In his presidential address, "The contraindications of today are the indications of tomorrow", Professor Ludwig von Segesser explained how advances in technology are continuing to expand the boundaries of cardiac-thoracic surgery.

Von Segesser began by saying that the inspiration for his address came from his uncle Albin Mar innsbruck, who claimed that "The most beautiful tracks for driving are there, where it is forbidden to drive!" He said that this statement made a huge impression on him, and it is something he has witnessed throughout his career.

He remembered, "When I was a student at the general hospital in Lucerne, bleeding gastric ulcers were first treated with cool water, then with the Sandstrøm-Balakrishna balloon, and finally by surgical resection". The essential lesson he learned was that in more difficult situations, staplers worked in about 50% of the cases. By then, reliable staplers were introduced, surgical treatment of ulcers had almost disappeared. However, almost 100 years after the introduction of staplers they are now used for endoscopic ablation of the left atrial appendage in the treatment of atrial fibrillation," he said. Von Segesser provided further examples of how treatment can change over time. For example, when treating fractures immobilisation was the rule. However, the rational for surgical stabilisation was early mobilisation of the patient, out of the bed, out of the room, and out of the hospital, thus reducing the risk of pulmonary embolism. A similar development happened more recently for mechanical circulatory support with ventricular assist devices, with immobilisation of the rule, but with the advent of portable and implantable IABP, mobilisation out of the bed, out of the ICU, out of the ward, and out of the hospital became possible. Wireless IABP now allow a patient to spend half an hour in the pool. He also discussed the evolution of the pump oxygenator, initially developed by John Gibbon for respiratory support in massive pulmonary embolism. One of the limiting problems of ECMO is massive hemodilution due to excessive priming volumes, but redesigned ultra-mini-systems allow for so little priming of the entire circuit that there is no detectable hemodilution. A second issue is to get acceptable venous drainage for ECMO in patients with very weak or fibrillating hearts, which can be solved by remote pulmonary artery drainage or, more aggressively, by cardiology with bi-avalve anastomosis relying on temporary caval stenting.

With regard to coronary artery disease in patients with very low left ventricular ejection fraction, he said that the Hannover group has shown that autologous pedicled, vascularized intestinal grafts transplanted into the cardiac wall are functional. Such pedicled grafts may also be valid carriers for stem cells or contractive patches grown on the bench which are supposed to function in avascular cardiac territory.

"Considering the fact that it took almost one hundred years to get reliable staplers for visceral anastomoses, it comes to no surprise that for coronary artery anastomoses there remains some work to do," he said. "However, there are already designs without intraluminal metal or other foreign material and optimized anastomosis configurations based on computational fluid dynamics may provide some insight."

He said that other advances on the horizon include new anticoagulants that do not require monitoring and could potentially re-move the main inconvenience of mechanical valves. "If studies currently underway are successful, then mechanical valves are back."

He acknowledged that there are several issues to overcome, but said that they would be solved with more technology, and suggested we take the advice of Thomas Alva Edison: "Pretty much everything will come to him who hustles while he waits."

Techno College sessions available online

In the last few years new knowledge has been accumulated in risk stratification, diagnostic methods and therapeutic options for patients affected by vascular heart diseases. In addition, a collaborative approach among cardiologists, cardiac surgeons and other specialists (“heart team”) is nowadays considered of great importance for appropriate decision-making and management of patients with cardiac valves pathology. The new guidelines are the product of a task force including members of the ESC and EACTS.

In regard to primary mitral regurgitation (MR), the statement that valve repair is superior to valve replacement when it is expected to be durable has been reinforced. As a matter of fact, mitral valve repair is associated with better preservation of LV function, avoidance of prosthetic related events, reduced hospital mortality and morbidity, improved long-term survival. If a durable repair of a severely incommensurate mitral valve is not possible, surgery should be considered even in patients with severe LV dysfunction (EF<30% and/or ESD<55mm). Surgical indications in asymptomatic patients with severe primary MR have been widened, including now patients with preserved LV function, frail leafer, ESD=40mm, if a durable repair with low surgical risk is feasible. Under this same condition, surgery may also be considered in asymptomatic patients with severe primary MR and left atrial dilatation (volume index > 60ml/m² BSA) or pulmonary hypertension on exercise (>60mmHg).

In regard to secondary MR, when concomitant myocardial revascularisation is not contemplated, surgery may be considered in patients with severe MR, EF>30%, who remain symptomatic despite optimal medical treatment (including CRT if indicated) and have low comorbidity. On the basis of the results from the EVEREST trials and from other registries in Europe and USA, the role of the percutaneous edge to edge repair in the treatment of heavy symptomatic patients with severe primary or secondary MR is recognized. The clip procedure may be considered only in those patients who fulfill the echo criteria of eligibility, are judged inoperable or at high surgical risk by a team of cardiologists and cardiac surgeons, and who have a life expectancy greater than one year (recommendation class IIb, level of evidence C).

In the new guidelines, the threshold for correction of secondary tricuspid regurgitation (TR) during left-sided valve surgery has been definitively lowered. Tricuspid valve repair is advisable even in patients with mild or moderate TR when the annulus is dilated (>40mm or > 21mm/m² BSA), since a substantial progression of TR has been documented in a large proportion of patients submitted to mitral surgery. For severe isolated TR with progressive right ventricular dilatation, surgery should be carried out early enough to avoid irreversible right ventricular dysfunction, even if patients are asymptomatic or mildly symptomatic.

The EACTS is delighted to announce that highlights from the conference’s Techno College sessions are now available on their website, at http://eacts.org/2012/video-highlights.aspx.
TAVI: The Importance of the Transaortic Approach

Mr Vinayak (Vinny) Bapal MBBS, MS, FRCS, FRCSC.
Cf: Department of Cardiothoracic Surgery and Cardiology, St. Thomas’ Hospital, London, UK.

Growing clinical experience, improved technique and technological refinements have greatly improved transcatheter aortic valve implantation (TAVI) outcomes over the past decade. The recent addition of a transaortic (TA) access is one such advance that has already had a strong impact and continues to hold great promise, notably for aortic stenosis patients in whom other approaches are contraindicated.

TAo can be considered a hybrid approach, adopting favourable elements of both transfemoral (TF) and transapical (TA) access. Drawing on TF, the approach is retrograde, with the new valve entering in a straight line from the iliac to the annulus. However, like TA, the approach is surgical and minimally invasive, with the operator working in close proximity to the native valve. The valve is inserted via a mini-sternotomy or mini-thoracotomy and a small incision in the aorta – procedures that cardiac surgeons are already familiar with.

There are several reasons why patients may be considered unsuitable for either TF or TA approaches. Classically, TF is ruled out in cases where the femoral arteries are inaccessible or there is a build-up of calcium in the aorta. TA, meanwhile, should be avoided where anatomical deformities are present, for example to the spine or rib cage, where the apex may be hidden behind the sternum. In some cases, patients may previously have endured a heart attack, with scarring of the left ventricle; others may have poor lung reserve, leading to challenging post-operative recovery. Prior to TAo, such patients would have risked procedural complications or simply may not have been treated.

The first-in-human TAo cases were completed at St. Thomas’ Hospital in 2009. After initial promising results, the focus turned to developing a more standardised technique – one that could be replicated safely to the benefit of patients everywhere, not only those at, pioneering, high volume heart centres. These early experiences played a strong role in the development of a new family of delivery devices, for example Ascendra+ (Edwards Lifesciences).

This received CE Mark approval in June 2012 and can conveniently be used for both TAo and TA delivery of the Edwards SAPIEN XT valve.

Since commercialization, we have continued to see good results, with high levels of procedural success, and only a few complications such as post-operative stroke or access site problems. The future is also bright, as catheters continue to become more surgeon-friendly, and show continual improvements in transaortic valve designs.

TAo further completes the TAVI access route offering, providing Heart Teams across Europe a broader array of options, and ensuring patients are treated with the technique best suited to their anatomical needs. As with all TAVI cases, patient selection continues to be vitally important, and decisions should be assessed with a qualified Heart Team. St Thomas’, along with a few other locations, continues to be a reference centre in the training and education of safe and effective use of the TAVI approach.
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Impact of the full implementation of the EWTD on operative training in adult cardiac surgery

Balakrishnan Mahesh, Lindye Sharpe*, Massimiliano Coglioti
Papworth Hospital, Cambridge, UK;
*MRC Biosciences Unit, Cambridge, UK

Surgical specialists have traditionally relied on practical and apprenticeship to train technical skills. In 2009, the European Working Time Directive (EWTD) has challenged this convention by imposing a drastic reduction in working hours to 48 hours. In turn, this has led to an expansion in the number of trainees required to cover on-call rota, with potential further dilution of training opportunities. We examined the impact of these changes on operative training in a single, high-volume (>1500 procedures/year) adult cardiac surgical center.

Between January 2006 and August 2010, 668 consecutive adult cardiac surgical procedures were analysed. The proportion of cases offered for surgical training were compared for two consecutive time periods: 4504 procedures before the final implementation of the EWTD (Phase 1: January 2006–December 2008) and 2184 procedures after the final implementation of the EWTD (Phase 2: January 2009–August 2010). Other predictors of training considered in the analysis were mode of trainee, logistic EuroSCORE, type of surgical procedure, out-of-hours procedure and consultant. Logistic regression analysis was used to determine predictors of training cases (procedures performed by trainee) and to evaluate the impact of the EWTD on operative surgical training, after controlling for confounding factors.

Our results indicate that the proportion of training cases rose from 34.6% during Phase 1 to 43.6% in Phase 2 (p<0.001), despite higher mean logistic EuroSCORE (4.29 during Phase 1 vs 4.95 during Phase 2, p<0.001) and higher proportion of cases performed out-of-hours (0.4% during Phase 1 vs 5.3% during Phase 2, p<0.001). A greater proportion of procedures were performed by senior trainees (last two years of training) during Phase 2 (17.8% vs 34.9%, p<0.001). Conversely, a lower proportion of procedures was performed by more junior trainees during Phase 2, as compared to Phase 1 (16.8% vs 8.7%, p<0.001), increasing complexity of surgery and a higher proportion of combined cases may explain this observation.

Independent positive predictors of training cases included consultant-in-charge, final EWTD, and senior trainees. Senior trainees had a 7.6 times greater chance of performing a procedure than a junior trainee. EWTD emerged as an independent predictor of training, with implementation of EWTD having a favourable impact (OR 1.27 (1.1-1.47), p<0.01). Independent negative predictors of training cases included logistic EuroSCORE, out-of-hours procedures, and surgery other than coronary artery bypass grafts. Training procedures were more likely to be isolated CABG and less likely to be combined valve and bypass graft, aortic, major and redo cardiac procedures. Out-of-hours procedures were less likely to be performed by trainees [OR 5.539?0.76] (p<0.001). Logistic EuroSCORE emerged as an independent predictor of training, with procedures with Higher EuroSCORE being less likely to be performed by trainees [3.48 vs 5.48, OR 0.96 (0.95-0.97), p<0.001]. To conclude, in our high-volume adult cardiac surgical practice, adequate training standards have been maintained, and even improved upon, despite the drastic reduction in working hours imposed by the EWTD and manpower risk profile of the patient population. Positive training and adaptability efforts from committed trainees can effectively counterbalance the challenges posed by the EWTD.
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**THE PRE-OPERATIVE PHASE IN THE MANAGEMENT OF PATIENTS IN THE REAL-LIFE SITUATIONS**

B. Carabello, M.D., Prof., Medical Care Line, Michael DeBakey Veterans Affairs Medical Center - Houston, TX, USA

**THE MITROFLOW VALVE IN DEMANDING SITUATIONS: HEMODYNAMIC BEHAVIOR, CLINICAL OUTCOMES AND FUTURE POTENTIAL IN TAVI - VALVE IN VALVE SCENARIOS**

J. Albes, M.D., MBA, Prof., Heart Centre Brandenburg - Bernau - Berlin, Germany

**NEW INSIGHTS IN POSTOPERATIVE OUTCOMES OF BIOPROSTHESES AND PATIENTS MANAGEMENT**

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Room 114

Tuesday, October 30th • 12:45 - 2:00 pm
Acquired Cardiac Disease

Focus Session

08:15 The new EACTS/EESC valve guidelines
Room P107
O. K. S. El Khatib, P. Lotze

08:15 What everybody needs to know about the new valvular guidelines on mitral and aortic valve disease
A. Valavanis (Paris)

08:30 What everybody needs to know about the new valvular guidelines on mitral and bicuspid valve disease
d. Allen (Melbourne)

08:45 Discussion

09:00 Carveo surgery in patients with paravalvular aorta in the area of transcatheter valve implantation
P. Utrielo, M. Raad, A. Begzide

09:15 Low incidence and minimal impact of paravalvular leak after conventional aortic valve replacement
I. Zien-Dacqua, M. El Shami, E. Altwahaish (United Kingdom)

09:30 Why the WAC-2 guidelines are not so important for studies in patients with aortic valve disease
S. Heard (Rotterdam)

Cardiac: Abstract 08:15–09:45 Room 120/121

Single-stage hybrid coronary revascularization with five-year angiographic follow-up

Corey Adams - University of Western Ontario University Health Science Centre, London, ON, Canada

Minimally invasive coronary artery bypass surgery represents an exciting and evolving field within cardiac surgery. Hybrid revascularization offers the potential for complete revascularization and achieving the best of both traditional coronary bypass grafting surgery (CABG) and percutaneous coronary intervention (PCI). First performed in 1996, this revascularization strategy utilizes minimally invasive robotic-assisted techniques to harvest the left internal thoracic artery (LITA) and then either via a small anterior thoracotomy or totally endoscopic approach to perform an off-pump LITA to left anterior descending artery (LAD) anastomosis. Immediately following both coronary bypass and PCI aortic surgical revascularization and in the hybrid operating room PCI to non-LAD vessel is performed. Potential benefits include achieving the proven long-term survival and symptomatic advantage associated with a LITA-LAD bypass graft, avoiding a full sternotomy and the morbidity of cardiopulmonary bypass, faster recovery and decreasing hospital length of stay. We report our five year clinical and angiographic results of a one stage hybrid revascularization strategy. At six-months coronary angiograms in a total of 87 patients revealed a LITA to LAD graft patency of 94%. A total of 106 stents were deployed (89 drug eluting stents and 16 bare metal) of which 95 were widely patent, eight with in-stent restenosis, and two with complete occlusion. At five year follow-up patients underwent a computed tomography angiographic assessment of graft patency. To date, 16 of 41 eligible patients have completed follow-up (66.6 +/− 5.3 months) and the LITA to LAD anastomosis was patent in 94% of patients. Of the 16 re-stented patients, 15 were widely patent and a single circumflex drug eluting stent was occluded. Five-year clinical outcomes demonstrated 91% overall survival, 94% freedom from recurrent angina, and 87% freedom from coronary revascularization.

Our study demonstrates that a single stage hybrid revascularization strategy appears to have acceptable six month and five-year angiographic patency results for both LITA-LAD grafts and PCI interventions. Survival, freedom from angina, and freedom from revascularization also appear favorable. We feel that continued research and evaluation into outcomes of hybrid revascularization strategies are needed to strengthen its clinical indication to a wider patient population.

Cardiac: Professional Challenges 08:15–09:45 Room 112

Ascending aortic distensibility, stiffness index beta and tissue doppler-based wall strain in bicuspid aortic valve patients

Marien Zembala - Silesian Center for Heart Diseases, Zabrze, Poland

The presence and natural development of ascending aortopathy associated with BAV syndrome has a well-documented clinical consequences. Precise monitoring of progression of aortic wall disease is of practical importance to select vulnerable patients of higher risk of aortic dissection. Apart from genetic screening, several imaging techniques were suggested for evaluating aortic wall mechanical properties since this subgroup of BAV patients may require early preventive surgery of the aortic root.

Kalinowski et al. in the study. Aortic distensibility, stiffness index beta and tissue Doppler based wall strain in bicuspid aortic valve patients, explored conventional echocardiography and new Doppler based indices to measure mechanical aortic wall properties. In the cohort of 85 BAV pts they found that aortic stiffness and distensibility are independent of severity of both aortic stenosis and regurgitation and these estimates should be the preferred parameters for screening of aortic elasticity. Tissue Doppler based aortic wall strain has been shown to be independent of conventional echocadio measures of aortic elasticity. It is also associated with the severity aortic disease and thus, the authors propose that it could be used for evaluation of the aortic hemodynamic stress triggered by aortic bicuspid valve.

Tomasz Kukulski

Marian Zembala

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Initiating ECLS in these patients is a bridge to decision, recovery or alternative therapy such as venoarterial assist, percutaneous or artificial heart.

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¹ Data on file. ² French testing completed by MAQUET. ³ French test results are not necessarily predictive of clinical results.
Cardioplegia, cross-clamp fibrillation or off-pump for coronary artery bypass grafting? Insights from 8,789 operations using principal component analysis

Dumag Nygaard
Baeklund University Hospital
Baeklund, Essex, UK

The role of off-pump CABG in the surgical myocardial revascularization continues to be debated. In a comprehensive review after a first finding, we identified the potential benefit of off-pump CABG and concluded that its role would be established through research. Since then published reports have been conflicting. This study is predicated on the premise that undertakes CABG present with different anatomic and physiologic abnormalities so optimal myocardial protection cannot be achieved by a single, uniform strategy for all patients. Cardiopulmonary bypass or its avoidance allows different myocardial revascularization strategies, which can be appropriately applied for good outcome. A major conflicting patients the basis of clinical characteristics rather than risk scores, as has been suggested, could help define cohorts of patients suitable for either on-pump or off-pump myocardial revascularisation strategies.

In order to achieve this, this study sought to identify the clinical profile of patients at risk of adverse outcomes with each of these myocardial protection strategies using cohort matching with principal component analysis; a powerful multivariate technique for facing the complex data and is used in face recognition and image compression.

We analysed early and late outcome data for 8779 patients who underwent isolated first-time CABG. Of these, 3862 (44.0%) had cardioplastic arrest, 3751 (42.7%) had cross-clamp fibrillation at rest and 1166 (13.3%) had off-pump CABG.

Adverse operative outcome was defined as operative (in-hospital and/or 30-day mortality, low cardiac output state requiring inotropic and/or mechanical support, myocardial infarction, re-operation for bleeding during on-pump or off-pump fibrillation, delirium, reversible and permanent stroke). Risk factors for adverse outcomes were the same for the on-pump strategy (cardioplegia and cross-clamp fibrillation) but different for off-pump CABG.

Renal dysfunction, non-elective surgery, and moderately high surgical urgency were risk factors.
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Hybrid approach to multi-vessel coronary artery disease

Alberto Repossini
University of Brescia, Italy

Despite more than 40 years of intensive scientific and clinical research, controversy still exists regarding the most appropriate therapy for patients with multivessel coronary artery disease (MH CAD). Both cardiac surgeons and interventional cardiologists feel they possess the ‘panacea’ to treat the disease and it is widely accepted that the survival advantage offered by CABG is related to the presence of a patent left internal mammary artery (LIMA) to LAD artery. Moreover, a minimally invasive direct CAB (MIDCAB, LIMA to LAD) technique has been performed, eliminating the need for sternotomy, aortic clamping and cardiology bypass (CPB), while achieving the same patency rates as conventional surgery.1,2 Hybrid coronary revascularization (HCR) intends to combine the advantages of both MIDCAB and PCI-sterling. Thus, HCR is a sternal sparing, off-pump, minimally invasive, hand-saved LIMA to LAD bypass with a 5–4 cm anterolateral minithoracotomy with PCI to non-LAD lesions, in order to achieve a functional complete revascularization. Uniting these two approaches could, in theory, provide the perfect revascularization: stents replace the need for the SVG, and MIDCAB provides a minimally invasive approach to reduce surgical morbidity. Despite the potential benefits of HCR, the technique has not been widely adopted, mainly due to a lack of co-operation between surgical and interventional groups.

ACURATE™: Multicenter Registry Outcomes 1 Year After CE Approval

Prof Thomas Wailer
Director
Department of Cardiac Surgery
Kings College London
Centre, Belsize Park, London W9 2UB

The ACURATE™, a 2nd generation transapical aortic valve prosthesis, is used to treat elderly high risk patients with severe aortic stenosis. Specific features are its intuitive positioning with tactile feedback, partial repositioning capability in case of wrong deployment and thus a remarkably simple and straightforward implantation technique. The device is available in three sizes to treat patients with annulus diameters of 21mm to 27mm. CE approval for the ACURATE™ prosthesis was obtained in September 2011 after treating 90 high risk elderly patients in a prospective clinical trial successfully. These data illustrate a solid safety and efficacy profile through one year post implant with a survival rate of 80.0% and low incidence of significant paravalvular leak (only 2 patients with a+2 leak).

The ACURATE™ device was launched commercially in Lisbon during the EACTS 2015 Annual Meeting and since then over 200 implantations of the device have been performed in Europe and South America. Syetim S.A. is currently sponsoring a post-market registry for continued safety and efficacy surveillance of the new-generation product. The Syetim ACURATE™ Valve Implantation, or SAVI Registry, is collecting procedure results and follow-up on the first 250 consecutively treated patients. Procedure success and 30 day results (average of 51.9 days) are now available for the first 150 implantations (SAVI 150) and this "real-world" data looks similar, if not improved, to the early clinical trials. The first 150 treated patients with the commercially available device were elderly high-risk patients with a typical MVP profile. Patients are 81.2 ± 6.0 years old, 48% are female and logistic EuroSCORE is 2.3 ± 14.5 and STS Score 86%, respectively. The vast majority of patients are in NYHA Functional Class III or IV.

Patients were treated at thirteen centers with more than half having no previous experience with this device. The average number of patients per center was 11.5 and the over-all procedural success rate was 98.7%. Only two patients out of 150 required a re-intervention: one was converted to surgery due to the bio-prosthesis being pulled into the LV during delivery system retrieval and one required a valve-in-valve procedure due to second degree aortic incompetence. There were no dissections, no migrations of the device and there was no mitral valve impairment in any patient. Overall self-aligning and conformable anchoring allows for perfect positioning within the patients annulus once the valve is deployed. With its successful first year on the market the ACURATE™ device is being used in more and more centers with favorable results and it has been approved for treatment of high-risk elderly patients with severe aortic stenosis.
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We shall not be running out of thoracic or cardiac surgeons in France in the next ten years

Marc Lavaux

Weich President of the French Society of Thoracic and Cardiovascular Surgery, Paris, France

The French Society of Thoracic and Cardiovascular Surgery (SFTCV) built a database of the 830 surgeons involved in thoracic and/or cardiac surgery in France. It includes all the surgeons (523) who perform cardiac or thoracic surgery whatever the number of operations performed per year, being or not member of the SFTCV, and all the trainees (UTR) as soon as they enter a training program of thoracic and/or cardiac surgery.

Global analysis of the age shows that there are briskly 1.7 surgeons a year of age between the age of 35 and the age of 65. The number of senior residents per year reflects the inflow of manpower in thoracic and cardiac surgery. Distribution according to sex gives evidence of the recent feminization of our profession. There are 5 % of women among the senior residents while there are 23 % of women in the senior residents and 31 % of women among our residents. 274 senior surgeons practice cardiac surgery. Among them, 15 practice only thoracic surgery, 27 practices the paediatric cardiac surgery, 31 cardiac and thoracic surgeries, 67 cardiac and vascular surgeries and 34 practices at the thoracic, cardiac and vascular surgery. The distribution according to the age and the status of the cardiac, junior and senior surgeons shows that the flow entering of senior residents is completely sufficient to replace the flow of those who retire. There are 47 senior surgeons practicing the cardiac surgery what makes an entry in the flow of 11 surgeons a year (consideration of the seniority of four years in France). This will be far enough for the next two years (2013-2014) but the need drops in the next five years (2015-2019) as only 25 senior cardiac surgeons will reach the age of 65 during this period so the need will be only of 5 per year. On the next four years (2020-2023) the situation should improve for the young surgeons (Table 1). The residents entering the specialty must get ready to make an intermediate period between the end of their residency or senior residency and their final position as senior surgeon.

There are 346 surgeons practising thoracic surgery but this activity is often shared with another surgery (thoracic and general Surgery: 20, thoracic and cardiac surgery: 31, thoracic, cardiac and vascular 34, thoracic and vascular surgery: 102 and thoracic surgery only 159). The distribution according to the status is approximately different from that of the cardiac surgeons with a more important proportion of staff physicians (40 %) and of private practitioners (40 %) while the professor-staff physicians represents only 16 % of the surgeons practising the thoracic surgery but their activity is always focused on thoracic surgery. The need in activity is according to the age of the thoracic surgeons shows that inflow adequate outcome. It is likely that the generation to come will mostly supply to the activity, and the activity of thoracic surgery is going to concentrate on a lower number of individuals who will make a more exclusive thoracic surgery, or mostly will associate thoracic surgery and vascular.

On the whole we thus can consider that the demographic situation of our specialty is from the desert that one promises to us since year.

Cardiac: Abstract: 08:15-08:45 Room 115

The new generation of Carpenter-Edwards stented aortic bioprosthesis in patients with small aortic roots: 5 year single center experience with 200 patients

Reinhard Moiz MD, Martin Grenzemenroder MD General Hospital Hilding, Department of Cardiovascular Surgery, Vienna, Austria

Aortic valve replacement is the gold standard for patients with severe symptomatic aortic valve stenosis. It allows indeed to decrease postoperative transvalvular gradients and to increase effective orifice areas, leading to left ventricular mass regression and better patient survival.

The aim of hemodynamic improvement of different aortic valve substitutes is to avoid patients postoperative mitral insufficiency as it is a strong independent predictor of both overall mortality and cardiac events (moderate or severe)

In fact PPM is associated with a 4.2 fold increase in the risk of mortality and a 3.2 fold increase in the risk of cardiac events.

In our experience, Carpenter-Edwards PERIMOUNT™ design valves in sizes 19-21mm. In 200 patients received different Carpenter-Edwards percutaneous tissue valves in sizes 19-21mm. In 200 patients received different Carpenter-Edwards percutaneous tissue valves in sizes 19-21mm. In our study European Journal of Dalmau et al, Cardio-thoracic surgery, 6. Hancock II : a matched hemodynamic comparison. M. Borger et al, Ann.

Extended studies such as two or three field lymph node dissections are gaining more acceptance for treatment of this malignancy. Sentinel node biopsy is an established approach in this regard. In this current study we evaluated the accuracy of sentinel node mapping of the squamous cell carcinoma of the oesophagus using intra-operative combined blue dye and radiotracertechiques.

Immediately after thoracotomy and before mobilizing the tumor, 1mcg/ml-trip-99m-synthet ide solution was drawn in a detachable catheter (Sentsafe) into the subcutaneous in 2 steps proximal and distal to the tumor. Concomitantly 2ml of 1% Methylene blue was also injected in the same manner. Sentinel node were removed and sent for frozen section and H&E staining. Two field lymphadenectomy was performed for all patients. Thirty patients (17 males and 13 females) were included in the study with the age of 62.2±15.2 years. Detection rate was 98%. Mean number of sentinel nodes was patient 2.7±1.3. All detected sentinel nodes were hot and no blue/scold sentinel node was harvested. Fifteen patients with successful sentinel node mapping and pathological lymph node involvement in 14 of whom sentinel node was pathologically positive (false negative rate of 6.6%). Frozen section results are not shown. There were no postoperative deaths. Three patients with detection failure had pt4 tumor. One patient with false negative result had pt3 tumor.

Sentinel node mapping in SCC of the mid to distal esophagus is feasible and accurate especially in pt1 and pt2 tumors.

Table 1: Demographic perspectives of the next following years in cardiac surgeons in France

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of resident surgeons in position</th>
<th>Annual flow of senior resident ending training</th>
<th>Number of senior surgeons reaching 65</th>
<th>Mean annual flow of “retired” senior surgeons</th>
</tr>
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<tbody>
<tr>
<td>2013</td>
<td>47</td>
<td>11 per year</td>
<td>18</td>
<td>9.5 per year</td>
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<tr>
<td>2014</td>
<td>46</td>
<td>11 per year</td>
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<td>2015</td>
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<tr>
<td>2016</td>
<td>45</td>
<td>11 per year</td>
<td>23</td>
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Thoracic: Abstract: 08:15-09:45 Room 133/134

Accuracy of sentinel node mapping of the squamous cell carcinoma of the esophagus using intra-operative combined blue dye and radiotracer techniques

Reza Bagheri, Ramin Sadeghi, Seyed Ziaollah, Mahmoud raoz Kalantar, Seyed Hosein Fattahi

Intra-operative combined blue dye and Tc-99m-synthesiside techniques were used for sentinel node mapping of the squamous cell carcinoma of the esophagus using intra-operative combined blue dye and radiotracer techniques.

Table: Mean value of “retired” senior surgeons

<table>
<thead>
<tr>
<th>Year</th>
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<th>Annual flow of senior resident ending training</th>
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In blood post-coronary artery bypass surgery had for long-term survival? M. Pusda, M. Polan, N. Modrus, J. Chauhes (Switzerland)

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LEADING VALVE REPLACEMENT TECHNOLOGY

CARPENTIER-EDWARDS PERIMOUNT MAGNA EASE PERICARDIAL AORTIC BIOPROSTHESIS

Progress Confidently
Optimized extracorporeal circulation system in patients with isolated coronary artery bypass surgery: a five-year single-centre experience

Marie Luisa Harrer
General Hospital in Heidelberg, Vienna, Austria

C
orona
t artery bypass surgery (CABG) with the help of conventional extracorporeal circuits (ECC) is an established and safe procedure; however, efforts in establishing less invasive procedures have gained increased popularity in the cardiac surgical field. It is known that CABG can trigger a systemic inflammatory reaction (SIR), which can and lead to dysfunctions in the coagulation pathway.

To reduce the side effects of CABG a minimized extracorporeal circulation system (ECC) was developed following the concept of a short, closed and heparin-coated cardiopulmonary circuit. Subsequently, this concept was reduced to a reduction of foreign surfaces and blood-air contact aiming at minimization of the biocompatibility and lowering the inflammation.

The principle goal of our study was to evaluate clinical outcome parameter in patients with minimally invasive CABG operated with ECC O compared to conventionally operated patients.

Our study population contains 2539 patients (100%) of which 1557 (77.8%) were in the group with CPB and 496 (24.2%) were in the ECC O group. The mean age (67 ± 10.8 years), BMI (37.7 ± 9.7 years), P:0.008, n.s.), as well as the mean logistic EuroSCORE of patients undergoing CABG with ECC O were comparable to conventionally operated patients.

Our conclusion is that the use of the minimized extracorporeal circulation leads to statistically significant reduction of the overall complication rate in patients with isolated coronary bypass surgery. Additionally the intra- and postoperative red blood cell requirement could be further decreased. Supported by our results we strongly recommend that ECC O should be used more frequently in coronary artery bypass grafting.

Cardiac: Abstracts: 08:15-09:45 Room 118/119

Choice of lesion set during paroxysmal AF ablation in mitral valve patients based on continuous monitoring

Alexander Bogatscher-
Prokhorov State Research Institute of Circulation Pathology, Novosibirsk, Russia

Atrial fibrillation (AF) is the most prevalent arrhythmia, and is present in patients with mitral valve disease. It is unknown whether pulmonary vein isolation or a Maze procedure is needed to ablate paroxysmal AF during mitral valve surgery. In interventional methods (ECG and Holter monitoring) are commonly used to assess mitral valve rhythm after surgical therapy of AF have low sensitivity in detecting paroxysmal AF episodes. The aim of this prospective randomized study was compare two different AF-ablation lesion sets in patients with paroxysmal AF who had undergone mitral valve surgery based on implantable loop recorder (IRL) data. From 2009 to 2011, 52 consecutive patients were enrolled in the study. Patients were randomly assigned to PV isolation or Maze surgery (27 patients receiving pulmonary veins isolation only) or to Maze group (25 patients undergoing complete left atrial maze procedure). The ablation procedure was performed by using a dry bipolar radiofrequency ablation clamp in all patients. Mitral valve surgery was performed through standard techniques after AF ablation. At the end of the operation the implantable loop recorder (IRL) for continuous monitoring was implanted to all patients. Patients with an AF 0.5% were considered AF-free (Responder).

There is no early deaths and procedure-related complications occurred with regard to either ablation or the monitoring device in both groups. No patient had any cerebral thromboembolic complications postoperatively.

One (3.7%) patient in the Maze group required pacemaker implantation before discharge, owing to sinus node dysfunction. All other patients were discharged in sinus rhythm.

Each patient had 3-, 6-, 9-, 12- and 18-month follow-up LIR data collection.

At 18-month follow-up surgery, 15 (57.6%) of the 26 patients in the PV group and 22 (88.0%) of the 25 in the Maze group were AF-free (log-rank test, p = 0.012; Figure 1).

One (4.0%) patient in the Maze group had typical atrial flutter and was underwent catheter ablation.

Baseline on continuous monitoring showed significantly lower AF recurrence in Maze group suggests that only PV isolation in patients with paroxysmal AF during mitral valve surgery is not enough.

Reference

Figure 1 (left): Kaplan-Meier estimates of AF freedom (% ± structural) survival.
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Cardiac: Abstract: 08:15–09:45 Room 120/121

Endoscopic vein harvesting for CABG: a systematic review with meta-analysis of 27,789 patients

Antje-Christin Deppe1, Oliver Liskoupski2, Inge Stotzke3, Elmar Kuhn3, Sebastian Stumper4, Yvonne-Hoss Chue4, Thorsten Wahlers5

Department of Cardiothoracic Surgery, Heart Center of the University of Cologne, 2 Center of Molecular Medicine Cologne, University of Cologne, Germany.

The present study is the largest systematic review to date to evaluate the current strength of evidence for or against endoscopic vein harvesting (Ehv) in patients undergoing coronary artery bypass grafting (CABG). Data are summarized from 43 trials with over 27,000 patients with special focus on graft-related outcomes. We analyzed postoperative outcomes of randomized (RCT) and observational trials (OT) and included wound infection, postoperative pain, length of hospital stay, vein graft failure, myocardial infarction, and mortality.

To our surprise, the results of our analysis contradicts the recently published findings of the PREVENTIV Project of Ex vivo vein Graft Engineering via Transfection (x4) and the ROBYN trial (Randomized On/off Bioprostheses) showing inferior results in terms of graft patency of and midterm clinical outcomes after Ehv and, thus, fundamentally question the value of Ehv for CABG (Lopes et al. N Engl J Med. 2009; Denari et al. Thorac Cardiovasc Surg. 2010). In contrast, our pooled analysis suggests a significant reduction of saphenous vein associated wound infections after Ehv (OR 0.27, 95%CI 0.22 to 0.32), but fails to show a deleterious effect of Ehv on midterm graft failure, myocardial infarction or mortality after pooled analysis of RCT. Given the paucity of data from large RCT and inconclusive results from existing observational trials our meta-analysis, therefore, sets the ongoing controversy by providing the best clinical evidence to date, that Ehv is a safe and valuable option for obtaining bypass graft in patients undergoing CABG.

Based on this evidence we advocate in compliance with existing guidelines from the International Society of Minimal Invasive Surgery (SIMSIC) the preferred use of Ehv in CABG to provide the best possible treatment option for all patients undergoing operation myocardial revascularization.

Cardiac: Abstract: 08:15–09:45 Room 114

Novel surgical ablation through a septal–superior approach for valvar atrial fibrillation: Seven-year experience

Satoshi Kainuma1, Toshifumi Furuta1, Hiroshi Kato1, Atsukazu Nakamura1, Takayuki Damour2, Koshi Toque1, Yosuke Sawar1, Katsuhiro Taniguchi1

Department of Cardiovascular Surgery, Tokyo Women’s Medical University, Japan. (Czech Republic) and the Heart and Vascular Organization Osaka, Osaka Hosp aital, Osaka, 2 Department of Cardiovascular Surgery, Osaka University Graduate School of Medicine, Suita, Osaka, 3 Departments of Cardiovascular Surgery and 4 Biomedicine, Hoogezand College of Medicine, Nijmegen, Nijmegen.

In contrast, after performing the ablated appendage into the ablation lines isolating the left PVs (Figure 1 a, b), septal–superior approach was applied and two connecting lesions were created from the left atrial roof to the left and superior PVs, respectively (Figure 1 c, g). A small incision was then made in the distal site of the right inferior PV and an ablation line was created from the small incision towards the posterior portion of the mitral annulus (Figure 1 j). The cryolesion was added at the left and right atrial isthmuses.

Objective

We previously reported favorable short-term results of our “transapical maze procedure,” a novel technique for creating bi-atrial lesions through a septal-superior approach during mitral valve surgery. Herein, we reviewed the long-term results of this procedure and determined the impact of restricted left atrial (LA) contraction on late clinical methods.

Methods

We examined clinical data of 50 patients undergoing permanent or long-standing persistent atrial fibrillation (AF) (mean period of rhythm disturbance 77.7±8 months) with more than 2 patients performing a transapical maze concomitant with mitral valve surgery and were followed postoperatively for at least 24 months. The mean preoperative LA dimension was 59±4mm (40–85mm). The presence of an A wave in Doppler echocardiography was considered to indicate evidence of LA mechanical contraction. Severe echocardiography was performed to evaluate left ventricular and LA dimension, degrees of valvular regurgitation, and estimated systolic pulmonary artery (PA) pressure. Follow-up was completed with a mean duration of 55.1±16 months (7–88 months).

Results

There were no atrial ablation-related complications and 48 patients (96%) were free from AF immediately after the ablation. At the latest follow-up, 39 patients (78%) were free from AF, while 28 (56%) presented echocardiographic evidence of LA mechanical contraction. Patients without LA mechanical contraction showed a higher incidence of significant tricuspid regurgitation (41% vs. 7%, p=0.006) and worse hemodynamic function in terms of high values for systolic PA pressure at 2 years after surgery. Moreover, patients without LA mechanical contraction were more likely to experience postoperative cerebral infarction than those with it (23% vs. 4%, p=0.07). Multivariate analysis revealed LA dimension >60mm at baseline as an independent risk factor for both failure to recover from AF (adjusted odds ratio 9.4, p=0.049) and lack of LA mechanical contraction (adjusted odds ratio 12, p=0.001).

Conclusions

Our transapical maze procedure may be an effective alternative surgical treatment for eliminating AF during mitral valve surgery. Restored LA mechanical contraction might be associated with favorable hemodynamic function, as well as low incidences of postoperative aggravation of tricuspid regurgitation and thromboembolic stroke. Early surgery is warranted to restore sinus rhythm with LA mechanical contraction, before severe LA dilatation occurs.

Surgical technique (Figure 1)

At first, pulmonary vein (PV) isolation was performed under a standard cardiopulmonary bypass using a bipolar device (Figure 1 a, b). After a right-sided ablation (Figure 1 c, d, e), the heart was arrested and the left atrial appendage was amputated. A connecting lesion was created from the amputated appendage into the ablation lines isolating the left PVs (Figure 1 f). Next, a septal-superior approach was applied and two connecting lesions were created from the left atrial roof to the left and superior PVs, respectively (Figure 1 g, h). A small incision was then made in the distal site of the right inferior PV and an ablation line was created from the small incision towards the posterior portion of the mitral annulus (Figure 1 j). The cryolesion was added at the left and right atrial isthmuses.

Figure 1 (A, B) Atrial incisions, ablation lines, and sites of cryothermia used in our technique. Blue lines indicate connecting lesions made with bipolar radiofrequency, and yellow ovals show cryo-lesions created on the left and right atrial isthmuses. (C) Connecting lesion created from the small incision in the right inferior PV towards the posterior portion of the mitral annulus. (D) Connecting lesion created from the left atrial roof to the right superior PV. Abbreviations: IVC = inferior vena cava, SVC = superior vena cava, PV = pulmonary vein, MV = mitral valve, TV = tricuspid valve, RAA = right atrial appendage, LAA = left atrial appendage, SN = sino node, FO = fossa ovalis, CS = coronary sinus.

References

More cannulae lines, more cannulae sizes, more cannulae choices

Today, more than half of the cardiac surgery procedures in the world are performed using Sorin Cardiac Surgery products. Sorin’s equipment, devices and disposables can be found in the vast majority of the world’s leading hospitals. This is the result of more than three decades of commitment in meeting the most diverse demands within the cardiovascular community.

As a further testament to its dedication to the Cardiac Suite, Sorin committed to further strengthen its position within the cannulae market by extending its Cannulae product portfolio. Since 2011 our company started a process aiming to provide more cannulae lines, more cannulae sizes and more cannulae choices to surgeons worldwide.

The first milestone, dated July 2011, consisted in the acquisition of the Echast cannulae portfolio supporting minimally invasive and traditional cardiac surgery procedures. This portfolio of cannulation solutions provides optimal blood flow with the smallest possible size. The product’s advanced designs (advanced obturator and over the wire designs) allow easy insertion for minimally invasive and traditional cardiac procedures. Key features of the product line are:

• Direct aortic and femoral access
• Excellent flow characteristics
• Dispersion tip flow dynamics
• Easy access without kinking
• Allows easy bloodless insertion
• Reduces potential of vascular damage
• Sorin has been historically present in the cannulae market since 1984 with its own brand in the Conventional Cannulae market segment. During this period, Sorin brought to the market unique products such as dispersion flow aortic cannula “Optiflow”, Coronary Ostium Cannulae 3D, a full range of pediatric solutions and much more.

Nevertheless, in order to further reinforce its ability to provide suitable solutions and high quality products in the cannula product line, Sorin strove to improve the cannula offering with a new, complete family for conventional cardiac surgery, suitable for all single clinical cases. This is now reality with the second milestone: the acquisition of Californian Medical Laboratories Inc. (CalMed) in July 2012. This latest, important step completes and improves the Sorin Group offering in the conventional cannulae market by adding state-of-the-art devices and extending the possibility of providing solutions to needs previously unmatched with the Sorin brand portfolio.

CalMed acquisition brings, in particular, Venous Cannulae, manufactured using an outstanding monolithic design, a complete myocardial protection range with particular emphasis to the retrograde cardioplegia offering. Moreover, complete vent catheters portfolio and intracardiac suckers and sumps as well as minimally invasive devices such as the Blowermeister are now part of the Sorin Group offering.

Innovative product development, commitment and investments in internal resources will continue to play an important role in Sorin Group’s strategy to further reinforce its worldwide position.

Stop by and join us at the Sorin Group booth # 85 to see for yourself the complete cannulae portfolio for minimally invasive and conventional cardiac surgery.

For further information, please contact us at info.cp@sorn.com

Vascular: Professional Challenges 08:15–09:45
Room 114

Step by step way to minimally access aortic surgery

Mohit Sreedhar, Andreas Martens and Asal Naverich Harriover Medical School, Germany

Objective:
Even though minimally access Cardiac Surgery may reduce morbidity, this approach is seldom used, especially for technically demanding operations such as aortic root surgery. At our center, we prospectively moved in a planned manner from minimally access aortic valve surgery to more demanding ascending aortic surgery and finally to aortic root replacements such as Bentall operations and finally to valve-sparing aortic root replacements (David procedures). The purpose of this surgical video is to show a step by step way to aortic root surgery via an upper mini-sternotomy up to the 3rd inter-costal space.

Methods
After a substantial experience with minimally access aortic valve surgery (AVR), we moved first to isolated ascending aortic replacement and then to combined AVR and ascending aortic replacement. Finally, we moved to Bentall procedures and David procedures via upper mini-sternotomy up to the third inter-costal space.

Results
There was no 30-day mortality. There was no intra-operative conversion to full sternotomy. Peri-operative echocardiography revealed no aortic insufficiency in David procedure patients. There was one re-thoracotomy due to post-operative bleeding.

Conclusions
Even though aortic surgery is technically demanding, our ‘step by step’ approach shows that minimally access aortic surgery can safely be performed with excellent results. The key to success is a step by step technique of moving from minimally access AVR to more demanding aortic root surgery. Meticulous hemostasis & attention to surgical details is, of utmost importance to prevent post-operative complications. We believe that such surgery can routinely be performed in selected patients in centers of excellence.
The stentless xenograft as an alternative to the pulmonary homograft in the Ross operation

J. Hechadi, L. de Kerchove, N. E. Céline Vandevoorde, D. Gérard, P. Richomme, J. Hubert
Université Catholique de Louvain, Brussels, Belgium.

Background
Because of limited availability of pulmonary homografts, porcine stentless xenografts have been proposed as an alternative for pulmonary valve replacement in the Ross operation. However it is unknown whether they have similar good long-term durability. Therefore we compared medium-term outcomes between these two right ventricular outflow tract (RVOT) substitutes.

Methods
In 256 adults (>18 years) undergoing Ross opera-
tion between 1991 and 2010, Freestyle stentless xeno-
graff (SX) was used in 174 and cryopreserved pul-
nary homograft (PH) was used in 239 patients for RVOT reconstruction. We matched the 17 SX patients with 37 patients having PH. Among hospital survivors and according to operative period, gender and age, 37 patients with PH could be matched with the 17 SX patients. Groups were compared on basis of clinical and echocardiographic follow-up. In a subset of pa-
tients (SX, n=21; PH, n=25), a Cardiac CT scanner was performed to compare calcific degeneration of both RVOT substitutes. Results: Mean follow-up period was 8.2±4.0 years (range: 2 to 14.6). During this period, 3 patients died, all from cancer, 2 in SX group and one in PH group (p=0.15). No patient needed RVOT re-
operation. At follow-up, peak RVOT gradient was 21 ±2 mmHg and 16 ±7 in SX and PH groups respectively (p=0.09). Peak gradient above 40 mmHg was observed in 1 patient in the PH group (p=0.49). In the SX group, RVOT regurgitation was nil in 79% and grade 1 in 21%, in PH group, regurgitation was nil in 31%, grade 1 in 18% and grade 2 in 11% (p=0.007). Patients with SX presented higher Calcium Scores than those with PH but the difference was statisti-
cally significant between the two groups only after 10 years of follow-up.

Conclusion
At midterm follow-up, the Freestyle SX showed similar functioning compared to the PH. Calcific degeneration occurred in both substrates mainly in their wall, with a trend for a more rapid progression in the SX. The stentless Freestyle bioprosthesis offers an acceptable alternative for RVOT reconstruction, in the Ross proce-
dure, if pulmonary homografts are not available.

Prognostic value of nutritional screening protocols for patients scheduled for cardiac surgery

Surgery Efremov Novosibirsk Research Institute of Pathology of Circulation, Novosibirsk, Russia.

Screening of nutritional status is a necessary aspect of good surgical practice, is cur-
tently implemented in many hospitals of Europe. Frightening is the fact that in the absence of nutritional screening, more than half of cases of malnutri-
tion are skipped. Because a va-
riety of pathologies lead to malnutri-
tion, several different tools have been developed for nutritional screening. However, despite well-known wide prevale-
ence of malnutrition among card-
iac patients (10-25%) a specific tool for nutritional screening in this pop-
ulation has not been designed. Fur-
thermore, the lack of comparative
analysis of different screening tools among cardiac patients leaves clin-
icians with no way to select the most effective approach. The aim of this study was to compare the five different nutritional screening tools (Subjective Global Assessment (SGA), Malnutrition Universal Screening Tool (MUST), Nutritional Risk Index 2002 (NRI-2002), Short Nutritional Assess-
ment Questionnaire (SNAQ) and Mini Nutritional Assessment (MNA)) with regard to adverse outcome among cardia-
c patients undergoing cardiopul-
monary bypass. Our prospective single center observational study includes 1193 patients (597 coronary artery disease patients and 596 patients with heart valve disease) undergoing cardiac surgery. The incidences of malnutrition varied depending on the screening tool and were in ranges 1.5%-12.6% among patients with cor-
nary artery disease and 8.5%-27.5% for patients with heart valve diseases. Taking into account predictive value and simplicity, we concluded that MUST is the most reliable nutritional screen-
ing tool for patients undergoing cardio-
opulmonary surgery. It revealed malnutri-
tion in 9% of patients with coronary artery disease and in 24.8% of patients with heart valve diseases. MUST tool had prognostic value with regard to prolonged ICU stay (OR 1.5, CI 1.1-2.1; P=0.01) and hospitalization >20 days (OR 1.6, CI 1.1-2.2; P=0.03). Moreover, MUST tool independently predicted postoperative complications (OR 1.6, CI 1.1-2.3; P=0.03). Howev-
er, MUST tool independently predicted postoperative complications (OR 1.6, CI 1.1-2.3; P=0.03). Moreover, MUST tool independently predicted postoperative complications (OR 1.6, CI 1.1-2.3; P=0.03).

Vascular: Professional Challenges 10:15–11:45 Room 113

Risk analysis and improvement of strategies in patients who have acute type A aortic dissection with coronary artery dissection

Kiyotake Kimoto
Yokohama City University, Yokohama, Japan.

Objective
Identify risk factors for mortal-
ity and establish improved treatment strategies in patients who have acute type A aortic dissection with coronary artery dissection.

Methods
From January 1994 through December 2011, we performed surgery in 516 patients with acute type A aortic dissection. We studied 75 (15%) of these patients who had coronary artery dissection. Myocardial infarction was present in 48/76 (64%) patients. The culprit coro-
nary artery was the RCA in 406 patients, the LCA in 19, and the RCA + LCA in 3. For coro-
nary artery reconstruction, per-
operative coronary stent place-
ment was done in 7 patients (RCA, 4; LCA, 3), aortic root repla-
acement in 14, CABG in 23 and bio-
gical glue application in 28.

The relations of preoperative risk factors, and coronary ar-
tery reconstruction procedures to in-hospital death and post-
operative low cardiac output syndrome (LCOS) were analyzed using Fisher’s exact test.

Results
Hospital death was 17/75 (23%) patients (23%), 154/8 (31%) among patients with ischemia and 20/77 (24%) without ischemia. The culprit lesion in-
volved the RCA in 406 pa-
tients (15%), RCA + LCA in 29/74 (47%), and RCA - LCA in 23/74 (31%). Factors related to oper-
ative mortality were ischemia (P=0.019), RCA territory ischemia (P=0.003), and preop-
erative CPA (P=0.01). Postop-
erative LOS was less common in patients with coronary artery stent placement (P=0.042).

Conclusions
In patients who undergo sur-
urgery for acute type A aortic dissec-
tion with coronary artery dis-
section, preoperative CPA and myocardial ischemia (parti-
cularly LCA territory ischemia) negatively affect survival out-
comes. Early revascularization by coronary stent placement is effective for preventing postop-
erative LOS.
Effects of intermittent lower body perfusion on end-organ function during repair of acute DeBakey type I aortic dissection under moderate hypothermic circulatory arrest

Suk-Won Song
Gangnam Severance Hospital, Seoul, Korea

The avoid deep hypothermia-related side effects, moderate hypothermic circulatory arrest (HCA) is commonly employed during aortic arch repair, thereby jeopardizing end-organ protection. We sought to analyze the effect of intermittent lower body perfusion (ILBP) on end-organ function during repair of acute DeBakey type I aortic dissection. Between May 2008 and May 2011, 107 patients underwent surgical repair for acute DeBakey type I aortic dissection. All operations were performed with selective cerebral perfusion (SCP) under either moderate HCA only (n = 57) or moderate HCA with ILBP (n = 50). Adverse outcomes, including operative mortality, permanent neurologic deficit, temporary neurologic deficit, renal failure requiring dialysis, and hepatic dysfunction were compared between the two groups. The results are as follows. The mean body temperature at the initiation of SCP was 28.7 ± 1.9°C. Overall operative mortality occurred in six (5.6%) patients. The incidence of permanent neurologic deficit and temporary neurologic deficit was 1.9% and 4.7%, respectively. None of the 9 (8.4%) patients who suffered postoperative renal failure requiring dialysis and hepatic dysfunction (p < 0.001). In conclusion, significantly lower levels of hepatic and kidney enzymes indicate more effective end-organ protection with the use of ILBP. Our data suggests that ILBP provides more effective end-organ protection during repair of aortic arch under moderate HCA.

The Hybrid Stent Graft System

E-vita open plus

The E-vita open plus hybrid stent graft system combines surgical vascular reconstruction with minimal invasiveness. This unique prosthesis simplifies previous therapeutic techniques which impose a severe strain on the patients with their two-stage procedure and invasiveness. By using E-vita open plus, the operative procedure can be reduced to a single intervention from which both patient and surgeon, benefit in equal measure. E-vita open plus allows the so-called optimized “Fro-zen Elephant Technique” technique. This technique enables treatment of complex lesions of the thoracic aorta during a single-stage procedure combining the endovascular stenting of the descending thoracic aorta with conventional surgery using the concept of the elephant trunk. After median sternotomy and under circulatory arrest the arch is opened. The E-vita open plus stent graft system is introduced in an antegrade fashion in the aorta descendens over the previously placed stilt guide wire. By using of the safe and precise Squeeze-to-Release deployment mechanism the hybrid stent graft can be deployed. After surgical fixation of the stent graft portion by a circumferential sutures line the inflitided surgical cuff can be easily everted and sutured to another vascular graft or used for the aortic arch reconstruction. The E-vita open plus stent graft system is available in diameters from 24 to 40mm as well as in different lengths of the surgical cuff portion (50, 70mm) and stent graft portion (30mm, 150mm and 170mm). The one-piece hybrid stent graft is made of blood tight polyester and supported by nitinol springs in the stent graft section. Due to the special weaving process the surgical cuff is primarily blood tight without any impregnation or pre-clotting. The unique delivery system allows precise positioning of the stent graft and controllable deployment. Since a few months a new delivery system is available which offers a more compact size in order to ensure space-saving handling in the operating field.

Founded in year 2000, JOTEC has become firmly established on the market as a specialist for aortic diseases. The product portfolio contains numerous solutions for life-threatening aortic and peripheral vascular diseases. The production is based in Germany, at the company headquarters in Hechingen. Direct sales units are located in Italy, Poland, Spain and Switzerland together with an international network of distributors guaranteeing worldwide market presence. To learn more about our E-vita open plus stent graft system please visit us at our booth No. 121.
Join us for the luncheon symposium
“Innovations for the hybrid OR in CTVS”

Time: October 30, 12:45-14:00
Location: Room 131/132
Chairman: Giuseppe Bruschi

1. Giuseppe Bruschi, Niguarda Hospital, Milan: “DynaCT and advanced software applications for TAVI”

2. Anne Figel, Siemens AG: “Interventional imaging in VATS for early stage lung cancer”

3. Dr. Juan Margarit, University Hospital La Fe, Valencia: “Hybrid surgery in patients with CAD and associated vascular athalogy”

4. Klaus Christian, Maquet: “Optimize your workflow”
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A division of the aortic valve leaflets within the dissected sinuses of Valsalva with a biologic glue and subsequent supracoronary aortic replace- ment offers an easy and simple method of preserving the native valve and abolishing the aortic insufficiency when it is caused by dissection and distortion of the root anatomy. How- ever, this technique is still a matter of debate because non-curling root repair can result in the develop- ment of several pathologies necessitating redo sur- gery that is even more challenging after previous use of the glue. The modified remodeling of the aortic root with replacement of selected sinuses of Valsalva has been used at our centre exclusively for valve-sparing root repair for years. Even if this technique is lim- ited only to pathologic sinuses, a cureative surgery of the dissected aortic root can be achieved. The patho- logical sinuses of Valsalva, especially those with dis- solved aortic end are excluded, leaving a rim of the aortic wall attached to the aortic valve. Depending on the number of sinuses that have to be replaced, one or three patches are excised from the vascular graft and trimmed to teardrop shapes matching the size of the aortic sinuses’ cusps, keeping in mind that the sum of the sinuses’ widths has to be equal to the cir- cumference of the tube graft chosen.

A total of six patients (median age 76, range 63-81 years) died, on average, 10 months (range 0.9-44) af- ter surgery resulting in an overall survival of 8.7% at the mean follow-up of 54±37, range 0.5-132 months. No death was related to the aortic valve or aortic root. No patient required reoperation on the proximal aorta and/or aortic valve during the entire follow-up time.

Vascular: Professional Challenges 08:15-09:45 Room 113

Valve-sparing aortic root repair in acute type A dissection: How many sinuses have to be repaired for curative surgery?

**Paul P. Urbanski**
Cardiovascular Clinic Heidelberg, Germany

The authors conclude that agreement on specific patient therapy, such as transfusion triggers, provides the foundation for any performance improve- ment initiative. However, until the specific metric is quantified and regu- larly presented to caregivers, adherence to agreed-upon guidelines is unpredict- able. However, routine, regular presen- tation of performance metrics leads to improvement in standardization of care and adherence to guidelines. But, re- moval of anonymity, with public pres- entation of provider-specific behavior was associated with even better per- formance. This is the reason why we con- tinue to try to improve the care we give, routine review of agreed upon qual- ity metrics appears essential. However, identification of provider-specific per- formance appears to measurably add to the benefits derived from a group per- formance improvement program.
Active mitral ring for continual post-surgery remote and reversible correction of residual mitral regurgitation on the beating heart

Piergiorgio Rizzoli
Cardio Hospital Universitaria Udoleo, Lousanne, Switzerland

“M
ithral repair is bet
er than mitral re-
placemen
ever it’s possible”
is one of the rare statements agreed upon by both cardiolo-
gists and cardiac surgeons. Because the surgical treatment is technically demanding, residual MR is often only detectable when the intervention is completed. Triviality (1+) and mild (2+) residual MR are usually tolerated be-
cause mortality and morbidity as-
sociated to another cardiac arrest exceed potential clinical benefit. Moderate (3+) and severe (4+) residual MR usually lead to valve re-
placement. Although its incidence is not clearly described in literature and depends on the etiology, it is fair to assume that every cardiac sur-
geon experienced this stressful situation several times. Some au-
tors report that 5 to 11% of post-
operatory echocardiography iden-
tifies residual MR requiring imme-
 diate surgical intervention. Other studies report a 30% incidence of residual MR in patients treated for ischemic MRI with undamaged ring annuloplasty. The clinical im-
 pact of less than moderate re-
 residual MR after repair is difficult to quantify and only prospective studies on large cohorts of pa-
 tients would allow stratifying the risk in patients suffering of cardi-
muscular and other diseases. However, residual 1+ and 2+ MR is clearly associated with higher reintervention rate. There are several causes leading to failed repairs, however they usually share the same patho-
physiology: inadequate systo-
tic coaptation with less than-
common leaflets’ overlap. Theoret-
ically, any device allowing leaflets’ coaptation surface increase should decrease residual MR. A post-implant adjustable mitral ring would potentially address this issue, for allowing beating heart annulus reshaping under echocardiography control any time after implant.

The Mitraflex ring is a novel mitral ring allowing valve geometry remodeling after the im-
plant and potentially correcting residual mitral regurgitation. Mitra-
flexx consists of 2 concentric rings: one internal and flexible ring, suited to the annu-
lus and a second external rigid ring. A conic element slides be-
tween the two rings modifying the shape of the flexible inner
ring. This sliding element is re-
motely activated with a rotating tool that is positioned under the skin, similar to a pacemaker im-
 plantation. The correction is anticipated to be reversible at any time af-
 ter implant. In adult swine, un-
der CFB and cardiac arrest, we shortened primary coronal of F2 segment to reproduce type III re-
gurgitation and we implanted the Mitraflex ring according to the interproximal distance us-
ing Carpenter’s technique. Af-
ter CFB weaning, we used int-
racardiac ultrasound to assess mitral regurgitation and the effi-
cacy of the Mitraflex to correct it. Severe mitral regurgitation (3+ and 4+) was induced in 8 ani-
 mals, 5%±10%. Vena contracta width decreased from 0.8±0.2 cm to 0.1±0.1cm, PISA radius decreased from 0.8±0.2 cm to 0.1cm. Effect-
ive Regurgitant Orifice Area de-
 creased from 0.5±0.2 cm² to 0.1±0.1cm². All corrections were reversible. Post-implant adjust-
able mitral ring corrects severe mitral regurgitation trough re-
versible beating heart annulus geometry modification. We antic-
ipate that this promising device will address the frequent and morbid issue of post-surgical re-
pair mitral valve regurgitation.

Robust navigation platform integrates real-
time transesophageal echo (TEE) with a mag-
netic tracking system that guides a surgeon to virtual images of target anatomy

NeoChord, a medical device company focused on minimally invasive mitral valve repair, has obtained the exclusive rights to state-of-the-art ‘augmented reality’ imaging technology from Western University’s Robarts Research Institute.

“NeoChord plans European TACT Register for 2013

The NeoChord DS1000 mitral repair system may soon offer European patients a less invasive procedure choice. Historically, mitral chordae tendineae replacement has been used with excellent results for repairing leaflet prolapse, but it typically requires sternotomy and always requires cardiopulmonary bypass. The NeoChord DS1000 delivers neochordae in an off-pump procedure using minimally invasive techniques. The NeoChord procedure is performed through a left-sited mini thoracotomy and utilizes transapical access to the mitral valve. The NeoChord DS1000 mitral repair system seeks to avoid the invasiveness associated with open-heart surgery performed on a stopped while still providing a durable reduction in MR grade. Using echocardiographic guidance, the NeoChord DS1000 device is introduced through the apex of the heart, into the left ventricle, and between the mitral valve leaflets. The prolapsed leaflet is then grasped using the expandable jaws of the device. When the monitor confirms that the leaflet has been adequately captured, an ePTFE suture is deployed and attached to the leaflet, then pulled through the apex as the device is removed. Correct neochordae length is determined by using real-time echo guidance and observing the improvement in MR in the beating heart. Multiple chords may be placed in this fashion to optimize MR reduction and durability. When appropriate MR reduction is achieved, the neochordae are attached at the apex, and the apex is closed. Visit NeoChord at EACTS booth 67, and www.neochord.com. What if there was a sternal-sparing, beating-heart, neochordae implant procedure?

What are the KOLs saying about the NeoChord DS1000 mitral repair system...

Giovanni Speziali, MD
Cardiothoracic Surgeon, University of Padua,
Medical Center, Heart & Vascular Institute; pri-
mary inventor, NeoChord

“NeoChord’s technology allows the implantation of artificial chordae tendineae, a proven technique for repair of mitral valve prolapse and regurgitation, via a minimally invasive approach with a small thoracotomy in a beating heart, off-pump surgery.”

Richard C. Daly, MD
Cardio-thoracic surgeon, Mayo Clinic,
Mayo School of Medicine.

“One key advantage of NeoChord’s technology is that the chord length can be adjusted in real time, on a beating heart, and thus be optimized to reduce mitral regurgitation.”

What if there was a sternal-sparing, beating-heart, neochordae implant procedure?

What are the KOLs saying about the NeoChord DS1000 mitral repair system...


**Cardiac: Abstract** 10:15–11:45 Room 114

**Balancing the Benefits and Risks of Blood Transfusion in Patients Undergoing Cardiac Surgery: Propensity-Matched Analysis**

Juan B. Gross, Christopher John Instituto

I n certain situations, blood transfusions are needed in order to de ciently manage the patient's clinical condition and avoid life-threatening complications. In this study, we aimed to evaluate the risks and bene ts of blood transfusions in patients undergoing cardiac surgery. We performed a propensity-matched analysis of patients who underwent cardiac surgery at our institution from 2006 to 2010. The outcomes of interest included all-cause mortality, complications, and costs associated with blood transfusions. Our results showed that patients who received blood transfusions had a significantly higher risk of mortality, complications, and hospital stay compared to those who did not receive transfusions. These ndings highlight the importance of carefully managing blood transfusions in patients undergoing cardiac surgery. Further research is needed to develop strategies to minimize the risks associated with blood transfusions.

What is not clear is if there are any negative effects of transfusing cardiac surgery patients who have prophylactic hematocrit (HCT) levels within the normal range or higher. In order to address this issue, we compared operative mortality and complication rates in a cohort of propensity-matched cardiac surgery patients stratified by preoperative HCT level. Our study indicates that patients who receive blood at higher HCT levels may be placed at increased risk for operative mortality and other surgical complications. A multivariable logistic regression analysis indicates that patients with preoperative HCT ≥42% are more likely to receive blood products at a 2.5-fold increased risk for 30-day mortality independent of other factors. Given the success seen with institutional blood conservation programs and in the lack of a 'lifesaving' component, there is overwhelming data showing that cardiac surgery can be safely carried out without transfusion guidelines.
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Dr. N. Wunderlich
University Hospital Mainz, Cardiology
Center Darmstadt, Germany
Challenges in new structural heart disease interventions: How 3D Echo can help

Prof. Dr. V. Falk
Cardiovascular Surgery Division,
University Hospital Zürich, Switzerland
Role of 3D Echo-X-ray fusion (EchoNavigator)® in challenging structural heart interventions

Dr. H. Schröfel
Heart Surgery Clinic,
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Key surgical principles in infective endocarditis

Roland Hetzer

Deutsches Herzzentrum, Berlin, Germany

Infective endocarditis (IE) remains a major problem with unchanging incidence and a mortality approaching 30% per year. Surgery is potentially lifesaving, and is required in 25–50% of cases during acute infection and in 3–70% of cases with complications. Operative procedures are often technically difficult and associated with high risk, not least because patients are frequently extremely sick with multisystem disease. Nevertheless, indications for surgery are clear in many patients, and international guidelines\(^1\) provide strong recommendations that are applicable for all patients. The guidelines do, however, not support by robust clinical evidence, and clinical decision making often happens by diverse conditions, including advanced age of the overall patient cohort, the presence of extracardiac complications or preexisting comorbidities, prior antibiotic therapy and varying duration, and the availability of appropriate surgical expertise. The role of surgery in active IE has evolved progressively since early reports of successful outcome. Subsequent declines in mortality may be attributed to a variety of improvements, although expeditious surgery in carefully selected patients has played a major role. Contemporary data in Europe indicate that surgery is now undertaken in approximately 50% of patients with IE. The most frequent indications are congestive heart failure (61%), refractory sepsis (40%), atrial fibrillation (18%), and vegetation size (48%), with a combination of these factors being present in most patients. Indications for surgery are congestive heart failure, wherein surgery should be performed immediately, irrespective of antibiotic therapy, in patients with persistent pulmonary edema or cardiogenic shock. If congestive heart failure is controlled with medical therapy after these other surgical options, intervention can be postponed to allow for a period of days or weeks of antibiotic therapy under careful clinical and echocardiographic observation. Other indications are perianal extension, tenosynovial embo-zem, cerebrovascular complications, persistent sepsis, presence of difficult organisms such as S. aureus, S. lugdunensis, Brucella, Pseudomonas aeruginosa, fungus, methicillin-resistant S. aureus or vancomycinresistant enterococci, rare infections caused by Gram-negative bacteria, and O’-vef. Timing of surgery: Surgical interven-tion is preferable when the patient is afebrile. Emergency surgery (within 24 hours) is performed for native (aortic or mitral) or prosthetic valve endocarditis and severe congestive heart failure or cardiogenic shock caused by acute val-veur regurgitation, severe prosthetic dysfunction (dissemination or obstruction) and fistula into a cardiac chamber or on to the pericardial space. Urgent sur-gery (within 24 hours) is performed for na-tive and prosthetic valve endocarditis with persisting congestive heart failure, signs of poor hemodynamic performance, large vegetation (>1 cm), abscess and/or paravalvular involvement evi-dence by the emergence of atresias in ventric-ular block. Surgery is performed in an afebrile state, usually after seven days of effec-tive antibiotic treatment. Our protocol prescribes the preservation of the native valve and avoidance of pros-thetic materials whenever possible. Standard operative principles are ade-quate debridement of all infected tis-sues, elimination of previously placed prosthetic materials, meticulous irri-gation and bathing of all intracardiac cavities with 1.5% povidone solution. Valve reconstruction with untrained autologous pericardium is performed when feasible, and when not, homol-ogous or xenopericardium (equine, bov-ine) is used as an alternative. For valve implantation, monofilament sutur-e materials and pledgets of biological tis-sues are strongly recommended. Performance of surgery: In aor-tic position, when the annulus is not infected, mechanical or stented ve-xenographs are acceptable. When the annulus is infected (absces forma-tion), homograft valves or stenless ve-xenographs (without any prosthetic mate-rials) are preferred in extensive abscess formation (ventriculo-aortic disconti-nuity), aortic root replacement with Ben-tal anastomosis is the procedure of choice. Use of anterior mitral leaflets of the homograft to restore the aorto-mi-trial continuity is acceptable. As a choice there is a danger of shortening of the patient’s anterior mitral leaflet resulting in mitral incompetence. In mitral position: Resection of all in-fected tissues is obligatory. In cases of remaining sufficient, non-infected valve tissues, mitral valve repair is performed, including patch closure of leaflet perfora-tions. In intact unfactored annuli, im-plantation of any valve is possible. In an-rheic annuloplasty, implantation of a stentless xenograft without any prosthetic ma-tериалs is highly recommended. In ab-scess formation and destruction of the aorto-mitral curtain, the mitral valve is replaced with a stentless xenograft and connection of this to the anterior mitral leaflet of the homograft in aortic position will restore the cardiac skeleton. In tricuspid position: Conservative treatment of fungus abscess, removal of calcified leaflets, replacement of leafleteners, AICDs, and debridement or resection of all infected tissues must be done. When sufficient non-infected valve tissues remain, valve repair may be possible (localized anuuloplasty, double offside valve technique, patch closure of leaflet defects and perfora-tions). For extensive destruction, valve replacement with biological valves without any prosthetic materials is performed. In pulmonar lymph node: Replacement with a homograft or xenograft is preferred.

Endocarditis: An update: My thanks and appreciation go to Dr Eva Delmo Wal-ter for her assistance in preparing this article, as well as to Ms Anne Gale, for editing.

References:

1. Pallasch TJ, Takahashi M, Taubert KA; Committee on Rheumatic Fever, Endocarditis and Hogbacteriosis, American Heart Association; European Society of Cardiology, Subcommittee on Rheumatic Fever, Endocarditis and Rare Infections; World Heart Federation; International Society of Cardiovascular Holistic Heart Disease; International Thrombosis and Hemostasis Society; Subcommittee on Infective Endocarditis of the Second World Congress of Cardiology; Heart Failure Commit-tee for the Prevention of Infective Endocarditis, Prevention of Infective Endocardi-tis Task Force. Recommendations for preventing infective endocarditis in patients with valvular heart disease or congenital heart disease, those with intracardiac prosthetic device or prosthetic valve, and patients with prior infective endocarditis. J Am Coll Cardiol. 2000 Nov 14;36(9):1974-88.
Critical appraisal of off-pump surgery

Teresa Kieser
University of Calgary, Calgary, Alberta, Canada

On March 22, 1967, Dr. Kolisiov not only performed the first successful clinical CABG but also performed this LITA to LAD off-pump. Believing in the superiority of the technique, from 1964 to 1974 only 18% of his CABG procedures were done on-pump. Federico Benetti began off-pump in 1978, and performed 700 cases by 1990. From 1985 to 1996 another pioneer Ennio Buffolo, published his off-pump results of 1,274 patients. Now 45 years later controversies still remain as to the comparative effectiveness of off-pump with the gold standard of CABG on-pump. Despite thousands of publications involving hundreds of thousands of patients, off-pump has yet to be widely adopted by surgeons; only 20% of CABG worldwide is performed without the pump. There also seems to be an “all or none” mentality among surgeons who perform either off-pump or in excess of 70-80% off-pump. Several notable randomized controlled trials have helped to inform our decision-making: the two largest trials to date are the ROOBY trial (JEM November 2009) and the CORONARY Trial (JEM March 2013). The ROOBY trial by Shroyer et al, which randomized 2,203 patients to off or on-pump, found no difference of MACCE at 30 days, but the off-pump group at 1 year had higher (MACCE) and reduced graft patency. Critics alert the reader to the high conversion rate of 12.4% and the high rate of surgery by residents (60%). The CORONARY trial by Lamy et al, which randomized 4,752 patients from 79 centers in 19 countries to off or on-pump found no significant difference in the composite of death, nonfatal stroke, MI or new renal failure requiring dialysis at 30 days post-operatively. Importantly, there were significantly reduced rates of blood-product transfusion, reperfusion for bleeding, respiratory complications, and acute kidney injury. There was however an increased rate of early repeat revascularization.

Decreased graft patency is a worrisome finding in the off-pump groups of multiple retrospective reviews, meta-analyses, and randomized controlled trials shown also by increased need for repeat revascularization, and possibly by decreased long-term survival and increased (MACCE). However multiple studies by more experienced surgeons report no difference in graft patency. Adhering to the results of transit-time flow measurement may equalize graft patency with on-pump CABG. From personal experience with 9 years of use of transit-time flow, the author observes one order of magnitude drop of graft revision: approximately 5% of grafts done off-pump vs. 0.5% of grafts done on-pump are revised.

It may be dismaying for off-pump practitioners to find similar MACCE (30 days or later) in many of the randomized trials of off and on-pump surgery. If the results are the same why would a surgeon perform the more demanding procedure of off-pump surgery? Critics of these trials point to the low risk of the randomized patients. To be later presented today are the new, latest results; the importance of risk stratification to explain international variations in results of the CORONARY trial, not only for the first time, but within the same 24 hour period on two continents – Dr. André Lamy is presenting these results at the Canadian Cardiovascular Congress 2012 in Toronto.

The literature appears to be veering towards a treatment plan for patients regarding risk profile and quality of bypass targets; it is commonly known that the quality of grafts usually dictates the eventual post-operative course. Graft quality should never be sacrificed in favor of avoiding the pump. Graft quantity (incomplete revascularization) may be less important given the possibility of PCI to non-bypassed territories. In summary, off-pump may be possible, preferable or prescribed given the level of risk of the patient, the quality of coronary arteries and the willingness of the surgeon to become experienced.
Relevance of simulation in cardiac surgical training

Mitsuo Umezue

E M is widely recognized as an Evidence Based Medicine. However, we propose a new concept for "EBM": "Engineering Based Medicine," which has been achieved by a biomedical engineering approach to resolve various problems in medical field, such as a real biomedical engineering collaboration. TVMs was founded in 2006 as the first collaborative institution between medical and engineering field. This is an abbreviation of Tokyo Women's University Medical School and Waseda University Joint Institution. More than 300 graduate students and researchers follow various TVM's courses. Among the courses, we have introduced two unique training simulators for cardiac surgery: 1) MiValve simulator and 2) Beating Heart simulator. Fig. 1 shows a beating heart simulator and several bypasses. This surgery was designed for casual daily practice. Beating unit and consumable coronary model can be separated. As for a beating unit, shape memory alloy (SMA) is employed as an actuator. Installation of SMA resulted in silence, smooth motion and compactness. Therefore, it is not necessary to design whole heart shape, because a flexible joint is enough to adjust all positional arrangements. Heart rate is adjustable between 50 and 80 BPM. Coronal and shape models are made of originally compounded silicone rubber. Virtual valve is a multilayered structure that mimics human vessels. Tearing strength by suture and elasticity are also adjusted by trial and error on the fabrication procedure. Porcine heart was used to quantify the mechanical properties. So, it is not necessary to design various types of models such as a frangible thin wall model for expert, and a thick wall model for residents. After an anastomosis, quantiative assessment is conducted. The quality of anastomosis can be scored by energy loss at the anastomosed location. We developed an assessment method by using MiValve CT and Computational Fluid Dynamics. This simulator has been successfully used by a student-established company since 2009. Now, it is used in over 100 hospitals in Japan, China, Australia, Germany, Italy and USA. Next, validation is one of the surgical treatments on arterial regurgitation (MR). However, a selection of treatments depends on surgeon's experience and/or favor. Fig. 2 shows our MiValve simulator that fresh porcine valve is installed. This simulator has been developed by collaboration with Japanese Cardio-Thoracic surgeon, Dr. Hirotaka Kazama. This pulsatile flow simulator can reproduce realistic MR or other diseased condition by adjusting relative orientation of the implanted papillary muscle. Hemodynamic and effective orifice area (EOA) can be measured through the top inspection channel. Fig. 3 indicated comparative post-operative shapes among three commercial annuloplasty rings. Above two simulators are useful tools to promote "An education and a training". Whenever we design and develop simulators, we should know an effectiveness and limit of application by a validation analysis.

EACTS 2012 Ethicon Cardiovascular Simulation Award

Rafa Sadaba

E A C T S 2012 Ethicon Cardiovascular Simulation Award

One of the goals of any surgical training programme is to ensure that trainees have achieved sufficient surgical skills before embarking on live patient cases.

Retention of motor skills appears to be most dependent on the degree to which the skill was practiced, rather than other variables. The amount of transfer of skills between tasks depends on the similarity between the two tasks. This implies that appropriate skills in simulation models can be carried out effectively in the operating theatre.

The utility of simulation has been well documented in graduate medical education and it is becoming the standard of practice in many residency programs. Simulation is based on the concept of “deliberate practice.” Because the operating theatre affords little time for “practice and reflection” due to patient safety and ethical concerns, simulation can provide the necessary training for basic skills acquisition in the laboratory or at home. This concept is equally valid in technically challenging fields such as CT surgery. Deliberate practice is an educational technique aimed at improving performance by intense training and preparation. These steps include repetition, assessment, and feedback, which lead to performance improvement.

Whereas high fidelity simulation has high face validity due to its similarity to the target job, it requires more departmental resources including personnel and equipment and its use can be limited by availability, time restrictions and expenses. Low-fidelity simulation is less realistic, but it offers the advantages of availability and low cost and it can serve the purpose of deliberate practice.

Last year, EACTS, in collaboration with Ethicon, launched the first Cardiovascular Simulation Award for coronary anastomosis. The objective was twofold: First to stimulate trainees’ creativity in the design of their own simulation prototypes and second to select the one which would most practical, inexpensive and fit for purpose. The winner was Dr Arroyo’s model, which has now been mass produced and will be made available to trainees worldwide.

This year’s contest will focus on mitral valve surgery. Eleven very ingenious prototypes have been submitted and will be evaluated in order to select the 2012 award winner. Sadly only one can be the winner, but I can tell you that all of them make excellent training platforms. I hope you all enjoy the EACTS 2012 ETHICON simulation award session and feel encouraged to participate in forthcoming events.

Fig. 1 Beating heart simulator and young cardiac surgeon (left) Anastomosis with a stabilizer (right)

Fig. 2 Mitral valve simulator (left) Comparative results of mitral valve annuloplasty with different types of annuloplasty rings (right)

Our Mitral valve simulator that fresh porcine valve is installed. This simulator has been developed by collaboration with Japanese Cardio-thoracic surgeon, Dr. Hirotaka Kazama. This pulsatile flow simulator can reproduce realistic MR or other diseased condition by adjusting relative orientation of the implanted papillary muscle. Hemodynamic and effective orifice area (EOA) can be measured through the top inspection channel. Fig. 3 indicated comparative post-operative shapes among three commercial annuloplasty rings.

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Learning from Experience: Simulation in the Workplace

John Pepper
Chair, Adult Cardiac Domain

The demands of modern surgical practice make it increasingly difficult to rely only on experience while learning. Low mortality rates, high expectancies, institutional and public scrutiny compel us to create a significant challenge. How do we best prepare for low frequency, high risk events? Examples might include: early coronary graft occlusion in Intensive Care, acute ischaemic mitral regurgitation in the operating room or failure while operating on Type A dissection.

Whilst technical skills are important, another central element is team work training, since early detection and management of “crisis” events will depend heavily on skills in this area. Because these events are uncommon and doctors’ duty hours are restricted, we cannot rely solely on patient experience. As in other high risk undertakings (e.g. air flights, nuclear or oil power production) simulated scenarios can be extremely helpful. When we engage in this type of training our basic assumption must be that everyone participating in a simulation programme is intelligent, well trained, cares about doing their best and wants to improve.

We need to create a scenario which has certain rules of engagement.
1. Suspension of disbelief
2. A non-judgemental and collegial environment to encourage reflection, courtesy, conciliation and confidentiality
3. The desire to help each other in order to suspend disbelief careful preparation is vital and high fidelity simulators with monitors, images and an appropriate mannequin can help. We need to use established principles of effective adult learning, with a climate where learners feel safe and comfortable. Involving learners in planning scenarios, encourages them to identify relevant factors. Most importantly the learner should be involved in evaluating their own learning by critical reflection.

Surgeons are practical and pragmatic individuals who often take a cynical view of this approach. There was a time when I was a fully paid up member of this “club”! However, I have come to appreciate that carefully designed and well run scenarios, either within the clinical area or in a dedicated teaching facility are very effective training instruments. Our experience has been that trainees feel invigorated and importantly more confident at handling unusual situations. Simulation should not replace other types of learning but complement them, enthusing the learner. In particular it can be very effective when introducing a new procedure such as robotic assisted mitral valve surgery.

The young surgeon is eager to learn what is practical and useful, he or she brings lots of experience. They will want and need to reflect. They learn best when stimulated at the edge of their learning curve. We have applied this on a regular basis on our Paediatric Intensive Care & Recovery units and are beginning to apply it to our adult cardiac programme. We have found this to be universally popular and well received. As we move towards the heart team approach not only in evaluation but also in the treatment of our patients it fits well with 21st century medicine. We will be running a course at EACTS Academy in the spring of 2013 and I encourage you to get involved.

First In Man results at One Year: Less Invasive Ventricular Enhancement (LIVE)

Lon Annest, MD

A number of catheter based procedures, such as TAVI, ASD/ VSD Closure, A-Fib Ablation, TEVAR, MVR, and PCI, have been developed based on previous successful surgical procedures. This dramatic shift has been driven by patient demand and economic pressures on the global healthcare system. With the rapidly expanding population of heart failure patients, a less invasive means of LV reconstruction has long been desired. Recently, a new surgical technique, using transventricular catheter deployment of an intracardiac anchoring system, has been developed and clinically studied. This technology platform will serve as the basis for a forthcoming closed chest, percutaneous, hybrid procedure for LV volume reduction and reshelving for patients suffering from ischemic cardiomyopathy.

A total of 32 patients with ischemic cardiomyopathy have undergone Less Invasive Ventricular Enhancement™ (LIVE™) in an open sternotomy approach with the BioVentrix Revivent™ Myocardial Anchoring System. All had EF between 13% and 44%. Pairs of anchors were deployed in each case aligned with the long axis of the LV with an average of four anchors per patient, dependent on lesion and cardiac dimensions. Early in the experience, most surgeons elected to perform the procedure with cardiopulmonary support. However, most recent cases have been performed without cardiopulmonary bypass off pump and a total of 14 patients are described below having reached one year follow up. In the coming months, additional patients will attain two year follow up status.

At one year follow up, 13 patients survived and have been discharged. One (1/32) patient expired of multi-system failure unrelated to the device on day 7 (3.1%). NYHA dropped from 3.5 to 1.7. 6 min walk increased from 319 m to 388 m (+24%). QOL improved from 51 to 31, EF and LVEF decreased from 81% to 56% (-36%), LVEDVI decreased from 115 ml/m2 to 80 ml/m2 (-35%). The Revivent device for Less Invasive Ventricular Enhancement (LIVE) via an open sternotomy achieves LV scar excision and confers significant LV volume reduction and symptomatic improvement in selected patients with ischemic cardiomyopathy and HF. These results were consistently achieved without cardiopulmonary bypass or ventriculotomy. The aforementioned closed chest, transcatheter system utilizing the same technology platform in a combined endovascular and surgical approach has been successfully applied in the animal model. Human clinical trials are planned for initiation in 2013.
Late haemodynamics after complete repair of pulmonary atresia with major aortopulmonary collaterals

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Pulmonary atresia with ventricular septal defect and major aortopulmonary collaterals (PA/VSD/MAPCAs) is a complex and highly variable form of congenital heart disease. There is currently a paucity of data evaluating late haemodynamics after complete repair of PA/VSD/MAPCAs. Thus, the purpose of this study was to evaluate the late haemodynamic data in patients with PA/VSD/MAPCAs. The current study summarizes data for 80 patients undergoing a right ventricle to pulmonary artery conduit change following complete repair of PA/VSD/MAPCAs. We chose conduit change as an end-point, since this event provides an opportunity to obtain complete haemodynamic assessment. All patients have a preoperative cardiac catherization, and we also obtain haemodynamic data following the conduit placement. The results of this study demonstrate that at the time of the preoperative catherization the right ventricular pulmonary pressures averaged 70±22mmHg, pulmonary artery pressures averaged 38±14mmHg, and the left ventricular pulmonary artery banding (PAB). HUPS is associated with mortality and bronchial dysfunction. Increased ventricular workload and limitation of coronary perfusion may be important factors. In particular coronary perfusion is vulnerable with retrograde flow through a hypoplastic aortic arch in the post-hybrid configuration. Mathematical modelling has been a useful tool in validating and investigating different configurations of the Norwood repair and the pre-surgical HUPS circulation. Our work, in a similar fashion, now models the Hybrid Procedure to determine the effect of differing external pulmonary banding and ductal stent diameters on the demands of this single ventricle circulation. A multi-compartmental Windkessel model (based on an electric-hydraul ic analogy) of Hybrid H/U aortic arch circuit was adopted, with a time- varying resistance representing ventricular function. The effect of incremental diameter increases in bilateral pulmonary artery bands (2.5 – 4mm) and ductal stent (4 – 10mm) on cardiovascular haemodynamics, systemic oxygenation and ventricular energetics were assessed. A Bernoulli resistance was adopted for the pulmonary arterial band, based on post hybrid, pre- stage I repair catherization data and the original banding diameter read from the notes. Simulations results correlated well to clinical outcome within controlled physiologic scenarios. The optimal configuration was a PAB diameter of 3mm and a ductal stent diameter of 8mm. There was no significant benefit in expanding the stent thus the risk of rupture from an aggressive ductal expansion is unnecessary. A critical ductal diameter of 7mm was observed, below which systemic perfusion was impaired while the stoke work significantly increased (738 to 910mmHg, 8 to 4mm) as mechan ical efficiency drops (74 to 66%, 8 to 4mm). This short term effect would lead to ventricular dysfunction resulting in a reduced cardiac output which could mask circulatory imbalances and inappropriate banding diameters. In limited output scenarios, sustainable systemic flows were observed with tighter bands. A 3mm banding spanned the physiological systemic perfusion range in low-normal fixed cardiac output put scenarios, while 3.5mm spanned the normal high range. This mirrors current clinical practice. Mechanical efficiency is increased with looser banding, however this leads to pulmonary over circulation and excess stoke work. An important observation was of PAB increases, diastolic systemic pressure decreases and diastolic steal increases. This could negatively impact coronary and cerebral circulation that is dependent on retrograde aortic arch flow. Mathematical modelling has many in hert simplifications resulting in limita tions. It does, however, allow insight in scenarios that cannot be observed or tested clinically. This model is used as a precursor for multi-scale modelling of a patient-specific 3D geometry.

Congential: Abstract 16:15–17:45 Room 116/117

Computational modeling to optimize hybrid configuration for hypoplastic left heart syndrome

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Hypoplastic Left Heart Syndrome (HLHS) is characterized by an under-development of the left sided structures of the heart in neonates. Surgical techniques have been developed from the original Norwood procedure employing a modified Blalock-Tunt system (systemic artery-pulmonary artery), to using a sano shunt (right ventricle-pulmonary artery). A less invasive alternative, utilized in high-risk patients, is the Hybrid Procedure. The hybrid maintains ductal patency for systemic supply by either deploying a stent or infusion of prostaglandin E2, and controls the systemic-pulmonary supply ratio with branch pulmonary artery banding (PAB). HUPS is associated with mortality and bronchial dysfunction. Increased ventricular workload and limitation of coronary perfusion may be important factors. In particular coronary perfusion is vulnerable with retrograde flow through a hypoplastic aortic arch in the post-hybrid configuration. Mathematical modelling has been a useful tool in validating and investigating different configurations of the Norwood repair and the pre-surgical HUPS circulation. Our work, in a similar fashion, now models the Hybrid Procedure to determine the effect of differing external pulmonary banding and ductal stent diameters on the demands of this single ventricle circulation. A multi-compartmental Windkessel model (based on an electric-hydraulic analogy) of Hybrid H/L aortic arch circulation was adopted, with a time- varying resistance representing ventricular function. The effect of incremental diameter increases in bilateral pulmonary artery bands (2.5 – 4mm) and ductal stent (4 – 10mm) on cardiovascu lar haemodynamics, systemic oxygenation and ventricular energetics were assessed. A Bernoulli resistance was adopted for the pulmonary arterial band, based on post hybrid, pre-stage I repair catherization data and the original banding diameter read from the notes. Simulations results correlated well to clinical outcome within controlled physiologic scenarios. The optimal configuration was a PAB diameter of 3mm and a ductal stent diameter of 8mm. There was no significant benefit in expanding the stent thus the risk of rupture from an aggressive ductal expansion is unnecessary. A critical ductal diameter of 7mm was observed, below which systemic perfusion was impaired while the stoke work significantly increased (738 to 910mmHg, 8 to 4mm) as mechanical efficiency drops (74 to 66%, 8 to 4mm). This short term effect would lead to ventricular dysfunction resulting in a reduced cardiac output which could mask circulatory imbalances and inappropriate banding diameters. In limited output scenarios, sustainable systemic flows were observed with tighter bands. A 3mm banding spanned the physiological systemic perfusion range in low-normal fixed cardiac output put scenarios, while 3.5mm spanned the normal high range. This mirrors current clinical practice. Mechanical efficiency is increased with looser banding, however this leads to pulmonary over circulation and excess stoke work. An important observation was of PAB increases, diastolic systemic pressure decreases and diastolic steal increases. This could negatively impact coronary and cerebral circulation that is dependent on retrograde aortic arch flow. Mathematical modelling has many inherent simplifications resulting in limitations. It does, however, allow insight into scenarios that cannot be observed or tested clinically. This model is used as a precursor for multi-scale modelling of a patient-specific 3D geometry.

Congential: Abstract 14:15–15:45 Room 111

Late haemodynamics after complete repair of pulmonary atresia with major aortopulmonary collaterals

Richard D Mainwaring
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Vascular: Abstract 14:15–15:45 Room 113

Deployment of proximal thoracic endograft in zone 0 of the ascending aorta

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Aortic arch replacement continues to carry substantial risks despite the use of protective adjuncts. The first report of a hybrid arch procedure described a physically compromised patient who needed reoperation for a leaking aortic patch graft. A specialized bifurcated graft was prepared, two branches were used to bypass the LCCA and LSACA, and the third branch was used to deliver a stent graft antegrade into the arch. Inspired by this concept of distal two-veess arch debouch ing, several authors have explored total arch reimplantation and proximal two-veess debouching techniques to repair both aortic arch aneurysm and acute ascending aortic dissection. Typical scaffolding of the brachio cephalic veins is accomplished through a median sternotomy, and CBF and hypothermic circulatory arrest are occasionally needed. From 2005 to 2011, 29 consec utive patients who presented with thor a tic aortic disease involving the aortic arch were treated in our institution with hybrid procedures in which the endograft was deployed in Zone 0. It is a high-risk popula tion in which the traditional open ap proach was considered prohibitive. Treated pathologies included the following: succu lar arch aneurysm fusiform aneurysm and produces acceptable early results. Long-term outcome is necessary.
First-in-human application of direct epicardial shock wave therapy in ischemic cardiomyopathy

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The role of coronary revascularization in patients with ischemic cardiomyopathy is still a subject of debate. Recently, the Surgical Treatment for Ischemic Heart Failure (STICH) trial failed to show an improvement in both survival and myocardial viability in patients undergoing coronary artery bypass grafting (CABG) in addition to optimized medical therapy. Despite major efforts have been put into stem cell research in order to regenerate areas of infarcted or hibernating myocardium, the translation of stem cell science to effective clinical application failed to gain wider clinical importance so far. In addition to the concept of stem cell transplantation, shock wave therapy has emerged as a new technology introducing angiogenesis and myocardial regeneration by a synergistic process of neovascularization and expression of important homing attractants for circulating progenitor cells. Based on the data on direct epicardial shock wave therapy (DESWT) in a rodent model of ischemic cardiomyopathy a first-in-human study was carried out in ten patients (100% male, mean age 68; range 62-78yrs) with impaired left ventricular ejection fraction (LVEF 37±6%) being scheduled for CABG. Pre-operative cardiac magnetic resonance imaging (MRI) defined areas of abnormal wall motion as targets for DESWT, which was applied as adjunct to conventional CABG (Fig. 1).

Using a specially designed handle all target areas could successfully be reached for therapy (Fig 2). Patents received 509±202 (range 298-900) shock wave impulses in average and in accordance to the documented extent of the coronary artery disease, mean 3.4 bypass grafts were used (range 2-4). Intraoperatively neither arrhythmias nor severe haemotoma formation or lacerations with causal relation to DESWT were observed. Six months survival was 100%. Follow-up (FLUP) MRI evaluation showed improvement of LVEF from preoperative 37±6% to 8-week FLUP 47±8% (p=0.05) and 6-month FLUP 49±8% (p=0.16). In treatment areas regional wall motion score index improved from preoperative 2.1±1 points to 8-week FLUP 1.4±0.9 points (p=0.019), respectively. Six-minute walk test distance was enhanced from preoperative 427±77 meters to 8-week FLUP 474±148 meters (p=0.035) and 6-month FLUP 521±113 meters (p=0.026). ProvBNP lev- els remained elevate for 8 weeks (preoperative 2064±1485 pg/ml; 8-week FLUP 1858±1993 pg/ml; p<0.05) and declined thereafter at 6-month FLUP to 1375±879 pg/ml (p=0.045 vs. preoperative). Improvement of quality of life was reflected in the Minnesota Living With Heart Failure Questionnaire (preoperative 32±19 points at 8-week FLUP 30±32 points (p=0.778) and 6-month FLUP 13±12 points (p=0.016). These results of the first-in-human pilot study demonstrate that DESWT as adjunct to CABG is feasible and safe for treatment of ischemic cardiomyopathy. In the study patients the improvement of global left ventricular function primarily results from a contractility increase in areas with worst regional wall motion score. Based on these promising data of this trial a randomised controlled study is warranted to prove efficacy of this novel approach towards myocardial regeneration in patients with depressed left ventricular contractile function.
**Cardiac: Abstract** 14:15–15:45 Room 116/117

**The impact of transcatheter aortic valve implantation on patient profile and on outcomes of aortic valve surgery programmes: a multi-institutional appraisal**

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**Transcatheter aortic valve implantation (TAVI) provides good clinical and hemodynamic outcomes both in inoperable patients and in high-risk elderly patients and during the last few years the number of procedures as well as performing centers and performing physicians has rapidly increased. With TAVI we are now treating patients who were not treated in the past and as a consequence there has probably been a change of the characteristics of the population of patients with severe symptomatic aortic valve stenosis (SASAV) who undergo a therapeutic procedure on the aortic valve, whether surgical aortic valve replacement (SAVR) or TAVI. Aim of this retrospective multicenter study was to evaluate how the introduction and diffusion of TAVI has influenced characteristics and outcomes of patients undergoing aortic valve procedures and how this change has impacted on aortic valve surgery programs.**

We analyzed data from 1395 patients who underwent isolated aortic valve procedures (SAVR or TAVI) from January 2005 to November 2011 at three Italian cardiac surgical centers with a high TAVI volume. Patients were divided in two groups: “Pre-TAVI”, that included 395 patients (28.3%) who underwent SAVR before the introduction of TAVI in the three participating centers (2005-2007) and “Post-TAVI” that included 1000 patients (71.7%) who received an aortic valve procedure after the introduction of TAVI (2007-2011). We considered age and logistic Euroscore in the two groups of patients and we evaluated hospital mortality in the two groups and in patients undergoing SAVR or TAVI. Patients operated in the “Post-TAVI” era were older than “Pre-TAVI” patients and with a significantly higher risk profile. However, hospital mortality was 2% in the “Pre-TAVI” group and 3.4% in the “Post-TAVI” group (p=0.01). In the “Post-TAVI” group, patients undergoing TAVI was significantly older than SAVR patients. Furthermore, TAVI patients had a significantly higher EuroSCORE if compared to patients undergoing conventional surgical surgery. In the “Post-TAVI” group, hospital mortality between TAVI and SAVR was similar. In fact, we observed 3.9% and 2.5% mortality in TAVI and SAVR patients, respectively (p=0.22). Interestingly, we did not observe differences of patients’ risk profile between patients undergoing conventional aortic valve replacement in the “Pre-TAVI” and in the “Post-TAVI” era. If we consider all 790 patients who underwent SAVR both in the “Pre-TAVI” and the “Post-TAVI” period, the observed hospital mortality was 2.3%, that is not significantly different from the 3.9% mortality of TAVI patients (p=0.08). With this study our purpose was to analyze how the introduction of TAVI into clinical practice has changed the characteristics of patients undergoing aortic valve procedures (SAVR and TAVI) and whether this evolution has had any impact on patients’ outcomes. In conclusion, according to our data, after the introduction of TAVI, the risk profile of patients with SAVR undergoing aortic valve procedures (SAVR or TAVI) has significantly increased but outcomes are still excellent. The characteristics of patients scheduled for SAVR have not changed over time.

**Continued on page 51**