Daily News

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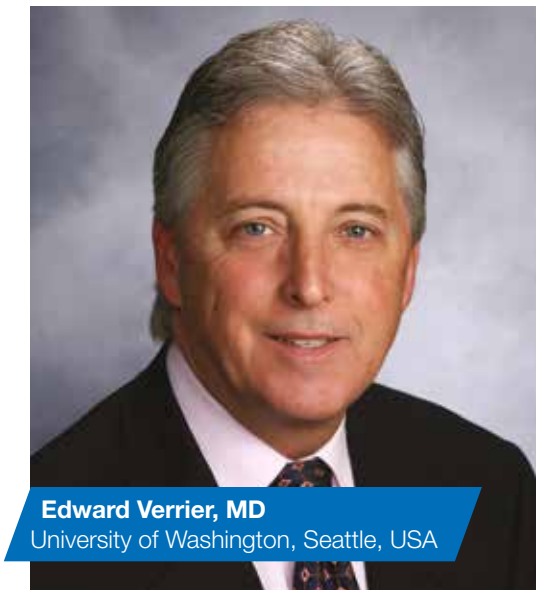
EACTS European Association For Cardio-Thoracic Surgery

The changing requirements of cardiothoracic surgical training



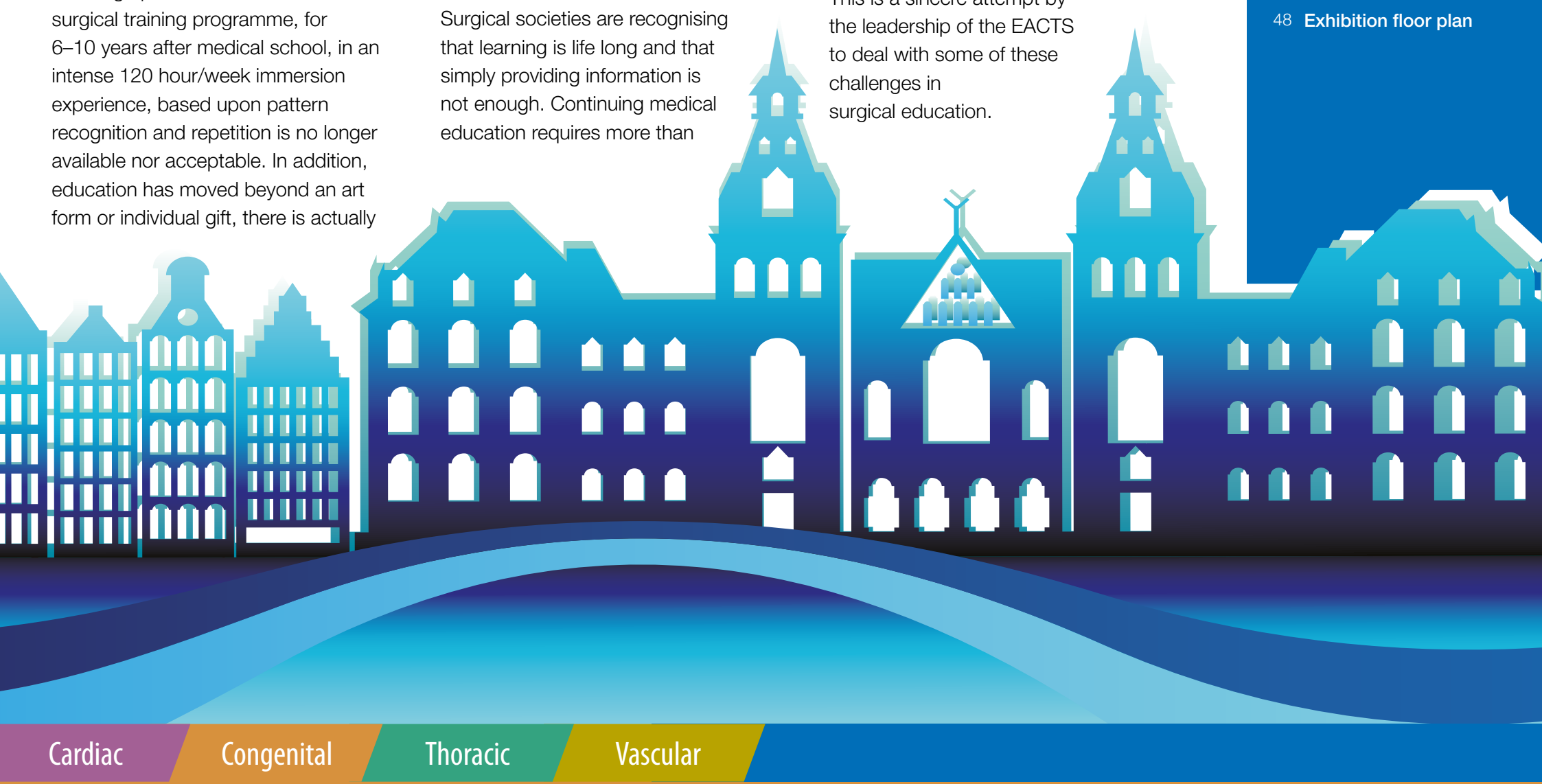
Edward Verrier, MD
University of Washington, Seattle, USA

The environment for cardiothoracic surgery residency training has changed dramatically over the past 20 years. Case complexity has increased, new technology is constantly being introduced, outcome databases are increasingly transparent, societal expectations are higher than ever, faculty are increasingly distracted with generating hospital revenue, while resident duty hour restrictions necessitate learning outside of the hospital or operating room. In contrast, the Halsteadian model of surgical residency training, which was founded on basic scientific principles, taught by experienced senior surgeons, time based in duration, and modeled upon the principles of graded responsibility, has changed minimally since 1906. University is followed by medical school and then graduate surgical education or residency.

The problem is that, in 2015, simply showing up in a formal cardiothoracic surgical training programme, for 6–10 years after medical school, in an intense 120 hour/week immersion experience, based upon pattern recognition and repetition is no longer available nor acceptable. In addition, education has moved beyond an art form or individual gift, there is actually a science to how people learn and how people should teach. New words are increasingly penetrating our educational vocabulary such as: adult learning theory, psychomotor skill development, simulation, deliberate practice, content management systems, learning management systems, flipping the classroom, competency based medical education, formative feedback, performance evaluation and accountability; and the belief that expertise was transferable across domains, so if I was a good surgeon I must be a good educator, is no longer held to be true.

Most of our scientific journals now have a content area dedicated to education innovation and research. The availability of the internet and rapid telecommunications has led to us all having increasing responsibilities to the global community to improve universal educational standards. Surgical societies are recognising that learning is life long and that simply providing information is not enough. Continuing medical education requires more than simply showing up and reuniting with old friends or colleagues. More importantly for our societies and residencies, the new digital learner cannot simply learn everything about cardiothoracic surgery from Google. We have to add educational accountability in the classroom, in the operating room, at our meetings and in all aspects of continuing medication education. Surgical education cannot be simply time based. Accountability for learning and maintaining competency skills must be assumed by very individual surgeon in residency and in practice. Those faculty members actually training residents must be trained to become educators, not just senior surgeons. This seems like a whole new world! Yesterday, the European Association for Cardio-Thoracic Surgery (EACTS) programme committee put together a stimulating session entitled: 'CanBetter: optimising training programmes in cardiothoracic surgery'. This is a sincere attempt by the leadership of the EACTS to deal with some of these challenges in surgical education.

In this issue...



Cardiac Congenital Thoracic Vascular

Cardiac – Abstract: Cardiac general

Professional behaviour in the operating room, outcomes

David J O'Regan Leeds General Infirmary, Leeds, UK

Professionalism is defined in the Oxford English dictionary as 'the competence or correct demeanour of those who are highly trained and disciplined'. The training and competency of the surgeon is rarely in question but it is the discipline that is often called into question. As surgeons, we have the privilege of leading expert teams. The culture in theatre is largely due to the conduct of the lead surgeon, and is determined by their attitude and behavior using the model of Edgar Schein.[1] We can all choose the attitude we bring to work. Everybody has 'a cross to bear' and nobody knows what goes on in people's own lives. However, the way we interact and talk to other people is entirely within our control. Our behaviour is clearly evidenced by verbal and non-verbal cues. Body language is important. Irritation, annoyance, frustration are all things that surgeons experience on a regular basis but any 'facial leak' transmitting that annoyance, can have detrimental effects. We, as professionals, need to have self-control, or self-regulation as termed by Goleman.[2]

Discipline is particularly important with regards to hospital checklists, which save lives. A pilot study of eight hospitals around the world was quite remarkable; complications such as post-surgical infections fell by more than a third and death rates almost halved. However, there is increasing concern about why these fail with many hospitals unable to replicate such outcomes. The success story appears more complicated. I believe this is because power distances in theatre, especially between the surgeon and staff, still prevail. In 2008, I returned from the Executive Patient Safety Officer programme at the Institute of Health Improvement and felt that I had an epiphany, as I realised the importance of the checklist and my own behaviour and attitude in theatre. I therefore put up a cartoon of myself inviting people to challenge my behaviour and to ask questions (Figure 1). The cartoon was looked upon as an object of amusement but it did have the desired effect. I knew it was working when I was reprimanded by an operating department practitioner as being an 'a**e' as I let my frustrations get the better of me. We do ask at debriefing if there have been any problems with communication.

I believe that the checklist is too frequently regarded as just a tick box exercise without people engaging in the process. The operative word in the WHO checklist is 'who'. Who is on the table and who is working with you? I start the checklist at the beginning of the day with 'Does everybody know each other?' We all introduce each other by our first names and insist on writing them on the board. I note many surgeons still use their 'title' in theatre and often wonder how this is perceived by the team. It is building a subconscious hierarchical barrier. I reflect on a senior colleague (retired),who even after 20 years of service, had difficulty remembering the names of the staff. People do feel valued if acknowledged by name. Furthermore, I believe it is extremely difficult to be rude or abrasive to anybody if you speak to them using their first name! The second question 'Has anybody got anything to celebrate?' has become a very useful tool to enable staff to talk to each other and share the real you. We have celebrated promotions, engagements, marriages, births, graduations and divorces! It has facilitated conversations and enabled staff to become more familiar with each other.

We also ask if anyone is troubled with anything. The sharing and support of the team engendered by this practice builds confidence and cohesion and thus enhances a culture of safety.

The second reason why checklists fail is because the debriefing is haphazard. I prefer to think of debriefing as an after action review. This has been used very successfully by the US Armed forces and commercial aviation. It asks what has gone well and gives an opportunity to reflect on what might be done better. It offers the team a learning opportunity to improve operations. More recently, it was pointed out to me that it is an important vehicle to help people to come to terms with a death on the operating table.

Implementation scientists are trying to make sense of complexity and failure of the WHO checklist. Researchers at Imperial College, London found that the checklist was used in 97% of 7000 cases but completed only 62% of the time. Practitioners often failed to give checks their full attention and only read two thirds of the items out loud, 10% of the time the lead surgeon was missing. It is going through all the steps in a disciplined fashion that really matters. The more of the checklist that teams complete, the lower the complication rates and several studies have revealed the higher compliance of checklists associated with better outcomes. Studies have reported that senior surgeons and anaesthetists actively resisted checklists and very frequently viewed them as yet another example of top down and intrusive initiatives.

In summary, it is not the checklist itself, but the professional manner and behaviour of the people in theatre contributing and adhering to the discipline of the checklist that is going to have a significant effect on the wellbeing of our patients. It starts with the surgeon. An arrogant KLM 'it can't happen to me' captain flew a fully loaded Boeing 747 into another in Tenerife in 1977 resulting in the loss of over 800 lives – the airline industry realised the importance and role of the captain. Power gradients kill. Professionalism evidenced by your attitude and behaviour does matter.

References

1. Schein E. Culture = attitude plus behavior. *Personal communication.*

2. Goleman D. Working with Emotional Intelligence. London, UK: Bloomsbury; 1988.

Coffee Reception for Residents

The Surgical Training and Manpower Committee (STMP) will host a coffee reception for all residents on **Monday 5th October at 12:45–14:00 in room F002**.

The aim of the meeting is to inform you about the activities of the STMP, both at the Annual Meeting and throughout the year.

We will also be looking for new members to join us and we will announce new vacancies for which residents can apply.

Furthermore, we will inform you about resident's associations across Europe and their needs and explore how we can collaborate.

Peyman Sardari Nia

Cardiac – Rapid Response: Supporting the heart and lung

Acquired von Willebrand syndrome in patientson long-term support with HeartMate II

Claudia Heilmann University of Freiburg, Freiburg, Germany

Acquired von Willebrand syndrome (AVWS) was first described in patients with ventricular assist devices (VAD) in 2008 and has gained much attention since then because AVWS contributes to bleeding tendencies in VAD patients.

One main function of von Willebrand factor (VWF) is to mediate the binding of platelets to uncovered subendothelial collagen. According to current knowledge, the shear stress that is exerted on blood in VAD leads to unfolding of the high molecular weight (HMW) multimers of VWF, which, in turn, allows for processing by the protease ADAMTS13. This loss of HMW multimers results in impaired binding of VWF to both platelets and collagen.

The quality of binding of VWF to platelets can be estimated from the ratio of the ristocetin-cofactor activity of VWF (VWF:RCo) to the overall amount of VWF antigen in plasma (VWF:Ag). Likewise, binding to collagen is reflected by the ratio of the collagen-binding capacity of VWF (CB:VWF) to VWF:Ag. Furthermore, western blotting allows visualisation of multimers of VWF and determination of the absence or presence of HMW multimers. Immediate onset of AVWS after VAD implantation and equally fast reversal at explantation has been demonstrated.

Our current study aimed to investigate the long-term course of AVWS in VAD patients. We monitored 74 patients with a HeartMate II for 3 to 80 months after VAD implantation (mean, 11.2±12.1 months; median, 6.3 months) and obtained 278 data sets. A pathological VWF:RCo/VWF:Ag ratio was found in 192 of 278 (69%) tests. The VWF:CB/VWF:Ag ratio was decreased in 224 of 231 (97%) analyses. In addition, HMW multimers were reduced or lost in 169 analyses (93%) of 70 patients and normal in only 12 analyses (7%) of 10 patients. No changes were found over time for any of the parameters. Only two patients had no losses of HMW multimers, and two analyses were performed for both. In summary, AVWS was detected in 72 of 74 (97%) patients. Our data indicate that AVWS is a typical phenomenon in most patients on long-term support with HeartMate II. The VWF:CB/VWF:Ag ratio and VWF multimer patterns correspond. However, the VWF:RCo/VWF:Ag ratio is less sensitive for AVWS, which is in keeping with previous data.

Considering the genesis of AVWS, there is no causative therapy. Any treatment of bleeding events aims to restore coagulation equilibrium. This stabilisation can be approached by reducing anticoagulation and by correcting other pathological changes of coagulation, like substitution of platelets or coagulation factors. Tranexamic acid can be considered, especially for mucocutaneous bleedings. VWF-centred measures include application of desmopressin acetate to recruit stored VWF from endothelial cells and of products containing VWF and factor VIII. However, additional VWF is subject to proteolysis. Although the tendency for bleeding remains, acute bleeding can be stopped with the use of this escalating therapeutic scheme for longer periods in a number of patients.

OUTCOMES FOR NEXT-GENERATION HEARTMATE 3™ LVAS

The recent HeartMate 3 CE Mark trial was a multicentre, multinational clinical study designed to evaluate the efficacy and safety of the HeartMate 3 LVAS against established standards.

HeartMate 3 builds on the legacy of proven performance established by HeartMate II®, designed to offer unprecedented blood-handling characteristics that elevate LVAD therapy to even higher standards.

The new pump incorporates Full MagLev™ flow technology, which allows the device's rotor to be magnetically levitated, or suspended, by magnetic forces. This contact-free environment is designed for haemocompatibility, with large blood-flow pathways designed to reduce blood trauma and minimise complications.

Patients who received HeartMate 3 were studied for 6 months, with follow-up continuing up to 24 months post-implant.

- Primary endpoint: survival
- Secondary outcome measures: quality of life, 6-minute walk distance, adverse events, device malfunctions, reoperations, rehospitalisations, and stroke

Study patients were required to meet the following criteria: age ≥18 years with a body surface area ≥1.2 m^2; New York Heart Association (NYHA) class IIIB or IV or American College of Cardiology/American Heart Association stage D; left ventricular ejection fraction ≤25%; and cardiac index ≤2.2 L/min/m^2 while not on inotropes.

Patients also met one of the following criteria: on Optimal Medical Management, based on current heart failure practice guidelines, for at least 45 out of the last 60 days and failing to respond; in NYHA class IIIB or IV heart failure for at least 14 days and dependent on intra-aortic balloon pump for at least 7 days; inotrope-dependent/unable to wean from inotropes; or listed for transplant. For exclusion criteria, please see ClinicalTrials.gov, identifier: NCT02170363.

Results of the HeartMate 3 CE Mark clinical trial suggest significant implications for the care of patients with advanced heart failure.

HEARTMATE 3™ CE MARK TRIAL

6-MONTH DATA TO BE REVEALED

Time and date: **Tuesday 6 October,** 12:45–14:00

Location: Forum Room, RAI Amsterdam

Exclusively for clinical investigations.

Cardiac/General – Focus Session: Pro and con debates

Octogenarians and extracorporeal life support

JG Maessen Maastricht University Medical Center, Maastricht, The Netherlands

Extracorporeal life support (ELS) is the *nec plus ultra* 'bridge to recovery' therapy. It's the most sophisticated and versatile technology that resuscitation medicine can offer. Yet, many doctors outside the cardiac surgery community still don't have the faintest idea about the revolutionary potential of ELS. At this level there is a world to be conquered, and it may be harmful and ill-timed to rush into exceeding our limits by offering ELS to octogenarians.

A technology known for almost half a century can hardly be called revolutionary. The revolution is not in the technique *per se*, but in the access to this technology. Starting as a tool exclusively used to allow cardiac surgeons to operate on hearts without losing their patients, ELS has now been taken outside the operating theatre. First to intensive care for post-surgical support, then for any patient in need of cardiopulmonary support in the intensive care unit. Here the powerful possibilities for resuscitation really became apparent and finally, ELS has been taken outside the hospital, in the ambulance, in the trauma helicopter, into the street and the home.

In the meantime the technique has changed in line with the demands of these new developments. ELS has become smarter, smaller, and less invasive with a fully automated operating system. Earlier, less physiological, models started to harm patients after an hour and a half. Now support can be continued for days, weeks or even months as critical spare parts can easily be replaced. It all contributes to a low threshold availability of ELS for new applications.

The revolutionary increase in access to ELS technology is at the same time the biggest threat to a durable adoption of the use of ELS. Large-scale application may inadvertently make unsolved issues bigger than necessary. Concerns about the impact on health care costs, high mortality rates and ethical discussions may put the development on hold. At this stage, advertising access to ELS for octogenarians does not help.

When patients do not die because of resuscitation by ELS they need time to recover. Though, the ELS equipment itself is relatively inexpensive, this means a considerable burden on healthcare costs that can only be justified by regained quality of life for the patient. Such economic considerations are not in favour of offering ELS to octogenarians.

If in-hospital mortality is considered the single outcome parameter for ELS applications it erroneously gives you too pessimistic a picture of the true success rate of ELS. Twenty years ago, a similar sloppy misinterpretation finished off the use of ECMO in adults. In order not to throw out the baby with the bathwater again there is no need to increase the number of inclusions at the high end of high-risk indications. Octogenarians are likely to belong to this latter group. As a last resort therapy, ELS shares ethical issues with similar therapies. Who is entitled to deny access to this therapy, who can decide to stop if the patient is okay on the machine but will never recover? How much increased life expectancy warrants ELS therapy? We need sound and widely accepted guidelines before exceeding limits again.

If by accident, an 80-year-old vital patient with a bridgeable problem is in need for ELS support, why not? That is not the real question. If 'octogenarian' stands for 'end of life' we should be aware that ending your life does not mean by default that someone has to switch off your ELS device. In this respect, ELS in octogenarians is a bridge too far.

Thoracic – Focus Session: Minimally invasive surgery for lung cancer: up-to-date debates

Anatomic video-assisted thoracoscopic lobectomy (VATS)

Douglas J Mathisen Thoracic Surgery, Massachusetts General Hospital, Boston, MA, USA

Anatomic video-assisted thoracoscopic lobectomy (VATS) has transformed the management of early stage non-small cell cancer (NSCLC). In large centres, and in centres with special expertise, over 50% of lobectomies are typically performed in this fashion. Outside of these centres the procedure has been much slower to be adopted. Much of the available data has been generated from retrospective, single-centre studies, with few large randomised prospective studies.

The focus of analysis has mainly been on efficacy, complications, length of stay, return to work and cost. These reports, while rarely randomised and prospective in nature, have made a compelling argument for the benefits of this minimally invasive approach. One could argue that if the same energy was devoted to the same issues around open lobectomy, the differences would be less or even non-existent.

Improving short-term outcomes is important. In lung cancer, long-term outcome and survival are still the most important factors to judge a new procedure. VATS lobectomy is not a new treatment, just a different procedure. Gains in lung cancer survival have been slow and hard won. Over the last half century, overall survival has gone from about 10% to about 20%. A new procedure should at least be as successful as traditional methods. Two recent retrospective studies comparing open versus VATS lobectomy have been conducted. One is a large national database from Denmark,[1] the other from the Society of Thoracic Surgeons General Thoracic Database.[2] In early stage lung cancer both studies found significant upstaging of N1 and N2 nodes. The implication being that survival may be adversely impacted.

This finding using these two large databases begs the question of a randomised prospective study comparing open and VATS lobectomy. It isn't enough to say that the two are comparable based on non-randomised retrospective studies. If survival is equivalent or better, VATS should be the procedure of choice. If not efforts should be undertaken to show which condition produces equivalent results. Patients deserve to be informed of any differences to enable them to make the most informed decision regarding the management of their NSCLC.

References

1. Licht P, Ladegaard L, Jakobsen E. Nodal upstaging is lower after thoracoscopic lobectomy compared with thoracotomy for clinical stage-1 lung cancer: A nationwide study. Abstract STS 49th Annual Meeting 2013.
2. Boffa DJ, Kosinski AS, Paulet S, et al. Lymph node evaluation by open or video-assisted approaches in 11,500 anatomic lung cancer resections. *Ann Thorac Surg* 2012;94:347–53.

Satellite sessions at the 29th EACTS Annual Meeting

Monday 5 October 2015			
Company	Time	Room	Session
AtriCure Europe BV	12.45–14.00	E106/E107	Does AF ablation also have a role in AVR and CABG patients?
Edwards Lifesciences	12.45–14.00	Forum Room	Innovation in aortic valve therapy: procedural trends and outcome
JOMDD Inc	12.45–14.00	G109	Ozaki's autologous pericardium aortic valve neo-cuspidisation
MAQUET Vertrieb und Service Deutschland GmbH	12.45–14.00	E102	To pump or not to pump? What is the role of IABP in cardiac surgery?
Medos Medizintechnik AG	12.45–14.00	E108	Talking about extracorporeal therapies – there is much more beyond ECMO
Medtronic International Trading Sàrl	12.45–14.00	G104/105	Evolution of aortic stenosis treatment options: perspectives from cardiac surgeons, cardiologists and industry
Somahlution, VGS and Medistim	12.45–14.00	E104/105	Optimising vein graft outcomes for CABG: new solutions
Sorin Group Italia SRL	12.45–14.00	Emerald Room	Current controversies and future perspectives in aortic and mitral fields
St Jude Medical	12.45–14.00	G102/103	Novel technologies for aortic stenosis, built on close to 40 years of valve expertise, deliver better patient outcomes on short- and long-term view
Vascutek Ltd	12.45–14.00	G106/107	Management and treatment of the diseased aortic arch

Tuesday 6 October 2015			
Company	Time	Room	Session
AtriCure Europe BV	12.45–14.00	E106/E107	Integrated management of persistent atrial fibrillation – how, when and why?
Auto Tissue Berlin GmbH	12.45–14.00	E108	The use of decellularised tissue in cardiac surgery
JOTEC GmbH	12.45–14.00	G109	10 years E-vita OPEN PLUS – a track record
Medtronic International Trading Sàrl	12.45–14.00	G104/105	Mitral valve disease management: positioning yourself for success today and tomorrow
PneuX Life Systems	12.45–14.00	E103	Improving cardiac surgery outcomes by reducing VAP rates
Symetis	12.45–14.00	E102	ACURATE TAVI: easy, stable TAVI for all access and anatomies
Thoratec Corporation	12.45–14.00	Forum Room	HeartMate 3™: early experiences and outcomes

Cardiac – Focus Session: Joint session EACTS SBCCV PASCaTS – cardiothoracic surgery

Pattern of oesophageal injuries and surgical management in West Africa: mid-term results

Mark Tettey[1,2], Frank Edwin[1], Lawrence Sereboe[1,2], Ernest Aniteye[1,2], Martin Tamatey[1]
1. Korle Bu Teaching Hospital, Ghana. 2. University of Ghana

We retrospectively reviewed patients who presented to Ghana's National Cardiothoracic Center with oesophageal injury from January 2005 to March 2015. One hundred and eleven patients were included in the study; 85 (76.6%) presented with complications of corrosive injury and 26 (24.4%) presented with non-corrosive oesophageal injury.
Patients with non-corrosive oesophageal injury were predominantly male (4:1) with a mean age of 34.4±20.1 years (1–73 years). Oesophageal perforation from instrumentation accounted for 14 (53.9%) of the non-corrosive injuries, with foreign body impaction (11, 42.3%) and spontaneous perforation (1, 3.8%) making up the rest. These patients were managed by employing the following measures: oesophagotomy and removal of foreign body (7, 26.9%), oesophagectomy, cervical oesophagostomy and feeding gastrostomy (10, 38.6%), primary repair (7, 26.9%), Ivor Lewis procedure (1, 3.8%) and emergency oesophagectomy and colon replacement (1, 3.8%). Patients who had oesophagectomy, cervical oesophagostomy and feeding gastrostomy underwent oesophageal replacement with colon 2–3 months later. There were two (7.7%) early deaths. Operative survivors were routinely followed up at 2 weeks, 1 month, 3 months, 6 months and then annually thereafter. Four patients (15.4%) were lost to follow-up. The functional success of the remaining 20 patients was excellent with no instances of dysphagia.
Eighty-five patients presented with corrosive oesophageal injuries. They were predominantly male (2:1), mean age 12.8±14.2 years (2–58 years) and predominantly children (53% ≤5 years; 18.8% ≥18 years). Except for four (4.7%) adults who ingested battery acid with suicidal intent, all other patients including 69 (81.2%) children accidentally ingested corrosive substances. Following evaluation by barium swallow and oesophagoscopy 67 (78.8%) patients had oesophageal stricture without pharyngeal involvement; 18 (21.7%) had severe pharyngoesophageal strictures. The treatment procedures for these patients included oesophagocoloplasty 64 (75.3%), colopharyngoplasty 10 (11.8%), colon-flap augmentation pharyngo-oesophagoplasty four (4.7%), colopharyngoplasty with tracheostomy four (4.7%) and oesophagoscopy and dilatation three (3.5%). Colon-flap augmentation pharyngo-oesophagoplasty was employed in selected patients. The left colon was used as a conduit in 81 (95.3%) patients. Functional success after 6 months follow-up was excellent without dysphagia in survivors. Early complications were arose in 14 (17.1%) patients, and included salivary fistula (11), colo-colic anastomosis leak (2), and graft necrosis (1). There were five (5.9%) late complications; colo-oesophageal anastomotic stenosis (3), thoracic inlet compression (1), and reflux with nocturnal regurgitation (1). Two early (2.4%) and three late (3.7%) mortalities were observed. Five (5.9%) patients were lost to follow-up. The follow-up protocol was similar for patients with non-corrosive injuries.
We conclude that although corrosive oesophageal injuries are rare in the developed world, they are the most important form of oesophageal injury in nations with unrestricted access to corrosive substances. The majority of victims are young children, 5 years of age or younger. Surgical intervention based on individualisation of care yields excellent early and mid-term results. Urgent legislative measures are required to control access to corrosive substances as a means of primary prevention in developing nations.

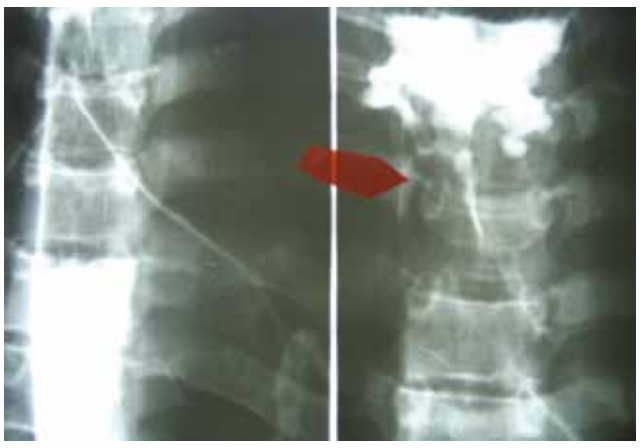


Figure 1. Barium swallow of a 35-year-old man with tracheo-oesophageal fistula from an impacted denture of 15 years' duration.

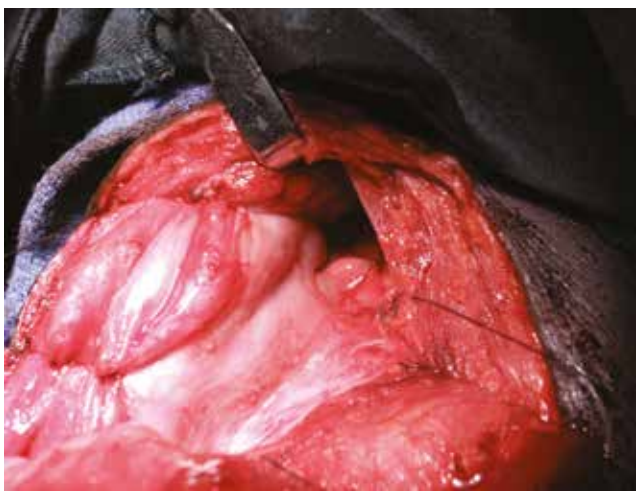


Figure 2. Pharyngotomy in a patient with severe pharyngo-oesophageal stricture during colon-flap augmentation pharyngo-oesophagoplasty.

Cardiac – Abstract: Results of Ross procedures and homografts in aortic surgery

Is there still a place for homografts in elective aortic procedures?

John Pepper Royal Brompton and Harefield NHS Foundation Trust, London, UK

The aortic valve homograft has been in use for five decades and is associated with excellent haemodynamics, akin to that of the native aortic valve. Different methods of implantation have been established but surgical preference remains an important determinant of the mode of homograft insertion, with an increasing realisation that, after an initial learning process, all techniques can provide consistent and reproducible results.
The homograft was the initial stentless prosthesis. Since its introduction, the pulmonary autograft and stentless porcine valve have also entered the clinical arena. These can be considered as appropriate substitutes for the homograft depending on certain clinical criteria, such as patient age, homograft availability and preference of the surgeon. The homograft remains a reliable prosthesis for aortic valve replacement and continues to represent the gold standard in terms of haemodynamic performance.
From the surgeon's viewpoint, the homograft is most useful in the setting of infective endocarditis and especially prosthetic valve endocarditis. These complex operations are characterised by absent tissue planes and the need to remove all infected tissue from the circulation. Unlike a classical Bentall aortic root procedure employing a Dacron tube, the homograft tissue is easier to work with, is able to fold into irregular surfaces and is far more forgiving to any irregularity in the suture line than an artificial graft. Thus, haemostasis is easier to achieve. The absence of any prosthetic material is also a distinct advantage and allows for a very low incidence of recurrent endocarditis.
In a standard stented bioprosthetic valve, the resting peak pressure gradient is usually between
15 and 25 mmHg. In our own studies, plus those of other teams, Doppler echocardiography peak and mean transvalvular gradients at 12 months follow-up are around 10 and 5 mmHg, respectively. During supine exercise, the peak gradient increases from 10 to 18 mmHg, while the mean gradient increases from 5 to 8 mmHg. There is virtually no turbulence in the left ventricular outflow tract. In effect, the homograft allows the restitution of inertial flow rather than the resistive flow characteristic of all stented prostheses. From a theoretical viewpoint, this is very satisfying but so far it has been difficult to demonstrate any obvious advantage to the patient because of the crude measures of myocardial performance, such as LV mass, available to us at this time. The disadvantages of homografts are their availability and durability. For cryopreserved valves, the 10-year freedom from structural valve disease ranges from 19–38% at 10 years, and 69–82% at 20 years. Accelerated degeneration of the cryopreserved homograft is observed when it is implanted in younger recipients. Additional factors suggested to be associated with an increased rate of valve attrition include increasing age of the homograft donor and implantation into recipients aged older than 65 years. The freedom from redo aortic valve replacement in patients receiving an aortic homograft is of the order of 85% at 10 years and 35% at 20 years. Valve failure is commonly associated with progressive calcific and non-calcific deterioration. The native aortic valve is cellular and layered, with regional specialisations of the extracellular matrix. These elements facilitate marked repetitive changes in shape and dimension throughout the cardiac cycle, effective stress transfer to the adjacent aortic wall, and on-going repair of injury incurred during normal function. These features are absent in the decellularised preserved homograft.
Currently, homografts in the aortic position are most useful for the treatment of infective endocarditis. They require some expertise to insert and are best carried out in experienced centres. The future of decellularised valves is potentially very exciting and studies currently in preparation will be the focus of much attention.

Thoracic – Abstract: Mediastinum

Minimally invasive oesophagectomy for oesophageal squamous cell carcinoma: results of lymph node dissection from number to location

Zhigang Li Shanghai Chest Hospital, Shanghai, China

It has been a period of rapid development in the use of minimally invasive oesophagectomy (MIE) in China. At the Shanghai Chest Hospital, the busiest thoracic centre in the world, more than 200 MIE are now performed for squamous cell oesophageal cancer each year. Previous studies have not reported in detail whether MIE can deliver the same lymph node dissection results provided by open surgery. In particular for oesophageal squamous carcinoma, it remains unknown whether MIE can meet the technical requirements for each anatomical site in lymph node dissection from the mediastinum to the upper abdomen, especially in the early phase of the learning curve of the technique. This study retrospectively reviews data from patients with oesophageal squamous cell carcinoma, who were treated at Shanghai Chest Hospital, and compares the lymph node dissection results from MIE and open surgery.
We reviewed results from patients who underwent either MIE or open surgery for oesophageal squamous cell carcinoma between January 2011 and September 2014. The number of lymph nodes resected, the positive lymph node (pN+) rate, lymph node sampling (LNS) rate and lymph node metastatic (LNM) rate were evaluated. Data were analysed from operations on 447 patients, 123 underwent MIE and 324 underwent open surgery. The number of lymph nodes resected did not differ significantly between the two groups (MIE 21.1±4.3, open surgery 20.4±3.8, p=0.0944). The pN+ rate of T3 stage oesophageal squamous cell carcinoma in open surgery group was significantly higher than that of the MIE group (16.3% versus 11.4%, p=0.031), but there were no differences between the two groups for either T1 or T2 stage oesophageal squamous cell carcinoma. The LNS rate at the left para-recurrent laryngeal nerve (RLN) site was significantly higher for open surgery than for MIE (80.2% versus 43.9%, p<0.001), but there were no significant differences at other sites. The LNM rate at the left para-RLN site in open surgery group was significantly higher than that in MIE group, regardless of pathologic T stage. For T1 and T2 stage oesophageal squamous cell carcinoma, the lymph node dissection results after MIE were comparable to those achieved by open surgery. However, the efficacy of MIE in lymphadenectomy for T3 stage oesophageal squamous cell carcinoma, particularly at the left para-RLN site, remains in need of improvement. To some extent this drawback has been overcome via improvements in technique. Long-term follow-up results, including recurrence status and survival, will provide validation for the selected approach.

Inside Amsterdam

WHERE TO GO AND WHAT TO DO?

Stuart Head

ACTIVITY

Concertgebouw

This is the place to go for lovers of classical music. There are concerts and events on every day, particularly in the evenings starting at around 8.15 pm. For concert details and tickets, check the website:

www.concertgebouw.nl/en/concert-schedule/van=03-10-2015

MUSEUM

Van Gogh Museum

Who doesn't know Vincent van Gogh? One of the most well-known Dutch people that ever lived, van Gogh's paintings are exhibited all over the world. The largest collection, however, is in Amsterdam in his own dedicated van Gogh museum. It is open daily from 9.00 am to 5.00 pm – perfect for the Wednesday afternoon after the EACTS Annual Meeting has finished!

RESTAURANT

Happy Happy Joy Joy

A restaurant from TV chef Julius Jaspers, specialising in Asian streetfood. A fantastic eatery with loads of excellent, tasty small meals to share or just order your own favourites. Located at Bilderijkstraat 158hs.

GO TO

Begijnhof

In the midst of Amsterdam's centre, where you start to think it can't possibly get any busier, lies the tranquil Begijnhof (address: Begijnhof 30). A truly private, quiet courtyard dating from medieval times. A peaceful spot to read a book after a long day of sessions, or just stop in to take some pictures while strolling through the city.

SWEET SNACK

Winkel 43 apple pie

Said to be the best apple pie in town, Winkel 43, located at Noordermarkt 43, will definitely make for a mouth-watering experience. A great stop when walking to the Jordaan, a popular area of Amsterdam with quaint, narrow streets and plenty of bars and restaurants.

RESTAURANTS

The Roast Room

A stylish restaurant with their very own butcher! A must go for meat lovers! Right next to the RAI, located at Europaplein 2, there's no need to travel far for a tasty meal.

Vis aan de Schelde

One of the best fish places in town. Although a bit pricier, it's great for dinner. Make sure to make a reservation beforehand at wwwww.visaandeschelde.nl/en It is located right next to the RAI at Scheldeplein 4.

Cardiac – Focus Session: Minimally invasive surgery for lung cancer: up-to-date debates

Minimally invasive extensive resections: pro

Diego Gonzalez-Rivas Minimally Invasive Thoracic Surgery Unit (UCTMI), Coruña, Spain

Locally-advanced lung tumours often require complex surgical techniques to achieve a oncologic and safe procedure. Although the most common approach is the thoracotomy, with the skills and the experience gained from major video-assisted thoracic surgery (VATS) procedures, these complex surgical techniques can be performed thoracoscopically. However, despite the multiple advantages of VATS compared with thoracotomy, including decreased postoperative pain and better recovery, this minimally invasive approach is still not widely adopted for advanced stages of lung cancer and complex resections. The concern about performing an oncologic resection and safe reconstruction by conventional or uniportal VATS in locally-advanced cases is the main reason for low adoption. Nowadays, more complex resections, such as post-chemo-radiotherapy cases, lobectomies including chest wall or diaphragm resection, broncho-vascular reconstructions, and even tracheal or carinal resections, are being performed by VATS in experienced centres. Over time, experience gained through thoracoscopic techniques, improvements in surgical instruments, and the use of high-definition cameras have greatly contributed to advances in VATS. Because it is less invasive, the single or uniportal approach for VATS has emerged as a novel technique, applicable to a large spectrum of pulmonary resections including sleeve procedures.

Since the first sleeve procedure by open surgery was reported in 1947, the indications and adoption of reconstructive techniques has been slowly expanding to minimally invasive techniques. VATS for major pulmonary resection has numerous advantages compared with thoracotomy, such as decreased postoperative pain, decreased chest tube drainage and shorter length of stay, better preservation of pulmonary function, and earlier return to normal activities. These results are obtained without sacrificing the oncologic principles of thoracic surgery. In fact, there is evidence that VATS lobectomy may even offer reduced rates of complications and even better survival rates for early stage tumours. However, there are yet to be any studies which show benefits in survival using VATS for advanced cases of non-small-cell lung cancer (NSCLC) over thoracotomy. Further studies are also needed to determine if similar advantages can be found for sleeve resections when comparing VATS with open surgery.

Most authors reported using 3–4 incisions for the VATS sleeve procedures, but the surgery can be performed using only one. As our experience using the single-port VATS approach has grown, the number of thoracoscoscopic sleeve procedures undertaken at our centre has increased and the incidence of pneumonectomy has decreased. The geometrical explanation and ergonomy of the approach, with the direct view and bimanual instrumentation, could explain the good results we have obtained with this technique. We consider proper placement of the incision to be extremely important for a good outcome, especially when it is performed using a single port.

When performing bronchial suturing using uniportal VATS, it is very important to maintain the camera on the posterior part of the incision, operating with both hands below the camera. Here we apply the same principle as when performing an anterior thoracotomy in open surgery: direct view with the surgeon's eyes above his/her hands.

Placing interrupted sutures by VATS can be more complex and time-consuming. Our preferred method is to use a continuous absorbable suture (Polydioxanone, PDS 3/0 or V-Loc™), which makes both the thread movement and tying easier. The surgeon ties the knot outside of the chest, holding both ends of the thread with the first and fourth fingers of the left hand and pushing down the knots using a thoracoscopic knot pusher.

We believe it is important to minimise aggressive surgical procedures, especially in patients with advanced stage lung cancer whose immune system is already weakened by the disease or by induction treatments. Minimally invasive surgery represents the least aggressive approach to operating on lung cancer, and the single or uniportal technique is the final evolution in these minimally invasive surgical techniques.

Congenital – Professional Challenge: Part II / A lifetime living with transposition of the great arteries and left ventricular outflow tract obstruction

Transposition of the great arteries

George Sarris Athens Heart Surgery Institute, Iaso Children's Hospital, Athens, Greece

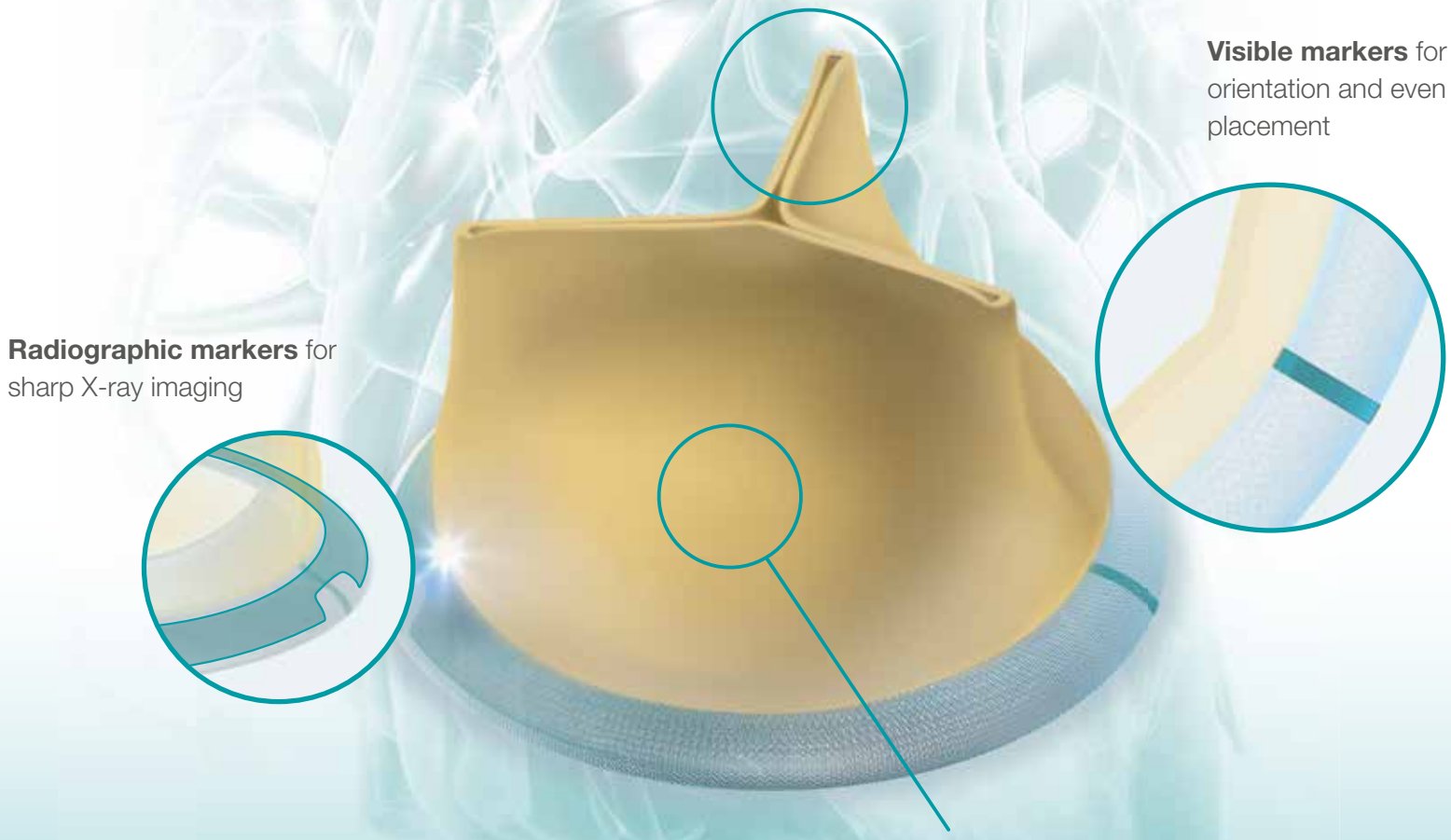
Transposition of the great arteries (TGA) is the most common cyanotic congenital heart defect and, if untreated, it is universally lethal early in life. From the very beginning of congenital heart surgery, surgical pioneers have tried to find a solution for this problem, initially with poor results for palliative procedures, but subsequently achieving excellent survival with the atrial switch operations (ASO), devised by Senning and Mustard in the 1960s and widely adopted in the 1970s. Increasing concern regarding the long-term complications of these physiological corrections, namely, baffle obstructions and leaks, arrhythmias, systemic tricuspid atrioventricular valve regurgitation, and eventually failure of the systemic right ventricle, led to increasing efforts to achieve anatomic correction. The introduction of anatomic correction of TGA, the ASO by Adib Jatene in 1975 ushered in a new era of congenital heart surgery. This operation was subsequently adopted, refined and popularised by other surgical pioneers such as Yacoub, LeCompte and Castaneda, and became the operation of choice for neonates with TGA around the world. Although ASO is now performed in many centres of excellence with minimal mortality, it remains a challenging operation with many technical variations. Most importantly, much variability and many controversies persist regarding the diagnosis, preoperative, perioperative and postoperative management of TGA, as well as issues of long-term follow-up and management of long-term complications.

In order to address these issues, the Congenital Domain of the European Association for Cardio-Thoracic Surgery (EACTS), at the time under the leadership of Juan Comas, decided to launch the ambitious project of creating clinical practice guidelines for the management of TGA. In accordance with the philosophy of the Congenital Domain approach to congenital heart disease, and especially complex conditions such as transposition, in a multidisciplinary fashion, this project was launched in collaboration with the Association for European Paediatric and Congenital Cardiology (AEPC), with the fervent support of Eero Jokinen, AEPC President, and the heads of the EACTS Guidelines Committee, Philip Kolh and Miguel Sousa Uva. A joint committee of experts representing the disciplines of paediatric cardiology, anaesthesia, intensive care and congenital heart surgery was formed by the EACTS and the AEPC. Procedures endorsed by the European Society of Cardiology and adopted by the EACTS Guidelines Committee were followed to define specific issues of interest, review the pertinent literature, evaluate the strength of evidence, and to create appropriate clinical practice guidelines.

It should be acknowledged that guidelines are evidence based, but, in the field of congenital heart disease, most studies involve relatively small patient numbers of any given condition, especially when variants and coexisting lesions are considered. Therefore, there is a paucity of robust data such as prospective randomised trials and, consequently, it is frequently impossible to use stronger endorsements like those used in guideline documents pertaining to other disciplines. Thus, the vast majority of recommendations are based on expert consensus rather than on solid data (i.e. level of evidence C). In fact, this difficulty represented a major factor in the maturation of this project. It should be further emphasised that guidelines are no substitute for textbooks, primary literature sources, or clinical evaluation and judgment. Guidelines and recommendations should help physicians to make decisions in their daily practice. However, the ultimate decisions regarding the care of an individual patient must be made by his/her responsible physician(s).

Despite these limitations, these detailed multidisciplinary guidelines for the management of simple TGA, presented at this Annual Meeting of the EACTS, are a milestone in the field of congenital heart disease, because they have come about as a result of the first close collaboration between the EACTS and the AEPC, carrying the weight of support of both major scientific organisations in this field. The lessons learned in formulating these guidelines are also important in the creation of future guideline documents for other important congenital heart defects, for the benefit of the multidisciplinary teams taking care of patients and, of course, for the benefit of patients themselves. The EACTS and the AEPC are committed to this continued effort.

THE CROWNING TOUCH



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Long-term follow up will ultimately reveal how effective PRT anti-calcification treatment is in preventing valve degeneration. However, animal study data presented at the 64th Congress of the European Society for Cardiovascular and Endovascular Surgery (ESCVS) in Istanbul[i] demonstrated that PRT technology significantly reduced calcium absorption in subcutaneously implanted pericardial tissue patches compared to the control group of standard glutaraldehyde-treated patches.
Preliminary clinical data supporting PRT efficacy combined with early Crown PRT clinical experience strengthens confidence that anti-calcification technologies can enhance valve durability, and it highlights the critical role surgeons play in mitigating the risk of valve degeneration by minimizing patient-prosthesis mismatch and employing the latest tissue-treating technologies.

Find out more at Sorin Group Booth # 3.15

i. Herijgers et al. Anticalcification Treatments of Bioprosthetic Pericardial Heart Valve Tissue: a Comparative Experimental Study. 64th European Society for Cardiovascular and Endovascular Surgery. March 26-29, Istanbul. www.abstractagent.com/av2/afpr.asp?pdir=2015uccvs-program&plng=tur&au=1192&afu=157344

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Surgical treatment of heart failure

18–20 November 2015
Windsor, UK

Course Directors:
G Gerosa (Padua, Italy)
and M Morshuis (Bad Oeynhauson, Germany)

The programme will include highly interactive lectures, video presentations and practical demonstrations. This course is aimed at consultant surgeons engaged in the management of patients with end-stage heart disease. Key learning objectives are to understand:

- **the principles underlying the mechanical support of the heart**
- **how to manage very sick and unstable patients**
- **how to avoid and how to manage complications arising from mechanical support**
- **how to build a programme in your own unit and develop a successful team from all specialities**

Full details regarding the programme and registration can be found via the EACTS Academy website:
www.eacts.org/academy/courses/surgical-treatment-of-heart-failure

The surgical treatment of lung and heart failure courses will run consecutively in Windsor, UK. A specially discounted fee is available for delegates wishing to attend both.

Thoracic – Focus Session: TNM classification: 8th edition

Lung cancer staging: the 8th edition of the TNM classification

Ramon Rami-Porta
Hospital Universitari Mutua Terrassa, Barcelona, Spain

Following the methodology used in the 7th edition, the forthcoming 8th edition of the tumour, node and metastases (TNM) classification of lung cancer will be based on analyses of the new database of the International Association for the Study of Lung Cancer (IASLC). The new database contains data from nearly 80,000 evaluable patients diagnosed with lung cancer from 1999 to 2010 in 16 countries in Europe, Asia, North America, Australia and South America.[1] Analyses of the descriptors of the three components of the TNM classification provided solid evidence to recommend some changes in the T and the M components, but to leave unchanged the present N descriptors.
The analyses of the T descriptors have shown that tumour size has a greater prognostic impact that was shown in the previous analyses. This has allowed a sub-classification of T1 and T2, and the inclusion of tumour size as a T descriptor in all T categories from Tis to T4. Endobronchial location both less than, and more than, 2 cm from the carina has the same prognosis, therefore, it is recommended that both descriptors be classified as T2, in the absence of carinal involvement, which remains a T4 descriptor. Both partial and total atelectasis/pneumonitis also have the same prognosis and, therefore, the recommendation is to classify them as T2. Diaphragmatic invasion has a worse prognosis than other T3 descriptors and is similar to that of the T4 descriptors; therefore the recommendation is to classify it as a T4 descriptor. Mediastinal pleura invasion has been deleted as a T3 descriptor because it is rarely used.
The N descriptors (N0, N1, N2 and N3) have been validated again with this new database. The number of involved lymph nodes and lymph node stations also has prognostic impact, but these analyses were performed in pathologically staged tumours and could not be reproduced at clinical staging. Therefore, the recommendation is to maintain the present N descriptors, as they separate tumours of significantly different prognosis according to the anatomic extent of nodal disease at clinical and pathological staging.
For the M component, the analyses of the data provided enough evidence to retain the present M1a descriptors, but to separate extrathoracic metastases into two groups: single metastasis in a single organ, and multiple metastases in one or several organs, as they have different prognosis, and their division may help stratify future clinical trials on advance disease and to better define oligometastatic disease.
The above changes implied some rearrangement of stage grouping and are also applicable to small cell lung cancer. They will have clinical implications as they will facilitate the indication of prognosis, one of the objectives of the TNM classification, and will be useful to stratify tumours in clinical trial testing new therapeutic modalities.

Reference

1. Rami-Porta R, Bolejack V, Giroux DJ, et al. The IASLC Lung Cancer Staging Project: the new database to inform the eighth edition of the TNM classification of lung cancer. *J Thorac Oncol* 2014; 9:1618–1624.

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TERUMO

Cardiac – Focus Session: Infectious problems

The ideal material for infected grafts and valves

John Pepper Royal Brompton and Harefield NHS Foundation Trust, London, UK

Infective endocarditis is an uncommon yet lethal cardiovascular disorder. Despite advances in diagnostic and treatment methods over the past 30 years, 6-monthly mortality rates still approach 25–30%, similar to those for aortic dissection. Vascular graft procedures are rarely complicated by infection but if prosthetic vascular graft infection occurs, morbidity and mortality are high.

Prosthetic valve endocarditis

Usually, removal of the infected valve and all surrounding infected tissue combined with a new valve, results in a dramatic improvement in the patient's clinical condition. If this does not occur, it is important to check the integrity of the valve replacement or repair with echocardiography. Intracardiac devices such as pacemakers and implantable cardiac defibrillators (ICD) have become a daily fact of life. It is often very difficult to distinguish benign thrombus on an ICD from infected thrombus. But when there is documented evidence of infective endocarditis, there is a high likelihood of concomitant pacemaker or ICD infection, and thus these will need to be replaced at the time of valve surgery.

The choice of valve substitute in prosthetic valve endocarditis (PVE) remains controversial and tends to be ruled by the historical preference in experienced centres. There are no specific guidelines from the European Society of Cardiology regarding valve selection, but they do state that a homograft or stentless bioprosthetic root replacement is a reasonable choice for PVE, especially with complications such as perivalvular extension or, what surgeons commonly term, an aortic root abscess. The Society of Thoracic Surgeons (STS) clinical guidelines are more specific, but leave the choice of a biological, bioprosthetic or mechanical valve substitute, to the operator. They state that aortic homografts are considered reasonable particularly with 'periannular abscess and extensive annular or aortic wall destruction requiring aortic root replacement/reconstruction or extensive aortic-ventricular discontinuity' (Class IIb; Level of Evidence B).

Vascular graft infection

Few studies have compared the outcomes of different surgical strategies for the treatment of vascular graft infection. Ohta T et al. (2001), concluded that *in situ* techniques were superior to extra-anatomic reconstructions in preventing new graft failure and early mortality. Over the past 15 years, graft preserving techniques have been increasingly used and clinical cure rates of up to 100% have been reported in small case series if the graft was patent and if there was no evidence of systemic sepsis, local bleeding or the formation of a pseudo-aneurysm.

One of the largest series (44 patients) was reported recently by Mayer et al., with an excellent outcome using a graft-preserving approach and negative pressure wound treatment as an adjunct. All the patients survived to 30 days. One year mortality was 16% (7/44) and long-term mortality, after a mean of 43 months, was 41% (18/44).

Although a wide variety of graft substitutes have been used and include graft excision, total or partial, and *in-situ* reconstruction with cryo-preserved homografts, fresh antibiotic-sterilised homografts, or silver-bonded prosthetic grafts, the general trend is towards a more conservative approach, relying on powerful antibiotics and surveillance with modern imaging such as FDG-PET.

Conclusion

There is no ideal material for these very serious infections, which still carry a high mortality. Cardiac surgeons strive to remove all infected material before considering the replacement, which will invariably be some form of root replacement in the case of the aortic valve. Vascular surgeons take a more conservative approach. New challenges will inevitably emerge from the increased use of endografts in the thoracic and abdominal aorta. Prevention is the key, and the growth of hybrid operating rooms will hopefully help.

Cardiac – Rapid Response: Supporting the heart and lung

Can we safely use minimal heparinisation in patients supported with ECMO?

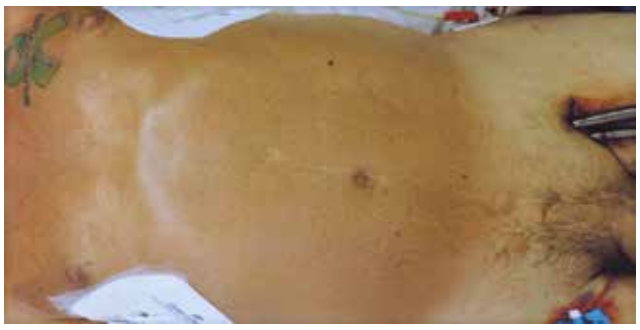
Jai Raman Rush University Medical Center, Chicago, IL, USA

Extra-corporeal membrane oxygenation (ECMO) is a resurgent technique in adult cardiac surgery. This technique, responsible for saving the lives of thousands of infants and neonates, is not commonly used in adult patients. This is in part due to the limited life of the oxygenators, bulky pumps, chunky cannulae and the need for high-dose systemic anti-coagulation. As a consequence, adult patients connected to ECMO were thought to be at increased risk of a range of complications, many related to bleeding and inadequate tissue oxygenation.

Advances in access techniques, cannulation, heparin-bonding of circuitry, the use of hollow-fibre membrane oxygenators, and improved pump technology have resulted in dramatic improvements in the survival of critically ill adult patients with the use of ECMO. Indeed, for the first time in decades, the pro-active use of ECMO has started to make a dent in the dismal survival rate of patients who experience an unexpected cardiorespiratory arrest in the hospital setting. Despite increasing experience with this technique in multiple centres around the world, there are no consistent guidelines regarding anti-coagulation, optimum flows, ventilatory strategies or fluid management in these patients.

Our 'survivor' below is an example of a young patient who had an unexplained cardiorespiratory arrest, and who was cannulated during a full-blown code with ongoing chest compressions and cardiopulmonary resuscitation. He recovered fully, was successfully decannulated after a week of support and was discharged home.

Based on previous experience with low heparin use in selected patients with heparin-induced platelet dysfunction, we embarked on a strategy of minimal heparin use in over 50 consecutive adult patients who needed emergency institution of ECMO as salvage therapy. The indications ranged from purely respiratory, to post-cardiotomy support and sudden in-hospital cardiac arrests. We used a small dose of heparin at the time of peripheral cannulation and almost no systemic heparin thereafter. When patients were being weaned off ECMO, we instituted heparin therapy. There was no incidence of thromboembolic events with this strategy. The support duration ranged from 48 hours to 70 days. In two patients it was necessary to change the oxygenator after 30 days and 45 days of support, respectively. Based on this experience, we are confident that adult patients can be successfully supported with ECMO using a strategy of minimal heparinisation.



Research Training/General – Focus Session: All you need to know for your next research project – part II

Choosing what to write about… is not easy

Bartosz Rylski Department of Cardiovascular Surgery, Heart Center Freiburg University, Germany

Basic and clinical research articles provide a means for physicians to communicate with other physicians about their research results. One of the most difficult steps in beginning a research paper can be choosing the topic. Whether selecting a topic for a doctoral thesis that will dominate the next several years of your life or selecting a topic for a research paper, choosing one that's appropriate may define your success.

Selecting an appropriate topic can be done in several ways. Generally, it is always good practice to select a topic that truly interests you before you begin to work on it. If you are interested in the topic, searching for data, interpreting results and writing the paper will be more enjoyable, and you will work on it with greater passion. It is important to answer a few questions before deciding on your topic: What clinical question needs to be answered? Is it relevant for your daily practice? Is the topic new and unique enough that I can offer a fresh point of view? Does this topic have the potential to change standards of care?

Start with yourself. As an academic researcher, think about your personal preferences. Are you passionate about any specific surgical areas? What excites or bores you about cardiothoracic or vascular surgery? What is your past academic work like, and is there anything there that can be developed further?

What is your aim in writing the paper? Many surgeons approach a project as a task that they must complete because they are expected to by the hospital administration or their department head. That kind of motivation is ultimately destructive and will not lead to success. Even if you are unaware of it, each research project, even those on the most common activities surgeons do on a daily basis, contribute to the body of knowledge on the subject, may challenge accepted standards, and provide evidence on how to attain better results.

It is important to have a good topic search strategy. The times when the ideal topic suddenly occurs to you do happen occasionally, but most new research-project topics result from a methodical search strategy. One simple approach is seeking a topic in the field of surgical procedures (aortic valve replacement, abdominal aortic replacement etc.) or in pathologies (aortic valve stenosis, abdominal aortic aneurysm etc.). When considering aortic valve replacement, there are many questions one can ask about each step of this operation: How long should the skin incision be? Who benefits from hemi- and who from full-sternotomy? Where should the pericardial suture be placed for optimal aortic valve exposure? What about myocardial protection strategies, and aortic valve replacement with continuous, interrupted or no sutures? Biological versus mechanical valve for different patient risk profiles? These questions can be classified as being answerable by a retrospective or prospective approach, or via animal experiments.

There are different approaches on how to identify the perfect topic for your next research project. You should not expect a topic to suddenly appear like magic from another article, or by listening to lectures. Even when such a topic suddenly catches your eye, it is important to read additional articles and discuss it with experts in the field. Searching for the right topic should be approached methodically. It is important to find a topic that genuinely fascinates you. Find out whether there are any ongoing projects in your institution. Ask your supervisor for suggestions. Make a short list of ideas, examine it, and think about it every day, gradually narrowing it down. Finally, being able to say 'why' you did that particular piece of research is as important as saying 'how' you did it.

How to manage your career

The EACTS mission is to advance education in the field of cardiac, thoracic and vascular interventions. To help you to develop your career in cardiovascular and thoracic surgery the EACTS launches two important tools: the **EACTS Skills Programme** for surgeons to learn an advanced technique and the **EACTS Digital Management Portfolio System** to keep track of your residency training programme.

The EACTS Skills Programme

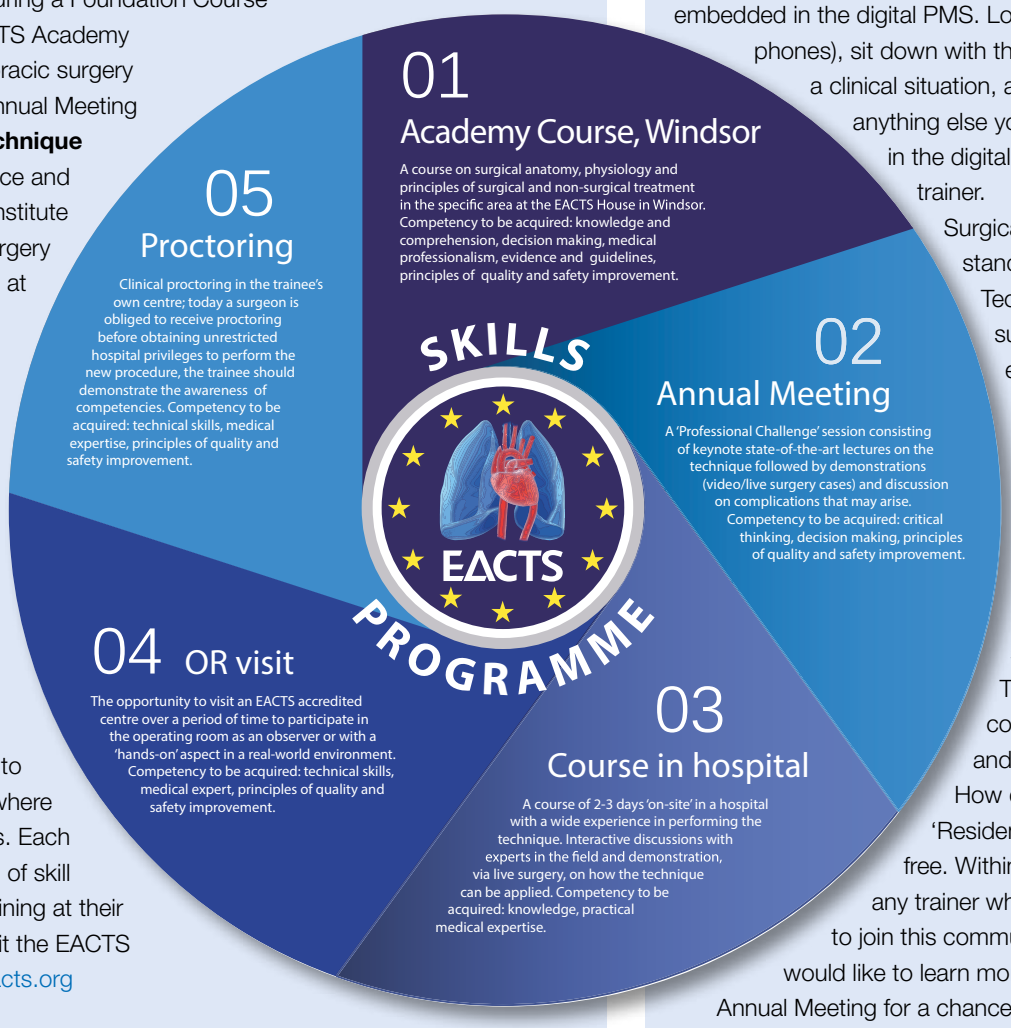
The variety of technology-driven procedures is ever increasing. The evolution towards less invasive procedures and the introduction of advanced techniques to treat complex cardiothoracic diseases has created an ongoing educational need among practicing surgeons. Training in advanced techniques and technology is a necessity and no longer a luxury for the practicing surgeon.

As techniques are regularly introduced by industry partners, the EACTS strongly believes that it has a responsibility to provide appropriate training to optimise patient outcome and patient safety. Training in surgical skills should not be the obligation of industry alone.

The EACTS has developed the EACTS Skills Programme, a training stream for medical doctors in specialty training who want to learn a specific/advanced technique at a European institute of excellence and implement this technique in his/her home institute.

This skills programme offers surgeons the opportunity to:

- **Learn** more about the technique during a Foundation Course and a Specialist Course at the EACTS Academy
- **Participate** in the largest cardiothoracic surgery meeting in the world, the EACTS Annual Meeting
- **Learn this specific advanced technique** at a European institution of excellence and implement this technique in home institute
- **Gain insight** into cardiothoracic surgery and clinical or translational research at a European institution of excellence
- Support efforts to **expand professional networks**
- **Improve career development** through collaboration with a European institution of excellence
- **Provide the necessary support** to develop specific (research) projects in cardiothoracic surgery



One short course is insufficient to fully comprehend a new therapy. The EACTS Skills Programme will offer up to five separate modules for instruction where one can obtain different competencies. Each programme will address the spectrum of skill levels and allow surgeons to begin training at their individual level of expertise. Please visit the EACTS website for more information: www.eacts.org

The EACTS Digital Portfolio Management System

Keep track of your residency training programme
Free for members!

Wouldn't it be great to keep track of your proceedings during residency training without a big pile of paperwork? Wouldn't it be great if resident supervisors could track their residents' developments with only a mouse click? Wouldn't it be great to have a portfolio where professional evaluation methods are incorporated and you can add anything yourself? Wouldn't it be great if you could travel around during your residency and keep using your own digital portfolio, while attending different clinics? Wouldn't it be great if all this was for free? The EACTS has developed such a system. After a lot of time and energy, the Digital Portfolio Management System (PMS) will soon be available and it's free for our members.

The system will be launched shortly after the EACTS Annual Meeting. Watch the EACTS website for more news! How does it work? There are several types of evaluations that are embedded in the digital PMS. Log in to the system anywhere (also possible through smart phones), sit down with the supervisor who is training you and evaluate an operation, a clinical situation, an operative report, a presentation, a scientific manuscript, or anything else you would like to evaluate. Evaluations are only incorporated in the digital PMS when they are signed off by both the resident and the trainer.

Surgical skills can be tracked by evaluations through the standardised method of Objective Structural Assessment of Technical Skills (OSATS). During an OSATS evaluation, different surgical skills shown during an operation or part of it, can be evaluated. Among the evaluated skills are tissue handling, timing and movement, handling and knowledge of surgical instruments, use of assistance and knowledge and planning of the procedure.

Another instrument that is very useful and aims to evaluate non-surgical skills, such as running the in- or out-patient clinic, writing an operative report, or giving a presentation, is the Concise Clinical Assessment (C_2A). With a C_2A all seven CanMeds competencies can be evaluated in detail. This encompasses the resident's role as a medical expert, communicator, collaborator, scholar, health advocate, manager and professional.

How do you get it? Just go to the EACTS website, click on the 'Residents' section and find the digital PMS. Registration is easy and free. Within 30 seconds, the digital PMS is ready to use. You can add any trainer who is registered at the EACTS. The trainer will get an invitation to join this community and he or she can start filling out your evaluations. If you would like to learn more about the digital PMS, come and join our session at the Annual Meeting for a chance to see it in action.

Adults with congenital heart diseases: the surgical challenges

Nirmal Gupta and Sanjay Gandhi
Postgraduate Institute of Medical Sciences, Lucknow, India

Today's cardiac surgeons are equipped with methods and technologies developed over the past 50 years. However, the problem of congenital heart disease (CHD) remains fraught with multiple issues: increasing numbers of adult CHD patients with different physiology and needs, declining numbers of CHD specialists, limited financial resources, the exploding knowledge base, information sharing and barriers to shared learning. In the 1970s about 25% of children born with CHD died as neonates with 60% dying within 1 year, even in the US or Europe. The chance of surviving to adulthood was approximately 15%. At that time the situation was hopeless in under-developed and developing countries.

Today, rapid advances in cardiac surgical techniques and technology, instrument miniaturisation, new drugs, and the use of medical monitoring software in operations have improved the survival prospects of a child born with CHD to 90% in most countries. Other contributing factors include the advent of the dedicated paediatric ICUs; developments in the care of vascular disease and arrhythmia; progress in imaging technologies; advances in interventional techniques; and improved education and skills of caregivers through both conventional and collaborative information sharing.

From the available data it is estimated that over 2 million adults are living with CHD, a population growing at 3–5% per year. Adults with CHD present a totally different set of challenges, with different, more complex, needs than adults with other forms of heart disease. The shortage of sub-specialty cardiologists, surgeons and paramedical staff trained in the management of adult CHD is posing a major challenge and is likely to worsen in the future. Since 1995, the estimated worldwide prevalence of CHD births has been 9.1 per 1,000 live births, corresponding to 1.35 million births each year. Some population surveys and epidemiological studies report a lower prevalence of CHD among low-income groups, highlighting the need for robust data to support disease burden calculations.

At a tertiary postdoctoral teaching and research institute in an Indian north-central state (population 210 million), the admission ratio of adult CHD patients to children under 5 years of age has dropped from 1:5 to 1:1.5 since 2000. As in the US the annual number of adult CHD hospitalisations increased faster than for children, 87.8% versus 32.8% ($p<0.001$) during 1998 to 2010. The collaboration between regions to create specialty boards and associations has led to the realisation of the need to approve certification for the sub-specialty of adult CHD. Caring for adult CHD patients is challenging for a number of reasons. Patients have structural disease that may only be partially repaired or palliated. They are at higher risk of adult-onset comorbidities and they are at risk of early hypertension, hyperlipidaemia, diabetes, obesity, atherosclerotic disease, chronic kidney disease and other conditions. On top of a structurally abnormal heart they have an extremely unusual and challenging mix of physiological treatment needs. Many patients also have arrhythmia, pulmonary hypertension and heart failure posing further technical challenges.

Creating a network in remote areas, of diagnostic setups and tele follow-up kiosks, for the growing number of patients with CHD offers a way forward in the large, diverse countries of Asia and Africa. Already echocardiogram images obtained by local physicians, can be transferred on broadband connections to specialist centres, unburdening adults with CHD and improving resource utilisation. Such adults have often undergone multiple operations and/or catheter-based procedures, and living with ugly scar tissue or complications from those procedures can also pose psychological problems.

Our growing understanding about the genetic factors that result in the development of CHD, better parental screening, counselling and genetic manipulation may ultimately prevent these malformations occurring in the next few decades.

Thoracic – Focus Session: Minimally invasive surgery for lung cancer: up-to-date

Uniportal VATS lobectomy

Diego Gonzalez-Rivas Minimally Invasive Thoracic Surgery Unit (UCTMI), Coruña, Spain. Shanghai Pulmonary Hospital, Tongi University, Shanghai, China

Uniportal video-assisted thoracoscopic surgery (VATS) has a history spanning more than 10 years and recently has become an increasingly popular approach for managing most thoracic surgery. Its potential advantages include less pain, reduced access trauma and better cosmesis, and patient demand has helped uniportal VATS to become widespread throughout the world. Since we developed the uniportal technique for VATS major pulmonary resections in 2010, we have increased the number of indications in which it is used, thanks to greater experience with the technique as well as improvements in surgical instruments and technology.

The use of specially adapted conventional materials (long curved instruments with both proximal and distal articulation) is one of the key requirements for accomplishing a successful single-incision lobectomy. The technological improvements of high-definition cameras, curved tip appliers for vascular clips, and more narrowed angulated staplers have made this approach safer and increased the number of indications for single-port thoracoscopic resections. The use of a video laparoscope with the distally mounted charge-coupled device (CCD) design enhances the instrumentation.

The surgeon and the assistant must be positioned in front of the patient in order to have the same thoracoscopic vision throughout the procedure. Even though the field of vision can only be obtained through the anterior access site, the combined movements of the 30° thoracoscope along the incision allow for different angles of vision. The advantage of using the thoracoscope in coordination with the instruments is that the vision is directed to the target tissue. By doing this, we are lining up the instruments to address the target lesion from a direct, sagittal perspective. Optimal exposure of the lung is vital in order to facilitate the dissection of the structures and to avoid any instrument interference.

The patient is placed in a lateral decubitus position as is usual for conventional VATS. The incision, about 3–4 cm long, is preferably made in the fifth intercostal space in the anterior position. This location of the incision provides better angles for hilar dissection and insertion of staplers. It is helpful to rotate the surgical table away from the surgeons during the hilar dissection and division of structures, and towards the surgeons for the subcarinal lymph node dissection. We always recommend inserting the staplers through the anterior part of the incision with angulation. The use of curved-tip stapler technology allows for improved placement around the superior pulmonary vein and bronchus through a single incision; these are the most difficult structures to divide through a single port. It is important to dissect the vessel as distal as possible in order to achieve better angles for insertion of the stapler. When the angle is difficult for stapler insertion we can use vascular clips or ligate the vessels using sutures.

It is crucial that the thoracoscope remains at the posterior part of the utility incision at all times, as it works with the instruments in the anterior part. The only step where we place the camera below the stapler insertion (anterior part) is for the division of the anterior part of the minor fissure.

In upper lobectomy, the pulmonary artery is normally divided first, followed by the vein. When the lobectomy is completed, the lobe is removed in a protective bag and a systematic lymph node dissection is accomplished. At the end of the surgery, the intercostal spaces are infiltrated with bupivacaine under thoracoscopic view. A single-chest tube is placed in the posterior part of the incision.

Three-year clinical outcome of perventricular off-pump septal defects closure: a randomised comparison versus conventional ventricular septal defects closure

Alexander Y Omelchenko and Alexey V Voitov

Pediatric Cardiac Surgery Department, Novosibirsk State Research Institute of Circulation Pathology, Siberia, Russia

The first perventricular ventricular septal defect closure was performed on 1 July 2012 at the Novosibirsk State Research Institute of Circulation Pathology, Russia. To date we have performed more than 300 such procedures, 17% of which were in children in their first year of life. Neither the weight, nor clinical condition, of patients is a contraindication for use of this technique. For underweight patients with critical heart failure and severe concomitant diseases, we consider it a preferred option. The smallest patient treated to date weighed 2.5 kg.

Contraindications are determined mainly by the presence of concomitant cardiac pathology and anatomical defects preventing effective closure using this method. The perimeter around the sub-aortic defect deprived region should not exceed 30% of the perimeter of the defect, and there should be no concomitant aortic regurgitation or prolapse flap into the defect. The size of region under the aortic ring may be absent, but if the edge is >2 mm, implantation using conventional symmetric occluder type II may be indicated.

In our experience we use slightly 'oversize' occluders, implantable occluders with a slightly larger diameter than the diameter of the defect; approximately 1 mm symmetric occluders for size defects and about 2 mm for muscle devices. The use of large 'oversize' occluders risks the occurrence of atrioventricular block. There is a need to avoid the use of implantation occluders of the same size as the defect, as this increases the risk of residual shunting. The choice of large size occluders risks that disks remain undiscovered and can cause intraventricular obstruction. In our opinion perventricular closure of ventricular septal defects is an absolutely safe and effective procedure. Safety is achieved by controlling the entire process and the adequacy of both location and occlusion defects at any stage of the operation.

The successful application of this procedure has reached 98% in our clinic. Frequency of arrhythmias, including atrioventricular block, are significantly lower versus conventional ventricular septal defects closure, and occurred extremely rarely. Residual shunting is an infrequent complication, and is five-fold lower comparing our approach with the conventional approach. Less than 5% of small shunts are closed within 1 year of surgery due to reactive processes in the area of implantation.

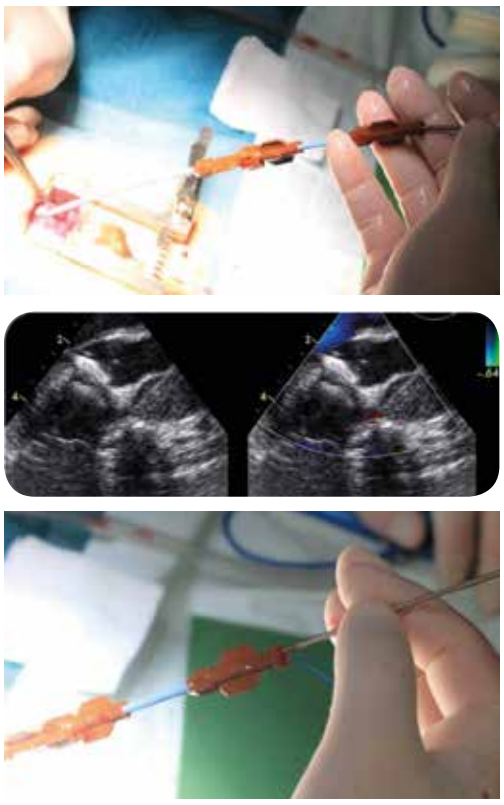


Figure 1. Positioning and opening the occluder.

Vascular – Abstract: A broad view on acute dissection

Acute non-A-non-B aortic dissection: pro arch repair

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Two classifications of aortic dissection were proposed almost 50 years ago. Both are widely accepted, and used in clinical practice, because they reflect the therapeutic consequences of particular anatomo-pathological presentations. Thus, in acute dissection of Stanford type A and DeBakey types I and II a surgical approach is generally indicated; while in an uncomplicated dissection of Stanford type B and DeBakey type III medical therapy is recommended.

The curved form of the aortic arch and the origins of its branches, especially the innominate artery (IA) and left subclavian artery (LSA) build two natural barriers, which can stop the extension of a dissection (Figure 1). Compared with an anatomical determination of the aortic arch, which begins before the origin of the IA and ends after the LSA, our classification considers a surgical-functional aspect and the aortic arch is defined as an aortic segment localised between the natural barriers mentioned above. Consequently, they can cause two very characteristic anatomo-pathological dissection forms, which belong neither to type A nor to type B. One of these is isolated arch dissection (Figure 2), while in the second form; the dissection extends only throughout the aortic arch and the descending aorta and spares the ascending aorta (Figure 3). This surgical-functional classification respects the surgical implications, which result from the particular extents of dissection.

An anatomical rather than surgical description of the arch leads many authors to consider the isolated involvement of the LSA origin as an arch involvement. Even if anatomically completely correct, it seems to distort the surgical implications because a combination of type B dissection with an extension of dissection through the arch is not as frequent as with an isolated LSA involvement. Consequently, it can result in exaggerated numbers of aortic arch involvements and even lead to incorrect conclusions suggesting favourable efficacy of conservative treatment in type B dissections involving the aortic arch.

The current literature, as well our own experience, has revealed, however, that the extension of the type B dissection into the LSA alone (Figure 1) has no, or very few, implications for the treatment choice. Clinical outcomes for such patients do not differ regardless if they received conservative or surgical or endovascular therapy. Similarly, if the base of IA is dissected or not the surgery consisting of ascending repair in an open manner leads to definitive repair without the need for aortic arch repair (Figure 1). Accordingly, the isolated involvement of the LSA cannot be considered as a criterion for the diagnosis of non-A-non-B dissection, which should include only such pathologies that clearly extend into the arch beyond the level of the LSA (Figure 3). Our, recently described experience indicates that the latter presentations have to be considered as a sign of pathological instability, regardless if the intimal tear is localised in the arch or in the descending aorta. In cases with an intimal tear in the arch, an open tear-oriented repair offers good and durable results and should be considered as the therapy of choice. In cases with an intimal tear site in the descending aorta, a tear-oriented intervention can consist of endovascular repair or, in cases with concomitant cardiac and/or proximal aorta pathologies, an open arch surgery combined with an antegrade deployment of the vascular graft or stent graft within the descending aorta using so-called elephant trunk technique.

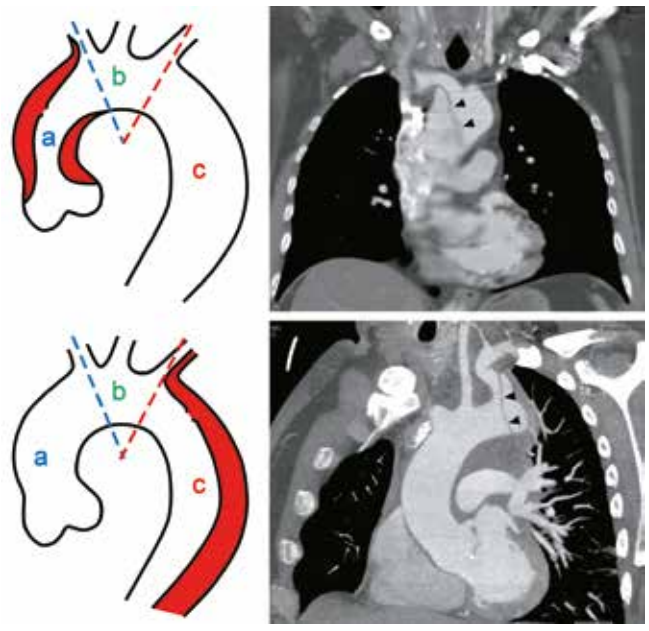

Figure 1. Schematic illustration of functional extent of aortic dissection (D) considering 3 main segments: a-ascending aorta including root, b – aortic arch and c – descending aorta. The aortic arch is considered as aortic segment localised between two lines, each running at right angle to aortic axis – the proximal line (blue) runs through origin of IA and distal line (red) through origin of LSA. Accordingly, ascending aorta dissection involving origin of IA (upper row) and descending aorta dissection involving origin of LSA (lower row) are considered as ascending (D-a) or descending aorta (D-c) dissections without involvement of arch.

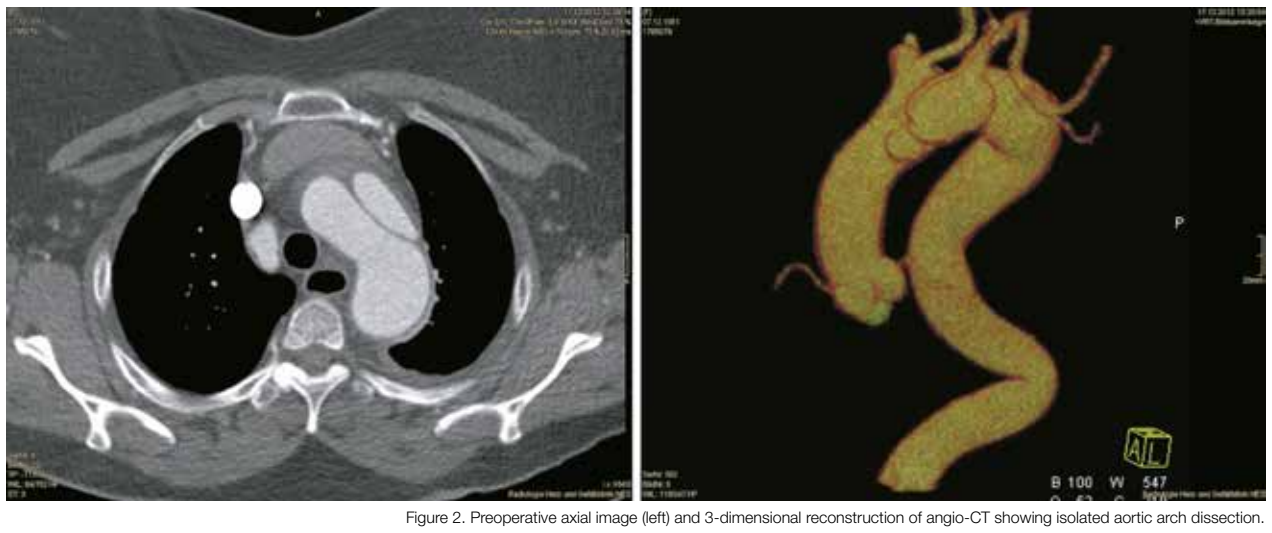

Figure 2. Preoperative axial image (left) and 3-dimensional reconstruction of angio-CT showing isolated aortic arch dissection.

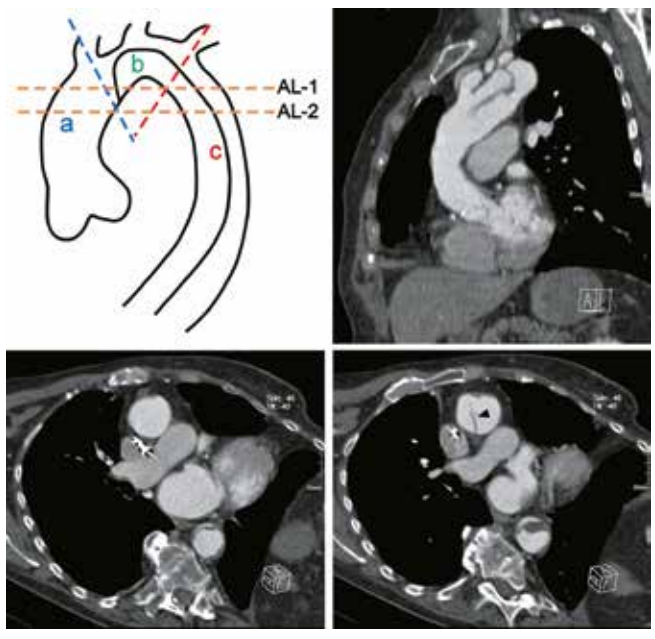

Figure 3. Schematic illustration (upper row, left) and corresponding angio-CT demonstrating role of reconstructive techniques in evaluating the extent of dissection. The dissection membrane extends clearly within aortic arch (upper row, right) but not beyond functional border of ascending aorta (dotted blue line). Accordingly, dissection membrane (black arrowhead) seems to be visible in ascending aorta in axial scan (lower row, right), but in fact, it is still the concave aortic arch curvature at this axial level (AL-1). At deeper axial level (AL-2), it is clearly visible that ascending aorta is not involved (lower row, left).

Cardiac – Abstract: Left ventricle – strategies in left ventricular moderations

Surgical ventricular restoration plus mitral valve repair in patients with ischaemic heart failure: risk factors for early and midterm outcomes

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Ischaemic mitral regurgitation (IMR) is common following an acute myocardial infarction (MI), occurring in up to 40% of patients, and in 50% of those with congestive heart failure, adversely affecting the prognosis. It occurs in the context of left ventricular (LV) remodelling, and it is mainly related to changes in LV geometry and function, which stand as the primary culprit for the development and progression of the disease. The matter of chronic IMR, in terms of whether, when and how it should be corrected, is one of the most common and controversial dilemmas faced by cardiac surgeons. Some authors support the role of mitral valve (MV) repair, advocating the well-established negative impact that IMR has on survival in patients undergoing coronary artery bypass graft (CABG) alone. Clinicians supporting the role of the left ventricle in causing IMR argue in favour of CABG alone, which should theoretically improve regional wall motion abnormalities and papillary muscle function, and induce reverse LV remodelling, avoiding the incremental mortality with which adjunctive MV repair has been historically associated. Not surprisingly, the results are conflicting. Furthermore, expanding knowledge of the mechanisms underlying IMR along with the high rate of recurrence suggest the need for concomitant or alternative surgical strategies addressing both ventricle and mitral valve apparatus (i.e. papillary muscle repositioning). To this aim, surgical ventricular reconstruction (SVR) of the left ventricle has the advantage in treatment of the underlying ischaemia, reversal of LV remodelling and valve repair when indicated (Figure 1).

In this study, we report the outcome of patients undergoing SVR combined with MV repair for moderate to severe IMR at our institution. From January 2001 to October 2014, we observed 175 heart failure patients out of a total of 626 (28%). The mean follow-up for all-cause death was 42±37 months. Operative mortality occurred in 25 patients (14.3%). Independent predictors were the age, creatinine, and ejection fraction (ACEF) score (OR=5.1, $p<0.001$), previous stroke (OR=8.0, $p=0.017$), unstable angina (OR=8.8, $p=0.018$), and diffuse remodelling (OR=5.8, $p=0.047$). At follow-up, the actuarial survival rate of the whole population at 3, 5 and 8 years was 72%±4%, 65%±4% and 45%±6%, respectively. Risk factors for late mortality were pre-operative creatinine (OR=2.6, $p=0.001$) and previous ICD implantation (OR=4.7, $p=0.005$). The operative mortality was relatively high but not disproportionally when compared with the mortality associated with CABG plus MV surgery in previous reports.[1,2] Observational data from the STICH hypothesis 1 population, addressing the matter of MV surgery in ischaemic heart failure patients, showed a significantly higher operative mortality in patients treated with CABG only as compared with patients treated with CABG with an added MV repair (14.3% vs 2%, $p=0.046$)[3]. Overall, it seems that it is not MV surgery per se to increase the operative risk, but rather that ischaemic MV regurgitation in patients with LV dysfunction carries a higher risk regardless of treatment. Indeed, predictors either for early or late mortality in our analysis identify a high-risk population, which despite the increased risk at the time of the operation, may have a late survival benefit. The STICH trial showed that adding MV repair to CABG in patients with LV dysfunction and moderate to severe IMR may improve survival compared with CABG alone or medical therapy alone (50% mortality risk at 5 years in the latter).[3] Compared with these data, our results, coming from a larger population with a longer follow-up, show that combining MV repair with SVR added to CABG in the majority may further improve survival at 5 years (59% in the STICH population vs 65% in our population), making this challenging procedure a reliable therapeutic option for this high-risk population.

References

1. Schurr P, Boeken U, Limathe J, et al. Impact of mitral valve repair in patients with mitral regurgitation undergoing coronary artery bypass grafting. *Acta Cardiol* 2010;65:441–7.
2. Kang DH, Kim MJ, Kang SJ, et al. Mitral valve repair versus revascularization alone in the treatment of ischemic mitral regurgitation. *Circulation* 2006;114(1 Suppl):I499–I503.
3. Deja MA, Grayburn PA, Sun B, et al. Influence of mitral regurgitation repair on survival in the surgical treatment for ischemic heart failure trial. *Circulation* 2012;125:2639–48.

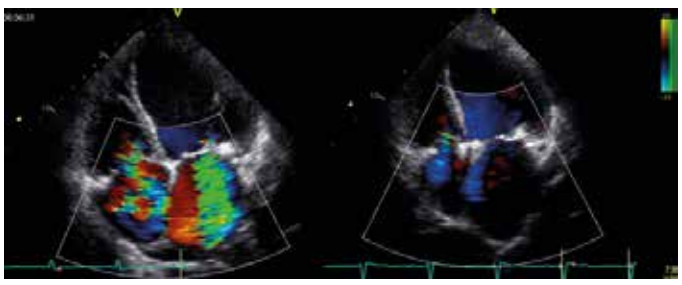

Figure 1.

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Cardiac – Rapid Response: Supporting the heart and lung

Left ventricular assist device implantation in patients after prior left ventricular reconstruction: surgical technique and case series

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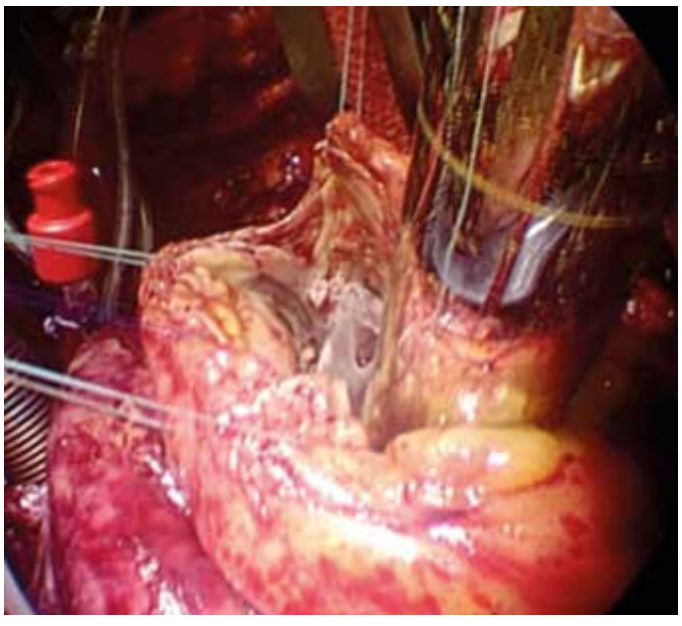
Left ventricular assist device (LVAD) implantation can be challenging in patients with a complex left ventricular (LV) apical anatomy. This may be the case in patients with a history of prior surgical ventricular restoration (SVR) using the Dor procedure, in the presence of an intraventricular Dacron patch. Although some clinicians advocate introduction of the LVAD inflow cannula through the Dacron patch, there may be some concern about the longitudinal diameter of the LV cavity in these patients that might predispose them to LVAD inflow cannula suction of the LV or sub-valvular mitral apparatus. Therefore, in most patients we are inclined to remove the patch and (re-)reconstruct the LV. The orientation of the inflow cannula is of paramount importance for adequate LVAD function. It should be positioned parallel to the intraventricular septum and directed towards the mitral valve. LV (re-)reconstruction and subsequent successful LVAD implantation in this patient group can be facilitated by the use of a Hegar dilator. In this paper, we describe the surgical technique used in a case series of six patients with a history of prior SVR.

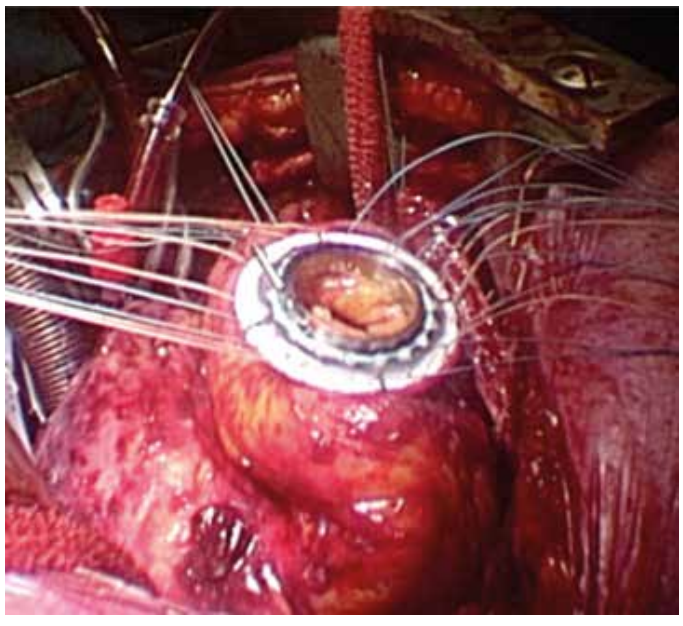
Six patients (4 males; mean age 63±3.3 years) with a history of prior SVR with end-stage chronic heart failure (NYHA class IV, INTERMACS score 2 or 3) were rejected for cardiac transplant (due to age and comorbidity) and accepted for long-term LVAD support. The mean interval between SVR and LVAD implantation was 75±57 months.

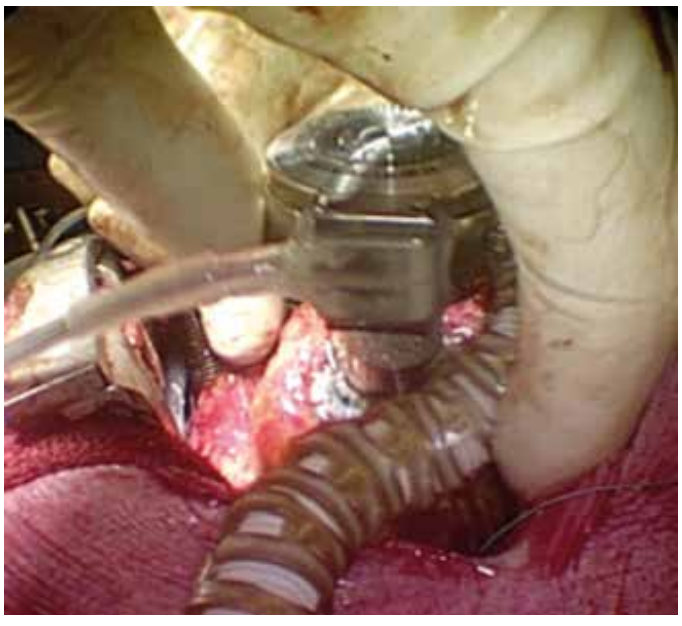
After installation of extracorporal circulation, concomitant procedures were performed (amputation of left atrial appendage in five patients and tricuspid valve annuloplasty in four patients). After cardiologic arrest, the LV was reopened longitudinally parallel to the septum and the Dacron patch was removed. Subsequently, a Hegar 22 dilator, mimicking the outer diameter of the HeartWare© LVAD inflow cannula, was inserted in the LV at the estimated optimal position of the LVAD inflow cannula, directed towards the mitral valve and parallel to the septum. The LV was (re)reconstructed around the dilator from LV apex to base. Finally, the LVAD sewing ring was sutured onto the remaining apical defect and a HeartWare© LVAD was implanted in a standard fashion.

LVAD implantation was successful in all patients. TEE ensured adequate LVAD position and inflow and outflow cannula Doppler flow recordings in all patients. Mean intensive care unit (ICU) stay was 6.0±2.8 days. Mean hospital stay after surgery was 35±15 days. All patients follow regular visits (follow-up duration is 18±17 months) at the outpatient clinic without any remarkable event (besides one readmission for GI bleeding).

Using the technique described, LVAD implantation for long-term support in patients with a history of SVR is feasible and safe. Prior LV reconstruction should not be a contraindication for LVAD implantation.







Vascular – Professional Challenge: Uncertainties in the treatment of chronic dissection

Whole body perfusion in patients undergoing frozen elephant trunk procedure for type A acute aortic dissections: early experience

Giampiero Esposito Humanitas Gavazzeni, Bergamo, Italy

Use of the frozen elephant trunk (FET) technique is considered a good therapeutic option in patients with type A acute aortic dissection (TAAAD) and distal intimal tears in the arch or the proximal descending aorta (DA). Even adopting antegrade cerebral perfusion (ACP) the duration of distal circulatory arrest and its consequences on the spine and visceral organs is concerning, particularly if moderate hypothermia is adopted. Use of distal antegrade lower body perfusion (DALPB) has been described in other settings, but in TAAAD the obvious risk of disrupting the dissected DA by placing a pressurised balloon-tip cannula into the DA discourages routine use of this technique.

The hybrid endovascular stent graft inserted into the DA at the beginning of FET constitutes a –'temporary safe' landing zone for the DALBP cannula, allowing DALPB, aside from ACP, to be performed safely, permitting 'whole body perfusion' while replacing the arch.

In Humanitas Gavazzeni, Bergamo, Italy, between October 2012 and October 2014 'whole body perfusion' was added to the FET technique performed in 21 patients (mean age, 65.6±8.9 years) presenting with TAAAD and distal intimal tears. These patients were included in a single arm, retrospective, observational study. The operation was performed in moderate hypothermia at 28ºC with antegrade arterial perfusion via the innominate artery or the right subclavian artery. All the patients considered in the study had a total arch replacement associated with the implantation of a short-stented (130 mm) E-Vita Open Plus Hybrid Graft (Jotec, Hechingen, Germany). ACP was performed via the innominate artery and left subclavian artery (previously detached and selectively perfused). Effectiveness of ACP was monitored using near-infrared spectroscopy (NIRS). DALBP was started after deployment of the endovascular stent graft in the proximal DA. A Pruitt catheter was used as DALBP cannula in the first five patients (Figure 1), while a size 24 three-way Foley catheter (Rusch) with a Dufour tip was used in the remaining patients, achieving a maximum perfusion flow up to 2.3 L/min. The target flow for DALPB was 10–30 mL/kg/min with a target femoral artery pressure of 30–60 mmHg. Distal NIRS (lower calf) was used to monitor the effectiveness of DALBP. The primary outcomes of the study were acute renal injury (AKI), visceral ischaemia, spinal cord injury, in-hospital death, and DALBP-related complications (i.e. aortic disruption). Secondary outcomes were trends in lactate, and renal and liver function markers. The CPB time was 167±20 min with an X-clamp time of 101±18 min and an ACP time of 51±15 min. Distal circulatory arrest (without DALBP) was 10±3 min (considering the time to open the distal arch and deploy the endovascular stent graft in the DA). No patient died, and none had cerebral- spinal injury or visceral ischaemia. Incidence of AKI III was 0%, and of AKI II was 4.7%. We did not observe any DALBP-cannula-induced complications and no patient was reopened because of bleeding. Seventeen patients had complete false lumen thrombosis, while four required subsequent completion with TEVAR. It is concluded that the adoption of 'whole body perfusion' (ACP + DALBP) during FET repair for TAAAD seems to be feasible, safe and very effective. DALBP cannulas positioned inside the endovascular stent graft did not interfere while performing the distal aortic anastomosis and did not cause any damage to the dissected DA. It appears from these preliminary clinical outcomes and from the laboratory results that DALBP together with ACP may enhance protection of visceral organs and spinal cord during arch surgery with FET. Major limitations are the single-arm design, the retrospective nature of the study and the small sample size. If these data can be confirmed on a larger scale, they may support the safe use of a higher CPB temperature (mild hypothermia) while performing FET for TAAAD.

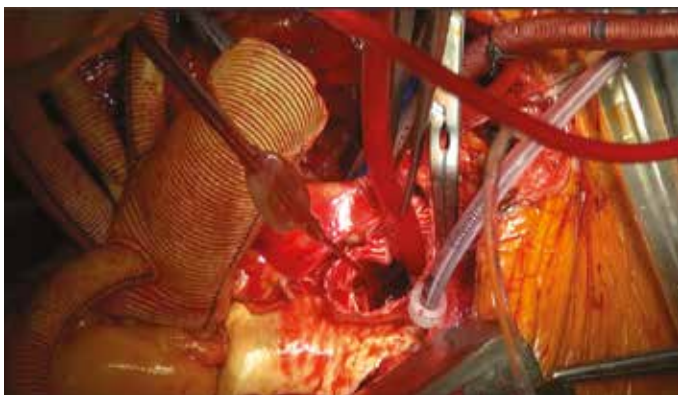


Figure 1. Distal antegrade lower body perfusion.

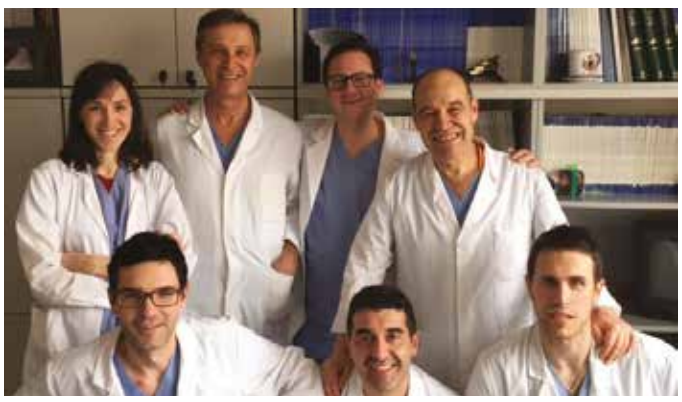


Figure 2. Cardiovascular surgery team, Humanitas Gavazzeni.

Cardiac – Abstract: The two faces of arterial revascularisation

Is a third arterial conduit necessary? Comparison of the radial artery and saphenous vein in patients receiving bilateral internal thoracic artery grafting for triple vessel coronary disease



WY Shi, J Tatoulis, AE Newcomb, J Fuller, A Rosalion and BF Buxton University of Melbourne, Australia

During this year's EACTS Meeting in Amsterdam, the University in Melbourne group led by Drs Brian Buxton and James Tatoulis will present results on the prognostic survival benefit of using the radial artery (RA) versus the saphenous vein (SV) as a third conduit during coronary artery bypass surgery in patients already undergoing bilateral internal thoracic artery grafting. The RA technique was introduced in Melbourne in the mid-1990s, and has since become a popular conduit among local surgeons. Its excellent long-term patency, coupled with minimal harvest site complications has made it an attractive option in multi-vessel revascularisation.

Data from the University of Melbourne suggest that the right internal thoracic artery (ITA) is associated with better survival when compared to the use of the RA as the second arterial conduit.[1] The group has also published data suggesting that the addition of a RA nonetheless yields improved survival compared with the conventional ITA plus vein strategy of revascularisation.[2] There remains concern regarding the RA's propensity for spasm, resulting in early graft failure with the potential for morbidity and mortality. There is limited data as to whether the RA confers a long-term survival benefit in patients already receiving bilateral internal thoracic arteries (BITA).

In this study, we examined 1497 patients who underwent multi-vessel coronary artery bypass graft (CABG) with BITA over a 15-year period across seven centres affiliated with the University of Melbourne. For the third conduit, the SV was used in 460 patients while a RA was used in 1037. RAs were used primarily to revascularise the circumflex and right coronary artery territories and, for the most part, were anastomosed proximally to the aorta. Locally, RA are used only when the target vessel stenosis exceeds 70%.

Even after propensity-score matching (262 matched pairs), patients receiving a RA experienced improved survival at the 15-year mark (RA 82% versus SV 72%; p=0.021 at 15 years). This was the case after the risk-adjusted analysis was repeated to specifically compare the RA versus SV (148 matched pairs) for grafting of the right coronary artery and its branches (RA 86% versus SV 74%; p=0.0046 at 15 years). We postulate that this is secondary to the RA's previously reported improved patency, as well as its protective effect on the native circulation. As such, the Melbourne group encourages the use of the RA in all patients where clinical factors permit, especially when they are relatively young (<70 years of age).

In Melbourne, the RA forms an important component of an all-arterial revascularisation strategy together with the left and right internal thoracic arteries.[3] Melbourne is also the site of the randomised Radial Artery Patency and Clinical Outcomes (RAPCO) Trial, which compares the patency and clinical outcomes of the ITA, RA and SV.

References

1. Shi WY, Hayward PA, Tatoulis J, et al. Are all forms of total arterial revascularization equal? A comparison of single versus bilateral internal thoracic artery grafting strategies. *J Thorac Cardiovasc Surg* 2015 Jul 2. pii: S0022–5223(15)01091–0.
2. Shi WY, Hayward PA, Fuller JA, et al. Is the radial artery associated with improved survival in older patients undergoing coronary artery bypass grafting? A propensity-score analysis of a multicentre experience. *Eur J Cardiothorac Surg* 2015 pii:ezv012.
3. Buxton BF, Shi WY, Tatoulis J, et al. Total arterial grafting in triple vessel coronary artery disease is associated with improved long-term survival. *J Thorac Cardiovasc Surg* 2014;148:1238–44.

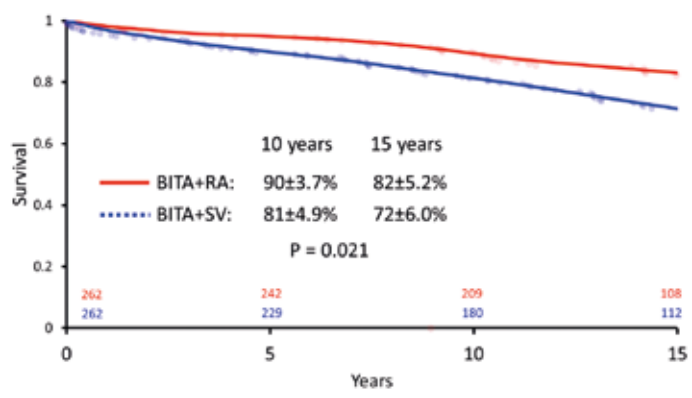


Figure 1. Long-term survival of patients receiving bilateral internal thoracic arteries plus radial artery (BITA+RA) versus bilateral internal thoracic arteries and saphenous vein (BITA+SV): propensity-score matched comparison of 262 matched pairs.

Thoracic – Abstract: Non-oncology II

Multidisciplinary approach of catamenial and endometriosis-related pneumothorax

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Catamenial pneumothorax (CP) has always been considered an unusual condition but, since recognition of the condition has improved, its frequency is nowadays quoted as being between 23% and 30% of pneumothoraces among women. CP is the most frequent expression of the thoracic endometriosis syndrome (TES). TES refers to the presence of endometriotic lesions in the lungs and pleura, and comprises four clinical entities: CP, catamenial haemothorax, catamenial haemoptysis and lung nodules. CP may be further complicated by pelvic endometriosis, but despite this, treatment is generally carried out in departments of thoracic surgery because of the relevant clinical manifestations; few studies have considered the gynaecologic perspective. In this study we analyse our experience of a multidisciplinary approach to CP and endometriosis-related pneumothorax.

From January 2001 to December 2014, 22 women were surgically treated for CP in our department using video-assisted thoracoscopic surgery (VATS). CP was defined as a pneumothorax occurring between 24-hours before and 72-hours after the onset of menses. It was considered endometriosis-related on the basis of pathologic findings. Pelvic endometriosis was diagnosed on the basis of clinical findings and results of pelvic exploration by MRI, laparoscopy or both. CP patients with either suspected or diagnosed pelvic endometriosis were scheduled for combined VATS and laparoscopy, while staged abdominal intervention was carried out for subsequent findings. Laparoscopy was performed before VATS at the time of surgery. Before discharge all patients were referred to a gynaecologist for further investigation and medical treatment.

TES was diagnosed in eight patients (36%). Diaphragmatic defects were observed in 16 patients (72%), of whom seven were found to have diaphragmatic endometrial implants histologically confirmed. One patient presented with endometrial tissue in the resected bulla. The diaphragm was repaired by means of direct suture or plication after removal of suspected endometrial foci. Bullae and/or blebs were the only finding in six patients. Pleurodesis was performed in all patients; chemical basal pleurodesis was given only to patients with diaphragmatic defects. Pelvic endometriosis was either suspected or diagnosed preoperatively in six of these patients who underwent combined laparoscopy and VATS. Diagnosis was confirmed at laparoscopy in all six patients. Two patients underwent staged laparoscopy after 2 months for late diagnosis of pelvic endometriosis. Postoperative complication rate was 4.5%, with one patient experiencing prolonged air leak. Postoperative hormonal treatment was proposed to all patients. Three patients were given hormonal oestrogen–progesterone complex. The remaining patients were offered gonadotropin-releasing hormone agonist for 6 months.

The mean follow-up was 112±66 months (range 15–251). Pneumothorax recurrence occurred in five patients (22%) and was significantly correlated with oestrogen–progesterone treatment (three out of five patients) (p<0.005). One patient with TES underwent abdominal surgery after 1 year for intestinal occlusion due to localisation of endometriosis. Five patients recovered from infertility. At the present time all women are well with no sign of pneumothorax recurrence.

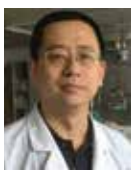
In conclusion, CP might be the expression of TES and therefore all these patients should be investigated for endometrial thoracic foci at surgery and an examination for pelvic endometriosis should be included in the preoperative study. A close collaboration between thoracic surgeons and gynaecologists is advocated for better treatment of patients in a multidisciplinary modality. Thoracic and abdominal surgery can be performed simultaneously or in a staged manner.

References

1. Alifano M, Jablonski C, Kadiri H, et al. Catamenial and noncatamenial endometriosis-related or nonendometriosis-related pneumothorax referred for surgery. *Am J Resp Crit Care Med* 2007;176:1048–53.
2. Soriano D, Schonman R, Gat I, et al. Thoracic endometriosis syndrome is strongly associated with severe pelvic endometriosis and infertility. *J Minim Invasive Gynecol* 2012;19:742–8.
3. Kumakiri J, Kumakiri Y, Miyamoto H, et al. Gynecologic evaluation of catamenial pneumothorax associated with endometriosis. *J Minim Invasive Gynecol* 2010;17:593–9.

Cardiac – Abstract: Endocarditis: a continuous dilemma

Early surgery and the optimal timing of surgery for infective endocarditis: a meta-analysis



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Despite advances in medical and surgical treatment, infective endocarditis (IE) remains a serious disease that carries a considerable risk of death and morbidity. The role of surgery in the treatment of IE has been expanding and current guidelines advocate surgical management for complicated left-sided IE. However, the effect of early surgery and the optimal timing of surgery is still controversial. Our objective was to systematically review early surgery and the optimal timing of surgery for patients diagnosed with infective endocarditis (IE).

Foreign and domestic articles published from inception to October 2014 were searched in PubMed, EMbase, WanFang Data, CBM and CNKI for cohort studies on the association between early surgery and infective endocarditis. According to the inclusion and exclusion criteria, the studies were screened, the data were extracted, and the method quality of included studies was assessed. Next a meta-analysis was performed using Stata 12.0 software. Sixteen cohort studies including 8141 participants were finally included. The results of the meta-analysis showed that early surgery could reduce the incidence of in-hospital mortality (OR=0.57; 95% CI 0.42, 0.77; p=0.0004) and long-term mortality (OR=0.57; 95% CI 0.43, 0.77; p=0.0007) for patients with IE. Moreover, performing the operation within 2 weeks of diagnosis could reduce a patient's long-term mortality further (OR=0.63; 95% CI 0.41 0.97; p=0.19). For different kinds of IE, it was observed that early surgery reduced mortality rates for patients with native valve endocarditis (NVE) (OR=0.45; 95% CI 0.30, 0.68; p<0.0001), but the same effect was not apparent for prosthetic valve endocarditis (PVE) (OR=0.76; 95% CI 0.52, 1.12; p=0.18).

In conclusion, early surgery may reduce the incidence of in-hospital mortality and long-term mortality for patients with IE, but the optimal timing of surgery is unclear. Compared with NVE, early surgery did not reduce the incidence of mortality in patients with PVE.

Rapid deployment with the EDWARDS INTUITY Elite Bioprosthesis: MIAVR reoperations made simpler?

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Optimal application of new devices typically evolves naturally with time and experience. Yet despite the advantages of rapid deployment (or sutureless) valves, including ease of implantation, fast learning curves and the associated reduction of procedural times, clear-cut indications remain broadly undefined.

As minimally invasive aortic valve replacement (MIAVR) requires easily implantable devices, rapid deployment devices are especially suitable for UHS and RAT videothoracoscopy; in our view, potentially one of the more interesting applications is for redo-MIAVR patients.

Indeed patients undergoing redo-MIAVR due to a failed conventional stented, stentless or full root prosthesis, often require lengthy procedures, with a high risk of injury during debridment especially in small calcified annuli or during the removal of degenerated aortic root stentless bioprostheses.

In these challenging cases RDAVR could prove the difference.

We report herein our first two implants of an EDWARDS INTUITY Elite valve in complex redo-MIAVR.

The first patient was a 55-year-old male with systemic and pulmonary hypertension, HCV chronic infection and persistent AFib. The patient underwent AVR in 2006 for severe AR and a 29 mm Toronto SPV (St. Jude Medical, Minneapolis, MN) bioprosthesis was implanted. In 2015, the patient underwent a minimally invasive upper J-resternotomy due to the recurrence of severe AR due to post-endocarditis with perforation of the non-coronary leaflet and a peak pressure gradient (PPG) of 37 mmHg. Externally the aortic root was heavily calcified with massive mediastinal adhesions; the valve had a fully calcified root, and severe fibrosis with a perforation of the non-coronary cusp. After leaflet excision, a 23 mm EDWARDS INTUITY Elite valve was easily implanted. Aortic cross clamp and CPB time were 57 and 117 minutes, respectively. The patient was weaned from CPB with a minimal inotropic support. Postoperative TEE showed no PVLs and low gradients. The patient was extubated after 5 hours of AMV. Inotropic agents were suspended after 6 hours. ICU stay and hospital stay were 2 and 9 days, respectively. No transfusions were needed.

The second patient was a 57-year-old male affected by systemic hypertension. In 2009 the patient underwent AVR for severe AR due to aortic root enlargement; at that time a 25 mm homograft was implanted. In 2015, the patient presented with a severe calcific degeneration of the homograft and underwent a minimally invasive upper J-resternotomy with a 21 mm EDWARDS INTUITY Elite. Aortic cross clamp and CPB time were 62 and 113 minutes respectively. No inortopic agents were needed. AMV time, ICU stay and hospital stay were 3 hours, 1 and 6 days respectively.

These two cases demonstrate how the prosthetic choice at the time of the first and second operation is crucial. The classical surgical approach would have required a redo-Bentall procedure with a higher grade of surgical complexity and risk.

Rapid deployment bioprostheses demonstrated to be safe and suitable for redo-MIAVR patients, allowing performing fast and efficient reoperation in a safe minimally invasive fashion.

In our experience redo-MIAVR has finally become 'minimal' for patients and 'simpler' for surgeons.

Full tri-leaflet aortic valve reconstruction using bovine pericardium: an experimental study

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Full tri-leaflet aortic valve reconstruction has been performed clinically with autologous pericardium. The technique gained renewed attention through the work of Prof. Ozaki (Toho University, Tokyo, Japan) who published early and mid-term follow-up data from over 400 patients.[1] Ozaki developed a specific tool set of sizers and templates to create three custom-made pericardial cusps that are sutured to the aortic annulus.

The Admedus CardioCel® patch is a bovine pericardial patch treated by complete decellularisation, monomeric glutaraldehyde fixation and detoxification. Prof. Neethling (University of Western Australia) conducted the basic research for the development of this so-called ADAPT treatment of bovine pericardium, and evaluated the technology in small[2] and large animal[3] models in simple and more intricate procedures.

The CardioCel® patch has demonstrated favourable characteristics in several animal models, and significantly positive outcomes in a Phase II clinical trial in simple and complex congenital repair procedures.[4] CardioCel® has FDA and CE approval in a wide array of indications, and is currently in worldwide clinical use for both adult and congenital cases.[5]

Regarding aortic valve reconstruction, the potential advantages of this patch over autologous tissue are off-the-shelf availability, complete decellularisation, monomeric glutaraldehyde fixation and proper detoxification.

We tested the behaviour of this decellularised bovine pericardial patch as a material for tri-leaflet aortic valve reconstruction in a juvenile sheep model. The implantation was performed similarly to the clinical technique described by Prof. Ozaki. *In vivo* evaluation included echocardiographic control at 1 week, 3 months and 6 months. The pericardial tissue was explanted at 6 months with macroscopical control, X-ray evaluation for calcification, histological analysis and quantitative calcium content determination.

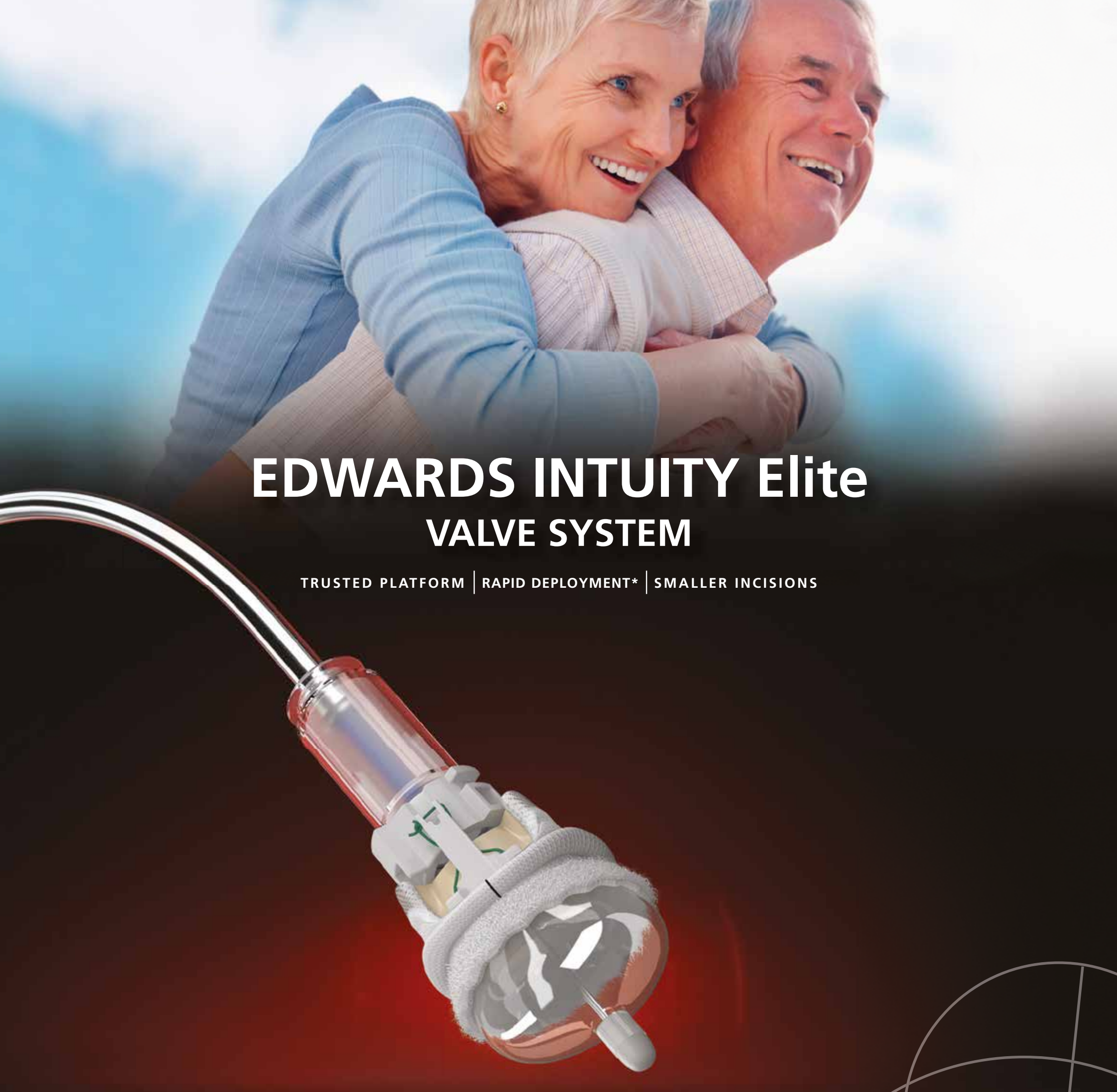
All the animals surviving the surgical technique remained in good condition. Echocardiography revealed perfect valve function with pliable, mobile cusps and a large coaptation area. We measured low peak (11–13 mmHg) and mean (4–6 mmHg) gradients that were stable over time. There was no valve insufficiency. At explantation, we found nicely pliable and soft cusps, with minimal calcification on X-ray and a very low calcium content: median 1.62 µg/mg (IQR 1.31–2.42). Histology showed nicely preserved collagen structure, coverage by a thin and endothelialised neo-intima and partial re-cellularisation of the acellular patch by host cells.

The Admedus Cardiocel® tissue performs well in aortic valve position. After more than 6 months in aortic position in a juvenile sheep model, the tissue reveals very low calcification and a nicely preserved tissue integrity and stability.

A clinical trial for aortic valve reconstruction will be initiated in the US and Europe this year. Potential benefits of reconstructing the aortic valve with three custom-made cusps includes: 1) superior haemodynamics (no stent or metal frame); 2) promising resistance to calcification; and 3) potential re-cellularisation of the acellular bovine scaffold.

References

1. Ozaki S, Kawase I, Yamashita H, et al. Aortic valve reconstruction using autologous pericardium for patients aged less than 60 years. *J Thorac Cardiovasc Surg* 2014;148:934–8.
2. Neethling W, Brizard C, Firth L, et al. Biostability, durability and calcification of cryopreserved human pericardium after rapid glutaraldehyde-stabilization versus multistep ADAPT® treatment in a subcutaneous rat model. *Eur J Cardiothorac Surg* 2014;45:e110–7.
3. Brizard CP, Brink J, Horton SB, et al. New engineering treatment of bovine pericardium confers outstanding resistance to calcification in mitral and pulmonary implantations in a juvenile sheep model. *J Thorac Cardiovasc Surg* 2014;148:3194–201.
4. Neethling WM, Strange G, Firth L, et al. Evaluation of a tissue-engineered bovine pericardial patch in paediatric patients with congenital cardiac anomalies: initial experience with the ADAPT-treated CardioCel® patch. *Interact Cardiovasc Thorac Surg* 2013;17:698–702.
5. Strange G, Brizard C, Karl TR, et al. An evaluation of Admedus' tissue engineering process-treated (ADAPT) bovine pericardium patch (CardioCel) for the repair of cardiac and vascular defects. *Expert Rev Med Devices* 2015;12:135–41.



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Cardiac – Abstract: Endocarditis: a continuous dilemma

Improved rehabilitation programmes are mandatory to improve the results of cardiac surgery for infective endocarditis in patients with intravenous drug use

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Intravenous drug users (IVDUs) have an extraordinary high risk for developing infective endocarditis (IE) compared with the general population, and IE is also a major cause of death among IVDUs. Risk factors, indications and the results after cardiac surgery for IE in IVDUs were retrospectively studied at Haukeland University Hospital, Bergen, Norway.

Between January 2001 and December 2013, 91 patients with IVDU were treated for IE, of whom 29 (32%) underwent surgery. Mean age was 36 years (range 24–63 years) and 27 (93%) were male. The most common illicit drugs were opioids, amphetamine and benzodiazepines. Mixed abuse was seen in 19 patients (66%). Prior intracardial implants or untreated aortic valve pathology was found in seven patients (24%). Three patients (10%) received medication-assisted rehabilitation preoperatively. Hepatitis C was found in 25 patients (86%), whereas none carried the human immunodeficiency virus. Twelve (41%) were homeless and 15 (52%) had poor dental status.

The main indications for first time heart valve surgery were heart failure, embolisation and uncontrolled infection. *Staphylococcus aureus* (52%) and *Enterococcus faecalis* (17%) were the most frequent isolated organisms. Aortic valve replacement was performed in 22 patients (76%) and multiple valve surgery in seven patients (24%). All except three patients received biological valve prosthesis or repair. Thirty-day mortality was 7% after first time surgery. During follow-up, a total of 15 patients (52%) presented with recurrent IE. Ten patients (35%) were offered a second operation, and two patients (7%) a third operation due to recurrent IE. Thirty-day mortality was 10% after repeat surgery. Thirteen patients (45%) died within a median of 22 months (range 0–84 months). A relapse of the initial IE or recurrent IE in the prosthetic valve was the major cause of death. Continued drug abuse was reported in 70% and 44% of patients who were discharged from the hospital after their first and second operation, respectively.

Cardiac surgery for IE among IVDUs has acceptable early postoperative results. Survival was 79% and 59% at 2 and 5 years, respectively. The reinfection rate of IE is high within 2 years. To improve survival and reduce the risk of reinfection, drug abuse has to be discontinued and improved rehabilitation programmes are mandatory.

Vascular – Professional Challenge: Arch involvement in acute aortic dissection: a surgical challenge

Should right axillary artery cannulation in type A aortic dissection with dissected innominate artery be prohibited?

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Selection of the arterial cannulation site for cardiopulmonary bypass (CPB) in patients with acute Stanford type A dissection is critical. Currently advocated routes include the axillary, common carotid, innominate and femoral arteries, as well as the ascending aorta or apex of the left ventricle. There is increasing evidence that cannulation of the axillary artery is superior to other cannulation sites, since it preserves antegrade flow in the descending aorta reducing risk for embolisation and making it easier to use selective cerebral perfusion during the aortic arch repair. A significant dilemma remains the cannulation of the axillary artery in case of dissected innominate artery. Supra-aortic branches are involved in the dissection process in up to 37% of acute type A dissection patients. It is unclear whether right axillary artery cannulation for arterial inflow in these patients is safe. It remains unknown what happens with both lumina of dissected innominate artery during the retrograde innominate artery CPB blood flow after axillary artery cannulation, and whether there is a significant risk of false lumen expansion, true lumen collapse and multiorgan malperfusion in this scenario.

Our aim was to evaluate the efficacy and safety of the right axillary artery cannulation for aortic repair in acute type A dissection patients with dissected innominate artery.

Among a total of 416 patients with acute type A aortic dissection operated on at the Saitama Medical Center in Saitama, Japan, and at the Heart Center Freiburg University in Freiburg, Germany, 186 patients (63±13 years of age; 43% females; 81% DeBakey type I) had dissected innominate artery and comprise the study population. Patients with right axillary cannulation (RAX, n=84) were compared with patients who underwent non-right axillary cannulation (non-RAX, n=102) for arterial inflow.

Seven (8.3%) RAX and nine (8.8%; p=0.885) non-RAX patients had new-onset postoperative stroke. In-hospital mortality was 9.5% and 10.8% (p=0.97) for patients with RAX and non-RAX, respectively. Survival did not differ between RAX and non-RAX patients and was 92±3% versus 87±4, and 85±5% versus 73±9%, at 1 and 5 years, respectively (log rank, p=0.29).

There was no more dissection detectable in the innominate artery at the follow-up CT-angiography in 12% RAX and 14% non-RAX patients (p=0.82). The highest remodelling level was observed in primarily dissected right carotid artery in the non-RAX group (26%; Figure 1). There was no significant difference in remodelling frequency of primarily dissected arteries coming off the aorta between RAX and non-RAX groups. In eight RAX patients, the right axillary artery was cannulated although it was dissected. In all of these patients, the axillary artery was cannulated via Dacron graft anastomosed end-to-side to the true lumen. None of these patients had new-onset post-operative stroke or died perioperatively.

No differences were observed in short- and mid-term outcome in patients who did and did not undergo RAX in case of dissected innominate artery. Furthermore, even after exclusion of patients in cardiogenic shock (who were more frequently cannulated rapidly via the femoral artery under cardiopulmonary resuscitation), there were no differences in terms of perioperative mortality and morbidity. Moreover, in patients with dissected axillary artery no postoperative adverse events associated with the axillary artery cannulation were observed. Our findings support using axillary artery for arterial inflow of the heart–lung machine regardless of the innominate artery involvement in the dissection process.

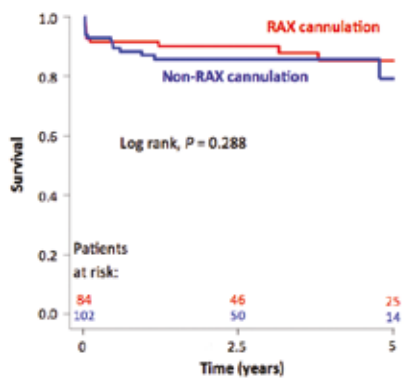

Figure 1. Survival after surgery for acute type A aortic dissection in patients with dissected innominate artery. RAX indicates right axillary artery.

Cardiac – Abstract: Basic science 2

Longer coronary anastomosis provides better haemodynamics in coronary artery bypass grafting

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In coronary artery bypass grafting (CABG), distal anastomosis technique affects graft patency and long-term outcomes. However, there is no standard for the appropriate length of distal anastomosis. In this study, we analysed the appropriate length using a state-of-the-art CABG anastomosis training device and computational flow dynamics (CFD) technology.

The distal anastomosis model used, YOUCAN (EBM Corporation, Tokyo, Japan), was originally developed for vascular anastomosis training, particularly in off-pump CABG. This high fidelity silicone vascular model reproduces the fragility and multi-layered structure of native arteries. The essential mechanical property, for a training model, of tearing strength was validated using porcine coronary arteries.

Two lengths of distal anastomosis, 4 mm and 10 mm, were prepared by end-to-side continuous anastomosis techniques using 7-0 polypropylene sutures. The worldwide standard length of distal anastamosis is 4 mm, while the longer 10 mm model requires better technique and a longer time for the anastamosis, but is expected to offer improved haemodynamics.

The quality of anastomosis was compared using CT scans and the 3-dimensional inner shape of distal anastomosis. Energy loss and haemodynamics were analysed by CFD. The working flow was defined as a Newtonian fluid, density 1050 kg/m^3 and viscosity 4 mPaS. The boundary condition was set to 100 mmHg at inlet, 50 mL/min at outlet, and 100% stenosis of proximal coronary artery.

Beautiful 3-dimensional CT images were obtained (Figure 1) showing the precise quality of anastomosis in both models. Distal anastomosis was more uniform in the 10 mm model, without vessel wall inversion or kinking.

CFD analysis revealed several interesting findings. The 4 mm model demonstrated sudden changes of blood flow direction at the junction and a flow separation phenomenon distal to the anastomosis. The latter reflects blood flow congestion, and a risk of thrombosis. The 10 mm model provided a more streamlined blood flow, and thus faster recovery to normal flow in the distal coronary artery. Haemodynamic analysis showed significantly lower energy loss in the 10 mm model and with less variation than in the 4 mm model (34.8 + 6.9 μW versus 77.1 + 21.5 μW, p<0.0001).

These findings support the use of 10 mm anastomosis, which provided higher quality distal anastomosis and better haemodynamic properties with lower energy loss, less change of blood flow direction, and no flow separation. Although technically difficult and time-consuming, longer distal anastomosis has the potential to provide better graft patency and long-term outcomes in CABG.

References

1. Tsukui H, Aomi S, Yamazaki K. Surgical strategy for kommerell's diverticulum: total arch replacement. *J Thorac Cardiovasc Surg* 2014;148:1423–7.
2. Tsukui H, Yamazaki K. Contemporary strategy for aortic valve stenosis in octogenarians. *Surgery Today* 2013;44:992–1003.
3. Tsukui H, Umehara N, Saito H, et al. Early outcome of folding mitral valve repair technique without resection for mitral valve prolapse in 60 patients. *J Thorac Cardiovasc Surg*; 2013;145:104–8.
4. Tsukui H, Umehara N, Yamazaki K: Left ventricular aneurysm repair without ventriculotomy. *Heart Vessels* 2013;28:401–403.
5. Tsukui H, Abla A, Teuteberg JJ, et al. Cerebrovascular Accidents in Patients with a Ventricular Assist Device. *J Thorac Cardiovasc Surg* 2007;134:114–23.
6. Tsukui H, Teuteberg JJ, Murali S, et al. Biventricular Assist Device Utilization for Patients with Morbid Congestive Heart Failure: A Justifiable Strategy. *Circulation* 2005;112(Suppl 1):I-65–I-72.

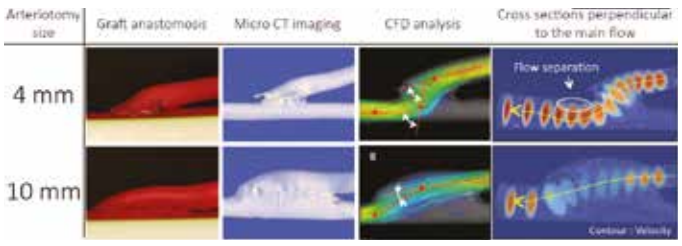

Figure 1.

Cardiac – Abstract: Left ventricle – strategies in left ventricular moderations

First in human extracellular matrix implantation in post-infarct ischaemic heart failure – 6 months results

Piotr Suwalski
Central Clinical Hospital of the Ministry of Interior, Warsaw, Poland

Despite undoubted progress in myocardial reperfusion strategies and novel pharmacological and surgical approaches, therapies directed towards alleviating the deleterious consequences of chronic myocardial ischaemic damage remain limited and there is a clear need for solutions for this growing group of patients.
Decellularised technologies, such as small intestinal submucosal-derived extracellular matrix (ECM), are being developed for clinical application and have demonstrated recruitment of vascular growth factors and promotion of myocardial regeneration in cardiac defects and acute infarct models.[1] Techniques for the delivery of biomaterials include topical (epicardial) application using commercially available patches, but also intracoronary or intramyocardial injection in experimental settings revealing positive effects after 8–12 months after injection.[2]
Particulate extracellular matrix (P-ECM; CorMatrix Cardiovascular Inc, Roswell, GA) is an ECM that has been cryogenically ground into an injectable particulate, allowing for intramyocardial delivery. The first clinical application in man is the RESTORE Study, which is evaluating the safety of CorMatrix ECM delivered trans-epicardially with a proprietary delivery system to patients with left ventricular ejection fraction (LVEF) 25%–40% during coronary artery bypass grafting (CABG). The RESTORE Study is being conducted at the Central Clinical Hospital of the Ministry of Interior in Warsaw, Poland under the direction of Piotr Suwalski. The endpoints of the study include device related safety and improvements in global ventricular function. Echocardiography and MRI data will be evaluated by Yale Cardiovascular Research under the direction of Alexandra Lansky. Patients will be followed for 18 months for safety and efficacy, with interim assessments being conducted at 6 and 12 months post-treatment.
We treated a total of nine patients presenting with an LVEF of 34.5% (28.4%–39%) and receiving 2.7 bypasses (range 1–4). The device was delivered with 100% success. The average volume injected per patient was 4.0 mL (2.8–5.6 mL) in infarct areas of 35.12 cm^2 (6.45–51.61 cm^2). There were no device-related adverse events in the first 6 months, but after 1 month there was one patient death, resulting from duodenal bleeding. One patient underwent NSTEMI 3 months after the procedure was successfully treated with PCI in a different region than P-ECM injection. The P-ECM was traceable in echocardiography for 1–3 months. Histology samples from the deceased patient revealed good protrusion of the P-ECM and initial signs of neo-angiogenesis. So far, echocardiography and MRI reveal stable myocardium function and thickness.
At this point in time it can be concluded that the P-ECM transepicardial implantation is safe and feasible. Taking into account the animal data, we are looking forward to observing the results after 12–18 months. The prospective randomised study comparing CABG with CABG plus P-ECM, is necessary to ultimately confirm the therapy efficacy in this cohort of patients.

References
1. Slaughter MS, Soucy KG, Matheny RG, et al. Development of an extracellular matrix delivery system for effective intramyocardial injection in ischemic tissue. *ASAIO J* 2014;60:730–6.
2. Toeg HD, Tiwari-Pandey R, Seymour R, et al. Injectable small intestine submucosal extracellular matrix in an acute myocardial infarction model. *Ann Thorac Surg* 2013;96:1686–94.

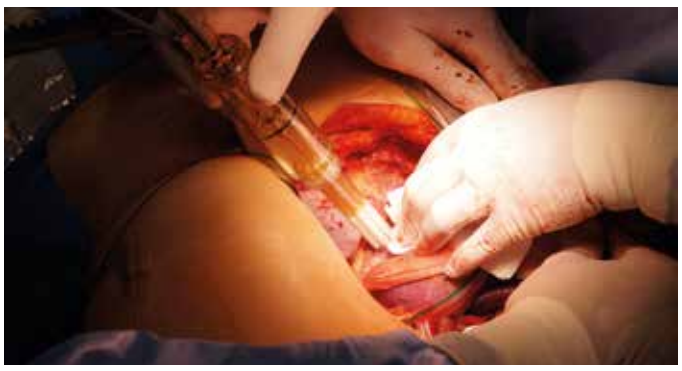

Figure 1.

Cardiac – Abstract: Aortic valve replacement: what is new?

Simulators for minimally invasive cardiac surgery

Toshiyuki Yamada Tokyo Medical Center, Tokyo, Japan

The concept of minimally invasive surgery has been growing in importance in cardiothoracic surgery, but there are few opportunities for its simulation or training. We have therefore used our existing 3D printing technology named 'Bio-Texture Modeling', which can create realistic replicas of human organs, to make a simulator for minimally invasive cardiac surgery (MICS). In particular for minimally invasive aortic valve replacement (MIAVR) and minimally invasive mitral valve repair (MIMVR).
Collaboration between medicine and engineering allows us to carry out this type of project. The MICS simulator was constructed in cardiac and thoracic cavity model. The thoracic cavity model had already been made by the co-authors, and the cardiac model was created using Bio-Texture Modeling as follows (Figure 1). Cardiac CT was used to obtain data for the heart in the Digital Imaging and Communications in Medicine (DICOM) standard, and this was used to design the cardiac model with a 3D computer-aided design (3D-CAD) (Figure 2). An accurate mould was created from the design using a 3D printer, and materials such as polyvinyl alcohol (PVA) were inserted into the mold to make the model.
The cardiac model was constructed in three parts (Figure 1): the Aortic Complex Model (ACM) that included the ascending aorta, sinus of Valsalva, aortic valve; the Mitral Complex Model (MCM) that included the left atrium, mitral valve, and left ventricle; and the remaining parts of the heart. ACM and MCM are important for cardiac surgery, so we replicated them with the greatest accuracy with Bio-Texture Modeling.
We simulated MIAVR via a small right parasternal thoracotomy with a mechanical valve, and MIMVR including ring annuloplasty, artificial chordal reconstruction, resection and suture, and edge-to-edge with or without using a robot (Figure 3). The shape and feel of the replica are remarkably similar to the real bio-texture of a patient's organs, and the difficulty of the simulation is the same as that of an actual surgery.
Simulation and training of minimally invasive surgery is important. There are evidences suggesting that virtual simulation like 'flight simulator' is useful for operation using an endoscope,[1] a method of traditional training such as using 'black box' is useful for surgeons,[2] and furthermore there is a learning curve of MICS.[3]
We are certain that this simulator can help younger and less experienced surgeons to practice MICS procedures with life-like models instead of virtual simulators and animal organs and that it can become the standard simulator and trainer for MICS procedures. The cardiac model without the thoracic cavity model can also be used to simulate and train for conventional procedures such as aortic valve replacement/repair/reconstruction, aortic root reconstruction with valve conduit/valve sparing, mitral valve repair/replacement, and ascending aortic repair.
We are already seeking to move forward. The cardiac model needs clear, fine-resolution CT data showing details of the heart. However, while the aortic valve can be clearly shown by a CT scan, the mitral valve, especially the chordae and leaflet, cannot. For this reason, we have already started to consider how to obtain clearer data of the mitral valve from a CT scan. If succeed, we would be able to make a 'patient's specific cardiac model' and provide the best opportunity for simulation and training in operative procedures before actual operations. It will also help the general public have a better understanding of diseases and treatments. Furthermore, in the future, this simulator can help with safer and easier MICS procedures and in creating new surgical procedures and tools.

References
1. Våpenstad C, Buzink SN. Procedural virtual reality simulation in minimally invasive surgery. *Surg Endosc* 2013;27:364–77.
2. Jensen K, Ringsted C, Hansen HJ, et al. Simulation-based training for thoracoscopic lobectomy: a randomized controlled trial. *Surg Endosc* 2014;28:1821–9.
3. Holzhey DM, Seeburger J, Misfeld M, et al. Learning minimally invasive mitral valve surgery: A cumulative sum sequential probability analysis of 3895 operations from a single high-volume center. *Circulation* 2013;128:483–91.

Figure 1. Bio-Texture Modeling of a cardiac model.

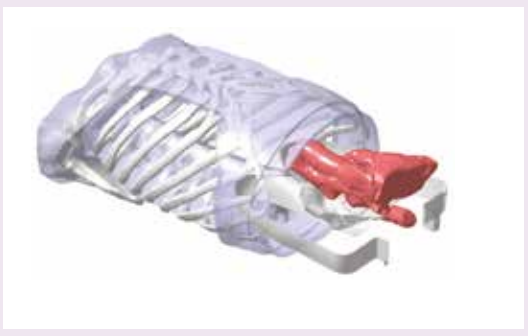

Figure 2. 3D computer-aided design (CAD).

Figure 3. Actual simulation of minimally invasive aortic valve replacement and minimally invasive mitral valve repair with/without robot.

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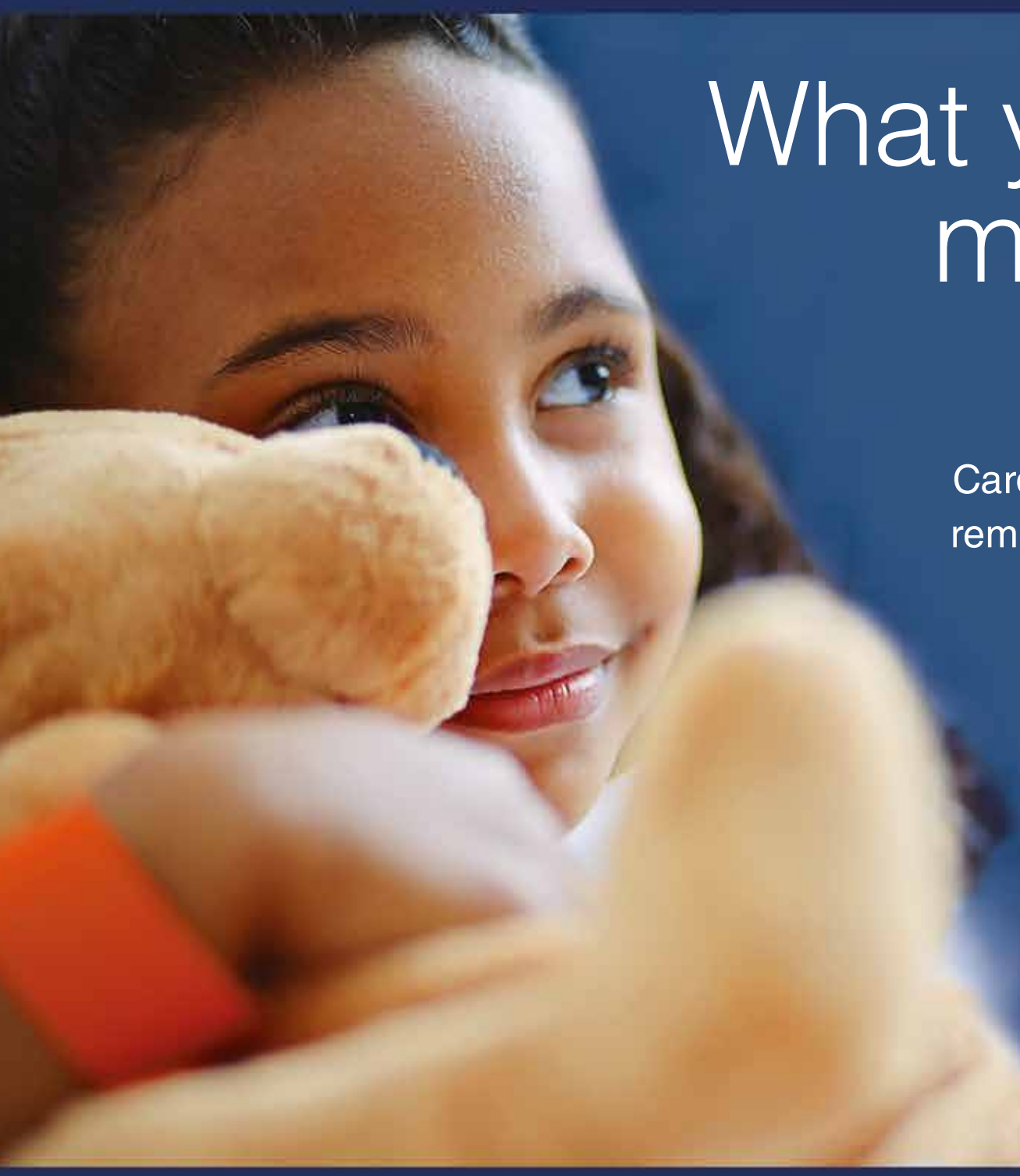

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Research Training/General – Focus Session: All you need to know for your next research project – part II

Innovation: the compromise of commercially funded research

John Pepper
Royal Brompton and Harefield NHS Foundation Trust, London, UK

Innovation brings to mind new devices and new procedures, but we may also apply existing procedures to new populations, such as the foetus or the very elderly, and new concepts of patient care, such as automated infusion devices. So what do we mean by innovation? It is a practical activity, which involves implementing something new that adds value. This is very attractive to surgeons. Bold experimentation, the Ross pulmonary autograft, or the first sleeve resection performed on a pilot who did not want a pneumonectomy, is rare. The most likely direction today will be in some form of regenerative medicine, using peptides, genes or cells and preceded by hundreds of experiments in small animals such as zebra-fish. Much more common are observations, which bring about improvements to existing or even old techniques.

In most industrialised countries money is tight and becoming tighter. Senior officials in health departments across Europe implore us to do more and more research with commerce.

The philosophies of scientific investigation and business are irreconcilable. One thrives on open dissemination of information, the other on proprietary information, which offers a competitive advantage. In an era of dwindling public resources for research and increasing commercial funding, we may be seeing the beginning of the end of open scientific inquiry. But let us explore this further. The record of surgical trials funded by charities is not without serious problems. Most obvious is the phenomenon of slow recruitment, usually due to institutional inertia and the absence of true and honest equipoise in the mind of the person recruiting a patient to the trial. As a direct consequence, the trial organisers may seek to alter the exclusion criteria, commonly by reducing them. Gradually the nature of the trial changes and the cohort of patients, which the trial was designed to examine, has now changed significantly. The STICH trial was an example of this. A trial that was set up to examine the influence of surgery on heart failure ended up examining ischaemia. The methodology was meticulous but the result was neutral.

On the commercial side the interests of the shareholders are paramount. Companies therefore prefer to try out new valves or devices on low risk patients, the very individuals who are already well served by routine clinical practice. Furthermore, commercial funding invariably depends on device sales. But the picture is not all bleak. In the best medical companies, there is a robust and well-developed safety culture. Added to this there is a just culture. Errors are viewed as learning opportunities and not a chance to attack colleagues with whom there is already a simmering soup of discontent! In commerce there exist high levels of incident reporting and root cause analysis, which are well embedded in successful organisations. This is not the situation in most cardiothoracic units.

On the horizon is the promise that medicine will become less empirical and more deterministic. But as long as the treatment of heart disease requires complex procedures and most of the treatments remain palliative, there will be a need to understand more fully the nature of the disease and its optimal management. This will require the adoption of new approaches to the analysis and synthesis of data.

In conclusion, we must innovate to be safe and there are many ways in which this can be achieved.

Culture of innovation

Idea-toxic	Idea-wasteful	Idea-friendly	Idea-hungry
Creativity not welcomed or rewarded	New ideas treated casually and mismanaged	Creativity welcomed New ideas valued Reviewed by hierarchy	People seek new ideas Radical improvement beyond existing limits

Cardiac – Abstract: Aortic valve replacement: what is new?

Effect of aortic valve morphology on fluid dynamics of the thoracic aorta – indication for a new modality of valve assessment?

Pouya Youssefi St George's Hospital, London, UK

For many years, treatment guidelines and intervention criteria have concentrated on traditional echocardiographic measurements for the aortic valve. Furthermore, size remains the principal decision-making index for treatment of the thoracic aorta. However, there is growing evidence that haemodynamics play an important role in aneurysm formation.

Flow characteristics are highly variable in the thoracic aorta, where the inflow velocity profile is largely dependent on the morphology of the aortic valve. Disease processes such as aneurysm formation and atherosclerosis are greatly affected by haemodynamic factors. Spatial velocity gradients together with blood viscosity result in wall shear stresses on the endothelium. Wall shear stress (WSS) refers to the force per unit area exerted by a moving fluid in the direction of the local tangent of the luminal surface. Oscillatory shear index (OSI) is a metric which allows quantification of the change in direction and magnitude of WSS and has been associated with vasculopathy. These forces are a known pathophysiological stimulus leading to gene expression and extracellular matrix remodelling.

In this study, we aimed to assess the effect of different aortic valve morphologies on velocity profiles, flow patterns and helicity, wall shear stress and oscillatory shear index in the thoracic aorta. In doing so, we endeavour to ask whether there is a need to seek new modalities of flow assessment in considering valve function and disease.

Patients were divided into the following five groups: *Volunteers* – healthy volunteers with tricuspid aortic valves; *AR-TAV* – aortic regurgitation tricuspid aortic valves; *AS-TAV* – aortic stenosis tricuspid aortic valves; *AS-BAV(RL)* – aortic stenosis bicuspid aortic valves with fusion of right and left coronary leaflets; *AS-BAV(RN)* – aortic stenosis bicuspid aortic valves with fusion of right and non-coronary leaflets. Patients underwent Cardiac Magnetic Resonance imaging (CMR) and Magnetic Resonance Angiography (MRA), used to create 3D geometric models of the thoracic aorta. Phase-contrast MRI was performed in the ascending aorta orthogonally at the sino-tubular junction, used to define the patient-specific inflow velocity profile. Blood flow simulations were carried out using a stabilised finite element formulation. Computational fluid dynamics analysis of flow symmetry, 3D velocity streamlines, helicity, WSS and OSI were carried out.

A total of 45 patients were studied. Blood flow in the ascending aorta was more eccentric and asymmetrical in the bicuspid groups (flow asymmetry = 78.9±6.5% for *AS-BAV(RN)*, 72.6±17.2% for *AS-BAV(RL)*, 41.1±9.8% for *AS-TAV*, 23.2±5.3% for *AR-TAV*, and 4.7±2.1% for *Volunteers*; $p<0.05$). Blood flow helicity was significantly higher in the *AS-BAV(RL)* group. Mean Wall Shear Stress (MWSS) was found to be similar in the ascending aorta of the *Volunteers* (9.8±5.4 dyn/cm^2) group and *AR-TAV* group (17.4±8.8 dyn/cm^2). However, it was significantly elevated in the aortic stenosis groups, being highest in the *AS-BAV(RN)* group (MWSS=37.1±4.0 dyn/cm^2, compared with 27.3±10.0 dyn/cm^2 for *AS-BAV(RL)* and 35.0±20.1 dyn/cm^2 for *AS-TAV* groups, $p<0.05$). For each patient, the ascending aorta was circumferentially divided into eight sectors in order to assess wall shear stress differences and asymmetry on different sides of the aorta. The aortic stenosis groups showed significantly asymmetrical MWSS distributions, with the right-anterior (RA) and right (R) sectors (located at the greater curvature) experiencing the highest levels of wall shear stress. Ascending aorta oscillatory shear index (OSI) was lower in the *AS-BAV(RN)* group.

These haemodynamic indices may play a physiological role in the aortic valve influencing disease of the thoracic aorta. Further work in the field of image-based computational modelling may enable the development of improved diagnostic tools and decision-making indices for managing both aortic valve-related aortopathy and the aortic valve itself beyond traditional treatment guidelines.

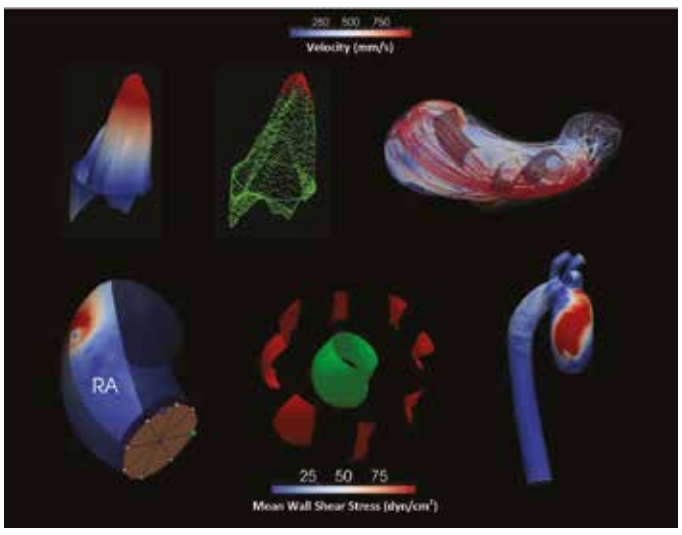

Figure 1.

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Cardiac – Focus Session: Avoiding disasters in cardiac surgery

Keeping the bloodbank happy: strategies to reduce transfusion

Anders Jeppsson Sahlgrenska University Hospital, Gothenburg, Sweden

Bleeding after major surgery is influenced by a number of patient characteristics, surgical factors and an impaired perioperative haemostasis. Impaired haemostasis may be caused by haemodilution, enhanced fibrinolysis, consumption of platelets and coagulation factors, and platelet dysfunction secondary to the exposure to non-endothelialised surfaces. In addition, many patients are preoperatively treated with antithrombotic agents, such as platelet inhibitors and anticoagulants, which may increase perioperative bleeding.

Excessive bleeding after cardiac surgery is still a major problem. In cardiac surgery bleeding complications occurs in approximately 10 –15% of the patients and in 4–8% of the patients the postoperative bleeding is so severe that the patient needs to be re-explored. Re-exploration for bleeding is an independent risk factor for early mortality after cardiac surgery and increases the risk 2–3-fold.

Excessive bleeding also results in transfusion of blood products. There is wide variation in the incidence of perioperative transfusions in cardiac surgery, ranging from 20–80% of the patients. Most centres report figures around 50%, but the optimal level is unknown. The large difference between institutions cannot only be explained by differences in patient characteristics. Instead institutional and individual differences in transfusion practice, guidelines, and attitudes influence the frequency and number of transfusions.

Transfusion of blood products can be lifesaving but they are also associated with well-recognised risks and adverse effects. There is a small, but not negligible, risk of transmission of pathogens, and blood transfusion may also increase the risk of infections and malignancies. Recent data have also suggested that transfusion with blood products is an independent risk factor for both short- and long-term mortality after cardiac surgery, although contradictory reports exist. Blood products are also associated with high direct and indirect costs, and shortage of blood products is a reality at many centres. Thus, there are many reasons for restricting the use of blood products to necessary transfusions.

Potential methods and measures to reduce bleeding and transfusions in cardiac surgery patients include: optimal timing of surgery in relation to discontinuation of antithrombotic drugs; the use of cell savers; more biocompatible cardiopulmonary bypass circuits; and intraoperative monitoring of coagulation. In addition, individualised transfusion algorithms and structured blood conservation programmes may contribute.

During the presentation, different aspects of bleeding and transfusion in cardiac surgery will be discussed. Experiences from blood conservation programmes will be presented and a handling strategy will be discussed.

Vascular – Abstract: A 4D view of the aortic root

Surgical management of aortic root in type A acute aortic dissection: a propensity-score analysis

Sebastiano Castrovinci and Davide Pacini
University of Bologna, Sant'Orsola-Malpighi Hospital, Bologna, Italy

Type A acute aortic dissection (TAAAD) remains a life threatening condition and surgery represents the best therapeutic option. The primary objective of the surgery is the prevention of lethal aortic rupture by resection of the proximal intimal tear and supracoronary aorta replacement restoring blood flow in the true lumen. Many surgeons have encouraged an extensive replacement of the aortic root, justifying this option with the reduced risk of root dilatation and re-dissection. However, the short-term risks associated with a more radical intervention are perceived higher. Between March 1999 and December 2014, 296 patients underwent surgery for TAAAD at Sant'Orsola-Malpighi Hospital, Bologna, Italy; 177 (59.8%) underwent conservative root (CR) management and 119 (40.2%) underwent root replacement (RR), including Bentall and David procedures. Pre- and intra-operative data were stratified by type of root management and results were presented using statistical methods controlling for treatment-selection bias (propensity score analysis). We obtained two groups each with 82 patients. Primary end points were hospital mortality, long-term survival and freedom from proximal aortic root re-intervention.

Overall in-hospital mortality was 20.9%. The unadjusted comparison of hospital mortality showed no significant differences between groups (p=0.983). This finding was confirmed after adjusting for other 15 measured covariates (OR: 0.514, 95% CI: 0.200–1.319; p=0.166) or for the estimated propensity of root management (OR: 1.213, 95% CI: 0.622–2.368; p=0.571) using logistic regression models (Table 1). Using binary logistic regression, age at increments of 1 year (OR: 1.045; 95% CI: 1.011–1.080; p=0.008) and orotracheal intubation at hospital admission (OR: 3.773; 95% CI: 1.189–11.975; p=0.024) were independent predictors of hospital mortality. Excluding patients who died during hospitalisation, Kaplan–Meier estimate of survival at 5 years was 87.3±4.4% for the RR group and 80.9±4.4% for the CR group (log-rank p=0.503) (Figure 1). Unadjusted late mortality did not differ significantly between the groups (p=0.700). This result was confirmed after adjustment for other 10 covariates (OR: 1.494, 95% CI: 0.524–4.262; p=0.453) and adjusting for the propensity score estimated on the management of the aortic root (OR: 0.952, 95% CI: 0.418–2,167; p=0.907), using multivariate analysis with Cox regression (Table 1). Using binary logistic regression, age at increments of 1 year (HR: 1.079; 95% CI: 1.031–1.129; p=0.001), and diabetes (HR: 5.148; 95% CI: 1.048–25.291; p=0.044) emerged as independent predictors of late death. For RR patients, freedom from proximal aortic reoperation at 5 years was 96.0±2.8%, while for CR patients it was 90.8±3.5% (log-rank p=0.029) (Figure 2). Analysing the cohort of patients matched with the propensity score, freedom from proximal aorta reoperation at 5 years was 97.7±2.3% for RR group and 86.5±5.9% respectively for CR group (log-rank p=0.064) (Figure 3). The multivariate analysis with Cox regression, both unadjusted (HR: 2.929, 95% CI: 0.175–48.877; p=0.454) and adjusted by propensity (HR: 3.402; 95% CI: 0.349–33.129; p=0.292) did not show any association between the type of aortic root management and proximal aorta reoperations.

Our results indicate that the more radical approach of root replacement doesn't increase short term operative risk nor does it affect long term survival. However, on the long-term results, root replacement reduces the need of proximal reoperation and it should be adopted in patients with connective tissue diseases, in young patients and in cases with a proximal location of the intimal tear.

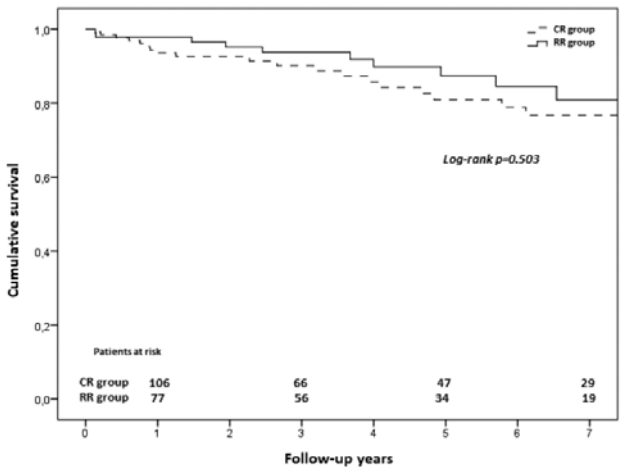

Figure 1.

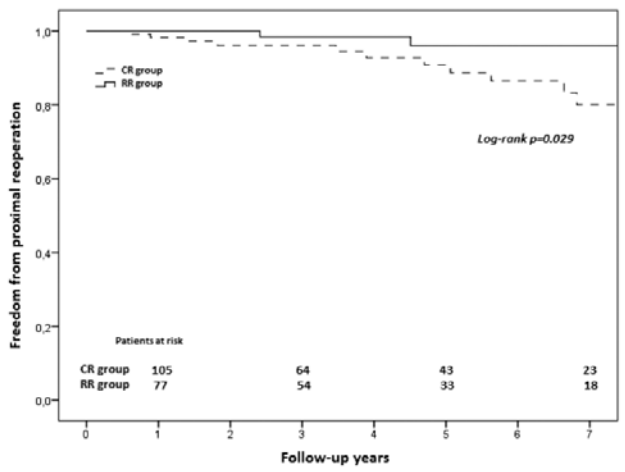

Figure 2.

Risk-adjustment method for hospital and follow-up mortality (RR versus CR)	p	Odds ratio	95% CI
Hospital mortality			
Unadjusted	0.983	1.006	0.569–1.781
Standard logistic regression[A]	0.166	0.514	0.200–1.319
Propensity-adjusted logistic regression[B]	0.571	1.213	0.622–2.368
Follow-up mortality			
Unadjusted	0.700	0.800	0.387–1.779
Standard logistic regression[A]	0.453	1.494	0.524–4.262
Propensity-adjusted logistic regression[B]	0.907	0.952	0.418–2.167

A. Logistic regression against 15 measured covariates (hospital mortality) and 10 covariates (follow-up mortality)
B. Logistic regression against type of aortic root management adjusted for the estimated probability of RR

Table 1. Unadjusted and adjusted odds ratios for hospital mortality and follow-up mortality with RR versus CR.

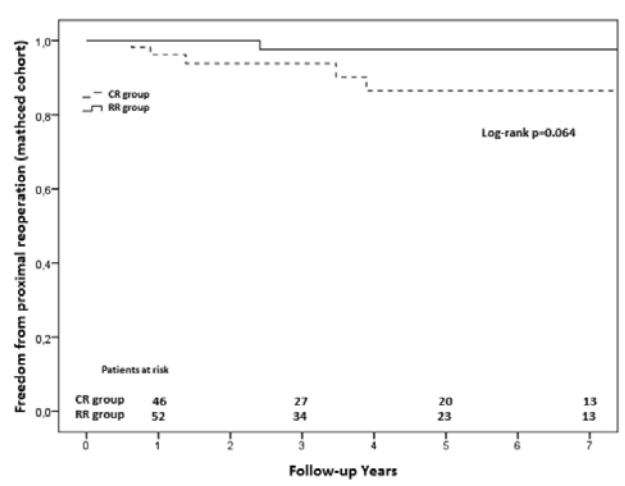

Figure 3.

Cardiac – Rapid Response: Reducing invasiveness

Comparison between off-pump and on-pump coronary artery bypass grafting: long-term results from a real-world registry

Francesco Nicolini University of Parma, Parma, Italy

Although several large-scale trials have compared the results between off- and on-pump coronary artery bypass grafting (CABG), few studies have investigated the long-term outcomes between the two strategies, generally reporting data only on long-term mortality. The main purpose of this multicentre registry study was to compare 5-year rates of overall mortality, myocardial infarction, target vessel revascularisation, stroke and post-operative renal failure in a large cohort of patients affected by coronary artery disease and who underwent off- and on-pump CABG. The secondary endpoints were to evaluate significant risk factors for mortality in this cohort of patients and to show the subgroups of patients who reported worse outcomes after off-pump CABG.

From 2003 to 2013, data from 7308 patients who underwent isolated and elective CABG were collected from the RERIC Registry (Registro dell'Emilia Romagna degli Interventi Cardiochirurgici). This registry is a prospective regional database collecting pre-, intra- and post-operative data from all patients undergoing cardiac surgical procedures in the region. During the study period, 6711 patients were operated on using on-pump CABG and 597 patients received off-pump CABG.

Exclusion criteria were associated valve surgery procedures, supra-aortic vessels disease requiring surgery, emergency/urgency, and anatomical contraindications to aortic cross-clamping, such as porcelain aorta.

Off-pump CABG patients were on average older, with a more depressed ventricular function, had a higher clinical risk profile due to systemic comorbidities like chronic renal failure, chronic pulmonary disease and extracardiac arteriopathy. Conversely, patients with the most severe angiographic risk profile (three-vessel disease) were significantly more represented in the on-pump group.

Propensity score (PS) matching enabled a cohort of 560 patients who underwent off-pump CABG to be selected and matched with 560 on-pump CABG patients with similar demographic, clinical and angiographic risk profiles.

At 5-year follow-up, Kaplan–Meier estimates showed that overall mortality was higher in patients who underwent off-pump versus on-pump CABG (22.8% versus 17.7%), although not statistically significant (p=0.06). Both groups experienced similar 5-year stroke rate (6.7% off-pump versus 4.4% on-pump; p=0.25) and myocardial infarction rate (9.7% off-pump versus 6.7% on-pump; p=0.45). At 5 years, repeat revascularisation with percutaneous coronary intervention (PCI) was significantly higher in off-pump versus on-pump CABG (15.5% versus 9.1%; p=0.05), as was new occurrence of renal failure (7.8% versus 4.6%; p=0.01).

To compare the long-term mortality in subgroups, a PS matched sample was calculated for each subgroup, and Cox proportional hazard models with robust standard errors were performed to estimate hazard ratio of off- versus on-pump CABG. In the subgroup analysis performed on the matched cohorts, on-pump CABG benefit was more evident on the risk of death in patients with left ventricular ejection fraction (LVEF) ≤30% (HR 4.0; 95% CI 1.1–14.1), three-vessel disease (HR 2.0; 95% CI 1.0–3.8), creatinine ≥2 mg/dL (HR 4.5; 95% CI 1.9–10.8), body mass index (BMI) ≥30 (HR 1.9; 95% CI 1.0–3.5), and EuroScore ≥10 (HR 3.7; 95% CI 1.7–8.1).

In this real-world registry, in patients undergoing elective isolated CABG, on-pump strategy confirmed a long-term survival advantage compared with off-pump strategy. No significant statistical difference was found between groups in terms of stroke. Significantly higher repeat revascularisation rate has been reported after off-pump surgery, probably due to the incomplete revascularisation at the index admission. On-pump CABG remains the preferred surgical strategy particularly in patients with a more complex and diffuse coronary artery disease.

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SOLUTIONS FOR VASCULAR DISEASE

Agenda

Saturday 3 October

Techno College

08:00	Transcatheter aortic valve implantation/aortic valve	Auditorium	
11:00	Heart failure/aortic disease	Auditorium	
14:30	Atrioventricular valves	Auditorium	
09:00	Diagnosis and surgery	G102+G103	
13:30	Outcome	G102+G103	
13:00	3D Technology	G104+G105	
16:20	Mechanical support	G104+G105	

Sunday 4 October

Professional Challenge

08:15	Challenges in mitral valve repair	Auditorium	

Focus Session

08:15	Safer surgery for who?	G104+G105	
10:15	Quality improvement	E106+E107	
10:15	Safer surgery for who?	G104+G105	
13:45	Women in cardiac surgery	F003	
13:45	Quality improvement programme update	F002	
13:45	Basic science – heart	G109	
10:15	Basic science – lung	G109	

Abstract Rapid Response

10:15	Transcatheter aortic valve implantation versus surgical aortic valve replacement	E102	
13:45	Aortic valve substitutes: the long-term view	E102	

Plenary

12:00	CanBetter: optimising training programmes in cardiothoracic surgery	Auditorium	

Postgraduate Education

08:15	Perfusion	Forum	
08:15	Nurse and nurse physician postgraduate programme	E108	
13:15	Update on the results and rationale and design of ongoing clinical trials	Auditorium	
13:45	Extracorporeal life support devices and strategies for management of acute cardiorespiratory failure	G104+G105	
08:15	Pneumonectomy controversies: what is the problem?	E104+E105	
10:15	Management of oesophageal perforations	E104+E105	
13:45	Management of acquired tracheal disorders: from stenosis to laceration	E104+E105	
08:15	Update on hypoplastic left heart syndrome management	G106+G107	
10:15	Update on Tetralogy of Fallot with pulmonary valve atresia and major aortopulmonary collateral arteries	G106+G107	
13:45	Meet the experts	G106+G107	
14:45	Surgical film session	G106+G107	
08:15	Basics in proximal thoracic aortic surgery: session 1	G102+G103	
10:15	Basics in proximal thoracic aortic surgery: session 2	G102+G103	
13:45	Outcome and follow-up after major thoracic aortic surgery: session 3	G102+G103	
14:45	Thoraco-abdominal aneurysms revisited: session 4	G102+G103	

Monday 5 October

Professional Challenge

08:15	A lifetime living with transposition of the great arteries – part I	G106+G107	
10:15	A lifetime living with transposition of the great arteries and left ventricular outflow tract obstruction – part II	G106+G107	
08:15	Arch involvement in acute aortic dissection: a surgical challenge EACTS/STS	G102+G103	
10:15	Uncertainties in the treatment of chronic dissection EACTS/STS	G102+G103	
08:15	Wire skills for the surgeon	Auditorium	
10:15	Wire skills for the surgeon	Auditorium	

Focus Session

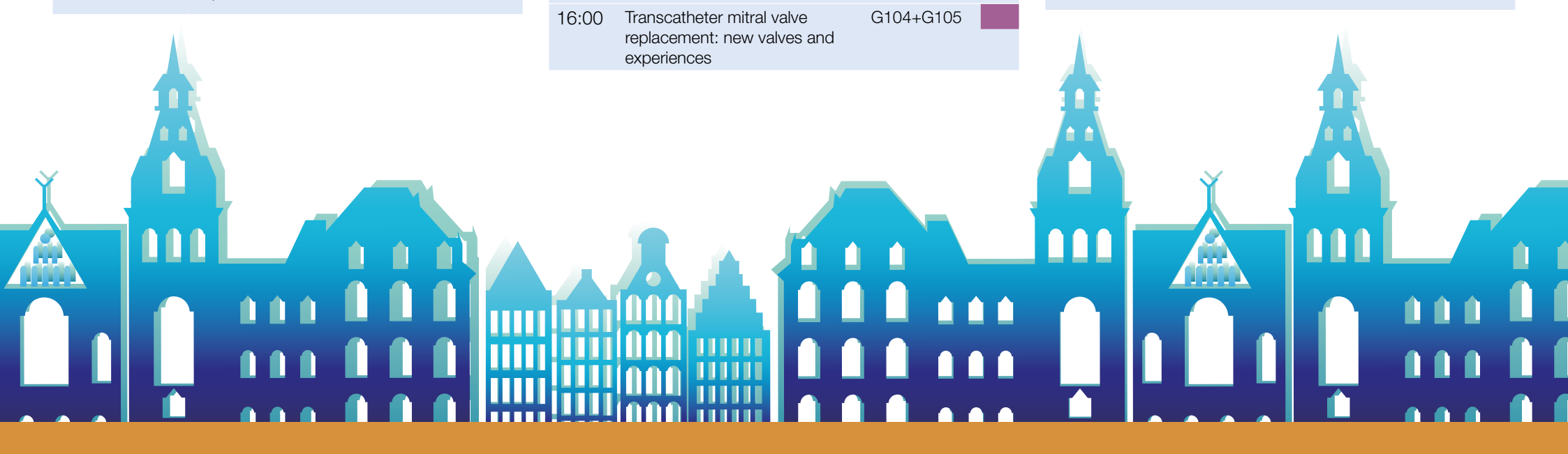
10:15	Avoiding disasters in cardiac surgery	E106+E107	
10:15	Meet the experts	Emerald Room	
14:15	Coronary artery bypass graft is on the rise, don't give it up	Auditorium	
14:15	Infectious problems	E106+E107	
14:15	Transcatheter aortic valve implantation: current and future perspectives	E104+E105	
14:15	Pro and con debates	Emerald Room	
14:15	Joint session EACTS SBCCV PASCaTS – Cardiothoracic surgery	G109	
16:00	Fast-track management	E104+E105	
16:00	Live-heart team of complex pathologies	Emerald Room	
16:00	Transcatheter mitral valve replacement: new valves and experiences	G104+G105	
16:00	Joint Session EACTS SBCCV PASCaTS – Cardiac surgery in the emerging economies: the evolving management strategies	G109	
10:15	Minimally invasive surgery for lung cancer: up-to-date debates	E108	
14:15	Meet the experts in robotic cardiothoracic surgery	E103	
16:00	TNM classification: 8th edition	E103	

Abstract

08:15	Heart transplantation in the modern era	Forum	
08:15	Endocarditis: a continuous dilemma	G104+G105	
08:15	Risk models in coronary surgery	E104+E105	
08:15	Work in progress	Emerald Room	
10:15	Left ventricle – strategies in left ventricular moderations	Forum	
10:15	Aortic valve replacement: what is new?	G104+G105	
10:15	Cardiac general	E104+E105	
10:15	Basic science 1	G109	
14:15	Future of sutureless valves	Forum	
14:15	Challenges in surgical aortic valve replacement	G104+G105	
14:15	Basic science 2	F002	
16:00	The two faces of arterial revascularisation	Auditorium	
16:00	Results of Ross procedures and homografts in aortic surgery	E106+E107	
08:15	Thoracic oncology I: staging	E103	
08:15	Non-oncology I	E108	
10:15	Thoracic oncology II: perioperative management	E103	
14:15	Mediastinum	E108	
16:00	Fontan circulation	G106+G107	
14:15	A broad view on acute dissection	G102+G103	
16:00	A 4D view of the aortic root	G102+G103	

Abstract Rapid Response

08:15	Reducing invasiveness	E102	
10:15	Supporting the heart and lung	E102	
16:00	Thoracic quick fire session	E102	
14:15	Congenital	E102	



	Plenary	
11:50	Presidential Address	Auditorium

	Residents Session	
10:15	EACTS Cardiothoracic Masters Jeopardy	F002
12:45	Cardiac surgery residents – where do we come from and where are we heading	F002
16:00	Endoscopic port access mitral valve repair	F004

	Training in Research	
10:15	All you need to know for your next research project – part I	F003
14:15	All you need to know for your next research project – part II	F003
16:00	How to statistically analyse your next research project	F003

Tuesday 6 October

	Professional Challenge	
08:15	Less invasive procedures for complex patients	Auditorium
10:15	Less invasive procedures for complex patients	Auditorium

	Focus Session	
08:15	Aortic valve disease and heart failure: how do they connect?	E104+E105
10:15	Acute extracorporeal support and mechanical circulatory assist	Forum
10:15	Is minimally invasive cardiac surgery the present and the future of mitral valve repair?	G104+G105
10:15	Perioperative complications in cardiac surgery	E104+E105
10:15	Nightmares in cardiothoracic surgery	Emerald Room
14:15	Pilots and passengers after cardiac surgery: so you want to fly again?	F002
14:15	Challenging the options for younger patients – minimising long-term risks with biological valves along the patient journey	Forum
14:15	Pre-operative planning, simulation, 3D printing and intra-operative navigation in cardiothoracic surgery	Emerald Room
16:00	Aortic valve replacement: ever had any problems?	Forum
16:00	Better outcomes through optimising international normalised ratio management and anticoagulation in aortic valve replacement	E104+E105
16:00	A contemporary approach to the aortic valve and aortic root	E106+E107
14:15	Guidelines	E103
16:00	Sublobar resections: controversies	E103
08:15	Paediatric and congenital cardiac activities in emerging economies	F002
14:15	Infections and chylothorax	G106+G107
08:15	Inflammatory and infectious aortic disease: a difficult environment	G102+G103
14:15	Arch repair	G102+G103
16:00	A contemporary approach to the aortic valve and aortic root	E106+E107

	Abstract	
08:15	Current challenges for extracorporeal life support	Forum
08:15	Native and prosthetic valve endocarditis: an update	G104+G105
08:15	Revisiting the tricuspid valve	E106+E107
10:15	Functional mitral regurgitation	E106+E107
14:15	Optimising outcomes in coronary surgery	G104+G105
14:15	Left ventricular assist device: Latest advances	E104+E105
14:15	Degenerative mitral regurgitation	E106+E107
16:00	What is new in transcatheter aortic valve implantation	Auditorium
16:00	Case reports and videos	G104+G105
08:15	Thoracic oncology III: Postoperative follow-up	E103
08:15	Thoracic non oncology II	E108
10:15	Session case report	E103
10:15	Lung transplantation	E103
14:15	Basic science and education	E108
16:00	Chest wall	E108
08:15	Tetralogy of Fallot	G106+G107
10:15	Valve surgery	G106+G107
16:00	Congenital miscellaneous	G106+G107

	Abstract Rapid Response	
08:15	How to perform an effective surgical atrial fibrillation ablation	E102
14:15	General cardiac	E102
16:00	New technology in mitral surgery	E102
10:15	Innovation and new strategies in thoracic aortic surgery	E102

	Plenary	
11:50	Honoured Guest Lecture	Auditorium
12:25	EACTS Award Presentations	Auditorium
12:35	Presidential Inauguration	Auditorium

	Residents Session	
12:45	Residents Luncheon	Amsterdam Cafe

	Simulator Session	
08:15	Endoscopic port access mitral valve repair	F004
10:15	Endoscopic port access mitral valve repair	F004
14:15	Endoscopic port access mitral valve repair	F004
16:00	Endoscopic port access mitral valve repair	F004

	Training in Research	
08:15	A summary of essentials for your next research project	F003
10:15	Clinical studies	F003

Wednesday 7 October

	Advanced Techniques	
09:00	Controversies and catastrophes in adult cardiac surgery	G102+G103
09:00	A future without suture	G104+G105
09:00	Advance technique session on multiple arterial grafting	G106+G107

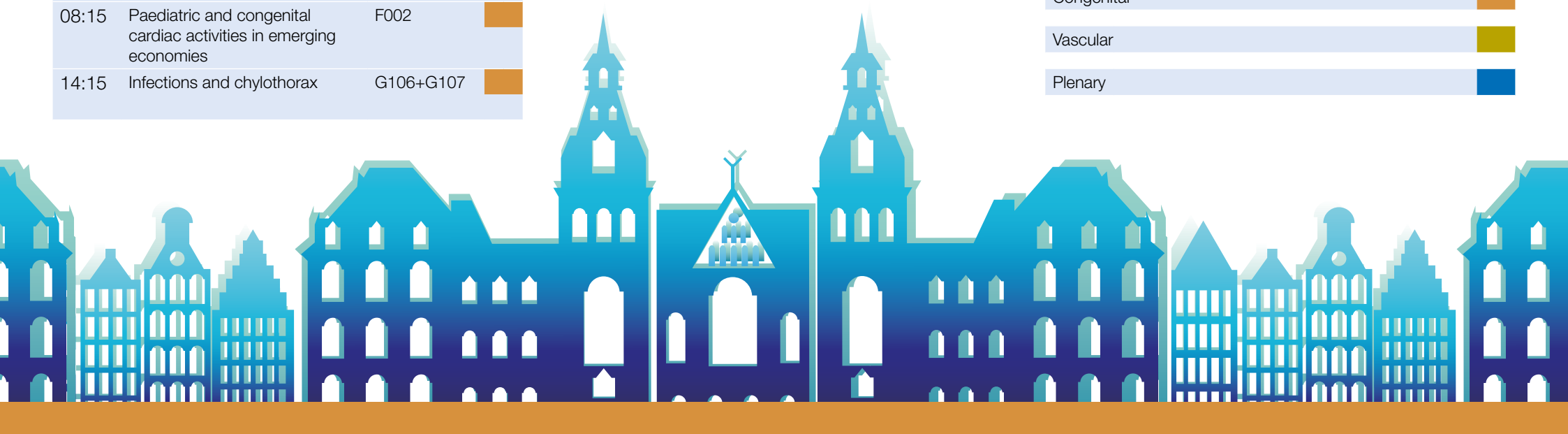
	Focus Session	
09:00	How to do it? With live in a box	Emerald Room

	Wetlab	
09:00	Learn from the experts how to do a remodelling or a re-implantation procedure	E106+E107
09:00	Mitral valve repair	E104+E105
10:30	Learn from the experts how to do a remodelling or a re-implantation procedure	E106+E107
09:00	VATS lobectomy	E103
09:00	AoV reconstruction and Senning	E102

	Abstract	
09:00	Video session	G109

Key

- Cardiac
- Thoracic
- Congenital
- Vascular
- Plenary



Congenital – Abstract: A lifetime living with transposition of the great arteries – part I

Mentoring new surgeons: can we avoid the learning curve?

Shafi Mussa Birmingham Children's Hospital, Birmingham, UK

Surgical management of congenital heart disease is intellectually and technically demanding, resource intensive and emotionally charged. A wide variety of complex surgical procedures are undertaken for a broad range of cardiac malformations in a heterogeneous population. Despite this, outcomes following treatment of congenital heart disease have improved considerably over the preceding decades such that surgery for the majority of congenital heart disease is now undertaken with a very low mortality.

Newly appointed congenital heart surgeons are expected to achieve the same excellent outcomes as more experienced surgeons. However the environment for training is challenging for all of the aforementioned reasons, and newly appointed surgeons may have limited first operator experience for complex procedures. Mentorship of newly appointed surgeons by more experienced surgeons is a potential way of maintaining outcomes, while consolidating and enhancing important decision making and technical skills.

The arterial switch operation is a valuable benchmark procedure for mentorship of newly appointed surgeons for the following four reasons. Firstly, the arterial switch operation is relatively commonplace, providing an appropriate volume and frequency of procedures. Secondly, morphological variations that may significantly increase the complexity of repair form a consistent, but only small, subset of all patients with transposition of the great arteries. Thirdly, although technically demanding, the procedure is readily reproducible and includes important transferable techniques in congenital heart surgery that may be applicable to repair of less commonly encountered defects. Lastly, all steps of the procedure are easily visualised by both the primary and the assisting surgeon, so that the procedure should be able to be performed safely by a newly appointed surgeon assisted by a mentor.

We tested our hypothesis that complex surgical procedures can be learned and performed safely and effectively by newly appointed surgeons with appropriate mentorship and support by examining a range of outcomes following the arterial switch operation undertaken at Birmingham Children's Hospital over a 25-year time period during which three new surgeons joined the team, each mentored by a more experienced surgeon.

From 449 patients under 1 year of age undergoing the arterial switch operation with or without concomitant closure of ventricular septal defect, there were only five deaths within 30 days of surgery. There was no difference in 30-day mortality or longer-term survival between the four surgeons. Other markers of technical proficiency such as re-intervention rates were low, and again, with no significant difference between surgeons. Bypass and ischaemic times remained remarkably consistent for individual surgeons during their experience.

Our results demonstrate the importance and value of mentorship in enabling complex surgery to be performed by newly appointed surgeons without compromising patient safety and maintaining excellent outcomes. The arterial switch operation forms an excellent platform for the mentorship process, including pre-operative and operative decision making, transferable technical skills and post-operative management. We would suggest this approach could be extended to other surgical specialties in which newly appointed surgeons perform complex, technically demanding procedures, while maintaining patient safety and avoiding the associated learning curve.

Cardiac – Abstract: Challenges in surgical aortic valve replacement

Ascending aorta replacement under circulatory arrest for severe aortic calcification in patients with aortic stenosis

Pyo Won Park Samsung Medical Center, Seoul, Korea

Heavily calcified ascending aorta is a challenge during aortic valve replacement (AVR) for severe aortic stenosis (AS) because aortic cannulation, cross clamping and aortotomy are difficult to manage. Since the introduction of transcatheter aortic valve implantation (TAVI), severe calcified ascending aorta has become one of the major indications of TAVI instead of surgical AVR. Although the techniques and technologies used for TAVI have improved, there are still several drawbacks, such as residual aortic regurgitation, high incidence of heart block and uncertain long-term durability of crimped tissue valves. The aim of this study was to evaluate the clinical results of surgical AVR with ascending aorta replacement (AAR) under circulatory arrest in patients with severe AS.

From January 2004 to December 2014, a total of 32 patients with severe AS underwent AVR plus AAR due to severe calcified ascending aorta. Patients who had previously undergone cardiac surgery or significant aortic regurgitation were excluded. Mean patient age was 74±7 (59–87) years, and seven (22%) were octogenarians; the Logistic Euroscore was 21.4±19.0% (3.3–68.2%). Preoperative comorbidities included stroke history (6%), chronic kidney disease (22%), atrial fibrillation (22%), New York Heart Association (NYHA) III or IV (28%) and intravenous inotropics (19%). Non-contrast and/or contrast cardiac computed tomography including aortic arch was performed in all patients. As we preferred arterial cannulation on all ascending aorta or aortic arch sites, careful evaluation of computed tomography and intraoperative epiaortic ultrasound of the aortic arch and ascending aorta was required. Arterial cannulae were placed at the ascending aorta (n=26, 81%), aortic arch (n=5, 16%), and right axillary artery (n=1, 3%). The other strategy to reduce circulatory arrest time was to choose an optimal location for distal graft anastomosis according to the intravascular pathology of atheromatous plaque. Sometimes we chose oblique anastomosis or a short segment of one branched graft replacement instead of endarterectomy, which is a time-consuming procedure during arrest. The circulatory arrest was used in all patients with an average lowest rectal temperature of 22±2°C. The duration of total circulatory arrest was 25±5 minutes. Bioprosthetic valve were implanted in 29 patients (91%). Concomitant procedures were coronary artery bypass grafting (n=5, 16%), subaortic myectomy (n=3, 9%) and maze procedure (n=1, 3%).

There was no early mortality. Postoperative complications included one minor stroke, which was recovered without sequela at discharge, one transient ischaemic attack, two pacemaker insertions (one: heart block: one: sick sinus syndrome), one reoperation for bleeding and one acute renal failure.

The mean circulatory arrest time for the last 16 patients was significantly decreased compared with that for the initial 16 patients (22.2±3.3 versus 27.4±5.6 minutes, p=0.003). The mean follow-up period was 2.7±2.1 years (0–9.4 years). Among 448 patients who had undergone AVR without ascending aorta replacement in the same period, 64 patients were matched for age, sex, coronary artery disease, NYHA functional class, and atrial fibrillation (1:2 matching). Kaplan–Meier analysis showed similar survival curves in both groups (Figure 1). Five-year survival was 83% in the AVR+AAR group and 86% in the AVR-only group. A limited number of TAVI procedures (n=21) were performed during the same study period due to the high cost of the device.

In conclusion, surgical AVR with AAR under circulatory arrest in patients with calcified ascending aorta showed acceptable early and late outcomes. Although the indications for TAVI are growing, a surgical approach may still be a valid option for carefully selected patients with ascending aortic calcification.

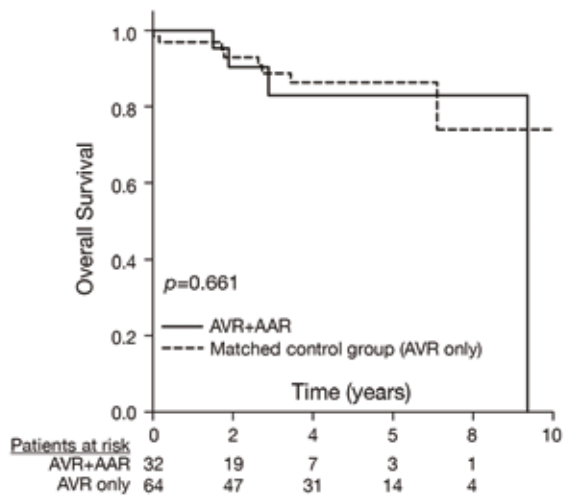


Figure 1. Overall survival of study population (AVR+AAR) and matched control group without AAR.

Vascular – Professional Challenge: Uncertainties in the treatment of chronic dissection

Novel and simple exposure for extended descending and thoracoabdominal aortic replacement: straight incision with rib-cross thoracotomy

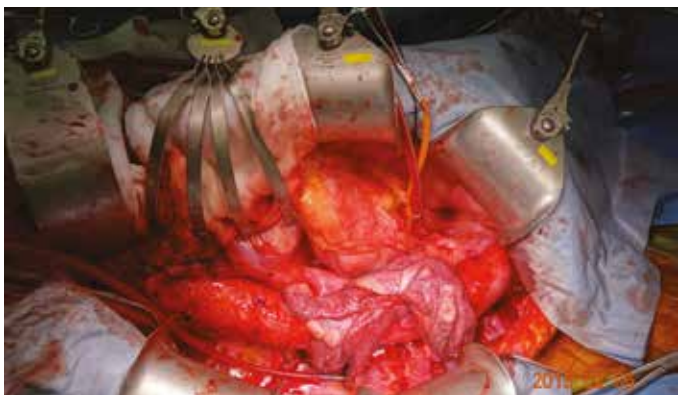
Kenji Minatoya National Cerebral and Cardiovascular Center, Japan

Spiral incision of the thoracic wall toward a tip of scapula and approach through the 6th intercostal space has been a standard approach for replacement of thoracoabdominal and descending aortic aneurysms. The exposure of the proximal lesion of aorta with the traditional spiral incision, however, is not sufficient for patients with lesions extending into the arch. Our patients tend to have thinner chest cavities; therefore we started to use this novel approach.

A straight incision was made from the axilla to the umbilical region and the 4th to 6th ribs were transected. *Latissimus dorsi* muscle and thoraco-dorsal artery were preserved, which could be collateral circulation of Adamkiewicz artery. The ribs were repaired with absorbable pins at the end of operations.

Since May 2012, 47 patients (mean age 51.2±16.1, 33 male) had graft replacements with the novel incision. There were two emergency operations for acute aortic dissection. Twenty-four patients (51%) had undergone previous proximal aortic operation, and two patients had debranched TEVAR for aortic arch. Connective tissue disorders were diagnosed in 16 (34.0%) patients (Marfan syndrome 13, Loeys-Dietz syndrome 3). All surgery was performed under profound hypothermia. Seven patients underwent total descending aortic replacements, and rest had Type II thoracoabdominal aortic replacements. Three had partial arch replacement, five had total arch replacement, and three had Y-grafting for abdominal aorta concomitantly. Operation time was 567±141 minutes and cardiopulmonary bypass time was 259±60 minutes. Three patients had a major stroke (6.4%), and one had a minor stroke. There were no spinal cord complications among the survivors, and the hospital mortality rate was 4.3% (2/47). These two patients had thoracoabdominal replacement, and had major strokes. No frail chest was found postoperatively.

Patients with Marfan syndrome tend to have a flat chest and it is generally difficult to operate on the aortic arch through a left thoracotomy in such cases. This new exposure along straight incision with rib-cross thoracotomy provided excellent exposures for the long segment of thoracoabdominal aorta, and it enabled extended replacement from ascending aorta to abdominal aorta.



Blood flow analysis of aortic arch using computational fluid dynamics

Satoshi Numata (left) and Keiichi Itatani (right)
Kyoto Prefectural University of Medicine, Kyoto, Japan

Although size of the aorta is an effective predictor of cardiovascular events, progress is needed towards better prediction using other parameters. It is obvious that haemodynamic parameters such as blood flow velocity, blood pressure, and wall shear stress are closely related to the pathophysiology of aortic diseases. These fluid dynamic parameters should also be considered when surgical strategy is discussed. Computational fluid dynamics have been recently introduced into clinical practice. It is possible to simulate blood flow velocity and wall shear stress using a 3-dimensional model created using computed tomography data from real patients.
We evaluated blood flow from the aortic root to proximal descending aorta using computational fluid dynamics. In the first study we selected five patients with a dilated thoracic aorta and evaluated the relationship between haemodynamic parameters and the preferred site of aortic dissection. In a second study we simulated right subclavian artery cannulation as the inflow of the cardiopulmonary bypass and analysed blood flow distribution inside the aortic arch.
Simulation models from aortic root to proximal descending aorta were made from computed tomographic angiography of five patients who had ascending aorta or arch dilatation (patient 1: annuloaortic ectasia, patient 2: annuloaortic ectasia + ascending aorta aneurysm, patient 3: ascending aorta aneurysm with unicuspid aortic valve, patient 4: distal arch aneurysm, and patient 5: bovine aortic arch + distal arch aneurysm). Computational fluid dynamics analyses were performed using commercially available software (ANSYS Fluent). Flow velocity, wall shear stress (WSS), and oscillatory shear index (OSI) were calculated during one cardiac cycle. Heart rate was set to 60 beats per min and cardiac output was defined as 5.0 L/min.
In the first study (Figure 1), thoracic aortic aneurysm caused disturbed vortical flow in a dilated space, resulting in turbulent flow not only inside the aneurysm but also in the proximal and/or distal normal aortic portion. In models 1, 2 and 3 with dilated aortic root or ascending aorta, there was helical spiral flow with circumferential vortex during early systole in the ascending aorta. In model 4, turbulent flow inside the arch aneurysm caused a disturbed reflection wave, resulting in turbulence in the ascending aorta. In all models, a vortex flow at the lesser curvature of the proximal descending aorta at late systole, resulted in high OSI. WSS was high at the sinotubular junction in models 1, 3 and 5, and in all models high OSI was detected at the orifice of the supra-aortic branches and sinus of Valsalva in all patients.
In the second study (Figure 2), 75% and 50% of total flow were simulated. On both simulations, blood flow from the right subclavian artery cannulation perfused the right common carotid artery throughout the whole cardiac cycle. With 75% flow simulation, the left common carotid artery and the left subclavian artery were perfused by blood flow from the right subclavian artery cannulation at almost of all cardiac cycle except peak systolic phase.
Location of oscillatory shear index during one cardiac cycle was similar to the favorite site of acute aortic dissection. Right subclavian artery cannulation could prevent cerebral embolic events during cardiopulmonary bypass circulation by deflecting blood flow from the ascending aorta to the descending aorta.

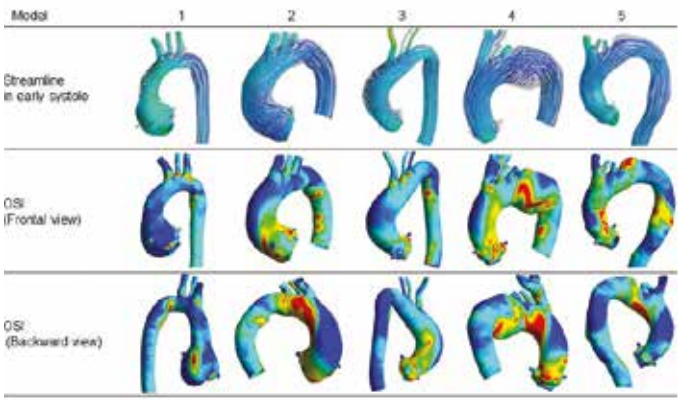


Figure 1. Simulated blood flow from the aortic root to proximal descending aorta.

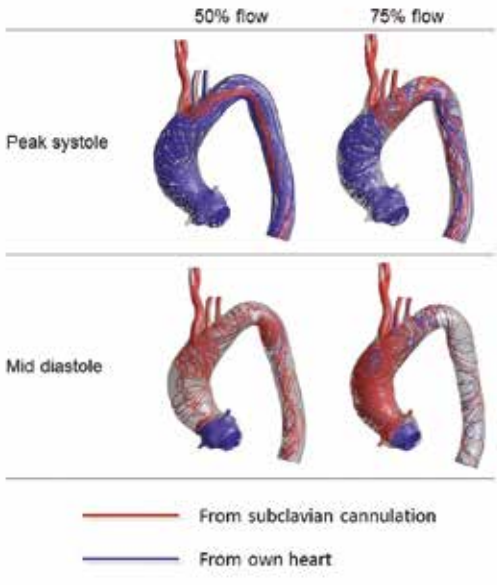


Figure 2. Simulations of aortic blood flow during the cardiac cycle at different flow rates.

December 2015: Two-day advanced course on anatomic correction of ccTGA

http://www.eacts.org/academy/courses/advanced-course-on-anatomic-correction-of-cctga/

Date/duration: 3–4 December 2015

Location: German Pediatric Heart Center, Sankt Augustin, Germany

Course Director: V Hraska, Sankt Augustin

Programme Committee:

B Asfour, Sankt Augustin, Germany	**GJ Krings, Utrecht, Holland**	**M Schneider, Sankt Augustin, Germany**
A Bogers, Rotterdam, Holland	**M Kostolny, London, UK**	**O Stumper, Birmingham, UK**
C Hart, Sankt Augustin, Germany	**JE Mayer, Boston, USA**	**P Suchoverskyj, Sankt Augustin, Germany**
M Hazekamp, Leiden, Holland	**R Prêtre, Lausanne, Switzerland**	**N Vansen, Koblenz, Germany**
V Hraska, Sankt Augustin, Germany	**S Quarshi, London, UK**	**P Vouhe, Paris, France**
J Janousek, Prague, Czech Republic	**E Schindler, Sankt Augustin, Germany**	**P Zartner, Sankt Augustin, Germany**

Course overview

Two-day onsite course in a hospital with a large amount of experience of anatomic correction of corrected transposition of the great arteries. This module will offer interactive discussions with experts in the field and live surgery demonstrations on how the technique can be applied.
This interactive course represents a great opportunity for paediatric cardiac surgeons and cardiologists to discuss all aspects of medical and surgical management of corrected transposition of the great arteries. The first day will provide an update on diagnosis of the condition, focusing on assessment of suitability for anatomical correction using different diagnostic tools. The indication criteria for physiological repair and single ventricle pathway will be elaborated on in detail and typical problems related to the double switch operation, including the left ventricle training and issues related to atrial and arterial switch will be covered. Technical details of the double switch operation will be further demonstrated in live cases from the operating theatre. Anaesthesiological, cardiopulmonary and post-operative management will also be discussed.
The second day will focus on issues related to the Senning–Rastelli operation and the long-term problems associated with the treatment of corrected transposition of the great arteries. Burning questions, such as how to deal with arrhythmias, severe tricuspid regurgitation, progressive dilatation of the aortic root associated with aortic regurgitation after double switch operation etc., will be answered, and there will be live-case demonstrations from the operating theatre and cath lab focusing on the technical aspects of surgery and necessary long-term interventions, respectively. The quality of life and long-term outcomes of patients after anatomical correction will also be discussed. By the end of the course, through teaching, discussion and demonstrations from the experts, the aim is that participants will have a greater understanding about when to operate, what kind of procedure should be used and when the operation should be avoided.
This course is dedicated to William Brawn from Birmingham, UK for his extraordinary contribution to current management strategies of corrected transposition of the great arteries.

Vascular – Professional Challenge: Uncertainties in the treatment of chronic dissection

Open aortic arch surgery in chronic dissection with visceral arteries originating from different lumens. What is the best strategy?

Paul P Urbanski Cardiovascular Clinic Bad Neustadt, Bad Neustadt, Germany

Since the establishment of endovascular techniques for aortic repair, surgical management of chronic type B aortic dissection became controversial because these techniques is the covering of intimal tears and obliteration of the false lumen. This aspect is especially important when dissection extends into the abdominal aorta, where the visceral arteries originate from a false lumen, because its closure can result in the impaired perfusion or even severe malperfusion. This also translates to chronic dissections with co-existing aortic arch pathologies, in which 'hybrid procedures' consisting of arch replacement and antegrade application of a stent graft, the so-called 'frozen elephant trunk' technique, is gaining increased interest.

Surgery targeting the obliteration of the false lumen in chronic dissection can frequently be a vicious circle. There is no doubt prevention of progressive aortic dilatation, or even reverse remodeling of dissected aorta, can only occur after complete thrombosis of the false lumen. This can only be expected if there are no further intimal tears in the distal aortic portion. The obliteration of the false lumen can be advantageous when the extent of dissection is limited, yet, can be catastrophic when the organ or spinal cord supplying arteries originate in a false lumen that is getting thrombosed (Figure 1). On the other hand, impairment of organ perfusion can be avoided when there is a wide intimal tear, or tears, in the abdominal aorta. Yet, the therapeutic aim, i.e., thrombosis of the false lumen, will also fail. Moreover, some reports demonstrated that partial thrombosis does not lead to the desired aortic remodeling; it can even result in increased progression of distal aortic dilatation.

At the 2013 EACTS Meeting Weiss reported experiences with the 'frozen elephant trunk' (arch replacement combined with antegrade application of a stent graft) technique for concomitant repair of dissected aortic arch and descending aorta.[1] They defined a complete thrombosis of the false lumen as a surgical success, without considering the origins of visceral arteries. Consequently they encountered complications such as spinal cord injury, bowel ischemia and permanent dialysis exclusively in patients with chronic aortic dissection. This indicates that all complications occurred in cases with visceral arteries originating from the false lumen; consequently its thrombosis is an unaccepted risk rather than surgical success of the distal aortic endografting.

Between June 2002 and 2015, a total of 17 patients (mean age 59 years; SD: 13 years) presented aortic arch pathology necessitating surgery in combination with chronic dissection of the thoraco-abdominal aorta in which the visceral arteries originated from different lumens. This number results in a 5.3% rate of all total arch replacements (321) performed during this period at the Cardiovascular Clinic in Bad Neustadt. Fourteen patients (82%) had previously had cardiac surgery, 13 of which were performed on the proximal aorta because of acute Type A dissection. Nine patients without considerable dilatation of the descending aorta received aortic arch replacement with distal resection of the dissection membrane, and eight patients with progressive dilatation of the thoracic aorta underwent aortic arch and descending aorta replacement via clamshell approach.

No early (defined as 30-day, 90-day, and in-hospital period) deaths, strokes, permanent dialyses, or spinal cord injuries occurred. All but one patient, who died due to leukaemia, were alive at the last follow-up (mean duration 40.3 months; SD: 32.6 months), and no patient needed a reoperation or an intervention on the thoracic and/or abdominal aorta.

These results indicate that conventional aortic arch repair with distal resection of the dissection membrane and, if necessary, with replacement of the progressive dilated chronic dissected thoracic aorta can offer excellent results in experienced hands. This method may be considered as a preferable option for surgical treatment of chronic aortic dissection with involvement of the aortic arch and the visceral arteries originating from different lumens.

Reference

1. Weiss G, Tsagakis K, Jakob H, et al. The frozen elephant trunk technique for the treatment of complicated type B aortic dissection with involvement of the aortic arch: multicentre early experience. *Eur J Cardiothorac Surg* 2015;47:106–114.

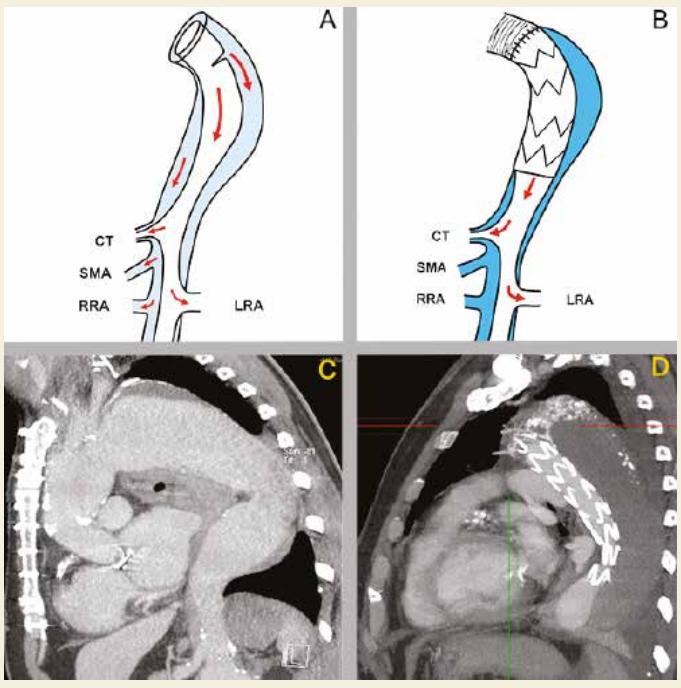


Figure 1.
A: Schematic illustration demonstrating aortic dissection extending through arch and thoraco-abdominal aorta with a sole intimal tear in proximal descending aorta and visceral arteries originating from different lumens.
B: Schematic illustration demonstrating that covering of intimal tear results in thrombosis of false lumen and consecutive flow impairment in aortic branches originating there.
C: Preoperative angio-CT in patient (corresponding to A) with chronic aortic dissection after previous ascending aorta replacement.
D: Postoperative angio-CT of same patient after complete aortic arch replacement with antegrade stenting of descending aorta ('frozen elephant trunk' technique), which led to complete thrombosis of false lumen and permanent injury of spinal cord.
CT-coeliac trunk, SMA-superior mesenteric artery, RRA-right renal artery, LRA-left renal

Cardiac – Abstract: Left ventricle – strategies in left ventricular moderations

Calculation of the expected end-diastolic volume of the left ventricle using the Teichholz method in patients with left ventricular aneurysm

Renat Babukov Penza, Russia

Heart failure is one of the common pathologies of the cardiovascular system. One of the main reasons for chronic heart failure is left ventricular aneurysm formation. This represents 10–35% of all cases. Surgical treatment of left ventricular aneurysm improves the prognosis and clinical course of the disease. But, despite the fact that a number of surgical approaches have been established and are now routinely applied in clinical practice, hospital mortality for operations of this nature remains high. Some authors count it as being as high as 2–19%. In 65–90% of cases the development of serious complications is related to inadequate asynergy zone elimination of the left ventricle, as well as the excessive resection of the left ventricle cavity. This can also result in low cardiac output syndrome and diastolic dysfunction. Thus, the surgeon must know the value of the optimal end-diastolic volume to be able to increase the effectiveness and safety of the surgical intervention. This value is necessary for successful left ventricular aneurysm plasty.

Based on our research, we suggest that it is important to pay special attention to the basal reserve of the left ventricle in preoperative patient selection. For this purpose we applied the Teichholz method, in which the calculation of the end-diastolic volume and ejection fraction is based on basal contractility. The objective of this study was to identify how accurate using the Teichholz formula is for calculating expected end-diastolic volume in left ventricular aneurysm plasty.

A total of 684 patients were included in the study. All operations took place during the period from 2012–2015, at the Center for Cardiovascular Surgery in Penza, Russia. Left ventricular aneurysm plasty was carried out in all cases. Patients were divided into two groups: the first group included 460 patients, in which end-diastolic volume was calculated using the Teichholz method preoperatively, matched with the Simpson method postoperatively; the second group included 224 patients, in who end-diastolic volume was calculated using the Teichholz method preoperatively, not matched with the Simpson method postoperatively. End diastolic volume indicators were considered comparable if there was a difference of not more than 20 mL. We used Marisa Di Donato et al's. classification of left ventricular aneurysm, which is based on the evaluation of left ventricular geometry and basal reserve.

Our findings demonstrate that both groups were comparable for indicators such as class of heart failure (NYHA), 6-minute walk test, EuroSCORE, hypertension, diabetes mellitus, body mass index, sex and age (p<0,05). Echocardiographic preoperative indicators of end-diastolic volume (EDV), end-systolic volume (ESV), ejection fraction (EF) and stroke volume (SV) were calculated using the Simpson method and their indexed values were not statistically significant in either group (p<0.05). Preoperative echocardiographic indicators of EDV, ESV, EF, SV and their indexed values calculated by the Teichholz method and postoperative values for these indicators calculated using the Simpson method are presented in Table 1. In the first group there is no significant difference between the values calculated by methods of Simpson and Teichholz (p≥0.05). Indicators of EDV, ESV, EF, SV and their indexed values in the second group, calculated by the Simpson method, were significantly lower than the values calculated by the Teichholz method preoperatively. Mortality in the second group (4%) was significantly higher than in the first group (1%) (p<0.001). The cause of death in all patients in the second group was low cardiac output syndrome, which subsequently lead to progressive organ failure. In the first group the main cause of an unfavourable outcome was recurrent myocardial infarction.

The early postoperative period in patients in the first group was more favourable. The number of days spent in the ICU and in the hospital, the duration of mechanical ventilation, the dose of cardiotonic support, lactate and creatinine were significantly lower in the first group (p<0.001). Installation of intra-aortic balloon counterpulsation was required in 30 patients in the second group (10.5%) and eight patients (2%) in the first group (p<0.001).

In conclusion, using the Teichholz method does make it possible to calculate the indicators of optimal end-diastolic volume, which is necessary to save and maintain adequate stroke volume of the left ventricle.

Parameters	Teichholz method (before the operation)	Simpson method (after the operation)	p value
Group 1 (n=460)			
EDV	180.02±48.5	175.05±41.96	.097
ESV	105.65±50.81	102.81±41.08	.352
SV	71.45±12.31	72.24±7.52	.241
EF	41.21±10.91	43.14±8.32	.003
EDVI	92.36±29	91.17±23.67	.496
ESVI	55.21±27.09	53.59±22.45	.324
SVI	37.19±6.77	37.57±4.68	.322
Group 2 (n=224)			
EDV	187.43±25.53	162.09±47.75	<.001
ESV	113.57±26.9	111.43±42.65	.523
SV	73.86±6.3	50.14±8.74	<.001
EF	40.19±7.3	32.38±7.58	<.001
EDVI	96.86±15.98	83.11±22.34	<.001
ESVI	58.67±14.91	57.04±20.39	.335
SVI	38.19±4.84	25.8±4.26	<.001

EDV = end-diastolic volume; ESV = end-systolic volume; SV = stroke volume; EF = ejection fraction; EDVI = end-diastolic volume index; ESVI = end-systolic volume index; SVI = stroke volume index.

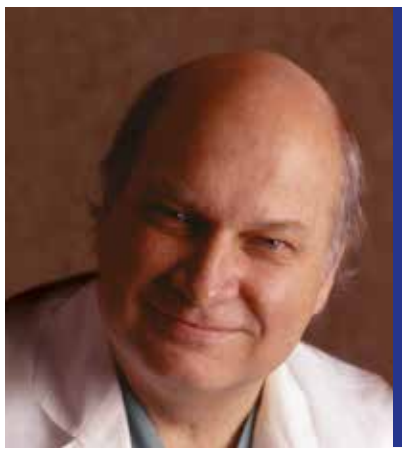
Table 1. Echocardiographic parameters and their indexed values calculated by the Teichholz method before surgery, and parameters calculated by the method of Simpson after surgery.

Vascutek Symposium at EACTS 2015

Monday 5 October 2015
12:45 - 14:00
Rooms G106 / 107

Management and Treatment of the Diseased Aortic Arch

Chairman: Professor Duke Cameron, USA



12:50 - 12:55

Introduction by Professor Duke Cameron, USA

12:55 –13:10

Professor Malcolm Underwood, Hong Kong

Managing Acute Aortic Syndromes in Asia

13:10 –13:25

Professor Christian Detter, Germany

Tips & Tricks of the Frozen Elephant Trunk Technique using Thoraflex™ Hybrid

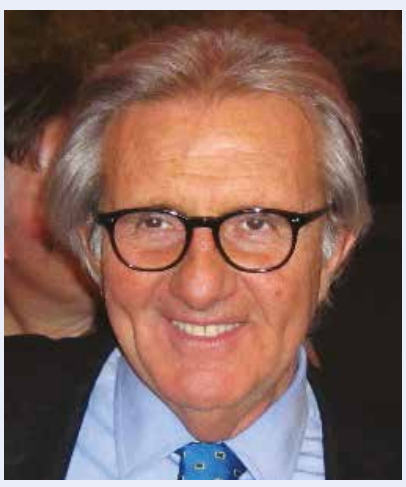
13:25 – 13:40

Professor Allan Stewart, USA

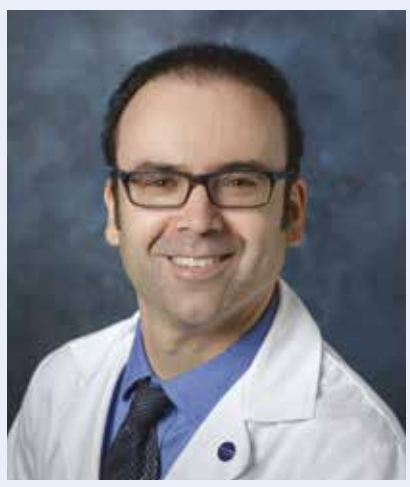
Challenges of the Aortic Root and Aortic Dissection

Panel

Professor Malakh Shrestha, Germany



Professor Roberto Di Bartolomeo, Italy



Professor Ali Khoynezhad, USA

Professor Eric Roselli, USA

14:00 Close

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Congenital – Abstract: Congenital rapid response

Forty years' experience with surgical repair of congenital mitral valve stenosis

M Carrozzini, M Padalino, V Vida, C Rasola, AC Frigo, O Milanesi, G Stellin
University of Padova, Italy

Congenital mitral valve (MV) dysplasia is a relatively rare yet highly complex cardiac disease. It comprises a wide spectrum of morphologic abnormalities of the MV and is frequently associated with other intracardiac anomalies. When treating these malformations, MV repair should always be pursued in the first instance to avoid the untoward effects of prosthetic valves. Anomalies presenting with prevalent MV stenosis are associated with the worst outcomes, but it remains unclear what effect the age of the patient at intervention and the type of malformation will have on the results of surgery.

We reviewed our surgical experience with MV dysplasia with prevalent stenosis, the aim being to analyse early and long-term results of surgical repair and to identify possible risk factors for worse outcomes. All patients who underwent surgical repair for congenital MV dysplasia with prevalent stenosis at our institution were included. Exclusion criteria were association with atrioventricular septal defects or transposition of the great arteries and single ventricle physiology. Clinical charts and operative reports were retrospectively reviewed and follow-up data were obtained either at the last outpatient visit or by telephone contact. Outcomes considered in the statistical analysis were: 30-day mortality; incidence of postoperative complications; late mortality; and the rate of reoperation caused by MV dysfunction. Variables analysed were: age at intervention (as a continuous variable); intervention during the first year of life; and the type of malformation (parachute MV, arcade/hammock MV, supravalvular mitral ring, papillary/chordal fusion, Shone's complex). Follow-up was completed in 40 out of 41 patients (98%).

Between 1974 and 2014, 41 consecutive patients were included in the study, of which 25 (61%) were male and 16 (39%) female. The median age at intervention was 2.3±4.5 years (range 2 months – 19.5 years) and 11 patients (27%) underwent surgery during the first year of life. Types of malformation were: parachute MV (n=8, 19%); mitral arcade or hammock MV (n=6, 15%); papillary muscles and/or chordal fusion (n=12, 29%); supravalvular mitral ring (n=6, 15%); and Shone's complex (n=9, 22%). Median hospital stay was 10±11 days, with a median ICU stay of 2±3 days. Postoperative complications occurred in nine patients (22%), with a 30-day mortality of 12% (n=5). Among early survivors, during a median follow-up time of 15.9 years (range 1 month – 36.4 years), there were six late deaths (17%), with a 10-year survival of 86%. Late reintervention on the MV was required in seven patients (20%). Statistical analysis showed a significantly higher rate of late reintervention in patients who underwent MV repair during the first year of life (71% vs 14%; $p<0.01$) (Figure 1). There were no other significant risk factors identified for the outcomes considered.

In our experience, congenital MV stenosis was characterised by consistent early and late mortality and morbidity. The statistical analysis showed no significant changes in early and long-term outcomes with different MV anatomical features. MV surgery within the first year of life led to a higher rate of reoperation on the MV, this being the effect of a more complex and severe pathology. However, it is noteworthy that it did not show a similar impact on early or late mortality.

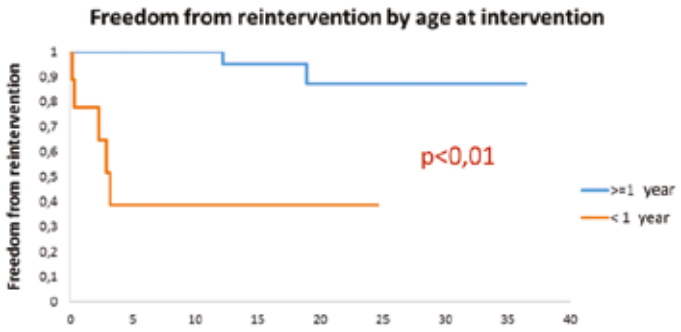

Figure 1.

Cardiac – Abstract: Results of Ross procedures and homografts in aortic surgery

Results of the Ross procedure in adults: a single-centre experience of 741 operations

Alexander Bogachev-Prokophiev, Ravil Sharifulin, Sergey Zheleznev, Igor Demin, Evgeny Lenko and Alexander Karaskov State Research Institute of Circulation Pathology, Novosibirsk, Russia

The Ross procedure is an attractive alternative to mechanical prosthesis because it provides physiological haemodynamics, prevents the need for anticoagulation with minimal risk of thromboembolism, and results in excellent long-term survival. In this observational study, we evaluated the 16-year results of the Ross procedure in 741 adult patients at a single centre. The mean patient age was 47.4±12.8 years (range, 18–67 years). The total root replacement technique was used in all patients. The right ventricular outflow tract (RVOT) reconstruction was performed with pulmonary allograft in 175 (23.6%) patients, different types of xenografts in 561 (75.7%) patients, and polytetrafluoroethylene conduits in five (0.7%) patients.

The early mortality was 3.0%. The mean follow-up duration was 5.8±2.2 years. The survival rate at 5 and 10 years was 93.9±1.1% and 90.4±1.9%, respectively and was comparable to the survival rate of an age- and sex-matched general population in our country (Figure 1). At the final follow-up of all examined patients (674), 614 (91.1%) were categorised as NYHA Class I–II, and 60 (8.9%) as NYHA Class III.

Fifty-seven patients underwent reoperations due to autograft and conduits in the RVOT position failure. Eight patients underwent both autograft and xenograft interventions. The overall freedom from all reoperations was 91.4±1.3 and 80.1±3.4, at 5 and 10 years, respectively. Thirty-seven patients required reoperations due to autograft dysfunction (seven in the early postoperative period). The rates of freedom from autograft reoperations were 94.1±1.1% and 88.3±2.2% at 5 and 10 years, respectively. Multivariate analysis identified an aortic annulus of ≥27 mm as the only independent predictor of autograft failure (HR, 3.4; 95% CI 1.3–6.9; $p<0.001$). The overall freedom from RVOT reoperation rates was 95.4±1.1% and 83.5±4.1% at 5 and 10 years, respectively. The 10-year freedom from reoperations for allograft, diepoxide- and glutaraldehyde-treated pericardial xenografts, and porcine aortic root grafts were 100%, 94.4±3.0%, 82.3±5.1%, and 80.6±4.9%, respectively. The reoperation rate varied according to the different age groups. The 10-year freedom from xenograft reoperation rates in patients >60 years (n=111) was 100%, while in groups <50 years (n=202) and 50–59 years (n=248), these rates were 76.9±5.7 ($p=0.03$) and 92.2±4.7 ($p=0.1$), respectively (Figure 2).

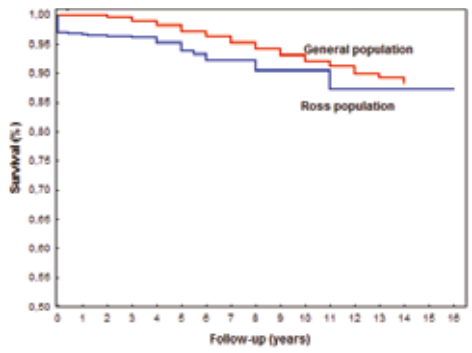

Figure 1. Survival rates (%) for the Ross procedure compared with the general population in Russia over 16-year's follow-up.

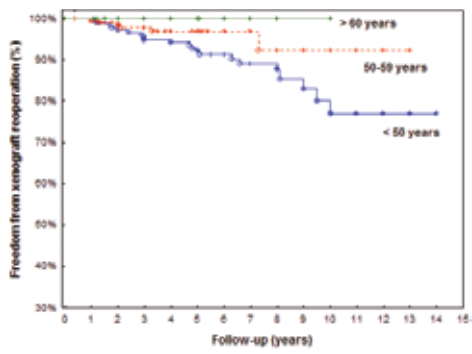

Figure 2. Freedom from xenograft reoperation rates (%) following the Ross procedure in patients >60 years (n=111), <50 years (n=202) and 50–59 years (n=248).

Thoracic – Abstract: Mediastinum

Correlation between preoperative anterior mediastinal tissue volume and anti-acetylcholine receptor antibody in patients with myasthenia gravis undergoing extended thymectomy

Akihiro Takahagi Department of Thoracic Surgery, Kyoto University, Kyoto, Japan

Extended thymectomy is a treatment option for myasthenia gravis (MG). However, the surgical indications for MG patients are restrictive. Although the pathological features of the thymus, such as the presence of thymic lymphoid hyperplasia and atrophic thymus, can be used to predict surgical outcomes, there is currently no reliable method for the preoperative evaluation of these characteristics. In the present study, we investigated the correlation between anterior mediastinal tissue volume on CT and the transition in anti-acetylcholine receptor antibody (AChRAb) levels by using three-dimensional-computed tomography (3D-CT) volumetry.

Among 61 patients who underwent extended thymectomy for MG between 1999 and 2015 in our institute, 28 patients with non-enhanced chest CT data were enrolled. 3D-CT volumetry of the anterior mediastinal tissues was performed with imaging software (Figure 1). The volume of the anterior mediastinal tissue without thymoma (VAM), volume of tissue with a value >-30 HU (V-30HU), and the CT value consistent with peak volume (CT-peak) were calculated, and the correlations between these values and the AChRAb levels were investigated using Spearman rank correlation coefficient analysis.

The VAM and CT-peak values were not correlated with the preoperative AChRAb levels or the post-/preoperative AChRAb ratio. However, the V-30HU value was significantly, and positively, correlated with the preoperative AChRAb level ($\rho=0.505$, $p=0.006$) and inversely correlated with the post-/preoperative AChRAb ratio ($\rho=-0.453$, $p=0.018$) (Figure 2).

The volume of tissue with a value more than -30 HU on CT was positively correlated with the preoperative AChRAb level and inversely correlated with the post-/preoperative AChRAb ratio. These findings suggest that the quantification of anterior mediastinal tissue by 3D-CT volumetry can help predict the surgical outcome for myasthenia gravis.

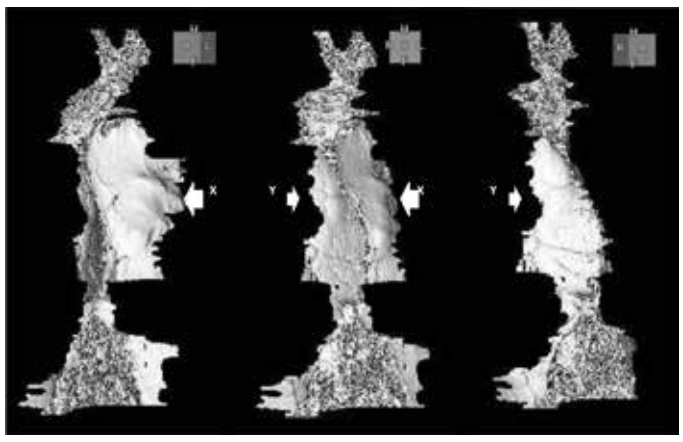

Figure 1.

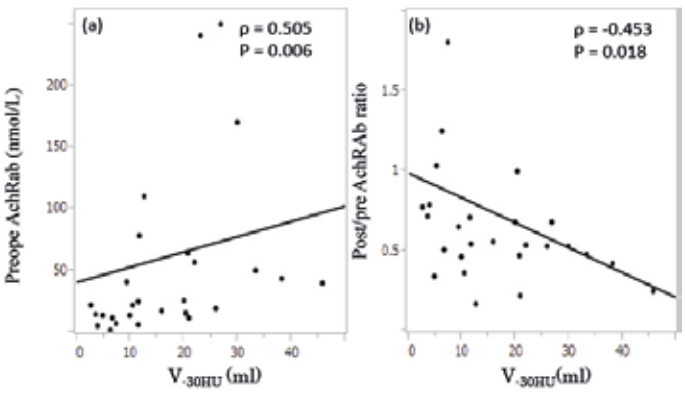

Figure 2.

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Both Lunch Symposiums will be held from 12:45 – 14:00 hours at Meeting Room 106-107.

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Cardiac – Abstract: Cardiac general

Over 30 years results of bileaflet mechanical valve replacement

Satoshi Saito Tokyo Women's Medical University, Tokyo, Japan

Heart valve replacement using bileaflet mechanical valves is a well-established procedure. However, the long-term results, over a 30-year period, of valve replacement with bileaflet mechanical valve remain unclear. Furthermore, identifying predictors for long-term mortality and valve-related events is of paramount importance.
We carried out a retrospective cohort analysis of 2,851 patients (average age: 52±12 years) who underwent valve replacement with the St Jude medical valve at our institution from 1978 to 2012, using either a questionnaire and chart review, or physician contact. Of 1,101 patients who underwent aortic valve replacement (AVR), 1,236 who underwent mitral valve replacement (MVR), and 514 who underwent double valve replacement (DVR), follow-up was 91% complete and total follow-up was 40,797 patient years. Operative mortality was 3.0% with AVR, 2.1% with MVR, and 3.7% with DVR.
Freedom from late mortality at 34 years was 79.2% (AVR 80.0%; MVR 78.2%; DVR 81.4%), and from valve-related mortality 86.4% (AVR 88.3%; MVR 85.7%; DVR 84.3%) (Figure 1). Freedom from thromboembolic events was 39.1% (AVR 45.6%; MVR 35.6%; DVR 38.3%), from bleeding events, 93.5% (AVR 95.6%; MVR 93.6%), and from reoperation, 98% (AVR 99%; MVR 97%) (Figure 2). Significant risk factors for death were male gender, age >65 years, and atrial fibrillation. A significant risk factor for all valve-related events was atrial fibrillation.
We have concluded as follows:

- A reduction in both late mortality and the incidence of valve-related events can be achieved with mechanical bileaflet valve replacement over 30 years.
- Pannus formation in the aortic position and paravalvular leaks in the mitral position are major causes of long-term reoperation.
- Persistent atrial fibrillation is a significant risk factor for both mortality and morbidity in the long term.

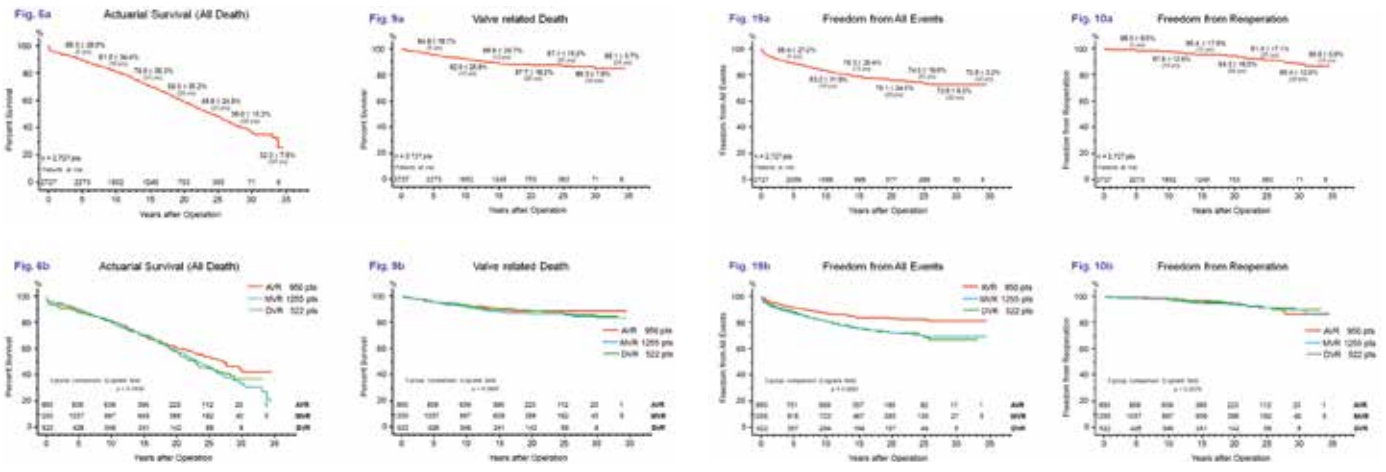


Figure 1.

Figure 2.

Research Training/General – Focus Session: How to statistically analyse your next research project

Seeing the wood for the trees: all you need to know on the art of meta-analysis

Ruben L Osnabrugge Rotterdam, The Netherlands

Systematic reviews and meta-analyses collect, evaluate and combine all evidence on a specific research question. They are believed to be the highest level of evidence, help physicians stay up to date and enable them to make informed clinical decisions.
It is therefore no surprise that this study design has become enormously popular. As there can be more than one meta-analysis on the same research question and the methodological quality of the meta-analyses may differ, interpreting meta-analyses correctly has become an essential skill for physicians.
In the cardiovascular field, the number of meta-analyses has increased almost 1800% between 1993 and 2012 (Figure 1).[1] During the same time period, the number of randomised controlled trials (RCTs) increased by only 140%. This trend indicates the relative growth of published meta-analyses compared with other published research. It was observed both in the cardiovascular field (Figure 1A) and all other medical specialties (Figure 1B).
This increasing popularity led to duplicate meta-analyses on the same topic. In 2010, 67% of all meta-analyses had at least one overlapping meta-analysis that did not represent an update, and no less than 5% of topics were investigated by eight or more meta-analyses.[2] Although replication of research can be a way of validating findings, it can also be a waste of time and effort and add to confusion.
Results of meta-analyses can differ because different search criteria may have been used, but there are more subtle methodological causes of differences, including heterogeneity and publication bias. These and other important aspects for the interpretation of meta-analyses will be discussed by Ruben Osnabrugge during today's statistics session in Room F003 at 4 pm.

References

1. Osnabrugge RL, Capodanno D, Cummins P, et al. Review and recommendations on the current practice of meta-analyses: a guide to appraise the evidence. *Eurointervention* 2014;9:1013–1020.
2. Siontis KC, Hernandez-Boussard T, Ioannidis JP. Overlapping meta-analyses on the same topic: survey of published studies. *BMJ* 2013;347:f4501.

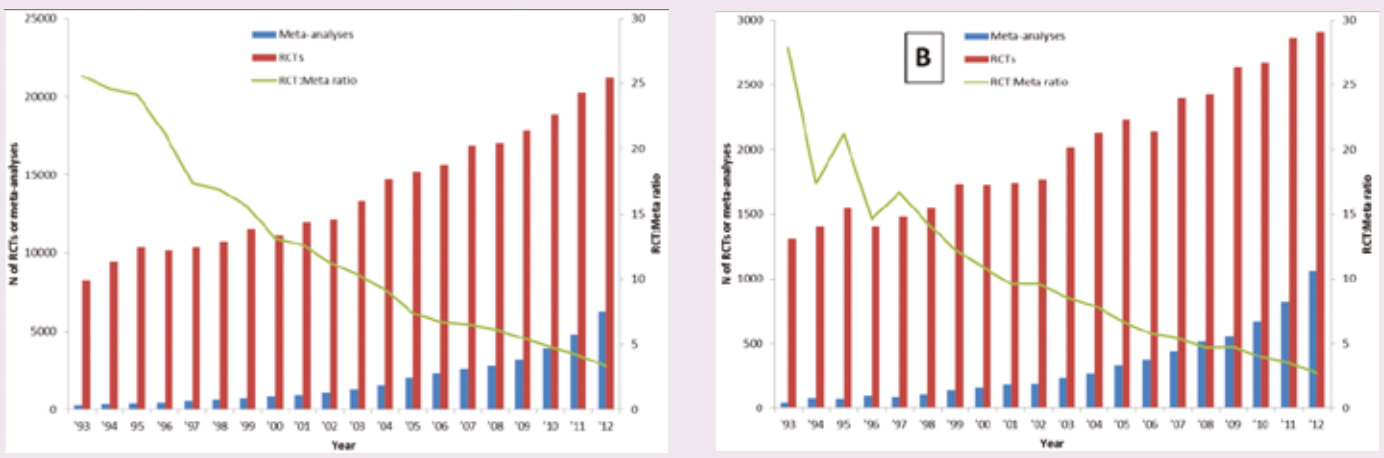
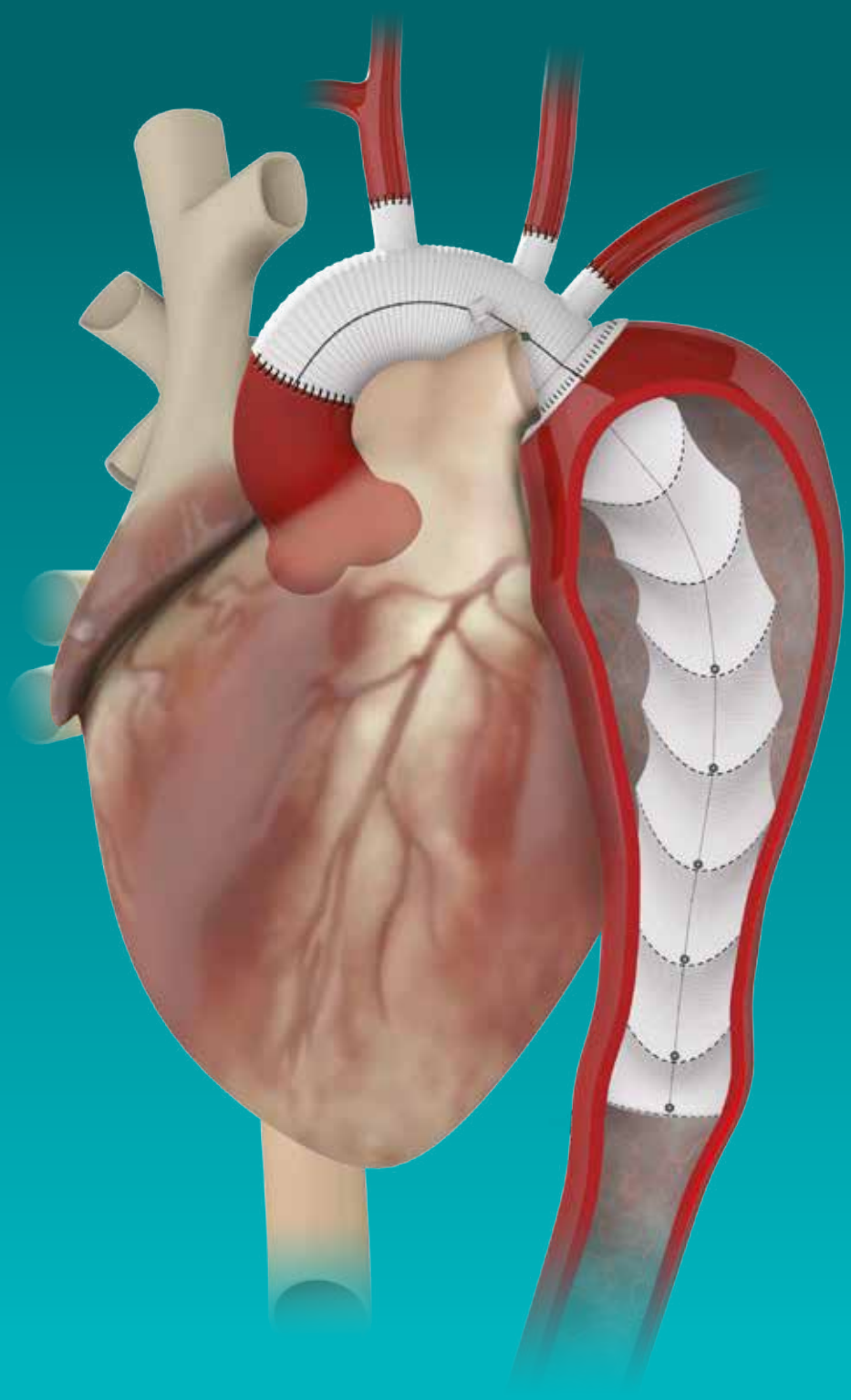


Figure 1. Number of annually published meta-analyses and RCTs in (A) the cardiovascular field and (B) all disciplines.

The red and blue bars represent the annually published RCTs and meta-analyses, respectively. The green line represents the number of published meta-analyses compared with the number of published RCTs in each year. It is an indication of the relative growth of meta-analyses as compared with the overall growth of published research in the cardiovascular field.

Data is based on the following PubMed searches: A: (randomi* OR meta-analysis [ptyp]). B: (randomi* OR meta-analysis [ptyp]) ("Cardiovascular Diseases"[Mesh]).N: number; RCT: randomised controlled trial.



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References:

1. Clinical Investigational Report
2. Design history file 036.
3. Shrestha M, Pichlmaier M, Martens A, Hagl C, Khaladj N & Haverich A. Total Aortic Arch Replacement with a Novel 4-Branched Frozen Elephant Trunk Graft : First-in-Man Results. European Journal of Cardiothoracic Surgery 2013.
4. Shrestha M *et al*. Innovative Product Designs & Emerging Implantation Techniques: First-in-Man Results with a Novel 4-Branched Elephant Trunk Graft for Total Aortic Arch Replacement. Symposium October 2011.

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Cardiac – Abstract: The two faces of arterial revascularisation

Efficacy of multiple arterial coronary bypass grafts for diabetic patients

Atsushi Yamaguchi Jichi Medical University, Saitama, Japan

Use of the left internal mammary artery (LIMA) in patients with diabetes and multi-vessel coronary artery disease improves survival after coronary artery bypass graft (CABG) surgery; however, the survival benefit of multiple arterial grafts in diabetic patients is debated. In this retrospective study, efficacy of multiple arterial grafts on early and late outcomes following CABG in diabetic patients was evaluated.

A consecutive series of 2618 patients underwent isolated CABG between 1990 and 2014. In the first series, perioperative characteristics, in-hospital outcome, and long-term outcomes (survival, major cardiac and cerebrovascular events (MACCE), cardiac death) were compared between diabetic (n=1110) and non-diabetic patients (n=1508). In the second series, the long-term outcomes (survival, MACCE) were analysed between the patients receiving CABG with single arterial graft (SAG) and multiple arterial grafts (MAG) with full unmatched patient population analysis and with propensity-matched patient analysis.

In the first series, female sex, obesity, hypertension, dyslipidaemia, peripheral artery disease, chronic kidney disease, ejection fraction <40%, triple vessels disease were more prevalent in the diabetic group. LIMA was used in more than 94% of patients in both groups. Use of multiple arterial grafts was comparable (40.3% in the diabetic group versus 43.6% in the non-diabetic group; p=0.09). In-hospital outcomes were similar for the diabetic and non-diabetic group (in-hospital mortality 2.2% versus 1.5%; deep sternal wound infection 1.8% versus 1.1%; and stroke 0.8% versus 0.6%; p=NS, respectively). Though survival and MACCE free rate at 15 years was decreased in the diabetic group (survival 48.6% versus 55.1%, p=0.019; MACCE free rate 40.8% versus 46.1%, p=0.02), cardiac death free rate at 15-years was similar (88.0% versus 89.3%, p=0.34).

In the second series, full unmatched patient population analysis showed the SAG had a decreased 12-year survival in both the diabetic (56.8% versus 64.9%, p<0.01) and non-diabetic groups (60.5% versus 71.9%, p<0.01) compared with the MAG (Figure 1). Similarly the MAG showed an improved MACCE-free rate both in the diabetic and non-diabetic group.

Next, we established propensity-matched 431 diabetic pairs and 644 non-diabetic pairs who received CABG with either SAG or MAG. The SAG showed a decreased 12-year survival in both the diabetic (58.1% versus 64.9%, p=0.039) and non-diabetic groups (63.3% versus 71.9%, p<0.01) (Figure 2) compared with the MAG. Propensity-matched patient analysis also showed efficacy for the MAG on MACCE-free rate in both the diabetic and non-diabetic groups.

In conclusion, diabetic patients had many more preoperative comorbidities compared with non-diabetic patients. However, this was not associated with in-hospital outcomes. Overall survival and MACCE-free rate were lower in diabetic patients. However, cardiac death free ratio was comparable. Multiple arterial grafts could demonstrate beneficial effects on the long-term outcomes following CABG in both diabetic and non-diabetic patient populations.

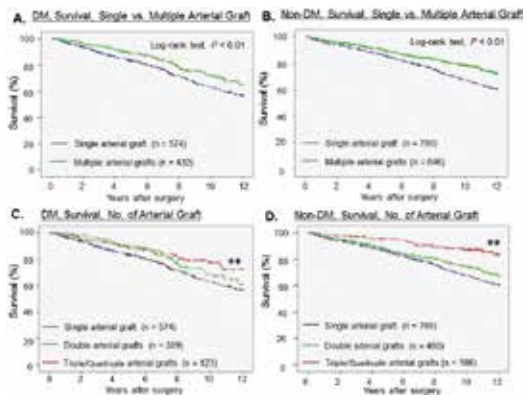

Figure 1. Non-risk adjusted Kaplan–Meier survival analysis in diabetic and non-diabetic patients according to arterial graft status. Comparisons by single versus multiple arterial grafts. A: Diabetic patients, B: Non-diabetic patients. Comparisons by numbers of arterial graft. C: Diabetic patients, D: Non-diabetic patients. DM: diabetes mellitus. ** p<0.01 (by log-rank test) versus single arterial graft group.

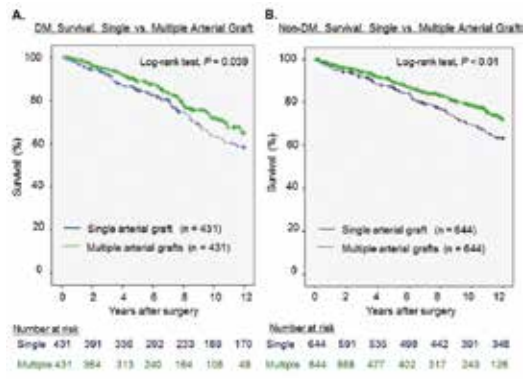

Figure 2. Kaplan–Meier survival analysis in diabetic and non-diabetic patients for 1:1 propensity-matched single or multiple arterial grafts group. DM: diabetes mellitus.

Thoracic – Abstract: Thoracic oncology II: perioperative management

Marginal pulmonary function for lung cancer surgery is associated with poor short-term and long-term outcomes

Naoki Ozeki, Koji Kawaguchi, Toshiki Okasaka, Takayuki Fukui, Koichi Fukumoto, Shota Nakamura, Kohei Yokoi
Department of Thoracic Surgery, Nagoya University Graduate School of Medicine, Nagoya, Japan

Current evidence suggests that a predicted postoperative (PPO) forced expiratory volume in the first second (FEV1) of <30% and/or a PPO-diffusing capacity of the lung for carbon monoxide (DLCO) of <30% are high-risk factors for lung cancer surgery. On the other hand, the long-term prognostic significance of PPO-pulmonary function values is not well known. We hypothesised that 'marginal-risk' patients with a PPO-FEV_1 of 30–60% and/or a PPO-DLCO of 30–60% define a subgroup not only with poor short-term postoperative outcomes but also poor long-term postoperative outcomes.

Between April 2008 and December 2012, 78 'marginal-risk' and 355 'normal-risk' (PPO-FEV_1 of ≥60% and PPO-DLCO of ≥60%) patients who underwent surgery for suspected clinical stage I lung cancer were enrolled in this retrospective study. Postoperative morbidity and prolonged hospital stay (>14 days) were assessed using multivariate logistic regression analysis. Overall survival (OS) was assessed using the multivariate Cox regression analysis in 412 patients with pathological lung cancer diagnosis. The variables included in the analyses, stratified the group by PPO-values, age, sex, smoking status, nodule size (or pathological stage in the OS analysis), surgical procedure, surgical approach, and lymph node dissection.

Patient characteristics were as follows: mean age was 68.6 years; 285 patients were male; 294 had a history of smoking; the mean nodule size was 2.5 cm; 343 patients underwent lobectomy; 343 tumours were classified as pathological stage 0 and I, 69 tumours were pathological stage II and III, and 21 tumours were non-lung cancer. Postoperative morbidity occurred in 37 (47%) 'marginal-risk' patients and 70 (20%) 'normal-risk' patients, and prolonged hospital stay occurred in 19 (24%) 'marginal-risk' patients and 20 (6%) 'normal-risk' patients. The median follow-up period was 38 months. The five-year survival rate was 63% in the 'marginal-risk' patients and 87% in the 'normal-risk' patients. The 'marginal-risk' was a significant factor predicting both the postoperative morbidity (OR 2.97, 95% CI 1.74–5.08, p<0.001) and the prolonged hospital stay (OR 4.55, 95% CI 2.2–9.38, p<0.001). Furthermore, the 'marginal-risk' had prognostic value for OS (HR 1.97, 95% CI 1.04–3.62, p=0.038).

The results indicate two points regarding the management of the patients with a suspected lung nodule. First, the two published studies reporting prognostic significance of the PPO-values for OS don't include patients who underwent sublobar resection.[1,2] In our study, although the selection criteria for sublobar resection were highly dependent on the decisions of individual surgeons, not lobectomy or sublobar resection but 'marginal risk' was an independent prognostic factor for OS. Second, for 'marginal-risk' patients with an unverified suspected nodule, it is preferable that a definitive, non-surgical, diagnosis be obtained before surgery due to the worse short-term outcomes.

In conclusion, stratifying 'marginal-risk' patients by PPO-values defines a subgroup with poor short-and long-term outcomes after surgery for suspected clinical stage I lung cancer. When considering lobectomy or sublobar resection, surgeons should take into account not only morbidity and local control of cancer, but also long-term mortality and quality of life.

References

1. Ferguson MK, Watson S, Johnson E, Vigneswaran WT. Predicted postoperative lung function is associated with all-cause long-term mortality after major lung resection for cancer, *Eur J Cardiothorac Surg* 2014; 45:660–664.
2. Berry et al. ATS 2015.

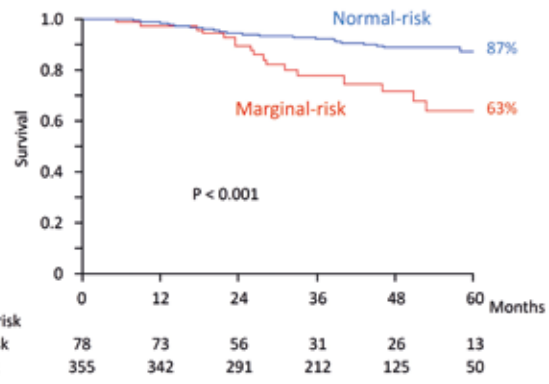

Figure 1.

Congenital – Rapid Response: Congenital rapid response

A staged decompression of right ventricle allows growth of right ventricle and subsequent biventricular repair in patients with pulmonary atresia and intact ventricular septum

Yasuhiro Kotani, Shingo Kasahara, Yasuhiro Fujii, Takahiro Eitoku, Kenji Baba, Shin-ichi Otsuki, Sadahiko Arai, Shunji Sano
Okayama University Hospital, Okayama, Japan

What is a predictor for achieving biventricular repair (BVR) in pulmonary atresia/intact ventricular septum (PA/IVS)? What strategy would make BVR possible? To answer these questions, a retrospective study was performed in patients with PA/IVS who were treated at Okayama University, Japan.

Our choice of the first palliation for patients with PA/IVS includes a modified Blalock–Taussig shunt (BTS) with pulmonary valvotomy. Inter-stage percutaneous balloon pulmonary valvuloplasty is then followed to achieve staged decompression of right ventricle (RV). RV overhaul (muscle resection) with or without RV outflow tract reconstruction is proposed as a definitive repair.

Fifty patients with PA/IVS who underwent a staged surgical approach from 1991 to 2012 were retrospectively reviewed. RV-coronary fistulas were seen in 42% of patients at the time of birth. All 50 patients had a modified BTS with pulmonary valvotomy. Six patients died after first palliation or inter-stage. Thirty patients achieved a biventricular repair (BVR group), six patients had a 1+1/2 ventricular repair (1+1/2V group) and five patients had Fontan completion (Fontan group). After modified BTS with pulmonary valvotomy, normalised tricuspid valve diameter did not increase in any of the groups (BVR: pre, 80% versus post, 83%; 1+1/2V: pre, 63% versus post, 51%; Fontan: pre, 57% versus post, 49%). Normalised right ventricular end-diastolic volume increased only in the BVR group after modified BTS with pulmonary valvotomy (BVR: pre, 32% versus post, 64%; 1+1/2V: pre, 43% versus post, 42%; Fontan: pre, 29% versus post, 32%). Major coronary artery fistula was a strong factor with proceeding single-ventricle palliation (BVR: 4/30 (13%) patients; 1+1/2V: 1/6 (17%); and Fontan: 4/5 (80%)).

To conclude, tricuspid valve growth was not obtained by modified BTS with pulmonary valvotomy; therefore, tricuspid valve size at birth appears to be a predictor for achieving BVR. Proportionate RV growth was seen only in the patients that achieved BVR. However, RV growth was not seen in patients having 1+1/2 ventricular repair. Major coronary artery fistula was a strong predictor for proceeding single-ventricle palliation.

EACTS
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2015 COURSES

Congenital heart disease	27–30 October
Mitral valve surgery	9–11 November (Barcelona, Spain)
Surgical treatment of lung failure	16–18 November
Surgical treatment of heart failure	18–20 November
Endoscopic port-access mitral valve repair drylab training using high-fidelity simulators	19–20 November (Maastricht, The Netherlands)
Hospital leadership: the human factor	23–24 November
Chest wall diseases	2–4 December
Advanced course on anatomic correction of ccTGA	3–4 December (Sankt Augustin, Germany)
Thoracic surgery part II	8–11 December
Endoscopic port-access mitral valve repair drylab training using high-fidelity simulators	17–18 December (Maastricht, The Netherlands)

All courses to take place at EACTS House in Windsor, UK, unless stated otherwise.

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Research Training/General – Focus Session: All you need to know for your next research project

Moving up the ladder: performing a peer-review

Marko Turina University Hospital, Haldenbach, Zurich, Switzerland

Peer review is usually described as an assessment of scientific material by a group of experts in the field. There are some **basic rules** about peer reviewing in medicine:

- When assessing a manuscript, a peer review should never be a simple yes/no decision.
- Reviewers should bear in mind that author(s) have performed a major effort when preparing their manuscript, which deserves a careful assessment of the material, and should not be only a flippant rejection or acceptance.
- Thoughtful review by a group of experts can often improve a manuscript, although such a review might also detect some basic methodological errors.
- Peer review has an important social role: it might also prevent the dissemination of erroneous scientific conclusions.

An invitation to perform a scientific review for a journal is not only an honourable acknowledgement of the invitee's scientific standing; it also holds **many advantages** for the reviewer. It represents a substantial educational gain for the reviewer: after some experience with reviewing, and being able to read other reviewers' comments, the reviewer's future publications will undoubtedly improve. One should remember that journal and abstract reviewing is the path to prestigious appointments! In EACTS, as in many other major organisations, potential officers and councillors are usually first tested by their reviewing competence.

What is considered a **good peer review**? It should be constructive and not destructive. It points out weaknesses, identifies statistical and/or mathematical errors, suggests improvements, assesses a manuscript's relevance for the journal's readership, and checks originality.

Detection of plagiarism remains one of the most challenging tasks for the reviewer. Simple copy/paste plagiarism will be easily detected in an editorial office using web software (e.g. iThenticate etc.). Flagrant cheating and fabrication of results, regretfully becoming more common today, is impossible to detect initially, but truth usually emerges later, leading to retraction, with the gravest consequences for the author in question.

There is another reviewer's task, a more delicate one: to detect '**salami publishing'** or '**Parma manuscripts**'. These are names given to the publishing of the same material in various formats in different journals. Authors use it to inflate their publication list; but it burdens journals with similar material and wastes valuable publishing space at a cost to other authors, whose work may not be published owing to editorial space constraints. It is not plagiarism in a narrow sense, but it is still unfair.

Duplicate (parallel) publications remain a problem. In 1999, a group of editors from leading cardiothoracic journals met during the EACTS meeting in Glasgow and designed a simple set of rules,[1] which are shown in Figure 1. All six conditions must exist to meet the definition of a 'duplicate' publication.

What is a **poor review**?

- Uses offensive language ("this is the most stupid way to repair a mitral valve", "authors try to make some sense out of their data graveyard" and similar)
- Empty: "Very good manuscript deserves to be published". Truly perfect?
- Unhelpful for the editor: "I suggest a local journal."
- "This manuscript will not be of interest to our readers."

Timing of a review? In most journals, a reviewer's assessment is expected in 1 week; for editorial board members and associated editors it is usually 2–3 days. There exists a hierarchy of peer reviewing: from journal reviewer to editorial board member, associate editor and finally to the stratospheric position of Editor-in-Chief, with each position entailing more work and stricter time schedules!

Reference

1. Cho BK, Turina MI, Karp RB, et al. Editorial. Joint statement on redundant (duplicate) publication by the editors of the undersigned cardiothoracic journals. *Ann Thorac Surg* 1999;68(1):1

For the purposes of this declaration, redundant publication is defined as follows:

I. The hypothesis is similar.
II. The numbers or sample sizes are similar.
III. The methodology is identical or nearly so.
IV. The results are similar.
V. At least 1 author is common to both reports.
VI. No or little new information is made available.

Figure 1.

Cardiac – Abstract: Aortic valve replacement: what is new?

Late gadolinium enhancement in cardiac magnetic resonance as a marker of morphological and functional deterioration in patients with severe aortic stenosis

R Sádaba, V Arrieta, V Alvarez-Asiain, M Ciriza, F Olaz, F Gomez, N Lopez-Andres Complejo Hospitalario de Navarra in Pamplona, Pamplona, Spain

Aortic stenosis (AS) generates left ventricular (LV) pressure overload. One of the physiological mechanisms in place to overcome this burden is to increase the LV muscle mass. This remodelling results in concentric LV hypertrophy, which can be recognised at a histopathological level as hypertrophy of existing myocytes rather than hyperplasia, and diffuse (reactive) fibrosis. As LV hypertrophy increases, it will ultimately decompensate. This is characterised by progressive impairment in LV performance and the development of symptoms. The pathologic change from ventricular adaptation to decompensation is driven primarily by two processes: myocyte death and focal (replacement) myocardial fibrosis (FMF). Late gadolinium enhancement (LGE) cardiac magnetic resonance (CMR) has been used to evaluate FMF in patients with AS. Two distinct patterns of FMF have been described: a mid-wall enhancement pattern with a clear correlation with the severity of concentric LV remodeling, and a localised subendocardial enhancement consistent with myocardial ischemia or infarction (with or without coronary artery disease). FMF is one of the histological hallmarks of end-stage heart failure and is associated with LV diastolic and systolic dysfunction and arrythmogenicity. Unsurprisingly, FMF has been suggested as a marker of advanced disease and worse prognosis following aortic valve replacement (AVR).

The aim of this study was to assess the presence, pattern and extension of FMF and to evaluate the correlation between FMF and morphological and functional variables of the LV in our cohort of 79 patients with severe AS referred for AVR. LGE images were obtained for the assessment of FMF. Both morphological and functional LV parameters were evaluated with CMR. Patients were grouped according to the presence or absence of FMF. Patients with FMF were further divided into those with mid-ventricular or subendocardial FMF. In order to evaluate an association with a marker of prognosis and risk stratification of cardiac failure, plasma BNP levels were measured in all patients.

As expected, patients with FMF had significantly higher LV end-diastolic and end-systolic diameters and volumes, higher LV mass, lower LV ejection fraction (LVEF) and higher plasma BNP levels than those without FMF. The extension of FMF showed a positive correlation with LV volumes and mass and a negative correlation with LVEF. Among patients with FMF, those with subendocardial fibrosis had significantly higher LV volumes, and lower LVEF. Those with predominant LV mid-ventricular fibrosis had significantly higher mass. Interestingly, FMF was demonstrated in all patients with LV dysfunction (LVEF<50%).

Our results confirm previous suggestions that FMF is associated with deterioration in LV dimensions and function in patients with symptomatic severe AS. Management and timing of surgery in asymptomatic patients with severe AS and preserved LVEF is still debatable. FMF assessment has been proposed as an additional test to distinguish those patients who would benefit from earlier surgery from those in whom this can be delayed. Our findings support CMR as an evaluation tool in patients with severe AS, particularly in the absence of symptoms and preserved LV function. The presence of FMF in these patients would indicate a closer monitoring of progress.

Cardiac – Abstract: Heart transplantation in the modern era

Surgical complications in *de novo* heart transplant patients on everolimus: the results of a randomised controlled trial (SCHEDULE trial)

Mitra Rashidi, and co-authors on behalf of the SCHEDULE investigators Oslo University Hospital, Oslo, Norway

The use of mammalian target of rapamycin (mTOR) inhibitors have been limited by adverse events (AE), including delayed wound healing. We recorded surgical complications in this substudy of The Scandinavian heart transplant (HTx) everolimus (EVE) *de novo* trial with early calcineurin (CNI) avoidance (SCHEDULE).

A total of 115 patients (mean age 51±13 years; 83% men) were randomised within 5 days post-HTx to low-dose EVE and reduced dose Cyclosporine (CyA) followed by CyA withdrawal weeks 7–11 post-HTx (EVE group; n=56) or standard CyA regimen (CyA group; n=59). The primary endpoint of superior renal function at 12 and 36 months in favour of the EVE group was met. Number of patients with surgical complications and total number of events during the first postoperative year were prospectively recorded according to the SCHEDULE study protocol, and re-assessed retrospectively by two independent reviewers. Events were divided between total, before and after 14 days post-HTx as complications within first 14 days were mostly related to the HTx procedure.

There were no significant differences between the groups with regards to total surgical complications before (p=0.44) or after day 14 post-HTx (p=0.16). However, after the first 14 postoperative days, the EVE group had a significantly higher number of wound complications (p=0.004). Age >54.5 years (median) was an overall risk factor for surgical wound complications regardless of treatment group (p=0.025). There was no difference in EVE versus CyA with regards to other surgical complications. Majority of events were in 1/3 of the patients.

In the SCHEDULE trial, EVE demonstrated superior results with regards to renal function, however, early introduction of EVE with CyA withdrawal is associated with significantly increased number of wound complications. Immunosuppressive medication should therefore be tailored depending on the events and clinical course of the patient post-HTx.

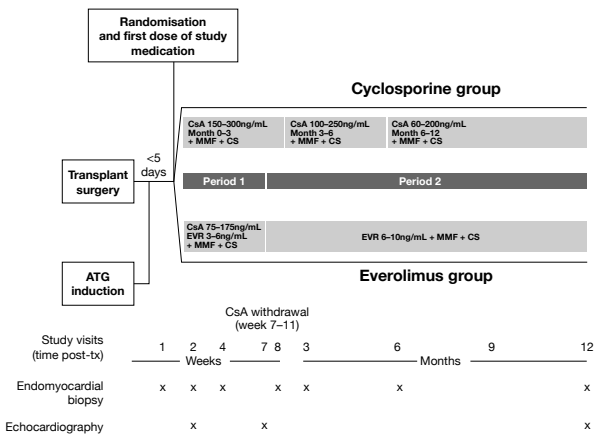

Figure 1. SCHEDULE study design.

In occasion of 29th EACTS Annual Meeting, **Sorin Group** has the pleasure of inviting you to attend the **Lunch Symposium**:

CURRENT CONTROVERSIES AND FUTURE PERSPECTIVES IN AORTIC AND MITRAL FIELD

Monday, October 5, 2015 – 12:45 - 2:00 pm

AMSTERDAM Rai Congress Centre – Emerald Room

Moderators: O. Dapunt, *Austria* - R.J.M. Klautz, *The Netherlands*
H.K. Najm, *Saudi Arabia* - V.H.Thourani, *USA*

- **Is Patient Selection Driving Clinical Outcome in AVR?**
  T.A. Folliguet, *France*

- **Latest Evidence on Sutureless Valves**
  B. Meuris, *Belgium*

- **What's New with Stented Valves?**
  T.J.M. Fischlein, *Germany*

- **Current Challenges and Latest Innovations in Mitral Valve Repair**
  H. Treede, *Germany*

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AT THE HEART OF MEDICAL TECHNOLOGY

Vascular – Professional Challenge: Uncertainties in the treatment of chronic dissection

Is frozen elephant trunk always indicated in type a chronic dissection?

Roberto Di Bartolomeo St Orsola-Malpighi Hospital, Bologna, Italy

The continuous improvement of the techniques for the treatment of patients with extensive disease of the thoracic aorta represents a formidable challenge for the cardiovascular surgeon. The beginning of thoracic aortic endovascular aortic arch repair has promoted the development of different hybrid approaches as the Frozen Elephant Trunk (FET) strategy, including classic arch replacement and antegrade stenting of the descending thoracic aorta.[1-7] It represents an interesting approach for patients with extensive disease of the thoracic aorta, and its application has significantly increased over recent years.

The FET technique was first performed at our Institution in 2007. Indications include diseases ranging from degenerative aneurysms of the aortic arch to type A or B acute or chronic aortic dissections. In the surgery of type A chronic dissection, the conventional approach considers initial open surgical replacement of the aortic arch using the classic elephant trunk technique, followed by open repair of the aneurysmal descending or thoraco-abdominal aorta.[8-9] However this approach remains associated with high mortality and morbidity, only 46% of patients undergoing the second-stage of the operation.

These shortcomings can be attenuated by the FET technique, which allows one stage replacement of the thoracic aorta.

The main advantage of FET in acute and chronic type A dissection is promoting the false lumen peri-stent thrombosis, with shrinkage of the aorta. However, its main problem remains paraplegia. This catastrophic complication ranges from 0–21.7% in the literature.[10-11] Potential pathogenic mechanisms for spinal cord injury after the FET procedure include circulatory arrest, coverage of the intercostal arteries, embolisation, and postoperative periods of hypotension. To avoid these complications, we employed moderate hypothermia, total brain perfusion with perfusion of the left subclavian artery, lower body perfusion to reduce the duration of circulatory arrest, cerebro-spinal liquor drainage, and maintenance of postoperative stable haemodynamics with a mean arterial pressure >80 mmHg.

Such operations are very complex and time demanding. Key points during surgery require an accurate assessment of the aortic anatomy, reliable methods of organ protection and surgical techniques and strategies. AngioCT scans must be carefully analysed, especially in aortic dissection to identify the true and false lumen, the re-entries sites and the origin of the epiaortic and visceral arteries. In chronic aneurysm it's also important to study the post-aneurysm aortic diameter to select the optimal diameter of the stent-graft. Antegrade selective cerebral perfusion remains fundamental for cerebral protection.

In type A chronic aortic dissection utilising FET technique it's possible to use the stent-graft as landing-zone for secondary endovascular extension in order to cover the re-entry tears at the distal descending thoracic aorta. In our experience its main indication is represented by type A chronic dissection with satisfactory short- and mid-term results. Longer-term studies are needed in order to show the survival benefits of the FET technique versus other techniques, new strategies for spinal cord injury reduction should be researched.

References

1. Shrestha M, Pichlmaier M, Martens A, et al. Total aortic arch replacement with a novel four-branched frozen elephant trunk graft: first-in-man results. *Eur J Cardiothorac Surg* 2013;43:406–10.
2. Hoffman A, Parker JA, Raweh A, et al. Restoration of the thoracic aorta in Type A dissection with hybrid prosthesis. *Asian Cardiovasc Thorac Ann* 2011;19:123–7.
3. Tsagakis K, Pacini D, Di Bartolomeo R, et al. Multicenter early experience with extended aortic repair in acute aortic dissection: is simultaneous descending stent grafting justified? *J Thorac Cardiovasc Surg* 2010;140:S116–20.
4. Di Bartolomeo R, Di Marco L, Armaro A, et al. Treatment of complex disease of the thoracic aorta: the frozen elephant trunk technique with the E-vita open prosthesis. *Eur J Cardiothorac Surg* 2009;35:671–5.
5. Sun L, Qi R, Zhu J, Liu Y, et al. Total arch replacement combined with stented elephant trunk implantation: a new 'standard' therapy for type a dissection involving repair of the aortic arch? *Circulation* 2011;123:971–8.
6. Pochettino A, Brinkman WT, Moeller P, et al. Antegrade thoracic stent grafting during repair of acute DeBakey I dissection prevents development of thoracoabdominal aortic aneurysms. *Ann Thorac Surg* 2009;88:482–9.
7. Roselli EE, Rafael A, Soltesz EG, et al. Simplified frozen elephant trunk repair for acute DeBakey type I dissection. *J Thorac Cardiovasc Surg* 2013;145:S197–201.
8. Borst HG, Walterbusch G, Schaps D. Extensive aortic replacement using 'elephant trunk' prosthesis. *Thorac Cardiovasc Surg* 1983;31:37–40.
9. Schepens MA, Dossche KM, Morshuis WJ, et al. The elephant trunk technique: operative results in 100 consecutive patients. *Eur J Cardiothorac Surg* 2002;21:276–81.
10. Hoffman A, Damberg AL, Schälte G, et al. Thoracic stent graft sizing for frozen elephant trunk repair in acute type A dissection. *J Thorac Cardiovasc Surg* 2013;145:964–9.
11. Leontyev S, Borger MA, Etz CD, et al. Experience with the conventional and frozen elephant trunk techniques: a single-centre study. *Eur J Cardiothorac Surg* 2013. 013 Dec;44(6):1076–82.

Meeting EACTS – National Societies

Date:
Tuesday 6 October 2015

Time:
16:15–17:15

Venue:
Room G108 –
Auditorium Building (1st floor)
RAI Congress Centre –
Amsterdam (The Netherlands)

Agenda:

1.	**Welcome and introduction** (M Grabenwöger)
2.	**EACTS QUIP** (D Pagano)
2.1.	**Database**
2.2.	**Benchmarking tool**
3.	**Training and education** (A Kappetein)
3.1.	**Courses**
3.2.	**Skills programme**
3.3.	**Portfolio**
4.	**Clinical guidelines**
5.	**Adjournment**

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Thoracic – Abstract: Thoracic oncology I: staging

Accuracy of sentinel node biopsy by ^{99m}Tc-phytate in patients with non-small cell lung carcinoma

R Bagheri*[1], S Shafiei[2], R Sadeghi[2], VR Dabbagh[2], R Afghani[1], A H Jafarian[3], D Attaran[4], R Basiri[4], SH Lari[4], AM Asnaashari[4]

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[2]Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Iran
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Lymph node metastasis is the most significant prognostic factor in localised non-small cell lung cancer (NSCLC). Identification of the first nodal drainage site (sentinel node) may improve detection of metastatic nodes. Moreover, extended surgeries such as lobectomy or pneumonectomy with lymph node dissection (hilar and mediastinal) are gaining greater acceptance for treatment of this malignancy. Sentinel node biopsy can be an alternative approach in this regard to perform surgeries less invasively. We evaluated the accuracy of sentinel node mapping in 21 patients with NSCLC using intra-operative radiotracer techniques.

In this prospective study, from September 2012 to March 2014, a total of 21 patients with biopsy-proven (trans-bronchial biopsy or trans-thoracic needle biopsy) NSCLC were selected for sentinel node mapping. All patients underwent thoraco-abdominal computed tomography (CT) scanning and mediastinoscopy, and none had evidence of lymph node involvement. Criteria for lymphadenopathy (N1) on thoracic CT scans were a well-defined lymph node larger than 1.0–1.5 cm or an ill-defined mass in a lymph node area. Patients with a history of neo-adjuvant treatment and concomitant co-morbid conditions were excluded. All patients underwent lobectomy or pneumonectomy via a right or left thoracotomy followed by mediastinal lymphadenectomy. The study was approved by an ethical committee, and all patients gave informed consent before recruitment to the study.

Immediately after thoracotomy, 1 mCi/0.4 mL Tc-99 m-phytate was injected around the tumour in four divided specimens (Figure 1). Blue dye was not injected due to black discolouration of the mediastinal lymph nodes in most patients, which can make it difficult to find dye-stained sentinal nodes. After mobilisation of the mass and related lobes of the lung, the sentinel nodes were sought in the hilar and mediastinal areas using a hand-held gamma probe (GPS Navigator, Tyco Healthcare, Tokyo, Japan). Any lymph node with an in vivo count twice the background count was considered to be a sentinel node; all identified sentinel nodes were removed and sent for frozen section evaluation. Hilar and mediastinal lymphadenectomy was performed subsequently for all patients. All dissected nodes were evaluated by step sectioning and haematoxylin and eosin staining (H&E).

In this prospective analysis, 21 patients (15 males and 6 females; average age of 58.52±11.46 years) with biopsy-proven NSCLC were selected for sentinel node mapping. One patient's pathology showed SCC after surgery, but samples from all 21 patients were analysed. At least one sentinel node could be identified in all patients except for one patient with adenocarcinoma of the RML (detection rate of 95.2%). The mean number of sentinel nodes per patient was 3.61±2 (median

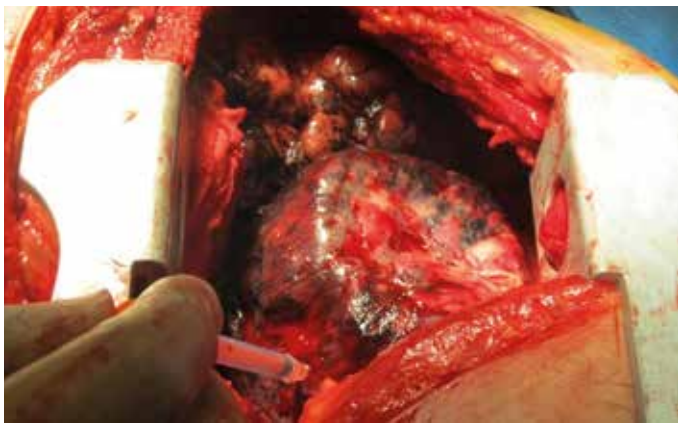

Figure 1. NSCLC after exposure of the lung and Injection of the tracer in the peri-tumoural area.

of 3 nodes per patient). The mean number of dissected nodes per patient was 5.71±2.9. Six patients had pathological lymph node involvement, and in all of them each sentinel node was pathologically positive (false-negative rate of 0%) and sentinel nodes were the only involved nodes among the dissected nodes. In one patient with adenocarcinoma of the right lung (middle lobe) no sentinel node was detected. Frozen section results showed 100% concordance with H&E results.

In conclusion, sentinel node mapping can be considered a feasible and accurate method for lymph node staging (detection rate of 95.2% and false negative rate of 0%) and NSCLC treatment.

Cardiac – Focus Session: Avoiding disasters in cardiac surgery

Holes in the heart: an approach to treating penetrating intracardiac injuries

Darshan Reddy
Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Due to the extraordinarily high rate of penetrating heart injuries in South Africa, our centre has significant experience in diagnosing and treating the various lesion patterns. The traditional surgical literature on this subject, consisting largely of case reports and case series, is dated, and so we undertook a review of management in the era of modern imaging and current surgical and catheter interventional techniques. During a 10-year period (between July 2003 and July 2013), we treated 17 patients with penetrating intracardiac injuries. The spectrum of pathology encountered included ventricular septal defects, valve apparatus lacerations, intracardiac fistulae, ventricular aneurysms and retained intracardiac missiles. Preoperative imaging, indications for intervention, the timing of surgery and the specific surgical techniques utilised will be presented, together with our institutional approach and results.
We demonstrate that using standard principles of intracardiac shunt repair, as well as contemporary valve repair techniques, favourable surgical outcomes may be reproduced. We suggest that percutaneous catheter device techniques may be useful in a highly select group.

Reference

1. Reddy D, Muckart DJ. Holes in the heart: an atlas of intracardiac injuries following penetrating trauma. *Interact Cardiovasc Thorac Surg* 2014;19(1):56–63.

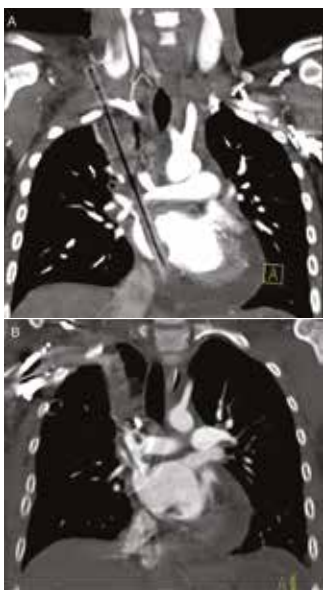

Figure 1.
(A) A coronal computed tomography angiography (CTA) image demonstrates an impaling wooden rod – transfixing the right pulmonary artery and the left atrium. (B) CTA made after extraction of the rod defines the presence of a fistula between the right pulmonary artery and left atrium.

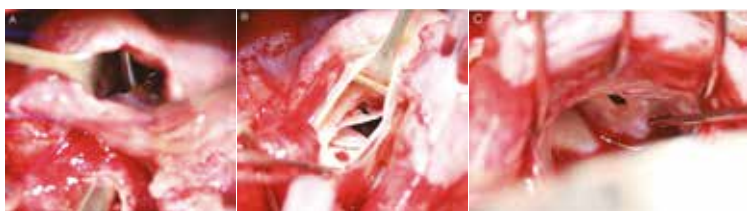

Figure 2.
This lesion pattern reflects the trajectory of a single anterolateral to posteromedial cardiac stab injury with perforation of (A) the outlet ventricular septum, (B) the right coronary leaflet of the aortic valve and (C) the anterior mitral leaflet. The assailant is right handed.

Cardiac – Abstract: The two faces of arterial revascularisation

Excellent results of arterial revascularisation with low wound complications or, having your cake and eating it too

Teresa M Kieser Cardiovascular Institute of Alberta, University of Calgary, Canada

Coronary artery bypass graft (CABG) surgery with bilateral internal mammary (BIMA) total arterial grafting little or no deep sternal wound infection (DSWI) is an ideal operation. Can it be done? Yes it can. Applying one basic principle can get there. What causes a serious infection in coronary artery bypass graft surgery? Infection occurs because of the transgression of several barriers to infection, either natural or man-made. For example a diabetic patient with chronic obstructive lung disease, whose skin preparation for surgery was a little 'skimpy', who had a long difficult operation and subsequently had to return to theatre for bleeding may well be one of those unfortunate patients who develop a DSWI. Conversely the addition of multiple layers of prevention such as performing the surgery off-pump, strictly controlling blood sugar, having the judgement to avoid doing the difficult graft that caused the long operation, consistently applied skin preparations and ensuring everything is 'dry' before chest closure might prevent such a patient from DSWI.
Three principal times in all aspects of surgery relate to the development of serious infections. The 'before' surgery time includes 'patient' factors; surgery time itself which includes 'surgery' factors; and the 'after' period, which includes 'patient-care' factors. Studies elucidating 'patient' factors or co-morbidities associated with the development of infection identify a patient population in which surgeons will avoid the use of BIMA grafting for fear of DSWI. The long list of these comorbidities might disqualify many patients from BIMA grafting but 'excusing' the surgeons does not help our patients. Patients with diabetes, a group in high need of arterial grafting because of the diffuse nature of their atherosclerotic disease, are one of the highest risk groups for serious infection.

Everyone knows arterial grafts are better than venous but one of the strongest deterrents to the use of BIMA grafts is the fear of DSWI. As surgeons, we try to control the 'surgery' factors such as skeletonisation of the internal mammary artery (IMA) with or without harmonic technology, one observer per case, using wound and sternum irrigation, vancomycin paste on sternal marrow, iodine-impregnated skin drapes, chlorhexidine-alcohol skin, preparation, more off-pump surgery and aseptic wound care.[1] And avoiding bone wax and BIMA grafts in obese diabetic women.
To perform utopic operations of BIMA total arterial grafting with no/minimal incidence of DSWI:

1. Learn to skeletonise the IMA. Two videos on the process are available from Teresa Kieser (t.kieserprieur@ucalgary.ca), one using the cautery tip as a dissector and one using the harmonic scalpel.
2. Do the simple things: switch to the skin preparation of chlorhexidine-alcohol, use vancomycin antibiotic paste on the sternal halves before closure and do not use bone wax. (Figure 1).[2,3]
3. Control blood sugar before during and after the operation.
4. Avoid using BIMA in only in just the obese female subgroup of diabetics.

Adopting these four strategies should halve your rate of DSWI.

References

1. Kieser TM, Rose MS, Aluthman U, et al. Toward zero: deep sternal wound infection after 1001 consecutive coronary artery bypass procedures using arterial grafts: implications for diabetic patients. *J Thorac Cardiovasc Surg* 2014;148:1887–95.
2. Feraz de Arruda MV, Braile DM et al. The use of the vancomycin paste for sternal hemostasis and mediastinitis prophylaxis. *Rev Bras Cir Cardiovasc* 2008;23(1):35–39.
3. Desmond J, Lovering A, Harle C, et al. Topical vancomycin applied on closure of the sternotomy wound does not prevent high levels of systemic vancomycin. *Eur J Cardiothorac Surg* 2003;23:765–770.

Figure 1. Vancomycin paste is prepared from 2 g of vancomycin powder in 2 mL saline and applied to irrigated sternal halves **just before** approximation *after* sternal wires are in place to avoid liquification.

Research Training/General – Focus Session: How to statistically analyse your next research project

How to achieve comparable patient groups in absence of randomised controlled trials?

Mostafa Mokhles Erasmus University Medical Center, Rotterdam, the Netherlands

Although randomised controlled trials (RCTs) are considered to be the 'gold standard' and provide the strongest evidence for the efficacy of preventive and therapeutic procedures in the clinical setting,[1] it is not always possible or feasible to perform an RCT because of medical or ethical reasons. In these instances, observational studies can offer a solution. However, in contrast to RCTs, investigators have no control over the treatment assignment in observational studies and treatment groups may significantly differ with respect to characteristics related to outcome. For decades, risk factor adjustment (e.g. multivariate analyses) has been considered sufficient for identification of differences in patient outcome adjusted for patient characteristics. It has been shown, however, that these differences in outcome often need to be considered as associations and not as causes since risk factor adjustment does not guarantee correct identification of cause and effect relationship.[2]

Propensity score analyses can offer an elegant solution for achievement of comparable patient groups. The propensity score technique was introduced by Rosenbaum and Rubin in the early 1980s and offers a way to achieve more comparable groups in observational studies.[3–5] The calculated propensity score for each individual reflects that person's probability to receive a certain treatment conditional on observed baseline characteristics. The propensity score is, therefore, a balancing score which means that conditional on the propensity score, the distribution of measured baseline variables is similar between the treatment and control group. In contrast to RCTs, investigators have no control over the treatment assignment in observational studies. Propensity score can, therefore, be used to reduce the potential bias in estimated effects obtained from observational studies. The additional advantage of calculating the propensity scores for the different group of patients is that it can elegantly illustrate the strict selection of patients for a particular procedure. Most widely used propensity-score methods are covariate adjustment using the propensity score, propensity score matching and stratification of the study population based on the propensity score.[6,7]

Although the propensity score method offers an elegant solution for reducing bias in observational studies, the main limitation of this method is that the propensity score can only make a balance based on registered or measured baseline characteristics between treated and untreated subjects. Hence, it is theoretically possible that there are important unregistered or unmeasured characteristics for which the matched groups are not balanced. These unmeasured baseline characteristics and subsequently unbalanced propensity score can result in biased estimation of the true treatment effect and, therefore, wrong conclusions. Despite these limitations, when applied correctly, the propensity score method offers a powerful tool in case an RCT can't be performed while major differences exist in patient characteristics between the treatment groups in an observational study.

References

1. Collins R, MacMahon S. Reliable assessment of the effects of treatment on mortality and major morbidity, I: clinical trials. *Lancet* 2001;357:373–80.
2. Drake C, Fisher L. Prognostic models and the propensity score. *Int J Epidemiol* 1995;24:183–7.
3. Rosenbaum PR, Rubin DB. The central role of propensity score in observational studies for causal effects. *Biometrika* 1983;70:41–55.
4. Rubin DB. Using propensity score to help design observational studies: application to the tobacco litigation. *Health Services and Outcomes Research Methodology* 2001;2:169–88.
5. Blackstone EH. Comparing apples and oranges. *J Thorac Cardiovasc Surg* 2002;123:8–15.
6. Austin PC. A critical appraisal of propensity-score matching in the medical literature between 1996 and 2003. *Stat Med* 2008;27:2037–49.
7. Mokhles MM, Kortke H, Stierle U, et al. Survival comparison of the Ross procedure and mechanical valve replacement with optimal self-management anticoagulation therapy: propensity-matched cohort study. *Circulation* 2011;123:31–8.

Congenital – Abstract: Fontan circulation

Clinical outcome following total cavopulmonary connection: a 20-year single-center experience

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Since its first description by Fontan and Baudet, surgery for functional single ventricles has evolved for decades. Currently the preferred treatment is the total cavopulmonary connection (TCPC). This study aimed to evaluate the clinical outcomes of contemporary TCPC and identified factors affecting early and late outcome.

Between May 1994 and March 2015, 434 patients underwent TCPC at the German Heart Center Munich. The mean age at TCPC was 4.0±4.4 years, and the mean weight at TCPC was 15.7±10.5 kg. Prior partial cavopulmonary connection was performed in 360 patients (88.7%). Lateral tunnel (LT)-TCPC was performed on 50 patients between 1994 and 2002, and extra-cardiac conduit (EC)-TCPC was performed on the remaining 384 patients, since 1999.

The 30-day survival was 97.9% (94.0% in LT; 98.4% in EC, p=0.04), and the estimated survival rate at 15 years was 92.3% (89.4% in LT and 95.5% in EC, p=0.14). The mean follow-up period was 6.6±5.4 years in all patients (14.2±5.3 years in LT and 5.6±4.5 years in EC, p<0.01). Late-onset tachyarrhythmia was documented in 13 patients, including atrial flutter in six patients, supraventricular tachycardia in six patients, and junctional ectopic tachycardia in 1 patient. Freedom from tachyarrhythmia at 15 years was 91.0% (89.5% in LT and 91.8% in EC, p=0.61). Other late morbidities included bradyarrhythmia in 17 patients, protein losing enteropathy in 15 patients, thromboembolism in three patients, and plastic bronchitis in three patients. At the last follow-up, normal systemic ventricular function (ejection fraction >50%) was observed in 88.2% of patients, and atrioventricular valve regurgitation was, at worst, mild in 90.4% of single mitral valve patients, 63.3% of single tricuspid valve patients, and 57.9% of common atrioventricular valve patients. Cardiopulmonary exercise capacity test was performed in 120 patients at the mean of 9.0±2.3 years postoperatively. The peak VO2 was 29.3±8.4 mL/kg/min and it was 70.7% of age- and sex-related value. The predicted peak VO2 value was significantly better in EC patients than LT patients (60% versus 75%, p<0.01). A significant increase of gamma-glutamyl transferase value was observed at 10 and 15 years follow-up (74.5 versus 98.3 U/L, p<0.01). In the multivariate analysis for risk factors, pre TCPC trans-pulmonary gradient was a predictor for delayed hospital recovery (0.002), late mortality (0.029), and reoperation (0.013). Heterotaxy was a risk for late mortality (0.013), and dextrocardia for tachyarrhythmia (0.046). Late mortality, reoperation, and re-intervention were strongly correlated with delayed hospital recovery (hospital stay more than 20 days).

In conclusion, contemporary TCPC can be performed with extremely low risks and provides excellent survival in the long-term. Classic morbidities such as Fontan pathway revision, tachyarrhythmia, and thromboembolism were remarkably mitigated. However, Fontan specific complications including exercise intolerance, protein losing enteropathy, and liver dysfunction remain, and must be progressive. The progressive atrioventricular valve regurgitation, especially with tricuspid type atrioventricular valve, should be taken care in the long-term. Careful management during the long-term follow-up is essential.

Cardiac – Abstract: Challenges in surgical aortic valve replacement

Global longitudinal strain for prediction of left ventricular mass regression and clinical outcomes in patients with aortic prosthesis–patient mismatch

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Aortic prosthesis–patient mismatch (PPM) may be associated with less regression of left ventricular hypertrophy, leading to an increased risk of major adverse cardiac events. In a single-centre study at West China Hospital, we investigated the predictive value of preoperative global longitudinal strain (GLS) for left ventricular mass regression and its association with adverse outcomes in patients with aortic PPM.

From January 2007 to June 2013, a total of 316 patients with a preserved ejection fraction undergoing isolated mechanical prosthesis implantation for aortic stenosis were screened, and data from 91 patients with aortic PPM (effective orifice area index <0.85 cm^2/m^2 at the first postoperative outpatient visit, 21.6±4.2 days after surgery) and 165 non-PPM patients, were prospectively collected and retrospectively analysed. All 256 patients underwent measurement of preoperative GLS by two-dimensional speckle tracking echocardiography and were followed up for postoperative outcomes.

During follow-up (median 48.6±10.9 months), left ventricular mass index (LVMi) in PPM patients decreased from 139.6±20.8 g/m^2 to 119.6±26.5 g/m^2 (p<0.001). These PPM patients were divided into two subgroups (left ventricular mass regression [LVMR] group and non-LVMR group) according to the median value of the reduction rate of LVMi at final follow-up, and preoperative GLS markedly decreased in PPM patients with non-LVMR (p<0.001). Multivariate analysis identified preoperative GLS >-17.9% (OR 22.22; 95% CI 6.89–79.53; p<0.001) and LVMi >138.5 g/m^2 (OR 6.55; 95% CI 1.83–22.89; p=0.003) were independent predictors of non-LVMR. Except for the major adverse valve-related events (p=0.03), perioperative outcomes and all-cause mortality (p=0.09) at 4 years' follow-up between the two PPM subgroups were not significantly different. Similarly, no significant difference was observed between PPM patients and patients without PPM. However, outcome data in PPM patients with non-LVMR were worse than those in non-PPM patients (Figure 1).

In patients presenting with aortic PPM shortly after surgery, reduced preoperative GLS provides important information beyond standard risk factors for predicting the lack of regression in left ventricular hypertrophy. Reduced LVMR were associated with an increased risk of adverse events in PPM patients. Future large studies are warranted to investigate the prognostic value of left ventricular GLS with regard to long-term outcomes in PPM patients.

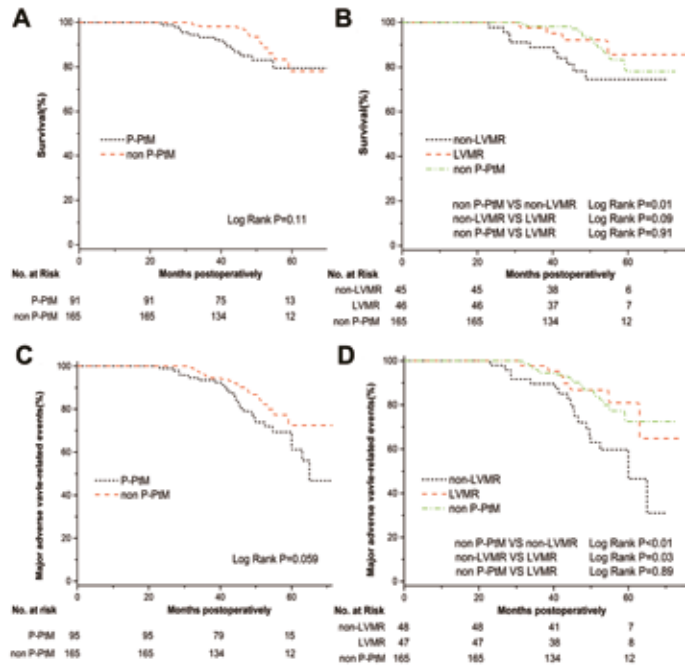
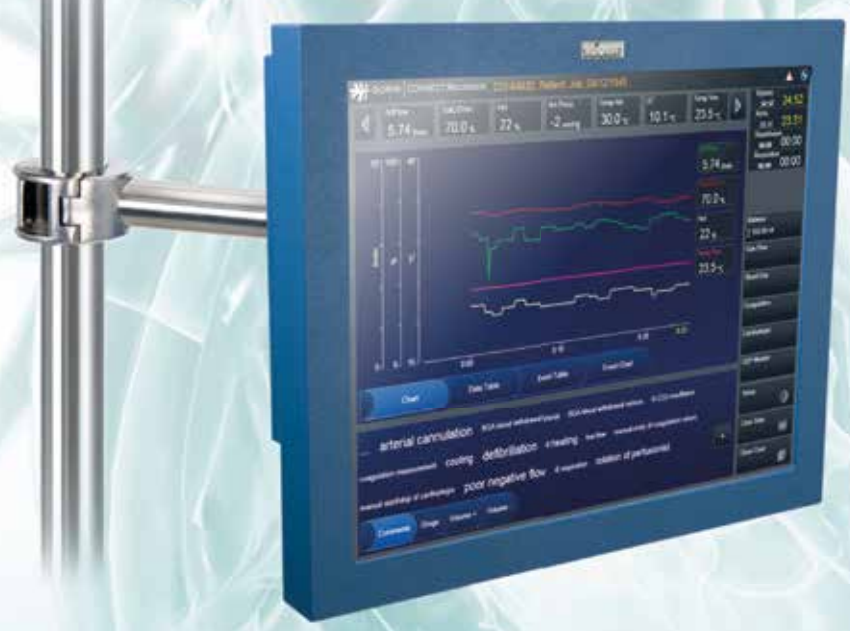


Figure 1. Impact of PPM and LVMR on survival and major adverse valve-related events.

ENABLING GOAL-DIRECTED PERFUSION

Enables **Goal-Directed Perfusion**, helping reduce AKI, shorten ICU and length of stay [1]



Unique monitoring of **DO_2/VCO_2** to adapt perfusion to the patients' individual metabolic needs

Monitoring, trending and recording of advanced parameters such as DO_2, VO_2, VCO_2, O_2ER, for **Goal-Directed Perfusion**

EQUIPPED TO PERFORM

SORIN | GDP™ MONITOR

Minimizing the invasiveness of cardiac surgery.

GDP Monitor is an optional module of Sorin Connect™ and part of the integrated **HeartLink™ System**. It allows to adapt perfusion to patients' individual needs by monitoring advanced patient parameters such as DO_2 and DO_2/VCO_2, therefore enabling Goal-Directed Perfusion.

1- De Somer F, *et al.* Crit Care. 2011;15(4): R192

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IM-00490 A

Sorin GDP™ monitor: the intuitive monitoring of goal-directed perfusion parameters

In cardiac surgery, improved patient outcomes are clinicians' main goal. These outcomes are influenced by several factors, including surgical approach, anesthesia and perfusion management, which all play a significant role.

Having specific solutions and strategies in place helps clinicians ensure that cardiopulmonary bypass (CPB) is as effective and controlled as possible. One of these strategies is to establish Goal-Directed Perfusion guidelines that guarantee oxygen delivery to the patient remains above critical threshold levels.

In the literature, maintaining oxygen delivery above critical values has been associated with a reduction of post-operative Acute Kidney Injury (AKI) occurrence and with a shortening of hospital and ICU length of stay (LOS).[1]

Recently released guidelines from The American Society of Extracorporeal Technology (ASET) include oxygen delivery as one of the most important considerations when setting pump flow rates.[2] Continuously monitoring the value of oxygen delivery and adjusting pump flow or hematocrit is the easiest and a more effective way to ensure that the oxygen delivery goal is reached.

New, innovative solutions, when used in conjunction with ASET guidelines, may further expand the patient population that will benefit from optimized oxygen delivery, increasing adoption rates and contributing to improved outcomes. One of these new technologies is the Sorin GDP™ Monitor, a new, optional module of the Sorin CONNECT™ electronic perfusion data management system.

The innovative Sorin GDP™ Monitor enables intuitive monitoring and recording of Goal-Directed Perfusion parameters. Continuous, real-time data recording and trends visualization of oxygen delivery and several other critical patient metabolic parameters are monitored, including oxygen consumption and carbon dioxide production. The detailed documentation and management of these parameters helps match the adequacy of perfusion to a patient's metabolic needs during CPB.

According to Goal-Directed Perfusion principles, the perfusionist has two options for maintaining adequate oxygen levels: managing arterial flow or hematocrit values. More specifically, this involves either increasing the pump flow to compensate for a low hematocrit or limiting hemodilution to raise the hematocrit.

The Sorin INSPIRE™ oxygenation system, which minimizes hemodilution, also helps implement Goal-Directed Perfusion by allowing the perfusionist to maintain a higher hematocrit during CPB to keep the patient above critical oxygen delivery thresholds.

In a recent study published by Ranucci M., et al., routine use of Goal-Directed Perfusion led to a significant reduction of AKI incidence, which was further reduced by the adoption of new "ultra-low priming volume oxygenators" such as the INSPIRE 6.2. In a second study, the same research group concluded: "The INSPIRE 6 oxygenator allows a significant containment of hemodilution during CPB, reducing the risk of RBC transfusions and postoperative AKI."[3]

The Sorin GDP™ Monitor, Sorin CONNECT™ data management system and Sorin INSPIRETM adult oxygenator are all key elements of the HeartLink™ System, the first automatically integrated perfusion management system designed for improved outcomes, increased clinical efficacy and Goal-Directed Perfusion.

Find out more at Sorin booth #3.15.

REFERENCES

1. De Somer F,Mulholland JW, Bryan MR, Aloisio T, Van Nooten GJ, Ranucci M. O2 Delivery and CO2 Production During Cardiopulmonary Bypass as Determinants of Acute Kidney Injury: Time for Goal-Directed Perfusion Management? *Crit Care*. 2011 Aug 10;15(4):R192.
2. Ranucci M, Aloisio T, Carboni G, Ballotta A, Pistuddi V, Menicanti L, Frigiola A. Acute Kidney Injury and Hemodilution During Cardiopulmonary Bypass: A Changing Scenario; Surgical and Clinical Outcome REsearch (SCORE) Group. *Ann Thorac Surg* 2015.
3. Ranucci M, Pistuddi V, Carboni G, Cotza M, Ditta A, Boncilli A, Brozzi S, Pelissero G. Effects of priming volume reduction on allogeneic red blood cell transfusions and renal outcome after heart surgery; Surgical and Clinical Outcome Research (SCORE) Group. *Perfusion*, 2014.

IM-00492 A

Thoracic – Abstract: Thoracic oncology II: perioperative management

Fissureless video-assisted thoracoscopic lobectomy for all lung lobes: a better alternative to decrease the incidence of prolonged air leak?

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Prolonged air leak (PAL) after major lung resection is a common postoperative complication. The incidence of PAL has been shown to be between 8% and 15% in various studies, and PAL leads to an increased length of hospital stay (LOS), a higher overall complications rate and higher hospital costs.

Dissection through the fissure can increase the incidence of PAL, especially in patients with incomplete fissures.

We hypothesised that if we used 'fissureless technique' on all the lung lobes and thus avoid dissection in the fissure, dividing it at the very end of the lobe resection as a last step, we could produce a better outcome in terms of air leak, PAL, LOS and overall complications rate.

Of 61 video-assisted thoracoscopic (VATS) lobectomy operations in 2014, it was found that 54 were eligible for this retrospective study: 24 operations were performed using the 'conventional' technique (group 1), i.e. with dissection in fissure, and 30 were performed using the 'fissureless' technique (group 2).

No differences were found between groups 1 and 2 in terms of patient characteristics.

Furthermore, no differences were found between the two groups in operation time (p=0.525), number of staplers (p=0.088) and postoperative complications (p=0.149).

When comparing operative and postoperative characteristics between the two groups, statistically significant differences were found for the presence of air leak (p=0.004), PAL (p=0.003), days with chest tube (p=0.028) and LOS (p=0.020).

For air leak itself, significance was found with male gender (p=0.034), higher American Society of Anesthesiologists (ASA) score (p=0.012), postoperative complications other than air leak (p=0.001) and age between groups with and without air leak (p<0.001).

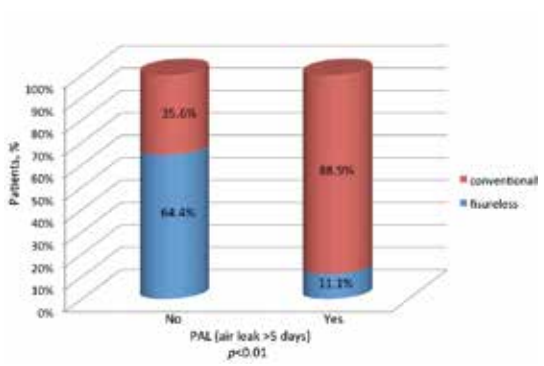


Figure 1. Comparison of the two surgical techniques in patients with or without PAL.

No amount of air leak is ever good, as the occurrence of air leak predicts a worse outcome after anatomical lung resection, with prolonged LOS and a more complicated postoperative course. Therefore, not only PAL but any air leak should be considered as a surgical complication, and every effort should be taken to avoid it.

Fissureless VATS lobectomy is a feasible technique, equivalent to conventional VATS lobectomy in terms of operation time, stapler use and complications. Nevertheless, it appears to be a superior technique to conventional VATS lobectomy in terms of preventing PAL and reducing LOS.

Since we began to use the fissureless VATS lobectomy technique, air leak and PAL levels in our clinic has decreased markedly, leading to wider acceptance of this technique by all surgeons in our clinic for VATS and even for open resections.

As a result of this clinical experience, knowing that conventional VATS lobectomy in patients with incomplete or fused fissures can easily lead to avoidable complications, it did not feel right to randomise the patients. Therefore, our results need to be confirmed in a large randomised trial.

Congenital – Abstract: Fontan circulation

Impaired pulmonary function is an additional potential mechanism for the reduction of functional capacity in clinically stable Fontan patients

Aída LR Turquetto[1], Luiz F Canêo[1], Daniela R Agostinho[1], Patrícia A Oliveira[1], Maria ICS Lopes[1], Patrícia F Trevisan[1], Frederico LA Fernandes[1], Maria A Binotto[1], Gabriela Liberato[1], Glaucia MP Tavares[1], Rodolfo A Neirotti[2], Marcelo B Jatene[1]

[1] Heart Institute, University of Sao Paulo, Medical School, Brazil

[2] Michigan State University, East Lansing, United States

Despite remarkable improvements in the quality of life and prognosis of patients treated by the Fontan operation, patients have a decreased exercise capacity compared to healthy controls. The univentricular physiology leads to organs and sub-systems developing adaptive mechanisms to the sub-optimal cardiac output, due to the absence of a sub-pulmonary ventricle, lack of pulsatile pulmonary blood flow, and passive systemic venous return. The exercise intolerance is directly related with these factors; even asymptomatic patients are not able to surge their stroke volume during periods of increased demand. Thus, there is an increased systemic vascular resistance, which reduces peripheral blood flow and the efficiency of oxygen extraction by the muscles.

Studies have demonstrated that cardiac output in an asymptomatic Fontan patient is approximately 70% of normal for the body surface area. Otherwise, these patients often develop scoliosis, kyphosis, have small lungs and consequently a restrictive pulmonary pattern due to previous thoracic surgical procedures. Thus, their already known, diminished, functional capacity, involves not only a sub-optimal cardiac function, but also alterations of their pulmonary function. Although the pulmonary function has been studied in the Fontan population, more evidence of this impairment is necessary for a better understanding of the changes found in single-ventricle physiology.

The aim of the study was to identify the pulmonary variables that could explain the poor functional capacity in asymptomatic Fontan patients. We prospectively studied 21 patients that underwent a Fontan operation and 18 matched controls.

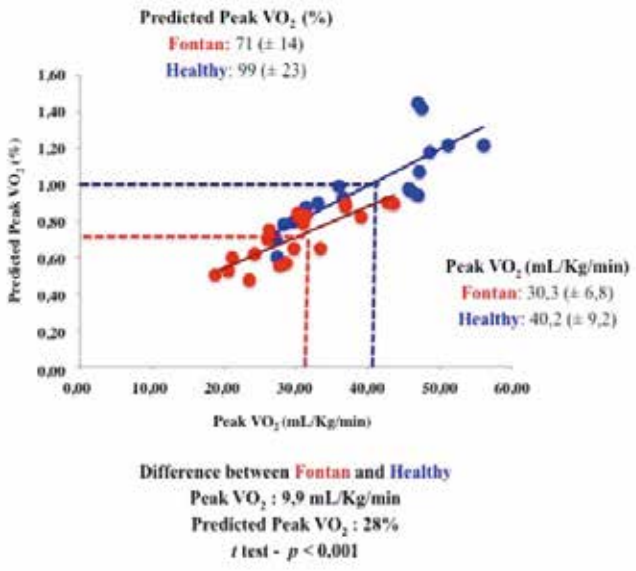


Figure 1.

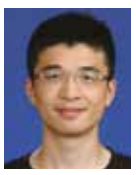
Pulmonary function and cardiopulmonary exercise tests were performed. Cardiovascular magnetic resonance, echocardiography and the plasmatic level of brain natriuretic peptide (BNP) were used to evaluate the functionality of the Fontan circulation.

The mean age of Fontan patients was 21±5.4 years, the mean age at surgery was 8.7±2.9 years and the median follow-up time was 10.3 years (8.2–15.5). Lung volumes and diffusion capacity were significantly lower than expected, when compared with the control group. Reduced strength of the respiratory muscles was also found. The maximal voluntary ventilation reached by patients was significantly lower than in controls. Restrictive patterns were diagnosed in 52% of patients, who had lower total lung capacities and normal or increased FEV_1/FVC (forced expiratory volume in 1 second forced vital capacity) ratios. The mean maximal oxygen uptake (VO2) was 1.78±0.1 mL/kg/min in the Fontan patients versus 2.75±0.2 mL/kg/min in the control group (p=0.001). When correlated lung function to functional capacity, we observed a strong influence of the abnormal pulmonary function in the exercise tolerance (Figure 1).

Then we concluded that the late postoperative reduction of the functional capacity in clinically stable Fontan patients, can be explained by their reduced respiratory muscle strength, decreased lung volumes and capacities, along with a diminished diffusing capacity for carbon monoxide related to the sub-optimal cardiac output found in our patients.

Cardiac – Abstract: Basic science 1

Controlled-release hydrogen sulfide delivery system based on mesoporous silica nanoparticles protects endothelial cells from ischaemic/reperfusion injury via preserving mitochondrial membrane potential



Wenshuo Wang Zhongshan Hospital, Fudan University, China

Hydrogen sulfide (H_2S) has attracted increasing attention in recent years due to its clinical potential as an inhibitory agent of oxidative stress. The lack of an ideal H_2S donor, however, has severely hampered further research efforts which seek to elucidate its involvement in various physiological and pathological processes. Previously, we have constructed a novel drug delivery system based on diallyl trisulfide-loaded mesoporous silica nanoparticles (DATS-MSN) to achieve controlled release of small molecules.

In this study, we demonstrated the donor-loaded nanoparticles can be rapidly internalised by human umbilical vein endothelial cells (EC) and protect them from systemic damages caused by ischaemia-reperfusion (IR). Long-term observations indicated that DATS-MSN promoted the proliferation of endothelial cells under oxidative stress. Mitochondrial membrane potential, which plays a crucial role in maintaining cellular redox homeostasis, was stabilised by the release of H_2S from DATS-MSN. Taken together, these results suggested that DATS-MSN can mimic the biological function of endogenous H_2S.

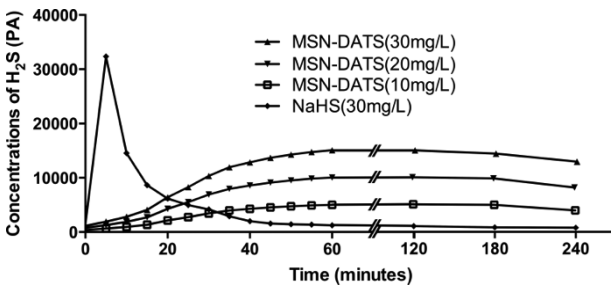


Figure 1. The time course for H_2S release in complete medium measured by an H_2S-selective microelectrode.

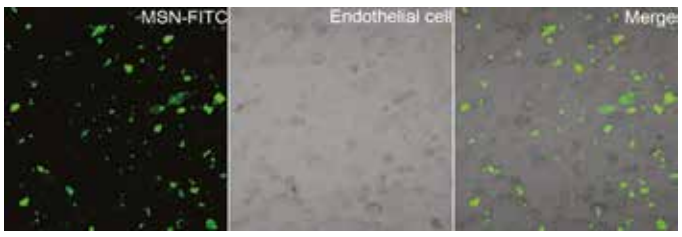


Figure 2. *In vitro* uptake of FITC-conjugated DATS-MSN by ECs. The ECs and MSN-FITC were detected using confocal microscope, respectively. The images were merged in Fluoview (Olympus, Japan).

EACTS
European Association For Cardio-Thoracic Surgery

30th EACTS Annual Meeting

Barcelona, Spain

1-5 October 2016

Abstract deadline 30 April 2016

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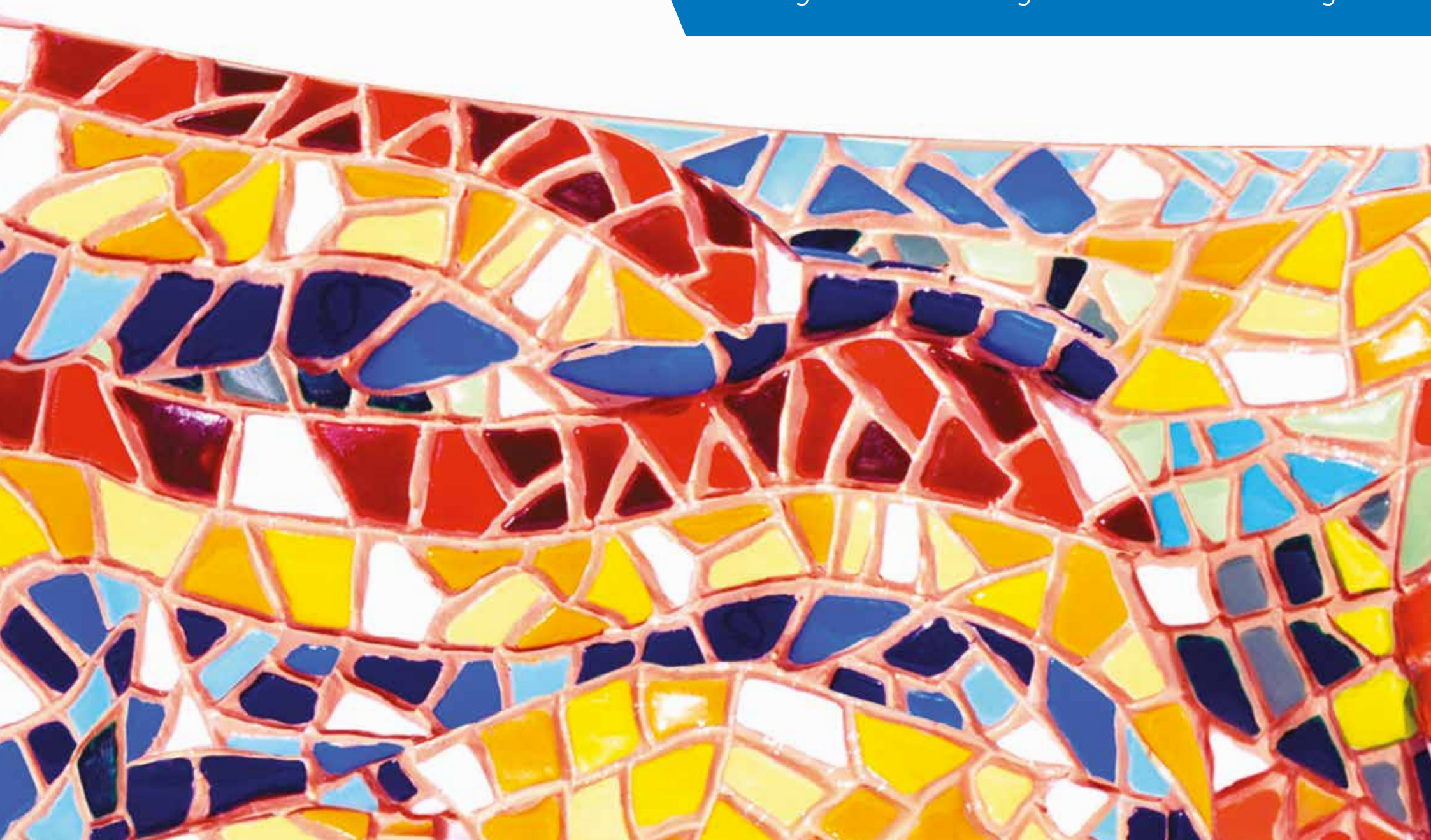
Raising Standards through Education and Training



Floor plan – Exhibition opening times: *Sunday 4 October 15.00–19.00 Monday 5 October 09.00–17.00 Tuesday 6 October 09.00– 17.00*

2.65	3-D Matrix Ltd
2.73	A&E Medical Corporation
3.08	AATS-American Association for Thoracic Surgery
2.51	Admedus
2.72	Advancis Surgical
2.68	Andocor NV
2.54B	AngioDynamics
2.55	Argentum Medical LLC – Curasurgical LLC
3.26	Asanus Medizintechnik GmbH
2.47	ATMOS MedizinTechnik GmbH & Co. KG
2.50	AtriCure Europe BV
2.19	B Braun Surgical S.A.
2.22	Bard Davol
3.12	Berlin Heart GmbH
2.52	BioCer Entwicklungs-GmbH
2.11	Biointegral Surgical, Inc.
2.56	Biometrix BV
2.46	Cardia Innovation AB
2.25	CardiaMed BV
2.06	Cardica GmbH
2.53A	Cardio Medical GmbH
3.29	Carmat
2.76	ClearFlow Inc.
2.41	Cook Medical
2.52A	CorMatrix Cardiovascular Inc.
2.79	CORONEO Inc.
2.32	Cryolife Europa Ltd.
3.10	CTSNet
2.42	CytoSorbents Europe GmbH
3.01	De Soutter Medical Limited
2.59	Delacroix-Chevalier
2.13	Dendrite Clinical Systems Ltd
2.23	Direct Flow Medical GmbH
3.09	EACTS-Euromacs and QUIP Programme
3.17	EACTS-The European Association For Cardio-Thoracic Surgery
3.16	Edwards Lifesciences
Training Village Unit 2	Edwards Lifesciences
2.78	ESCVS 2016-European Society for Cardiovascular and Endovascular Surgery
3.14	Eurosets SRL
3.32	Fehling Instruments GmbH & Co KG
2.66	Gebemed medical systems GmbH
2.18	Geister Medizintechnik GmbH
2.36	Genesee BioMedical Inc.
2.67	GUNZE Int'l Europe GmbH
2.16	Hamamatsu Photonics Deutschland GmbH
2.74	Heart and Health Foundation of Turkey
3.24	Heart Hugger / General Cardiac Technology
2.33	HeartWare Inc.
2.61	Hemotec Medical GmbH
2.70	HMT Medizintechnik GmbH
2.23A	Inter Medical Services Ltd
3.07	ISMICS-International Society for Minimally Invasive Cardiothoracic Surgery
2.53	Jena Valve Technology GmbH
3.04	Johnson & Johnson Medical S.p.A.
Training Village Unit 6	Johnson & Johnson Medical S.p.A.
3.28	JOMDD INC – Japanese Organisation for Medical Device Development, Inc
3.20B	JOTEC GmbH
2.07	KLS Martin Group – Gebrueder Martin GmbH & Co KG

2.44	Labcor Laboratorios Ltd.
3.20	LSI Solutions
2.04	Mani, Inc.
2.31	MAQUET
Training Village Unit 5	MAQUET
2.37	Master Surgery Systems AS
2.14	MDD Medical Device Development GmbH
2.63	Medela AG
2.77	Medex Research Ltd
3.20C	Medical Concepts Europe BV (co-exhibitor with Wexler Surgical Inc.)
2.20	Medistim ASA
2.21	Medos Medizintechnik AG
2.28	Medtronic International Trading SARL
Training Village Unit 1	Medtronic International Trading SARL
2.10	Meril Life Sciences Pvt. Ltd
2.22A	Moeller Medical GmbH
3.03	NeoChord Inc.
3.19	On-X Life Technologies INC™
2.58	OpInstruments GmbH
2.05	Oxford University Press
3.02	PEMCO Medical
3.22	Peters Surgical
2.22C	PneuX Life Systems
2.54	Posthorax Ltd
2.09	Qualiteam SRL
2.40	Redax S.p.A.
2.26	ReliantHeart
2.39	RTI Surgical Inc.
2.52B	Rumex International Co.
2.12	Sage Products
2.01	Scanlan International Inc.
2.49	Siemens Healthcare
3.31	Smartcanula LLC
2.54A	Somahlution
3.15	Sorin Group Italia Srl
Training Village Unit 3	Sorin Group Italia Srl
2.48	Spectrum Medical
Training Village Unit 4	St Jude Medical
2.30	St Jude Medical
3.25	stroke2prevent
3.11	STS-The Society Of Thoracic Surgeons
3.18	Symetis SA
2.17	SynCardia Systems Inc.
3.20C	TeDan (co-exhibitor with Wexler Surgical Inc.)
3.21	Terumo & Vascutek
2.53C	The Heart Valve Society
2.38	The Medicines Company
3.13	Thoratec Corporation
2.24	Tianjin Plastics Research Institute Co. Ltd (TPRI)
2.34C	Tianjin Welcome Medical Equipment Co Ltd
2.34A	Transonic Europe BV
2.34	VGS-Vascular Graft Solutions Ltd
2.15	Weigao Group
3.20C	Wexler Surgical Inc.
2.80	Wisepress Online Bookshop
2.45	WL Gore & Associates GmbH
2.75	WSPCHS-World Society for Pediatric and Congenital Heart Surgery
2.37	Xenosys (co-exhibitor with Master Surgery Systems)
2.71	Zimmer Biomet

Cardiac – Focus Session: Joint Session EACTS SBCCV PASCaTS – Cardiothoracic surgery

Quality cardiothoracic training challenges in a resource-limited environment

Francis E Smit University of the Free State, Bloemfontein, South Africa

When addressing training in cardiothoracic surgery, it makes sense to think about the end product: a general cardiothoracic surgeon, with or without an interest in a specific sub-specialty, capable of independent practice, within an average 6-year training cycle. This has to be achieved in a social environment that does not tolerate learning curves, complications or death, in patients not treated by PCI, with more comorbidities than ever before. This is a tall order and to achieve endpoints imply a very focused and well-designed training programme, especially in resource-limited environments in the developing world.

More with less

Our goal is to train young surgeons that are fulfilling internationally accepted training endpoints, e.g. Royal Australasian College. Although South Africa has limited public sector resources, we have a wonderful case distribution. Apart from disease profiles similar to the industrialised world (in the privately insured population), we have the spectrum of rheumatic heart disease and infective endocarditis, pericarditis, late presentations with advanced pulmonary hypertension in congenital heart disease, neglected coronary artery disease presentations, endemic idiopathic dilating cardiomyopathies and HIV-related vascular disease. This allows for unique training opportunities. However, it is absolutely important that clear training and development objectives are set. For that we use flight training as a parallel, and have a fairly set development and evaluation programme. It has theoretical, practical, research and management components. Our registrars have completed a primary (anatomy, physiology, pathology) and intermediate (general surgical principles, ICU and trauma) exams and a specified surgical, trauma and ICU clinical rotations over about a 2-year period before joining our program for a period of 4 years. These pre-cardiothoracic surgery rotations now include a 3-month rotation in cardiology to obtain imaging and interventional cardiology exposure. Regular assessment is an imperative in a resource depleted environment, because of limited caseloads, registrars cannot afford to loose cases because of a lack of preparation. Assessment also allows for interaction with, and monitoring of teaching staff.

Theoretical knowledge is addressed by a modular curriculum over a 4-year cycle. Weekly discussion programs, with registrar presentations and written and oral semester examinations are conducted as assessment.

Surgical skills and dexterity is developed in a step-wise fashion. Basic surgical skills courses are usually completed before training in cardiothoracic surgery commences. Skills and dexterity is developed in the wetlab programme and stepwise clinical exposure.

Analytical thinking, integration, people skills and teamwork are naturally acquired in the operating room, ICU and wards as elsewhere. We also conduct a personality assessment and development, team relationships and human performance course every 3 years. Trainees participate in management and administration through out their training career. Research exposure and training takes place as part of a formal attendance course presented by the Department of Biostatistics and trainees have to complete either a peer reviewed article or dissertation before registration with the Health Professions Council of South Africa for independent practice.

Outcomes

Two cycles of 6-month rotations each in adult cardiac surgery, paediatric cardiac surgery and thoracic surgery are performed and the last year can be directed to an area of specific interest or consolidation. Candidates perform more than 100 cardiac cases within the training period and the success rate in the final examination of the Colleges of Medicine of SA Fellowship required for registration as a Cardiothoracic Surgeon in SA has been excellent.

The minimum training requirements set by the international Cardiothoracic Surgical community have been met and also exceeded. Quality training in resource-limited environments is possible in well-structured and closely monitored programmes.

Cardiac – Abstract: Heart transplantation in the modern era

Recipient age impact on outcomes of cardiac transplantation: should it still be considered in organ allocation?

Sandro Sponga Udine University Hospital, Udine, Italy

When first introduced, heart transplantation was restricted to recipients under 60 years of age. Due to the improvement in outcomes the upper limit of recipients' age has been increased to over 70 years. Consequently the gap between organ supply and demand has increased. Owing to a shortage of donors, the debate remains whether heart transplantation is justified for older recipients. Even if there is a tendency to prioritise younger patients compared with older ones, current guidelines do not address a policy in listing patients between 20 and 70 years.

We analysed whether age, in the modern transplant era, should still be considered a significant prognostic factor for outcome, and if it should be determinant in organ allocation.

Data from 364 consecutive patients who underwent cardiac transplantation between 1999 and 2014 at the University Hospital of Udine were prospectively collected and retrospectively analysed. Patients were treated using the bicaval technique, immunosuppressants used included steroids, cyclosporine and mycophenolate. Serial endomyocardial biopsies were performed during the first year and coronary angiography every 2 years. Patients were divided into three groups according to age (group 1, <40 years; group 2, 40–60 years; group 3, >60 years). Survival and major complications were evaluated at long-term (mean follow up 6.7±4.5, 1–15 years).

Preoperative renal failure (2.9%, 16.6%, 39.5%, groups 1–3 respectively; $p<0.01$) and cardiovascular factors such as diabetes (1.2%, 17.1%, 36.4%, groups 1–3 respectively; $p<0.01$), systemic hypertension (5.9%, 31.5%, 40.8%, groups 1–3 respectively; $p<0.01$) and dyslipidaemia (5.9%, 40.3%, 42.9%, groups 1–3 respectively; $p<0.01$), as well as ischaemic cardiomyopathy (0%, 42.6%, 44.1%, groups 1–3 respectively; $p<0.01$) were all less frequent in younger patients. Furthermore, donor age was typically lower in younger patients (33±15 years, 39±14 years, and 45±15 years, groups 1–3 respectively; $p<0.01$).

Thirty-day mortality was similar across the three age groups (0%, 7%, 8%, respectively; $p=0.32$), but older patients showed worse long-term survival, even after adjusting for major cardiovascular risk factors and renal failure (age group HR 2.0; 95% CI 1.4–2.9). In fact, 15-year survival was 100% in group 1, while at 1, 5, 10 and 15 years, survival was 88%, 78%, 69% and 56% in group 2, and 87%, 68%, 49% and 43% in group 3, respectively. Even major long-term complications were less frequent in younger patients in terms of neoplasms ($p<0.01$), infections ($p=0.03$), re-hospitalisations ($p=0.01$) and a tendency to better freedom from coronary allograft vasculopathy ($p=0.06$).

Our results showed a significant different outcome according to the recipient's age even after correction for major risk factors. Notably, patients under 40 years showed 100% survival, representing a subgroup of patients with an expectancy of life at 15 year afters transplantation similar to the general population of the same age (Figure 1). These patients also seem less affected by immunosuppression complications. Since 15-year survival in the under 40s is twice that of the over 60s, recipient age should be taken in account in allocation of organs for transplant.

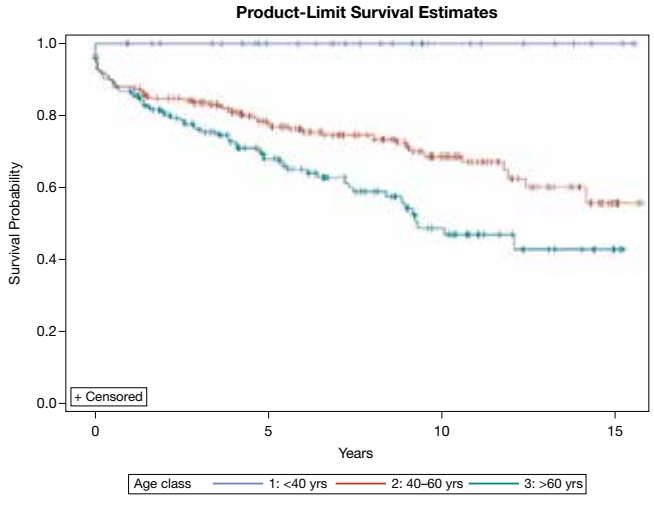


Figure 1.

Cardiac – Professional Challenge: Wire skills for the surgeon

Transfemoral artery puncture

Robin H Heijmen St. Antonius Hospital, Nieuwegein, The Netherlands

The continuous search for less invasive treatment options for cardiovascular pathologies has led to the development, clinical introduction, and wide-spread use of various transcatheter technologies, like thoracic endovascular aortic repair (TEVAR) and transcatheter aortic valve implantation (TAVI). As technology has evolved, their field of indication has extended rapidly and both techniques are now considered true alternatives to open surgical repair in an increasing subset of patients.

All catheter-based procedures require access to the arterial vascular system. Trans-apical, -subclavian, -carotid, and direct aortic approaches are all being utilised, in addition to the less invasive transfemoral approach. For balanced decision making and optimal procedural performance, a multi-disciplinary team with knowledge and experience in all the available treatment options being open, endovascular, or hybrid is a prerequisite. The cardiac surgeon should be actively involved.

There is a need to acquire wire skills. At the current EACTS annual meeting, a session called 'Wire skills for the surgeon' offers lectures by experienced (endovascular) cardiac surgeons, in addition to a transfemoral TAVI live case. One of the presentations is entitled 'transfemoral artery puncture'.

In many catheter-based procedures, femoral access is needed for angiography and/or introduction of the device. The latter using a large bore catheter (upto 24 Fr), requiring a (suture-mediated) closure device afterwards. The application of closure devices will be discussed separately in this session. Optimal performance of these devices, however, fully relies on a perfect puncture of the femoral artery. These are routine, every day practice in the catheterisation laboratory, so join the interventionalist to learn. The impact of vascular access complications cannot be overstated, clearly demonstrated by the marked increase in mortality in patients undergoing transfemoral TAVI.

Optimal, percutaneous access to the common femoral artery (CFA) using Seldinger's technique starts with knowing the anatomy and choosing the best puncture site. An important anatomical landmark is the inguinal ligament, that runs from the anterosuperior iliac crest to the pubic bone. After crossing this ligament, the external iliac artery continues into the CFA after the take-off of the inferior epigastric artery. The CFA lies midway the inguinal ligament, accompanied by the femoral vein medially and the femoral nerve laterally, and bifurcates usually 3–5 cm distal to the ligament. In contrast to the ligament, the inguinal skin crease my be misleading, certainly in obese patients, and may result in low puncture. So, one approach is to palpate these bony landmarks, define the inguinal ligament, and puncture midway approximately 2 cm below the ligament at the level of the CFA. Another approach relies on the maximal femoral pulse, which is located over the CFA in >90% of limbs. So, puncturing the artery at its point of maximal intensity is a reliable means in localising the CFA, although no approach is foolproof. In absence of a palpabel pulse, the CFA can be found 1.5 cm lateral to your finger that is positioned immediately lateral to the pubic tubercle and inferior to the inguinal ligament. Fluoroscopy can also be used as an adjunct to obtain femoral access The optimal location to enter the CFA is at the bottom of the upper inner quadrant of the femoral head. Additionally, ultrasound guidance may not only identify plaque and thrombus, but may also prevent inadvertent posterior wall puncture. Combining these techniques whenever considered necessary, will aid in performing an optimal transfemoral artery puncture.

QUIPnewsletter

Quality Improvement Programme

In this newsletter…

QUIP Project makes international progress

Domenico Pagano and **Theo de By**

Twenty-five cardiothoracic surgery centres from 13 European countries have now registered to participate in the European Association for Cardio-Thoracic Surgery (EACTS) Quality Improvement Programme (QUIP), and we expect more to join.

Increasingly, centres that already cooperate within the framework of national databases, decide to join the QUIP Project collectively. With the consent of the individual centres, the QUIP team, cooperates with national database managers in different countries to enable the upload of national data to the QUIP database. This method ensures that data, which have already been screened for quality and completeness, are transferred to QUIP. Moreover, time and energy are saved for participating centres and their data remains individually recognisable within the QUIP tool.

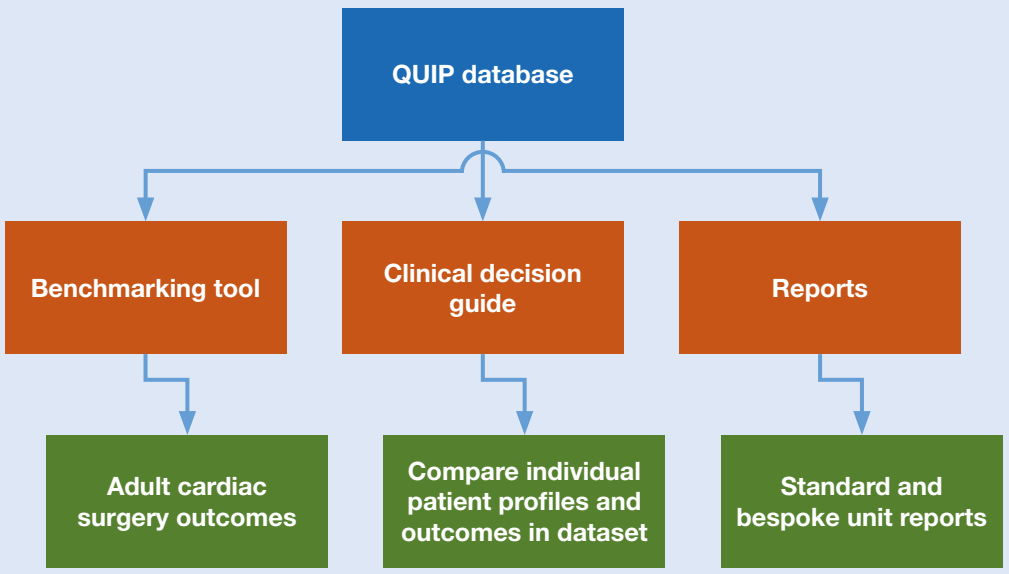
Below, we highlight the main objectives of the QUIP Project and elaborate on the way in which the benchmarking tool works.

Multi-purpose database, anonymous data

The EACTS has initiated the QUIP Project for adult patients with three aims:

- To function as a benchmarking tool
- To serve as a clinical decision guide
- To create the possibility of obtaining both standard and bespoke reports.

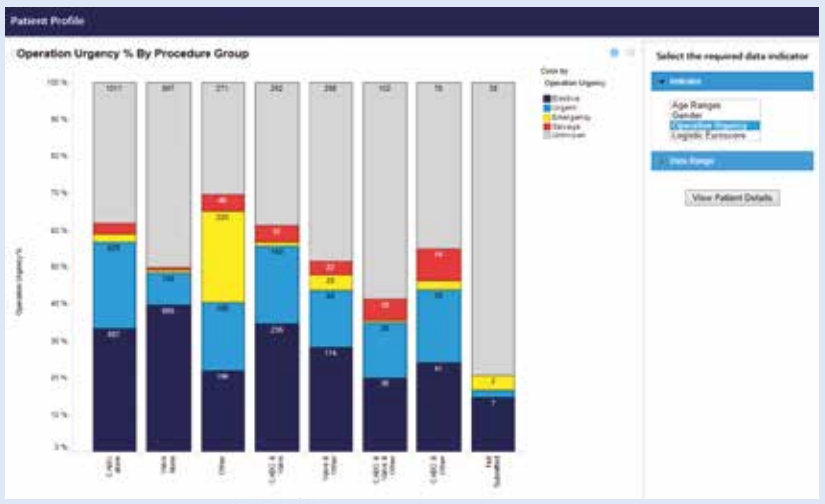
Now that the QUIP database has been populated with records from the first participating centres, the initial aims – benchmarking and the creation of reports – are operational. The quantity of data, which will be accumulated over time, will provide diagnoses and intervention in a large spectrum of patients, both 'standard' and outliers. The profiles and outcomes of these documented cases will provide individual surgeons with a clinical decision guide when consulting the QUIP database.



The benchmarking tool prototype was first presented at the 2014 EACTS Annual Meeting. In cooperation with Birmingham University Hospital's department of Quality of Outcomes and Research, the tool has been further developed into an easy-to-use instrument to anonymously compare data from the participating hospitals. Selection and filtering of data can be made for different surgical procedures such as single or multiple CABG's, a range of valve operations, and combinations of CABG and valve interventions.

State-of-the-art software enables users to make a large variety of selections of data, by time, per year, of groups of hospitals, diagnoses and outcomes etc. All the time the user's own hospital remains identifiable, while the names of the other hospitals in the database remain anonymous. The screens have been designed in such a way that by using the mouse, the user can select parts of the screen, which if they wish, they can copy into a Microsoft Word® document or PowerPoint® presentation, for example. Thus, the data that are of interest to the individual surgeon or hospital can be highlighted and documented.

The QUIP database already contains more than 20,000 patient records. With the increased uptake, this figure is expected to rise to an estimated 80,000 by the autumn of 2015. The large volume of data collated in the QUIP database will increasingly enable surgeons to search for and find a variety of combinations of diagnoses and outcomes in surgery. This opens up the possibility



to compare an individual patient profile with the results of the interventions made in similar diagnoses on a large international scale.

How can a hospital engage with QUIP?

The import of existing data from an individual centre is relatively simple.
The efficient procedure is subdivided into the following steps:

1. Download the anonymised in-hospital patient records into an Excel® spreadsheet.
2. Submit data to the EACTS QUIP project using a web-based link with secure connection (SFTP).
3. The QUIP Project group evaluates the compatibility of data with the specifications of the QUIP Registry, and creates a 'map' of data, which highlight any differences and missing data.
4. The mapped data are sent to the participating hospital for verification.
5. When verified, data that are compatible with the file specification are added to the database. If not, an effort to harmonise the data is undertaken.

The clinical informatics and software developers from QuORU then link the available data with a computer program allowing the display of the outcomes of the three test hospitals, which includes the types of intervention and the number of cases.

The hospital's registered participator receives a unique password with which he, or she, can consult the QUIP database at any time.

Formalities to fulfil: The QUIP Charter

When it comes to such an important matter – the exchange of data that must remain anonymous – before joining the QUIP Project, both the EACTS and the hospital that wishes to join have to agree to certain terms and conditions, which are set out in the QUIP Charter.

The QUIP Charter outlines the purpose of the project; describes the obligation of the EACTS to maintain the highest level of data protection; specifies how data may be used; and stipulates that no identifiable patient or surgeon data will be held in the database.

The responsibilities of those participating in the QUIP database are defined as:

1. Providing accurate, complete and truthful information
2. Ensuring that participation in the adult cardiac database (ACD) complies with any applicable local laws and internal procedures
3. Advising the committee of any change in circumstances affecting its participation or the reliability and completeness of the data that it is supplying.

The entire Charter can be downloaded from www.eacts.org/quip/.
After signing the Charter's Registration Form the participation of an individual hospital is formalised. Then, a password, giving access to the QUIP online tools will be issued to the registered participator(s) of the hospital.

QUIP Project organisation

The EACTS Council has delegated day-to-day control to the ACD Committee.
The ACD Director chairs the committee. The Director is responsible for day-to-day operation, maintenance and development of the ACD and data analysis, and determines any issues concerning the verification of the data provided by the participating hospitals.

Further, the Director:

1. Gives consent to the publication of information and reports contained in the ACD
2. Monitors the participators' actions to ensure compliance with the Charter
3. Appoints a member of the committee to act as the ACD coordinator
4. The coordinator is responsible for the creation, development, maintenance and upgrade of the software allowing the participators to submit data to the ACD. In particular:
   - data collection activities, data optimisation and data protection
   - assisting participators and providing technical support
   - technical organisation of the process of verification of data.

Further information can be downloaded from **www.eacts.org/quip**. To contact the QUIP Project manager: **Theo.Deby@Eacts.co.uk**

Cardiac – Professional Challenge: Wire skills for the surgeon

Thoracic endovascular aortic repair done by surgeons – the TEVAR App

Bartosz Rylski Heart Center Freiburg University, Freiburg, Germany

Endovascular skills are an integral part of vascular patient care. As the scope of catheter-based treatment broadens, our ability to manage ever more aortic pathologies with these techniques will continue to improve and lead to better overall patient care. The development of guidewire-catheter skills has in recent years become an integral part of surgical vascular education.

Endovascular repair of thoracic aortic pathology (TEVAR) has become not just a generally accepted alternative to open surgery for certain patients but also a preferable approach to thoracic aortic disease. Even in those patients considered eligible for open surgery, the open repair of thoracic aortic disease is still associated with a considerable mortality rate. The perioperative mortality rate of elective open thoracic aortic repair ranges from 7–9% and 37–46% in emergency circumstances. TEVAR is a genuine alternative to open aortic repair because it reveals a far better perioperative aorta-related survival rate (elective 2–5%, emergency 8–28%).

As the endovascular era continues to advance, and the low complication rate of TEVAR makes it an attractive treatment method (even in young patients in good condition), it is essential that surgeons learn how to perform TEVAR confidently and safely. The pre-procedural workup for TEVAR defines its later success. This includes: 1) a drawing of the patient's aortic anatomy with aortic dimensions that can be taken into the operating room; 2) the decision on stent-graft specification (with or without bare springs, proximal and distal diameter, covered stent length) must be made at least 1 day before surgery to order a device not available on site; 3) being prepared for unexpected events or complications, such as inaccurate stent-graft deployment and the need for an additional stent graft, a ruptured access artery, incorrectly measured length of the aortic segment being treated, intraoperatively-detected endoleaks, retrograde type A aortic dissection, aortic rupture, etc.; 4) reviewing the instructions on use, including stent-graft deployment steps, troubleshooting information and localisation, and the meaning of radiopaque markers, and finally; 5) deciding on the access site.

A helpful tool in preparing for TEVAR is the TEVAR App (Figure 1). It is free, and easy to use. Once downloaded on a smartphone or tablet, it requires no internet access. It helps to plan and prepare for TEVAR without searching for information from different sources. It has been developed as a reference aid for thoracic endovascular aortic repair and contains summarised instructions for use, with animations demonstrating the stent grafts' deployment, as well as troubleshooting information. The TEVAR App includes size tables with the diameters and lengths of stent grafts, and also the outer diameters of delivery-system catheters. There are drafts of each stent graft showing radiopaque markers' locations, their shape and meaning. Furthermore, the TEVAR App provides stent-graft and delivery system photos and chest X-rays that help the user understand what the stent graft looks like on fluoroscopy. It helps to assess the immediate result after stent-graft deployment in the operating room, as well as plan a reintervention in patients with stent grafts already in place. The TEVAR App includes information on magnetic resonance (MR) safety and compatibility, which are important because TEVAR is also performed in relatively young patients. Moreover, MR, which requires no ionising radiation, is an attractive diagnostic tool, particularly in this group.

The TEVAR App also contains the TEVAR Calculator, which assists you in planning stent-graft size according to individual aortic dimensions and desired oversizing factors. The TEVAR App is cost-free, and its development has not been supported financially by any industry. It is a non-profit project whose aim it is to educate and help physicians perform TEVAR. It can be found in the App Store by searching for 'TEVAR App'.

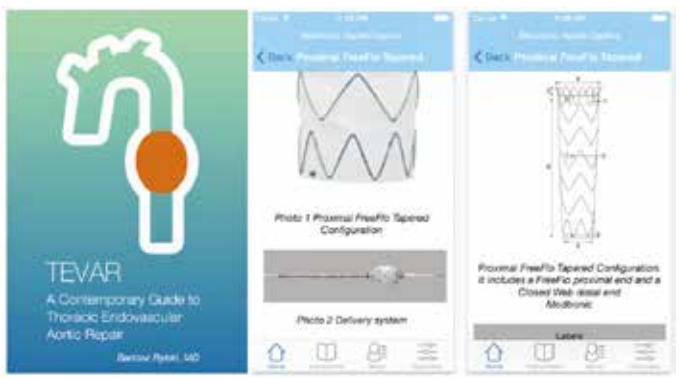


Figure 1. Screenshots from the TEVAR App.
A contemporary guide to thoracic endovascular aortic repair.

Vascular – Professional Challenge: Uncertainties in the treatment of chronic dissection

Optimal treatment of type B dissection in connective tissue disorder patient

Michael Jacobs European Vascular Center Aachen – Maastricht, Maastricht, The Netherlands

The main connective tissue disorders (CTD) associated with aortic diseases include the Marfan (MFS), Ehlers-Danlos type IV and Loeys-Dietz syndromes, causing aortic dissection and aneurysmal dilatation of the thoracic aorta. The most common cardiovascular complications in patients suffering from MFS are aortic root dilatation, aortic valve insufficiency and dissection.

Type B aortic dissection in CTD patients most often involves the entire thoraco-abdominal aorta and iliac arteries as well. Indications for treatment of type B dissection include untreatable hypertension, persistent pain, malperfusion and rupture. In addition, post-dissection aneurysms develop over time and require repair if exceeding a diameter of 5.0–5.5 cm

Current practice

During the last decades, open descending thoracic aortic aneurysm (DTAA) and thoraco-abdominal aortic aneurysm (TAAA) repair has changed from the 'clamp-and-go' technique to a controlled procedure with extracorporeal support, selective organ perfusion and neuromonitoring of the spinal cord. In large volume centres, operative treatment of aortic pathology in Marfan patients provides excellent results and long-term survival when applying adjunctive measures to support organ perfusion and spinal cord protection.

Endovascular repair of type B descending aortic dissection has become the standard of care. Few open procedures are performed for this potentially lethal disease. In contrast, stent grafts are not considered as primary tools to treat type B dissection in patients with CTD, however, progressive reports demonstrate the feasibility of this approach as well.

Following the first case reports some 12 years ago, the first small series showed the technical feasibility of endografting in sub-acute and chronic expanding aortic dissection. The published results of endovascular aortic treatment in patients with MFS mainly address post type B dissection pathologies. In these series patients are relatively young and almost all already underwent surgery of the aortic root or arch. Pacini reviewed studies addressing the results of endovascular treatment in MFS patients with type B aortic dissection.[1] Primary end points included perioperative and late death, major complications, endoleaks, surgical conversions and need of additional endovascular procedures. A PubMed database search ultimately identified 12 articles with 54 patients: 11 (20.4%) underwent endovascular treatment for acute dissection, and 43 (79.6%) for chronic dissection. The periprocedural mortality was only 1.9%, however, the incidence of endoleaks was very high (overall 22%). The latter is of great importance since the majority of patients had already undergone aortic surgical procedures, offering adequate landing areas in aortic grafts, either proximal or distal. In patients in whom the stent graft landed in native aortic tissue, endoleaks approached 30%. During follow-up, high endoleak rates persisted, requiring many re-interventions. At follow-up, mortality rose to 12%, which is obviously high in a relatively young population. They concluded that the complications following endovascular repair in MFS patients are too high to consider this a safe approach for acute and chronic dissections. They suggest caution against the routine use of endovascular stent grafting in Marfan patients.

When reviewing the literature it becomes clear there is no evidence or scientific support for changing from open to endovascular treatment of descending aortic dissection and aneurysms in patients with connective tissue diseases. This statement specifically applies for CTD patients who did not undergo complex aortic operations before and who are fit for surgery. Open surgery remains the treatment of choice but only when performed in centres with high volume and adjunctive protective measures.[2] Endovascular options can be included in the open surgical management of dissected or aneurysmal ascending aorta and aortic arch by implanting a (frozen) elephant trunk, allowing secondary open or endovascular treatment of descending and abdominal aortic pathology.

Endovascular repair of descending aorta dissection and aneurysms in CTD patients should also be considered in redo surgical cases, hostile chests, unfit patients and severe anatomic deformities.

References

1. Pacini D, Parolari A, Berretta P. Endovascular treatment for type B dissection in Marfan syndrome: is it worthwhile? *Ann Thorac Surg*. 2013; 95: 737–749.
2. Greiner A, Grommes J, Langer S, et al. Marfan syndrome: when to operate TAA(A)s? *J Cardiovasc Surg*. 2010; 51 :693–699.

Cardiac – Abstract: Future of sutureless valves

Aortic valve replacement with sutureless prosthesis: better than root enlargement to avoid patient–prosthesis mismatch?

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Aortic valve replacement in patients with a small aortic annulus may result in patient–prosthesis mismatch (PPM). Aortic root enlargement (ARE) can reduce PPM, but leads to extended cardiac ischaemia time. Sutureless valves, due to the absence of a suturing ring, are stentless, and thus have the potential to avoid PPM, while reducing cardiac ischaemia time.

Between January 2007 and December 2011, a total of 136 patients with a small aortic annulus underwent surgery for aortic tissue valve replacement at our centre. Thirty-six (83% female; n=30) patients received a conventional valve replacement with ARE and 100 (83% female; n=83) patients received a sutureless Sorin Perceval valve. We compared these two groups and conducted a retrospective study with follow-up.

The Perceval group showed a significantly higher age (79.5+/-4.9 years) than patients in the ARE group (62.4+/-16.3 years; $p<0.001$) and received significantly more concomitant cardiac procedures (31% [n=31] vs 6% [n=2]; $p=0.002$). The mean operation, cardiopulmonary bypass and cross-clamp times were significantly lower in the Perceval group (146+/-42, 66+/-25 and 35+/-15 minutes, respectively) than in the ARE group (181+/-41, 105+/-29 and 70+/-19 minutes, respectively; $p<0.01$). The mean aortic valve opening area as measured in postoperative echocardiography was 1.49 cm^2 in the Perceval group and 1.67 cm^2 in the ARE group. Postoperative pacemaker implantation rate was significantly lower in ARE patients (6%, n=2) than in the Perceval group (20%, n=20; $p=0.044$). The 30-day mortality rate was comparable in both groups (2% [n=2] in the Perceval group vs 5.4% [n=2] in the ARE group; $p=0.279$). The 1- and 5-year survival rates of patients in the Perceval group were 90.8% and 56.6% years, respectively. Both 1- and 5-year survival rates of patients in the ARE group were 75.9%. There was no significant difference in survival.

Although the sutureless valve patients were significantly older and received significantly more concomitant procedures, all operation-associated times were significantly shorter. As 30-day mortality and survival rates were ranging at comparable results in the two groups, we conclude that sutureless valve implantation is at least a safe alternative for patients to avoid patient prosthesis mismatch, especially in geriatric patients.

Aortic and mitral deteriorated bioprostheses

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In recent years, the cardiovascular community has witnessed major changes in the treatment of valvular heart disease. Most importantly, novel transcatheter techniques have rapidly entered the clinical stage and are now firmly established for treatment of specific subsets of patients. For severe, symptomatic aortic stenosis, transcatheter aortic valve implantation (TAVI) has proven to be an effective and safe therapeutic alternative to surgical aortic valve replacement (SAVR) if indicated by a consensus of interdisciplinary heart teams. Following extensive evaluation in controlled clinical trials and confirmation of results in major registries reflecting real-world clinical scenarios, TAVI has been incorporated in recently updated international guidelines for the treatment of inoperable or high-risk patients.

Another more subtle development has been a gradual transition from mechanical towards biological surgical valve substitutes. According to annual reports issued by the German Society for Thoracic and Cardiovascular Surgery, the number of biological SAVR procedures surpassed those using mechanical valves in 2001. In 2014, 86.9% of all isolated SAVRs were performed using biological prostheses[1] and similar trends have been observed for other anatomic positions. In our own experience during the period 2002–2012, the use of mechanical aortic prostheses decreased from 11% to 2%. During the same period, there was a significant increase in valve sizes for biological SAVR.[2] This profound change in use pattern likely reflects awareness of potential subsequent valve-in-valve (ViV) therapy requiring large diameter surgical prostheses to preserve ViV options.

Because of this shift, an increasing caseload of patients presenting with deteriorated biological valve substitutes can be expected. Presently, repeat open surgery is still considered the standard of care. However, these procedures can be associated with significant perioperative morbidity and mortality. Furthermore, in many instances patients are elderly and considerably comorbid, and may not be ideal surgical candidates.

The technical feasibility of ViV procedures for surgical xenograft failure has previously been demonstrated, with most reports focusing on aortic ViV. The results have recently been summarised in a collaborative multicentre registry effort.[3] To a lesser extent, experience in mitral, tricuspid and pulmonary positions has also been reported.

Our group has recently summarised cumulative experience with ViV techniques in all four anatomic positions, reporting results from 75 consecutive patients treated for xenograft failure. This report focused on the technical aspects of this relatively new technique and included experience of six different types of transcatheter heart valves (THV).[4] While the overall haemodynamic and clinical acute outcomes were favourable in this high-risk patient population, several important limitations remain. Most importantly, treatment of small-sized deteriorated aortic bioprostheses (≤23 mm) frequently resulted in elevated residual transvalvular gradients. Thus, failure to meet the VARC-2 defined criteria of device success was observed in approximately 50% of all aortic ViV cases, which is consistent with the findings of others. Technically, this issue is likely to have been influenced by a number of reasons, such as patient–prosthesis mismatch, type of THV (e.g. supra-annular vs intra-annular position) or THV implantation height.

In summary, ViV therapy has become an attractive therapeutic option in select cases of structural valve deterioration in any anatomic position; however, more data are needed to refine this novel technique.

References

1. Funkat A, Beckmann A, Lewandowski J, et al. Cardiac surgery in Germany during 2013: a report on behalf of the German Society for Thoracic and Cardiovascular Surgery. *Thorac Cardiovasc Surg* 2014;62:380–92.
2. Silaschi M, Conradi L, Seiffert M, et al. Predicting risk in transcatheter aortic valve implantation: comparative analysis of EuroSCORE II and established risk stratification tools. *Thorac Cardiovasc Surg* 2015; 63:472–8.
3. Dvir D, et al. Transcatheter aortic valve implantation in failed bioprosthetic surgical valves. *JAMA* 2014; 312:162–70.
4. Conradi L, Silaschi M, Seiffert M, et al. Transcatheter valve-in-valve therapy using six different devices in four anatomic positions – clinical outcomes and technical considerations. *J Thorac Cardiovasc Surg* 2015; in press.

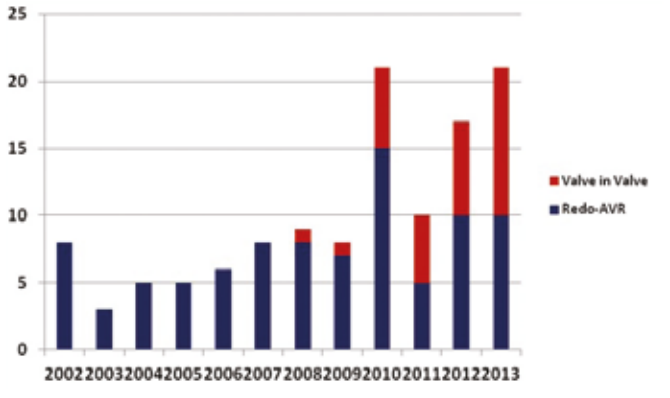

Figure 1. Ratio of redo open surgical aortic valve procedures versus aortic ViV at University Heart Center Hamburg.

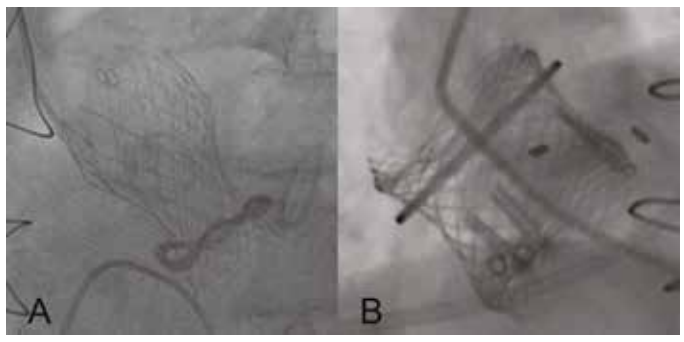

Figure 2. ViV therapy has become established as an attractive alternative option in select cases of structural valve deterioration in any anatomic position. (A) Aortic ViV using Medtronic CoreValve, (B) Mitral ViV using Boston Scientific Lotus.

EACTS Cardiothoracic Masters Jeopardy

The European Association for Cardio-Thoracic Surgery (EACTS) is offering a unique opportunity for two EACTS residents to attend the Society of Thoracic Surgeons (STS) 52nd Annual Meeting in Phoenix, Arizona, USA, 23–27 January 2016.

The Joint Council on Thoracic Surgery Education, Inc. (JCTSE) has organised a cognitive skills competition among US residents during the American Association for Thoracic Surgery (AATS) and STS in previous years. The competition is based on the US TV show 'Jeopardy'.
(https://www.youtube.com/watch?v=pFhSKPOF_II) and has been a great success among US colleagues.

This year, the EACTS has decided to organise a European version during the 29th Annual Meeting of the EACTS in Amsterdam. The competition will be entitled EACTS Cardiothoracic Masters Jeopardy. The EACTS will sponsor the winning team to go the STS 52nd Annual Meeting to compete in the final against the winning US team. EACTS will pay each team member's registration fee for the meeting, economy travel and hotel accommodation.

Participation is voluntary with all EACTS European and other non-US residents in cardiac, cardiothoracic, cardiovascular or thoracic surgery, eligible to participate.

Prior to the Annual Meeting, anyone wishing to participate was asked to:

1. **Create a team comprised of two cardio-thoracic trainees or one cardiac trainee and one thoracic trainee**
2. **Take an individual online screening exam and answer 60 questions in 20 minutes**

The European Competition

The top four national teams will compete during the Annual Meeting here in Amsterdam, on **Monday 5 October 2015**. Two rounds of 'Jeopardy' will be conducted in a live competition with the top two teams competing in the final round. The team with the best overall score will be the EACTS 2015 Resident Jeopardy Winners. The winners will go forward to play the US Resident Jeopardy Winners during the STS 52nd Annual Meeting.

We encourage you to join us for this new and exciting competition for residents.

Cardiac – Focus Session: Joint session EACTS SBCCV PASCaTS – cardiac surgery in the emerging economies: the evolving management strategies

Long-term clinical results of mechanical valve replacement versus Ross operation in children and adolescents in Saudi Arabia

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Aortic valve replacement (AVR) has been shown to improve the natural history of patients with severe symptomatic aortic valve disease. Often the degree of improvement depends on the valve substitute used. To date, there is no 'ideal' valve substitute. The pulmonary autograft to replace the aortic valve (the Ross procedure first described by Ross in 1967) comes closest to the ideal valve substitute. It is silent, non-thrombogenic, generally does not require anticoagulation, provides the best haemodynamics at rest and during exercise, and most importantly has the potential for growth. This latter characteristic made this procedure most suitable for paediatric patients with aortic valve disease with and without left ventricular outflow tract obstruction or hypoplasia. When the procedure was initially reported, it was associated with excessive mortality and morbidity. The adoption rate was low. However, when excellent long-term outcomes were demonstrated, the operation was met with renewed enthusiasm. The introduction of the full aortic root replacement technique, which made early outcomes more predictable, resulted in widespread popularity of the Ross procedure.

The procedure has been scrutinised in the literature, perhaps, more than any other valve procedure. Longer follow-up demonstrated problems related to aortic root dilatation, progressive aortic valve regurgitation and subsequent need for reoperation in some patients. This actually led to 'restrictive' recommendations on the use of the procedure in the Society of Thoracic Surgeons (STS) guidelines.

With over two decades of experience performing the procedure, in mostly a young patient population and with good follow-up, we can safely say that Ross procedure remains an attractive option for AVR. Nevertheless, it is not suitable for all aortic valve pathologies. Proper selection is crucial for maintaining good long-term outcomes.

AVR in children is associated with several challenges. Although many replacement options are available, all alternatives have some limitations. AVR with a mechanical prosthesis and the Ross procedure are the most commonly used valve substitutes in children. Mechanical valves in children can be associated with increased frequency of complications, including morbidity related to long-term anticoagulation, and development of patient–prosthesis mismatch as the child outgrows the initial valve and hence the need for subsequent valve replacement.

In a study we conducted on our Ross population, we aimed to review our experience with AVR in children and to compare indications and outcomes of children undergoing mechanical valve replacement with those of children undergoing the Ross procedure (346 children; 215 underwent Ross procedure and 131 underwent mechanical AVR). Propensity adjusted comparison of long-term outcomes was performed. Patients receiving the Ross procedure were younger, more likely to have a congenital cause and less likely to have a rheumatic or connective tissue disorder. They had a lower frequency of regurgitation, required more annular enlargement and had less concomitant cardiac surgery.

Results from this study showed good outcomes and an acceptable complication rate with both valve choices. Mechanical valves were associated with constant-phase mortality. Given the significantly increased risk of early and late death in younger children receiving smaller mechanical valves, the Ross procedure confers a survival advantage in this age group at the expense of increased reoperation risk, especially in patients with rheumatic aetiology. However, it should be noted that patients with rheumatic aetiology of aortic valve disease, particularly those with pure aortic regurgitation and dilated aortic roots, are no longer considered good candidates for the procedure.

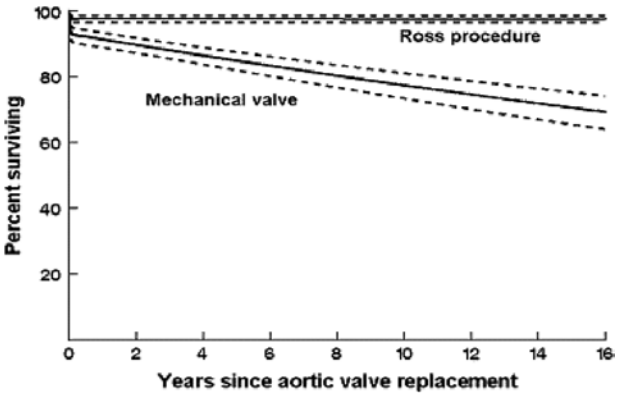

Figure 1. Propensity-adjusted effect of initial aortic valve replacement type (Ross procedure or mechanical prosthesis) on survival without repeated aortic valve reoperation.

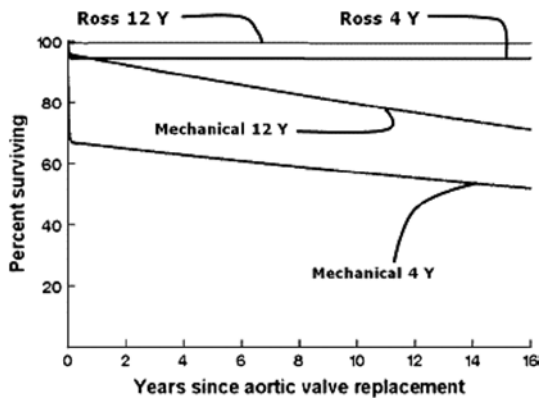

Figure 2. Survival without repeated aortic valve reoperation stratified by age in patients undergoing aortic valve replacement with the Ross procedure versus placement of a mechanical prosthesis.

Congenital – Professional Challenge: Part II / a lifetime living with transposition of the great arteries and left ventricular outflow tract obstruction

The functional status of neo-aortic valve and left ventricular outlet tract after arterial switch operation for transposition of great arteries with left ventricular outlet tract obstruction

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The incidence of left ventricular outlet tract obstruction (LVOTO) of newborn transposition of the great arteries (TGA) ranges from 20% to 33%. LVOTO often occurs in combination with ventricular septum defect (VSD), and a simplex or multifaceted anatomical anomaly can be present. The selection criteria for arterial switch operation (ASO) among patients with TGA and LVOTO according to the type and severity of obstruction remains unknown. The present retrospective study attempted to assess the functional status of neoaortic valve and left ventricular outlet tract (LVOT) after ASO along with surgical relief of LVOTO for patients with TGA and LVOTO.

A total of 42 patients with TGA and LVOTO were identified among the 549 patients who underwent ASO from April 2002 to December 2013 according to following criteria: 1) TGA; 2) simultaneous LVOTO; and 3) ASO performed. LVOTO was confirmed by two-dimensional and Doppler ultrasound as follows: any anatomical anomaly leading to obstruction from outlet tract to pulmonary valve; and a peak pressure gradient through the LVOT >10 mmHg. The median age and body weight at operation were 12 months (range, 7 days–96 months) and 6.5 kg (range, 3.5–2 kg). The median pressure gradient of all patients was 37.2 mmHg (range, 12.1–70.6 mmHg).

All the patients accepted ASO with moderate hypothermic cardiopulmonary bypass. According to the type of abnormality of the LVOT detected via a pulmonary incision, a surgical strategy was determined. Doing nothing for isolated thickened pulmonary valve was advised. Commissurotomy was required for commissural fusion of PV. Resection of ridge and muscle were performed for subpulmonary ridge and muscular tissue respectively. Partial resection of the left ventricular outflow septum was required if necessary. Removal of fibromuscular tissue should be adequate for ring-form or tunnel-form stenosis. Accessory mitral valve tissue and non-functional straddling chordate of tricuspid valve could be resected safely, but the contributing chordae of tricuspid valve responsible for LVOTO should be reattached after VSD repair. Reimplantation of coronary arteries and anastomosing of great arteries were conducted routinely. Other combined malformations were corrected simultaneously.

There were two early deaths. Three patients were lost to follow-up and 36 patients completed follow-up, with a median follow-up time of 24 months (range, 3–116 months). All surviving patients had satisfactorily perform activities of daily living. Mild and moderate ne-oaortic regurgitation occurred in 11 and two patients, respectively. A reoccurred LVOTO with inner diameter of 6 mm and pressure gradient of 49 mmHg secondary to proliferative sub-neoaortic membrane did not produce any symptom and no measures were taken. One patient who received commissurotomy and resection of subvalvular muscle had mild neoaortic stenosis with a pressure gradient of 46 mmHg and had no symptom and, thus, no further treatment as well. One patient who received reattachment of tricuspid chordae had good function of the tricuspid valve. The median pressure gradient across LVOT after operation was 4 mmHg (range, 2–49 mmHg). The difference between preoperative and postoperative pressure gradient had statistical significance, with a Z value of -5.153 using Wilcoxon sign rank tests. The pressure gradient outcome for each patient is shown in Figure 1. We defined death, a pressure gradient from left ventricle to neo-aorta of >30 mmHg and moderate or greater neoaortic regurgitation as a cardiac event; the cardiac-event-free survival rate at 1 year and 5 years was 91%±5% and 78%±8%, respectively.

We conclude that the severity of LVOTO would be overestimated by pressure gradient only when left to right shunt on ventricular level exists for patient with TGA and LVOTO. Surgical strategies should be developed based on morphology and pressure gradient. Hypoplastic pulmonary annulus was not a contraindication of ASO. Furthermore, mid- and long-term outcomes can be excellent for the appropriate candidates.

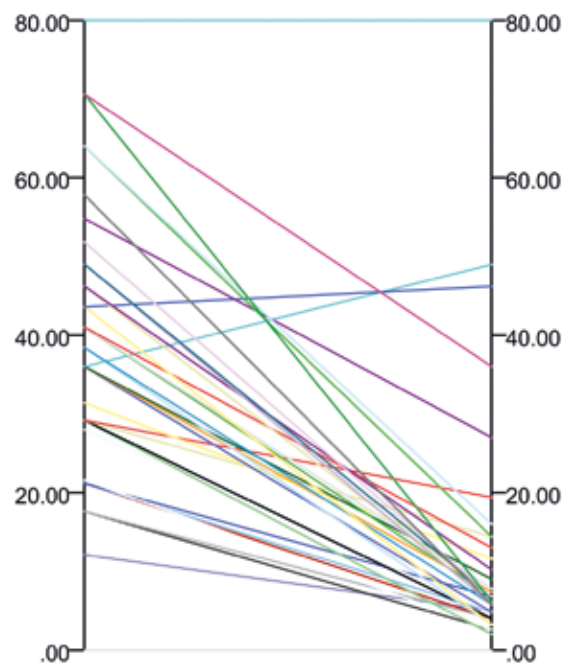

Figure 1. Comparison of pre- and postoperative pressure gradients (mmHg). Pressure gradient increased after operation in two patients.

Vascular – Professional Challenge: Arch involvement in acute aortic dissection: a surgical challenge

EACTS position paper: frozen elephant trunk

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The frozen elephant trunk (FET) technique has been increasingly used to treat complex pathologies of the aortic arch and the descending aorta, but there still is an ongoing discussion in the surgical community about the optimal indications. This position paper represents a common effort of the Vascular Domain of the European Association for Cardio-Thoracic Surgery (EACTS) in collaboration with other surgeons with a particular expertise in aortic surgery, and summarises the current knowledge available on this state of the art technique.

In acute type A aortic dissection, there are two main issues that should be considered when using FET: 1) FET may be an ideal technique to treat complications due to malperfusion, because it helps to expand the true lumen in the proximal part of the descending aorta and thereby closes some of the communication between the lumina at this level; and 2) FET may help to prevent future events (mainly aneurysm formation in the chronically-dissected descending aorta). Visceral and renal malperfusion are frequently associated with an entry tear in the distal aortic arch or the proximal descending aorta. Consequently, replacement of the ascending aorta with a distal anastomosis at the level of the proximal or mid-aortic arch will not re-establish regular antegrade flow conditions to resolve malperfusion due to true lumen compression. To achieve this result, more extensive repair is needed and the FET technique represents an ideal modality to fix the problem.

Preventing post-dissection aneurysm formation is attractive, because secondary surgical repair may be challenging and secondary endovascular repair is not always feasible. In acute type A aortic dissection, the indication to proceed with FET has to balance the risk of a more demanding procedure against the mid-term benefits it may have. In an emergency situation, survival of the patient is the first and most important goal, and a later operation under optimal conditions may carry a lower risk when performed in an experienced aortic centre.

The use of the FET technique is also reported for the treatment of post-dissection aneurysmal formation after type A repair. In this case the following aspects must be considered: 1) the location of the segment with the maximal diameter – the more proximal, the higher the likelihood of effectiveness; 2) the size of the true lumen, which is often very narrowed because there is still a risk for pseudocoarctation after FET implantation. It should be the aim of future investigations to define the minimal size for the true lumen to avoid this complication.

Any type of thoracic aortic aneurysm that otherwise would require a surgical two-step approach may qualify for the FET technique but it remains a strategic choice if primary distal seal is intended or secondary retrograde thoracic endovascular aortic repair (TEVAR) for completion is chosen in order to reduce the potential risk of symptomatic spinal cord injury by priming the collateral network.

Applying the FET technique in other thoracic aortic pathology, such as acute and chronic type B aortic dissection in patients with an inadequate proximal landing zone for primary TEVAR as well as in patients with penetrating atherosclerotic ulcers, may serve as an ideal conceptual approach in fixing these clinical challenges.

Based on the available literature and on the expert consensus opinion of the authors, the following recommendations can be made:

1) The FET technique, or an alternative method to close the primary entry tear, should be considered in patients with acute type A aortic dissection with a primary entry in the distal aortic arch or in the proximal half of the descending aorta, to treat associated malperfusion syndrome or to avoid its postoperative development. Class of recommendation IIa; Level of evidence C.

2) The FET technique may be considered for use in patients undergoing surgery for acute type A aortic dissection to prevent mid-term aneurysmal formation in the downstream aorta. Class of recommendation IIb; Level of evidence C.

3) The FET technique should be considered in patients with complicated acute type B aortic dissection when primary TEVAR is not feasible or the risk of retrograde type A aortic dissection is high. Class of recommendation IIa; Level of evidence C.

4) The FET technique should be considered in patients with extensive thoracic or thoracoabdominal aortic disease when a second procedure, either open surgical or endovascular, in downstream aortic segments can be anticipated. Class of recommendation IIa; Level of evidence C.

In summary, the FET technique has broadened the armamentarium of surgeons to simplify the treatment of complex thoracic aortic pathology. The concept to obtain the most possible complete primary repair and to facilitate any secondary future intervention is effective. However, a trade-off regarding a higher rate of spinal cord injury is a serious problem. Further research will hopefully clarify the mechanisms of symptomatic spinal cord injury and help to reduce its incidence.

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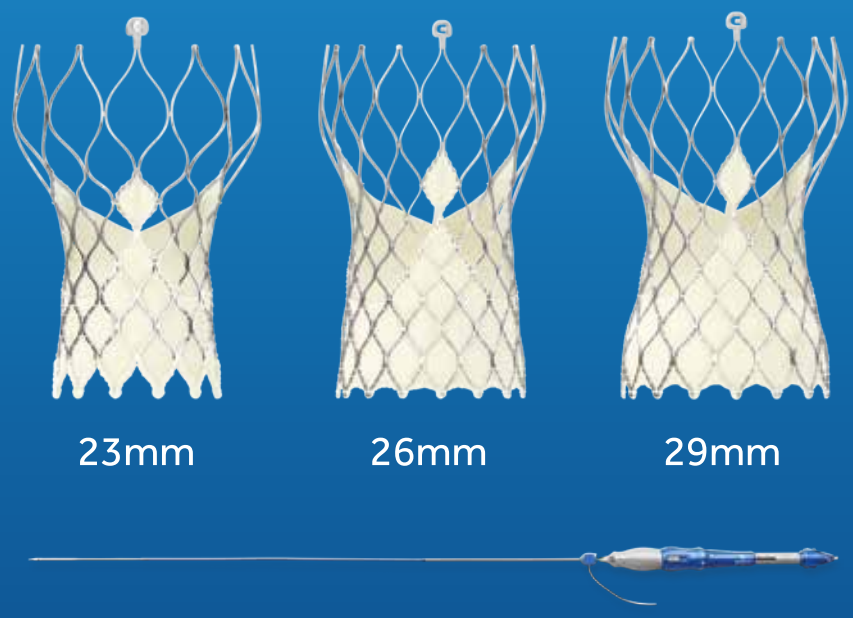

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