From knowledge to wisdom

The Presidential Address of the 31st EACTS Annual Meeting in Vienna took place on Monday afternoon, with EACTS President Miguel Sousa Uva stepping up to the podium to deliver a fascinating exploration of the pressing needs and ongoing goals essential to transform ‘knowledge into wisdom’.

After a kind introduction by Domenico Pagano and Jose Pomar, Professor Sousa Uva opened his Address by paying tribute to his mentors, his family and his colleagues, underlining their importance in helping him reach his professional goals throughout the years. Diving into his lecture, he began: “Today, cardiothoracic surgery is at a crossroads. The world is changing at an incredible pace.”

The core messages of his presentation were two-fold. First, he emphasised the importance of percutaneous techniques, noting how essential it will be for cardiothoracic surgeons to add catheter skills to their armamentarium. Second, he reasoned that we should focus due time and effort into effective decision-making.

Professor Sousa Uva commented that, faced with increased information, cardiothoracic surgeons need to use reason to select what we should learn, as well as working to better structure information into knowledge. This, as the title of his presentation suggests, is important in integrating experience and knowledge to achieve wisdom or clinical expertise in decision-making (Figure 1).

And this wisdom includes patient preference which, as Professor Sousa Uva put it, can carry a strong message of its own. “Let’s face it, patients don’t want surgery!” he said. “They come to you with an already very clear idea of how they want their aortic valve stenosis fixed. ‘I want just a small puncture here’, they say, pointing to the groin.”

As he exemplified (Figure 2), patient decision-led TAVI has increased from 21% to 35% between 2013 and 2015, hammering home the importance for surgeons to acquire the skills that facilitate treatment. This way, they will know both avenues of treatment, and can give advice to the patient from a position of wisdom.

“Decision-making in medicine has become increasingly complex,” he continued. “In the future we will certainly need the help of machine-learning and algorithms. However, clinical thinking will remain crucial.”

He added: “Medicine is a science of uncertainty, and an art of probability.”

Professor Sousa Uva underlined that, since its birth 31-years ago, EACTS has been at the forefront of technical and conceptual knowledge dissemination in Europe and beyond. Initiatives such as those birthed by EACTS are essential in supporting education as we move forward. Whether that is with databases/registries, trial units, initiatives such as the Francis Fontan Fund or other methods, this can lead to more pragmatic trials, evidence reports and, ultimately, better education as a whole.

“If surgeons wish to remain in control of their own future, the time has become to reflect on the current challenges to our profession, and find firm responses, while keeping the patient in mind,” he said, adding: “Surgeons need to continuously adapt, and include in their curricula new training of endovascular skills in order to encourage less-invasive treatments and respond to patients’ wishes to avoid operation.

“Secondly, literacy in data analysis, critical thinking, mindfulness of uncertainty, and the development of empathy of patients – and openness to their preferences – are at the heart of decision-making, and should be incorporated into surgical education. Cardiothoracic surgery has great potential, if we adapt, while keeping our eyes wide open, and focus on a patient’s best interests. Our community, both individually and collectively, must embrace lifelong learning and allow time for reflection if it wants to achieve the wisdom required to help our patients.”

Figure 1

Figure 2
Mechanical circulatory support – state of the art

Jan Gummert (Clinic for Thoracic and Cardiovascular Surgery, Heart and Diabetes Center NRW, Bad Oeynhausen) presented the state of the art in percutaneous ventricular assist devices (VAD) on Sunday afternoon, during a session focussing on mechanical circulatory support.

VADs have seen increasing usage in the face of growing organ shortages, as well as presenting a destination therapy in itself for patients with end-stage heart failure. Dr Gummert discussed percutaneous options in mechanical circulatory support. He began with the intra-aortic balloon pump, noting that despite recent negative data the device remains an “excellent” option in post-cardiotomy patients.

On the topic of centrifugal pumps such as the Impella devices (Abiomed, Danvers, MA, USA), he continued: “What we want to avoid is hypoperfusion and the necessity to give a lot of vasopressors. Unfortunately those are the patients we will see when we come to a remote centre and they are stabilised with vasopressors. Yes they maintain blood pressure, but this is the result. This is a burden for the therapeutic options: maybe you can save their lives, but usually they lose their lower limbs.”

Dr Gummert also spoke of extra-corporeal membrane oxygenation (ECMO) “as the lifesaver as well as in our centre, in post-cardiectomy patients you will get over 25% survival. Of course this depends on the (patient) selection. In our centre, we still would put an 80-year-old patient on ECMO at least for several days to allow them to recover. Of course you can discuss this in terms of economic and other issues. But we have the feeling that, if you can still save 25% of the patients, it may be justified.”

Continuing to discuss the advantages of ECMO, Dr Gummert noted its rapid deployment, suitability for resuscitation, and reliable performance. Its disadvantages lie in the fact that it is not a true VAD, that there is no storage of the LV as well as increased afterload and (as yet) no standard weaning protocol.

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The questions are: when to say no, the need for definition of non-salvageable patients, and best practice to monitor and wean,” he summarised. “When to say no is a big issue. If you have a 10% chance of survival, would you deny a 20-year-old patient this chance? Probably not, but if it’s an 80-year-old patient - we don’t know. How you decide depends on your local situation, economic and other issues. But it is difficult.”

Presenting an interesting angle on data presentation, he continued: “If you want to have a better outcome, that can mean that you deny patients who have a chance to survive this form of therapy. Of course when you show slides at a meeting like this, with 90% survival after ECMO therapy, if you have proper patient selection that is no issue. But it is not about denying patients proper treatment. You have to keep in mind that you can easily destroy a method like this if the overall outcome is poor; then healthcare politicians say ‘we shouldn’t do this’, because the outcome is so poor. So there is a balance here in how to deal with this situation.

Moving on to stasis of the LV in ECMO, Dr Gummert questioned how best we can deal with issues such as thrombus formation and high risk of strokes, proposing that the only solution be an totally artificial heart, allowing thrombus removal from the ventricle. “One solution could be the TandemHeart [Cardiac Assist, Inc.], because you drain the left atrium with a cannula introduced through the septum. It is a very complex manoeuvre in the context of resuscitation.”

Offering an alternative solution, he spoke of unloading the LV using an Impella device, while perfusing lower limbs. “So far, we have some good results with this kind of therapy. We start to use it more often, and earlier, so our results are actually getting better. It is always the same issue - you start it only in patients you have more-or-less lost, and now we start to use it more frequently.”

On the topic of implantable devices, Dr Gummert quoted the ESC guideline definition of patients suitable for LVADs. Included those dependoent on LVotropic therapy; those with more than three hospitalisations; and those with progress of end-organ dysfunction. “You all know this,” he added, “And its cutoff is sometimes difficult to decide.”

Regarding the use of LVAD as bridge to transplantation, he noted a paradoxical situation that patients may find themselves in if not properly informed. “The trouble is that the bridge to transplant option is not really a reliable option. In countries with organ shortage, you have a 1% chance per year to get a transplant on the elective waiting list. That means if you have a LVAD implanted, and you don’t have serious complications justifying high urgency status, this will be forever. You have to be honest with your patients that it is a destination therapy. There is a slim chance to get transplanted, but it is low.”

He went on to evaluate long-term outcomes from a number of different trials, summarising that while LVADs have improved over the past ten years, survival remains poor after 5 to 7 years.

Discussing survival data in mechanical circulatory support, he continued: “In the patient group 19-50 years, after five years you have a survival of almost 60%. So it’s really getting better, close to transplantation. In the older patients it is not really that good. The reason why our results are like this is that we still try to transplant as many patients as possible. We still do 85 transplants per year. Our strategy is that we would rather keep a patient on inotropes for a month in order to allow them to be transplanted. Of course you can discuss whether this is justified or not.”

Despite continuous progress, the field, he said, remains “a pig”, with many difficult complications persisting. He noted that 40% - 60% of patients have an unplanned readmission after LVAD implantation. “The top challenges, he said, are the blood-pump interface, right heart failure, neurological complications, GI bleeding, infection, device-related complications, quality of life, palliative care. ‘Right heart failure is an issue. [We can give] temporary support with centrifugal pumps; the disadvantage is that you cannot mobilise those patients.’

Other options to address right heart failure, he added, include the HeartWare and HeartMate devices. “This is very expensive, and sometimes it is not possible to avoid this nasty complication; the more mobile the patients are, the more often you have this kind of problem. ‘GI bleeding is another issue, and in the Momentum trial... with the HeartMate III, there were no confirmed pump thromboses in this cohort. But the stroke rate was not significantly different from the HeartMate II. So we will have to stay cold.”

Summarising the needs in VAD therapy, Dr Gummert concluded: “Implantable, biventricular support, transcutaneous energy transmission - those would be great - and disruptive technology for the pumping mechanism to reduce the risk of end-organ damage, and should be implemented as soon as possible in specialised centres.”

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Are all pumps the same?

A new retrospective study comparing the HeartMate3 and HeartWare HVAD pumps in advanced heart failure patients has come up with some very unexpected results, reveals Evgenij V. Potapov, a cardiac surgeon from DHZBE (German Heart Centre Berlin).

As Dr Potapov described, the Left Ventricular Assist System (LVAS) market is currently dominated by two small, implantable devices – the HeartMate 3 (St Jude Medical, USA) and HeartWare HVAD System (HeartWare, USA). Prior to the launch of HeartMate 3, and with rates of circulatory pump implantation expanding, there were concerns about pump thrombosis cases associated with both the axial continuous flow pump HeartMate 2, and the HeartWare – a centrifugal continuous low pump.

The HeartMate 3 system, approved in Europe at the end of 2015, was the first commercially-approved centrifugal flow LVAS using novel, “fully magnetically levitated” technology, which allows the device’s rotor to be suspended by magnetic forces. It has been engineered to avoid pump thrombosis, with enhanced blood flow and no mechanical bearings or friction.

Results at the first 365+ days for the HeartMate 3 CE mark trial found no pump thrombosis, haemolysis or pump thromboemboli or exchanges at 30 and 180 days. Survival at 30 days was 99%, and 92% at six months. Eighty-three percent of patients were alive at 98%, and 92% at six months.

“Before we prospectively analyze our single centre experience over one year, looking at outcomes and complication profiles in consecutive patients supported for the first time with HeartMate 3 or HVAD, both pumps were implanted – or off-pump, with no differences in the need for post-operative RVAD (20.6 vs 15.1% respectively (p = 0.396), explained Dr Potapov. “The incidence of pre-and intra-pump thrombosis was 0.08 EPPY [events per patient-year] for HeartMate 3, respectively (p = 0.404), while pump exchange was necessary in one case in each group [p = 1]. The incidence of major cerebrovascular events was 0.08 EPPY vs 0.10 EPPY respectively (p = 0.727). The 30-day survival was 81% and 80.4% respectively, and 6 months survival was 68.1% and 68.1% (p = 0.689).”

He continued: “Our data shows similar complication profiles and mid-term survival in patients supported with the two pumps. These results have come as quite a surprise to us as we were expecting the newer device to have better outcomes. Although HeartMate 3 does not produce any pump thrombosis at all – the incidence of other complications makes the survival similar. Therefore, the results still make it difficult for surgeons to choose one device over another.

“But having said that, these are only mid-term results. These results are disappointing in one sense: although there are some improvements in the newer device, it is not really a ‘breakthrough’.

“Perhaps these results are not that surprising, Dr Potapov postulated, given the health of patients receiving the pumps. “These are very sick people, with mortality rates of 10-20% in the first year after implantation. Survival is influenced mainly by their health status,” he said.

What is needed next

Dr Potapov stressed that longer follow-up and a larger dataset will be necessary to find statistical differences between the two pumps. “I will be preparing to take part in a prospective randomised study to compare these two pumps in a larger number of patients,” he said. “In Germany alone, almost a thousand of these pumps are implanted every year. If everyone in Europe agreed to take part in a study now, we could have some results within two years. Then we may have a definitive answer to this question. I think a randomised prospective study of the two devices is now needed.”

References


The Ozaki Valve Neo-Cuspidization (AVNeo) procedure using autologous pericardium

By Prof. Shigeuyki Ozaki

O zaki October 2017

The Ozaki Aortic Valve Neo-Cuspidization (AVNeo) procedure using autologous pericardium is a novel and innovative surgical procedure for the treatment of aortic valve disease, regardless of the age of the patient or the size of annulus. One of the main novelties of this procedure is that a diseased native bicuspid aortic valve (BAV) will be converted into a tricuspid valve for optimal functionality and hemodynamics.

An overview of a bicuspid case is displayed in Figure 1 below and will be described in more detail in the subsequent paragraphs.

A left-right type valve, as shown in case 1, normally will use one of the existing commissures as the reference. This is dependent on the location of coronary arteries in relation to the commissures and two new commissures may be necessary.

In the case of an ant-post type valve, case 2, the reference should be the midpoint of both coronary arteries or the existing commissure becomes the reference point.

Based on the type of valve and reference identified, a new commissure and annulus is drawn and designed with nearly equal distances between the commissures. When equally proportionate cusp sizes are maintained, the cusps will perform and move as a natural and healthy human valve. The process of deciding the position and placement of new commissures is aided by testing and verifying the distance between commissures using the Ozaki AVNeo™Sizer System.

The suturing technique for a native bicuspid valve is the same as a tricuspid valve and it also offers the same design benefits. Suturing the cusps directly onto the annulus enables the annulus to move naturally, preserving natural hemodynamics. Allowing natural annular movement, paired with full range of cusp motion and reduced mechanical stress to the cusps facilitates the reduction of calcification and postoperative pressure gradients. By raising the contact point, the new cusps make the new coaptation zone longer than the native valve. The elongated coaptation zone warrants the minimized postoperative aortic insufficiency.

Anticoagulation is not necessary, as there is no stent or prosthesis left in the circulation system. As reported on the previous page for 102 patients with BAV who were operated with AVNeo, midterm results have been excellent for aortic stenosis/insufficiency cases during the follow up of 5 years at the longest.

Figure 1 – Bicuspid Ozaki AVNeo Overview

Figure 2 – Identifying valve type and deciding the reference point

Identifying & Deciding the reference point

The Ozaki Valve Neo-Cuspidization (AVNeo) procedure using autologous pericardium

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A left-right type valve, as shown in case 1, normally will use one of the existing com...
An update on PEARS

Sunday played host to a dedicated session on personalised external aortic root support (PEARS), beginning with an introduction by John Pepper, Professor of cardiothoracic surgery at the National Heart and Lung Institute, Imperial College, London, UK, who gave an overview of research conducted by his group.

The basic concept of PEARS is to create a bespoke personalised polymer sleeve tailored to each patient's individual aortic root morphology. This sleeve is created by using computer-aided design and rapid prototyping. The closeness of the fit allows incorporation of mesh support, stabilisation of the aortic dimensions and maintenance of aortic valve competence.

The first man who underwent the procedure, Tal Gilelesworth, was also the co-inventor of the technique.

Professor Pepper said that while PEARS research had started off slowly back in 2004, there are now several centres, on several continents, performing the procedure in small numbers. He added that in terms of intention to treat, there were 123 patients operated with intention to implant PEARS, but in fact one had a Florida sleeve, one required a VIVIS, and one had a TRR. He added that this was done at a time when the pericardium was open, the aorta was inspected, and the operator felt the tissue was too thin and too fragile to go ahead with the PEARS.

“... this is a new twist on an old idea of placing something around the aorta. But the two main differences are firstly, it’s personalised and secondly the material is completely different from the standard Dacron that we use: it’s a polyester but it’s different because it is a macroporous mesh.”

He argued that it was frequently asked whether the arterial wall would become thinner, but explained that follow up annual MRI scans had not found this. He added that incorporation makes migration unlikely and hadn’t seen it yet in 10 years of follow-up. “People say ‘well it could dissect within the sleeve and anything could happen’, but we haven’t seen it yet and maybe we won’t, but I don’t think you can ever say that in medicine. But maybe if you follow 100 patients for 10 years and don’t see it we can be a little more confident that it won’t happen.”

He said dilatation beyond the support could happen, but had not been seen on follow up imaging and there was less likelihood of it happening than with an interposition graft.

The audience heard that PEARS surgery has been applied to the following disease types: 82 ascending aortic dilations associated with Marfan syndrome (five patients with adjunctive mitral valve repair); six patients with BAV; two with transposition late after ASO; five with Loeys-Dietz syndrome; one with Fallot’s tetralogy; two with Turner syndrome; nine with non-syndromic degeneration; and five unspecified.

He summarised by saying that PEARS has maintained the same device manufacture, positioning and incorporation, and that they had used an identical protocol from 2004 to 2017. In total there had been 120 consecutive intention-to-treat cases, 412 patient-years of follow-up. There was one valve or aortic event, one death and three conversions.

“They are now several centres, on several continents, performing the procedure in small numbers.”

John Pepper
Left ventricular reverse remodelling after mitral valve repair for degenerative posterior leaflet prolapse: does it affect durability of chordal implantation repair?

Benedetto Del Forno, Michele De Bonis, Elisabetta Lapenna, Ilaria Giambuzzi, Fabrizio Monaco, Ottavio Alfieri
Cardiac Surgery Unit, San Raffaele Hospital – Scientific Institute, Milan, Italy

Reverse remodelling of the left ventricle is typical after surgical repair of severe degenerative mitral regurgitation and becomes more significant in patients with pre-operative left ventricular dilatation.

Since 1964, when fistor proposed the concept of repairing the mitral valve using a physiological approach, chordal implantation has become an interesting option, showing the same safety and effectiveness of the classic quadrangular resection. In addition, this technique has proven, excellent long-term results.

Key to this technique is an accurate measurement of the proper length of the PTFE chordae needed to correct the leaflet prolapse and achieve a competent valve. However, in the scientific community there are several concerns regarding the impact of significant reverse remodelling on implanted chordal length, assuming that it could lead to recurrence of leaflet prolapse once the ventricle becomes smaller. Given this possibility, many surgeons avoid this technique in patients with dilated left ventricles.

Considering this issue, we designed a study to evaluate the efficacy of chordal implantation repair to treat posterior leaflet prolapse in patients with enlarged left ventricle as compared with classic quadrangular resection. Moreover, the impact of these techniques on reverse remodelling and on the durability of mitral valve repair will be evaluated. From January 2011 to March 2016, 679 patients with enlarged left ventricle (left ventricle end-diastolic diameter [LVEDD] ≥59 mm in males, and ≥54 mm in females) and severe mitral regurgitation due to degenerative prolapse of posterior leaflet underwent mitral valve repair in our institute. For the purpose of our study, we excluded patients that received coronary artery bypass grafting or any procedure involving aortic valve or ascending aorta.

Thirty patients underwent mitral valve repair using chordal implantation (the study group). Then we selected 30 consecutive patients treated by classic quadrangular resection as a control group.

Preoperative variables were comparable between the two groups, except for female sex. At four years’ follow-up, we observed excellent results in terms of survival (chordae group: 100%; resection group: 97.3±3.3%; p = 0.3), freedom from reoperation (100% in both groups) and freedom from MR ≥3+ at 4 years’ follow-up.

Table 1. Comparison of left ventricle end-diastolic diameter between the two groups before surgery, immediately after surgery and at 4 years’ follow-up.

The mid-term outcome in the study group was comparable between the two groups, except for female sex. At four years’ follow-up, we observed excellent results in terms of survival (chordae group: 100%; resection group: 97.3±3.3%; p = 0.3), freedom from reoperation (100% in both groups) and freedom from MR ≥3+ at 4 years’ follow-up.

Table 1. Comparison of left ventricle end-diastolic diameter between the two groups before surgery, immediately after surgery and at 4 years’ follow-up.

<table>
<thead>
<tr>
<th>Pre-operative</th>
<th>Discharge LVEDD</th>
<th>Latest follow-up LVEDD</th>
<th>p Value (Pre-op vs. Disch)</th>
<th>p Value (Disch vs. F-U)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chordae (n=30)</td>
<td>61.6±3</td>
<td>49.1±3</td>
<td>47.9±4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Resection (n=30)</td>
<td>62.7±4</td>
<td>52.5±6</td>
<td>52.6±4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>p Value (Chordae vs Resection)</td>
<td>0.2</td>
<td>&lt;0.05</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
</tbody>
</table>

54.1% (n=17) of patient were operated as urgent or emergent cases. The most common complications were acute renal failure which occurred in 16.9% of patients. Further complications included AV Block followed by pacemaker implantation (13.9%), low cardiac output (4.9%), bleeding (6.3%), sepsis (4.0%) and stroke (3.7%). In-hospital mortality was as high as 5.9% (n=97).

Independent predictor of in-hospital mortality is urgent or emergent indication for operation (O.R: 2.5, 95% CI: 1.1-4.2, p = 0.001). The 1-, 3-, 5- and 8-year survival was 72.6±1%, 60.7±1%, 44.5±2%, and 38.5±2%, respectively. Cox regression analysis identified the following independent risk factors: Urgent or emergent indication for surgery (O.R: 2.2, 95% CI: 1.5-3.4, p = 0.000), serum creatinine of more than 200 mmol/l (H.R 2.9, 95% CI 1.5-6.0, p = 0.002), diabetes (H.R 4.7, 95% CI 1.1-18, p = 0.011), preoperative dialysis depend chronic renal failure (H.R 3.5, 95% CI 1.5-6.0, p = 0.002) and cardiogenic shock (H.R 1.8, 95% CI 1.2-3.0, p = 0.007).

The TA-AV procedure is suitable for high-risk patients with severe aortic stenosis and is has acceptable in hospital mortality. The mid-term outcome is associated with good survival and is negatively influenced by renal insufficiency and critical preoperative state. As shown in our study, the highest risk factors for in-hospital mortality are urgent or emergent indication for surgery, severe creatinine more than 200 mmol/l and preoperative dialysis.

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Inside Vienna
Where to go? What to do?

Thoracic endovascular aortic repair: Evolution and results in an 18-year experience

Nimesh D Desai, Wilson Y Szeto, Benjamin Jackson, Prashanth Valiabhapsyula, Grace Wang, Ronald Fairman, Joseph E Bavaria
Hospital of the University of Pennsylvania, Philadelphia, PA, USA

In 1999, we started the thoracic endovascular aortic repair (TEVAR) program at the University of Pennsylvania. During the first six years, patients were enrolled in pivotal TEVAR trials, the majority of whom had descending thoracic aortic aneurysms. However, after TEVAR was approved by the FDA in 2005, indications expanded significantly to include patients with aortic transections, acute and chronic type B dissections, and hybrid arch replacement. While TEVAR began as an experimental procedure, it is now our predominant technique to treat pathology of the descending thoracic aorta. In April 2017, during the 18th year of our TEVAR program, we completed our 1,000th procedure.

Of the 1,000 patients that underwent TEVAR from 1999 to 2017, the average age was 68.4 years with 53% of patients older than age 70 years. Approximately 59% (585) were female and 10% (104) had chronic renal failure. Urgent or emergent procedures were completed in 48% (481) of cases. Atherosclerotic aneurysms were the most common indication for TEVAR in 62% (623) with type B dissections a distant second in 15% (153) of patients.

Overall unadjusted survival was 47% at 10 years with a median follow-up of 4.2 years. Furthermore, we found that survival was significantly dependent on the primary indication for TEVAR. While patients with traumatic transection experienced early perioperative death, this group had the greatest long-term survival at 83% at 10 years. Patients with chronic and acute type B dissections had similar long-term survival to each other, with the exception that the acute type B patients had a worse perioperative mortality. Lastly, patients that underwent TEVAR for aneurysmal degeneration had the worse long-term survival of 39% at 10 years.

Stroke or TIA occurred in 6% (60) and permanent paraplegia was found in 24% (240) of patients during the perioperative period. Early mortality occurred in 10% (100) of patients. Predictors of early death were age (OR: 1.05, p=0.01), chronic renal failure (OR: 2.67, p=0.004), and emergent/urgent cases (OR: 2.79, p=0.001). Endoleaks were present in 143 (14.3%) patients, of which 91 (63.6%) resolved after additional ballooning or placement of another stent graft at the index procedure.

In conclusion, the TEVAR outcomes are variable and based on the initial indication of the patients’ aortic pathology. In our series spanning 18 years, patients with traumatic transection and type B dissections (acute and chronic) had significantly improved long-term survival as compared to patients that underwent TEVAR for descending thoracic aneurysms. Most importantly, these patients can undergo this minimally invasive approach with acceptable risk for stroke and paraplegia.
Simultaneous uniportal VATS right upper lobectomy with Nuss procedure for pectus excavatum repair; First reported uniportal combined lobectomy and Nuss operation

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We report a case of an eight-year-old male child with bronchiectasis and pectus excavatum (Figure 1). Although feasibility and safety of VATS became well-established in the treatment of benign pathologies, many surgeons would argue that two benign lesions in a small child should be approached through an open approach, especially given that bronchiectasis usually has thick adhesions due to repeated infections, and a small chest cavity may not allow a full range of movement of staplers.

However, several factors should be considered: patient are young, fearing from postoperative pain and more over like to have a good cosmetic result for his chest wall deformity. Pectus excavatum is the most common congenital chest wall deformity, and the minimally invasive repair of the pectus excavatum (MIRPE) has become the treatment of choice in the last decade, performed with a high degree of success. As a minimally invasive repair technique by Nuss, it involved remodelling of the anterior chest wall by employing a retrosternal metal bar without any cartilage resection.

Bronchiectasis is an airway chronic disease that is characterised by recurrent respiratory infections exacerbations with obstructive lung disease in children and adults. Thoracoscopic surgery for localised bronchiectasis is gaining more acceptance every day. Simultaneous open cardiothoracic operations and pectus repair are being used, but still lack satisfactory cosmetic results and are outside ‘minimally invasive’. Few publications report simultaneous multiport VATS and MIRPE. Our case is the first reported example of such combined procedures via a uniportal VATS approach, reported in an eight-year-old child.

We believe that utilising the uniportal VATS approach simultaneously with MIRPE should be offered rather than a staged operation or multiprofessional involvement. This work demonstrated our initial experience of minimally invasive surgery for pectus excavatum and recurrent pneumothorax. Interact Cardiovasc Thorac Surg. 2014;15(3):491-2.

Dr Hussein Elkhayat (left) and Dr Mahmoud Sallam

Scaffold-free trachea regeneration by tissue engineering with bio-three-dimensional printing

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There are general limits for safe tracheal resection, i.e. half of the tracheal length in adults and one-third in small children. Thus, safe and dependable techniques for tracheal replacement are being developed. There are many approaches for reconstructing the trachea, including regeneration with tissue engineering; however, no standard procedures for tracheal transplantation/regeneration, particularly circumferential replacement, have been developed. In the current situation, most artificial airway organs still require scaffolds to maintain the strength and stiffness of the airways. However, scaffolds for artificial organs have some issues, such as risk of infection, irritation, lower biocompatibility, and time-dependent degradation. Here, we aimed to assess circumferential tracheal replacement strategies using scaffold-free trachea-like structures made by bio-three-dimensional (bio-3D) printing technology with the isolated cells in an inbred animal model.

Chondrocytes and mesenchymal stem cells were isolated from three-week-old F344 male rats. Rat lung microvessel endothelial cells (RLMVECs) were purchased and used as a cell source. After the preparation of multicellular spheroids, trachea-like tube structures were prepared by bio-3D printing. The structure was matured in a bioreactor and transplanted into eight-week-old F344 male rats as tracheal grafts under general anaesthesia.

Trachea transplantation was performed using the silicone stent and followed up for 11 postoperative days (POD). The generated scaffold-free trachea-like structures showed around two-thirds the tensile strength of native adult trachea. The bio-3D printed structures were easy to handle with surgical forceps and had sufficient strength to transplant into tracheas using silicon stents (Figure 1). After sacrifice and resection of the transplanted tracheas, all tracheal grafts maintained shape and stiffness (Figure 2). Some connective tissue with microvessels surrounding the tracheal grafts was observed. Histologically, glycosaminoglycan (GAG) production was assessed by Alcian blue staining, and GAG deposits were found in the bio-3D printed structures after the maturation period; GAGs persisted until 11 POD. Immunohistochemistry showed that collagen was observed in structures after maturation and maintained after tracheal transplantation. Our findings showed that cartilaginous tissue was formed during the maturation period after the bio-3D printing and maintained after transplantation. Some small capillary-like tube formations consisting of CD31-positive cells were observed in the structures, and the number of these structures increased over time. These results showed that appropriate vasculogenesis could be obtained in scaffold-free trachea transplantation with our bio-3D printing technique.

This work demonstrated our initial experience of tracheal tissue engineering with bio-3D printing technology using a scaffold-free approach. The artificial tracheal fitted and matured in situ after transplantation. The structures produced by the bio-3D printer with isolated rat cells could be transplanted via allogeic trachea transplantation in an imbed animal model. This technology could give the opportunities for the patients with tracheal tumour, tracheomalacia or tracheal stenosis to have another option for better quality of life.
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Open heart surgery in late octogenarians and nonagenarians: Risk stratification models overestimate mortality in this cohort

Kazuyoshi Takagi, Tohru Takaseya, Koichi Arinaga, Takahiro Shojima, Satoshi Kikusaki, Kosuke Saku, Tohru Iwaki, Kazuyoshi Takagi, Tohru Takaseya, Koichi Arinaga, Takahiro Shojima, Satoshi Kikusaki, Kosuke Saku, Tomofumi Fukuda and Hiroyuki Tanaka Department of Surgery, Kurume University, Kurume, Japan

In recent years, surgical indications for super elderly patients have been expanded due to results of advances in anesthetic techniques, surgical techniques, postoperative care, and the expanding technology of catheter-based heart valve interventions. We face the necessity to consider surgical risks and patient’s benefits carefully in an aging society. Established risk stratification models such as the Euro II score, the Japan score and the STS score are very useful to predict surgical outcomes and decide surgical indications in open heart surgery. However, these scoring models are not specifically designed for late octogenarians and nonagenarians. The accuracy of these models to predict the surgical outcome in this cohort is still unclear. This study aimed: (1) to investigate the surgical outcome in late octogenarians and nonagenarians undergoing open heart surgery and (2) to assess the accuracy of these established risk stratification models in this cohort.

From 2001 to 2016, 96 patients aged between 85 and 94 years old received open heart surgery. Mean age was 86.7 years, and the percentage of men was 27%. There were 37 patients with heart valve surgery, 26 patients with aortic surgery, 15 patients with coronary bypass, 13 patients with combined heart valve surgery and coronary surgery, and five patients with other single procedure. The percentage of emergent surgery was 36%. We evaluated concomitant patient demographics, intraoperative details, postoperative courses including ventilation time, the length of ICU stay, major complications and 30-day mortality. The Euro II score, the Japan score and the STS score were evaluated for each patient. The accuracy of these models to predict 30-days mortality was evaluated using area under the curve (AUC) on the receiver operating characteristic curve.

Mean postoperative ventilation time was 5.7 ± 9.9 days. Mean length of ICU stay was 7.1 ± 11.0 days. The rate of major complications including stroke, renal failure, deep wound infection.

<table>
<thead>
<tr>
<th>Mortality (Elective)</th>
<th>Mortality (Emergent)</th>
<th>AUC</th>
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<tbody>
<tr>
<td>Euro II score</td>
<td>6.0 ± 6.8%</td>
<td>15.5 ± 13.9%</td>
</tr>
<tr>
<td>Japan score</td>
<td>7.7 ± 6.9%</td>
<td>20.3 ± 12.6%</td>
</tr>
<tr>
<td>STS score</td>
<td>8.0 ± 4.2%</td>
<td>16.2 ± 13.9%</td>
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In this study, 3.3% of patients developed 30-day mortality. The mortality was lower in elective versus emergent surgery (3.3% vs. 8.5%, p = 0.05). Estimated 30-days mortalities in elective versus emergent surgery were 6.0 ± 6.8% versus 15.5 ± 13.9% by the Euro II score, 7.7 ± 6.9% versus 20.3 ± 12.6% by the Japan score, and 8.0 ± 4.2% versus 16.2 ± 13.9% by the STS score. Predictive 30-day mortality using risk stratification models was estimated higher than outcome in real world (Table 1). The Euro II score was the most accurate model to predict 30-day mortality (AUC: 0.898).

We conclude that open heart surgery can be performed in late octogenarians and nonagenarians with a satisfactory outcome. Risk stratification models overestimate mortality in this cohort. These results suggest that age should be considered when making anesthetic exclusion to undergo open heart surgery. We have to consider surgical indication carefully, based on not only risk stratification models, but also our experiences and outcomes in late octogenarians and nonagenarians. The Euro II score helps us to consider surgical risks in this cohort.

Balloon expandable transcatheter aortic valve implantation without pre-dilation of the aortic valve – results of the multicentre EASE-IT TA registry

Daniel Wendt and Justus Strauch Department of Thoracic and Cardiovascular Surgery, West-German Heart and Vascular Center, Essen and Clinic for Cardiosurgery and Thoracic Surgery, Klinikum Bergmannsheil, Bochum, Germany

Frequently performed step prior to the deployment of the transcatheter heart valve in patients undergoing TAVI is the dilation of the aortic valve using an expandable balloon (balloon aortic valve expansion; BAV). BAV, however, can cause serious complications including cardiovascular events, bleeding complications, arrhythmias and cerebral embolism. Thus, physicians today tend to omit BAV wherever possible.

The EASE-IT TA registry aimed to evaluate clinical decision making in patients undergoing TAVI with or without BAV using an Edwards SAPIEN 3 valve and Ascendra Balloon Catheter. EASE-IT TA itself is a prospective, two-armed, multicentre registry, collecting essential data of procedural success rates, adverse events, and mortality in a large cohort of patients undergoing transcatheter (TA) TAVI with the aforementioned prosthesis. The data set of this analysis consisted of 198 patients from 10 experienced German TAVI centres, of which 61 patients underwent TAVI with BAV and 137 with TA-TAVI without BAV. Outcomes were assessed before and after the procedure three and six months.

The study demonstrated no clinical benefit for the performance of BAV based on its primary composite endpoint consisting of all-cause mortality, non-fatal stroke, non-fatal myocardial infarction, acute kidney injury, and pacemaker implantation within 30 days (OR 0.71; 95% CI 0.34-1.82) and six months (OR 0.74; 95% CI 0.37-1.47) after TAVI (with multivariable adjustment). On the contrary, there was even a trend for a net clinical benefit for the omission of BAV prior to TAVI.

Both approaches reduced the proportion of patients in NYHA class IV at 30 days. In the group that underwent BAV it was reduced from 85.2% to 1.7%, and 85.4% to 2.3% in the group without BAV.

Further to this, the omission of BAV reduced the requirement for procedural catheterlae usage (17.5% vs. 32.8%; P = 0.017). This might contribute to a better safety profile because it is considered that the use of such agents in cardiac surgery is associated with complications such as tachycardia, arrhythmias, and myocardial, intestinal, and renal ischemia. Several investigations into the omission of BAV in patients undergoing transfemoral TAVI reported that the omission was associated with a significantly shorter procedural duration, but here the analyses were not able to confirm such findings. In EASE-IT TA, the average procedural duration in the absence of BAV was found to be only 4.9 minutes shorter, whereas a significant reduction in fluoroscopy duration was observed (difference 3.2 min; p = 0.039).

These data suggest that there is little justification for maintaining BAV in TA-TAVI for the majority of patients.

References
ECMO and mechanical valves. An unfriendly relationship

Elena Sandovai, Maria Ascaso, Daniel Pereda, Guillermo Ventosa-Fernández, and Eduard Quintana

A 24-year-old female with Marfan syndrome was admitted to our hospital due to palpitations. As relevant previous medical history she had a mitral valve replacement at the age of 14 and an aortic valve and root replacement at the age of 22. In both cases, mechanical valves were used.

Echocardiography showed severely dilated left ventricle (64/78 mm) and EF of 10%. The right heart catheterisation contradicted pulmonary hypertension.

Despite initial stabilisation, the patient developed symptoms attributable to low cardiac output, and an intra-aortic balloon pump was implanted. The patient's clinical status worsened again, and femoral v-a ECMO support was started using a 21 F venous cannula and a 6-mm dacron side-graft to the femoral artery. Appropriate support was rapidly achieved and the patient's perfusion was restored. Four days later, the patient developed pulmonary oedema. Anatomically she was not a candidate for currently available total artificial heart therapies. Mitral prosthesis thrombosis was suspected and the patient was taken to the OR. The ECMO circuit was switched to CPB. The aorta was clamped and antegrade cardioplegia administered. The aortic prosthesis was closed with a pericardial patch sutured to the prosthetic annulus. The right atrium was then incised and the fossa ovalis was widely opened. The mitral prosthesis was removed and the annular margins were oversewn to avoid further emboli from raw-debrided edges. A new 40 F single venous cannula was placed halfway across the septostomy in the left atrium through the right atrial appendage.

Support was switched to full v-a ECMO using the new venous cannula and the previous arterial one. Pulmonary oedema resolved, and the patient was successfully transplanted two days later. She recovered uneventfully.

Patients with mechanical prosthesis receiving bridging ECMO therapies may need further aggressive interventions to solve or prevent thromboembolic complications.

Durability at 20 years of quadrangular resection with annular plication for mitral regurgitation due to posterior leaflet prolapse: the paradox of being a benchmark out of fashion

Elisabetta Lapenna, Michele De Bonis and Ottavio Alfieri

Degenerative mitral regurgitation (MR) due to prolapse of the posterior leaflet is the most common dysfunction of the mitral valve in the western world and is nowadays treated with a variety of surgical techniques. Quadrangular resection combined with annular plication and annuloplasty, as originally described by Carpentier, has been for many years the standard approach, before sliding/folding plasty and artificial chordae gained larger popularity in order to overcome some drawbacks connected to this technique (kinking of the circumflex artery, leaflet restriction and systolic anterior motion).

Nevertheless, the very long-term results (≥20 years) of quadrangular resection and annular plication are relatively unknown because the published series include all kinds of resection techniques (triangular resection, quadrangular resection with annular plication/folding/pleating, butterfly technique, etc.) without a clear distinction among them, often reporting only freedom from reoperation rather than from recurrent mitral regurgitation. We were rather intrigued by the fact that it is almost impossible to derive from the available literature the very long-term outcomes of one of the first methods of repair described to treat P2 prolapse, namely quadrangular resection with annular plication alone. Of course it does apply from our initial experience in order to look for long-term results. We identified no in-hospital mortality, with 92% of patients discharged from the hospital without any major complications. Only one patient went home with mild-to-moderate residual MR. Follow-up was 97% complete (median 19 years). At 20 years the overall survival was 74±3.7%, and the cumulative incidence function of cardiac death with non-cardiac death as competing risk was 9.9±2.5%. Age was the only significant predictor of death as competing risk was 4.3±1.7% and 8.8±2.8%, respectively. Indeed, only 11 patients (8%) had recurrent MR≥3+. Fine and Gray models failed to identify significant predictors of recurrence of MR≥3+. At the last follow-up, moderate MR (2±4+) was detected in 14 patients (10%).

In conclusion, the substantial absence of residual mitral regurgitation and the superb stability of the repair reflected in the low rate of MR recurrence and reoperation for up to two decades after surgery, suggest that this technique achieves excellent early and very long term results in a selected subset of patients and in a high-volume centre. Although surgical mitral repair techniques have evolved over the past two decades, our findings show that quadrangular resection with annular plication remains an important contemporary benchmark against which any new emerging surgical or transcatheter mitral valve repair solution should be compared.
What is the best biomaterial for a paediatric conduit? Analysis of clinical data and experimental study

Abstract

The clinical part aimed to determine the incidence of reintervention and calcification of xenograft in children. A total of 301 patients aged from 0 to 18 years who underwent RVOT reconstruction with xenograft from 2000 to 2016 were retrospectively analysed. The placement of 337 xenografts were performed, including glutaraldehyde-treated bovine jugular vein (GA-BJV) (n=171, 51%), glutaraldehyde-treated bovine pericardial valved conduit (GA-PVC) (n=75, 22%), diposy-treated porcine aortic root conduit (DE-PAC) (n=58, 17%), diposy-treated bovine pericardial valved conduit (DE-PVC) (n=33, 10%). The median follow-up was 4.2 years, equating to 1,279 patient-years. Calcification was the main cause of conduit dysfunction in 71% of cases. In the GA-BJV group, xenograft calcification occurred in only 9% of cases. No significant difference in calcification rate were found in the GA-PVC and DE-PAC groups (26% and 30%, respectively). The lowest freedom from calcification dysfunction was in the DE-PAC group (Figure 1).

Experimental part aimed to compare the calcification of porcine aortic valve, bovine pericardium and jugular vein (BVJ) wall cross-linked with glutaraldehyde (GA) and diposy (DE) in subcutaneous rat model. We also intended to weigh the anti-calcification efficacy of DE-preserved tissue modification with 2-[(2-carboxyethylamino)ethylidene-1,1-bisphosphonic acid (CEABA). CEABA is a novel bisphosphonate synthesized in Novosibirsk (Institute of Organic Chemistry Novosibirsk, RF) (Figure 2). Three groups of each biomaterial were evaluated: GA-, DE – and DE+CEABA-treated. According to our results the GA-treated biomaterials had a high calcium-binding capacity. DE-preservation decreased the calcium content in the BVJ and in the pericardium, but not in the aortic wall (Figure 3). CEABA effectively reduced mineralization in the DE-aortic wall and in the DE-pericardium, but it produced no effect in the DE-vein wall. Mineralization in the GA – and DE-treated aortic and BVJ walls was predominantly associated with elastin.

Our study demonstrated that GA-treated BVJ conduit has shown the lowest rate of calcification. However, calcification of the BVJ could be partially reduced by virtue of substitution of GA for DE compound. The strategy of cross-linking with DE and additional modification with CEABA is the most effective for the bovine pericardium and can be employed to further develop the paediatric conduit. Porcine aortic root conduits have demonstrated suboptimal results in terms of calcification at the clinical follow-up and underwent no calcification that cannot be bloated with CEABA modification in experiment.

Cardiac | Abstract | Surgical management of effective endocarditis: analysis of early and late outcomes

Is mitral valve repair superior to mitral valve replacement in patients with native mitral valve endocarditis? A systematic review and meta-analysis of 8,978 patients

Amer Harky, Mohamad Bashir, Rakesh Uppal | Department of Cardiac Surgery, St. Bartholomew’s Hospital, London, UK

In the western world, infective endocarditis (IE) represents a health burden on the coexistence of healthcare with an incidence of 10-15 per 100,000. The historical risk factors have evolved dramatically, and as such rheumatic fever has become quite rare. Having said that, the surge of IE amongst intravenous drug abuses, nosocomial infections or immunosuppression patients plays a greater role, with lack of robust epidemiological data representing this. However, the common native valve affected remains to be the mitral valve with a prevalence of 41% of all cases diagnosed with IE.

The guidelines and evidence extracted from a series of large cohorts highlight two main streams to managing IE, albeit through complex antibiotic regimens which remain the primary medical modality amongst patients without significant heart failure or structural valve destructions. The alternative managing pathway is a combination of surgical and medical interventions through intravenous antibiotics, as aforementioned, and either repair or replacement of the mitral valve.

Surgical repair of the mitral valve (MVR) in patients with native valve IE has attained surgical superiority over mitral valve replacement (MVR). However, to date there is no collective evidence that compares the outcomes between patients who underwent MV versus MVR for native valve IE. As such, we set out to investigate this through a systematic review of the current literature employing varied statistical methods to deduce a meta-analysis of the outcomes between MV versus MVR.

The results analysed a total of 8,978 patients, and 14 articles were included in the synthesis of the meta-analysis. Cardiopulmonary bypass time was lower in the MVR group compared to the MVR group (P = 0.03). There was no significant difference observed in the aortic cross clamp time between the two groups (P = 0.2). Post-operative outcomes (30 days / in hospital events) such as bleeding (P = 0.005) and reoccurrence of infective endocarditis (P = 0.004) were significantly lower in the MVR group. Beyond 30 days, outcomes were similar for recurrence of IE (P<0.0001) in both groups. Additionally, there are significantly less reoperation rates in the IE-MVR group compared to the IE-MVR group (P = 0.03).

The present meta-analysis shows that mitral valve repair has good clinical outcomes both while in-hospital and at one and five years of follow up, and is superior to mitral valve replacement in patients that undergo mitral valve surgery for native mitral valve endocarditis.
LivaNova Boosts Investment in Cannulae Technology, Expands Portfolio

During the past five years, LivaNova has been intently focused on and committed to acquiring and developing cardiac surgery cannulae. We remain one of the few companies continuing to invest the most in cannulae technology as we enlarge our product portfolio.

Our comprehensive cardiac surgery cannulae portfolio includes adult, pediatric and minimally invasive cannulae. Our adult cannulae feature both curved and straight-tip aortic arch designs for maximum clinical flexibility; our pediatric cannulae offer choices for the smallest of vessels, from children to small adults; and our minimally invasive MICS cannulae are designed to ensure excellent hemodynamics while providing easy insertion and minimal intrusion into the surgical field, thus improving patient outcomes.

Further demonstrating our investment in supporting cardiac surgeons and clinician partners, LivaNova launched the Cannulae Digital Hub, the only online cannulae hub for clinicians. At cannulae.livanova.com, clinicians will find a one-stop, comprehensive portal with news, resources, product highlights and information on our entire portfolio, including conventional adult cannulae, MICS and femoral cannulae and conventional pediatric cannulae.

Built on a 30-plus-year foundation of innovation, LivaNova offers a complete cannulae portfolio to the global cardiac surgery market. We look forward to meeting the needs of cardiac surgeons in the years ahead through our commitment to continual improvement of cardiac surgery cannulae technology.
EACTS Academy

Minimally Invasive Techniques in Adult Cardiac Surgery

The European Association for Cardio-Thoracic Surgery’s course on Minimally Invasive Techniques in Adult Cardiac Surgery (MITACS) ran from 20-22 June, 2017 at the Central Clinical Hospital of the Ministry of Interior and Administration in Warsaw, Poland. With a record attendance of over 200 cardiothoracic surgeons, cardiologists, cardiac anaesthetists, perfusionists, residents and fellows, the course served as a vibrant and engaging forum focusing on key topics in the minimally invasive field.

MITACS is designed to provide the participants with a platform and a basis for starting the same programme at their own institute. To emphasise the success of the teamwork approach, invited experts share their expertise over three days of keynote presentations, live-in-a-box videos and live surgical case transmissions in order to demonstrate the technical aspects of the new procedures.

Ten live cases took centre stage, with entralling explorations held primarily in 3D, thus providing a more immersive experience for the audience. What’s more, the MITACS course also emphasised hands-on experience, with a dedicated ‘SimCity’ session that provided an opportunity to practice minimally invasive techniques and skills using a wide range of technologies and equipment under the expert guidance of our faculty and industry partners.

MITACS forms part of EACTS’ ongoing Academy programme, providing training courses of the highest quality which are attended by delegates from all over the world. Highlights from this year’s MITACS course can be found in the accompanying Course Report (pictured) available for download from the EACTS website.

The next MITACS course will be held on 26-28 June, 2018 in Maastricht, the Netherlands. We encourage you to head to www.eacts.org to register your interest for this, and other upcoming Academy courses.

Thoracic Case Session 1 | Abstract | Thoracic

Intrathoracic gallstone: A rare case report

Sudhir Bhusari, Mohamed Osman, George Doukas, Gyanesh Namjoshi
Basildon and Thurrock University Hospital – Essex CTC, UK

Case Report

A 79-year-old male was admitted with acute cholangitis and underwent urgent laparoscopy, drainage of the gallbladder and cholecystectomy. Pre-operative CT demonstrated an enlarged gallbladder and a 2 – 2.5 cm gallstone. The surgical procedure was described as ‘difficult and long’ by his surgeon. However, he made an uncomplicated inpatient recovery and was discharged three days later.

One month post-operatively, the patient developed a lower respiratory tract infection characterised by a cough, streaky hemoptysis and shortness of breath. Antibiotics were prescribed on four occasions, however symptoms did not resolve.

CT of the chest demonstrated focal consolidation of the subpleural region of the right middle lobe surrounding an ovoid, well-circumscribed lesion which showed a laminated pattern of calcification. This lesion is similar to a gall bladder stone identified on prior abdominal CT. The intrathoracic appearances could possibly be due to gallstone migration into the right hemithorax (gallstone ectopia) with an associated inflammatory pseudo tumour/consolidation.

The patient underwent right middle lobectomy. The lung was adherent to the diaphragm and chest wall. There was dense fibrosis on the diaphragm which may indicate the site of entry point to the chest. An enlarged lymph node was found during lobectomy (station R11). The excised middle lobe was opened after excision which showed a 2 cm gallstone inside the lobe, totally surrounded by lung tissue.

Histopathology showed the gallstone close to the bronchus, and the lung tissue showed evidence of chronic inflammation. No evidence of malignancy was seen in both the lung and lymph node.

Post-surgery, our patient made an uncomplicated recovery. Drains were removed on day three, and the patient was discharged for outpatient follow-up.
The HAS-BLED score is associated to major bleeding in patients after cardiac surgery

Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Carmelo Dominici1, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1, Gianluca Santis1, Emmanuela Tedesco2, Saverio Nardella1, Francesco Migliano1, Dario Buioni1

Endoscopic port-access mitral valve repair drylab training using high-fidelity simulators

Peyman Sardari Nia Maastricht University Medical Center, Maastricht, the Netherlands

M itral valve repair is one of the most complex and difficult procedures in cardiac surgery, because of the complexity of the mitral valve and diversity of its pathology. Performing mitral valve repair in a minimal invasive fashion – whether endoscopically, through direct vision or with robotic assistance – is even more difficult. Minimal invasive mitral valve repair (MIMVR) has been shown to be effective and beneficial for patients. Application of this technique has been concentrated in high-volume centres, and in the hands of a limited number of surgeons. Dexterity of open surgery is insufficient for starting a MIMVR, and new dexterity should be developed in endoscopy, and in working with long-shafted instruments. The most critical technical steps are working with long-shafted instruments, endoscopically, as well as placing sutures on the mitral valve annulus. Therefore, the learning curve of MIMVR is steep, and unfortunately still undeveloped in patients. I have developed and designed a minimally invasive mitral valve simulator with the help of engineering department at Maastricht University Medical Center (MUMC), the Netherlands. This simulator was awarded the Techno-Collage award in 2015. This simulator will enable residents, fellows and surgeons to develop skills in MIMVR and practice those skills endlessly. During the past two years we have organised more than 10 courses, and trained over 100 surgeons from all over the globe during EACTS endoscopic port-access mitral valve repair drylab training in Maastricht. The course lasts two days, and has an air-plot-like training concept. The participants undergo a theoretical pre-assessment and technical pre-assessment on the simulator. In the subsequent two days, relevant subjects are learned by deconstructing the operation into multiple steps, with videos and presentations in an interactive manner. Parallel to the theoretical teaching, hands-on experience is gained on high-fidelity simulators in step-by-step manner, with participants finally performing a full repair on 3D-printed pathologic silicone replicas.

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The HAS-BLED score was associated to type 2 bleeding, OR 1.77 (95% CI1.27 to 2.46, p = 0.0077) reaching an OR of 4.63 (p=0.001) in patients with an HAS-BLED >4. The association was confirmed at the multiple logistic regression analysis with a C-statistic of 0.763 and an adjusted OR of 1.661 (p = 0.0003, independent of the type of cardiac procedure undertaken. As a collateral result it was found that a higher HAS-BLED score – as well as Type 2 bleeds – had an impact on survival (Figures 1 and 2).

This study confirmed that the HAS-BLED score can be useful to identify the patients with higher risk of retained clot syndrome (Type 2 bleeding). Probably, the risk of thrombosis should be weighted with the risk of bleeding to evaluate a correct balance in the anticoagulation regimen.
New standards in aortic valves with INSPIRIS RESILIA

Excellent early safety and efficacy are demonstrated by the new RESILIA tissue, which is now available as INSPIRIS RESILIA aortic valve featuring both the novel RESILIA tissue and VFit technology.

The first-in-class resilient heart valve was the subject of yesterday’s lunch symposium hosted by the following speakers: Anno Diegeler, MD, from Herz- und Gefäßklinik, Bad Neustadt, Germany, who addressed the packed hall with ‘What’s new about the new European and American guidelines?’; Ruggero De Paulis, MD, from the European Hospital, Rome, Italy, who discussed ‘Epidemiology and current treatment options in younger patients’; David Heimansohn, MD, from St. Vincent Heart Center of Indiana, US, who reported the ‘RESILIA tissue: 2-year clinical safety trials update’; and finally Olaf Wendler, MD, from King’s College Hospital, London, UK, discussed ‘Real-life clinical decision making with INSPIRIS RESILIA aortic valve’. Chairing the Edwards Lifesciences-sponsored session were Professor Diegeler and Professor Wendler.

One notable highlight of the symposium was the reporting of the recent two-year clinical trial results from the COMMENCE trial of RESILIA showing two-year actuarial freedom from mortality in isolated aortic valve replacement (AVR) patients, and for all patients was 95.3% and 94.3% respectively. At two years, New York Heart Association class improved in 65.7%, effective orifice area was 1.6 ± 0.5 cm²; mean gradient was 10.1 ± 4.3 mmHg; and paravalvular leak was none/trivial in 94.5%, mild in 4.9%, moderate in 0.5% and severe in 0.0%.

INSPIRIS RESILIA aortic valve approved by the FDA and the European regulatory authorities, and commercially available in Europe

In July this year, the INSPIRIS RESILIA aortic valve received US Food and Drug Administration (FDA) approval; and in Europe, the valve became commercially available earlier this year, after the granting of approval in 2016. The result of 12 years of research, the INSPIRIS RESILIA valve is different to its predecessor for a number of reasons. Firstly, the RESILIA tissue comprises a breakthrough Tissue Integrity Preservation technology incorporating stable capping of the free aldehyde acid groups (the binding site for calcium) and glycerolisation, which enables dry storage without further exposure to the gluaraldehyde solution.

Professor De Paulis pointed out that RESILIA tissue should offer greater durability than more conventional biological valves according to preclinical studies in an aggressive sheep model “but the time will tell”. The largest known pre-clinical randomised controlled trial (RCT) found that RESILIA tissue offered key benefits, such as significantly reduced calcification and sustained haemodynamics compared to current treatment options.

Another design feature that marks a departure from the design of previous heart valves is the INSPIRIS’ first-of-its-kind expandable frame known as VFit technology that incorporates three fluoroscopically-visible size markers and an expandable area designed for potential future valve-in-valve (ViV) procedures. This means that, under fluoroscopy, physicians can recognise the size of the valve so there is no need to check medical records for this information, as is required currently.

Dr Heimansohn commented on the importance of valve durability. “You’re trying to pick the best prosthesis that gives the patient possibly one more intervention, because if the valve replacement isn’t durable they’ll require three or four more interventions and probably shorten their lifetime,” he said. “This is where the appeal of the new tissue process comes in – if it lasts 15-20 years until the patient is in their 70s, then you probably only need one intervention to keep the patient on a normal life course, and that is where this will have major impact.”

2017 ESC/EACTS Guidelines

Professor Diegeler’s presentation concentrated on patients aged 65 years or over, and he referred to the core of the 2017 ESC/EACTS Guidelines including the new indications for TAVI and surgical AVR with a focus on the role of the Heart Team, new indications for TAVI in intermediate risk and for ViV procedures, and the indication to implant biological and mechanical valves with respect to the latter. The differences between the US and the European guidelines were discussed.

Recent 2017 AHA/ACC Guidelines widened the so-called ‘grey zone’ where either mechanical or biological valves can be proposed for patients from 60-70 years to those aged 50-70 years. The newly released ESC/EACTS Guidelines indicate that this grey zone relates to patients of 60-65 years when
used in the aortic, and 65-70 years in the mitral position (this indication didn’t change compared to the 2012 Guidelines). This difference in recommendation reflects the difficulty in identifying clear-cut medical-based evidence in the literature.

However, most indications for mechanical and biological valves have a class Ia recommendation, whereas the wishes of an informed patient in collaboration with consultation of the Heart Team are emerging as preponderant in the clinical decision making with a class I recommendation.

Summarising the guidelines, Professor Diegeler said that the choice between mechanical or bioprosthesis should not overstress age but take into account the patient’s wishes; patients with a mechanical prosthesis need lifelong vitamin K antagonists (VKAs); the addition of low-dose aspirin to VKA is restricted to certain patients; after ACS or PCI in a patient with mechanical prosthesis, ischaemic and bleeding risks; and antithrombotic therapy should be individualised according to ischaemic and bleeding risks; and management of anticoagulant therapy during anticoagulation.

De Paulis formulated a hypothesis about what should be a significant clinical benefit from a novel biological valve prosthesis. “I speculate we can have a 20% increase in durability with a new bioprosthesis,” remarked Professor De Paulis. He explained that in the over 60s, if known actuarial average duration of pericardial valves was 18 years, plus 20% would bring duration to 22 years plus eight years bonus with VNI lasting 30 years. “The duration of the valve exceeds expected average survival,” he said. Using the same calculation in patients aged 50 to 60 years, duration was predicted at 26 years, “so this is a reasonable choice,” he remarked. Finally in patients aged between 40 and 50 years, this calculation predicted that duration would extend to 24 years, so the expected age with a functioning valve ranges from 64 to 74 years if implanted at age 40. “We need to weigh quality of life versus risk of reoperation,” he said.

**Take into account patient preferences.** At the end of his talk Professor De Paulis formulated a hypothesis about what should be a significant clinical benefit from a novel biological valve prosthesis.

COMMEMCE prospective multi-centre IDE trial

The COMMEMCE pivotal trial, which was a global FDA premarket approval study that enrolled 699 patients who underwent surgical AVR using the Carpentier-Edwards PERIMOUNT Magna Ease aortic valve with RESILIA tissue in a prospective, multinational, multicentre study. Mean age was 67.0 ± 11.6 years; 71.9% were male, 26.3% were New York Heart Association Class III/IV. Mean STS PROM was 2.0 ± 1.8 (0.3-17.5).

Two-year results, reported by Dr Heimansohn, showed that isolated AVR was performed in 59.1% of patients; others had additional concomitant procedures, usually coronary artery bypass graft (CABG). Thirty-day outcomes for all patients included all-cause mortality 1.2%, thromboembolism 2.2%, bleeding 0.9%, major paravalvular leak 0.1% and permanent pacemaker implantation 4.7%. Median intensive care unit and hospital length of stay were 2 and 7 days respectively.

Also presented here at EACTS 2017, were four-year follow-up data from the European Feasibility RESILIA Trial on clinical outcomes after use of the new bioprosthesis valve with RESILIA tissue for surgical AVR, showed an excellent and sustained safety profile, no valve failures, and good procedural outcomes with patients requiring only a brief intensive care unit length of stay.

**Change the stent used in the aortic, and 65-70 years in the mitral position (this indication didn’t change compared to the 2012 Guidelines). This difference in recommendation reflects the difficulty in identifying clear-cut medical-based evidence in the literature.**

**However, most indications for mechanical and biological valves have a class Ia recommendation, whereas the wishes of an informed patient in collaboration with consultation of the Heart Team are emerging as preponderant in the clinical decision making with a class I recommendation.**

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Open surgical repair of post-dissection thoraco-abdominal aortic aneurysms: Early and late outcomes of a single-centre study involving over 200 patients

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C

The most important concept needed which is required to address the four fundamental reasons why people die in the first 24 hours: 1) aortic insufficiency with other valve replacement or replacement; 2) coronary malperfusion with an aortic root stabilisation procedure; 3) cerebral malperfusion (CVA) and aortic root repair (Table 1). This classic design is psychologically beneficial to the operating surgeon in an operation that is inherently difficult. (Most surgeons dread a complex arch procedure during a DeBakey I repair that also requires a root reconstruction.) This is especially true if a complex root reconstruction is required. The Zone 2 arch with slight “proximalisation” of the innominate and carotid, thereby constructing a robust Dacron Zone 2 TEVAR landing zone (L2) of 3 cm, can address most complex arch tears and eliminates the flap in proximal head vessels. This index procedure assures a shorter ACP time than a Zone 3 RET. The reconstructive concept allows all available TEVAR options in the future. Importantly, this sequential “conduct of operations” avoids TEVAR when it is not needed which is approximately 35% of the time. Moreover, and importantly, there is less risk of recurrent laryngeal nerve injury in the Zone 2 arch compared to a Zone 3 RET. For all these reasons, coupled with the availability of new branched arch endografts, there is a compelling argument that an index Zone 2 arch procedure with construction of a Dacron L2 will be an extremely attractive solution for repair of acute DeBakey type I dissections (Figure 2).

In CTAAD we found better early outcomes in comparison to our previously reported series of degenerative TAAA patients3. This is in line with the results recently published by Coselli et al.4

An endovascular approach to TAAA is becoming an appealing alternative to the traditional open repair due to better early outcomes – including lower perioperative mortality and morbidity rates, especially for TAAA with degenerative aortitis. On the other hand, after TEVAR, the need for a secondary intervention is common, and the complication rate after the procedure is still high.5

In the future, when endovascular devices become widely available, the paradigm of treatment of CTAAD will likely change.

In our opinion, open and endovascular repair should be complementary. Although more invasive than currently employed endovascular approaches for CTAAD, open surgical repair can be performed safely with acceptable morbidity and mortality when performed in a specialised aortic centre.

References


Figure 1. Illustration showing staged Zone 2 arch open repair.

Figure 2. Illustration showing endograft completion of sequential DeBakey I repair.

Table 1. Acute DeBakey Type I Dissection: Design of an Operation

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Treatment</th>
</tr>
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<tbody>
<tr>
<td>1. Acute CHF due to AI</td>
<td>Aortic valve replacement</td>
</tr>
<tr>
<td>2. Coronary malperfusion</td>
<td>Aortic root repair</td>
</tr>
<tr>
<td>3. Cerebral malperfusion</td>
<td>Arch replacement</td>
</tr>
<tr>
<td>4. Free Ascending rupture</td>
<td>Ascending aortic replacement</td>
</tr>
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Hybrid repair for the treatment of Acute DeBakey type I dissection will be the gold standard

Joseph E Bavaria and Nimesh Desai
University of Pennsylvania, Philadelphia, PA, USA

Hybrid repair for the treatment of Acute DeBakey type I dissection will be the gold standard. The classic therapeutic operation for acute DeBakey type I aortic dissection was developed, and addresses the four fundamental reasons why people die in the first two weeks after the dissection. This “classic” operative design treats: 1) aortic insufficiency with other valve replacement or replacement; 2) coronary malperfusion with an aortic root stabilisation procedure; 3) cerebral malperfusion (CVA) and brachiocephalic vessel dissection with an open distal anastomosis, hemiarch, or arch replacement; and of course 4) replacement of the proximal aorta to mitigate against free ascending aortic rupture (Table 1). This classic design of an operation has the following advantages for the past 15–20 years and has been very successful. However, multiple series from the global “cardio-aortic” community have noted the significant combination of distal reoperation requirement, aortic related death, and the growth of the downstream aorta after DeBakey I proximal repair. There is no doubt – we definitely have a problem with the downstream aorta. The most important concept for us is to actually eliminate distal (residual) dissection after DeBakey I dissection. Numerous reconstructive variations have been developed to address the fundamental problem with the dissected downstream aorta. They are as follows: 1) Direct

1. Antegrade TEVAR replacement using an open aortic arch followed by standard hemiarch repair
2. Zone 2TEVAR with sequential branched TEVAR completion. It is probable that for properly selected patients a solution at the index procedure will include either an FET operation or a planned sequential branched TEVAR completion after a Zone 2/1 index operation (Figure 1). The advantages of this Zone 2/March 2015 the FDA early feasibility trial

Presently, the FDA early feasibility trial has been completed with zero mortality and very low CVA rates using this sequential DeBakey I treatment strategy. The mean time to the TEVAR solution is four weeks after index DeBakey I repair. US FDA pivotal and CE Mark trials are now ongoing for U.S. and European approval.
Thoracic duct decompression for prevention and therapy of protein losing enteropathy

Benjamin Bierbach1, Boulos Asfour1, Viktor Kraska2

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In the Fontan circulation central venous pressure is elevated, impeding lymphatic return -and enhancing lymphatic production itself. This lymphatic system imbalance may result in lymphatic stasis. It plays an important role in the physiology of the failing Fontan and may itself contribute to the development of Fontan failure. As such, lymphatic engorgement may result in protein-losing enteropathy (PLE). PLE is characterised by intestinal protein loss, hypothyraminaemia and hypoproteinaemia. Additionally, retained intestinal lymphatics, lymphopenia, electrolyte abnormalities, diarrhoea and oedema may be present. Clinically this leads to malnutrition, obstipation as well as diarrhoea, immunoincompetence, osteopenia and other consequences of malnutrition. The prognosis of Fontan patients suffering from PLE is very poor with mortality between 30% and 50% at 5 years after onset of symptoms. We introduced a concept based on thoracic duct decompression to the low pressure systemic atrophy. The operation is performed during any type of Fontan operation on cardopulmonary bypass. The superior vena cava, the innominate vein and partially the left subclavian and jugular veins are dissected free. All venous branches of the left subclavian and jugular veins are clipped. Care is taken not to dissect the posterior aspect of the subclavian-jugular confluence, to avoid inadvertent damage to the thoracic duct. After completion of primary surgery, the junction of the right jugular vein and innominate vein is clamped and transected. The stump of the jugular vein is oversewn. Subsequently, anastomosis of the transected innominate vein is performed with the right or left atrial appendage. The length of the innominate vein, the size and position of the appendages, and the ability to mobilize these structures provide tension-free anastomosis determines the choice between the left and the right appendage. Between 08/2011 and 03/2016, 15 single ventricle patients for high-risk Fontan completion (n=12) or Fontan conversion due to PLE (n=3) received an 18-mm non-fenestrated external conduit and thoracic duct decompression. Additionally, one patient with repaired pulmonary atresia and intact ventricular septum suffering from PLE underwent thoracic duct decompression plus implantation of a 18 mm right ventricular to pulmonary artery conduit. Three patients died early resulting in mortality at 12 months of 81.3%. At both 24 and 36 months the mortality was 75%. The anastomosis patency was 93.8%. Currently, only one out of four patients is suffering from PLE, although the condition had completely resolved after thoracic duct decompression. Unfortunately she developed a superior caval vein thrombosis and the disease recurred thereafter. Only in this patient was the albumin level below the normal range. The median albumin level was 3.8 g/dl (range 2.5-4.3 g/dl). Survivors experience an excellent functional result (median NYHA class II). Saturation ranges from 83-98% (median 92.5%). There are only three patients with satisfactory at rest of below 90%. Thoracic duct decompression reduces the morbidity in patients affected by PLE preoperatively. Additionally, secondary occurrence of PLE and profound desaturation has not been observed. Therefore, we consider this adjuvant method safe for affected patients and patients at high-risk for PLE at Fontan completion.

Bicuspid aortic valve (BAV) disease affects 1% to 2% of the population. Although BAV can occasionally be associated with normal lifelong valve function, its presence is associated with a risk of early valve degeneration and aortopathy leading either to aortic insufficiency (AI), aortic stenosis and aortic aneurysm formation during adulthood. Young adults, who generally present with predominant AI, tend to have a higher rate of aortic root dilatation. In contrast, the older patients who typically present with predominant AS tend to have a higher rate of ascending aorta dilatation. Aortic valve repair is an attractive alternative to replacement in young adult with regurgitant BAV. During the last two decades, increased knowledge on BAV disease and refinement of surgical techniques have led to improve standardisation and reproducibility of BAV repair. BAV phenotypes follow a continuous spectrum with at one extremity the “symmetric” BAV with commissure orientation of 180° and at the other extremity very “asymmetric” BAV with commissure orientation near to 120°. Figure 1 (a) “symmetric phenotypes” (180° to 140°) sinuses of Valsalva and aortic cusps are of nearly equal size; the conjoin cusp is almost or completely fused with no or discrete raphé remnant. In “asymmetric” (140° to 160°) or “very asymmetric” (120° to 140°) BAV, fused cusp and corresponding sinuses of Valsalva occupied a larger portion of the root circumference compared to non-fused cusp. Cusp fusion is generally incomplete and tend to be shorter as much as the commissure orientation is close to 120°. Cusp fusion, also called the raphé, form a rudimentary abnormal commissure of which the height is lower than that of the two normal commissures but it tends to reach sinotubular junction as much as commissure orientation is close to 120°. (Figure 1) The source of those observations on BAV morphology is an ongoing multi-centre study performed in Homburg and Brussels by Dr Schülters and Dr de Kardhove. Their goal is to develop a repair oriented classification for regurgitant BAV. (Study presented at EACTS meeting on Monday, October 9th) Next to cusp phenotypes, BAV present also with relatively large annulus (ventricular-aortic junction, VAU) of 28-32 mm in BAV vs 23-24 mm in TAV) and eventually dilatation of aortic root or ascending aorta. Even if BAV repair techniques still varies among the centres with larger experience, over the years their approaches have progressively reached very similar goals consisting in 1) restoring cusp configuration with central cusp plication and intraopereative measure of effective height, 2) reduction of the diameters of VAU with concomitaneous annuloplasty when VAU> 25-27 mm i.e. external ring annuloplasty, suture annuloplasty or valve sparing remodelling; 3) Valve-sparing root replacement using remodelling or remodelling techniques when root diameter > 40-45 mm; 4) Improving valve geometry making it more symmetric (close to 180° commissure orientation) or leaving it at 120°. A valve-sparing root replacement techniques allows remplacement of the commissures at 180° (Figure 2), and in normal root size, a sinus plication stitch on the side of the fused cusp can increase the commissure orientation towards a better valve geometry (> 160°). Currently, BAV repair has reach a certain maturity traduced in excellent long-term durability that can reach 90% or more freedom from reoperation at 10 years. Further studies are necessary to validate whether our new classification is able to guide surgeons across reparative approach and to evaluate how this classification can predict outcomes to improve patient selection for BAV repair.

Cardiac | Advanced Techniques | Surgical challenges in bicuspid aortic valve syndrome

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References

Deep sternal wound infection has no impact on longer term mortality of cardiac surgery patients: a longitudinal case control study

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Sternotomy and leg wound after harvesting a vein are the most commonly infected sites following cardiac surgery and may become apparent in the first month or even years after the procedure. The deep sternal wound infection (DSWI) is a rare complication with an incidence of 1% to 5% and mortality rate of up to 10% to 20%. Mortality rate has remained constant for the last two decades. This complication can increase the length of stay and the cost of the procedure at least two-fold. Apart from its devastating early impact, DSWI also known as mediastinitis has been reported to have a negative impact on late mortality, some studies claiming that there is an increase in late deaths of two – to three-fold. In contrast, some recent studies demonstrated that there is no impact of DSWI in late deaths when it is treated properly. The treatment of this complication is either conventional, such as wound packing or opening, or by the application of negative pressure for the healing of the wound. The vacuum-assisted closure (VAC) technique was introduced as a modality of treatment less than two decades ago. We conducted a longitudinal case-control study aiming to investigate the impact of DSWI treated with negative pressure wound therapy (NPWT) on long-term mortality in post-cardiac surgery patients. All patients who underwent any type of adult cardiac surgery, apart from May 2012 to December 2016 constituted the initial study population. From the initial population, the patients who experienced DWSI post-operatively and were treated with NPWT, constituted the group of cases. A random number-generating algorithm was applied to identify a random sample of patients from the control group. All patients who underwent surgery were indicated. Needle lung and pleural biopsy was vetoed by the mother. Biopsy was not performed due to ethical concerns. Medium chain triglyceride (MCT) formula and breast milk were introduced with gradual weaning. Octreotide, propranolol, sirolimus and sildenafil were introduced as a modality of treatment for those who had shown promising results. From a total of 2,103 patients, 80 were identified as having DSWI. As such, an initial random population of 180 controls was constructed. Seven (6.8%) patients with DSWI and 15 (8.3%) patients without DSWI were lost to follow-up, resulting in a final study sample of 73 cases and 165 controls. Age (66.7±10.5 vs 65.9±10.4; p = 0.598), sex (78.1% vs. 75.2%; male; p = 0.625), EUROSCORE I (2.7±2.4 vs. 2.1±2.1; p = 0.071) and type of operation (p = 0.296) were similar between cases and controls. 19 cases and 12 controls (p<0.001) died during follow-up, with 16 of all deaths (94.2%) occurring within the first year of follow-up. Long-term survival did not differ between cases and controls (833 (495.6-1206.4) days versus 1004 (871-1117) days; p = 0.171), while duration of follow up was similar between the two groups (1072 (754-1300.8) days vs. 1032 (880.2-1163.8) days).

Based on these findings we can conclude that the presence of DSWI treated with NPWT did not have a negative impact on the long-term patient survival in this longitudinal, case-control, single centre study.

Congenital chylothorax managed antenatally and postnatally

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Congenital chylothorax (CC) is an erratic commonest cause of congenital pleural effusion and incorporates a 25-50% mortality rate, compromising lung development and cardiovascular function1. CC is often idiopathic, but can be conveyed by duct ligation with pleurodesis, pleuroectomy or conservative, chemical pleurodesis or thoracic shunting, and open or fetoscopic surgery, have shown promising results2. However, with escalating dimensions in fetal interventions, the gold standard in diagnosis is still chest ultrasound3. The right pleural effusion causing mediastinal shift and may become apparent in the first month or even years after the procedure. With escalating dimensions in fetal interventions, the gold standard in diagnosis is still chest ultrasound3. The right pleural effusion causing mediastinal shift and may become apparent in the first month or even years after the procedure. Aspirated chylothorax. (C) Resolution with thoracocentesis. (A) Massive pleural effusion was decompressed thoracocentesis done to decompress the lung (Figure 1 A, B). The fluid was straw coloured with a white cell count of 3200 cells/μL (97% lymphocytes), suggesting CC. With remounting CC at 38 weeks gestation, thoracocentesis was repeated. The female was born at term with elective caesarian section. Postnatal x-ray displayed right pleural effusion which increased with enteral feeding. Pleural fluid unveiled straw colour (Figure 2B), no odor, biochemically and cytologically suggestive chyle and sterile on culture9. Total enteric rest and parenteral nutrition (TPN) were started and right thoracostomy tube was inserted. Thoracostomy output was replaced intravenously to maintain intravascular volume. Drainage stopped at day 6 with complete lung expansion (Figure 2C). No further otorrhoea or surgery were indicated. Needle lung and pleural biopsy was vetoed by the mother. Medium chain triglyceride (MCT) formula and breast milk were introduced with gradual weaning of TPN. The drain was removed without pleurodesis following and no recurrence. At one-year of follow-up, the child was developing normally. With escalating dimensions in fetal interventions, early (<32 weeks) aspirations, thoracoamniotic shunting, and open or fetoscopic surgery, have shown more fetuses with CC from severe life-threatening hydrops.4 The gold standard in diagnosis is still lung biopsy with subsequent immunohistochemical staining5. The treatment algorithm is largely conservative, beginning with drainage, respiratory support, enteric rest, and TPN, reaching surgery in tenacious cases. As chyle is composed of fats, immune cells (mainly lymphocytes) and proteins, progressive loss is anticipated and replaced to confine drastic metabolic, nutritional and immunological depletion6. Ototracheostomy, propranolol, sirolimus and sildenafl have shown promising results7. However, no medical management fails with drainage of >10 ml/kg/hr after 2 weeks of conservation, chemical pleurodesis or thoracic duct ligation with pleurodesis, pleurotomy and pleuroperitoneal shunt, is the definitive treatment8.
EACTS initiated the Quality Improvement Programme in 2012 to improve clinical outcomes for patients. Since its inception, two international databases have become the highlight of the programme, with cardiothoracic centres collaborating across borders to collect data for scientific purposes and to create benchmarking tools for local quality improvement initiatives.

The Adult Cardiac Database is one of the EACTS Quality Improvement Programme’s international benchmarking databases, providing adult cardiac surgical data and a benchmarking tool for participating hospitals, enabling surgeons to access anonymous data of surgical procedures and compare their own hospital’s data with all other hospitals in the database, anonymously. It is also possible to anonymously compare data of a patient and their outcomes in a participating hospital with similar cases in the database.

2017 marks the first year for the publication of annual and bespoke reports for each contributing hospital, generated by EACTS using data from the Adult Cardiac database, which can be used by contributing centres to carry out research. With the increasing number of centres and procedures contributing to the Adult Cardiac Database, more rigorous data validation processes have been implemented, and new pages and benchmarking features have been added to the tool to improve statistical analysis and research. This includes information on how many records do not meet reasonable validation criteria, additional metrics for hospital comparison, more detailed filters and procedures, statistical controls (mean +/− 1SD, 95% CIs and IQRs), survival curves by individual procedures or all cases, an updated clinical support tool page and an interactive updates page for participants.

With the increasing number of centres and procedures contributing, new features have been added to the tool including more filters, more detailed procedures and better quality. With already over 70,000 procedures in the database from participating centres across 10 countries since 2015, the Adult Cardiac Database is becoming a key tool in global benchmarking for improving clinical outcomes for patients.

Go to www.eacts.org/quip to find out more or come see us at the EACTS booth in the Exhibition Hall to see a demonstration of the Adult Cardiac Database.

EUROMACS, the Mechanical Circulatory Support Database for Scientific Purposes, has continued to grow as a registry and pool of scientific research in the field of mechanical circulatory support. Since launching the EUROMACS Registry in 2012, hospitals have contributed data for patients receiving mechanical circulatory support (MCS). 3,300 implantations (including 178 in children) of long-term assist devices and 12,500 follow-up records have been registered from hospitals in 18 countries. This data has been, and are being, used for scientific research and studies.

To see the list of scientific publications with data from EUROMACS please see the EUROMACS website at www.euromacs.org/downloads/scientific-articles. Since 2016, EUROMACS has been actively part of the EACTS Quality Improvement Programme, providing the EUROMACS community with a new benchmarking platform for statistical analysis, which will be available soon.

To find out more about EUROMACS, please visit the website at www.eacts.org/quip/euromacs/.

The EACTS Quality Improvement Programme task force is made up of 11 members to further develop all aspects of the Programme’s quality improvement initiatives. The task force presented their research and advancements in adult cardiac surgical data and discussed quality outcomes for patients in the EACTS Quality Improvement Programme’s Focus Session at this year’s 31st EACTS Annual Meeting on Sunday 8 October.

More information: www.eacts.org/quip
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Are PTFE neo chordae necessary for optimal results in mitral valve repair?

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Mitral valve repair (MVR) is well established as being the gold standard to treat mitral regurgitation, especially from degenerative aetiology. As MVR is not just one technique for all lesions, there is an armamentarium of techniques to allow durable and reproducible results, and if patients are treated early enough, their life expectancy returns to normal.

PTFE became popular when pioneers like T David and R Frater published their results. It has gained a wide use over time and shown to be a safe alternative to native chord transection. However, Carpenter’s long-term results along with his “French correction” publication had shown, long before PTFE chordae, that MVR could provide excellent results, and last longer than any other techniques. Are PTFE neo chordae necessary for optimal results in MVR? At first glance, one would answer no.

It seems basic knowledge, but quite necessary to remind ourselves that when dealing with degenerative MVR, there are four areas to sort out: excess height of a segment or of the entire valve, excess width (localised or extensive), both being part of the following concept, some degree of prolapse, either localised or extensive, and ultimately the annular dilatation.

Therefore, chordae whether native or artificial should mainly be used to address prolapse and nothing else. The evolution of MVR and the boom in the minimally invasive approach, either endoscopic or robotic, has favoured the use of PTFE chordae. Altogether, there is less and less surgical analysis, and there is a trend to address all lesions by pulling the flabellum tissue down into the ventricle, without separate analysis of the lesions. With such a policy, PTFE chordae are indispensable in achieving such goals.

For a standard fashion procedure, we use 70% native chordal transfer and in 30% PTFE chordae. If we are using a robotic approach, we are more in the range of 40% native chordae and 60% PTFE chordae. If we are using a robotic technique for all lesions, there is an armamentarium of techniques focused on multi-disciplinary aspect of aortic valve repair, course delegates could include cardiac surgeons, echocardiographers (cardiologists and anaesthesiologists) and radiologists who are willing to start, or are already part of, a valve-sparing root replacement and aortic valve repair programme. Advanced residents interested in the field of valve repair are also welcomed and encouraged to present their scientific work via abstract submission. We look forward seeing you in Paris next June to share your experiences, and help raise better medical evidence to clarify the place of repair versus replacement in aortic valve surgery.

For more information, please contact EACTS House. Email: info@eacts.co.uk; Tel: +44 (0)1753 832 166.

References

EACTS Aortic Valve Repair Summit 2018
A new EACTS event in Paris. June 18-19, 2018

Emmanuel Lansac
on behalf of the AVRS scientific committee.

The Aortic Valve Repair Summit (AVRS) was created three years ago in Brussels from a collaboration between Professor Gébrine El Khoury and Professor Hans Joachim Schäfers’s teams, bringing their experiences for the widespread of aortic valve repair. Initial success was confirmed with the last edition in Ottawa. This coming year, AVRS 2018 – held June 18-19 in Paris – will be conducted by EACTS this time.

AVRS’s implication in aortic valve repair is in compliance with recent European guidelines for Heart Valve Disease, which recommend “a Heart team discussion in selected patients with pliable, non-calcified tricuspid or bicuspid aortic valve insufficiency in whom aortic valve repair may be a feasible alternative to valve replacement” (class 1C indication; Figure 1). New guidelines also overcome the initial valve-sparing debate on remodelling versus implantation by recommending (since 2014) “aortic valve repair using the remodelling or remodelling with aortic annuloplasty technique, in young patients with aortic root dilation and tricuspid aortic valves” (class I indication; Figure 1). AVRS is the world’s largest scientific meeting, gathering together the different schools of thoughts in aortic valve repair. It will cover all aspects of the disease including medical therapy, imaging, patient selection and surgical techniques focused on patient outcomes. The aim is to integrate state-of-the-art into daily practice, as well as to challenge current knowledge via high level scientific debates on the main burning topics of aortic valve repair. Abstract submission is strongly encouraged in order to stimulate the scientific debate and enlarge the community of AVRS.

This two-day summit will also provide an in-depth overview on aortic valve repair from valve-sparing root replacement to isolated aortic valve repair for tricuspid, bicuspid and unicusp valves. It will feature live surgeries, offering a fascinating overview of the whole procedure, which will be combined with a short video session illustrating specific lesions and technical issues. In addition, specific facets of aortic dissections as well as the paediatric population will be addressed. The programme will also include a “failure session”, in which attendees will discuss cases all the way from echo analysis to surgical repair, learning how to identify predictors of repair failure and bailout techniques in such conditions.

As AVRS reflects the multi-disciplinary aspect of aortic valve repair, course delegates could include cardiac surgeons, echocardiographers (cardiologists and anaesthesiologists) and radiologists who are willing to start, or are already part of, a valve-sparing aortic root replacement and aortic valve repair programme. Advanced residents interested in the field of valve repair are also welcomed and encouraged to present their scientific work via abstract submission.

We look forward seeing you in Paris next June to share your experiences, and help raise better medical evidence to clarify the place of repair versus replacement in aortic valve surgery.

For more information, please contact EACTS House. Email: info@eacts.co.uk; Tel: +44 (0)1753 832 166.

EACTS Daily News

Aortic Valve Repair Summit 2018
A new EACTS event in Paris.
June 18-19, 2018

Emmanuel Lansac
on behalf of the AVRS scientific committee.

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Indications for surgery (in A) severe aortic regurgitation and (B) aortic root disease (irrespective of the severity of aortic regurgitation)

<table>
<thead>
<tr>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Severe aortic regurgitation</td>
<td></td>
</tr>
<tr>
<td>Surgery is indicated in symptomatic patients [1, 14, 46, 61]</td>
<td>I B</td>
</tr>
<tr>
<td>Surgery is indicated in asymptomatic patients with resting L VFP &gt; 85 mmHg [19]</td>
<td>IIb A</td>
</tr>
<tr>
<td>Surgery is indicated in patients undergoing CABG or surgery of the ascending aorta or of another valve</td>
<td>I B</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Class</th>
<th>Level</th>
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<tbody>
<tr>
<td>B. Aortic root or tubular ascending aorta anomaly(1) (irrespective of the severity of aortic regurgitation)</td>
<td></td>
</tr>
<tr>
<td>Aortic valve repair, using the reimplantation or remodelling with aortic annuloplasty technique, is recommended in young patients with aortic root dilation and tricuspid valve regurgitation</td>
<td>IIb A</td>
</tr>
<tr>
<td>Surgery should be considered in asymptomatic patients with resting LVFP &gt; 85 mmHg or L VFP &gt; 35 mmHg in patients with small body size [1, 16]</td>
<td>IIa B</td>
</tr>
<tr>
<td>Surgery should be considered in patients with thoracic aorta who have aortic root disease with a maximal ascending aortic diameter ≥ 3.5 cm</td>
<td>IIa B</td>
</tr>
<tr>
<td>Surgery should be considered in patients with thoracic aorta who have aortic root disease with maximal ascending aortic diameter ≥ 3.5 cm in the presence of related risk factor(s) [10] or patients with a TGA/RI or TGA/RI (reconstructed) (including leaks-Dietz syndrome)</td>
<td>IIa B</td>
</tr>
<tr>
<td>Surgery should be considered in patients with thoracic aorta who have aortic root disease with maximal ascending aortic diameter ≥ 3.5 cm in the presence of a tricuspid valve with additional risk factor(s) [12] or coarctation</td>
<td>IIa B</td>
</tr>
<tr>
<td>Surgery should be considered in patients with thoracic aorta who have aortic root disease with maximal ascending aortic diameter ≥ 3.5 cm for all other patients.</td>
<td>IIa B</td>
</tr>
</tbody>
</table>

When surgery is primarily indicated for the aortic valve, repair of the aortic root or tubular ascending aorta should be considered when ≥ 5.5 cm, particularly in the presence of a bioprosthetic valve(3).

1. Aortic root repair using the reimplantation or remodelling with aortic annuloplasty technique, is recommended in young patients with aortic root dilation and tricuspid valve regurgitation.
2. Aortic root repair using the reimplantation or remodelling with aortic annuloplasty technique, is recommended in young patients with aortic root dilation and tricuspid valve regurgitation.

References
The concept of external vascular support is not new, but only recently has positive data emerged in this field. Interventional cardiologist Carlo Di Mario (Università degli Studi di Firenze, Florence, Italy) and cardiac surgeons Richard Taggart (John Radcliffe Hospital, Oxford, UK) spoke during yesterday’s Vascular Graft Solutions satellite symposium on the latest developments in the Venous External Stabilising Technology (VEST), which is launching its 1,000-strong EU registry after encouraging RCT findings.

Although coronary artery bypass grafting (CABG) remains the gold standard for severe coronary artery disease, saphenous vein graft (SVG) failure is a key limitation to its long-term clinical outcomes, with more than 20% failure at one year, 40% by 5 years, and more than 60% in 10 years. VEST is an endovascular and with in-patient randomisation.

Dr Di Mario was involved in the control programme from the very start, after the trial was designed to test the hypothesis that VEST would provide a significant reduction in intimal hyperplasia 4.5 years after CABG, plus disease progression. VEST I, which took place between 2012 and 2013, found a significant reduction in intimal hyperplasia (p<0.05) and significant reduction in oscillatory shear stress (p=0.05). VEST II (2014 to 2015), found that 60% of patients with VEST-supported grafts had a uniformity of follow up and an EU registry, speakers have not only looked at overall patency of the vein graft, but we have learned enormously about the nature of flow and making it much more physiological of graft function in terms of the flow, as well as the clinical perspective - he added: “We have not only looked at overall patency of the graft, but we have learned enormously about the nature of flow and making it much more physiological of graft function in terms of the flow, as well as the clinical perspective.”

The VEST II trial showed that drug-eluting stents or bare metal stents do not have an additional benefit of the presence of two mammaries instead of one. There is also not an exceptional difference when you use other arterial conduits. VEST can give a different and more in vivo results, and angiographic images are the best way to convince us that there is a difference and that there is something more to explore in vivo for 7 years results.”

Future implications of these findings are difficult to guess; however, Dr Di Mario noted that the principles underlying VEST are sound, and offer an alternative to existing solutions which tend to have a very high failure rate after 5 to 7 years post-implantation. The graft operation does very well because the mammary artery has a very longstanding effect on the main anterolateral descending (LAD) artery.

“However, we all see - especially we cardiologists, more so than surgeons - patients with late failure. And this is extremely difficult to treat, because stents in vein grafts have higher rates of reocclusion. There is a recent trial showing that drug-eluting stents or bare metal stents in vein grafts do make a difference, and the 6.5 years after CABG, failure is not related to the segment treated, but to the fact that the graft

-users. All the data seems to be in favour, and there will be a large FDA-approved randomised trial, as well as a very large european registry with over 1,000 patients, which are likely to give more convincing answers.”

“This is a very exciting potential technology,” added Dr Taggart. “There is the genuine possibility that it could change the way we routinely perform CABG.”
Saturday 7 October

08:00 Translational and Basic Science Course – Theory and reality of university-based enquiry
Hall A Abstract 0.31/ 0.32 Academy

08:00 Surgery at the crossroads
Hall A Techno College

09:00 Update on the Thyroid
Hall K1 Techno College

10:00 Translational and Basic Science Course – Cardiac: Alpha Gal and Bio valve immunology
Hall A Abstract 0.31/ 0.32 Academy

10:00 Imaging and 3D techniques
Hall A Techno College

12:00 Translational and Basic Science Course – Thoracic: The issue is the issue: building translational...
Hall A Abstract 0.31/ 0.32 Academy

12:30 1st International EACTS Ventricular Assister Device (MD) Co-ordinators Symposium and an…
Hall K1 Advanced Techniques

13:30 New techniques: the developers corner
Hall A Techno College

14:00 Translational and Basic Science Course – Cardiac: Repair medicine and Application: from epigen…
Hall A Abstract 0.31/ 0.32 Academy

14:00 Hands-on arterial switch operation – Congenital dry... Hall K2 Advanced Techniques

16:00 Translational and Basic Science Course – Regulatory aspects of Innovation: What do we have to know as developers...
Hall A Abstract 0.31/ 0.32 Academy

16:00 Transcatheter techniques and atrioventricular valves
Hall A Techno College

10:15 Left ventricular restoration and hypertrophic cardiomyopathy surgery – Healing the left ventricle
Hall K2 Abstract 0.31/ 0.32

10:15 Facing complications during and after emergent surgery for aortic dissection
Hall E1 Focus Session

10:15 2017 EACTS/PASCaTS – Intraoperative nutrition and metabolic support
Hall F1 Focus Session

10:15 Grown-up congenital heart 1 Hall F2 Focus Session

10:15 Current and future options in the treatment of aortic valve stenosis
Hall G2 Focus Session

10:15 Endo-epimysial emphysema management
Hall K1 Focus Session

10:15 Percussion session 2: Improving perfusion
0.14 Focus Session

10:15 Allied Health Professionals – Quality improvement initiatives
2.30/ 2.33 Focus Session

10:15 Research in medicine: your manuscript as the next scientific breakthrough
2.31 Focus Session

10:15 Young Investigator Award – Semi Final 2
Hall E1 Rapid Response

10:15 Jeopardy
Hall F1 Rapid Response

Cash lunch available

12:00 Minimaly invasive aortic valve bypass grafting
Hall A Focus Session

12:00 Complications after endovascular aortic repair: new challenge for open surgery
Hall E1 Focus Session

12:00 Translational and Basic Science Course – Thorac... Hall F1 Rapid Response

12:00 Aortic valve repair – Decision making in mitral surgery: trying to fill the gaps in evidence...
Hall G1 Focus Session

12:00 Health care design: opportunities and challenges for the future
Hall G2 Focus Session

12:00 Perfusion session 3: The state of the art – state of the art
0.14 Focus Session

12:00 Interdisciplinary competency training: Standardisation... 0.12 Focus Session

12:00 Allied Health Professionals – Abstracts
2.20/ 2.23 Focus Session

12:00 C. Walton Lillehei Young Investigator Award / EACTS/ LivLevaNova Cardiac Surgery Innovation A...
Hall E2 Rapid Response

12:00 The long on the cake
Hall F1 Focus Session

12:00 How to set up thoracic surgery research trials
Hall K1 Focus Session

12:00 Surgical Videos
Hall F2 Abstract

14:00 Short-term mechanical support
0.14 Abstract

14:00 Heart transplantation is still the best long-term option
0.31/ 0.32 Abstract

14:00 An old battlefield with casualties: infection of the aorta... Hall E1 Focus Session

14:00 What is new in left main disease
Hall G1 Focus Session

14:00 Work life balance in cardio-thoracic surgery
Hall G2 Focus Session

14:00 Update on chest trauma
Hall K1 Focus Session

14:00 Personalised external aortic root support
Hall K2 Focus Session

14:00 Evolution in bioprosthetic valve design
0.12/ 0.12 Focus Session

14:00 Allied Health Professionals – Hands on session
2.20/ 2.33 Focus Session

14:00 Research in medicine: the ultimate currency for every academic career?
2.31 Focus Session

14:00 Coronary artery bypass graft: Miscellaneous, robotics and off-pump
Hall F1 Rapid Response

14:00 The 2017 EACTS/ESC Guidelines on valvular heart disease
Hall D Focus Session

14:30 The Quality Improvement Programme
0.49/ 0.50 Focus Session

15:45 Thoracic Rapid Response 1
Hall E2 Rapid Response

15:45 Congenital Rapid Response
Hall F1 Rapid Response

Sunday 8 October

08:30 Getting to the root
0.11/ 0.12 Abstract 0.31/ 0.32

08:30 Translational and basic science course – when regulatory where overcome: Human trials
Hall E Abstract 0.31/ 0.32 Academy

08:30 Challenges in patients with connective tissue disorders
Hall E1 Focus Session

08:30 Controversies on peroperative management of heart... Hall F2 Focus Session

08:30 Making vein grafts great again
Hall G1 Focus Session

08:30 Optimal anticoagulant management in patients undergoing coronary artery bypass grafting...
Hall G2 Focus Session

08:30 Pleural empyema management
Hall K1 Focus Session

08:30 Will mini aortic valve replacement become the gold standard?
Hall K2 Focus Session

08:30 Perfusion session 1: Heater cooler induced infections
0.14 Focus Session

08:30 Research in medicine: getting acquainted with a scientific meeting as a starting researcher
2.31 Focus Session

08:30 Young Investigator Award – Semi Final 1
Hall E2 Rapid Response

08:30 Coronary artery bypass grafting – a lot of science
Hall F1 Rapid Response

08:30 Artic revascularisation after the ART trial
Hall D Professional Challenge

08:45 Allied Health Professionals – Prevention and management of infections
2.32/ 2.33 Focus Session

10:15 Translational and basic science course – Discussion and outcomes
0.31/ 0.32 Academy

10:15 Innovative techniques for mitral valve therapy
Hall Abstract 0.31/ 0.32 G1
Long-term outcomes of the Fontan for pulmonary atresia with intact ventricular septum

Patrick Elias1,2, Chin L Poh3, Karin du Plessis4,5, Diana Zannino1, Kathryn Rice1, Dorothy J Radford6, Andrew Bullock5, Gavin R Wheeton1, David S Celermajer1, Yves D'Udekem1,2,3.

1. Department of Cardiac Surgery, The Royal Children's Hospital, Melbourne, Victoria, Australia; 2. The Murdoch Children's Research Institute, Melbourne, Victoria, Australia; 3. Department of Paediatrics, Faculty of Medicine, University of Melbourne, Melbourne, Victoria, Australia; 4. Green Lane Paediatric and Congenital Cardiac Centre, University of Auckland, Auckland, New Zealand; 5. Adult Congenital Heart Disease Unit, The Prince Charles Hospital, Brisbane, Queensland, Australia; 6. Children's Cardiac Centre, Princess Margaret Hospital for Children, Perth, WA, Australia; 7. Department of Cardiology, Women's and Children's Hospital, Adelaide, SA, Australia; 8. Department of Cardiology, Royal Prince Alfred Hospital, Sydney, New South Wales, Australia

Pulmonary atresia with intact ventricular septum (PA-IVS) is a rare type of congenital heart disease with a wide variation by severity. Patients with the most severe form of this disease have hypoplastic right ventricles and small tricuspid valves. Up to one third of these patients develop coronary sinusoids as a result of the high pressure gradient across the intact ventricles. A right ventricle dependent coronary circulation occurs when the left ventricle is partially dependent upon retrograde blood flow through these sinusoids due to proximal coronary stenoses. Those at the most severe end of the spectrum, including those with coronary sinusoids and RVDCC, will have a Fontan procedure. The outcomes of these patients have been limited to 10 years from birth, with little follow-up after a Fontan circulation and small study populations. This study identified late outcomes of patients with PA-IVS in Fontan survivors. The study design was a retrospective analysis of the data of all patients with PA-IVS who have undergone a Fontan procedure in Australia and New Zealand between 1972 and 2012. Operative reports, discharge summaries and follow up letters were reviewed retrospectively, as well as cardiac investigation reports. Late death was defined as death in patients who survived the Fontan completion hospital admission. An ischaemic event was defined as a new significant depression of ≥3 mm in the ECG inversion of at least one lead that was determined to be a sign of ischaemia by the reporting cardiologist, an episode of chest pain or dyspnoea in association with ischaemic ECG changes, inducible ischaemia on exercise tolerance test or elevated cardiac enzymes associated with angina or dyspnoea. Kaplan Meier and Cox Regression were used for time-to-event analysis of mortality and ischaemia that occurred after Fontan.

The study included 120 patients: 20 (17%) had a RVDCC and 100 (83%) had a non-RVDCC. Overall survival for the entire cohort was 80% at 25 years. For the entire cohort there were 11 (9%) deaths a median of nine years (IQR 5-16 years) after hospital discharge. There were six sudden unexpected deaths and one RVDCC was present in four of these. Patients with RVDCC were at greater risk of late death and sudden death. By univariable analysis, RVDCC was associated with late death and developing ischaemia after Fontan. The RVDCC group had a 10-year survival of 77% compared to 98% in the non-RVDCC group. Coronary ischaemia was also an independent predictor of death when used as a time dependent covariate.

Long-term survival of patients with PA-IVS after the Fontan procedure remains excellent. Patients with an RVDCC remain at risk of sudden death. Furthermore, coronary ischaemia seems to be a major issue even late after Fontan completion, particularly those with an RVDCC. It is possible that ischaemia is playing a role in the pathogenesis of sudden death in these patients. This increased risk of sudden death and coronary ischaemia justifies closer surveillance in this group, and the benefits of preventative implantation of a defibrillator should be investigated in patients with RVDCC.

References

Thoracic | Abstract | Oncology lymph nodes and staging

Mediastinal up-staging during surgery in non-small cell lung cancer: Which patterns of mediastinal lymph node metastasis better predict the outcome? A multicentre analysis

Marco Chiappetta1, Giovanni Leuzzi2, Isabella Sperdui3, Gabriele Alessandrini3, Emilio Bria4, Felice Musumeci4, Daniele Facciolo5, Filippo Lococo6, Pierluigi Mucilli5, Daniele Forcella1, Filippo Lococo6, Pierluigi Mucilli5, Daniele Forcella1

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Table 1. Results of univariable and multivariable Cox proportional hazards analysis for late outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariable</th>
<th>Multivariable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late death</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RVDCC</td>
<td>4.7</td>
<td>2.6</td>
</tr>
<tr>
<td>LCA stenosis</td>
<td>6.3</td>
<td>1.6</td>
</tr>
<tr>
<td>RCA stenosis</td>
<td>9</td>
<td>2.7</td>
</tr>
<tr>
<td>Ischaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RVDCC</td>
<td>3.9</td>
<td>2.7</td>
</tr>
<tr>
<td>LAD stenosis</td>
<td>2.6</td>
<td>1.8</td>
</tr>
<tr>
<td>RCA stenosis</td>
<td>5.9</td>
<td>4.9</td>
</tr>
<tr>
<td>TVS-z-score (per unit increase)</td>
<td>0.7</td>
<td>0.09</td>
</tr>
<tr>
<td>Fontan before 2000</td>
<td>0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

HR: hazard ratio; 95% CI: 95% confidence interval; RVDCC: right ventricle-dependent coronary circulation; LCA: left coronary artery; RCA: right coronary artery; TV: tricuspid valve.

References
The clinical results of valve surgery for active infective endocarditis complicated with acute heart failure – When should they undergo the surgery?

Ryohi Matsura, Daisuke Yoshioka, Koichi Toda, Jun-ya Yokoyama, Yasushi Yoshikawa, Yoshiki Sawa
Department of Cardiovascular Surgery, Osaka University Graduate School of Medicine, Osaka, Japan

Background
Several guidelines have generally recommended early surgery for infective endocarditis (IE) patients with symptomatic acute heart failure (AHF), however the detailed timing of "early surgery" remains unknown.

Through it is clear that emergent surgery is essential for patients in cardiogenic shock, it is unclear that emergent or urgent surgery should be performed for patients with AHF without cardiogenic shock, because it is impossible to judge at the timing of IE diagnosis whether AHF without cardiogenic shock will be responsive or unresponsive to medical therapy. This study evaluated the impact of initial treatment for these patients.

Method
We investigated 470 patients with active IE who underwent valve surgery between 2009 and 2016. Of these, 177 patients had symptomatic AHF at the time of IE diagnosis (patients with cardiogenic shock or those who were intubated for AHF were excluded). These 177 patients were divided into two groups according to the initial intention to treat: group S included those who underwent valve surgery as soon as possible (n=74); and group M included those who were initially given medical treatment for AHF and infection (n=103). The characteristics of patients and results were compared.

Results
The median waiting period from diagnosis to surgery was 11(3) days and 108(33) days (p<0.001) for group S and group M, respectively. Although no significant difference was observed between the two groups in any other preoperative parameter, there was a trend of higher survival rate at five years in group S (80% vs 64%, p=0.108, Figure 1). In 103 group M patients, 62 patients (60%) could proceed to planned elective valve surgery after medical treatment at a median of 22 days after IE diagnosis (group P), whereas 41 patients (40%) required conversion to emergent surgery because of deteriorating AHF at a median of nine days after diagnosis (group E). Although there were no differences in in-hospital mortality (20% vs 13%, p=0.369), patients in the group E had a trend of longer hospital stay after valve surgery (36 days vs 52 days, p=0.089), and the ratio of patients who were transferred to long-term rehabilitation facilities was significantly higher in group E (19% vs 5%, p=0.001). Overall survival rate at 5 years was significantly worse in group E than P (79% vs 42%, p=0.012, Figure 2).

The multivariate analysis in the 177 AHF patients, revealed prosthetic valve endocarditis (HR 2.83(1.29-5.88), p=0.011) and conversion to emergent surgery (HR 2.62(1.34-5.12), p=0.005) as independent risk factors for mortality. Therefore, we further analyzed the risk of conversion to emergent surgery in the group M, and the analysis showed Staphylococcus aureus infection (OR 3.88(1.19-13.3), p=0.024) was a significant risk factor for conversion to emergent surgery.

Conclusion
Considering poor outcomes of patients who required emergent surgery for medically refractory AHF, early surgery may be reasonable option for every IE patient with AHF, especially those who suffer from Staphylococcus aureus infection.

Vascular | Abstract | The challenges of endovascular approach in thoracic aorta

Long-term results of endovascular stent graft implantation for the treatment of acute penetrating aortic ulcer

ME Steizmueller1, D Belitzke1, S Mahr1, F Wolf2, M Funovic1, G Laufer1, C Loewe1, M Ehrlich1
1. Department of Cardiac Surgery, Medical University Vienna, Austria
2. Department of Cardiovascular and Interventional Radiology, Medical University Vienna, Austria

Acute aortic syndromes are associated with a high risk of mortality. One disease in this group is the symptomatic penetrating aortic ulcer (PAU), based on an atherosclerotic plaque penetrating the internal elastic layer, causing haematoma formation within the media of the aortic wall. The incidence of PAUs is unclear, and varies in literature between 2.3-7.6%. Complicated or acute PAUs are defined as a development of aneurysms, pseudoaneurysms, dissections or rupture. In case of symptomatic PAUs of the descending aorta, TEVAR is a fast and safe treatment option, especially for elderly patients. Anatomically or unexplainable location of the PAU makes this procedure more complex.

For covering of the pathology in landing zone 0-2, an arch rerouting is inevitable, especially in an acute setting. For elective cases, a custom-made, scalloped, single- or double branched or fenestrated stentgraft could be used to avoid prior aortic arch rerouting for successful PAU exclusion. Acute arch rerouting may lead to an increased morbidity or increased neurological event rate. In this study, 41 patients, predominantly male (81%) underwent TEVAR for acute, symptomatic PAU. Thereof, five patients with PAU who were treated under pending rupture underwent an arch rerouting prior to TEVAR. Neurological deficits after transposition occurred in four out of five patients (90%). One patient developed signs of paraplegia after TEVAR, which could be resolved with acute spinal chord drainage resulting in a complete regression of the symptoms. Patients died within 30 days. The overall survival rate was 90%, 57% and 48% at 1-, 5- and 10-years follow-up. Freedom of reintervention was achieved in 95% of the patients with a mean follow-up of six years. Based on these results, TEVAR is the method of choice in the treatment of symptomatic PAUs, with excellent long-term results and a low rate of reintervention. Further outcome improvement and treatment of a more complex aortic anatomy or pathologies could be achieved in the future with fenestrated, scalloped or single branch prostheses “off the shelf”. Therefore, fast and safe treatment, avoiding an additional operation on high risk patients in an acute setting should be achieved shortly.

EACTS Birmingham Review Course in Cardiothoracic Surgery

Aaron Ranasinghe
Birmingham, UK

The Birmingham Review Course in Cardiothoracic Surgery (BRC) is approaching its 25th Anniversary. The idea of a review course in cardiac surgery – primarily to help surgeons approaching the end of their training, prior to sitting the FRCS exit examination – was conceived by the late Professor Robert Bonser and Mr Tym Graham in 1993. In 1995, Mr Pata Rajesh joined the programme committee and an all-empannacing Review Course in Cardiothoracic Surgery was started.

Over the years, and under the stewardship of different Course Directors, there have been iterations to allow the BRC to stay current. The nature of the faculty has changed from local faculty to national and international experts, including presidents of the STS and AATS.

The BRC attracts approximately 50-60 candidates per year, and the demographic has changed from UK trainees to a more international feel, with candidates attending from both Europe and USA. In the past 10 years, two barriers concerning course fees, travel and accommodation have been available to EACTS trainees. Aside from the educational programme, there is an active social programme every evening which allows candidates to sit with the faculty and continue with their education in a more relaxed fashion.

We look forward to the future success of the BRC and the continuing involvement of EACTS members both as candidates and faculty.
How to use ‘Guidelines’ to guide you

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How to use coronary, valvular and aortic guidelines in clinical practice

The Merriam-Webster definition for “guideline” is: ‘an indication or outline of policy or conduct’. However, the Wikipedia definition includes all aspects of ‘Guidelines’ as we know them: ‘A guideline is a statement of principles to determine a course of action. A guideline aims to streamline particular processes according to a set routine or sound practice. By definition, following a guideline is never mandatory. Guidelines are not binding and are not enforced.’

Guidelines are suggestions not rules but they descend from peer-review. The following rules pertain to ‘how to use guidelines in clinical practice’:

1. Guidelines are ‘guides’, not rules.
2. Read them (the guidelines).
3. Read them with a critical eye; if you disagree with a certain aspect, read the references to see from where the Guideline authors took their concepts of advice for practice.
4. Look at your own practice with a critical eye to see if it differs from the guidelines; if you see a trend in a certain group, for a certain procedure, study it, write it up and publish it.
5. By reviewing your own practice with a critical eye to see the real world surgical and medical treatment, and then by publishing this work, you may modify practice and hence may contribute to the next edition of guidelines. Guidelines are the result from ‘real world’ – retrospective reviews which in turn may give rise to randomized controlled trials, all of which may be referenced in adapted guidelines which are then used by ‘the real world’.

So instead of lamenting that the guidelines do not reflect the ‘real world’, become part of the solution: don’t be shy. Contribute by publishing thereby paying it forward. Guidelines are most useful when drawn from all that have contributed. The following are two examples of this author’s un Awaited inclusion in guideline references. Nothing to sound boastful, these studies were simply attempts at trying to improve patient care.

Example No. 1

Have used transiting-time flow measurement (TTFM) for three years, this author had no idea whether the Medistim machine made any difference to patient outcome and was curious to find out. Hence the publication of a retrospective review of its use in 1,000 actually randomized clinical trials.1 Bottom line: if a surgeon ignores the High Pulsatility Index (PH) of TTFM, a bypass graft, the patient has a statistically greater chance of not only increased major adverse cardiac events (MACE) but also of dying. End result: this paper is referenced in three guidelines: ESC/ EACTS 2010, and 2014 Guidelines on Myocardial Revascularization2,3 and the National Institute for Health and Clinical Excellence (NICE) Unit Medical Technology Guidance United Kingdom; Nov 2011. To paraphrase, these guidelines say: it is prudent to use TTFM to measure bypass graft function intraoperatively.

Example No. 2

At the 2010 EACTS meeting in Vienna, Mohammadi et al presented a well thought out study on the age up upon which BIMA grafting was beneficial. During the presentation the ‘age of benefit’ suggested was 65 years of age; when the study was published the age of benefit had dropped to 60 years. Being a strong arterial grafting proponent, this author was deeply disturbed by the age level and on reviewing the Calgary data of a similar population, and a similar timeframe. The subsequent study yielded a spline analysis in which the Hazard Rate crossed the age line at exactly 69.9 years, i.e. 70 years of age. End result: this study is referenced in two Guidelines on both sides of the Atlantic: the 2016 Society of Thoracic Surgeons Clinical Practice Guidelines on Arterial Coronary Bypass Grafting4 and ESC/EACTS Guidelines on Myocardial Revascularization5-6. These guidelines suggest that use of BIMA is of survival benefit up to age of 70 years.

Now this author’s concerns is the guidelines for use of the novel oral anticoagulants (NOACs)7-8, specifically regarding when to stop NOACs before cardiac surgery. The guidelines suggest three days for ‘high bleed risk surgery’, but cardiac surgery is ‘mega high bleed risk surgery’. There is no other procedure that opens up a major body cavity and then gives enough heparin that would exsanguinate a patient if left unchecked. Cardiac surgery should be in a class all by itself.

In a recent 76-year-old patient with normal renal function, in whom warfarin was stopped for four full days (one day more than the recommended time) undergoing aortic valve replacement and double bypass, the substantial bleeding from the non-surgical sites (bone marrow in particular) caused a drop of haemoglobin from 154 gm preoperatively to 92 gm at discharge on the patient’s six postoperative day. Two units of fresh frozen plasma and $600 worth of Etilon (fibrin sealant) sprayed on the marrow were required to stop the bleeding. This bleeding was so excessive that the patient’s health and operative procedure; one could only question the possibility of a lingering NOAC drug. Although this is an anecdotal report, observation of multiple similar circumstances by many surgeons may ultimately lead to ‘new guidelines’ on the appropriateness for cessation of NOACs prior to cardiac surgery.

Guidelines are an orphan until adopted. But they have to be ‘adoptable’. And to be perfectly blunt: peer review begins with your review of you. Keep observation and a curiosity to further develop an idea are key to the improvement of the practice of medicine. The development of useful guidelines is up to each and every one of us…

References

Salvage right lower lobectomy after right upper lobectomy followed by chemotherapy for T4(pmi) NoMo lung cancer

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Salvage surgery after chemotherapy or radiation therapy for local relapse or pulmonary metastasis is of great concern to thoracic surgeons. Salvage operations after surgical resection might be particularly challenging. Hence, the indications for such procedures should be fully considered, and special attention should be paid to appropriate patient selection.

A 65-year-old woman who underwent right upper lobectomy, partial resection of the right middle lobe, and mediastinal lymph node sampling for T4NO(M0) pulmonary adenocarcinoma six years ago was referred to our department. Despite several postoperative chemotherapy sessions, follow-up CT revealed a gradually increasing metastatic nodule leading to consolidation in the lower right lobe. HRTCD showed no lesions in the right middle lobe. In the lower lobe, ground glass opacity and consolidation formed a tumour shadow. The tumour covered the right inferior vein and shared a wide border with peripheral pleura, pericardia and diaphragm. On PET, the tumour showed a SUV max of 6.89 in the consolidating area. There was no metastasis to the residual lung, and no extrathoracic metastatic lesions were identified. We planned right lower lobectomy to preserve pulmonary function. Complete right pneumonectomy would have been performed if the interlobar artery could not be dissected, or if tumour invasion to the middle lobe had been confirmed. Predicted postoperative percentage vital capacity and forced expiratory volume per second were 50% and 810 ml, respectively, after completion of right pneumonectomy. Through a posterolateral incision in the right sixth intercostal space, we dissected air leak around the right lower lobe to avoid tumour dissemination. After dissecting the interlobar space, the basal artery was identified and cut using a stapler. Although adhesions existed around the apical artery, they could be safely cut using a stapler. The right lower lobe and lower bronchi were also cut using a stapler. The bronchial stump was covered with a pericardial fat pad. The patient’s postoperative course was uneventful and she was discharged on postoperative day 11. Postoperative pathological evaluation revealed invasive mucinous adenocarcinoma with no metastasis to the resected lymph nodes.

We have previously reported right lower lobectomy after right upper lobectomy, followed by chemotherapy, for T4(pmi)NoMo lung cancer is a feasible procedure for curative resection and preservation of pulmonary function.

Thoracic | Abstract | Thoracic Case Session 1
Tracheal resection and anastomosis combined with tracheoplasty utilising autologous costal cartilage in post intubation tracheal stenosis

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Different challenging scenarios are sometimes encountered after resecting the severe main tracheal stenosis. The removal of complicated stents leaving damaged tracheal mucosa, focal tracheomalacia, long additional mild stenosis, long resected segment with a high expected tension on the anastomotic sutures are all possible examples. Resection of these additional diseased parts will develop a very long resected segment and hazardous to anastomose. For such parts will develop a very long resected segment postoperative restenosis. So, after performing routinely a laryngeal drop, and once the posterior membranous wall was anastomosed, costal cartilage harvesting and integrated them in the diseased residual segment after completely resecting the main severe stenosis.

Twelve patients were included in this retrospective study (seven males and five females). Median age was 25 years (range 3-66). All patients had previous multiple bronchoscopic dilatations, eight patients had complicated tracheal stenests, and three tracheostomised. All patients were investigated by direct laryngoscopy, CT with airway volume rendering, and bronchoscopy. Dissection and mobilisation of the trachea was performed according to Grillo's technique. After opening of the airway and securing it distally, examining the stenotic area and the rest of the trachea alarmed an uneasy surgery. The presence of different pathologies separately of the main stenotic area forced us to think how will we avoid an anastomosis under severe tension? We removed eight complicated metallic stents leaving a mutilated mucosa with significantly weak anterior tracheal wall, focal tracheomalacia was sometimes encountered, some patients had additional stage two stenosis. Excising all the diseased tracheal rings ensured a dangerous anastomosis while leaving them behind threatened a future postoperative restenosis. So, after performing routinely a laryngeal drop, and once the posterior membranous wall was anastomosed, costal cartilage harvesting was done with subpericentral manner, then fashioned (BOAT Shaped) and incorporated with the trachea via 5/0 PDS sutures. All patients had autologous costal cartilage tracheoplasty combined with tracheal resection and anastomosis. Tracheoplasty was needed after stent removal in seven patients (58.3%), focal tracheomalacia in two patients (16.6%), additional long mild stenosis in three patients (25%). Median tracheal length resected was 4 cm, median costal cartilage length was 3 cm. All patients were decannulated intraperatively. Postoperatively, follow up was done by bronchoscopy at four months. It showed excellent integration of the costal cartilage into the tracheal wall. Eleven patients (91.66%) were cured and one female patient who was complicated with wound infection developed restenosis. She was managed by serial bronchoscopic dilatations.

Cardiac | Rapid Response | Current developments in transcatheter aortic valve implantation

Impact of low-flow, low-gradient aortic valve stenosis on early and long-term outcomes after transcatheter aortic valve replacement. Results from a national registry

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Classical low-flow, low-gradient aortic valve stenosis (LF/LGAS) is characterised by a low flow and a low gradient across the aortic valve due to left ventricular systolic dysfunction with reduced left ventricular ejection fraction (LVEF). This condition is associated with poor results following surgical aortic valve replacement but there is uncertainty about the outcomes of patients with LF/LGAS undergoing transcatheter aortic valve replacement (TAVR).

The aim of this retrospective multicentre study was to compare the outcomes of LF/LGAS patients versus “conventional” aortic stenosis (AS) patients undergoing TAVR and to assess if LF/LGAS is directly associated with mortality. We analysed data from a “real-world”, “all-comers” National Registry that included all patients who underwent TAVR with the balloon-expandable Sapien/Sapien XT bioprosthesis (Edwards Lifesciences, USA) at 33 Italian centres. The study population was divided into two groups: 1) LF/LGAS that included patients with LVEF<40% and mean transaortic gradient < 40 mmHg; 2) “conventional” AS that included all the remaining patients. Outcomes were defined according to the updated VAPRC definitions. Kaplan–Meier method was used for survival analysis. Cox proportional hazards regression model was fitted to determine the relative risk for death. From 2007 to 2012, 1,904 patients undergoing TAVR were enrolled in the Registry. We excluded 13 patients from the analysis for missing or incomplete data. Out of 1,891 patients that represent the population of this study, 145 (7.7%) were in the LF/LGAS group and 1746 (92.3%) were in the AS group. LF/LGAS patients were more likely to suffer from diabetes (44.1% vs 24.3%, p < 0.0001), chronic kidney failure (17.2% vs 7.2%, p < 0.0001), peripheral vascular disease (49% vs 34.4%, p = 0.0004), coronary artery disease (59.3% vs 39.4%, p < 0.0001), STS score and Euroscore II were significantly higher in LF/LGAS patients (STS: 13±11.2% vs. 8.9±7.1%, p < 0.0001; Euroscore: 13.1±13.5% vs. 6.8±5.5%, p < 0.0001). VAPRC mortality (30-day) was significantly higher in the LF/LGAS group (12.4% vs 6.8%, p = 0.0113). Mortality at follow-up was significantly higher in the LF/LGAS group, as demonstrated by Kaplan–Meier analysis. Survival at three years was 49.9±4.7% and 70.4±1.3% in LF/LGAS and in AS group, respectively; while at five years it was 33.2±10.5% and 49.1±2.8% (Log-rank, p < 0.0001; Figure 1). Gender, preoperative creatinine, preoperative rhythm abnormalities, NYHA class, previous operation but not LF/LGAS were identified as independent predictors of mortality.

Patients with LF/LGAS undergoing TAVR have worse early and late outcomes if compared to those suffering from AS. This is related to the higher incidence of comorbidities and to the worse preoperative status of these patients rather than to the LF/LGAS itself.
Mechanical circulatory support for failing systemic right ventricle: technical tips

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Mechanical assist devices specifically designed for failing right ventricles are not currently available in the clinic, or their use is very limited. Adult patients born with isolated congenitally corrected transposition of great arteries (ccTGA), in which the systemic circulation is supported by a morphological right ventricle, can be asymptomatic and reach adulthood (usually the fourth-fifth decade of life) with no signs of congestive heart failure. For these patients, as in our presented clinical case, a common first sign of cardiac dysfunction is new onset of heart AV-block, requiring biventricular pacemaker implantation. A morphological right ventricle cannot face systemic load and pressure for more than few decades, when it starts to show progressive failure. Certainly, heart transplantation remains the best option for these patients, but the number of donors is not always sufficient to satisfy recipients’ requests. Totally implantable ventricular assist devices (VAD) are valid therapeutic options for adolescents and adults with end-stage left ventricular failure, either as destination therapy or bridge to transplantation. Procedural steps for implantation are described as follows: i) an hypothermic (32°C) cardiopulmonary bypass (CPB) is established and the type of cannulation chosen based on heart anatomy (e.g. presence of an intra-atrial baffle compels bicaval cannulation); ii) if no other intracardiac procedures are planned and there are no other contraindications, VAD can be implanted in a beating heart. The role of the intracardiac transseptal echocardiographic technique (TOE) is essential; iii) evaluation process of the correct site for the pump insertion, where in these patients it is usually found (“finger test”) more posteriorly than in normally conformed hearts, because of the presence of dense cordae, trabeculae and the moderator band, and potentially causes device inflow obstruction. Additionally, TOE is a precise aid to confirm inflow cannula positioning and functioning postoperatively.

After ventricular site selection, i) a sewing ring is fixed to the ventricular wall with single U stitches, mounted on haemostatic pledgets. If preferred, surgeons can further help haemostasis by applying surgical glue at this stage. Next, ii) a specifically designed cannulating tool is used to create an intramyocardial tunnel; once the first cone of muscle is removed, if visible, the remaining obstructing trabecula can be cut and the internal rim trimmed. At this point, iii) the inflow cannula can be inserted, and the iv) pump fixed to the ventricular wall. The paracardial cavity, in these patients, has gradually dilated as well as the failing heart, therefore it is capable of accepting the device, with no need for abdominal surgery. Afterwards, v) a subcutaneous tunnel is created to connect a driveline from the intracardiac device to the external controller. After pump and appropriate lines, vi) an outflow cannula, armed on its proximal portion, is connected to the ascending aorta and the device circulatory support commenced. Finally, vii) all clinical and device parameters are verified and a gradual weaning from the CPB is achieved. At our centre, minimally invasive surgical approaches are often preferred at the time of VAD surgery, especially in patients waiting for transplant, to minimize risk of complications and bleeding at the time of sternotomy.

Our experience reproduces other previously described results, which have shown that third generation VAD to support failing right systemic ventricles in ccTGA reduces early mortality and pulmonary vascular resistance and improves quality of life of patients waiting for transplant.

How to use the RGEA in 2017, tips and pitfalls?

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The optimal strategy for coronary artery bypass grafting (CABG) in patients with multi-vessel disease may be total arterial grafting. The benefits of using bilateral internal thoracic artery (ITA) grafts to perform total arterial revascularization have already been well documented. However, whether the third best arterial graft choice is the radial artery (RA) or the right gastroepiploic artery (RGEA) has not yet been proven. In western countries, the RA is more popularly used, while in Asia the RGEA is more popular. This year marks the 30th anniversary of Pym et al. and Suma RO. Gastroepiploic-coronary anastomosis: a viable alternative bypass graft. J Thorac Cardiovasc Surg 1987;94:205-9.

The propensity for spasm is due to the histological characteristics of the RGEA having a muscular component in its wall. Topical vasodilators such as papaverine have been used to relieve and prevent spasm during surgery. Recent research has shown that denervation of the GEA can also reduce spasm, and skeletonization technique might be able to remove the perianal sympathetic nerves.3 Mild stenosis is thought to be one of the causes of flow competition. To avoid these concerns, the target vessel should be the distal RCA, and stenosis of the target vessel should exceed 90%. Suma et al. reported 20 years’ experience with using RGEA grafts for CABG, and patency was 66% at 10 years in their series.4 One of the reasons for this result is that the number of patients at risk was only 24, and most of those patients were symptomatic, making it difficult to determine the real patency rate. In addition, in their study, the target vessel was not always the distal RCA, but sometimes also the LAD and proximal circumflex and without tight stenosis. Moreover, the RGEA was not prepared in a skeletonized fashion. This relatively low 10-year patency rate can be improved by using the following technical improvements. The skeletonized RGEA graft and targeting coronary arteries with a tight >90% stenosis. Using this approach, Suzuki et al.5 reported 97.8%, 94.7%, and 90.2% cumulative patency rates immediately, and then 5 and 8 years after surgery, respectively. In my personal experience over the past 10 years with 426 consecutive patients, I strictly follow these indications using the RGEA graft to the RCA territory. All of these patients were operated on without cardiopulmonary bypass, and graft patency was 90.1% at 10 years. Heavy RGEA users believe it is the correct conduit to choose for grafting to the RCA, and those who apply RGEA precisely, denervate and provide the target selection find it to be reliable as the third best arterial conduit for CABG.

References
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Raising Standards Through Education and Training
Uniportal right upper bilobectomy after previous anterior thoracotomy for cardiac surgery: is still previous surgery a limit?


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Video-assisted thoracic surgery (VATS) lobectomy has become the gold standard for the treatment of early-stage lung cancer. Uniportal video-assisted thoracoscopic resections seem to offer potential benefits in terms of postoperative pain and morbidity. Previous cardiac thoracic surgery has been considered for years as being a contraindication for thoracoscopic lobectomies, for the presence of intra-thoracic adhesions and pleural adhesions. With increasing experience in VATS, this strategy is often proposed, even in complex procedures.

We report a case of uniportal VATS right upper lobectomy in a patient who previously underwent an anterior thoracotomy for mitral valve replacement.

**Case report**

A 69-year-old man – a former smoker – was referred to our institution for a highly suspected solitary pulmonary nodule in the right upper lobe. The patient underwent a mitral valve replacement (biological Edwards 29) via an anterior thoracotomy approach three years prior. A bicominar pacemaker was also implanted for a complete atrioventricular parasstic block. The positron emission tomography (PET) scan revealed a nodule with 4.5 standardised uptake value, no lymphadenopathy and no signs of distant metastasis. A transbronchial needle biopsy confirmed an adenocarcinoma. The patient had normal pulmonary function tests.

The procedure was performed under general anaesthesia and using selective one-lung ventilation. An unportal approach was used with a single 4-5 cm incision made in the axillary sulcus in the 7th intercostal space, parallel to the previous thoracotomy scar. A 10-mm, 30°-angled camera was placed in the posterior part of the incision. The initial step was to lyse, with a harmonic scalpel, all the adhesions between the lung parenchyma, the mediastinum, the diaphragm and the chest wall.

This part of the operation was very long, but with the high-definition angled camera the adhesiolysis was precise and safe, even at the apex and in the costophrenic sinus. Furthermore, the amount of bleeding was moderate. The lesion melted the minor fissure with minor lobe irritation, so we decided to proceed with an upper bilobectomy. Then, an anatomic dissection with individual ligation of arteries, veins and branches was performed in a standard manner. The specimen was retrieved through the utility incision in the 5th intercostal space, parallel to the previous thoracotomy scar. A systematic lymph node dissection completed the operation and the left 38 F drainage was left in place.

**Discussion**

This case offers a straight view, allowing a safe surgical field, even in complex cases. As expected, a great amount of adhesions increased the complexity of the case, but the magnification of the angled camera permitted a safe dissection even at the apex, that is always technically demanding in open thoracotomy. We believe that unportal video-assisted thoracoscopic resections are not contraindicated in patients who previously underwent cardiothoracic surgery. If hilar and mediastinal adhesions are too dense for a safe dissection and safe vascular structures, conversion to open thoracotomy is mandatory: this is a surgical fact and should be considered early enough to prevent vascular injuries.

**References**


**Further details will be announced at this year’s Annual Meeting.**
A propensity score analysis of fully endoscopic, non-rib-spreading technique versus conventional mini-thoracotomy for mitral valve surgery

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Over the last decades minimally invasive mitral valve surgery (MIMVS) has experienced both an evolution and a substantial revolution through well-defined steps: from direct vision to video-directed procedures, passing through reduction of surgical incision towards robotic telemanipulation, and eventually percutaneous procedures.

Many studies have shown that MIMVS is associated with low mortality, reduced need for blood-product transfusion, less ventilation time and shorter intensive care unit (ICU) and hospital stay when compared to standard sternotomy.

Our Center embraced the philosophy of less-invasive valve surgery back in 2003, progressively extending this approach to all-comers and developing our ‘flavour’ of MIMVS, using central cannulation and direct aortic clamping. Our results published two years ago in over 1,600 patients undergoing MIMVS show an overall mortality rate of 1.1% and a 95% repair rate in the setting of degenerative disease, with a freedom from reoperation of 94% at 10 years. Now we have reached over 2,400 MIMVS procedures and counting with the same results [intra-institutional data].

While the aforementioned development of percutaneous procedures is ongoing, we have focused upon further reducing surgical trauma by minimizing the chest wound and avoiding rib spreading.

From July 2015, a small team (the authors) dedicated themselves to evolve our standard MIMVS technique towards an endoscopic, non-rib-spreading approach (eNRS). The aim of our study was to compare standard right mini-thoracotomy (sRMT) MIMVS versus a eNRS in terms of feasibility and safety, functional status and early outcome.

A propensity score model (1:1 ratio) was built to compare mitral valve surgery patients who underwent sRMT with those receiving eNRS, yielding two groups, each of 105 patients. We were able to successfully complete the endoscopic procedure in all patients; 30-day mortality was absent in both groups. Duration of anaesthesia and overall procedure did not differ substantially.

While cardiopulmonary bypass (CPB) time was longer in the eNRS group, we found no differences in terms of cross-clamp (X-clamp) time and overall repair rate (92% vs. 89%, eNRS vs. sRMT; p = 0.17); furthermore, length of hospital stay and home discharge rate favoured the eNRS approach.

Patient satisfaction was higher in the eNRS group as measured by SF 12 evaluation. A cumulative sum (CUSUM) curve analysis also demonstrated that the process was consistent, exhibiting a learning curve length of about 60 patients.

In our experience, eNRS is safe, reproducible and yields results comparable with sRMT. A learning curve effect was present, but it did not affect the operative results, nor did it impact early mortality. This approach offers, even at initial stages of development, substantial advances in terms of early discharge and higher mental and physical fitness, linked to an early return to daily activities, increased effectiveness, and satisfaction with the procedure.

ETHICON Skills Training at EACTS 2017

Ethicon continues to provide hands on training opportunities for trainees and surgeons alike, throughout this year’s EACTS meeting.

PROGRAM OVERVIEW

Sunday
Anastomotic Skills Lab - 09:00 - 12:00
Aortic Skills Lab - 13:00 - 17:00

Monday
Anastomotic Skills Lab - 09:00 - 12:00
Aortic Skills Lab - 13:00 - 17:00

Tuesday
Mitral Valve Skills Lab - 09:00 - 12:30
A scientific approach to SSI reduction in sternal closure - 14:00 - 16:00

All courses are free of charge, please arrive ahead of time to register and avoid disappointment.

All courses led by Professor Sergeant and Dr De Rae, With guest trainer’s thc.

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Are sutureless valves a serious alternative to TA-TAVI? A matched pairs analysis

EACTS Daily News

Cardiac  | Rapid Response  | Current developments in transcatheter aortic valve implantation

Rawa Arif, Gabor Szabo

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Conventional surgical aortic valve replacement (AVR) remains the gold standard for patients with significant aortic stenosis. However, in intermediate and high-risk patients transcatheter aortic valve implantation (TAVI) is a feasible alternative to surgical AVR. Absence of arterial incisions, so-called sutureless valves (SU-AVR) were suggested to decrease procedural risks in conventional treatment, especially due to reduced arterial cross-clamp time. These features raised the question, if SU-AVR can compete with the continuously improving TA-TAVI procedure. We aimed to answer this question by paired-match analysis. Our retrospective database analysis revealed that 214 patients undergoing transapical TAVI (TA-TAVI) procedure and 62 SU-AVR procedures among 26 institutions in need of concomitant coronary artery bypass grafting (CABG). After matching for age, gender, BMI, emergency indication, New York Heart Association EuroSCORE, 52 pairs of patients were included and analysed.

Our results show that the in-hospital mortality (TAVI: n=3, 5.8% vs. SU-AVR: n=2, 3.8% death; p=0.643) was comparable between TAVI (mean age 77 ± 4.3 years) and SU-AVR groups (mean age 75 ± 4.0 years) including 32 females in each group. The calculated logistic EuroSCORE was similar (TAVI: 19 ± 12 vs. SU-AVR: 17 ± 10; p=0.257). The perioperative analysis revealed surprising results. Anal hysthymia occurred frequently without significant differences (TAVI: n=20, 26% vs. SU-AVR: n=15, 29%; p=0.538). Despite the risk factor of extracorporeal circulation within the SU-AVR group, renal failure requiring dialysis (TAVI: n=4, 7.7% vs. SU-AVR: n=1, 1.9%; p=0.169) and cerebrovascular accidents (TAVI: n=0 vs. SU-AVR: n=1, 1.9%; p=0.315) were without significant difference. Furthermore, maximum postoperative creatinine levels showed also no significant difference (TAVI: 0.85 ± 0.5 mg/dl vs. SU-AVR: 1.05 ± 0.7 mg/dl; p=0.115). Surprisingly, complete heart block requiring permanent pacemaker was relatively rare in both groups (TAVI: n=1, 1.9% vs. SU-AVR: n=4, 7.7%; p=0.169) and also did not differ significantly, while emphasising the extremely low incidence in the TAVI group. As expected, intraoperative use of blood transfusion was higher in SU-AVR group (TAVI: 0.72 U vs. SU-AVR: 1.46 U; p=0.014), while only one patient of the TAVI group required re-thoracotomy (TAVI: n=1, 1.9% vs. SU-AVR: n=0; p=0.315). During ICU stay ventilation time was also comparable (TAVI: 26 ± 166 d vs. SU-AVR: 25 ± 21 d; p=0.914) with low need of reintubation in both groups (TAVI: n=4, 7.7% vs. SU-AVR: n=1, 1.9%; p=0.169). Kaplan-Meier estimated survival calculated no significant difference between both groups after 6 months (TAVI: 74 ± 8% vs. SU-AVR: 92 ± 5%; log rank p=0.008).

In conclusion, this present study showed that SU-AVR is as safe and effective as TA-TAVI in patients at intermediate and high risk for conventional surgery, with low early morbidity and mortality. Combining the advantage of standard diseased valve removal with shorter procedural times, sutureless aortic valve replacement may be the first-line treatment for high-risk patients considered in the ‘grey zone’ between TAVI and conventional surgery, especially if concomitant myocardial revascularization is required.

What is the optimal timing for hepatic vein inclusion following the Kawashima operation in single ventricle patients with interrupted inferior vena cava?

In patients who have undergone the Kawashima operation for palliation of single ventricle anomalies associated with interrupted inferior vena cava, development of pulmonary arteriovenous malformations (PAVMs) with subsequent cyanosis necessitates late hepatic vein inclusion into the cavopulmonary circulation in order to provide the necessary hepatic factor that would allow regression of those PAVMs and improvement of the cyanosis. However, once established, complete regression of PAVMs is unpredictable and often incomplete. Therefore, several institutions have advocated early referral of those patients to receive hepatic vein inclusion prior to significant clinical evidence of PAVMs.

One additional challenge is the choice of operation that would provide even distribution of the hepatic factor into the pulmonary arteries and, subsequently, uniform resolution of those PAVMs. The flow from the hepatic veins to the pulmonary artery following hepatic vein incorporation with a completion Fontan operation might be steered to one lung versus the other based on several factors such as the presence of pulmonary artery stenosis, and streaming effects of the blood coming from the superior vena cava. The high incidence of bilateral superior vena cava in those patients further complicates the issue with various streaming effects of flow and the presence of central pulmonary artery hypoplasia. Procedures other than the Fontan operation to include hepatic flow into the pulmonary circulation have been proposed, such as the H-graft between the hepatic veins and the aygous vein, or a long extracardiac Fontan that extends from the hepatic veins to the superior vena cava that is attached to the aygous continuation of the interrupted inferior vena cava.

We report the results of a policy of early referral of those patients at our institution to receive hepatic vein inclusion surgery prior to development of major PAVMs and subsequent cyanosis. Between 2002 and 2012, 22 children with single ventricle and interrupted inferior vena cava underwent the Kawashima operation. Twenty-one patients (95%) had left atrial isomerism and 21 (95%) had previous first-stage palliation surgery (Norwood+9, Blalock-Taussig shunt=7, pulmonary artery band=5). Median age at time of Kawashima was 9.6 months. Median O2 saturations at time of discharge from the hospital following the Kawashima operation was 87% (IQ 81-90%). At last follow up, there were 21 survivors (95%). Among those, 18 underwent hepatic vein inclusion at a median age of 4.0 years and median interval of 3.4 years from the Kawashima operation. The median O2 saturation prior to hepatic vein inclusion was 76% (IQ 72%-82%), while the immediate post-operative O2 saturation at time of hospital discharge was 82% (IQ 76%-91%), including 4 patients who required supplemental home oxygen therapy. However, we noted a significant improvement of saturation on subsequent outpatient follow up with median O2 saturation of 96% and 88% of those patients had O2 saturation above 90%. Those findings are favorable compared to published reports and support the policy of timely inclusion of hepatic flow in those children to enhance the resolution of PAVMs.

One additional improvement to surgical planning has been that it has been adopted recently at our institution includes the preoperative MRI modeling of the vascular anatomy, coupled with virtual surgical planning that derives multiple possible surgical strategies. Following that, computational flow dynamic study of those various surgical models allows estimation of power loss and flow distribution from the hepatic veins for various models and subsequently identifies the surgical option that will allow even distribution of hepatic factor with minimal energy loss. This is a valuable tool that will help the outlook of Fontan patients in general and those with interrupted inferior vena cava specifically.

Bahaadin Alsoufi

Emory University School of Medicine, Atlanta, GA, USA

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Imaging of the mitral valve, new tools: 3D echo, Tomtech software, CT reconstruction, fusion imaging

Thilo Noack
Department of Cardiac Surgery, Heart Center Leipzig University, Leipzig, Germany

Imaging of the mitral valve (MV) is an important column in the clinical diagnostics and therapy of mitral valve diseases. In particular, transosophagial 2-dimensional echocardiography (2D TTE) as a non-invasive imaging method allows a quick and easy assessment of the MV function and dysfunction. New percutaneous transcatheter or surgical MV interventions require a more exact quantification of the MV geometry, which is important for therapeutically decision making and surgical or interventional planning. In particular, new treatment options, such as fully-endoscopic MV repair or catheter-based techniques, require a precise pre-interventional analysis of the MV due to the missing direct vision and inspection of the MV during the procedure. Furthermore, the asymmetrical MV complex as well as its dynamics throughout the cardiac cycle must be considered. These specific requirements have led to new and varied developments in MV imaging. Among the most important are the Live 3D transosophagical echocardiography (3D TEE), new comprehensive software solutions for the geometric quantification of the MV or the image fusion of ultrasound and fluoroscopy systems. The Live 3D TEE allows an excellent 3D representation of the MV in a high temporal and spatial resolution. The advantage is independence from cardiac rhythm or heart rate. Thus the Live 3D technology is also suitable for guidance during catheter-based interventions. Previous problems with the 3D TEE, such as stitching over four cardiac cycles, are now a thing of the past.

New software solutions (e.g. Philips QLAB, Siemens eSie Valves, Tomtec 4D MV-Assessment) offer extensive post-processing options. Recorded 3D TEE or 3D computed tomography (CT) image data can be analyzed extensively using additional software. The 3D TEE dataset is then imported into a software and then a user-driven analysis takes place. These range from geometric quantification (Figure 1), fluid-structure interaction analysis to the planning and simulation of a MV intervention, to the prediction of a possible therapeutic result. In particular, the initial problems of long processing time and complex operation are solved with the current solutions. Image fusion between fluoroscopy and TEE is technically extremely demanding. The goal of image fusion of ultrasound images and fluoroscopy images for a better intra-procedural guidance. In the first development steps, this was due to the overlay of the ultrasound signal (2D and 3D TEE) with the fluoroscopy. Further developments are the overlay of static and dynamic anatomical landmarks (e.g. trigones, annulus) on fluoroscopy systems. The extent to which image fusing is entering the clinical routine remains unanswered. It is certain that specific interventions such as the transcatheter MV replacement can be a potential application field. In summary, the developments in MV imaging are fast-paced and their possibilities in cardiac surgery are underestimated. New imaging techniques will significantly influence diagnostics, treatment planning, and delivery, especially in the context of catheter-based techniques. The aim of this lecture is therefore to present a comprehensive overview of current developments in MV imaging and to demonstrate possibilities of application in cardiac surgery.

Figure 1. Mitral valve assessment with eSie Valves.
New Active Members List 2017

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Satellite Symposia @ the 31st EACTS Annual Meeting

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<td>Abbott</td>
<td>K2</td>
<td>12:45-14:00</td>
<td>Improving your outcomes with the HeartMate 3™ LVAD</td>
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<td>Edwards Lifesciences</td>
<td>E1</td>
<td>12:45-14:00</td>
<td>Contemporary TAVI and SAVR indications and future perspectives</td>
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<td>12:45-14:00</td>
<td>Aortic Complex Cases: Current Options &amp; Outcomes</td>
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EACTS – New membership applications approved by the General Assembly 2017

New membership applications approved by the General Assembly 2017.

We are pleased to confirm that we have received 330 complete EACTS Membership Applications for 2017. Please find below the list of new members elected at the General Assembly.

From now on, we are happy to receive new EACTS Membership Applications for the year 2018. Please, spread the word amongst your colleagues: www.eacts.org/membership

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### EACTS – New membership applications approved by the General Assembly 2017

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