The changing requirements of cardiothoracic surgical training

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.
Professional behaviour in the operating room, outcomes

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 non-verbal cues. Body language is important. Imitation, annoyance, frustration are all things that surgeons experience on a regular basis but any ‘facial leak’ transmitting that annoyance, within our control. Our behaviour is clearly evidenced by verbal and non-verbal cues. I prefer to think of debriefing as an after action review. This has been used very successfully by the US Armed forces and civilian 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 cut out, 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.

Acquired von Willebrand syndrome in patients on 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 collage. 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 (WF:RCo) to the overall amount of VWF antigen in plasma (WF:Ag). Likewise, binding to collagen is reflected by the ratio of the collagen binding capacity of VWF (CB:VWF) to WF:Ag. Furthermore, western blotting allows visualization 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 WF:RCo/WF:Ag ratio was found in 192 of 278 (69%) analyses. The WF:CB-WF:Ag ratio was decreased in 224 of 231 (97%) patients. In HMW multimers were reduced or lost in 169 analyses (95%) 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 WF:CB-WF:Ag ratio and WF multimer patterns correspond. However, the WF:RCo/WF: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 useful for mucocutaneous bleedings. WF-centred measures include application of desmopressin acetate to recruit stored WF from endothelial cells and of products containing WF and factor VIII. However, additional WF is subject to protolysis. 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.

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 how we can collaborate.

Peyman Sardari Nia

Cardiac – Rapid Response: Supporting the heart and lung

 Claudia Heilmann
 University of Freiburg Freiburg, Germany

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

Coffee Reception

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Peyman Sardari Nia

Cardiac – Abstract: Cardiac general

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. Is it being 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 civilian 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 cut out, 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.

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

Please call me David

- Thank you working with me today
- Together we are aiming for ZERO defects - we are going to ensure the patient has uneventful recovery and a good experience
- I will listen to your concerns
- I will respect your opinion
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 m²; 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/m² 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
Octoxygenators and extracorporeal life support

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 octoxygenators 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 expensive, 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 it if the patient is okay on the machine but will never recover? How much increased life expectancy warrants ELS therapy? We need sound evidence 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)

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.

Satellite sessions at the 29th EACTS Annual Meeting

**Monday 5 October 2015**

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<td>E106/E107</td>
<td>Does AF ablation also have a role in AVR and CABG patients?</td>
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<td>Edwards Lifesciences</td>
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<td>JOMED Inc</td>
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<td>Integrated management of persistent atrial fibrillation – how, when and why?</td>
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<td>G104/105</td>
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<td>PneuX Life Systems</td>
<td>12.45–14.00</td>
<td>E103</td>
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<td>Synetis</td>
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<td>Thoratec Corporation</td>
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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 and the Chinese mainland is currently recognized as the thoracic centre in the world, more than 200 MIE procedures are currently performed for squamous cell carcinoma 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 mediastinal 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 T1 or T2 stage 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 was different significantly between the two groups (MIE 31.0±18.5, open surgery 20.4±14.8, p=0.0044). 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-vascular lymph node (LNL) site was significantly higher for open surgery than for MIE (80.2% versus 43.9%, p<0.0001), but there were no significant differences at other sites. The LNM rate at the left para-LNL 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-LNL 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.
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 in the 1970s. Increasing concern regarding the long-term complications of ASO, led to increasing efforts to achieve anatomic correction.

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 Jäkkinen, AEPC President, and the heads of the EACTS Guidelines Committee, Piphi Kohl 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. Process, 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 guidelines 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.

Transposition of the great arteries

George Santos
Athens Heart Surgery Institute, Neo Children’s Hospital
Athens, Greece

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Experience designs performance.

CROWN PRT is the latest advancement in stented aortic bioprosthesis technology, featuring surgeon-friendly design, optimal hemodynamics and the patented Phospholipid Reduction Treatment (PRT) to bolster durability through mitigation of calcium uptake. It offers patients with a performing and durable solution without the need of lifelong anticoagulation therapy.

Clinical Data & Early Experience Boost Confidence in Sorin Crown PRT Stented Aortic Bioprosthesis

With the 2014 European launch of the Crown PRT™ (Sorin Group) bioprosthetic aortic valve, a further technological advancement has been made available to the cardiac surgeon community. Having performed the first Crown PRT implants in September 2014 along with Christian Dinges, M.D., I can attest to the valve’s friendly design and state of the art performance. The short rinse time streamlines intraoperative handling and may save on aortic clamp time. The visible commissural markers and smooth sewing cuff facilitate suturing, and the valve adapts exceptionally well to the aortic annulus, ensuring excellent stability. The outer layer bovine pericardium ensures optimized hemodynamics. The patented Phospholipid Reduction Treatment (PRT™) reduces the nucleation sites for calcium deposition – the phospholipids in the pericardial tissue – addressing directly the origin of tissue calcification.

The early clinical experience with the Crown PRT in Salzburg confirms the valve’s ease of implantation and ability to adapt to different anatomic and morphologic conditions along with strong hemodynamic performance and safety.

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 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

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

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 specialties

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.
Surgical Stabilization

Simple. Smart. Solutions.
Assistant™ Attachment with StableSoft™ Technology

Delivers atraumatic positioning and retraction in cardiothoracic procedures traditionally requiring a human hand, such as:

- Cardiac Bypass Graft (on- and off-pump)
- Valve Surgery
- Ablation
- Lung Surgery
- Transmyocardial Revascularization

Endoscopic Vessel Harvesting

Harvesting a new standard of care.

VirtuoSaph® Plus
Endoscopic Vessel Harvesting System

Terumo Cardiovascular Group

Visit Hall 3, Booth# 3.21
Learn about our Endoscopic Vessel Harvesting System – now approved for Radial Artery Harvesting
The ideal material for infected grafts and valves

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 ‘paranerval abscess and extensive annular or aortic wall destruction requiring aortic root replacement/reconstruction or extensive aortic-ventricular discontinuity’ (Class I; 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.

Cardiac – Focus Session: Infectious problems

Fred Wilson

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

The ideal material for infected grafts and valves is 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 sternum bioprosthetic root replacement is a reasonable choice for PVE, especially with complications such as paravalvular extension or, what surgeons commonly term, an aortic root abscess.

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 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 personal preferences. Are you passionate about any specific topic? Are you passionate about a specific methodical search strategy. One simple approach is seeking 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?

Cardiac – Focus Session: Infectious problems

Fred Wilson

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

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

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 ‘paranerval abscess and extensive annular or aortic wall destruction requiring aortic root replacement/reconstruction or extensive aortic-ventricular discontinuity’ (Class I; 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.

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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 cardiovascular 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 specially 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 competences. 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 Management Portfolio 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 it was free for you?

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 outpatient clinic, writing an operative report, or giving a presentation, is the Concise Clinical Academic Skills (CCAS) test. All seven CamMedS 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.

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

Adults with congenital heart diseases: the surgical challenges

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 anaesthesiologists 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 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 6 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 1996 to 2010. The collaboration between regions to create specialty boards, unburdening adults with CHD and improving 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.
Uniportal VATS lobectomy

Diego Gonzalez-Rivera

Uniporal 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 led to widespread use of VATS in thoracic surgery. Since we developed the uniporal 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 applicators for vascular clips, and more narrowed angled 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 change-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 3D 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 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 thoracoscopic 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 we place the camera below the stapler insertion (anterior part) 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 thoracosopic view. A single-needle catheter is placed in the posterior part of the incision.
A COMPLETE AND FLEXIBLE ECMO SOLUTION

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

Paul P Urbanski
Cardiovascular Clinic Bad Neustadt, Paul P Urbanski
Nordrhein-Westfalen, Germany

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 anatomic-pathological presentations. Thus, in acute dissection of Stanford type A and DeBakey type I, 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 localized between the natural barriers mentioned above. Consequently, they can cause two very characteristic anatomic-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 localized 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.

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

S Castelvecchio
Department of Cardiac Surgery, IRCCS Policlinico San Donato, Milan, Italy

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 type A and type B dissection classify the preference 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 mitral and ventricular 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±57 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=0.018), unstable angina (OR=8.8, p=0.018), and diffuse remodelling (OR=6.5, 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 observed with CABG plus MV surgery in previous reports.1,2 Observational data from the STICH hypothesis 1 on survival in the surgical treatment for ischemic heart failure trial. Circulation 2012;125:2639–48.

References
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Left ventricular assist device (LVAD) implantation 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 selected for cardiac transplant due to age and comorbidity, and accepted for long-term LVAD support. The mean interval between SVR and LVAD implantation was 7±5 months.

After installation of extracorporeal circulation, cannulation procedures were performed (amputation of left atrial appendage in five patients and tricuspid valve annuloplasty in four patients). After cardiopulmonary arrest, the LV was opened 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.

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 CVP temperature (mild hypothermia) while performing FET for TAAAD.

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 (DALBP) 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 Humaitas Gavazzeni, Bergamo, Italy, between October 2012 and October 2014 14 patients (mean age, 68±3.9 years) presenting with TAAAD and distal intimal tears were identified. These patients were included in a single-arm, prospective, observational study. The operation was performed in moderate hypothermia at 26ºC 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 Dacron tip was used in the remaining patients, achieving a maximum perfusion flow up to 2.3 L/min. The target flow for DALBP 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 trend 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 II was 0%, and of AKI II 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.
Is there 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

Wyatt Shi, J Tatoulis, AE Nzengui, J Fuller, A Rizkallah 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 compared with the conventional ITA plus vein strategy of revascularisation.1 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 450 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 RAs 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.1 Melbourne is also the site of the group led by Drs Brian Buxton and James Tatoulis who will present their experience of a multidisciplinary approach to CP and endometriosis-related pneumothorax (RCP) at Trial, which compares the patency and clinical outcomes of the ITA, RA and SV.

References

Thoracic – Abstract: Non-angiology II

Multidisciplinary approach of catamenial and endometriosis-related pneumothorax

Paola Ciricio, Alessandro Bandiera, Angelo Carretta, Giusto Melloni, Giampaolo Negri, Massimo Candelari*, Piero Zeniti
Department of Thoracic Surgery and Department of Obstetrics and Gynecology*, Scientific Institute and University Vita Galathea Hospital San Raffaele, Milan, Italy

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 (TES) syndrome. 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 clinical 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 endometriotic 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. Preperitoneal endometriosis was diagnosed in six patients; five patients underwent 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 combination. 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 manner. Thoracic and abdominal surgery can be performed simultaneously or in a staged manner.

References

Cardiac – Abstract: Endocarditis: a continuous dilemma

Song Bing, Liang Fu-xiang, Liu Rui-sheng
The First Hospital of Jilin University, Changchun, China

Despite the significant 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.
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Long coronary anastomosis provides better haemodynamics in coronary artery bypass grafting

In the present study, we compared the haemodynamic properties between two lengths of coronary anastomosis: 4 mm and 10 mm. These findings support the use of 10 mm anastomosis, which provided better graft patency and long-term outcomes compared to the 4 mm model. 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 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, provided for better graft patency and 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.
Why sternal closures need external support

Sternal wound infections (SWI) have an incidence of 3.51% during hospitalization, however at 90 days follow-up it ranges from 0.5 to 9%, and from 0.3 to 7.3% for deep sternal wound infections (DSWI) which has mortality rate between 9% and 47%. [16-17,26,32-33,42,46,75,81]

Sternal instability and friction between the sternal halves promote inflammation, effusion and infection. These seem to be good reasons to complement an optimum internal sternal closure with preventive support from the outside. External chest devices that give constant support have been shown to reduce the percentage of DSWI by a factor of more than six (3.9% to 4.9% reduced to 0.6%). [75,81-86]

Worrisomely, most sternal wound infections are discovered after discharge (50% of SWI and 80% of DSWI) which trigger the question why? Is it due to ineffective sternal stabilization and protection at home after discharge? Are patients instructed clearly enough how to protect their sternal wound? Do they conform with instructions, and if not, why? Do they have effective, comfortable means available which they want to use for 6–8 weeks until their sternum has healed?

Obese patients and women have a significantly higher risk of sternal infections. The odds ratio (OR) for SWI in obese patients is directly proportional to the degree of obesity and ranges from 1.3 to 6.5. However, women with a breast cup larger than size D are at much higher risk with an OR of 38.5 for developing DSWI and the risk increases with breast size. [26,29,46,64,86]

The weight of breast tissue generates a significant pulling force on the sternal wound suture line, and besides the significantly higher risk for DSWI, there are 47% of women who report incision or breast pain up to 12 months after surgery. These seem to be compelling reasons to prevent pulling forces on the sternal wound and to keep it free from breast tissue to avoid heat and moisture production and risk of infection. [44,46,76] One case of DSWI adds 18–20 days to the length of hospital stay and costs more than € 50,000. This is roughly 3 times the cost of a CABG without complications, and could most likely be avoided by using an efficient external chest and breast support. [20,22-23,27,31-33,48,81]

In other words, protecting the sternum closure from the outside with a constant stabilizing chest and breast support is essential to reduce sternal wound infections and other complications, and the small investment is easily returned.

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References: Go to www.qualiteam.com for the complete list of references and detailed descriptions in the white paper publication, “Evaluation of External Chest Supports Based on the Entire Recovery Process in and out of the Hospital to Avoid Offset Costs of Long Term Complications and Medications”
Cardiac – Abstract: Left ventricle – strategies in left ventricular moderations

In this study, we have developed a method to prepare a 3D model of the left ventricle for use in simulators for minimally invasive cardiac surgery. The left ventricle model was constructed using computer-aided design (CAD) software and 3D printing technology. The model was then tested in a simulated surgical setting to evaluate its usefulness for training purposes.

Simulators for minimally invasive cardiac surgery

Simulators for minimally invasive cardiac surgery (MICS) have become an important tool for training surgeons and preparing them for real procedures. These simulators provide a safe environment for surgeons to practice their skills and improve their technique. In this study, we developed a new simulator for MICS procedures that includes a 3D model of the left ventricle.

Methods

The left ventricle model was constructed using CAD software and 3D printing technology. The model was then tested in a simulated surgical setting to evaluate its usefulness for training purposes.

Results

The left ventricle model was found to be a useful tool for training surgeons in MICS procedures. It provided a realistic simulation of the surgical environment and allowed surgeons to practice and refine their skills.

Conclusion

The left ventricle model developed in this study can be a valuable tool for training surgeons in MICS procedures. It provides a realistic simulation of the surgical environment and allows surgeons to practice and refine their skills.
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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?

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 degradation.

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(RR) – 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(RR), 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/cm²) and AR-TAV (7.4±8.8 dyn/cm²). However, it was significantly elevated in the aortic stenosis groups, being highest in the AS-BAV(RR) group (MWSS=37.1±4.0 dyn/cm²), compared with 27.3±1.0 dyn/cm² for AS-BAV(RL) and 35.0±20.1 dyn/cm² 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(RR) 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.
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 occur 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 centers 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 centers. 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.

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¹ Schmitto, J. Long-term support of patients receiving an LVAD for advanced heart failure: follow-up analysis of the registry to evaluate the HeartWare left ventricular assist system (The ReVOLVE Registry), presentation at ISHLT, April 16, 2015, Nice, France.
² Aaronson K. et al. Patients awaiting heart transplantation on HeartWare Ventricular Assist Device support for greater than two years. AHA Poster 2014.
Surgical management of aortic root in type A acute aortic dissection: a propensity-score analysis

Sebastiano Caversanti 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 suprarenal aortic 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-dilatation. However, the short-term risks associated with a more radical intervention are increased. Between March 1999 and December 2014, 296 patients underwent surgery for TAAAD at Sant’Orsola-Malpighi Hospital, Bologna, Italy, 177 (69.8%) 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 risk of root replacement didn’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.

<table>
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<tr>
<th>Risk-adjustment method for hospital and follow-up mortality (RR versus CR)</th>
<th>p</th>
<th>Odds ratio</th>
<th>95% CI</th>
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<td>Hospital mortality</td>
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<tr>
<td>Unadjusted</td>
<td>0.983</td>
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<td>Standard logistic regression</td>
<td>0.166</td>
<td>0.514</td>
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<td>Propensity-adjusted logistic regression</td>
<td>0.571</td>
<td>1.213</td>
<td>0.622–2.388</td>
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<td>Follow-up mortality</td>
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<tr>
<td>Unadjusted</td>
<td>0.700</td>
<td>0.800</td>
<td>0.387–1.779</td>
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<tr>
<td>Standard logistic regression</td>
<td>0.453</td>
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<tr>
<td>Propensity-adjusted logistic regression</td>
<td>0.907</td>
<td>0.962</td>
<td>0.418–2.167</td>
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</table>

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.
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**Sunday 4 October**

**Professional Challenge**

08:15 Challenges in mitral valve repair Auditorium

**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 at the great arteries and pulmonary 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 obstruction – part I G106+G107

10:15 A lifetime living with transposition of the great arteries – part I G106+G107

10:15 A lifetime living with transposition of the great arteries – part II G106+G107

14:15 Mediastinum E108

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: peroperative 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
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<td>11:50</td>
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<tr>
<td>10:15</td>
<td>Residents Session</td>
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<td>12:45</td>
<td>Cardiac surgery residents – where do we come from and are we heading</td>
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<td>Endoscopic port access mitral valve repair</td>
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<td>10:15</td>
<td>All you need to know for your next research project – part I</td>
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<td>14:15</td>
<td>All you need to know for your next research project – part II</td>
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<td>How to statistically analyse your next research project</td>
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<td><strong>Advanced Techniques</strong></td>
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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 the mentorship process, including preoperative and operative decision making, transferrable 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

Pye Min 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 some drawbacks, such as residual aortic regurgitation, high incidence of heart block and uncertain long-term management of longitudinal aortic stenosis. 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% (3.0–68.2%). Preoperative comorbidities included stroke history (8%), chronic renal failure (22%), atrial fibrillation (22%), New York Heart Association (NYHA) III or IV (28%) and intravenous inotropes (19%). Non-contrast and/or contrast computed tomography including aortic arch was performed in all patients. As we preferred arterial cannulation on all ascending aorta or arch aortic arch sites, careful evaluation of 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 preoperative and operative decision making, transferrable 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.

**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 traditional incision 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 branched 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 spiral cord complications among the survivors, and the hospital mortality rate was 4.3% (2/47). Two of these 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.

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

Shared Massa 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 the mentorship process, including preoperative and operative decision making, transferrable 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.

**Mentoring new surgeons: can we avoid the learning curve?**
Blood flow analysis of aortic arch using computational fluid dynamics

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 cerebral circulation 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.

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**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
- A Bogers, Rotterdam, Holland
- C Hart, Sankt Augustin, Germany
- M Hazekamp, Leiden, Holland
- V Hraska, Sankt Augustin, Germany
- J Janousek, Prague, Czech Republic
- GJ Krings, Utrecht, Holland
- M Kostolny, London, UK
- JE Mayer, Boston, USA
- R Prêtre, Lausanne, Switzerland
- S Quarshi, London, UK
- E Schindler, Sankt Augustin, Germany
- M Schneider, Sankt Augustin, Germany
- O Stumper, Birmingham, UK
- P Suchoverskyj, Sankt Augustin, Germany
- N Vansen, Koblenz, Germany
- P Zartner, Sankt Augustin, Germany
- 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 prosthesis 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 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.
Open aortic arch surgery in chronic dissection with visceral arteries originating from different lumens. What is the best strategy?

Paul U Urbanski Cardiovascular Clinic Bad Neustadt, BadNeustadt, Germany

Since the establishment of endovascular techniques for surgical treatment of chronic type B aortic dissection became controversial because these techniques is the covering of internal 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 internal 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 are 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 internal 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 development of a true false lumen and 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. 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 unacceptable risk rather than surgical success of the dissection technique.

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 abdominal aortic aneurysm treated performed during this period at the Cardiovascular Clinic in Bad Neustadt. Fourteen patients (82%) who 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, 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.

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

Renaud Babakov/Fenna, 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 myosotomy: 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 value 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 method is for calculating expected end-diastolic volume of the left ventricle using the Teichholz method in patients with left ventricular aneurysm.

Type B aortic dissection became controversial for aortic repair, surgical management of chronic type B aortic dissection with visceral arteries originating from different lumens 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.

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

Our findings demonstrate that both groups were comparable for indications 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 statistically significant in both 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 contributed to the lead to progressive organ failure. In the second 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 catecholamine 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.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Teichholz method (before the operation)</th>
<th>Simpson method (after the operation)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (n=40)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>EDV</td>
<td>180.02±48.5</td>
<td>175.05±41.96</td>
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<td>ESV</td>
<td>105.65±50.81</td>
<td>102.81±41.08</td>
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<td>SV</td>
<td>71.45±12.31</td>
<td>72.24±7.52</td>
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<td>EF</td>
<td>41.10±10.91</td>
<td>43.14±8.32</td>
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<tr>
<td>EDVI</td>
<td>92.36±29</td>
<td>91.17±23.67</td>
<td>0.496</td>
</tr>
<tr>
<td>ESVI</td>
<td>55.21±27.09</td>
<td>53.59±22.45</td>
<td>0.324</td>
</tr>
<tr>
<td>SVI</td>
<td>37.19±47.77</td>
<td>37.57±4.68</td>
<td>0.322</td>
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<tr>
<td>Group 2 (n=24)</td>
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<tr>
<td>EDV</td>
<td>187.43±25.53</td>
<td>162.09±47.75</td>
<td>&lt;0.001</td>
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<tr>
<td>ESV</td>
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<td>111.43±42.65</td>
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<td>SV</td>
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<tr>
<td>EF</td>
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<tr>
<td>EDVI</td>
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<td>83.11±22.34</td>
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<tr>
<td>ESVI</td>
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<td>57.04±22.59</td>
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</tr>
<tr>
<td>SVI</td>
<td>38.19±4.84</td>
<td>25.84±2.26</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

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.

Reference
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
Forty years’ experience with surgical repair of congenital mitral valve stenosis

M Carrozzone, M Padalino, V Vida, C Racca, AC Vrpi, O Milano, G Stella
University of Padua, 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 institute 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. Outcome 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 anatomic 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.

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

Alexander Bogachev-Prokophiev, Ravil Sharifulin, Sergey Zheleznev, Igor Demin, Evgeny Lensko and Alexander Karaskov
Siberian Medical University, Novosibirsk, Russia

The Ross procedure is an attractive alternative to mechanical prostheses 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 90±1.1% and 90±1.1%, 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.

The 10-year freedom from xenograft reoperation rates in patients >60 years (n=111), <50 years (n=202) and 50–59 years (n=248). Ninety-one percent of patients who underwent Ross repair had no complications; 9.1% had complications; and 1.7% died. The overall freedom from Ross failure (HR, 3.4; 95% CI 1.3–9.6; p<0.001) was 94±1.1% and 88±3.2% 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 1.3–9.6; p<0.001) (Figure 1). The overall freedom from Ross failure rates were 95±1.1% and 83±5.1% at 5 and 10 years, respectively. The 10-year freedom from autograft failures for allograft, depeoxide- and glutaraldehyde-treated pericardial xenografts, and porcine aortic root grafts were 100%, 94±3.0%, 82±3.5%, and 80±6.9%, 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=0.08) and 92±2.4±7 (p=0.1), respectively (Figure 2).

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

Akibiro 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 presence of 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 (r=0.505, p=0.006) and inversely correlated with the post/preoperative AChRAB ratio (r=−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.
AtriCure Inc. (West Chester, Ohio, USA) recently obtained CE mark for its cryoFORM™ cryoablation device. The cryoFORM device is operated using the cryoICE™ system and is indicated for the cryosurgical treatment of cardiac arrhythmias. The cryoFORM device offers a new, fully flexible and formable probe that can be shaped to handle some of the most challenging lesions. It allows surgeons to more easily perform conventional and minimally invasive surgical ablation.

The cryoFORM™ device offers the same feature of the cryoICE™ system that cardiac surgeons now rely on. The cryoICE™ Active Defrost technology allows for short procedure times and more reliable lesions as lesions are able to thaw more gradually. The cryoICE™ system utilizes N₂O coolant gas with its large capacity for heat transfer ensuring a uniform lesion that penetrates deep into the cardiac tissue. A recent study (“Freezing equals freezing: performance of two cryoaablation devices in concomitant mitral valve repair”; Thorac Cardiovasc Surg. 2015; Goette J., Weimar T., Vosseler M., Raab M., Walle U., Czesla M., Doll N. - Article In Press), demonstrated that the cryoICE™ system outperforms its competitors and results in a higher percentage of patients in sinus rhythm in the short and long term. The cryoICE™ system operation is intuitive and features a “one-push” button which automatically performs the appropriate sequence of ablation, defrosting and venting.

With the addition of cryoFORM™ to the existing CRYO2 and CRYO3 (US) devices, Atriecure now provides a full set of options tailored to the needs of various cardiac procedures. Visit Atriecure’s Booth # 2.50 to learn more about the new cryoFORM™ cryo ablation device as well as our other AF ablation solutions. You may also want to join us at Atriecure’s Lunch Symposiums “Does AF ablation also have a role in AVR and CABG patients” on Monday, October 5th, chaired by Dr. James Cox of the US and “Integrated management of persistent AF- how, when & why” on Tuesday, October 6th, chaired by Prof. Revishvilli of Moscow, Russia and Prof. Crijns of Maastricht, The Netherlands.

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

For more information please visit our web site: www.atricure.com.
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 85.7%; DVR 84.3%) (Figure 1). Freedom from thromboembolic events was 89.1% (AVR 85.6%; DVR 83.3%) from bleeding events, 93.5% (AVR 95.6%; MVR 93.6%), and from reoperation, 96% (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.

References

Thoraflex™ Hybrid combines the benefits of the “Frozen Elephant Trunk” (FET) procedure with the Gelweave™ Siena Plexus graft to substantially increase options available to the surgeon in the treatment of complex and diverse aortic arch disease. Indicated to treat patients with aneurysm and/or dissection in the ascending thoracic aorta, aortic arch and descending thoracic aorta, Thoraflex™ Hybrid consists of a proximal multi-branch aortic arch Gelweave™ Siena Plexus graft pre-sewn to a distal stent graft. The Gelweave™ material is made from woven polyester sealed with gelatin. The Gelweave™ Siena Plexus graft, designed for fast separate arch vessel reconstruction and arterial cannulation, has been demonstrated to reduce ischaemia times, time to rewarming and overall operating times.

The multiple independent ring stents of the distal stent graft allow excellent anatomical conformability, as they allow it to be shaped to cater for varying patient anatomies; radiopaque markers aid in vivo visualisation to confirm accurate deployment. The compact intuitive delivery system is designed to provide controlled, accurate deployment. The Gelweave™ Siena collar at the junction between the aortic arch Plexus™ graft and distal stent graft facilitates the anastomosis. The FET technique is an evolution of the classical ET technique making the single-stage treatment of complex and diffuse diseases of the thoracic aorta possible. In future, the FET procedure will be applied to even more complicated cases. In patients with acute dissection the FET technique will positively affect the prognosis. For more information on Thoraflex™ Hybrid, please visit the Vascutek booth, no. 3.21. Thoraflex™ Hybrid will be presented at Vascutek’s Symposium on Monday 5th October 2015, 12.45 – 14.00hrs in G106/107.

Product availability subject to local regulatory approval. For further details, go to www.vascutek.com/thoraflex-hybrid
The world’s FIRST Frozen Elephant Trunk Device with aortic Arch Plexus

References:
1. Clinical Investigational Report
2. Design history file 036.
Efficacy of multiple arterial coronary bypass grafts for diabetic patients

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

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

Cardiac – Abstract: The two faces of arterial revascularisation

Thoracic – Abstract: Thoracic oncology II: perioperative management

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

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 Futami, Shingo Kashihara, Yasuo Shiga, Takahiro Hasegawa, Kengo Baba, Sho-ichiro Okada, Shunsuke Kadowaki, Seiji Yokoyama, Chihito Miyazato
Osaka University Hospital, Osaka, 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 Osaka University Hospital, 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 outflow tract reconstruction is proposed as a definitive repair.

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 27 (7.4%) patients, and 50 (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.2,3 In our study, although the selection criteria for sublobar resection were highly dependent on the decisions of individual surgeons, 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
2. Berry et al. ATS 2015.

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

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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. Proportional 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.
**2015 COURSES**

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<td>Endoscopic port-access mitral valve repair drylab training using high-fidelity simulators</td>
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All courses to take place at EACTS House in Windsor, UK, unless stated otherwise.

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

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 study at the Toronto General Heart Transplant (HTx) everolimus (EVE) de novo trial with early calcineurin (CNI) avoidance (SCHEDULE) study protocol, and re-assessed retrospectively by two independent reviewers. Events were divided between EVE with CyA withdrawal and EVE with CyA + MMF + CsA. 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 the only risk factor for surgical complications regarding wound complications (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.

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

Cardiac – Abstract: Heart transplantation in the modern era

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

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

Roberto Di Bartolomeo 1 1Cardiothoracic Surgery and Transplant Research Center, Emam Reza Hospitals, Mashhad, Iran

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 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, which allows one-stage replacement of the thoracic aorta.

In type A chronic 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

Figure 1. NSCLC after exposure of the lung and Injection of the tracer in the peri-tumoural area.
Having your cake and eating it too

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

Everywhere know that 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 sternal irrigation, vancomycin paste on sternal marrow, iodine-impregnated skin drapes, chlorhexidine-alcohol skin preparation, more off-pump surgery and aseptic wound care. 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 (l.kieser@ru.nl), 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.

3. Control blood sugar before and after the operation.

4. Avoid using BIMA in just the obese female subgroup of diabetics.

Adopting these four strategies should halve your rate of DSWI.

Date: Monday 5 October

Time: 12.65-14.00

Venue: Amsterdam RAI Convention and Exhibition Center

Room G320/323

Chair: Prof Lange (Munich, Germany)

Co-chair: Prof Maisano (Zürich, Switzerland)

Agenda

Is severe PPM an endangered species? Trifecta™ valve hemodynamic performances during exercise on young patients cohort. – Dr Oes (Bordeaux, France)

Seven-year experience with Trifecta™ valve: Mid-term durability results from two large heart centers

- Munich Heart Centre: An experience with Trifecta™ valve over time – Prof Lange

- Leipzig Heart Centre: Seven-year experience with Trifecta™ valve on a 1000 patients cohort – Dr Lehman (Leipzig, Germany)

Portico™ valve program: How repositionable delivery devices delivers optimal outcomes – Prof Maisano

Reference


Figure 1. 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 arrow is right handed.

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 intraventricular 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.

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

CARDIAC – ABSTRACT: THE TWO FACES OF ARTERIAL REVASCULARISATION

Cardiac – Focus Session: Avoiding disasters in cardiac surgery

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

Cardiac – Abstract: The two faces of arterial revascularisation

Teresa Al-Mosawi 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, consequently 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.

Please note that St. Jude Medical adheres to both the Amedisys Code of Ethics for Interactions with Healthcare Professionals and the ECMA/ESC Code of Business Practices. As such, we cannot provide meals for spouses or guests of attendees. Customers, potential customers and respective associates and agents hired to provide medical, country-specific transparency laws may require St. Jude Medical to disclose the amount of value transferred to boned physicians, nurses and other professionals, as such, St. Jude Medical may be required to disclose the value of meals and drinks provided in relation to the educational training program to relevant governmental agencies. Unless otherwise noted, ™ indicates that the name is a trademark of, or licensed to, St. Jude Medical or one of its subsidiaries. ST. JUDE MEDICAL and the nine-squares symbol are trademarks and service marks of St. Jude Medical, Inc. and its related companies. © 2015 St. Jude Medical, Inc. All Rights Reserved. E-MACTS-0815-0003. Item approved for international use only.

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Cardiac – Abstract: The two faces of arterial revascularisation

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4. Avoid using BIMA in just the obese female subgroup of diabetics.

Adopting these four strategies should halve your rate of DSWI.

Reference


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

Marijke Molhoek, 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, 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.9 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.4,5 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.8,9 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

Congenital – Abstract: Fontan circulation

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

Maasamchi Ono, Alfred Hager, Julie Cleuziou, Jelena Kasnar-Sampere, Melchior Born, Constantin Langerbach, Alessia Callegari, Martina Strbad, Manfred Vogt, Christian Schneider, Rüdiger Langer

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 observed in 360 patients (86.7%), 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 functional ectopic tachycardia in 1 patient. Freedom from tachyarrhythmia at 15 years was 91.0% (85.9% in LT and 91.8% in EC, p=0.81). Other late morbidities included bronchial asthma in 17 patients, protein losing enteropathy in 15 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 atioventricular 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 atioventricular 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 (80% versus 75%, p<0.01).

A significant increase of gamma-glutamyl transferase value was observed at 10 and 15 years follow-up (7.4 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, tachyarrhythmias, 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 atioventricular valve regurgitation, especially with tricuspid type atioventricular 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

Ja He and Er-yong Zhang

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 prosthetic implantation were prospectively collected and retrospectively analysed. All 236 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/m² to 119.6±26.5 g/m² (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 LVM 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/m² (OR 6.65; 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 LVMi 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.
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 complications and a shortening of hospital and ICU length of stay (LOS).1

Recently released guidelines from The American Society of Artificial Organs (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 INSPIREM™ 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
Impaired pulmonary function is an additional potential mechanism for the reduction of functional capacity in clinically stable Fontan patients

Cardiac – Abstract: Basic science 1

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

Wenhui Wang, Zhitong Wu, Zhihang Gao, Jiachang Li, Yi Huang, Xiangmin Guo, et al.

Hydrogen sulfide (H₂S) has attracted increasing attention in recent years due to its clinical potential as an endogenous agent of oxidative stress. The lack of an ideal H₂S 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 ischemia-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 H₂S from DATS-MSN. Taken together, these results suggested that DATS-MSN can mimic the biological function of endogenous H₂S.

Figure 1. The time-course for H₂S release in complete medium measured by an H₂S-selective microelectrode.

Figure 2. In vitro uptake of FITC-conjugated DATS-MSN by ECs. The ECs and MSN-FITC were detected using confocal microscopy, respectively. The images were merged in Kyoto (Japan).
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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 is important to acknowledge that it is a multidisciplinary project. The end product is 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.

Methods

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 leprosy, dilating cardiomyopathy 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 this we use flight training as a parallel, and have a fair 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 resources, registrars cannot afford to lose 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 rotation 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.

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

Caroline Springe 
Columbia University Hospital, Columbia, Ky.

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 increased to over 70 years. Consequently the gap between organ supply and demand has increased. Over 30% of the candidates for heart transplantation is a prerequisite, with knowledge and experience in all the available treatment options being open, endovascular, or hybrid is a prerequisite.

In many catheter-based procedures, femoral access is needed in addition to a transfemoral TAVI live case. One of the presentations is entitled ‘transfemoral arterial 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 (subcutaneous) 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 location to enter the CFA, although no approach is foolproof. In absence of palpable 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 arterial puncture.
In this newsletter...

1. International progress, increase in the number of participating centres
2. Development of the benchmarking tool
3. Engagement procedure for individual centres
4. The QUIP Adult Cardiac Database Charter
5. Project organisation

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.

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 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 participants’ 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 participants to submit data to the ACD. In particular:
   • data collection activities, data optimisation and data protection
   • assisting participants 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 – Abstract: Future of sutureless valves

Erik Beckmann
Hannover Medical School, Hannover, Germany

Endovascular repair of thoracic aortic 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 periprocedural aortic-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 workflow 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 is to educate and help physicians perform TEVAR. It can be found in the App Store by searching for ‘TEVAR App’.
Aortic and mitral deteriorated bioprostheses

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, 86.5% of all isolated SAVRs were performed using biological prostheses 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, 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. 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). 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
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 1969) 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 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 mortality 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.

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

Yi Cheng
Pediatric Cardiovascular Institute, Fu Wai Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, People’s Republic of China

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

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) LVOTO of newborn transposition of the great arteries ranging from 20% to 33%; 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 outflow tract, 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 performed activities of daily living. Mild and moderate neo-aortic 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±6% and 78±8%, respectively. We conclude that the severity of LVOTO would be overstated 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.
EACTS position paper: frozen elephant trunk

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 aneurysm 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 pseudoacoarctation after FET implantation. It should be an 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 pathologies, 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 ulcer, 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 IIIa; 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 aneurysm 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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