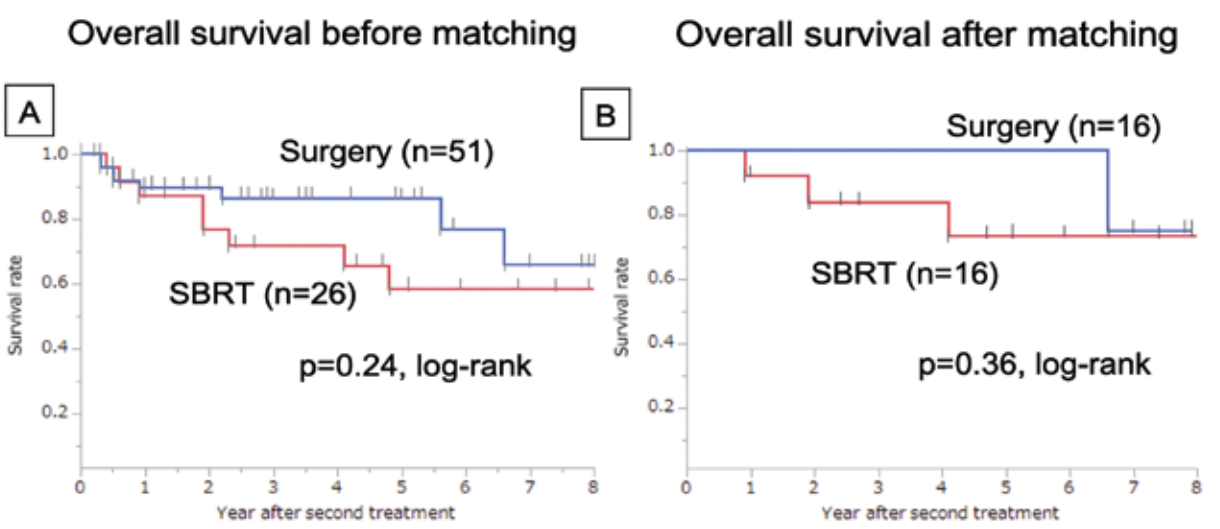

Figure 1. Overall survival of each treatment for metachronous second primary lung cancer. A) before propensity score matching (PSM); B) after PSM. SBRT = stereotactic body radiotherapy.

The incidence of metachronous second primary lung cancer (MPLC) after curative resection of primary lung cancer has been increasing due to improved surgical outcomes and early detection and postoperative surveillance of lung cancer. Thanks to advancements in chest CT, MPLC can be identified at an early stage and treated with secondary pulmonary resection.

However, surgical complications are increasing because of the decreased physical function of patients, as well as technical concerns – especially ipsilateral MPLC, which requires redo-thoracotomy. Stereotactic body radiotherapy (SBRT) has now widely been used in the treatment of early stage lung cancer, and produces equivalent outcomes to pulmonary resection. However, we believe that surgery is superior to SBRT for operable MPLC patients. Surgery can remove whole tumours (particularly relevant for large tumours), co-existing interstitial lung disease, and centrally located tumours that are not appropriate for SBRT.

In this study, we aimed to compare outcomes of MPLC patients treated either with surgery or SBRT in Nagasaki University Hospital from 2008 to 2018. Propensity score matching (PSM) was performed to reduce bias in various clinicopathological factors. The definition of MPLC was based on Martini and Melamed.

Secondary surgery was performed in 51 cases, and SBRT in 26 cases. Patient characteristics (value/median) including gender (67/65%), age (73/77 years), time from first surgery (6.2/4.7 years), first surgical procedure (lobectomy, 82/85%), second tumour size (11/12 mm), clinical stage (stage I, 96%/100%) and CEA (2.9/3.0 ng/ml) was not significant between treatment groups.

However, in the surgery group, ipsilateral secondary tumours (71/58%, p = 0.003) were significantly dominant. In addition, there was better performance status (p = 0.03), and preserved lung function (p = 0.02). Thus, surgery tended to be selected in patients of good physical function with contralateral MPLC. Before PSM, five-year overall survival (OS) after surgery (86.5%) was not significantly different compared to that of SBRT (58.5%, log-rank, p = 0.24). Nor was five-year cancer-specific survival (CSS) after surgery (85.9%) compared to that of SBRT (84.7%, log-rank, p = 0.50). Even after matching, the difference in five-year OS and CSS was insignificant between the matched pairs (100%, 84.4%, p = 0.73 and 92.9%, 92,3%, Figure 1).

This study had several limitations. Firstly, this was a retrospective study with a small sample size from a single institution. Secondly, most of the SBRT patients were histologically unproven and had an unknown lymph-node status.

In conclusion, surgery and SBRT for MPLC patients is a safe and feasible treatment option, with outcomes similar to that of SBRT. However, the compared cohort in this study does include bias, despite the use of propensity score matching. Thus, a well-designed randomised controlled trial with a large sample size is now required.

Focus Session | Vascular | Cerebral protection in aortic arch treatment

Impact of brain protection strategies on mortality and stroke in patients undergoing aortic arch repair with hypothermic circulatory arrest: Evidence from the Canadian Thoracic Aortic Collaborative

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Ali Hage (right) and Michael WA Chu

Outcomes of aortic arch repair with circulatory arrest have continued to improve; however, post-operative neurologic dysfunction and stroke remain the Achilles heel of aortic arch repair.

Contemporary trends include performing circulatory arrest at warmer temperatures and using antegrade cerebral perfusion more frequently for brain protection, although some centres still report good outcomes with more traditional techniques with deep hypothermia alone. No randomised evidence exists to guide optimal brain protection techniques, thus, we rely mostly upon small, single-centre series to guide clinical decision-making. The objective of our study was to investigate the optimal brain protection strategies when performing aortic arch repair with circulatory arrest using a large, multicentre registry.

To do so, we looked at a total of 2,520 patients who underwent aortic arch repair with hypothermic circulatory arrest (HCA) between 2002 and 2018 in 11 centres of the Canadian Thoracic Aortic Collaborative. Our primary outcomes included mortality, stroke, a composite of mortality or stroke, and a newly defined composite outcome for mortality or major morbidity (STS-COMP) including stroke, reoperation, renal failure, prolonged ventilation, and deep sternal wound infection. We performed multivariable logistic regression and propensity score matching for cerebral perfusion and nadir temperature practices in order to identify independent predictors of outcomes.

Antegrade cerebral perfusion was found on multivariable analysis to be protective against mortality (OR 0.64, 95% CI 0.48–0.86, p = 0.005), stroke (OR 0.55, 95% CI 0.37–0.81, p = 0.006), composite of mortality or stroke (OR 0.57, 95% CI 0.45–0.72, p = 0.0001), and STS-COMP (OR 0.53, 95% CI 0.41–0.67, p < 0.0001), as compared to HCA alone. Retrograde cerebral perfusion yielded similar outcomes as compared to antegrade cerebral perfusion.

When compared to HCA with nadir temperature < 24∞C, a propensity score analysis of 647 matched pairs identified nadir temperature ≥ 24∞C as predictor of lower mortality (OR 0.62, 95% CI 0.40–0.98, p = 0.04), stroke (OR 0.51, 95% CI 0.31–0.84, p = 0.008), composite of mortality or stroke (OR 0.62, 95% CI 0.43–0.89, p = 0.01), and STS-COMP (OR 0.64, 95% CI 0.49–0.85, p = 0.002).

We conclude that antegrade cerebral perfusion and nadir temperature ≥ 24∞C during HCA for aortic arch repair are independent predictors of improved survival and neurological outcomes.

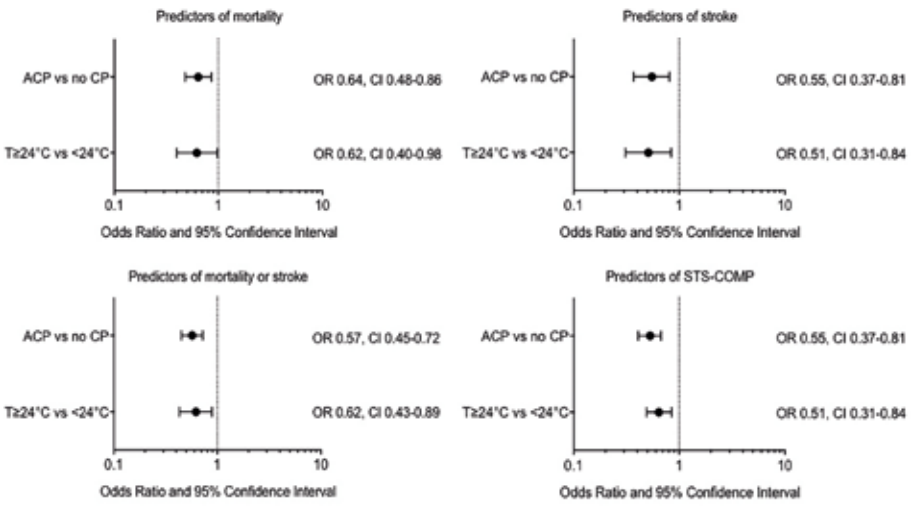

Figure 1: The effect of antegrade cerebral perfusion and moderate hypothermia (≥24∞C) during hypothermic circulatory arrest on outcomes. Circles represent the odds ratios, while ticks represent the 95% confidence intervals.

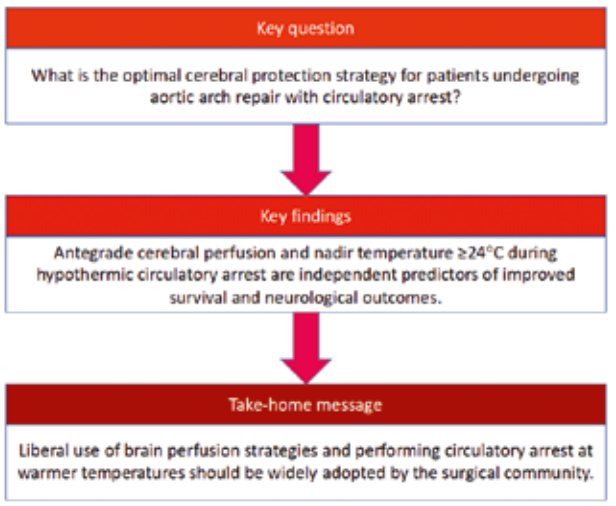

Figure 2: Schematic summary of the study.

Abstract | Cardiac | Improving outcomes by a perioperative personalized blood management

Do we undertake too many blood tests after cardiac surgery?

Sobaran Sharma, Joseph George Department of Cardiothoracic Surgery, Morriston Hospital, Swansea, UK

Post-operative cardiac surgical patients undergo intensive monitoring, including multiple serial blood testing for arterial blood gas monitoring and routine blood panels. There is increasing recognition of the total blood utilised to undertake these blood tests. Our aim in this study is to quantify the blood loss from routine blood-testing. We also evaluate the haemoglobin concentration and transfusion requirements after cardiac surgery and its financial implications.

We discovered that patients undergo a significant amount of blood testing post-operatively in routine monitoring. In our series of more than 300 patients over six months, we examined the total number of blood tests, and the volume of blood used. An average of 77 samples were taken post-operatively, from admission to intensive care to discharge from the hospital. This equated to 415 ml of blood withdrawn from the patient. Blood gas samples, though only about 1 ml, requires an additional 5 ml to be withdrawn first to clear the line, i.e. 6 ml per analysis. Thus, 240 ml on average was utilised solely on blood gas samples. This represents more than 58% of the total volume withdrawn for testing.

In addition, patients were being transfused an average of 2.8 units of red cells, though a third of patients did not require any transfusion. However, this represents not only a substantial clinical cost to the patient by way of the well-known adverse short and long-term effects of blood transfusion, but also a financial cost of £128,550 to the institution. Patients' haemoglobin concentration dropped by an average of 27 g/L.

Sobaran Sharma

Blood used for phlebotomy, when represented in units of red cells, amounts to approximately 1.5 red cell units. Although we cannot conclude on causality between phlebotomy and post-operative anaemia, we can infer that blood drawn for tests may have a significant impact on the patient's haemoglobin concentration resulting in anaemia and need for blood transfusion. We hope that any strategies or protocols for blood conservation in cardiac surgery will also scrutinise the significant impact of phlebotomy volumes. Our study is the first to report results from a European perspective and gives further insight into the potential areas where blood test volumes could be minimised.

Max Emmert receives the Techno-College Innovation Award

Abstract | Congenital | Congenital Valve

Double -root rotation: feasibility in model of structurally normal hearts

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The Ross operation is the gold-standard for management of the unrepairable aortic valve in children and young adults. However, it requires implantation of a right ventricle to pulmonary artery (RV-PA) conduit, which subsequently requires reinterventions and reoperations. A procedure that would avoid these reinterventions, while offering the benefits of the pulmonary autograft in the aortic position, would therefore be desirable.

In patients with transposition of the great arteries, ventricular septal defect (TGA-VSD) and pulmonary stenosis, double-root translocation or outflow-tract rotation has been used effectively to recycle the stenotic pulmonary valve, avoiding the RV-PA conduit necessary in a 'réparation à l'étage ventriculaire' (REV) or Rastelli procedure. We hypothesised that a similar operation could be offered for congenital aortic stenosis, however the feasibility in a structurally normal (non-TGA-VSD) heart is unknown. Furthermore, in TGA-VSD, the ventricular septal defect pushes the conduction system further away from the sub-arterial plane, protecting it during the double-root harvesting. The conduction system could be more at risk during the harvesting of these roots in a structurally normal heart than a TGA-VSD-PS heart. The aim of this study was to assess the feasibility of harvesting both roots in a structurally normal heart and to identify potential pitfalls.

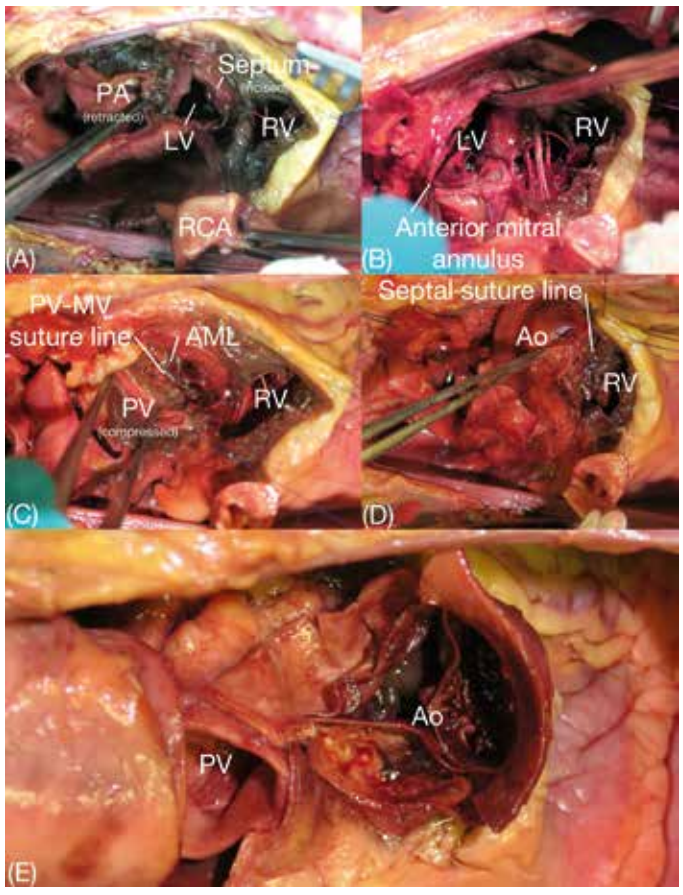

Figure 1. Fresh cadaveric double-root rotation: A) View after harvesting coronary buttons and incising the infundibulum, showing the right ventricle (RV), and starting to incise the conal septum between the two roots, giving access to the left ventricle (LV); B) view after harvesting of the two roots, showing the anterior mitral annulus and leaflet (AML), held in the forceps; C) view after rotating the roots by 180° and of the pulmonary valve (PV) – mitral valve (MV) suture line; D) the suture line is then brought around to the interventricular septum; and E) to the RV infundibulum. This last view shows the rotated roots.

* Interventricular septum. Ao: aorta; PA: pulmonary artery; RCA: right coronary artery.

Two structurally normal human donor cadaveric hearts were dissected to assess the feasibility of double-root translocation, first in a formaldehyde-fixed heart, then a fresh heart. In both specimens, the aortic and pulmonary roots were harvested en bloc. The coronary buttons were harvested from the aortic root and mobilised. A horizontal incision was made below the pulmonary valve (as in autograft procurement in the Ross procedure). The incision was extended on each side towards the aortic root. The ventricular septum was incised below the combined roots as close to the roots as feasible without damaging the leaflets and leaving enough tissue to sew to. The incision was brought around the aortic root, incising the aorto-mitral continuity.

In the fresh specimen, the roots were rotated en bloc 180%, and the pulmonary root was anastomosed to the mitral annulus with a running polypropylene suture. The suture line closed the ventricular septum to the root bloc. The aortic root was then anastomosed to the infundibulum. Harvesting was successful in both hearts, and reimplantation was technically successful in the fresh heart. Histology showed no conduction tissue in the harvested root.

This procedure may be an option in young patients with aortic valve disease candidates for a Ross procedure. Similar to a rotation of the outflow tracts, but in reverse, the dysplastic aortic valve could be recycled to the lower pressure pulmonary position, and it may avoid late reoperations on the RV-PA conduit. Experience from managing patients with tetralogy of Fallot shows that a pulmonary valve which isn't perfect, but has a gradient not too high, can be very well tolerated without requiring reoperation or reintervention. On the other hand, the durability of a homograft or other valved conduit on the RV-PA side after a Ross procedure is suboptimal.

En bloc harvesting and rotation of the outflow tracts is feasible in this adult human cadaveric model and appears to not injure the conduction system. Further clinical evaluation in animal models will ascertain if this is clinically feasible.

Rapid Response | Cardiac | Complexity in Brief: Translational Research in Cardiac Surgery

Bicuspid aortic valve: associated with aortopathy but protective for atherosclerosis?

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Juno Legué

A bicuspid aortic valve (BAV) is associated with an increased risk for aortopathy. The mechanism behind the pathological changes of the aorta in patients with BAV is still uncertain. Aortic dilatation in tricuspid aortic valve (TAV) is associated with features of cardiovascular aging, i.e. atherosclerosis, whereas the BAV aorta is characterised by immaturity of the ascending aortic wall, with a defect in differentiation of the vascular smooth muscle cells. It has been suggested that the same pathophysiological mechanism involved in the development of atherosclerosis is also involved in the progression of aortapathy in the BAV aorta.

The relationship between BAV and atherosclerosis is not yet confirmed. The purpose of this study was to evaluate the association between aortopathy in BAV and the presence of atherosclerosis in the ascending aorta and coronary arteries.

A histopathology study was conducted comparing ascending aortic wall samples of 36 BAV patients (mean age 55.8 ± 8.7, 72% male, non-dilated n = 22, dilated n = 14) with 17 TAV patients (mean age 60 ± 8.9, 82% male, non-dilated n = 7, dilated n = 10). The aortic samples were graded for seven histopathologic features, including atherosclerosis, using routine histologic stainings and immunohistochemistry[1].

The extent of coronary artery atherosclerosis was evaluated by examining computed tomography (CT) scans without contrast to calculate coronary artery calcium scores and coronary angiograms to calculate CAGE scores [2]. Coronary artery calcium scores were compared between 36 BAV patients (mean age 60.1 ± 9.79, 83% male) and 27 TAV patients (mean age 58.88 ± 21.4, 78% male) who had undergone an aortic valve or aortic root replacement. We further compared the severity of coronary sclerosis using the CAGE scores of 114 BAV patients (mean age 59.2 ± 9.37, 78% male) with 72 TAV patients (mean age 62.8 ± 15.7, 58% male).

Histopathological analysis showed that the TAV aorta had features of intimal atherosclerosis whereas the BAV aorta showed no signs of atherosclerosis (Figure 1). Mean coronary artery calcium scores were significantly lower for BAV patients compared to TAV patients (BAV 3.14 ± 3.3, TAV 7.48 ± 5.67, p = 0.00). Similarly, mean CAGE 20 and 50 scores were significantly lower for BAV patients compared to TAV patients (CAGE 20 mean BAV 0.86 ± 1.3, TAV 1.55 ± 1.8, p = 0.003; CAGE 50 mean BAV 0.39 ± 1.025, TAV 1.14 ± 1.9, p = 0.001).

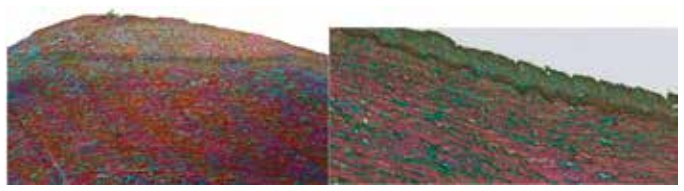

Figure 1. MOCVAT, 11x, TAV. Left, features of an intimal atherosclerosis; Right, no features of atherosclerosis.

Investigated BAV patients exhibited significantly less signs of atherosclerosis in the aorta. The CAGE scores and the CT-calcium scores were significantly lower in the BAV as compared to the TAV. It is plausible that having a BAV decreases the risk for atherosclerosis.

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Rapid Response | Cardiac | Approaches to minimise stroke and improve survival in atrial fibrillation patients

Hybrid totally thoracoscopic and catheter ablation for long standing persistent atrial fibrillation confers excellent early outcomes

Adrian Pick

Imran Khan

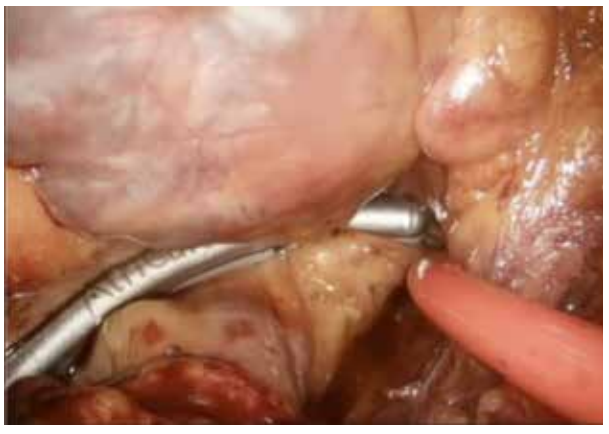

Figure 1. Bipolar clamping of the left pulmonary veins.

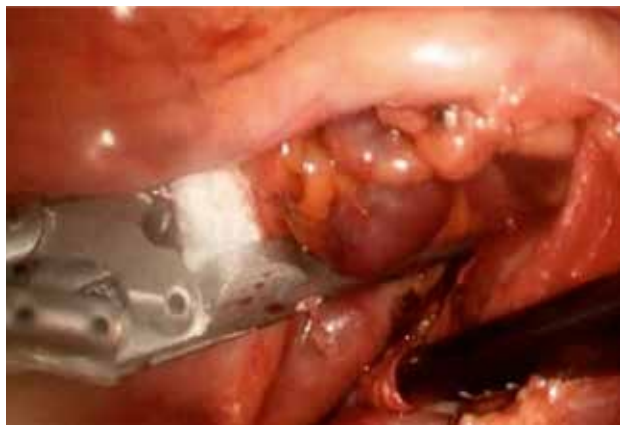

Figure 2. Application of the Atriclip to isolate the left atrial appendage.

Adrian W Pick, Imran Khan, Andrew Kroger, Emily Kotschet, Stuart Healy, David Adam, Logan Bittinger Department of Cardiothoracic Surgery, Monash Medical Centre, Clayton, Melbourne, Australia

Atrial fibrillation (AF) is now a pandemic in our ageing and expanding population. Despite Cox's development of a surgical procedure with near-universal curative success in 1987, widespread clinical practice has failed to adopt it. Meanwhile, catheter-based interventions have flourished and become the mainstay. For persistent AF, however, an isolated endocardial approach has significant limitations: procedural times can be long, the interventions are not without risk, and the outcomes are poor. By combining left atrial endocardial and epicardial interventions with staged mapping, we achieve the benefits of both approaches.

We report our first 25 consecutive patients undergoing a totally thoracoscopic (TT) maze procedure, followed at three months by electrophysiologic (EP) mapping. Selected patients had symptomatic, lone AF of greater than twelve months duration, having failed to revert despite multiple antiarrhythmic agents. Patients were excluded if they had received prior EP intervention or required additional procedures for coronary revascularisation, valvular heart disease, or thoracic surgery.

Epicardial radiofrequency lesions are constructed around both pulmonary veins and across the roof and floor to complete a "Box" lesion. The left atrial appendage is then excluded with a device (AtriClip, AtriCure Inc., USA) that also electrically isolates the base. Testing confirms lesion integrity. This unique approach requires only minimal surgical access and preserves the tenet of the "Cox Maze" lesion set, excluding only the mitral annular lesion. EP testing at three months assesses procedural success and can reinforce lesions if required.

Average patient age was 60 years (78% male). The main symptoms observed were palpitations (53%), fatigue (59%), chest pain (20%), and dizziness (23%). A history of transient ischaemic attack was recorded in only one patient.

There were no major in-hospital complications (death, stroke or left atrio-oesophageal fistula) nor conversions to sternotomy. Operative times reduced during the series from 280 to 85 minutes with increasing procedural familiarisation. Perioperative AF was observed in only three patients and, on antiarrhythmics, all patients were discharged in sinus rhythm. Fourteen of 25 patients progressed to staged EP mapping, revealing that at three months, 13 (92.85 %) were in sinus rhythm.

Connections were most common in the roof and floor lines followed by the right superior pulmonary vein (RSPV). Final mapping was able to isolate all four pulmonary veins completely. Residual connections in the floor, roof and posterior wall did not correlate with failure to achieve stable sinus rhythm, bringing into question the significance of an incomplete mapping lesion, to which we are currently directing further investigation. Mapped connections did not directly correlate with procedural failure.

Our first series of hybrid ablation for long-standing, persistent AF reports excellent early outcomes, freedom from complications and near-universal pulmonary vein isolation. Deploying the AtriClip also facilitates exclusion and electrical isolation of auricular appendage. This evolving technique allows for staged lesion confirmation and provides critical electrophysiologic feedback, enabling the surgeon to refine the surgical intervention further and progressively improve outcomes.

Table 1: Three-month EP testing results.

3 Month EP Testing	Connected	Isolated	Success	Success
14 patients				Post Ablation
LSPV	2	12	85%	100%
LIPV	2	12	85%	100%
RSPV	5	9	64%	100%
RIPV	3	11	78%	100%
ROOF	7	7	50%	93%
FLOOR	6	8	57%	100%

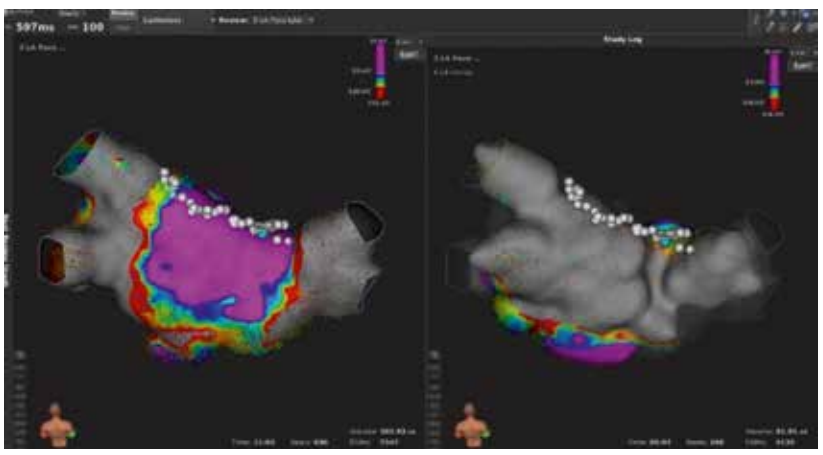

Figure 3. Voltage map post endocardial ablation along the roof.

Focus Session | Thoracic | TB and friends

Thoracoscopic approach for pulmonary non-tuberculous mycobacterial diseases

Hirohisa Kato, Hiroyuki Oizumi, Jun Suzuki, Satoshi Takamori, Kaito Sato, Mitsuaki Sadahiro Second Department of Surgery, Yamagata University, Yamagata City, Japan

Hirohisa Kato

Objectives

Non-tuberculous mycobacteriosis (NTM) has been increasing in recent years. NTM is an inflammatory disease that can lead to severe thoracic cavity adhesions, and open thoracotomy may be required for safe and curative resection. However, it is unclear whether open thoracotomy is truly essential. Thoracoscopy has increased in popularity due to its minimally invasive nature. We therefore adopted a thoracoscopic approach for NTM and evaluated our surgical outcomes.

Methods

This study involved 33 consecutive patients who underwent surgical resection and were ultimately diagnosed with NTM between June 2000 and April 2019. Pulmonary arteriovenous reconstruction was performed using a three-dimensional (3D) volume-rendering method, and the surgeon processed the 3D computed tomography (CT) image reconstruction. The surgical procedure was planned using the 3D CT reconstruction (Figure 1) and referenced during surgery. Lobectomy and wedge resection, as well as segmentectomy, were actively planned; the inter-segmental veins on 3D images and inflation-deflation line were referenced to identify inter-segmental planes for segmentectomy (Figure 2). We primarily performed thoracoscopic surgery, usually via four-port access. The extent of adhesions was classified into three categories (none, moderate, severe), while the surgical outcomes and technique selection were evaluated retrospectively.

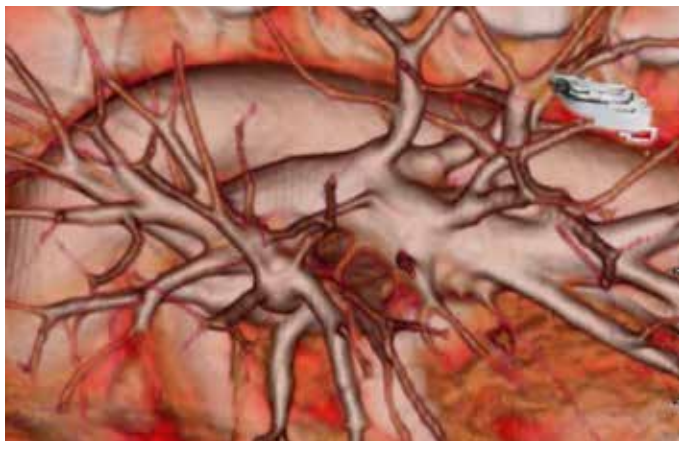

Figure 1. 3D CT reconstruction.

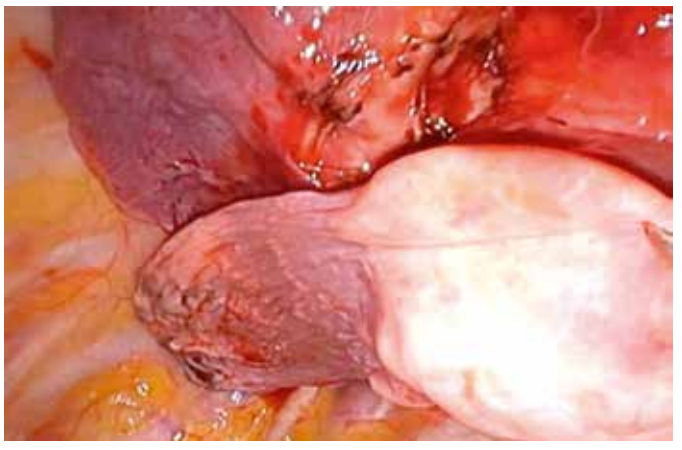

Figure 2. Thoracoscopic segmentectomy.

Results

Thirteen, nine, and eleven patients underwent lobectomy, segmentectomy, and wedge resection, respectively. Severe adhesions were observed in 3 patients, moderate in 13 patients, and none in 17 patients, respectively. Median values for the procedure were 169 minutes for surgical time (range, 34-687 minutes), 42.5 mL for blood loss (range, 0–990 mL), 1 day for the duration of chest tube placement (range, 1–5 days), and 5 days for the postoperative hospital stay (range, 2–172 days). Complications occurred in 5 patients (15.2%; prolonged air leakage: 2, others: 3). Twenty patients had cavity formation, atelectasis, disseminated shadows, or bronchiectasis on CT and underwent anatomical resections (lobectomy: 12, segmentectomy: 8).

Meanwhile, eight out of ten patients with solid nodules on CT underwent wedge resection as diagnostic surgery for indeterminate tumours. Lobectomy and segmentectomy was performed significantly more commonly for the curative resection of NTM, except in the case of solid nodules ($p < 0.001$). Finally, 31 and 2 patients underwent thoracoscopic surgery and open thoracotomy, respectively. Three out of thirty-one thoracoscopy patients (9.7%) were converted to open thoracotomy due to severe adhesion of Mycobacterium xenopi, advanced lung cancer combined by Mycobacterium avium infection, and Mycobacterium avium infection on a background of previous tuberculosis.

Conclusions

Patients with NTM exhibited a lower extent of pleural adhesion than expected, and thoracoscopy could be performed safely in most cases. Wedge resection was performed to diagnose indeterminate tumours, while segmentectomy and lobectomy were performed as curative resection for NTMs.

Rapid Response | Vascular | Do you like the elephant frozen?

Renal protective effect of aortic balloon occlusion technique in total arch replacement with frozen elephant trunk

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At present, total arch replacement (TAR) with frozen elephant trunk (FET) technique has become a routine surgical procedure to treat aortic arch disease in China[1]. In this procedure, moderate hypothermic circulatory arrest (MHCA) is inevitable, however, long-duration MHCA has great influence on distal viscera, especially for the kidney. Xiaogang Sun et al. have reported that the aortic balloon occlusion (ABO) technique shortened circulatory arrest time to approximately five minutes and made it safe to elevate temperature to 28°C.[2]

The purpose of this study was to determine whether the ABO technique provides better organ protection, especially for the kidney, when compared to MHCA in patients who underwent TAR with FET.

The ABO technique is an improvement on the conventional MHCA procedure. Patients in the ABO group were placed on cardiopulmonary bypass (CPB) by using cannulation of the right atrium and the right femoral artery. The cannulation of right axillary artery was only used for antegrade selective cerebral perfusion (SCP). Before the stented elephant trunk was released, surgical procedures were almost the same as the conventional MHCA strategy. The sheathed aortic balloon was passed through the trimmed four-branched graft (Figure 1A). Circulatory arrest temperature was set at 28°C.

Once the stent was inserted into the true lumen of descending aorta and released (Figure 1B), the aortic balloon with the sheath was deployed into the metal part of the stented graft and inflated by saline (Figure 1C). Then, perfusion of the lower body was resumed through the femoral artery and the CPB flow was gradually returned to half of the full rate. Surgeons could then reconstruct the distal aortic arch with perfusion of the lower body (Figure 1D). Following procedures were also the same in the conventional MHCA strategy.

From August 2017 to September 2018, 247 patients in the vascular surgery centres of Fuwai hospital underwent TAR with FET: 100 in the ABO group and 147 in the MHCA group. Demographics data were well matched between two groups.

The patients in ABO group underwent circulatory arrest at a warmer nasopharyngeal temperature (ABO, 27.9 ± 1.0°C vs MHCA, 24.7 ± 0.9°C, p < 0.001) and bladder temperature (ABO, 29.2 ± 1.2°C vs MHCA, 27.2 ± 1.4°C, p < 0.001) than the MHCA group. What's more, circulatory arrest time of the ABO group was significantly shorter than in the MHCA group (ABO, 5.2 ± 3.1 min vs MHCA, 17.9 ± 3.1 min, p < 0.001).

In the ABO group, peak post-operative SCr values were significantly lower than the MHCA group (ABO, 149.0 ± 83.5 μmol/L vs MHCA, 180.5 ± 108.1 μmol/L, p = 0.008). According to KDIGO criteria, the distribution of acute kidney injury (AKI) grade after operation was discrepant between the two groups (p = 0.04). More patients in the ABO group avoided suffering from AKI (ABO, 33% vs MHCA, 23.1%) and more patients in the MHCA were diagnosed with high-grade (Grade 2 and Grade 3) AKI (ABO, 21% vs MHCA, 32%).

The number of patients diagnosed with AKI Grade 1 was similar between two groups (ABO, 46% vs MHCA, 44.9%). In multivariable logistic regression, the ABO technique was proved to be a protective factor for postoperative AKI. The main protective mechanism of the ABO technique is that this technique shortens the circulatory arrest time and improves renal perfusion.

In conclusion, the ABO technique was a practical improvement on the basis of MHCA when surgeons performed TAR with FET, and deserved to be promoted.

Corresponding author Xiaogang Sun

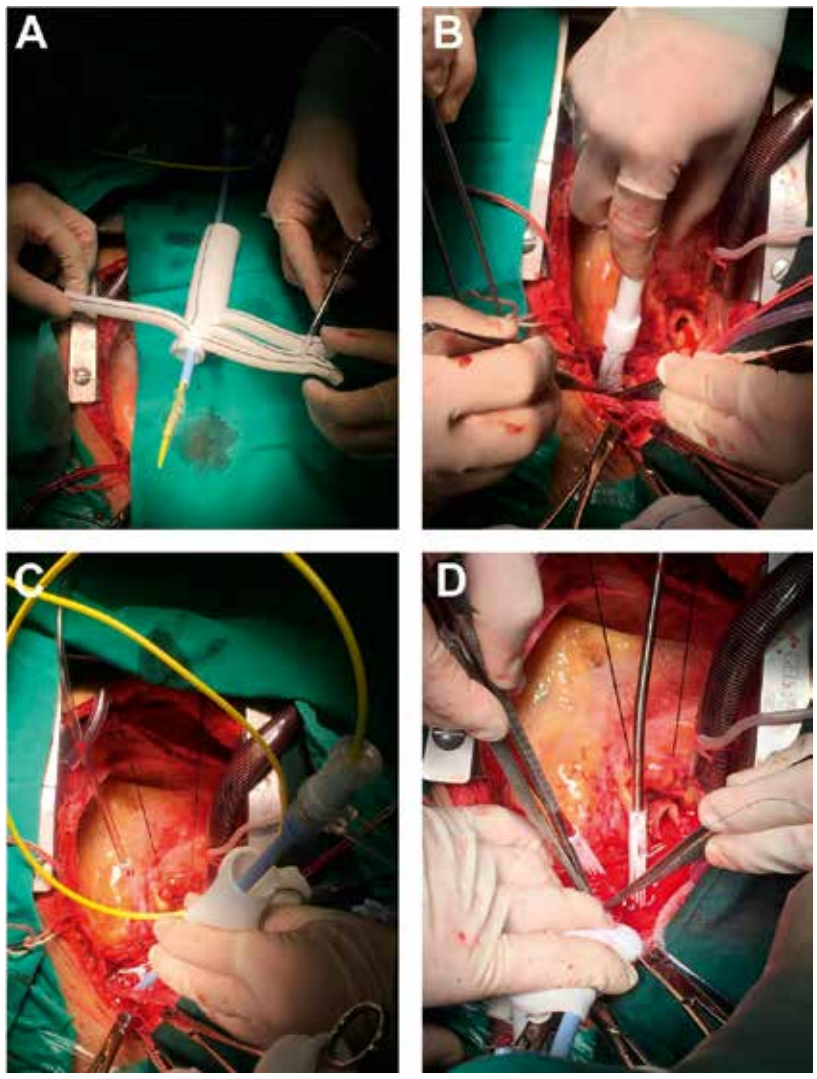

Figure 1. Aortic balloon occlusion technique.

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Abstract | Vascular Disease | Strategy and long-term results in aortic valve repair

Reimplantation for annular stabilisation in bicuspid aortic valve repair of moderately dilated aortic roots: Is it justified?

Hiroshi Tanaka1

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Bicuspid aortic valve (BAV) is a congenital anomaly which causes aortic regurgitation in young patients. Aortic valve repair for this pathology has been previously reported and has become an alternative for mechanical or bioprosthetic valve replacement. However, no standardised technique has been established for BAV repair.

The principle of BAV repair includes annular stabilisation and cusp repair. The three-dimensional functional aortic annulus – consisting of the sino-tubular junction and the ventriculoaortic junction – may be best stabilised by valve-sparing root replacement [1]. We believe the reimplantation technique brings a more secure reduction of the ventriculoaortic junction than the remodelling technique with suture annuloplasty. Valve-sparing root replacement procedures can be considered in BAV patients with root aneurysms greater than 45 mm in diameter according to the 2017 ESC guidelines [2]. We have expanded the indication for the reimplantation procedure to BAVs with moderately dilated roots (≤ 45 mm) to stabilise the annulus for the aortic valve repair. In the reimplantation of BAV, transforming the elliptical annulus to an almost circular conformation and repositioning the commissures to 180 degrees is technically feasible. This may bring better long-term durability [3] and reduce the occurrence of aortic stenosis.

Figure 1 (above). Bicuspid aortic valve with a raphe in which the angle between the commissures is 160 degrees. The annulus was elliptical.

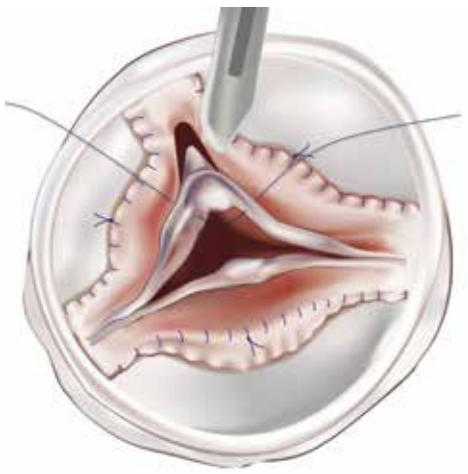

Figure 2 (right): The bicuspid aortic valve was reimplanted in the Valsalva graft. The revised conformation was close to circular. The commissures were repositioned to close to 180 degrees. The raphe was incised along the annulus and a central plication suture was placed.

Except in Sievers type 0 BAV, an additional consideration in BAV repair is how to address a fused raphe which limits the mobility of the involved cusps. To obtain sufficient mobility, we shave and remove fibrotic tissue and calcification and incise the raphe along the annulus as not to create a perforation. We then reattach the raphe as low as possible inside the graft. After confirming cusp mobility, the non-fused cusp is plicated to obtain an effective height of 9 mm [3]. The raphe is subsequently closed with plication sutures in order to adjust the free margin length of both cusps (Figure 1&2).

Within our cohort there were no hospital deaths or embolic events in the follow-up period. Five-year freedom from reoperation was 100% and five-year freedom from greater than moderate aortic regurgitation was 94 ± 4% (Figure 3). There were no significant pressure gradients (mean pressure gradient > 20 mmHg) except in one patient. Taking these results into account, reimplantation for annular stabilisation in bicuspid aortic valve repair of moderately dilated aortic roots could be justified for young patients.

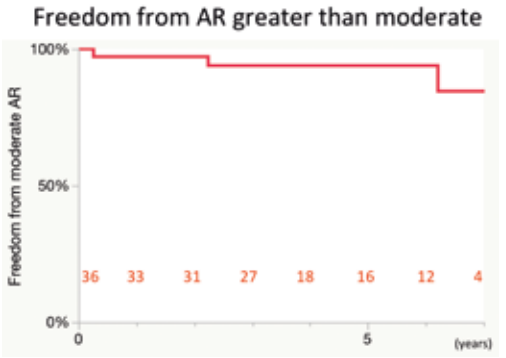

Figure 3: Freedom from greater than moderate aortic regurgitation. Five-year freedom from greater than moderate aortic regurgitation was 94 ± 4%.

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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 | Cardiac | Late Breaking Clinical Trials – Part 2

Sternal band and plate fixation superior to stainless steel wires

Alistair Royse, Doa El-Ansary, William Hoang, Lynda Tivendale, Stuart Boggett, David Canty, Yang Yang, Colin Royse Department of Surgery, The University of Melbourne and Royal Melbourne Hospital & Department of Health Professions (Physiotherapy), Swinburne University, Melbourne, Australia

A basic principle of orthopaedic surgery is that good bone healing requires minimisation of bone edge motion at a fracture site. But after sternotomy for cardiac surgery, patients are encouraged to breathe deeply and cough, making rigid bone fixation particularly difficult. In most cases, cardiac surgery uses stainless steel wire cerclage whereas wire fixation for all other forms of surgery has generally been abandoned. Why is this?

One of a number of commercially available "band and plate" fixation systems for use with sternotomy was subjected to a prospective randomised trial[1] and compared to conventional "figure of 8" stainless steel wire cerclage. Motion of the sternal edges was detected dynamically using high-frequency ultrasound video recording during coughing, and the maximum edge separation was measured at four sites of the sternum. Conventional radiologic imaging is a static test performed at rest, whereas coughing produces high intrathoracic pressure and results in a maximum distraction force acting on the sternum. Clinically, it is usually considered that moderate bone healing would have occurred by the sixth postoperative week.

Alistair Royse

Fifty patients were randomised, and after withdrawal of consent or death, 25 remained in the plates group and 22 in the wires group. There was a good match of demographic and preoperative risk factors. The EuroSCORE II for the plates group was 2.1 ± 2.5 vs 1.8 ± 2.6 for the wires group (p = 0.683). The former required more time to implant (16.2 ± 6.7 vs 12.6 ± 5.8 minutes, p = 0.045).

Figure 1. Stainless steel wires (left), Sternalock360.

Figure 2. 3D CT of "Figure of 8" wire cerclage.

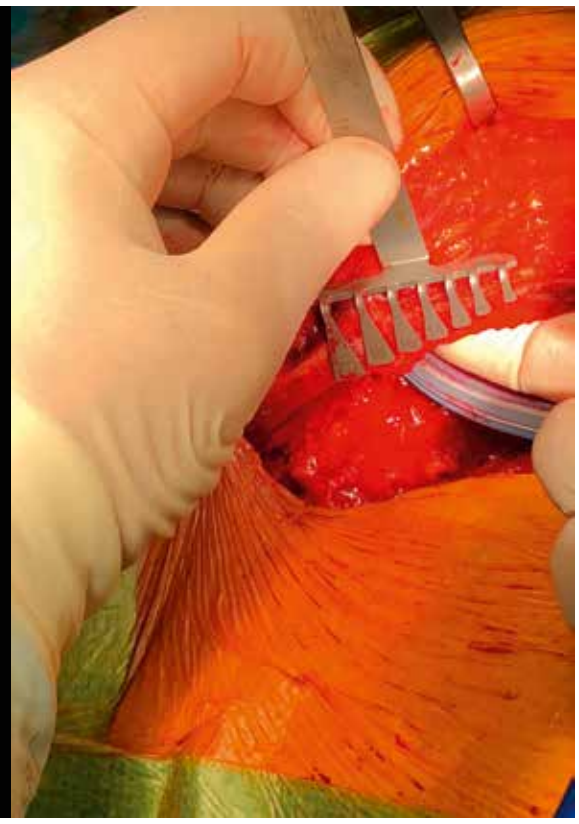


Figure 3. 3D CT of sternal band and plate.

Figure 4. Measuring screw length for sternal plate.

The primary endpoint was ultrasound-detected bone edge movement of ≥ 2 mm at ≥ 2 of 4 sites assessed, 6 weeks postoperatively. This was present in 4% and 32% of the plates and wires groups, respectively (p = 0.018).

A number of secondary endpoints were also analysed at the 12th postoperative week.

Ultrasound-detected bone edge movement was 0% for the plates group and 25% for the wires group (p = 0.014), while evidence of early bone formation or greater on CT was 21% /14% (p = 0.705). Separation of bone edges at rest on CT of ≥ 2 mm at ≥ 2 of 5 sites was 38% and 71% for the plates and wires groups, respectively (p = 0.036).

Postoperative quality of recovery score (PostopQRS) was also measured, whereby a patient is deemed "recovered" if they attain a postoperative score equal to or better than their baseline preoperative score. Overall there was no difference with recovery (71% for the plates and 52% for the wires group, p = 0.099). However, for the pain domain of the PostopQRS, there was improved recovery of 92% for the plates group and 67% for the wires group (p = 0.004).

These data suggest that the band and plate system have improved bone fixation compared to conventional stainless steel wire cerclage.

References

1. ClinicalTrials.gov. Sternalock Versus Wires for Sternal Closure Study. Available at: https://clinicaltrials.gov/ct2/show/NCT03282578.

Abstract | Cardiac | SAVR – long-term results, emphasis on particular sub-groups

Early results from a prospective European trial on decellularised allografts fo aortic valve replacement – The ARISE Study

Samir Sarikouch Hannover Medical School, Department of Cardiothoracic Surgery, Hannover, Germany

Aortic valve replacement (AVR) in children and young adult patients still constitutes a major problem as these young individuals face a difficult choice between a complex, multi-valve procedure such as the Ross-procedure and life-long medication with blood thinners and their inherent risks once a mechanical prosthesis is chosen. Decellularised aortic homografts (DAH) may constitute an additional AVR option in such patients as they hold the potential to overcome the high early failure rate of allogenic and xenogenic aortic valve prostheses in children and young adults.

In a European-Commission funded project led by the Hannover Medical School, nine hospitals, six tissue banks and an innovative bio-tech company (who provided the decellularisation service) came together for the world-wide first prospective study on cell-free allografts for aortic valve replacement (NCT02527629).[1]

One hundred and forty-four patients (99 male) were prospectively enrolled within the ARISE Study between 10/2015 and 10/2018 (mean age 33.6 ± 20.8 years); 45 % of the patients underwent previous cardiac operations. There were 2 early deaths (1 LCA thrombus on day 3 and 1 ventricular arrhythmia 5 hours postoperatively) and 1 late death due to endocarditis 4 months postoperatively, resulting in a total mortality of 2.08 %. One pacemaker implantation was necessary and 1 DAH was successfully repaired after 6 weeks for relevant early regurgitation. After a mean follow-up of 1.54 ± 0.81 years, the primary efficacy endpoints of peak gradient (mean 11.8 ± 7.5 mmHg) and regurgitation (mean 0.42 ± 0.49, Grade 0–3) were excellent. At 2.5 years, freedom from explantation/endocarditis/bleeding/stroke were 98.4 ± 1.1 / 99.4 ± 0.6 / 99.1 ± 0.9 / and 99.2 ± 0.8%, respectively.

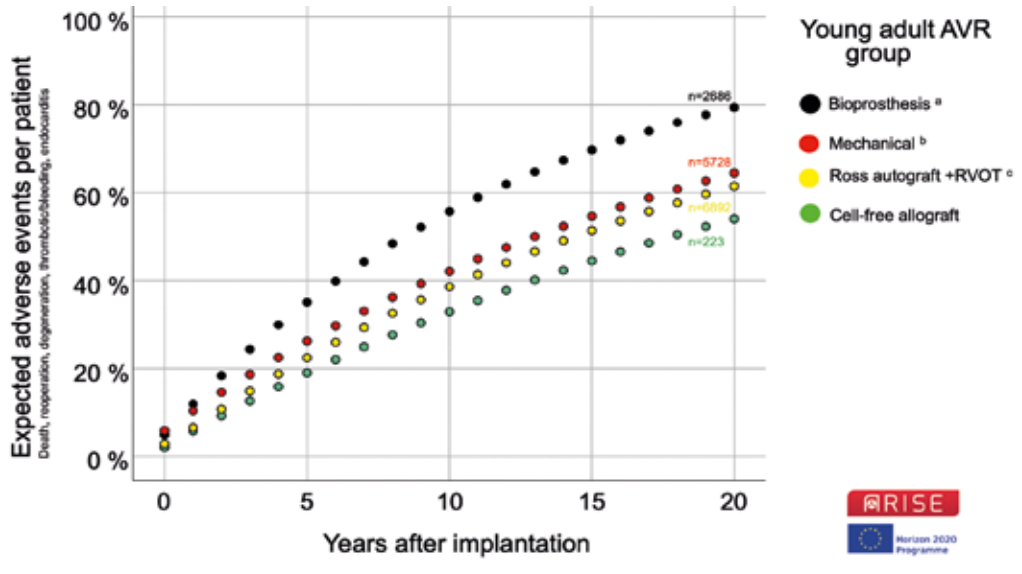


Figure 1. ARISE Registry Data of all 223 decellularised aortic homografts (DAH) implanted to date in comparison to recently published meta-analysis data for aortic valve replacement (AVR) options in young adult patients. Figure references: a) Etnel et al. Circ Cardiovasc Qual Outcomes. 2019;12(2):e005481; b) Korteland et al. Eur Heart J. 2017;38(45):3370-3377; c) Etnel et al. Circ Cardiovasc Qual Outcomes. 2018;11(12):e004748.

Figure 1 shows ARISE Registry Data of all 223 DAH implanted to date in comparison to recently published meta-analysis data for several AVR options in young adult patients. Based on current DAH data up to 10 years, the calculated expected adverse events (death, reoperation, degeneration, thrombotic/bleeding, endocarditis) in DAH were significantly lower than in conventional bioprostheses, and non-inferior to mechanical AVR and the Ross procedure despite more than twice the number of cardiac procedures previously in DAH patients.

The initial results of the prospective multi-centre ARISE trial prove DAH as safe for AVR with excellent haemodynamics in the short follow-up available. The planned follow-up period of at least 10 to 20 years will help to clarify whether DAH constitutes a good long-term biological AVR option for young patients.

Join us for "Early results from a prospective European trial on decellularised allografts for aortic valve replacement – The ARISE Study" (S Sarikouch, Hannover, for the ARISE-Investigators), held Saturday at 15:30 in Room 3A, Pav 3.

There will be also a second presentation by the ARISE study group just before in Auditorium 2 focusing on paediatric aortic valve replacement: Saturday, 14:45, Auditorium 2 – "Paediatric aortic valve replacement using decellularised allografts" (S Sarikouch, Hannover, for the ARISE Paediatric-Investigators).

References

1. www.arise-clinicaltrial.eu

Longer-term outcomes for heart surgery significantly better than other procedures, new evidence finds

Patients with heart disease who have surgery have significantly better longer-term outcomes than patients opting for heart stents or transcatheter aortic valve implantation (TAVI), according to new evidence presented today at the EACTS Annual Meeting in Lisbon.

The new findings from several international studies raise questions about whether the innovations have been adopted too quickly in some instances leading to worse five-year survival rates for patients. Leading international experts gathering in Lisbon will facilitate an important debate about the most effective treatment options for heart patients as EACTS highlights the importance of introducing new innovation safely and ensuring patients are able to discuss their individual risks and benefits with a multi-disciplinary heart team before having a procedure.

The findings, to be presented at the EACTS conference, the largest cardiothoracic conference in the world, include:

- For several decades bypass surgery (CABG) has been known to offer better survival and a much reduced risk of subsequent myocardial infarction (heart attack) and need for further interventions compared to stents. It was also thought that patients with less severe disease could do as well with stents. However, a new study (Excel: Everolimus-Eluting Stent of Bypass Surgery for Left Main Artery Disease) now suggests that even patients with less severe forms of this disease who have bypass surgery have a significantly better chance of surviving for five or more years if they choose surgery. The Excel study not only shows that surgery gives patients around a one-third improved survival rate in comparison to stents but that at 5 years that survival benefit appears to be accelerating.
- The results of the Partner 2 Trial, to be presented for the first time in Europe, found that the five year outcomes for patients with 'intermediate' operative risk having surgical aortic valve replacement (SAVR) were significantly better than for those having the TAVI procedure. This means that for every 100 patients dying within 5 years of having the TAVI procedure, 75 people would have died having had surgery.
- An analysis in Italy of the long-term outcomes of TAVI vs SAVR led by Dr Barili, Cuneo, Italy, found that while early results are promising for TAVI, from 40 months onwards TAVI has significantly worse outcomes than conventional surgery. TAVI procedures are undertaken by both cardiologists and surgeons.
- The latest update from the North American TAVI registry reveals that the "real world" outcomes for patients are worse than those of the randomised trials. Data also shows that complication rates are not decreasing with time even though the numbers of TAVI procedures are growing.

Discussing the findings of the Excel study, Professor David Taggart, Professor of Cardiovascular Surgery at the University of Oxford, said: "The EXCEL study looked at the best treatment for a potentially particularly lethal form of coronary artery disease called 'Left main disease' as it affects the most important blood vessel supplying blood to the heart muscle. While it is widely accepted that for severe patterns of disease that bypass surgery is best it was also previously thought that for less severe forms of disease the same result could be obtained with stents. However, the EXCEL study, the most definitive study of its kind for this type of disease, now shows that, assuming a patient is relatively fit, their chances of being alive after five years are dramatically better - by almost one-third - if they have heart bypass surgery rather than stent treatment. This confirms the importance of doing randomised clinical trials to ensure that potentially innovative techniques are actually as safe as the tried and tested standard techniques and that newer techniques must be implemented with caution. If a patient has blockages in the main heart artery or in more than two arteries and especially if the patient is diabetic, I strongly recommend that they get the opinion of a surgeon. Thankfully, in the UK, we have strong 'Heart Teams' consisting of cardiologists, surgeons and other experts who working closely together can recommend the best treatment to the individual patient. However, in most parts of the world the decision to recommend treatment is made by a cardiologist and, regrettably, the patient does not get any opinion from a surgeon.

Professor Nick Freemantle, Director Institute Clinical Trials and Methodology, University College London UK, said: "The Partner 2 findings should be considered very carefully in clinical practice. They serve as a wake-up call for the profession. It appears that some people may have adopted TAVI for too broad a range of patients. We know that for patients in need of aortic valve replacement - and who are not well enough for surgery - the TAVI procedure can be a lifeline. But now we have clear evidence - even for those patients with an intermediate level of risk – that the longer-term survival rates for patients who have surgical aortic valve replacement are significantly better than for those who have the TAVI procedure.

Dr Rita Redberg, Cardiologist at University of California San Francisco, who will co-chair the debate on Saturday 5 October, said: "These new findings highlight that some patients are living longer if they opt for surgery over some other techniques. This should focus minds: when advising on the right procedure for a patient, we need to know and share the data on risks and benefits. While avoiding surgery seems attractive in the short run, this short term benefit pales if it is at the price of longer survival with surgery. Patients will benefit from having their risks and benefits explained by a multi-disciplinary heart team to ensure they are able to access the best and personalized treatment. Innovation is vital and it's how practice evolves but we must ensure innovation is introduced safely and is best for patients. We should avoid a race to widely adopt new techniques until such innovations can demonstrate equivalent sustainable results to established surgical techniques."

David Taggart

References

The Excel Extended Survival study: http://dx.doi.org/10.1016/ S0140-6736(19)32040-9

African Cardiothoracic Surgery Database (AfroCaTS)

Charles Yankah; PASCaTS (www.pascats.com)

Background

Cardiac surgical care in sub-Saharan Africa (SSA) is worsened by the limited capacities of infrastructure, manpower and funding. One of our concerns is the lack of reliable data on surgical procedures on which to base effective concepts for developing sustainable cardiac surgical programmes. Mitral valve repair constitutes 10% of valve procedures in Africa and only 2% of children with CHD have access to surgery. It is timely and appropriate, therefore, to ask ourselves where we are?

PASCaTS has initiated a database (AfroCaTS Database) for cardiothoracic surgeries performed by local and foreign cardiac teams which could be used: 1. For clinical and academic research for the improvement of medical/surgical management of patients; 2. As a working instrument to evaluate the burden of disease and to develop strategies for prevention and treatment of cardiovascular diseases and their related morbidities; 3. For developing useful guidelines for clinicians and policy makers in order to plan appropriate cardiovascular disease prevention and therapy.

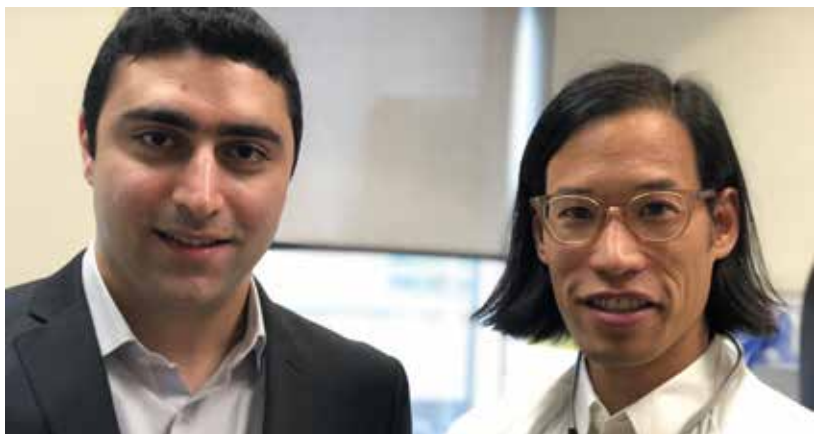
This initiative is a wake-up call for joint efforts to develop south-south cooperation. You are invited to join the AfroCaTS Working Group.

Reference

Cardiac surgery capacity in sub-saharan Africa: quo vadis? Thorac Cardiovasc Surg. 2014;62:393–401.

Rapid Response | Cardiac | Optimising outcomes in mitral surgery

Endoscopic mitral repair for degenerative mitral regurgitation: Effect of disease complexity on short and long-term outcomes



Fadi Hage (left) and Michael WA Chu

Fadi Hage[1], Ali Hage[1], Nikolaos Tzemos[2], Bob Kiaii[1], Michael WA Chu[1] 1. Division of Cardiac Surgery; 2. Division of Cardiology, Western University, London, Ontario, Canada

Critics of endoscopic mitral repair suggest that only simple mitral lesions can be treated with this approach, and patients with more complex disease experience compromised repair quality. We set out to compare, in a prospective cohort study, the long-term clinical and echocardiographic outcomes of patients undergoing minimally invasive, endoscopic mitral repair for simple (posterior leaflet prolapse) versus complex disease (anterior/bileaflet prolapse).

Two hundred and forty-five consecutive patients underwent minimally invasive, endoscopic mitral repair for severe degenerative mitral regurgitation (MR) through a right, endoscopic approach (n = 145 simple, n = 100 complex). The most common repair technique was annuloplasty + artificial chordae (84%, n = 121 for simple vs 88%, n = 88 for complex, p = 0.3) with the other patients receiving more traditional resection repair techniques. Patients were prospectively followed for a maximal duration of nine years. Patients' characteristics were well balanced between groups (age: 63 ± 12 years simple, 59 ± 15 years complex, p = 0.06; male: 71%, n = 103 vs 68%, n = 68, p = 0.6; LVEF: 62 ± 7% simple vs 62 ± 7% complex, p = 0.9; NYHA ≥ 3: 31%, n = 45 vs 34%, n = 34, p = 0.6; MR grade ≥ 3: 100%, n = 145 vs 100%, n = 100, p = 1).

The 30-day/in-hospital mortality was similar (0%, n = 0 simple vs 1%, n = 1 complex, p = 0.2). Both groups had similar rates of early post-operative complications: myocardial infarction (1.4%, n = 2 vs 0%, n = 0, p = 0.2); neurological complications (1.4%, n = 2 vs 0%, n = 0, p = 0.2); re-operation for bleeding (0.7%, n = 1 vs 3%, n = 3, p = 0.2); intensive care unit length of stay (1 IQR 1-1 days vs 1 IQR 1-1 days, p = 0.7). Early in-hospital residual mitral regurgitation was similar between groups (MR grade ≤ 1: 100%, total n = 245, for both groups, p = 1.0). Late survival (83% for simple vs 92% for complex, p = 0.3) and actuarial freedom from re-operation or valve-related complications (100% vs 88%, p = 0.07) at nine years were similar between both repair groups. Actuarial freedom from NYHA > 2 (90% for simple vs 100% for complex, p = 0.12) or MR > 2 (97% for simple vs 98% for complex, p = 0.8) at nine years was similar for all patients.

Repair of degenerative MR through a minimally invasive, endoscopic approach yields excellent long-term clinical and echocardiographic outcomes regardless of the complexity of the disease. Patients presenting at experienced mitral repair centres should not be excluded from minimally invasive approaches on the basis of the complexity of the disease.

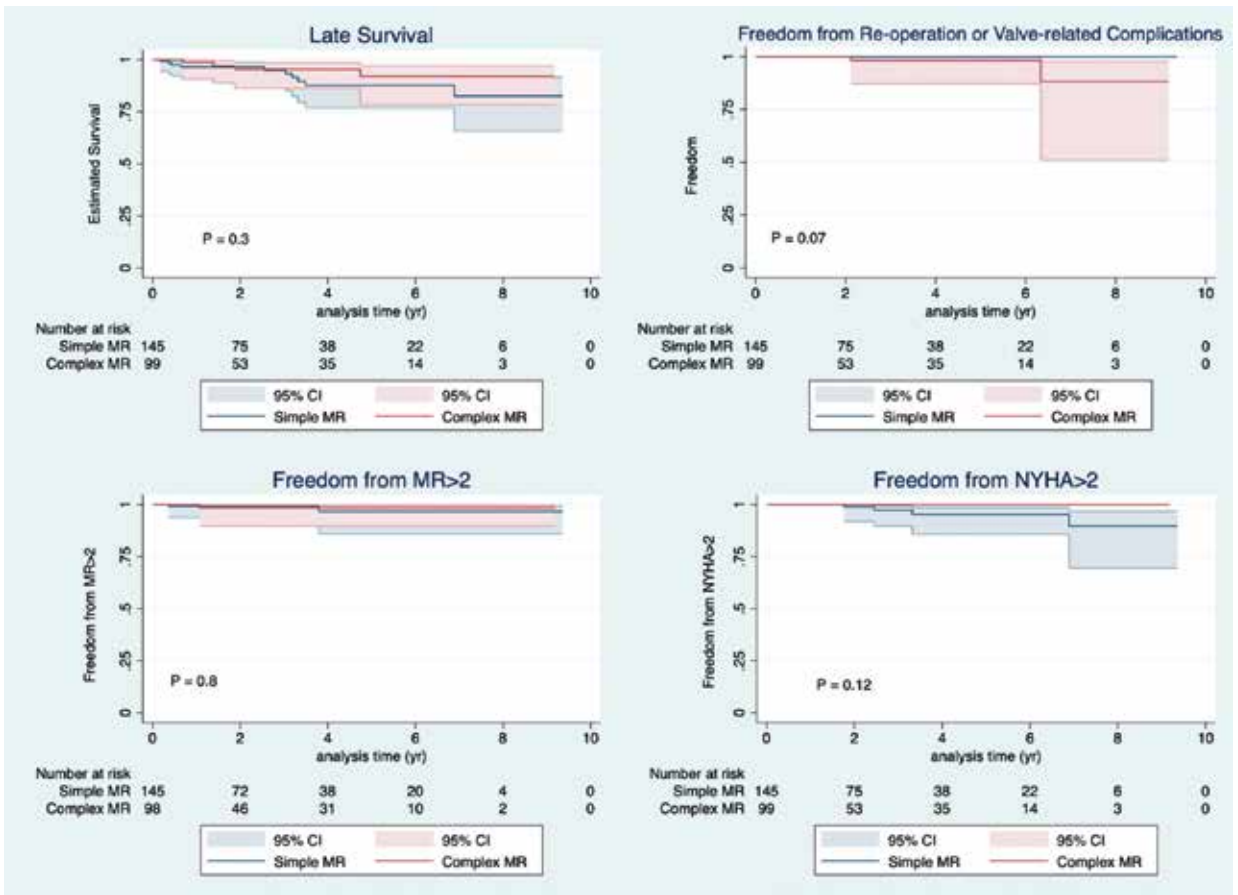
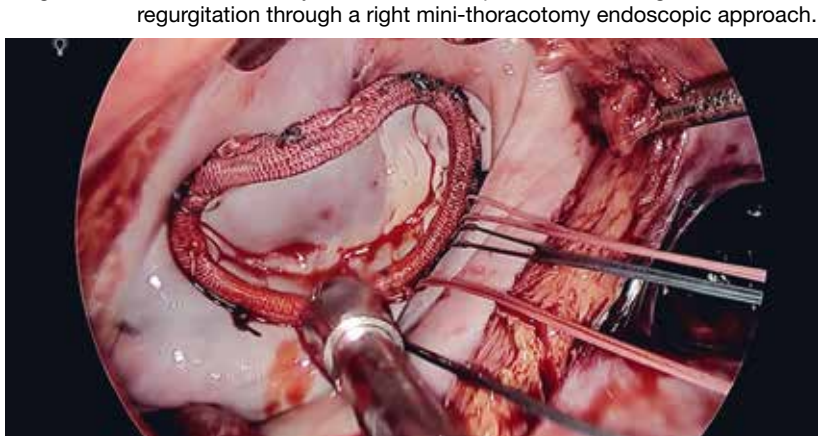


Figure 1. Kaplan-Meier survival curves comparing the long-term outcomes of simple vs complex disease groups.

Figure 2. Photo of a minimally invasive mitral repair for severe degenerative mitral regurgitation through a right mini-thoracotomy endoscopic approach.



Abstract | Thoracic | Oncology

Surgical treatment of pleural recurrence of thymoma: is hyperthermic intrathoracic chemotherapy worthwhile?

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Diana Bacchin

Thymoma recurrence is described in 10–30% of cases after surgical resection, and iterative surgery for pleural relapses (TPR) is often part of a multimodal treatment. Hyperthermic intra-thoracic chemotherapy (HITHOC) following macroscopic radical surgery is an option that combines effects of mild hyperthermia with those of chemotherapeutic agents. The aim of our study is to evaluate the effectiveness of surgery + HITHOC, compared with surgery alone, in TPR treatment.

We retrospectively collected data of all patients who underwent surgery for TPR in our centre from 2005 to 2017. Relapses were treated by partial pleurectomy with radical intent, followed by HITHOC when not contraindicated (preoperative impairment of cardiac or renal function; previous extended resection during the primary surgery; large involvement of pericardium or diaphragm). Patients were divided in two groups: surgery+HITHOC and surgery-alone. We collected demographic and clinical data and analysed postoperative results together with oncological outcomes.

Forty patients (27 surgery+HITHOC, 13 surgery-alone) with a mean age of 49.8 (± 13.7) years were included in this study. Perioperative mortality was nil. We experienced 33.3% perioperative morbidity in the surgery+HITHOC group compared with 23.1% in the surgery-alone group (p = 0.71). The overall survival was comparable between the two groups (p = 0.139), while the local disease-free interval (DFI) was 88.0 ± 15 months in the surgery+HITHOC group and 57 ± 19.5 months in the surgery-alone group (p = 0.046). The analysis of factors affecting the outcomes revealed that surgical radicality is related with a better overall survival (p = 0.040) while the local DFI was significantly influenced by HITHOC perfusion after surgery (p = 0.049).

This work confirms the safety and feasibility of HITHOC in TPR treatment and, most importantly, indicates that HITHOC perfusion following surgery is associated with longer local disease-free time compared to surgery alone.

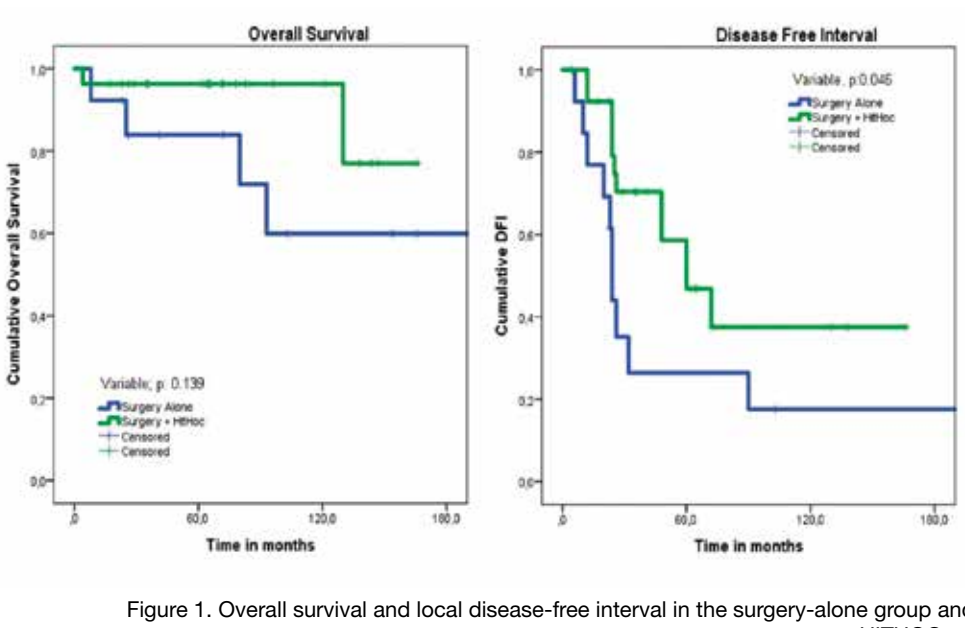

Figure 1. Overall survival and local disease-free interval in the surgery-alone group and the surgery+HITHOC group.

Focus Session | Vascular | Thoracic aortic surgery in the young (DA VINCI SESSION)

Can Marfan syndrome and Loeys–Dietz syndrome be treated in the same way?

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The 2010 revised Ghent nosology for Marfan syndrome (MFS) focused more on aortic root dilatation and/or dissection, ectopia lentis and the presence of fibrillin-1 gene (*FBN1*) mutations, which are the major causes of MFS[1,2]. However, Loeys–Dietz syndrome (LDS) is a recently recognised hereditary aortic disease (HAD) caused by mutations in transforming growth factor-beta receptor (TGFBR) 1, TGFBR2, SMAD3 and transforming growth factor-beta 2 (TGFB2)[3].

Both MFS and LDS have been commonly categorised in the same group for their syndromic forms of thoracic aortic aneurysms and dissections, which have the greatest influence on the prognosis. However, according to the recognition of the difference in mutations and accumulation of surgical results, the difference in postoperative presentation between MFS and LDS should be discussed. In this study, the clinical results of these HADs are compared to determine the differences in surgical outcomes in young adult patients carrying these gene mutations, MFS and LDS.

Standing/back row, from left: Takayuki Shijyo, Yosuke Inoue, Hiroaki Sasaki, Hitoshi Matsuda, Kyokun Uehara and Yoshimasa Seike. Kneeling/front row, from left: Yuya Miura, Takanori Kaneko, Matsuo Jiro and Yuki Yoshioka.

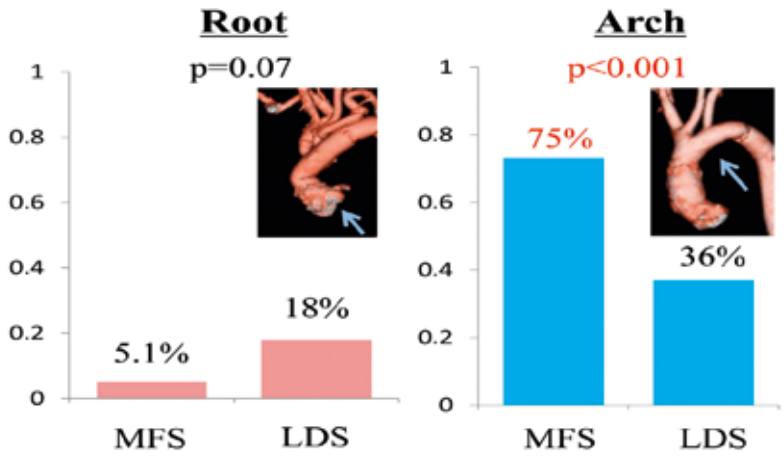

Figure 1. Proportion of unexpanded aortic root and arch.

We reviewed 368 patients < 50 years who underwent surgery for thoracic aortic diseases between 1988 and 2019, and enrolled 99 MFS patients (26.9%; 42 men, 33 ± 7.5 years of age) and 28 LDS patients (7.6%; 16 men, 29 ± 10 years of age) after the genetic screening.

The freedom from all-cause mortality rates at 10 and 15 years were similar between the two groups (MFS, 98% and 91%; LDS, 96% and 96%; p = 0.50). The rates of freedom from reintervention at 10 and 15 years were significantly lower in the LDS group (23%/12%) than the MFS group (48%/22%) (p = 0.017). The rates of freedom from aortic dissection after initial surgery at 10 and 15 years were significantly lower in the LDS group (58%/48%) than the MFS group (83%/69%) (p = 0.015) The aortic root was untreated in five patients (5.1%) with MFS and five patients (17.9%) with LDS (p = 0.07). The aortic arch was untreated more frequently in the MFS group (74 patients, 74.7%) than in the LDS group (10 patients, 35.7%) (p < 0.001; Figure 1).

In conclusion, LDS revealed higher rates of reoperation and aortic dissection after initial surgery than MFS. Extensive initial operation and early reoperation are more critical in LDS to avoid fatal aortic event. In MFS, aggressive arch surgery is controversial in patients without dissection for low possibility of expansion.

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Rapid Response | Cardiac | Predicting and managing Mechanical Circulatory Support -related complications

Impact of concomitant cardiac procedures during implantation of long-term continuous-flow LVADs: a European Registry for Patients with Mechanical Circulatory Support (EUROMACS) analysis

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Antonio Loforte

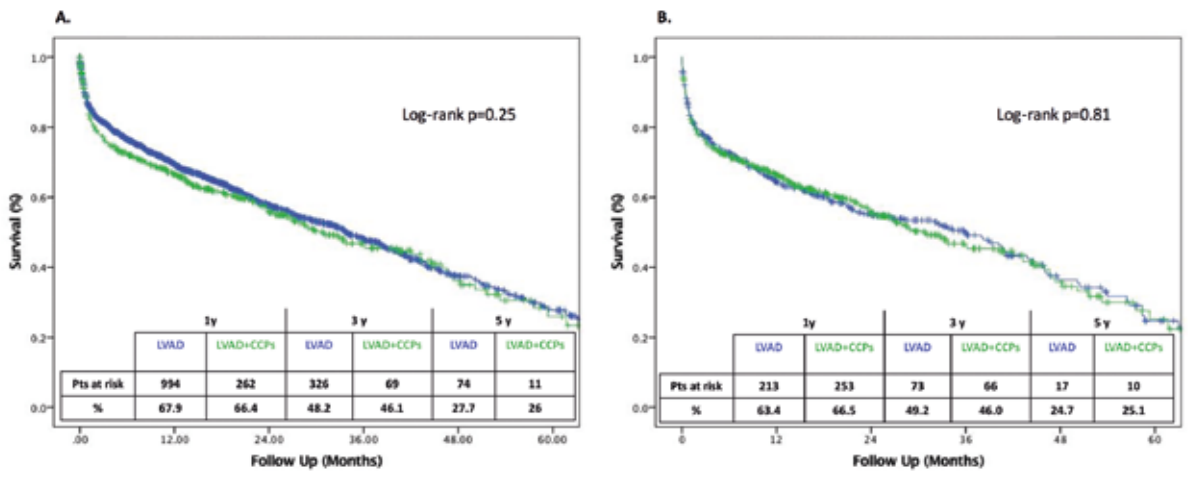

Figure 1. LVAD vs LVAD+CCP cohorts, Kaplan-Meier survival analysis (unmatched, Panel A; PS matched, Panel B).

There are still discordant data on the effect of concomitant cardiac procedures (CCPs) performed during left ventricular assist device (LVAD) implantation[1-5].

By investigating on the European Registry for Patients with Mechanical Circulatory Support (EUROMACS) dataset, we identified 2760 patients (pts) who underwent continuous-flow (CF), long-term LVAD implantation between 2006 and 2017.

LVAD implantation was associated with a single (at least) CCP in 533 pts (19.3%). LVAD+CCP (n = 533 pts) and isolated LVAD (n = 2,227 pts) cohorts have been matched and compared.

In hospital morbidity was significantly higher in the LVAD+CPP cohort, in terms of intensive care unit (ICU) stay (19.6 vs 27.2 days, p < 0.001), bleeding requiring rethoracotomy (5.2% vs 9.4%, p < 0.001), renal replacement therapy (4% vs 6.6 %, p = 0.014), and right ventricular failure requiring RVAD support (4.9 vs 7.3 %, p = 0.033). Furthermore, in-hospital mortality was significantly higher in the LVAD+CCP cohort (14.1 vs 21.4%, p < 0.001, OR 1.11, CI 1.30–2.79), particularly focusing on coronary artery bypass grafting (CABG; p = 0.041, OR 2.03, CI 1.03–4.02) and aortic valve surgery (AoVS; p = 0.007, OR 1.83, CI 1.18–2.86) CCPs.

During the mid- to long-term postoperative period, LVAD+CCP population showed higher incidence of bleeding (2.9% vs 5.4%, p = 0.011) and infectious (driveline wound source) adverse events (18.6 vs 39.1, p = 0.036), respectively. Valve surgery concomitant with LVAD implant did not seem to be associated with better clinical outcomes except for mitral valve surgery (MVS; p = 0.03).

A propensity score (PS) -matching analysis (LVAD pts, n = 481 vs LVAD+CCP pts, n = 481) confirmed the outcomes above. No differences were observed by Kaplan-Meier survival (overall) analysis in the two cohorts (Log-rank p = 0.25, unmatched, vs log-rank p = 0.81, matched; Figure 1).

In summary, the performance of a CCP increases peri-operative mortality and incidence of post-operative complications. This may be related to the increased cardiopulmonary bypass (CPB) time required to perform the CCP, the necessity of aortic cross-clamping with cardioplegic arrest as well as the heterogeneity of surgical strategies and postoperative management of EUROMACS centres involved.

Mid- to long-term conditional survival is not influenced by CCPs, thus the perioperative period is the most delicate phase. An accurate management of anticoagulation and antiplatlet regimen should be paid in LVAD+CCP recipients as being gastrointestinal bleeding events more recurrent. Additionally, a strict monitoring of driveline wound dressing and an early treatment of any infectious event should be addressed in LVAD+CCP recipients as they are at higher risk.

Our study has several limitations. Despite the big sample size, the long follow-up time, and the statistical PS matching analysis, our study is, first, not a prospective, randomised trial and is therefore subject to limitations inherent to any retrospective registry study. Second, our study is a multiple-institution investigation which is influenced by different policies concerning CCPs performance, thus bias may be present.

In conclusion, we demonstrated 'slightly' similar outcomes for patients who underwent CCPs compared with those who underwent isolated LVAD implantation, which should be adjusted per type of surgery addressed[1-5]. CCPs pts remain a delicate population to be strictly monitored and homogeneously managed to preserve satisfactory outcomes.

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Focus Session | Cardiac | Systematic Reviews and Meta-Analyses: at the top of the evidence?

TAVI is associated with less patient-prosthesis-mismatch than surgical AVR in severe aortic stenosis: A systematic review and meta-analysis

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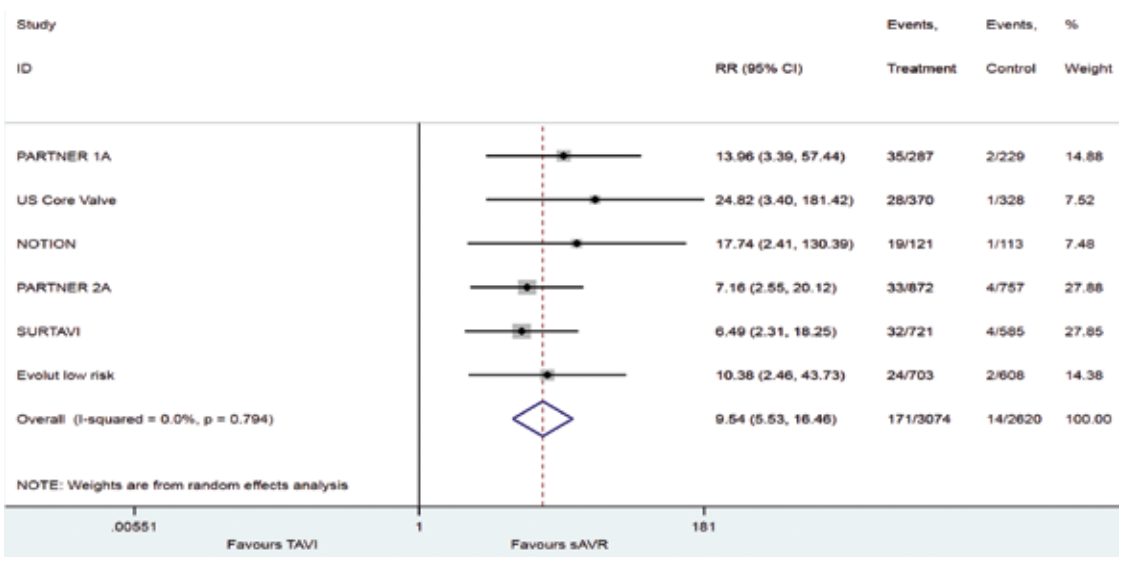
Nikolaos Bonaros



TAVI has shown to be at least non-inferior to surgical aortic valve replacement (sAVR) in terms of mortality for the treatment of low-, intermediate- and high-risk patients with severe aortic stenosis (AS). Our current study sought to assess whether there is a difference on echocardiographic parameters such as patient-prosthesis-mismatch, residual gradients and effective orifice area up to two years after TAVI and sAVR.

We conducted a random-effect model meta-analysis of randomised controlled trials that compared TAVI and sAVR. The primary outcome was post-procedural patient-prosthesis-mismatch (PPM). Secondary outcomes were post-procedural and effective orifice area (EOA), paravalvular gradient (PVG) and moderate/severe paravalvular leak (PVL).

We identified five trials with a total of 5,552 participants with AS, including 2,777 patients randomised to TAVI and 2,775 randomized to sAVR. TAVI was associated with a significant 35% relative risk reduction (RR = 0.65, 95%CI [0.50–0.84], p = 0.005) in moderate/severe post-procedural PPM with homogeneity across all trials (p for interaction = 0.351). The effect was more evident in self- rather than balloon-expandable valves (p = 0.029). Similar results were found in terms of post procedural EOA (RR = 0.53, 95% CI [0.43–0.62]), and residual gradients (RR = 0.54, 95% CI [0.32–0.76]). As expected, TAVI demonstrated higher rates of moderate/severe PVL (RR = 9.41, 95% CI [5.22–16.96]).

The results were sustainable at two years; there were pooled increased EOA (0.48 (95% CI [0.24–0.72]), and pooled decreased residual gradients of 0.58 (95 %CI [0.77–0.25]) in favour of TAVI. The incidence of moderate/severe PVL remained lower in sAVR patients (10.39 (95% CI [4.80–22.46]). The relative risk reduction of overall mortality was 7% at 1 and 4% at 2 years for TAVI as compared to sAVR, and was not statistically significant (1 year, p = 0.567; 2 years, p = 0.513). Similarly, TAVI as compared to sAVR was associated with an 11% (p = 0.808) and 4% (p = 0.638) relative risk reduction for cardiovascular mortality at 1 and 2 years, respectively.

The echocardiographic results obtained by the meta-analysis may explain the equipoise between the two treatment arms in terms of mortality: TAVI has the advantage of low residual gradients (and lower rates of PPM) but the disadvantage of higher rates of paravalvular regurgitation. As both conditions can be associated with increased mortality, any improvement on the incidence of PVL in TAVI valve or PPM in a surgical valve may lead to the cards being reshuffled again.

Interestingly, we demonstrated that there are differences in EOA, transvalvular gradients and PPM not only between the two treatment arms but also within the TAVI valves. Self-expandable valves have been found to be more advantageous than balloon-expandable valves. This is supported by registry data in the literature[1]. However, literature data demonstrate a higher incidence of PVL in self-expandable valves, though this has not been investigated in our analysis.[2]. From this point of view our meta-analysis provides the first evidence that patients at risk for PPM may benefit from transcatheter treatment especially by using a self-expandable valve. On the other hand, patients at risk for PVL should be treated by either balloon expandable valves or conventional surgery.

To summarise, our meta-analysis suggests that TAVI is associated with a lower risk of PPM, as well as higher EOA and lower residual gradients through two years of follow-up. This was accompanied by a higher incidence of moderate/severe PVL as compared to sAVR. Future research should focus on the effect of echocardiographic differences on clinical outcomes.

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Abstract | Congenital | Congenital Miscellaneous

Impact of pulmonary artery reduction during an arterial switch operation: 14-year follow-up

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Fernanda Lübe Antunes Pereira (right) and Bayard Gontijo Filho, co-author and supervisor

The arterial switch operation (ASO) has become the surgical procedure of choice to repair transposition of the great arteries (TGA) in neonates and infants, with excellent early- and mid-term results and satisfactory overall survival and functional status. From January 1998 until December 2018, 425 patients underwent ASO in our institute. In our experience we found that significant pulmonary artery/aorta size (PA/Ao) discrepancy plays an important role in the development of disproportionate neo-aortic root growth and valve regurgitation after ASO, especially in patients with complex variants of TGA and aortic arch anomalies association.

Since February 2004 we started using PA reduction to manage severe PA/Ao mismatch at the time of ASO, and this study evaluated the impact of this technique in the mid- and long-term follow-up of these patients. Thirty-one patients were followed up with clinical and image exams. Echocardiography findings were reviewed and Z-scores were recorded to evaluate incidence and progression of neo-aortic root dilatation and valve regurgitation.

PA reduction was indicated in patients considered to have severe PA/Ao mismatch (> 2:1 ratio) at the time of ASO and was achieved by resecting a 3–4 mm rectangular flap of the PA wall, reducing the entire pulmonary root including downsizing the valve annulus, achieving a symmetrical total reduction of the neo=aortic root and more harmonic anastomosis with the ascending aorta.

Median follow-up time was eight years (range 54 days to 14 years). The mean difference between Z-scores of the pulmonary annulus (before ASO) and neo-aortic annulus (at latest follow-up) were 2.05 (95% CI 1.70 to 2.39, p < 0,0001). Mean Z-score for the sinus of Valsalva was +0.29 ± 1, the sinotubular junction +0.71 ± 0.6, and ascending aorta +1.09 ± 0.7. There was no severe dilatation of the neo-aortic annulus, neo-aortic root or ascending aorta during follow-up. Neo-aortic valve regurgitation was none or mild in 93% of patients.

The pathophysiological mechanisms for neo-aortic root dilatation and development of moderate- to severe neo-aortic regurgitation are poorly understood, and probably multifactorial. We believe that preservation of the aortic diameter and valve function with PA reduction may be explained by reduction of the initial size of the neo-aorta and geometric concordance between the neo-aortic root and ascending aorta anastomosis, avoiding the distortion generated by suture trimming and resulting in a better hydraulic flow pattern, reducing the impact on the arterial wall.

PA reduction proved to be a feasible and low-risk procedure to approach PA/Ao mismatch in the ASO. Mid- and long-term follow up showed a tendency towards stabilisation of the neo-aortic root dilatation and satisfactory valve performance after the procedure. Nevertheless, further investigation is required with a larger population and longer-term follow-up. Furthermore, drawbacks regarding the technique must be taken into consideration.

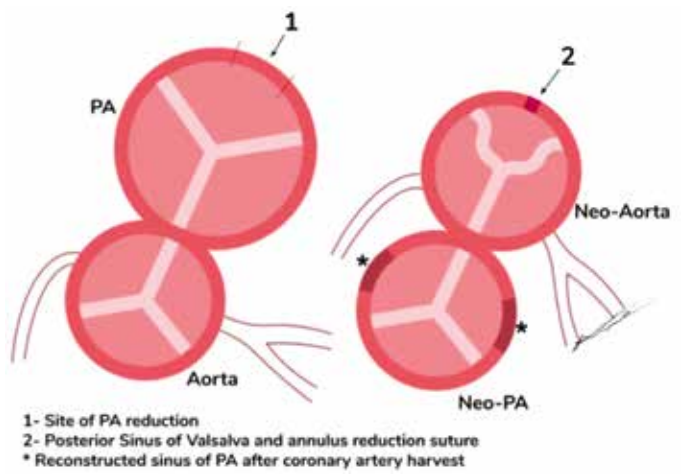

Figure 1. Schematic illustration of great vessels before and after pulmonary artery (PA) reduction during the arterial switch operation (ASO). Left: disposition of the great vessels during ASO, PA/aorta (Ao) mismatch and indication of PA reduction site. Right: the aspect of great vessels during ASO, after PA reduction, with posterior sinus of Valsalva reduction suture and leaflets redundancy in the neo-Ao as well as reconstruction of sinus of Valsalva in the neo-PA.

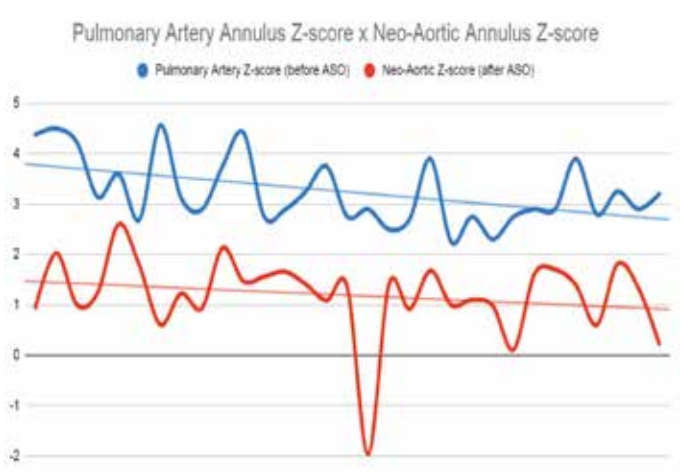

Figure 2. Comparison between the Z-score values of valve annulus before and after the arterial switch operation with pulmonary artery reduction.

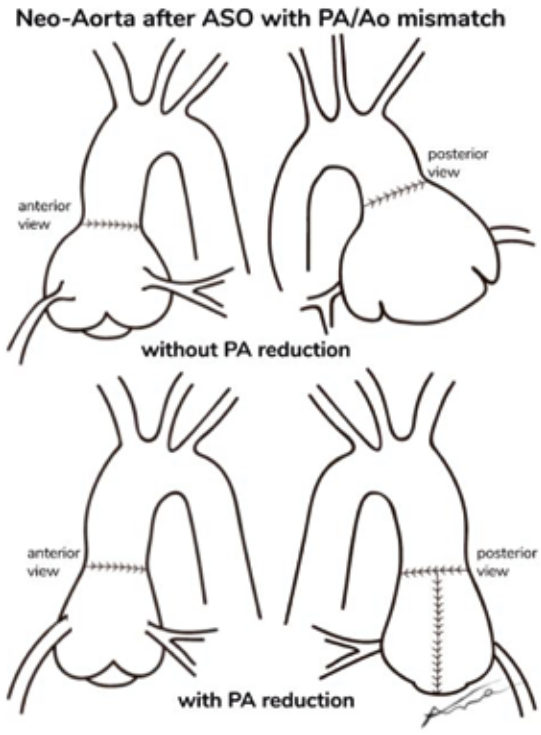

Figure 3. Schematic illustration of the neo-aorta (neo-Ao) after arterial switch operation in the presence of preoperative pulmonary artery (PA)/Ao mismatch. The top image shows neo-Ao in patients that were not submitted to PA reduction, showing size discrepancy in anastomosis between the neo-Ao root and ascending aorta. The lower image shows neo-Ao in patients submitted to PA reduction, showing geometric concordance of the anastomosis.

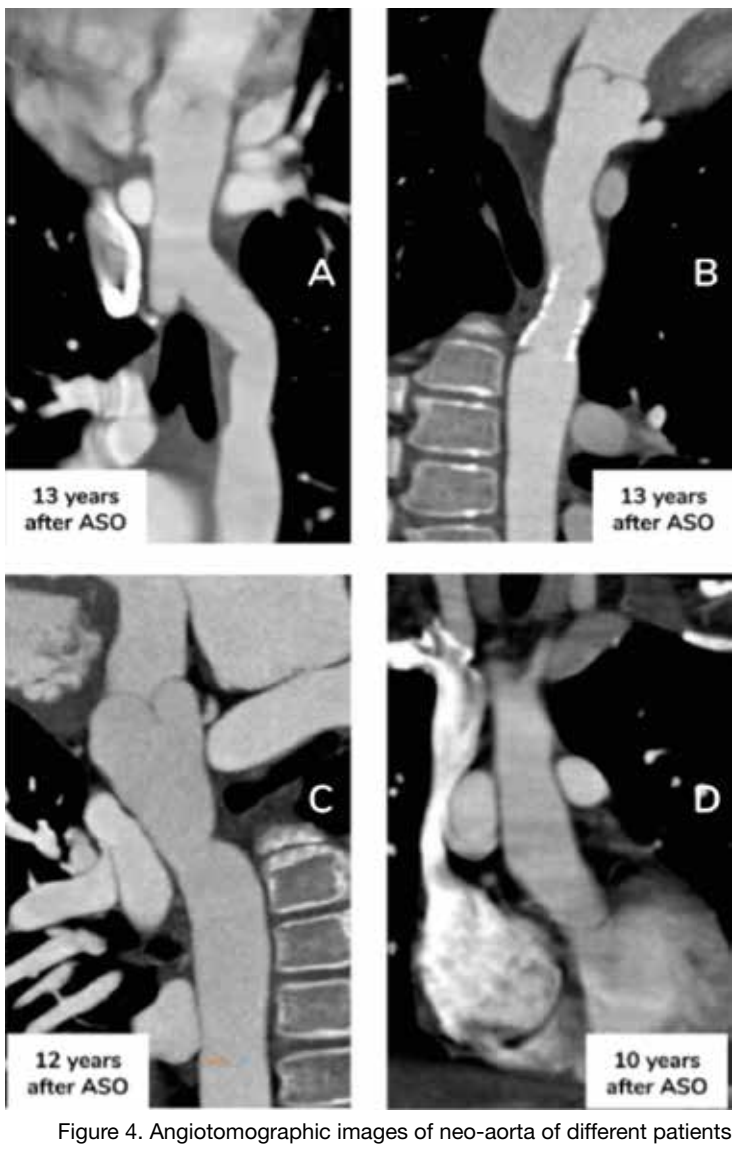

Figure 4. Angiotomographic images of neo-aorta of different patients submitted to pulmonary artery reduction in the long-term follow-up after an arterial switch operation. Patient B has angioplasty to correct recoarctation of the aorta. Patient C had interruption of the aortic arch associated with transposition of the great arteries.

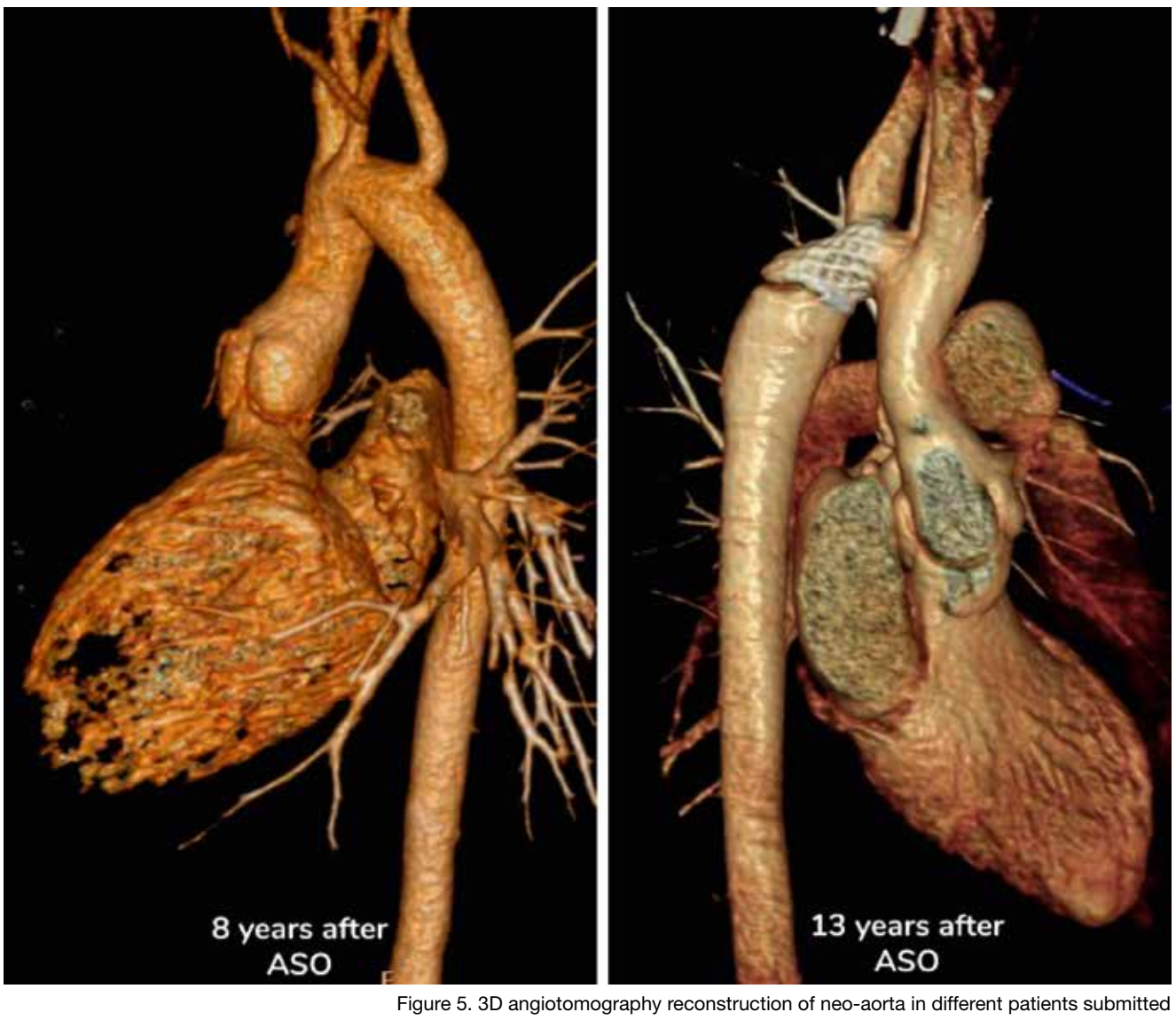

Figure 5. 3D angiotomography reconstruction of neo-aorta in different patients submitted to pulmonary artery reduction after an arterial switch operation. The patient on the right had angioplasty to correct recoarctation of the aorta.

Abstract | Cardiac | Improving outcomes by a perioperative personalized blood management

Improving outcomes by a perioperative personalised blood management: Preoperative patient optimisation prior to cardiac surgery

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Anaemia in surgical patients is a frequent and severe problem, affecting 35–40% of patients presenting for cardiac surgery. Patients with preoperative anaemia undergoing cardiac surgery have significantly higher rates of complications, ICU and hospital stay, and mortality. The extent of anaemia is worsened by haemodilution occurring with cardiopulmonary bypass and surgical bleeding (average blood loss 500–1500 mL), which in turn impairs end-organ blood flow and tissue oxygen delivery. Besides this, blood transfusions are costly, with around 50% of all transfusions used in surgery being for cardiac surgery. It is noteworthy to highlight that allogeneic blood transfusion is independently associated with numerous complications such as adverse reaction (haemolytic, anaphylactic, non-febrile), blood-borne infections (bacterial, viral), wound infections (sternal), graft-versus-host disease, purpura, thrombocytopenia, circulatory overload (TACO), acute lung injury (TRALI), renal dysfunction, increased hospital stays and death.

Whether preoperative treatment of anaemic cardiac surgical patients leads to prevention of blood transfusions and better outcomes is a matter of debate for many years. Until 2019, only four small trials of IV iron therapy in cardiac surgery were published. However, a Zurich clinical trial recently published in the *Lancet* was the first to demonstrate that ultra-short-term combination treatment with

Milan Milojevic and Richard L Prager from the University of Michigan, USA

intravenous iron, subcutaneous erythropoietin alpha, vitamin B12, and oral folic acid reduced RBC and total allogeneic blood product transfusions in patients with preoperative anaemia or isolated iron deficiency undergoing elective cardiac surgery. Moreover, in 2020, we are expecting the results from Intravenous Iron for Treatment of Anaemia Before Cardiac Surgery (ITACS) trial, which has been conducted at Monash University in Melbourne on 1,000 patients with anaemia. Based on the available body of evidence and disease burden, it seems reasonable to start treatment of preoperative anaemia in the cardiac surgical population because the potential for improvement is enormous. Treatment of preoperative anaemia leads to higher haemoglobin concentrations and improve the patient's tolerance to anaemia in the intra- and postoperative setting. Importantly, detection of anaemia should follow listing for surgery as soon as possible to allow enough time for optimisation.

In 2017, the European Association for Cardio-Thoracic Surgery (EACTS) in a joint effort with the European Association of Cardiothoracic Anaesthesiology (EACTA) published clinical practice guidelines (CPG) to support hospitals in the implementation of patient blood management, including the management and optimisation of pre-operative anaemia and the routine use of cell salvage.

The uneven implementation of evidence-based CPGs is widely recognised as a continuing challenge to improving patient outcomes. In order to improve adherence to guideline-directed medical therapies and strategies, the efficacy and safety in diagnosing and treating pre-operative anaemia should be evaluated yearly by collecting and presenting appropriate data, at the hospital and/or regional level. Our take-home messages for all health care professionals involved in cardiac surgery are: 1) surgical patients with anaemia are at increased risk for morbidity and mortality and are likely to be transfused with red cells; 2) red cell transfusion itself also increases morbidity and death; and 3) detection and treatment of pre-operative anaemia as part of patient blood management is a vital component in ensuring better outcomes for our patients.

RapidResponse | Thoracic | Oncology

Prehabilitation for surgery in lung cancer: is it worth it?

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Lung cancer continues to be the most common and deadly malignancy in developed countries. Anatomic resection with radical lymph node dissection is a curative treatment for lung cancer. There is a significant difference between the five-year survival rate of patients who underwent surgery (57.2%) and those who did not receive surgical intervention (7.5%) according to published data. Also, patients who underwent lobectomy seem to have a higher five-year survival rate compared with patients who underwent other surgical procedures.

Although surgery is the best option for treating patients with early-stage non-small-cell lung cancer (NSCLC), abnormal pulmonary function is a major problem in patients with potentially resectable tumours. Approximately 73% of men and 53% of women are diagnosed with chronic obstructive pulmonary disease (COPD) along with lung cancer. These patients may be at an increased risk of both immediate perioperative complications and long-term disability following surgical resection.

In recent years, the optimisation of a patient's physical capacity before surgery has been the subject of several studies including a preoperative exercise programme (pre-habilitation) for patients with resectable lung cancer.

Could prehabilitation optimise the physical status and overall medical stability before surgery and reduce postoperative morbidity? And, could these preconditioning exercises increase the percentage of operable cases by improving the physical status of a patient who was initially considered inoperable due to severe pulmonary function impairment? The objective of our study is to highlight the above questions.

Kalliopi Athanassiadi

In our study we included 30 patients (some of them rejected from other hospitals for surgery) and we divided them in two groups with (Prehab Group) or without prehabilitation (Non-Prehab). Inclusion criteria were patients aged ≥ 18 years old with NSCLC, oncologically operable (I to IIIa) and VO_2 max ≤ 20 mL/min/kg. A thorough preoperative assessment was done in all patients including spirometry, cardiac ultrasound, gas analysis and, in some of them, ventilation scanning. The prehabilitation programme consisted of exercise re-training, breathing exercises, muscular strengthening by a physiotherapist and the nurses of the ward, therapeutic education and help with smoking cessation. It was organised on an everyday basis within a week at the hospital preoperatively.

Patients received either lobectomy or pneumonectomy. Hospital stay and post-operative complications in the two groups were recorded. It was obvious that patients who had received prehabilitation had fewer complications and shorter hospital stay, while four patients – originally considered inoperable due to pulmonary restriction – underwent lobectomy.

Our results suggest that prehabilitation has an impact on the occurrence and severity of postoperative complications, and could improve physical performance and quality of life, but the data are limited. Additionally, it may increase the number of inoperable to operable patients with lung cancer. There is no consensus on the correct timing, duration and those components which should be part of the prehabilitation programme, but further well-designed studies are needed to better define the benefits and optimisation of the intervention.

Abstract | Congenital | Congenital Miscellaneous

Outcomes of bidirectional Glenn procedure in patients less than 3 months of age

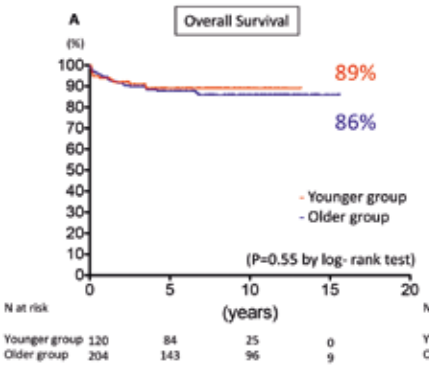
Noritaka Ota[1], Tsuyoshi Tachibana[2], Hidetsugu Asai[2], Jin Igarashi[2], Toshihide Asou[2], Hironori Izutani[1] 1. Department of Cardiovascular and Thoracic Surgery, Ehime University Graduate School of Medicine, Ehime, Japan; 2. Department of Cardiovascular Surgery, Kanagawa Children's Medical Center, Yokohama, Japan

Historically, the surgical strategy of the staged Fontan approach has led to a remarkable improvement of outcomes of the Fontan operation. The bidirectional Glenn procedure (BDG) has been performed for the palliation of functionally univentricular hearts. Its advantages as a primary or second-stage palliative operation include more efficient circulation without volume or pressure overload of the ventricles unlike the systemic to pulmonary artery shunt or pulmonary artery banding. However, it remains controversial with regards to its timing, especially in younger patients.

From 2004 to 2018, 120 patients underwent BDG at the age of less than 3 months ('younger' group) at Kanagawa Children's Medical Center, Yokohama, Japan. For reference, we also reviewed the data from 204 patients who had undergone BDG procedure aged more than 4 months in the same period ('older' group).

The younger and older groups were aged 99.7 ± 14.3 months and 303.5 ± 474.1 months ($p < 0.0001$), respectively and weighed 4.2 ± 1 kg and 7 ± 5.2 kg ($p < 0.0001$), respectively at the time of BDG. The major cardiac defects were heterotaxy syndrome in 74 patients (22.8%, 74 of 324; 26 in younger group, 48 in older group), hypoplastic left heart syndrome in 54 patients (16.7%, 54 of 324; 31 in younger group, 23 in older group). Two-hundred and seventy six (104 in younger group, 172 in older group) had various forms of single ventricle palliation before BDG procedure.

Noritaka Ota



Twelve patients (10 in younger group, 2 in older group) needed intensive care before BDG: 7 of 12 patients had cardiopulmonary resuscitation with extracorporeal membrane oxygenation (ECMO). ECMO was ongoing at the time of surgery for BDG; no patients were separated from ECMO prior to the surgery, and all 7 patients could be weaned off ECMO after the BDG operation. We rationalised that if infants with initial palliative operation were at a risk for developing unstable haemodynamics, earlier BDG could be considered for the unstable patients with post-palliative operation. Some reports have mentioned in follow-up analysis that interstage mortality after the BDG is better than at post initial palliative operation.

The overall survival was 89% at 10 years in the younger group and similar to older age group (Figure 1A). The atrioventricular valve regurgitation was identified as a factor associated with hospital mortality in the younger group ($p = 0.009$) and the much older age at BDG was associated with late mortality in the older group ($p = 0.027$). The Kaplan–Meier estimates of Fontan completion rates were 95.5 % after 10 years in the younger group, which was higher than the older group (86.8%; Figure 1B).

In this study population, early performance of BDG is applicable for patients who have undergone prior palliation and for those in whom primary BDG is the first surgical intervention, even for patients with haemodynamic instabilities.

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Rapid Response | Thoracic | Oncology

Thoracoscopic lobectomy for non-small cell lung cancer in patients with impaired pulmonary function: Analysis from a national database

Stefano Bongiolatti
Thoracic Surgery Unit, Careggi University Hospital, Florence

VATS-lobectomy (VATS-L) has become a safe and effective alternative to conventional thoracotomy, and is associated with a shorter length of stay, less postoperative pain, fewer postoperative complications, better compliance with adjuvant chemotherapy and more preserved pulmonary function. Some relevant papers[1-4] have demonstrated that VATS-L is feasible in patients with poor lung function, and is associated with better results than thoracotomy, but few multicentre studies have investigated the outcomes in this fragile population[2]. Furthermore, current pre-operative guidelines for risk assessment[5-7] were established according to the evidence obtained from large studies on patients undergoing lung resection through open thoracotomy, and so data are lacking on the effective impact of VATS-L on post-operative lung function and post-operative mortality and complications. The aim of our study was to show the mortality, overall- and pulmonary complication rate and the impact of impaired pre-operative pulmonary function on these outcomes, analysing data from the Italian VATS Group Database.

The Italian VATS Group Database is a multicentre, web-based data system for collecting and reporting clinical characteristics, patterns of care, and outcomes data on NSCLC patients treated with a VATS-L. The Italian VATS Group has maintained this prospective database since January 2014. At the time of the latest report, there were more than 55 participating centres (general thoracic surgery units or services, not individual surgeons) and about 8,000 collected cases.

Our study population consisted of patients who received VATS-L with curative intent as the primary procedure for NSCLC at VATS-Group participating centres, included in the VATS Group database between 1 January 2014 and 31 December 2018. Then, we compared two Groups based on pre-operative lung function: Group A comprised patients with normal pre-operative lung function, while Group B included patients with limited pre-operative lung function. Impaired lung function was defined as pre-operative FEV1% less than 60% or pre-operative DLCO% less than 60% or both. The threshold of 60% was chosen based on previous studies demonstrating that patients with these FEV1% or DLCO% values have an increased risk of morbidity and mortality after lung resection.[1,2,8,9]. Based on this functional limit, we compared post-operative results on n = 224 patients with pre-operative FEV1% less than 60%; n = 645 DLCO% less than 60% and n = 60 patients with both values lower than 60%.

Although we performed a retrospective analysis, our outcomes could be interpreted as generally adequate and universally acceptable for the large amount of cases with limited lung function that were analysed (n = 809), and the multicentre nature of this study.

Briefly, we observed no statistical difference regarding post-operative mortality between patients with normal and poor lung function; patients with limited lung function developed more overall and respiratory complications and the limited lung function was a strong risk factor for overall and pulmonary complications. Thus, VATS-L in high risk patients is safe and feasible. Pre-operative values of lung function must be still considered as the cornerstone of the patient selection algorithm and risk stratification should also be performed before minimally invasive lung lobectomy.

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Rapid Response | Vascular | Dissecting aortic dissection

Impact of quality of skeletal muscle on outcomes in acute type A aortic dissection

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Acute type A aortic dissection (ATAAD) is a life-threatening cardiovascular event that requires immediate surgical repair. In the field of aortic surgery, treatment methods such as surgical techniques, perioperative care, and sealing grafts have improved dramatically over the past decade. The aging population is rapidly increasing in many countries. However, with increasing life expectancy comes a rise in the incidence of cardiovascular disease, including ATAAD.

Sarcopenia has been linked to surgical outcomes following aortic and abdominal operations. Recently, increased intramuscular adipose tissue of skeletal muscle with aging (intramuscular fat [IMF] deposition) has been identified as a potential contributor to declined muscle strength and quality (of skeletal muscle). Furthermore, it was found to be closely involved with postoperative survival in patients undergoing resection of pancreatic cancer. However, there were few reports regarding the relationship between quality of skeletal muscle and surgical outcomes of cardiac surgery.

In the present study, we evaluated quality and quantity of skeletal muscle by determining computed tomography (CT) value and psoas muscle mass index (PAI), respectively, by using preoperative plain CT imaging. And we evaluated the impact of quantity and quality of skeletal muscle on the early and long-term outcomes of ATAAD.

Between May 2004 and December 2017, 343 patients underwent an emergency open operation for ATAAD at our institution. Nineteen patients were excluded (preoperative activities of daily life [ADL] dependence in eight patients, and insufficient CT records in 11 patients). Three hundred and twenty-four patients were eventually included in this study. We analysed the cross-sectional area of the right and left psoas muscles using preoperative plain CT. Psoas muscle area was measured at the level of third lumbar vertebra (L3) on the first image with both vertebral spines visible. Subfascial muscular tissue in the psoas muscle was estimated by manual tracing, and the mean CT values (Hounsfield units [HU]) for these areas were determined. Quality of skeletal muscle was assessed by mean CT value, and low CT value indicates increased IMF deposition. The cut-off CT value for IMF deposition were 44.4 HU in male and 39.3 HU in female.

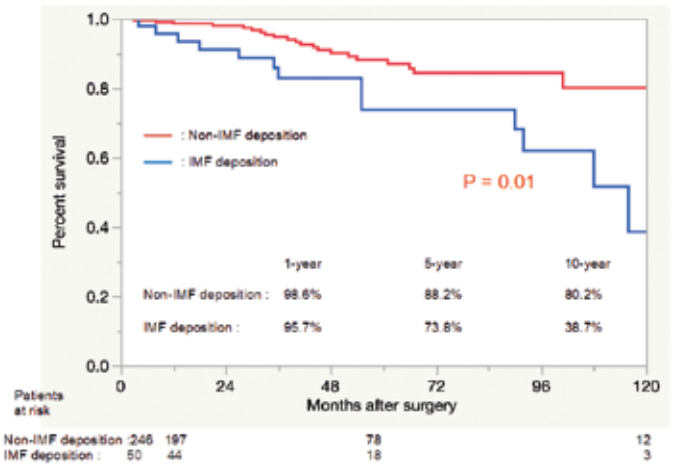

Figure 1. Survival curves of patients with intramuscular fat deposition and non-intramuscular fat deposition after discharge from hospital.

There were no significant differences between the groups for in-hospital mortality and major morbidities. IMF deposition was determined to be risk factors for deteriorated activities of daily living at discharge by multivariable analysis. Patients with IMF deposition had significantly worse long-term survival (Figure 1). Moreover, a multivariable Cox proportional hazard analysis showed that while IMF deposition could significantly predict poor survival, PAI and age could not.

Quality of skeletal muscle, as defined IMF deposition, can serve as an independent predictor of late mortality and postoperative ADL dependence risk in patients undergoing surgery in ATAAD. IMF deposition may be an additional risk factor to estimate the outcomes of thoracic aortic surgery.

Abstract | Congenital | Congenital Valve

Mid- to long-term follow-up of pulmonary valve replacement with Biointegral injectable valve

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Chronic pulmonary valve regurgitation (PR) is a common late sequaela following surgical repair of congenital heart diseases (CHD), namely tetralogy of Fallot (TOF) or pulmonary stenosis (PS). PR causes a long-standing volume overload that can result in right ventricle (RV) dilatation and failure, increasing late morbidity and mortality[1-8]. Surgical replacement of the pulmonary valve is the standard treatment for pulmonary valve disease. There is a general consensus that symptomatic patients with RV dysfunction should undergo pulmonary valve replacement (PVR) surgery, while the benefits on asymptomatic patients remains controversial, although several authors have suggested that timely reoperation may lead to a complete RV recovery[9-13].

The aim of our study is to evaluate, retrospectively, the feasibility of implantation, valve function and mid- to long-term clinical outcomes of the No-React® Injectable BioPulmonic valve prosthesis for PVR in symptomatic patients. (Figure 1). The No-React® Injectable BioPulmonic prosthesis consists of a porcine pulmonic valve covered with a bovine pericardium sleeve and mounted on a self-expandable nitinol stent. It is available in different diameters (ranging from 15 to 31 mm). It can be inserted with or without cardiopulmonary bypass (CPB) and even in a hybrid theatre setting; in either way, the valve is introduced via a right ventricle infundibular approach (Figures 2–4). Subsequently, the valve self-expands and can be anchored by placing 3 to 4 simple stiches on the flexible ring at the level of the predicted pulmonary valve annulus.

Data were collected from the registry of injectable pulmonary valves, from 18 different centres. The results of 85 symptomatic patients with severe PR or PS who underwent PVR between 2007 and 2019 were analysed. The underlying diagnosis was repaired tetralogy of Fallot in 70.6% of cases. Mean age at the PVR was 26.7 ± 16.6 years. All the patients underwent echocardiography before surgery, after implantation and during follow-up. Most of the patients also underwent pre/post-operative cardiac MRI or catheter investigation. More than one quarter of the population (25.9%) was operated on while off-pump. The mean follow-up was 4.9 years (1 month – 12.6 years). Over 90% of the patient had their follow up complete at 1 year, and 40% at 5 years. There were no device-related deaths; 3.6% patients developed a PV stenosis and the prosthesis was explanted in only 1 patient due to endocarditis. Both echocardiography and cardiac MRI during follow-up showed a good valve function, a significant reduction in RV size and low gradients across the pulmonary valve (Figures 5–6, Table 1).

Simone Ghiselli (left) and Stefano M Marianeschi

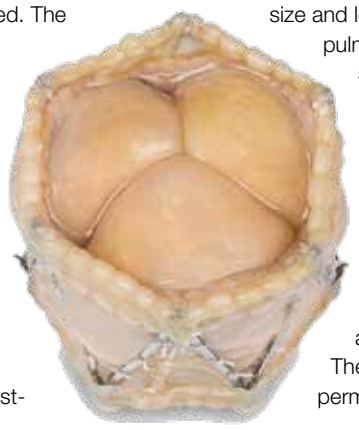
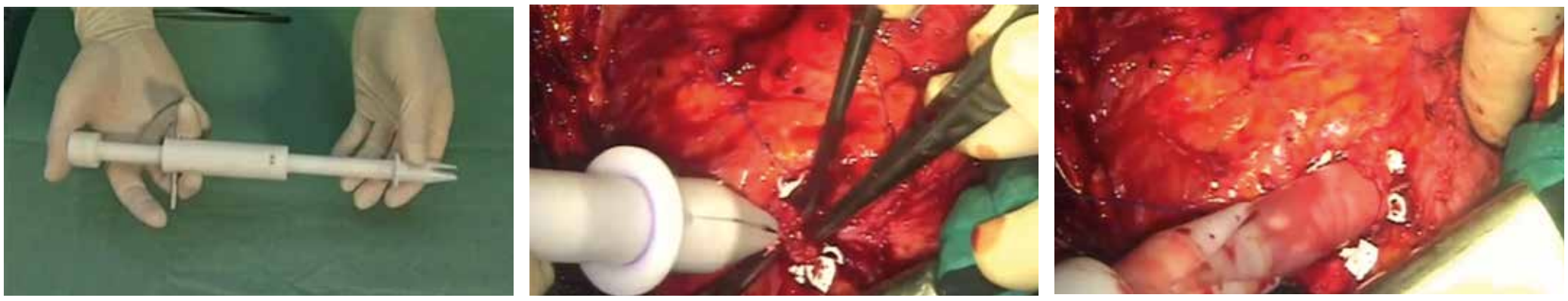


Figure 1: Injectable BioPulmonic prosthesis.

This prosthesis is designed to be less obstructive: it has a low profile and a soft stent that reduces the stretch of the annulus and avoids the risk of coronary artery compression. The lack of a suture ring permits the implantation of relatively larger size prosthesis, avoiding right ventricular outflow tract obstruction and maintaining a laminar flow inside the valve. The implantation technique requires only minimal mobilisation of the heart and great vessels and thus reduces both the operative time and the risks associated with extensive dissection[14]. After choosing the insertion site, the introduction and the deployment of the prosthesis takes only a short time, therefore significantly reducing the operative period. Despite most of the RVOTs being able to be addressed, off pump, with a trans infundibular technique, in cases of heavy calcifications or highly irregular anatomies of the infundibulum, it is recommended to adopt the use of CPB and a conventional implantation technique, albeit shorter in duration because of the lesser suturing needed.

Importantly, this device allows future percutaneous valve-in-valve procedures, if required. Results concerning durability are encouraging and mid- to long-term haemodynamic performance, in our experience, are excellent. This leads us to the conclusion that the Injectable BioPulmonic valve prosthesis is a viable alternative to conventional prostheses.



Figures 2–4: The injectable implant procedure.

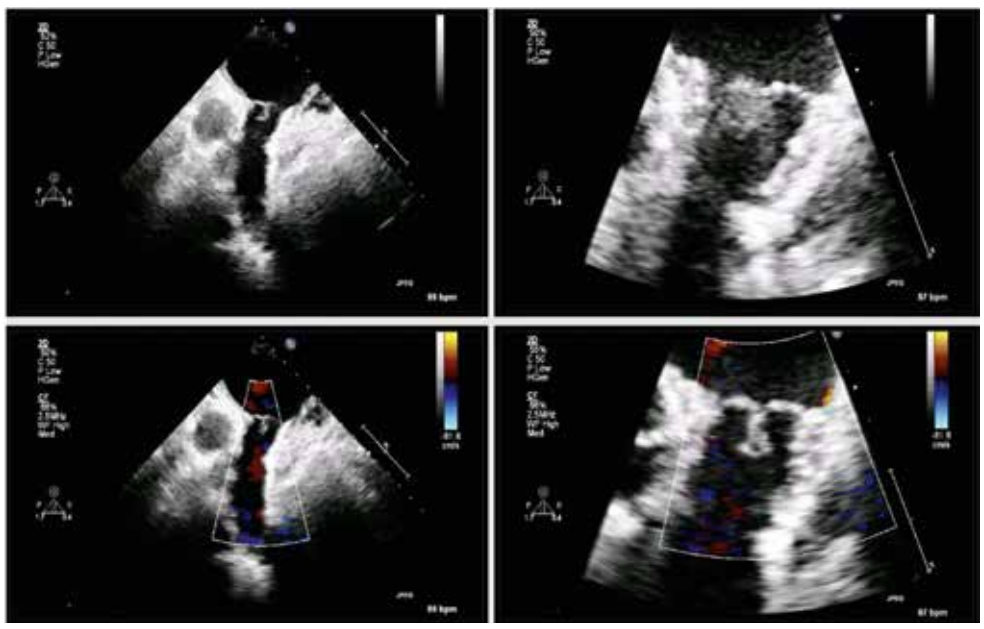


Figure 5: Intraoperative echocardiography.

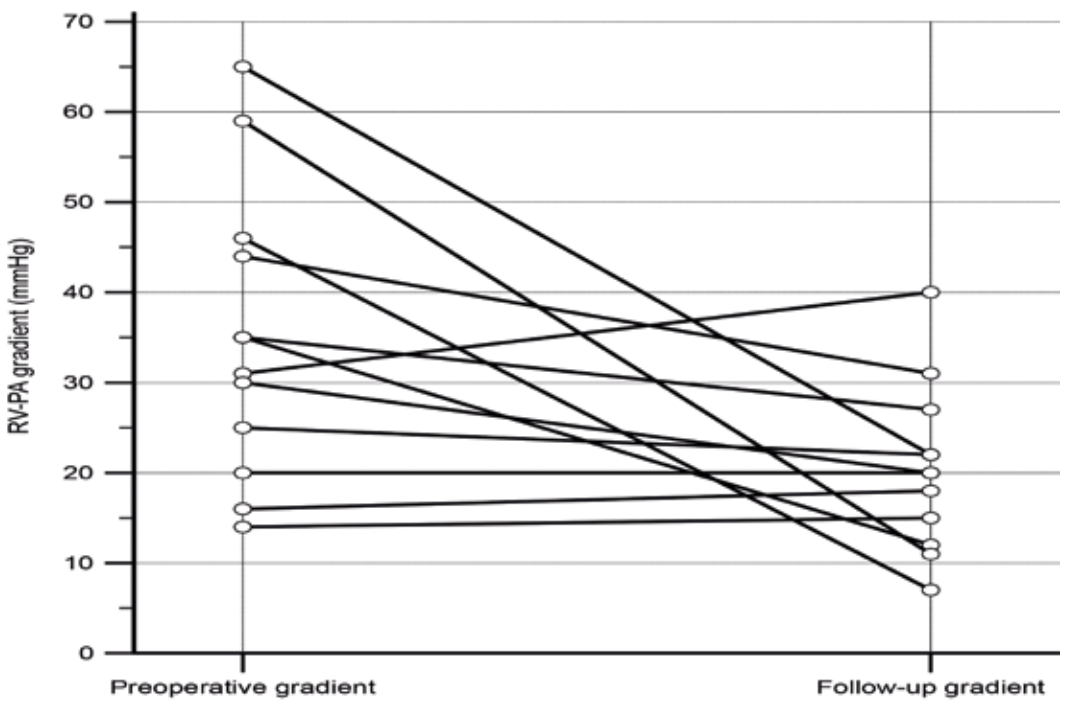


Figure 6: Pre- and post-implantation RV-PA gradient graph.

PARAMETERS	PRE-IMPLANT	POST-IMPLANT	*P*
RVEDVI (ml/m2)	150.3 ± 37.8 (50-221)	108.6 ± 28.3 (65-171)	<0.0001
RVESVI (ml/m2)	80 ± 26 (20.6-148)	57.4 ± 23 (27-108)	<0.0001
RV/LV diastolic volume ratio	2.1 ± 0.6 (0.8-4)	1.3 ± 0.4 (1-2.8)	<0.0001
RVEDD A-P (mm)	35.9 ± 10.2 (13-63)	30.9 ± 7.1 (19-52)	<0.001
RVEDD M-L (mm)	48.5 ± 10.5 (34-88)	41.3 ± 8.8 (30-65)	<0.0002
RV EF (%)	46.5 ± 9.5 (24-72)	49.4 ± 10.3 (34-70)	=0.05
RV Pmax (mmHg)	51.9 ± 23.8 (22-108)	38.4 ± 14.5 (10-80)	<0.001
RV-PA Gradient (mmHg)	43.9 ± 32.7 (10-120)	22.5 ± 14.6 (6-65)	<0.001

Table 1. Echocardiographic assessment pre and post implantation.

Table 1: Pre- and post-implantation echocardiographic assessment.

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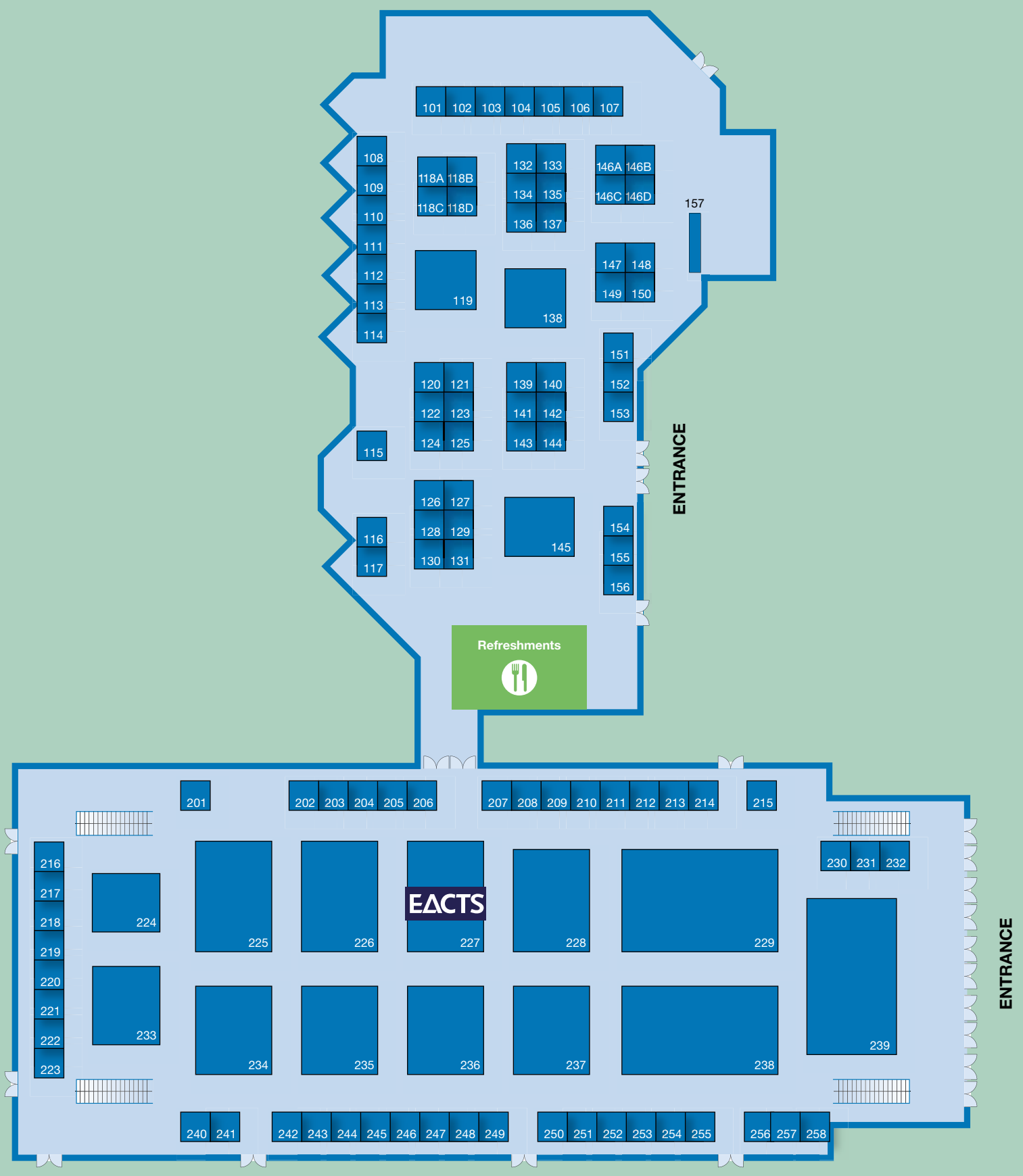

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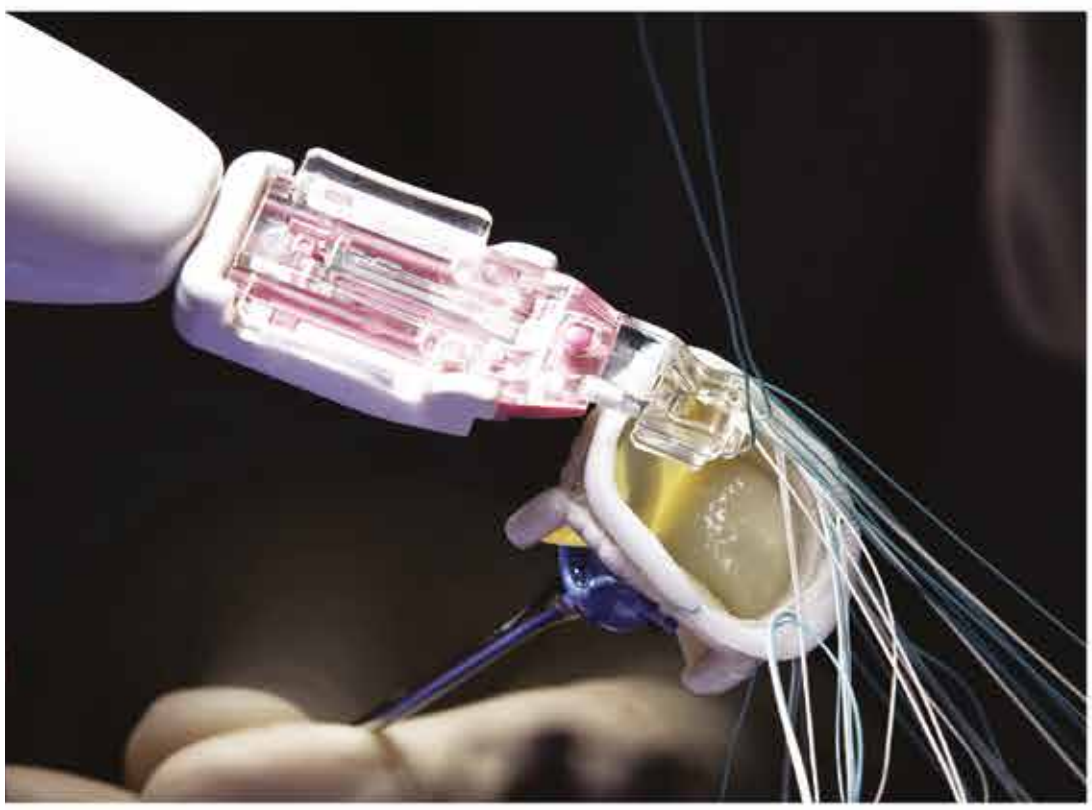

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