EACTS Daily News
European Association For Cardio-Thoracic Surgery
The official newspaper of the 27th EACTS Annual Meeting 2013
Monday 7 October

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Controversies and challenges in cardio-thoracic surgery

Professional Challenges and Controversies are just some of the highlights of Monday's sessions at this year's meeting. Today begins with two sessions looking at some of the controversies in coronary artery surgery, as well as a unique, combined Focus Session of the Vascular and Congenital Domains that will concentrate aortic disease in infancy and adulthood.

Today will also witness this year's Presidential Address by Jose L Pomar, entitled "Talent or Training". In addition, there will also a chance to hear the latest data from on-going clinical trials, the opportunity to develop and nurture your leadership skills in a special development course, and a Focus Session on the challenges cardiovascular surgeons face in the developing economies.

Monday is also the first opportunity for attendees to listen to all the latest papers from around the world, as delegates present their research in the Abstract Sessions.

The Professional Challenges sessions will also discuss the problem of tricuspid valve regurgitation in the biventricular and univentricular heart, cardiopulmonary bypass methods, myocardial protection techniques, the clinical anatomy of the aortic and mitral valves, as well as current treatments for rheumatic valve disease.

The advance of minimally invasive surgery continues and two sessions will examine how far the technologies have come and ask if transcatheter aortic valve implantation is now a routine procedure for cardiac surgeons, and whether percutaneous mitral valve repair is now the 'standard of care' for mitral regurgitation.

José Pomar

Today's Satellite Symposia

Sponsor	Location	Time
AtriCure Europe	Room B1	12.00-13.30
Baxter Healthcare	Room 12	12:45-14:00
Edwards Lifesciences	Hall E1	12:45-14:00
Ethicon	Room 24	12:45-14:00
JOTEC	Hall P	12:45-14:00
Maquet Cardiac Surgery	Forum Room	12:45-14:00
Medafor Inc	Room 14	12:45-14:00
Medos Medizintechnik	Hall H	12:45-14:00
Medtronic	Hall F1	12:45-14:00
NeoChord	Room 33	12:45-14:00
Sorin Group	Hall K	12:45-14:00
St Jude Medical	Hall F2	12:45-14:00
Symetis	Hall G	12:45-14:00
Vascutek	Hall I	12:45-14:00
AtriCure Europe	Room Y6	18:00-21:00

Controversies in coronary surgery 08:15 **Hall D**

A computational fluid dynamics simulation study of coronary blood flow affected by graft placement

Byung Moon *Southlake Regional Health Centre, Toronto, Canada*

This talk will show the results of a numerical study to investigate the effect of coronary graft placement on flow through the graft and grafted vessel. While bypassing a partial blockage will result in improved flow downstream of the graft junction, the resulting flow rate is not simply the sum of the two independent flows. As the flow is driven by a pressure difference, the mixing of the two competing flows produces additional losses that retard the flow. Perhaps more interesting is that the addition of a graft with higher flow rates

Continued on page 2

Byung Moon

How to recycle a misused LITA: tips and tricks

Monica Contino
Luigi Sacco University, Milan, Italy

Left internal thoracic artery (LITA) is the gold standard for left anterior descending (LAD) revascularization about long term patency, that's why it is always worth to use it or, if already harvested but functioning, to try to recycle it.

Last January a 67 year old woman came to our attention for NSTEMI. On September 2004 she underwent a left anterior small thoracotomy (LAST) operation, complicated by STEMI in the first post-operative day, treated with LAD stenting. Coronary angiogram highlighted intra-stent re-stenosis on LAD associated to circumflex

Continued on page 23

Monica Contino

Monday 7 October

Acquired cardiac

Professional Challenges

08:15 Session 1: Controversies in coronary artery surgery

Hall D

Moderators: M. Sousa Uva, Lisbon; T. Kieser, Calgary; A. Apaydin, Izmir

08:15	Bilateral internal mammary grafting; state of the art	*P. Kolh*
08:35	A computational fluid dynamics simulation study of coronary blood flow affected by graft placement	*Byung Moon*
08:50	Searching for the second best graft for coronary artery bypass surgery: a network meta-analysis of randomized controlled trials	*Umberto Benedetto*
09:05	Continuous perfusion of saphenous vein by oxygenated blood during beating heart coronary surgery	*Mohammad Hossein Mandegar*
09:20	How to recycle a misused left internal thoracic artery: tips and tricks	*Monica Contino*

10:15 Session 2: Controversies in coronary artery surgery

Hall D

Moderators: H. Reichenspurner, Hamburg; M. Jahangiri, London

10:15	Should off-pump coronary artery bypass grafting be abandoned?	*H. L.Lazar, Boston*
10:35	Discussion	
10:45	Hybrid surgery in patients with concomitant critical coronary and carotid artery lesions	*A. Edemskiy*
11:00	Simultaneous hybrid carotid stenting and coronary bypass surgery versus concomitant open carotid and coronary bypass surgery: a pilot feasibility study	*S. Mic´ovic´*
11:15	Advanced hybrid closed chest coronary revascularisation: an innovative strategy for the treatment of complex multivessel coronary artery disease	*N. Bonaros*
11:30	Iatrogenic aortic root and left main dissection in coronary artery bypass graft surgery: an unconventional fix	*T. Kieser*

Abstracts

08:15 How to handle the ischaemic mitral valve

Moderators: R. Klautz, Leiden; P. Perier, Bad Neustadt/Saale; M. Thielmann, Essen

Learning objectives

- Understand the pros/cons of different treatment.
- Techniques for repair.

08:15	Is mitral valve replacement a valuable option in the treatment of ischaemic mitral regurgitation?	*J. Karunanantham*
08:30	Mitral valve annuloplasty versus mitral valve replacement for ischaemic mitral regurgitation: haemodynamic and functional capacity comparison *Discussant: M. Misfeld, Leipzig*	*C. Fino*
08:45	Restrictive mitral annuloplasty does not limit exercise capacity *Discussant: M. Thielmann*	*M. Deja*
09:00	Should mild-to-moderate ischaemic mitral regurgitation be corrected in patients with impaired left ventricular function undergoing simultaneous coronary revascularisation? *Discussant: K. M. J. Chan*	*E. Prifti*
09:15	Tailored" valvular and subvalvular repair of chronic ischaemic mitral regurgitation: midterm follow-up *Discussant: M. Bitner*	*G. Esposito*
09:30	Minimally invasive mitral valve restrictive annuloplasty: standard of care for functional mitral regurgitation	*D. Ricci*

08:15 Blood management

Moderators: J. B. Grau, Ridgewood; A. Jeppsson, Gothenburg; M. Kaljusto, Oslo

Learning objectives

- The optimal peri operative blood management.

08:15	Increased perioperative mortality following aprotinin withdrawal: a real-world analysis of blood management strategies in adult cardiac surgery *Discussant: D. Pagano, Birmingham*	*G. Walkden*
08:30	Influence of red cell rejuvenation, beyond elimination of storage lesions with cell washing, on post-red cell transfusion-related acute lung injury *Discussant: S. Asopa, Plymouth*	*S. Qureshi*
08:45	Blood conservation strategies in cardiac surgery: more is better *Discussant: A. Jeppsson*	*D. Avgerinos*

Continued on page 4

Controversies in coronary surgery 08:15 Hall D

A computational fluid dynamics simulation study of coronary blood flow affected by graft placement

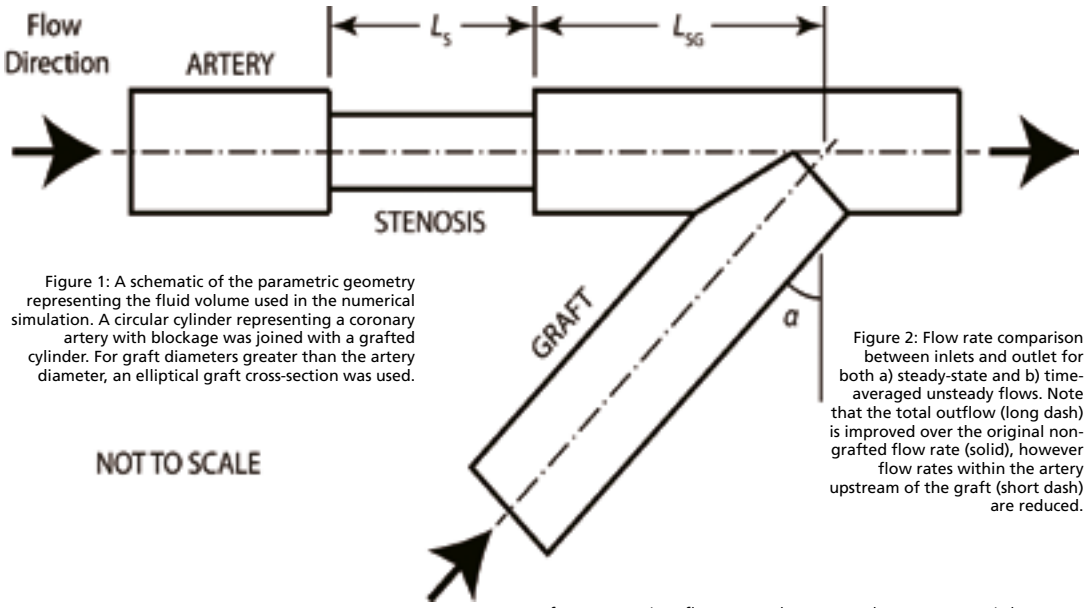

Figure 1: A schematic of the parametric geometry representing the fluid volume used in the numerical simulation. A circular cylinder representing a coronary artery with blockage was joined with a grafted cylinder. For graft diameters greater than the artery diameter, an elliptical graft cross-section was used.

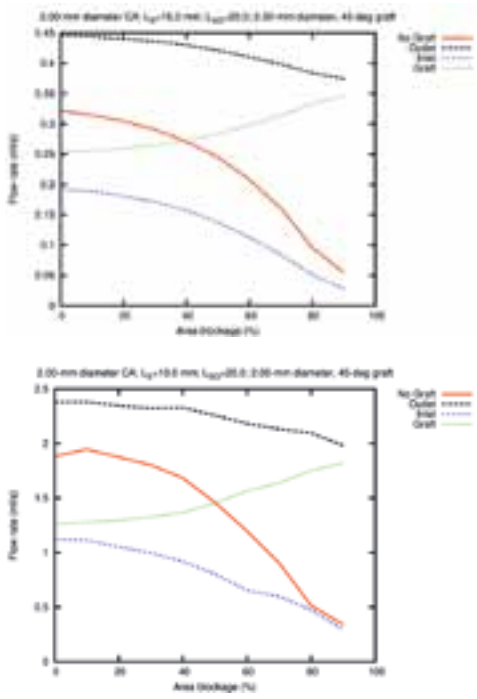

Figure 2: Flow rate comparison between inlets and outlet for both a) steady-state and b) time-averaged unsteady flows. Note that the total outflow (long dash) is improved over the original non-grafted flow rate (solid), however flow rates within the artery upstream of the graft (short dash) are reduced.

Continued from page 1

than the partially blocked artery greatly reduces the flow rate through the grafted artery upstream of the junction. This effect is much more pronounced at higher degrees of partial blockage.

This numerical study was completed using a parametric geometry representing a simplified model (see Figure 1) of a grafted artery with partial blockage. The shape of the geometry was defined by parameters including the length of the stenosis, the percent blockage (occluded cross-sectional area), the distance to the center of the graft junction, the angle of the graft relative to the perpendicular, and the inner diameter of both the coronary and the grafted vessel. By varying these parameters, flow through different geometries could be simulated using computational fluid dynamics (CFD).

These simulations were completed for both steady-state conditions (fixed pressures at inlets and outlets) and for unsteady conditions (time-varying inlet pressure). Unsteady simulations, when correctly configured, can produce physically accurate simulations. While steady-state simulations are not physically realistic, they are significantly faster and cheaper to compute. We found that steady-state simulations produced similar results for comparing flow rates between the geometry inlets and outlet, when compared to the time-averaged flow rates of unsteady simulations (see Figure 2). Thus an investigation of the effects of geometry parameters could be completed in a reasonable time using a large number of geometry configurations. Simulations were performed on the GPC supercomputer at the SciNet HPC Consortium, located in Toronto, Canada.

As may be expected, graft geometries for which the flows merged smoothly produced the least amount of losses, and thus produced higher total outflow and better-balanced flow rates upstream of the graft junction (see Figure 3). Total outflow is improved as the graft angle relative to the perpendicular is increased and by placing the graft closer to the exit of the blockage. Total outflow and flow rate through the blockage is less sensitive to graft position for high degrees of blockage. Outlet flow rate varies linearly with graft angle, regardless of the percentage blockage.

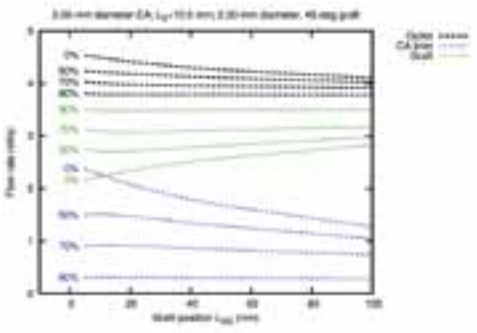

Figure 3: Steady-state flow rates for 0, 50, 70, and 90% blockage versus a) graft angle and b) downstream distance to graft junction.

The future of TAVI is about to change

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Continued from page 2

09:00 **Miniaturised extracorporeal cardiopulmonary bypass does not reduce blood transfusion in isolated coronary artery bypass graft surgery** *S. Asopa*
Discussant: W. Harringer

09:15 **Impact of training on post-operative bleeding and the need for blood transfusions** *A. Page*

08:15 **Arrhythmia I**

Moderators: S. Benussi, Milan; T. Hanke, Luebeck; A. Weber, Berne

08:15 **Rhythm course over five years following surgical ablation for atrial fibrillation** *N. Ad*
Discussant: T. Hanke

08:30 **Comparison of left and biatrial ablation techniques in non-mitral patients with atrial fibrillation: a randomised study** *A. Bogachev-Prokophiev*
Discussant: O. Alfieri, Milan

08:45 **Continuous event recorder monitoring to compare efficacy of left versus biatrial lesion sets in patients undergoing concomitant surgical ablation for atrial fibrillation** *S. Pecha*
Discussant: E. van Aarnhem

09:00 **Ablative maze surgery normalises left ventricular function in patients with lone atrial fibrillation** *A. Pozzoli*
Discussant: T. Folliguet

09:15 **Thoracoscopic stand-alone left atrial appendage amputation in long-standing non-valvular atrial fibrillation** *T. Ohtsuka*
Discussant: S. Benussi

09:30 **Two-stage hybrid treatment of persistent atrial fibrillation: short-term single-centre results** *V. Kurfirst*
Discussant: S. Salzberg

08:15 **Extracorporeal membrane oxygenation/ extracorporeal life support I: Risk prediction, salvage and bridging**

Moderators: F. Beyersdorf, Freiburg; S. Cicek, Istanbul

08:15 **Extracorporeal membrane oxygenation system as salvage treatment for patients with refractory cardiogenic shock** *A. Loforte*
Discussant: M. Strüber

08:30 **Extracorporeal membrane oxygenation for bridge to heart transplantation in adult recipients: single-centre, seven-year experience** *C. D'Alessandro*
Discussant: A. Montero

08:45 **Pre-operative patient optimisation using extracorporeal membrane oxygenation support improves outcomes of INTERMACS level 1 patients receiving a permanent ventricular assist device** *J. Riebandt*
Discussant: S. J. Park

09:00 **Blood lactate level during extracorporeal life support as a surrogate marker for survival** *S. J. Park*
Discussant: P. Leprince

09:15 **Overall five-year results of an extracorporeal membrane oxygenation programme in a university hospital** *E. Flecher*
Discussant: R. Lorusso

09:30 **Risk factors associated with adverse outcome following extracorporeal membrane oxygenation support: analysis from 360 consecutive patients** *N. Papadopoulos*
Discussant: G. Laufer

08:15 **Basic science regeneration**

Moderators: H. J. Ankersmit, Vienna; A. Haverich, Hannover; P. Punjabi, London

08:15 **Paracrine factors and regeneration** *H. J. Ankersmit*

08:30 **Co-transplantation of induced pluripotent stem cell-derived cardiomyocytes with mesenchymal stem cells reduces the infarct scar size and improves the recovery of left ventricular function** *K. Neef*
Discussant: G. Steinhoff

08:45 **CD133 positive bone marrow-derived stem cells are lost within minutes after intramyocardial injection** *A. Martens*
Discussant: Y. Choi

09:00 **Adult bone marrow-derived mesenchymal stem cell therapy complements cardioprotection afforded by ischaemic preconditioning** *M. Yasin*

09:15 **Cardiomyogenic differentiation signals conveyed by decellularised human myocardial extracellular matrix** *B. Oberwallner*
Discussant: U. Stock

Continued on page 6

Abstracts 14:15 Hall G

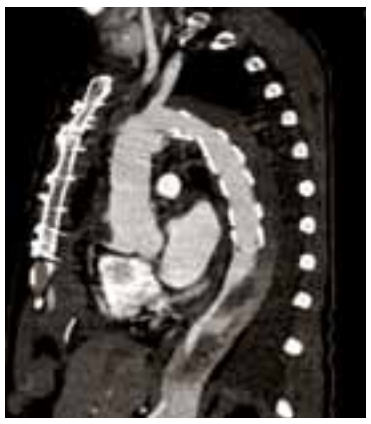
Paraplegia risk after Frozen Elephant Trunk technique –is it real?

Martin Grabenwoger
Hospital Hietzing, Vienna, Austria

The so-called 'frozen elephant trunk' technique is an advancement of the original elephant trunk operation introduced by H. Borst in 1983. This operation was developed for patients with extensive pathology of the thoracic aorta involving the arch, the descending and/ or thoraco-abdominal aorta. The Dacron prosthesis inserted into the descending aorta during the first operation was only a prerequisite to facilitate a subsequent operation, because clamping of the proximal descending aorta was possible and deep hypothermic circulatory arrest could be avoided. However, this procedure was associated with a significant operative and interval mortality as well as a high incidence of neurologic complications.

The Frozen Elephant Trunk technique enables a one-stage repair of multisegmental thoracic aneurysmal disease by endovascular treatment of the descending aorta. The indications for applying this concept are acute DeBakey type I aortic dissections (pict.), chronic DeBakey type 1 dissections, retrograde type B aortic dissections involving the arch with/without the ascending aorta and chronic aneurysms involving the ascending aorta, arch and descending aorta.

To evaluate the efficacy and durability of this hybrid concept, the International E-vita open registry was initiated in 2008. In the meanwhile, 416 patients from 10 European centres were recruited[1]. Stroke and spinal cord injury rates between 5–7% and 3–9% were observed. This relatively high percentage of paraplegia has to be taken seriously, although the occurrence of this catastrophic complication varies markedly between the individual centres. Ius et al.[2] reported a paraplegia rate of 1.5%, whereas Leontyev et al.[3] experienced this complication in 21.7% of patients after frozen elephant trunk repair. Based on these results



the paraplegia risk is real and it is a major task to identify factors, which increase the probability to develop spinal cord injury. Several measures are discussed to reduce the paraplegia risk. Beside the recommendation for simultaneous perfusion of the left subclavian artery during the period of hypothermic circulatory arrest, special emphasis should be paid to the length of circulatory arrest, a mean arterial blood pressure of more than 85mmHg in the postoperative period and the use of spinal cord fluid drainage for at least 72 hours postoperatively. Other groups underline the importance of distal aortic perfusion after accomplishment of the anastomosis with the proximal descending aorta[4]. Another important factor thought to have an impact on spinal cord injury is the number of intercostal arteries occluded with graft deployment. Consequently is it not recommended to extend the distal landing zone below T7/T8.

In summary, the risk of spinal cord injury after complex reconstruction of the thoracic aorta using the frozen elephant trunk technique is real, however, specific causes creating this complication are not identified yet.

References

1. Jakob H, Tsagakis K. International E-vita open registry. Ann Cardiothorac Surg 2013; 2: 296-99
2. Ius F, Fleissner F, Pichlmaier M, Karck M, Martens A, Haverich A, Shresta M. Total aortic arch replacement with the frozen elephant trunk technique: 10-year follow-up single centre experience. Eur J Cardiothorac Surg 2013; 1-9
3. Leontyev S, Borger M, Etz C, Moz M, Seeburger J, bakhtiary F, Misfeld M, Mohr FW. Experience with the conventional and frozen elephant trunk technique: a single-centre study. Eur J Cardiothorac Surg 2013: 1-8
4. Di Bartolomeo R, Pacini D, Savini C, Pilato E, Martin-Suarez S, Di Marco L, Di Eusanio M. Complex thoeacic aortic disease: single-stage procedure with the frozen elephant trunk technique. J Thorac Cardiovasc Surg 2010; 140: 81-5

Improving Outcomes for Patients

An update from the Network for Outcomes Research

Domenico Pagano
Network for Outcomes Research Chair

As part of the EACTS Quality Improvement Programme (QUIP), the Network for Outcomes Research has developed a new database, the QUIP Adult Cardiac Database, to provide quality improvement tools and improve outcomes for patients.

The database has been designed around the current EACTS Adult Cardiac Surgical Database, but includes some additional variables that are required for EuroSCORE II and the STS Risk Calculator. Data will be collected directly from individual cardiac surgical units, and used to inform quality improvement initiatives and to create interactive improvement tools, for example risk assessment and benchmarking in adult cardiac surgery.

As part of the EACTS commitment to encourage a global culture of data collection, a new legal framework has been established by the QUIP Publishing Outcomes Group to ensure that EACTS remain compliant with national and international legal and data protection processes. Data collection for the QUIP Adult Cardiac Database is expected to start shortly and the Network for Outcomes Research would like to invite units to join the project. Units must be able to fulfil the following requirements for participation:

- Able to collect required patient data from your in-hospital patient records, and combine this into three data files (instructions will be provided);
- Submit data online (using the free software provided);
- Provide appropriate data management support for data submission and queries;
- Internal data quality control and monitoring.

If you would like to find out more about the database, a member of the quality improvement team will be available at the EACTS exhibition stand (Hall XL, Booth 148) at the following times to answer questions:

- Monday 7th October: 09:00-10:00 / 13:00-14:00 / 15:45-16:30
- Tuesday 8th October: 09:00-10:00 / 13:00-15:15

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Continued from page 4

Focus Session

08:15 Is transcather aortic valve implantation now a routine procedure for the cardiac surgeon?

Hall E1

Moderators: H. Reichenspurner, Hamburg; T. Walther, Bad Nauheim

08:15	Introduction and learning objectives	
08:20	What have we learned with ten years of clinical practice?	*O. Wendler*
08:35	Why, when and how to perform the transapical approach	*L. Van Garsse*
08:50	Why, when and how to perform a transaortic approach	*R. Cocchieri*
09:05	ROUTE – the transaortic registry (baseline/first data)	*M. Romano*
09:15	Technological evolution and future perspectives (S3, Percutaneous approach)	*T. Walther*
09:30	Discussion	
09:40	Conclusion and take home messages	*H. Reichenspurner*

This session is supported by an unrestricted educational grant from Edwards Lifesciences SA.

Professional Development

08:15 Leadership – Introduction to Myers Briggs

Room 33

Faculty: G. Kitchingman; P. Newman, London

Learning objectives

- Getting results from your team members – and in turn your team – is vital to the success of any leader. This leadership programme has been designed to help and support doctors to achieve the organisational needs and develop skills and techniques which they can take back into the work-place and use in a practical fashion, the programme gives plenty of opportunities for delegates to understand and then develop their skills through effective learning, open discussions and practical, hands-on awareness.
- These two 90-minute introductory sessions will focus on two modules within the Leadership and Management Programme, linking together the Myers Briggs Personality Profile and Developing Leadership Capability. Session one will provide a platform where each delegate can build their understanding of their working style and how this impacts on their relationships with others in the clinical environment.
  Building on the first session, in session two, the fundamentals of creating a high-performance environment are explored. The delivery style will be tutor-led discussion, with group activities.

08:15	Introductions
08:35	Introduction to the Myers Briggs Type Indicator (MBTI)
08:50	The different preferences of MBTI
09:30	What MBTI might say about your leadership style

10:15 Session 2: Leadership – Developing leadership capability

10:15	Agenda
10:20	What gets the best from others?
10:50	Creating a high performance environment
11:15	Using feedback to enhance performance
11:40	Final Q&A

Professional Development

08:15 Non-technical skills for surgeons

Room 1

Faculty: N. Maran, S. Paterson-Brown; Edinburgh,

Learning objectives

- High performing teams in the operating room: introducing the role of human factors and non-technical skills to improve outcome and reduce error. This three-hour interactive workshop will use short lectures, small group discussions, video scenarios and an audience response system to discuss the role of human factors in adverse events in the operating room. It will go on to show how improving the non-technical skills of the operating team can reduce errors and improve outcome.

08:15

- Introducing the NOTSS (non-technical skills for surgeons) system for understanding, observing and rating surgeons non-technical skills in the operating room. This 90-minute interactive session will introduce the NOTSS taxonomy of non-technical skills for surgeons and demonstrate how these skills can be observed, rated and used to provide constructive feedback. The faculty are all part of the Royal College of Surgeons of Edinburgh 'NOTSS' training team.

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How to handle the ischemic mitral valve 08:15 Hall E2

Restrictive mitral annuloplasty does not limit exercise capacity

Marek A. Deja, Aleksandra Żak, Marcin Malinowski, Piotr Pysz, Ewa Gaszewska-Żurek, Maciej Turski, Piotr Janusiewicz, Krystian Wita, Jerzy Chudek *Medical University of Silesia, Katowice, Poland*

Restrictive mitral annuloplasty with a rigid annuloplasty ring is the preferred method to address secondary mitral regurgitation. High recurrence rate of MR leads to using smaller annuloplasty ring sizes, which in turn inevitably leads to a degree of mitral stenosis. Whether this mitral stenosis is clinically relevant remains controversial.

It seems logical to expect mild to moderate mitral gradients to increase significantly with exercise. On the other hand, it is not known if the degree of mitral stenosis created by restrictive mitral annuloplasty limits patients, exercise capacity; secondary mitral regurgitation typically develops in patients with depressed left ventricular function, so it may well be that the heart failure itself rather than mitral stenosis limits patients' functional status.

We studied 36 patients who underwent restrictive mitral annuloplasty with 26mm Carpentier Edwards Classic ring for functional mitral regurgitation median 16.6 (8.5-43.3) months earlier. Patients were subjected to exercise echocardiography to assess exercise mitral valve gradients and ergospirometry to assess patients exercise capacity. The order of the two tests was randomized between the patients. The patient was allowed to rest for at least two hours between the exercise tests. Resting blood samples were taken to measure serum NT-proBNP and catecholamine levels before exercise testing in all the patients. We hypothesized that if mitral stenosis limited patients exercise capacity the patients maximal VO2 on ergospirometry will be negatively related to mitral gradients on exertion.

Resting LV ejection fraction was 38.8 (28.3-59.0)%. The mitral valve gradient measured at rest with continuous wave Doppler was 9.5mmHg (7.0-14.7) peak and 3.4mmHg (2.4-4.9) mean.

On exercise echocardiography the peak mitral pressure gradient increased maximally to 19.7mmHg (12.8-23.3) ($p<0.001$), and the mean gradient to 6.8mmHg (5.4-8.8) ($p<0.001$). On cardiopulmonary exercise testing the energy expenditure was median 5.8MET (4.0-7.8) and the maximal achieved VO2 was 18.2ml/kg/min (16.3-21.5). This places 75% of our patients in Weber's Functional Class B or A, implying only mild functional impairment at most.

We failed to show a negative correlation of maximal and mean mitral valve gradients with maximal oxygen consumption on exertion ($p=0.5$ and $p=0.2$ respectively). On the contrary mitral valve gradients at peak exertion were positively correlated with energy expenditure ($r=0.4$, $p=0.03$) an obvious relation that one might expect with rising cardiac output.

Meanwhile, maximal VO2 and energy expenditure negatively correlated with resting norepinephrine level, a strong marker of the progress and prognosis in heart failure. Also, energy expenditure on ergospirometry negatively correlated with NT-proBNP level.

Marek Deja

Our results confirm that undersized mitral annuloplasty used in the treatment of secondary mitral regurgitation results in a degree of mitral stenosis. Mitral gradients rise with the level of exercise, but they do not seem to limit patient's functional capacity. It seems that primary heart disease might be of much bigger importance for patient's exercise performance than the mitral stenosis resulting from an undersized ring used.

Non-Oncology I 08:15 Hall P

A new surgical procedure for palmar hyperhidrosis

Is it possible to perform endoscopic sympathectomy under intravenous anesthesia without intubation?

Hua Tang, Lei Xue, Zhifei Xu, Bin Li, Bin Wu, Xuewei Zhao *Shanghai Changzheng Hospital, The Second Military Medical University, Shanghai, China*

Palmar hyperhidrosis is a common dysfunctional disorder. Endoscopic thoracic sympathectomy (ETS) was the most popular treatment method. However, until now, few improvements have been made to this now mature technique. Patients have to undergo general anesthesia with intubation and relatively traumatic surgery. In this study, we first reported a completely new surgical method. The patient was performed the surgery under intravenous anesthesia without intubation. And real "one hole" surgery was performed with the help of flexional medical thoracoscopy in our surgery. 13 patients was treated with this method. During the surgery, no patients needed intubation and the vital signs of all patients remained stable. The symptom of palmar hyperhidrosis disappeared as soon as the nerve chain was cut off. The patients was followed up to now. No side effects such as compensatory sweat or Horner's syndrome occurred. All patients were discharged from the hospital in good condition on the second postoperative day. The cost of hospitalization only was half of that of the conventional method. Though the number of cases is small, we received a satisfactory result and believe that it will be a promising and revolutionary method to treat palmar hyperhidrosis which may greatly interest the readers, as this method can reduce not only the wound but also the cost. And more patients who feared of the conventional surgery may consider to solve the palmar hyperhidrosis with this method. Also, more cases and further study will be done in our next work

Hua Tang

Can routine left atrial appendage closure during open heart surgery reduce peri-operative stroke?

S. Salzberg *Heart Clinic Zurich, Klinik Hirslanden, Zurich, Switzerland*

M. Emmert *University Hospital Zurich, Switzerland*

Concern about peri-operative stroke limits the acceptance of coronary artery bypass grafting (CABG) despite its well documented long-term superiority. Technical advances including avoidance of aortic manipulation are interesting adjunct therapies to reduce stroke; yet, approximately half of CABG related strokes occur in the post-operative period following surgery, and are often related to new-onset atrial fibrillation (AF).[1,2-4]

New-onset AF is a common complication, occurring in up to 20% patients following CABG.2 Recent studies have documented increased incidence of stroke with new-onset AF after CABG surgery. In a recent study of 16169 consecutive isolated CABG patients with no prior history of AF, postoperative stroke risk was significantly greater for patients who developed new-onset AF vs. those who did not (3.2% vs. 1.3%, $p<0.001$). Further, new postoperative AF was associated with a 21% relative increase in mortality over a mean follow up of 6 years, even after controlling for 32 covariates.

As with other forms of AF, the primary mechanism of stroke secondary to postoperative AF is believed to be cerebro-embolism of thrombus from the left atrial appendage (LAA). In a recent report (2067 patients, 81% CABG), postoperative AF was associated with a nearly three-fold increase in stroke (OR=2.79). Among patients who developed postoperative AF, those who had undergone concomitant LAA ligation had significantly lower risk of stroke than those who had not (0.0% vs. 6.1%, $p=0.003$).

Shortcomings of past surgical approaches to LAA exclusion using sutures or staples include risk of injury and incomplete closure. Recently a new epicardial clip was shown to provide easy, reliable, safe and durable exclusion during cardiac surgery procedures, without leaks or significant residual LAA cavity 5, other promising devices are providing surgeons with additional means to address the LAA during open heart surgery[6].

Despite earlier conceptions as benign, postoperative AF carries significant risk for late cerebral injury following non-eventful cardiac surgery. LAA closure may be an important adjunct to all cardiac procedures to reduce the risk of postoperative AF-related cerebrovascular accident. The current generation of epicardial LAA closure devices may make routine concomitant management of LAA easier and safer than past approaches.

The role of these new devices in attenuating risk of postoperative stroke resulting from new-onset AF merits further investigation.

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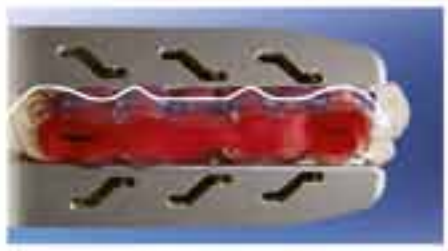

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Continued from page 6

Abstracts

10:15 Left ventricular assist devices. I: Improving outcome

Hall E2

Moderators: G. Laufer, Vienna; J. Lahpor, Utrecht

10:15 **Mitral regurgitation and its influence on long-term outcome in patients with ventricular assist devices** *A. Bernhardt*
Discussant: G. Gerosa

10:30 **Efficacy and safety of paravertebral block analgesia versus general anaesthesia for ventricular assist device implantation: a single-centre experience** *T. Bottio*
Discussant: P. Tozzi

10:45 **Comparison of post-transplantation outcomes in patients bridged with the Thoratec paracorporeal ventricular assist device versus the Heartmate II ventricular assist device** *M. Urban*
Discussant: D. Loisance

11:00 **Institutional approach to minimise the invasiveness of ventricular assist device implantation** *T. Haberl*
Discussant: G. Rabago

11:15 **Comparative study of different left ventricular assist device outflow graft placement on patient haemodynamics** *M. Rossi*
Discussant: L. Von Segesser

11:30 **Minimally-invasive left ventricular assist device implantation improves outcome in reoperative cases** *J. Hanke*
Discussant: A. Miralles

Abstracts

10:15 Aortic valve replacement: long-term outcomes

Hall F1

Moderators: A. P. Kappetein, Rotterdam; J. L. Pomar, Barcelona; M. Taramasso, Milan

Learning objectives
- Understanding durability of different procedures.
- Influence of technique and drugs on outcome.

10:15 **Ten-year results of redo aortic valve surgery in current practice: results from the multicentre European Redo Cardiac Operations Research Database (RECORD) initiative** *F. Onorati*
Discussant: S. Thelin

10:30 **A propensity-matched analysis of outcomes and long-term survival in stented versus stentless valves for aortic valve replacement** *B. Shultz*
Discussant: B. Bridgewater

10:45 **Aortic valve leaflet repair: a single-centre ten-year experience** *A. Mangini*
Discussant: D. Ngaage

11:00 **Bioprosthetic valve durability following stentless aortic valve replacement: the effect of implantation technique** *S. Mohammadi*
Discussant: O. Stanger

11:15 **Twenty-year durability of the aortic Hancock II bioprosthesis in young patients: is it durable enough?** *D. Une*
Discussant: M. Taramasso

11:30 **Statins and long-term survival after isolated valve surgery: the importance of valve type, position and procedure** *M. Pullan*
Discussant: H. Klein

Abstracts

10:15 Risk scores and outcome reporting

Hall F2

Moderators: K. Lobdell, Charlotte; D. Pagano, Birmingham; S. Head, Rotterdam

Learning objectives
- Understanding risk score.
- Outcome analysis.

10:15 **Mortality morbidity and long term outcome** *F. Edwards*

10:30 **Trends and outcomes of valve surgery: Sixteen-year results of the Netherlands Adult Cardiac Surgery Database** *S. Siregar*
Discussant: J. Gummert

10:45 **Performance of the Euroscore II in a large US database and implications for patient selection in clinical trials** *R. Osnabrugge*
Discussant: W. Brinkman

11:00 **Frailty is a predictor of short- and mid-term mortality after elective cardiac surgery independently from age** *S. Sündermann*
Discussant: S. Nashef

11:15 **Enhancing quality control and performance monitoring in thoracic aortic surgery: a ten-year single-institution experience with 753 procedures** *M. Murzi*
Discussant: M. Czerny

Continued on page 10

ECMO-ECLS I: Risk prediction, salvage and bridging 08:15 Hall H

Extracorporeal membrane oxygenation support system as bridge to solution in refractory cardiogenic shock

Antonio Loforte

Antonio Loforte*[*1], Emanuele Pilato[1], Sofia Martin Suarez[1], Andrea Montalto[2], Paola Lilla Della Monica[2], Francesco Grigioni[1], Luciano Potena[1], Guido Frascaroli[1], Antonio Menichetti[2], Giuseppe Marinelli1, Francesco Musumeci[2], Giorgio Arpesella[1].

1 Department of Cardiovascular Surgery and Transplantation, S. Orsola-Malpighi Hospital, Bologna University, Bologna, Italy; 2 Department of Cardiac Surgery and Transplantation, San Camillo Hospital, Rome, Italy

Extracorporeal membrane oxygenation (ECMO) is a well established technology that provides full circulatory support with the possibility to recover from organ injury in patients who present with cardiac arrest or severe hemodynamic instability even associated with multiple organ failure (MOF).

We report our double-centre experience in using the RotaFlow (Maquet, Jostra Medizintechnik AG, Hirrlingen, Germany) and the Levitronix CentriMag (Levitronix LCC, Waltham, MA) centrifugal pumps in the setting of central or peripheral veno-arterial ECMO support systems as treatment for patients with primary or post-cardiotomy refractory cardiogenic shock (CS).

Between January 2007 and October 2012, 228 consecutive adult patients were supported on RotaFlow (n=213) or CentriMag (n=15) veno-arterial ECMO, at our institutions (155 men; age 58.3±10.5 years, range: 19-84 years). The recent PLS (Permanent Life Support – Maquet, Jostra Medizintechnik AG, Hirrlingen, Germany) ECMO circuit which adopts a poly-methylpentene (PMP) oxygenator, Quadrox D (Maquet, Jostra Medizintechnik AG, Hirrlingen, Germany) was used and adapted for both RotaFlow and CentriMag centrifugal pumps systems.

Indications for support were: failure to wean from cardiopulmonary bypass in the setting of postcardiotomy (n=118) and primary donor graft failure (n=37); post-acute myocardial infarction CS (n=27); acute myocarditis (n=6); and CS on chronic heart failure (n=40).

A central ECMO setting was established in 102 (44.7%) patients while peripherally in 126 (55.2%). Overall mean support time was 10.9±9.7 days (range: 1-43 days). Eighty-four (36.8%) patients died on ECMO. Overall success rate, in terms of survival on ECMO (n=144), weaning from mechanical support (n=107; 46.9%), bridge to mid-long-term ventricular assist device (n=6; 2.6%) and bridge to heart transplantation (n=31; 13.5%), was 63.1%. Hundred-twenty-two (53.5%) patients were successfully discharged.

The following variables were significantly different if survivors and non-survivors on ECMO were compared: age (p=0.03), female gender (p<0.01), cardio-pulmonary resuscitation before ECMO (p<0.01), lactate level before ECMO (p<0.01), number of platelets, fresh frozen plasma (FFP) units and packed red blood cells (PRBCs) transfused during ECMO support (p=0.03, p=0.02 and p<0.001), blood lactate level (p<0.01) and CK-MB relative index 72 h after ECMO initiation (p<0.001), and multiple organ failure on ECMO (p<0.01).

Stepwise logistic regression identified blood lactate level and CK-MB relative index at 72 h after ECMO initiation, and number of PRBCs transfused on ECMO as significant predictors of mortality on ECMO [p=0.010, odds ratio (OR)=2.94; 95% confidence interval (CI)=1.10–3.14; p=0.010, OR=2.82, 95% CI=1.014 – 3.721; and p=0.011, OR=2.69; 95% CI=1.06–4.16; respectively].

Central ECMO population had more bleeders and an higher rate of continuous veno-venous hemofiltration (CVVH) need when compared with the peripheral ECMO population (62.7% vs. 48.4% and 56.8% vs. 43.6%, respectively). No significant differences were seen by comparing RotaFlow and CentriMag populations in terms of hemolysis rate and device performance.

Patients with a poor hemodynamic status may benefit by rapid central and peripheral insertion of veno-arterial ECMO. Both RotaFlow and CentriMag ECMO systems by usage of the PMP oxygenator Quadrox D are an optimal strategy and have to be seriously considered even when a perfusion longer than 7 days is forecast.

The blood lactate level, CK-MB relative index and PRBCs transfused should be strictly monitored during ECMO support since, at the moment, there are no specific guidelines for the management of ECMO and the decision to discontinue support is still a challenge and is entrusted to the experience of each center.

Controversies in coronary artery surgery 08:15 Hall D

Hybrid surgery in patients with concomitant critical coronary and carotid artery lesions

Alexander Chernyavskiy

A M Chernyavskiy, A G Edemskiy, M A Chernyavskiy, TE Vinogradova, O V Kamenskaya *Department of Aortic and Coronary Surgery, Novosibirsk Research Institute of Blood Circulation Pathology, Novosibirsk, Russia*

With the absence of randomized multicenter clinical trials to address the optimal management of patients with severe carotid and coronary artery disease we suggest a new hybrid approach that sees the patient undergo simultaneous carotid artery stenting (CAS) and coronary artery bypass graft (CABG) surgery in hybrid operation room.

Since 2009 we performed 125 hybrid procedures – coronary artery bypass surgery and carotid stenting. Our technique of the hybrid procedure is as follows. In the hybrid operating room sternotomy and conduit harvesting for CABG were performed. After heparin injection through the site for cardioplegic cannula in the ascending aorta introducer 6 Fr was placed and angiography was performed. Through this introducer embolic protection device was placed into carotid artery and carotid stenting was performed. With a residual stenosis > 30% we performed balloon dilatation with 4mm or 5mm balloon catheter. After stenting we continued on-pump CABG. Among our patients there were 104 men and 21 women; mean age was 65,9±7,4 years. 87 (69.5%) patients had III-IV angina functional class, 109 (87%) patients were neurologicaly symptomatic. Sixty-three (50.5%) patients had bilateral carotid stenosis > 70% and 16 (19.7%) had occlusion of the contralateral carotid artery. We consider that indications for this procedure is multivessel coronary artery lesion in association with symptomatic/asymptomatic hemodynamically significant unilateral carotid artery stenosis > 70% or bilateral carotid artery stenosis or contralateral carotid artery occlusion. We evaluated 30-day short-term follow-up in all patients. Mortality we registered in three cases – in two cases (1.6%) the cause was stroke in the occluded contralateral internal carotid artery, and one patient had fatal myocardial infarction (0.8%). In the immediate postoperative period (30 days) non-fatal myocardial infarction was in one (0.8%) case, stroke in two (1.6%) cases. Posthypoxic encephalopathy occurred in three patients (2.4%). Currently we evaluate long-term results (more than one year) in 42 patients in the period from one to 15 months after the hybrid operation. The mortality rate was one (0.8%) patient who died at six months after surgery from a fatal heart rhythm abnormalities. Three (2.4%) patients had ischemic transient attacks in the vascular pools of both middle-cerebral arteries. We firmly believe in the necessity of multicentral randomized clinical trials comparing different surgical approaches in these patients in order to identify the safest method.

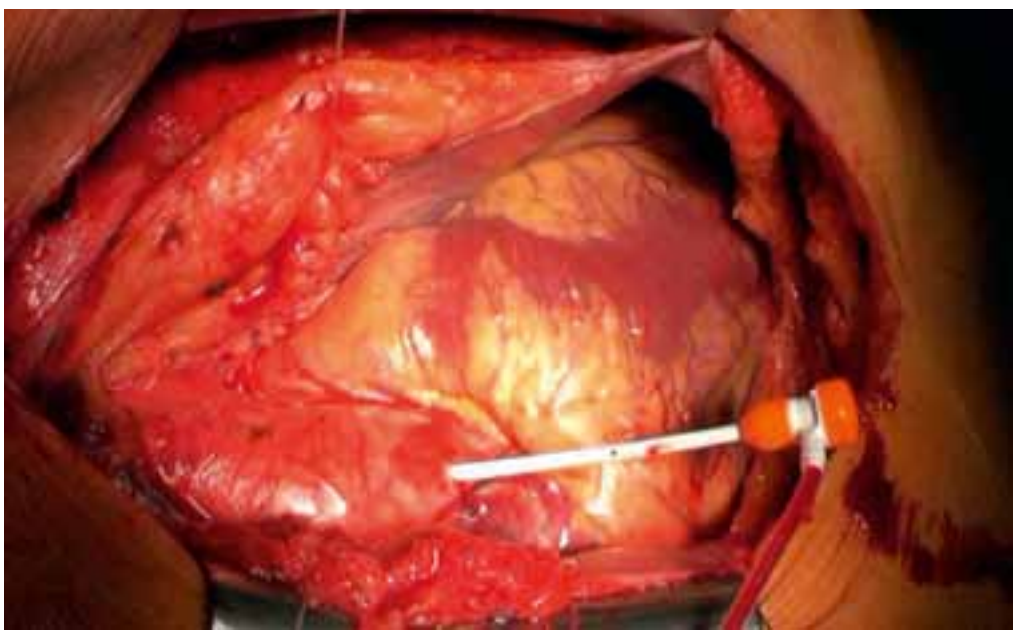

Figure 1: Introducer 6 Fr in ascending aorta

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• Mitral Valve Regurgitation: Watchful Waiting vs. Early Mitral valve Repair

The Cardiologist point of view:
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MONDAY, OCTOBER 7

Hall: K • 12:45 - 2:00 pm

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Continued from page 8

Focus Session

10:15 Percutaneous mitral valve repair: a standard of care for mitral regurgitation?

Rondo

Moderator: L. Menicanti, Milan

Learning objectives

- List MR treatment options and identify MitraClip patient population.
- Understand positive impact of MitraClip on surgeons' activity.
- Understand why surgeons should be on board and/or start.

10:15	Case 1: MitraClip converted to surgery	*H. Treede*
10:20	MitraClip converted to surgery – How would you treat? (Debate)	*Pro F. Maisano, Zurich; Con R. Dion, Genk*
10:30	MitraClip converted to surgery – How would you treat? (Discussion)	*A. Vahanian*
10:40	MitraClip converted to surgery – How the patient was treated	*H. Treede*
10:45	Case 2: Surgery failed then converted to MitraClip	*H. Treede*
10:50	Surgery failed then converted to MitraClip – How would you treat? (Debate)	*Pro F. Maisano; Con R. Dion*
11:00	Surgery failed then converted to MitraClip – How would you treat? (Discussion)	*A. Vahanian*
11:10	Surgery failed then converted to MitraClip – How the patient was treated	*H. Treede*
11:15	Case 3: Patient referred for surgery but declined and treated by MitraClip	*H. Treede*
11:20	Patient referred for surgery but declined and treated by MitraClip – How would you treat? (Debate)	*Pro F. Maisano; Con R. Dion*
11:30	Patient referred for surgery but declined and treated by MitraClip – How would you treat? (Discussion)	*A. Vahanian*
11:40	Patient referred for surgery but declined and treated by MitraClip – How the patient was treated?	*H. Treede*

This session is supported by an unrestricted educational grant from Abbott Vascular International BVBA.

Focus Session

10:15 Surgery for prognosis – Part I, mitral valve disease

Hall E1

Moderators: B. Bridgewater, Manchester; J. Kluin, Utrecht

10:15	Early interventions – Pro	*J. Vanoverschelde*
10:25	Early interventions – Con	*R. Rosenhek*
10:35	Discussion	
10:40	Results. How to set up a program – pitfalls – from open to robotic assisted	*F. Wells*
10:50	Discussion	
10:55	Rationale to alter my practice: What is the motivation from high volume centres to move to minimally invasive mitral surgery?	*M. Mack*
11:05	Discussion	
11:10	Should the asymptomatic patient make me alter mitral valve approach?	*P. Perier*
11:20	Discussion	
11:25	Perfusion strategies in minimally invasive mitral surgery	*P. Modi*
11:35	Discussion	

Focus Session

10:15 Work-in-progress abstract session

Room 1

Moderators: M. Siepe, Freiburg; A. Sihoe, Kowloon

Learning objectives

- Residents can present the projects that are working on and ask the audience for cooperation.

10:15	Robotic thymectomy: focus on the future	*M. Keijzers*
10:30	Single stage endovascular wheat procedure: a CT-based feasibility study	*B. Rylski*
10:45	A novel four-dimensional model for morphologic and dynamic analyses of mitral valve	*T. Noack*
11:00	Gastroepiploic artery without periarterial sympathetic nerve prevents vasospasm	*Y. Yokoyama*
11:15	Role of human album in cardiac surgery	*S. Pande*

The Presidential Address

11:50 Talent or Training

Hall D

J. L. Pomar, Barcelona

Continued on page 12

Abstracts 10:15 **Hall F1**

Ten-year results of redo aortic valve surgery in current practice: results from the multicentre European Redo Cardiac Operations Research Database (RECORD) initiative

Francesco Onorati *University of Verona, Verona, Italy*

The exponential growth of the geriatric population, the augmented survival and quality of life of people in the last decades of life, the significant improvements in surgical techniques, anesthetic management and medical care of fragile patients, has yielded to a significant increment of requests for repeat cardiac surgical procedures worldwide. Indeed, redo-cardiac procedures are still challenging operations, carrying a higher perioperative risk for mortality and morbidity compared to first-time operations. The increased surgical risks have recently favoured the use of alternative "less-invasive" techniques, such as trans-catheter interventions (TAVI) and trans-catheter valve-in-valve (TAVIV) procedures. However, although current Guidelines indicate TAVI in patients with prohibitive or extremely high surgical risk, a widespread use of "off-label" transcatheter technology is rapidly growing worldwide.

On the other hand, few studies on redo-aortic valve replacement (RAVR) have been published in the last years, being the literature on the topic quite aged, and almost all studies single-institutional experiences. It has been shown that the extreme variability in the reported surgical mortality and morbidity after RAVR is related to differences in risk-profiles of enrolled patients, operator's skill, surgical volume of individual hospitals, single-center design of the majority of the studies, lack of long-term data, etc. Therefore, the Division of Cardiac Surgery of the University of Verona Medical School decided to "coagulate" several experiences on redo-cardiac surgery. They institute an open RECORD (REdo Cardiac Operations Research Database) Registry, enrolling "all-comers" to redo-cardiac procedures, and to date representing seven different European Centers (one Finnish, one German, and five Italian institutions).

In the study presented at the 27th EACTS Annual Meeting, the Authors reported hospital and long-term results of RAVR executed during the last 10 years, focusing also on subgroups of patients traditionally considered at high surgical risk (elderly, NYHA IV at admission, urgent/emergent procedures, endocarditis). The present study demonstrated excellent results in the entire population, in terms of hospital mortality (5%), 10-year survival (77%), and 10-year freedom from acute heart failure (84%), reinterventions (97%), stroke (97%), and thromboembolisms (96%) (Figure 2). Moreover, 87% of survivors were in NYHA class I or II at last follow-up. The study also outlines the tremendous impact on hospital mortality of iatrogenic complications such as damage of major cardiovascular structures at reentry, and of postoperative low cardiac output syndrome and acute renal insufficiency. Furthermore, transfusions already represented the lion's share in terms of perioperative morbidity.

Francesco Onorati (left) and Giuseppe Faggian

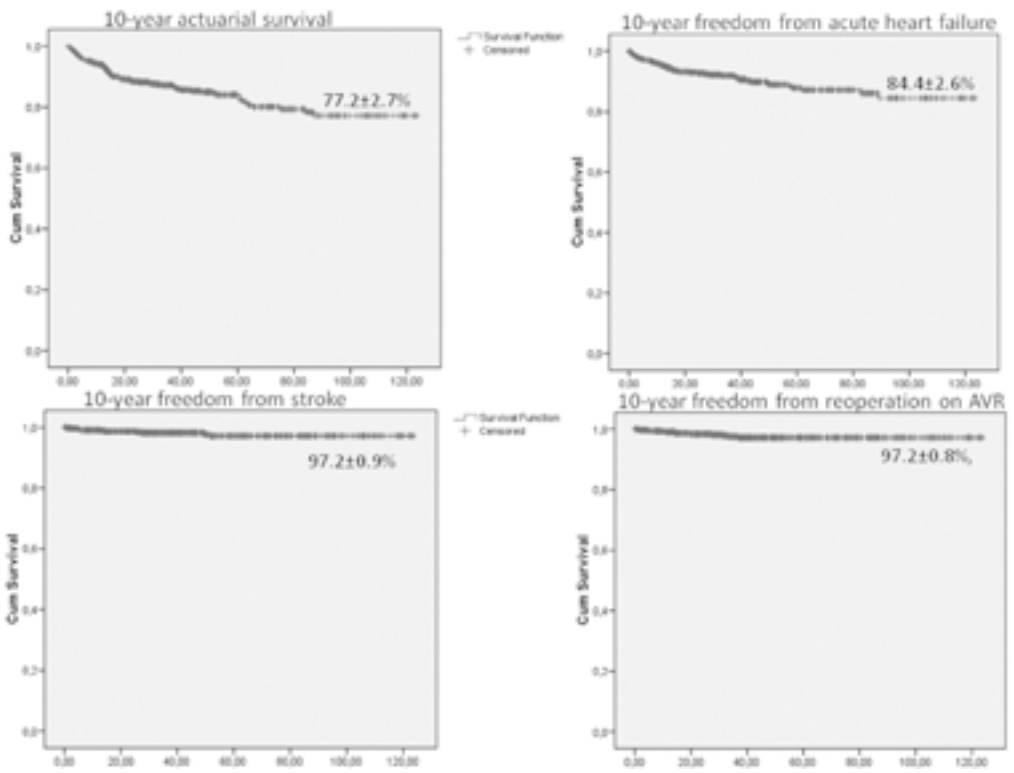

Figure 2

On the other hand, the study underscores the equipoise in terms of either hospital and long-term outcome between the elderly and the young patients, thus confirming that age should not be considered 'per se' a preferential indication to TAVIV procedures. NYHA class IV at admission and urgent/emergent priority, especially when severe systolic dysfunction coexists, correlate with an extremely poor hospital outcome, with important consequences also in the long term, perhaps representing two different preoperative "profiles" potentially better served with TAVI and TAVIV. Finally, the extremely poor outcome of endocarditis mandate major efforts in the next future to improve surgical and medical therapy of this disease, giving also the inability of TAVI to treat infections.

Abstracts 10:15 *Hall E2*

Efficacy and safety of paravertebral block analgesia versus general anaesthesia for ventricular assist device implantation: a Pilot study in a single-centre experience

Jonida Bejko, Tomaso Bottio, PhD, Giacomo Bortolussi, Marina Comisso, Massimiliano Carrozzini, Roberto Bianco, Guido Di Gregorio*, Cristiana Carollo*, Ivo Tiberio*, Gianclaudio Falasco*, Michele Gasparetto*, Demetrio Pittarello*, Vincenzo Tarzia, Gino Gerosa *University of Padua, Italy; Department of Anesthesiology**

Cardiac transplantation remains the best solution in the treatment of end-stage heart failure. Suitable donors have become less available; thus an increasing number of patients are treated with mechanical circulatory assistance as a bridge to transplantation. However, in most cases, these patients are complex with several risk factors associated, leading to an high post-operative risk of multi-organ failure. On the other hand, the off-pump less invasive surgical implantation helps not only in a rapid implantation system with reduced postoperative bleeding, but also in the preservation of physiology and respiratory mechanics, preserving a good exposure of heart and great vessels. At the same time, anesthesia and analgesia strategy must guarantee a safe planning of intraoperative work-up and an effective postoperative pain control. Therefore, a less invasive anesthesia should impact on rapid awakening, extubation and mobilization of the patient.

The aim of our study is to compare the impact of two different anaesthetic-analgesic approaches in the LVAD minimally invasive implantation outcomes (paravertebral block associated to mild general anesthesia: PVB; versus general anesthesia: GA). The primary endpoints of the study were to detect the differences on intraoperative and postoperative hemodynamics, mechanical ventilation, recovery and discharge times as well as mortality. The secondary endpoints of the study were to detect differences in the efficacy of the anesthesia on pain control, fast mobilization and pulmonary infections.

We considered in our study only the Heartware LVAD implantations performed with the less invasive surgical approach without CPB support. Thus in the study we included a total of twelve patients with a mean age of 49±14 years, supported for an average of 130±105 days at our Unit from January 2012 to February 2013. The same surgical technique was applied in all patients. In six patients the LVAD implantation was possible with the aid of PVB, while the remaining six patients were routinely anaesthetized (GA).

Considering the PVB risk of bleeding and the complexity of the preoperative conditions of these patients, with frequently anticoagulant and antiplatelet therapy, in order to decide if applying PVB approach associated with mild general anesthesia or general anesthesia (GA), an algorithm of indications was created. The aid of ROTEM and Multiplate were fundamental. In case of hypocoagulability we proceeded with GA. Subsequently, the platelet count was assessed. In case of platelets count < 100x10.9/L GA was performed. In case of pre-operative anti-platelet therapy, qualitative evaluation with the Multiplate was proceeded. Only with normal functional platelets we performed the procedure with the aid of PVB.

PVB analgesia allowed a fast postoperative weaning from mechanical ventilation and extubation in the operating room (OR) in four patients (67%). None of these patients required postoperative right ventricular support. No case of epidural haematoma was observed. In GA group one patient was similarly extubated in the OR (16.7%), while the others were extubated 6 to 24 hours later. Three patients required temporary right paracorporeal VAD support, further weaned and removed between 48 and 72 hours later. One patient (16.7%) died 7 days after implantation.

Paravertebral analgesia may play a substantial role in VAD surgery favouring faster recovery and shorter hospital length of stay, important when patients at very high risk are considered. Thus, the anesthetic treatment must be inserted between the institutional priority objectives, being an integral part of the LVAD patient treatment plan providing in fact, analgesia, early mobilization, and prompt general rehabilitation.

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Continued from page 10

Abstracts

14:15 Coronary artery bypass graft 1

Hall D

Moderators: P. Sardari Nia, Schoten; T. M. Sundt, Boston

14:15 **Coronary artery bypass graft-related bleeding complications in real-life acute coronary syndrome patients treated with clopidogrel or ticagrelor** *E. Hansson*

14:30 **Long-term results of minimally invasive direct coronary artery bypass: ten-year experience and follow-up** *A. Repossini*
Discussant: A. Calafiore

14:45 **Impact of coronary artery bypass surgery on long-term outcomes in patients with heart failure: from the CREDO-Kyoto percutaneous coronary intervention/coronary artery bypass graft Registry Cohort-2** *A. Marui*
Discussant: M. Poullis

15:00 **Long-term results of sequential vein coronary artery bypass grafting compared to totally arterial myocardial revascularisation: a propensity score-matched follow-up study** *A. Garatti*
Discussant: M. Lass

15:15 **Is there a future for hybrid coronary revascularisation?** *I. S. Modrau*

Abstracts

14:15 Reflections on aortic valve repair

Hall E2

Moderators: R. Haaverstad, Bergen; U. Rosendahl, London

Learning objectives
- Lessons from different repair techniques.
- Durability of aortic valve repair.

14:15 **Long-term outcome of valve-preserving root replacement for patients with aortic dissection: a propensity score-matched analysis** *T. Kunihara*
Discussant: J. Fragata

14:30 **Aortic valve reconstruction with a patch: indication, techniques and durability** *Z. Mosala Nezhad*
Discussant: S. Thelin

14:45 **Aortic valve repair in patients with unicuspid aortic valve by bicuspidization with augmentation using pericardium** *H. Takahashi*
Discussant: Z. Al Halees

15:00 **Long-term results of aortic valve-sparing operations in patients with aortic valve insufficiency and aortic root aneurysm** *N. Monsefi*

15:15 **Pre-operative aortic annulus diameter affects valve durability in bicuspid aortic valve patients undergoing primary valve repair plus subcommissural annuloplasty for aortic insufficiency** *P. Vallabhajosyula*
Discussant: G. El Khoury

15:30 **Aortic valve repair in acute type A aortic dissection** *R. Saczkowski*
Discussant: M. Pocar

Abstracts

14:15 Ventricular remodelling

Hall F1

Moderators: L. Menicanti, Milan; M. Zembala, Tarnowskie Góry

14:15 **Surgical ventricular restoration for ischaemic cardiomyopathy. Is there any difference in outcome between anterior and posterior dilatation?** *A. Garatti*
Discussant: M. Di Mauro

14:30 **Personalised surgical repair of left ventricular aneurysm with computer-assisted ventricular engineering** *I. Hartyanszky*
Discussant: R. Dion

14:45 **Clinical benefits twelve months after less invasive ventricular restoration operations without ventriculotomy** *A. Wechsler*
Discussant: D. Pededa

15:00 **Non-heart transplant surgical approaches with left ventricular restoration and mitral valve operation for advanced ischaemic cardiomyopathy** *Y. Cho*
Discussant: L. Menicanti

15:15 **Right ventricular function after surgical ventricular reconstruction in heart failure** *S. Castelvecchio*
Discussant: P. Ferrazzi

15:30 **Left ventricular surgical restoration: is it a matter of shape or volume?** *M. Di Mauro*
Discussant: R. Klautz

Continued on page 14

Risk scores and outcome reporting 10:15 Hall F2

Mortality morbidity and long-term outcome

Fred Edwards *University of Florida, USA*

Quality assessment in cardiothoracic surgery centers around national and international benchmarking along with the use of statistical models to ensure risk adjusted outcome comparisons. In order to ensure optimal use of these tools, it is necessary to periodically update reported outcomes and the current approaches used to assess operative results. In the upcoming EACTS session "Risk Scores and Outcome Reporting", an overview will be provided to address "Mortality, Morbidity, and Long-term Outcomes".

Current international mortality and morbidity rates will be presented along with an analysis of the trends observed over the last decade. Generally, most patient demographics have remained relatively stable over the decade, but the incidence of adverse clinical risk factors has steadily increased.

Composite measures, once opposed as undesirable "report cards", have come to be well-accepted and valuable adjuncts to the more traditional performance measures. The statistical approach to development of these measures will be briefly described and the application of composite scores in The Society of Thoracic Surgeons (STS) National Database will be presented. Since the concept of composite scores is familiar to patients from various trade publications, it seems logical to use these scores in public reporting applications. The advantages and disadvantages of public reporting will be discussed and the methods used to report STS outcome information will be described.

Fred Edwards

The importance of long-term outcome data has long been recognized, but the use of such data has traditionally been hampered by the need for onerous, costly, and time-intensive data collection methods. In recent years, the ability to link short-term clinical registry data with long-term administrative data has provided a valuable new way to efficiently combine datasets that permit long-term outcome analyses. This approach has been used in several recent observational trials that have provided valuable insights for formal comparative effectiveness studies. In addition, this data-linking method is useful in creating statistical outcome models that are designed to predict various risk-adjusted outcomes years after the operative procedure.

The future of quality assessment is promising and exciting. Several new innovations have appeared in the last few years. The need to measure patient frailty is now widely recognized and several metrics have been proposed to objectively define this entity. The major obstacle to implementation stems from the fact that this is a new and unfamiliar data element that requires education and support of hospital teams that will collect the information. Quality-of-life (QoL) metrics are also critically important adjuncts to the more traditional outcome measures and will likely play a key role in the near future. In addition, we have on the horizon a new generation of risk models that will predict not only traditional operative outcomes, but also some measure of patient benefit as well. These powerful new models will be designed for use by both physicians and patients so that an unprecedented wealth of information can be used to determine optimal patient management.

Focus session 08:15 Hall E1

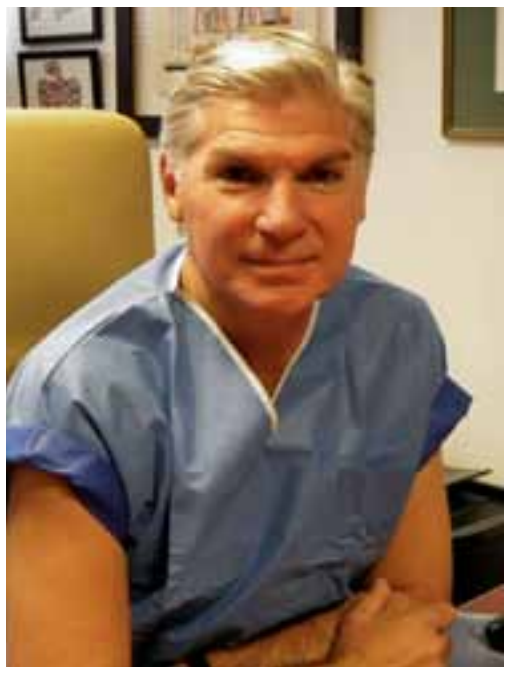
ROUTE – the transaortic registry (baseline/first data)

Mauro Romano *Institut jacques cartier, Massy France*

Transcatheter aortic valve implantation (TAVI) is an established intervention for patients with calcific aortic stenosis at hight surgical risk. A newly established access route is a transaortic delivery of the Edwards Sapien XT valve wich was approved in May 2012. It is an alternative access route to the transapical approach usually selected for patients with poor peripheral vascular anatomy to avoid its inherent drawbacks, namely: left ventricular bleeding, apical rupture or pseudoaneurysm and chest wall complications responsible for post-procedural pain and pleural effusion.

The potential advantages of the transaortic access route lie in the familiarity of all cardiac surgeons with partial sternotomy and aortic cannulation wich are daily practice, the possibility of rapid conversion to full sternotomy in case of need, the lower risk of myocardial damage and apical bleeding and the diminution in chest wall injury and its related complications.

First retrospective case series of this novel approach have been published, that are usually based on implantations at a single, highly experienced center or pooled retrospective data from a number of different centers. The data suggest that the procedure is feasible and safe with an acceptable risk of 30-day mortality and adverse events. Recent device refinements improved procedural outcomes.

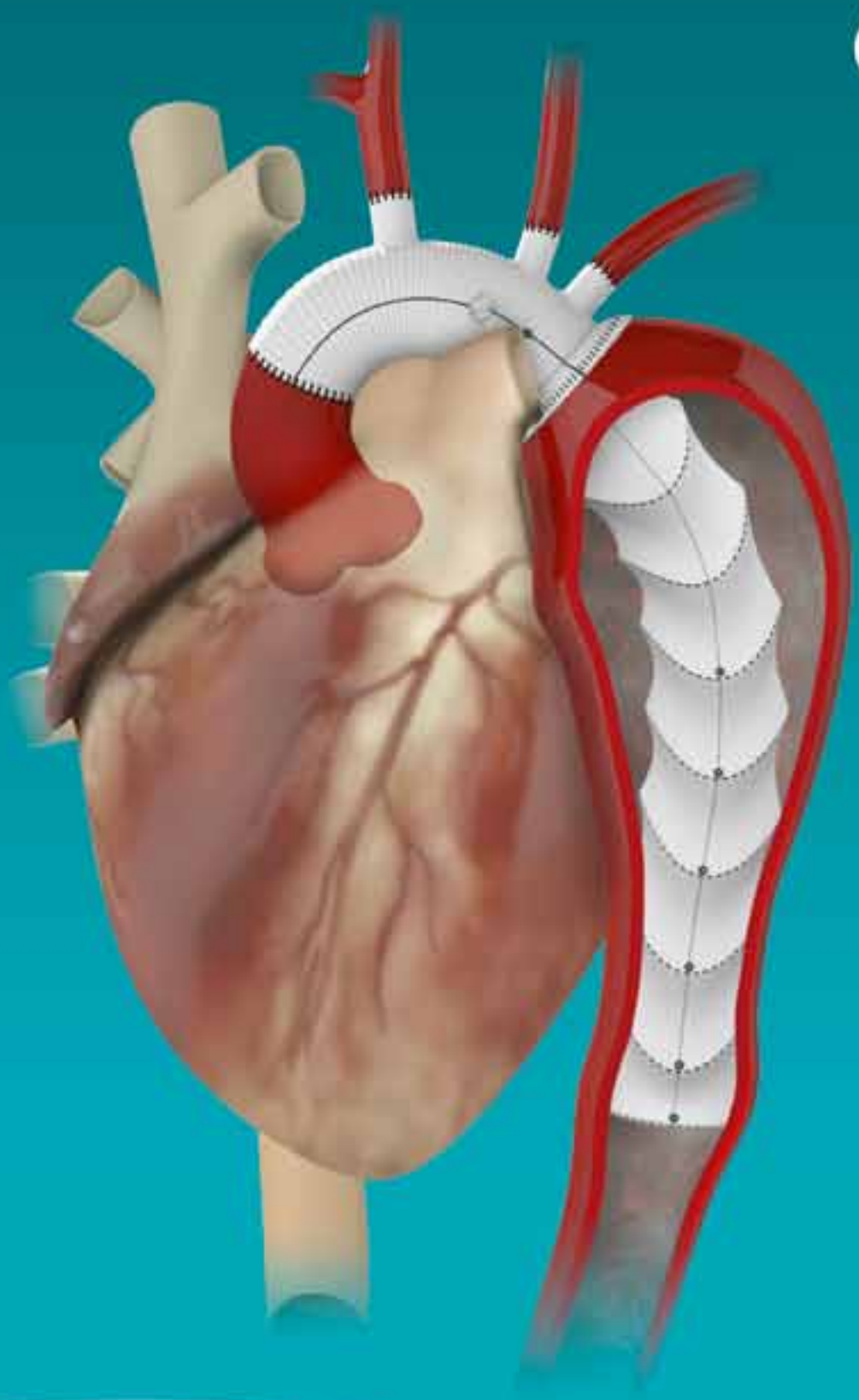


Mauro Romano

ROUTE is the first multicenter, multinational prospective registry on the use of the Edwards Sapien XT valve (ROUTE) in patients with transaortic transcatheter aortic valve implantation. It commenced in February 2013 and aims to document implantations at up to 25 sites across Europe with about 200 patients included. The principal objective is to determine overall mortality rates within 30 days after TAVI. Secondary objectives relate to TAVI related mortality, VARC complications and to identify predictors of adverse outcomes.

As of September 2013 the first 50 patients were included into ROUTE and the follow-up completed in the majority of patients. We will present site and patient characteristics of these first cases and the first estimate on the 30 day mortality rates.

The results of this landmark registry will provide important information on the procedural success rates and early mortality in patients undergoing transaortic TAVI in a large cohort of patients with aortic stenosis.



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References:

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

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Continued from page 12

14:15 Cardiopulmonary bypass – improving outcome in marginal patients

Hall F2

Moderators: G. Steinhoff, Rostock; D. Wendt, Essen

14:15	Advanced heart and lung protection perfusion technique for valve surgery	*V. Pichugin*
	Discussant: D. Chambers	
14:30	Real-time measurement of rectal mucosal microcirculation during cardiopulmonary bypass	*A. Kiessling*
	Discussant: K. Kvernebo	
14:45	A biocompatible perfusion strategy is safe and is associated with excellent clinical outcomes and reduced blood transfusions in a contemporary series of patients undergoing coronary artery bypass grafting: a two-centre study	*O. Shapira*
	Discussant: M. Kaljusto	
15:00	The influence of selective lung perfusion on the inflammatory response and clinical outcome of patients with chronic obstructive pulmonary disease undergoing cardiopulmonary bypass	*A. Kiessling*
15:15	Ex vivo evaluation of blood coagulation and thrombo-resistance of two extracorporeal circuit coatings under low and full heparin dose	*C. Baufreton*
	Discussant: K. Brehm	
15:30	A positive influence of pulsatile cardiopulmonary bypass on renal function in elderly patients undergoing aortic valve surgery	*M. Dodonov*
	Discussant: P. Deleuze	

Focus Session

14:15 Aviation medicine and cardiac surgery

Hall H

Moderators: J. Pepper, London; T. Syburra, Sion /London

Learning objectives

- Prophylactic coronary surgery in high risk professions has serious implications if not fully considered

14:15	The size of the problem: why should we be interested?	*S. Mitchell*
14:27	Flying after cardiac surgery	*T. Syburra*
14:39	Adjusting the operation to the occupation	*U. Rosendahl*
14:51	Cardiology in military aircrew	*E. Nicol*
15:03	Personal stories from pilots	*D. Bron*
15:15	Panel Discussion	

Focus Session

14:15 Surgery for prognosis – Part II, aortic valve disease

Hall E1

Moderators: T. Graham, Birmingham; D. Pousios, Eastleigh

14:15	The significance of myocardial fibrosis as a prognostic factor in aortic stenosis	*J. Baksi*
14:25	Discussion	
14:30	Effect of prosthesis on long-term outcome	*J. J. M. Takkenberg*
14:40	Discussion	
14:45	Randomised trial of surgery in asymptomatic patients with aortic stenosis; early surgery vs. watchful waiting	*A. P. Kappetein*
14:55	Discussion	
15:00	Valve disease in child-bearing-age women	*M. Jahangiri*
15:10	Discussion	
15:15	Assessment of asymptomatic aortic valve	*J. Vanoverschelde*
15:25	Discussion	

Focus Session

14:15 Treatment of rheumatic valve disease. Repair vs replacement

Room 1

Moderators: M. J. Antunes, Coimbra; C. Yankah, Berlin

14:15	Repair of mitral valve regurgitation: Predictability of outcome	*Z. Al Halees, Riyadh*
14:35	The challenges of valve replacement	*M. Antunes*
14:55	Treatment of mitral stenosis – balloon or closed mitral commissurotomy	*F. Smit*
15:15	Management of aortic and mitral disease	*T. Chotivatanapong*
15:30	Discussion	

Continued on page 16

Abstracts 10:15 Room G

The ascending aorta with bicuspid aortic valve: a phenotypic classification with potential prognostic significance

Alessandro Della Corte *Second University of Naples, Monaldi Hospital, Naples, Italy*

Bicuspid aortic valve is the most common cardiac congenital malformation: it is known to underlie the majority of aortic valve stenosis cases requiring surgery below the age of 80 years and it is associated with a unique form of aortopathy.

Bicuspid aortopathy is characterized by unpredictability of its natural history and heterogeneity of the anatomo-clinical forms that it can assume. The persisting unknowns on its causative mechanisms and the conflicting evidence from different clinical studies are believed to depend at least in part on this heterogeneity. Furthermore, there is a clear need for prognostic stratification criteria in BAV aortopathy, as the diameter of the aorta seems a poor risk marker for aortic events and it does not necessarily reflect the severity of the underlying aortic tissue degeneration.

Different methods have been proposed in the literature to classify the anatomical configurations of the aorta in patients with congenital bicuspid aortic valve. We aimed to compare them in terms of descriptive power (i.e. capability to identify different clusters of patients with unique associations of anatomo-clinical features) and possible prognostic significance. To this purpose, we analysed a consecutive echocardiographic series of 696 BAV patients (mean age 48±16 years, male:female ratio 3:1). Three possible schemes for classification of the patterns of aortic dimensions were compared. One, first suggested by Schaefer et al. in 2008 defined the aortic shape as:

- "N" (ascending<sinuses>sino-tubular junction),
- "A" (ascending>sinuses>sino-tubular junction) or
- "E" (sino-tubular≥sinuses);

the second method, introduced by us in 2007 and also adopted by others more recently, categorized the pattern of aortic dimensions as

- "non-dilated",
- "ascending phenotype" (dilated, with ascending>sinuses) or
- "root phenotype" (dilated, with sinuses>ascending);

the third scheme, after a paper by Park et al. (2011), defined the aorta as

- normal,
- "type I" (dilated only at the ascending tract),
- "type II" (dilated at both ascending and sinus levels) or
- "type III" (dilated only at the sinuses).

The three classification methods proved meaningful in terms of association with the valve cusp fusion pattern: significant associations were found between right-left-coronary BAV and the root phenotype ($p<0.001$) and between the right-noncoronary BAV and the shapes A and E ($p<0.001$) as well as type I aortic configuration ($p<0.001$). The aortic shape (Schaefer's class) showed significant association with other eight of the tested clinical variables, the phenotype (Della Corte's class) and the type of dilatation (Park's class) with 10.

In a smaller longitudinal analysis (n=150), the root phenotype showed the most significant association with fast growth (>1mm/year) of the ascending diameter (50% root phenotype patients; $p=0.005$) during follow-up (5±3 years). The association with the N type was weaker ($p=0.055$); no association was found with types from the other classification scheme ($p=0.42$).

Therefore, when tested on a large population, three previously suggested phenotypic classifications of the BAV aorta proved to categorize patients into significantly different clusters, but only the classification system distinguishing between ascending phenotype and root phenotype showed a potential prognostic value. Phenotypic class of the aorta could be a factor to integrate in future comprehensive models for risk stratification of BAV aortopathy.

Alessandro Della Corte

References.

1. Prapa M, Ho SY. Risk stratification in bicuspid aortic valve disease: still more work to do. Eur J Cardiothorac Surg 2012;41:327-328.

2. Della Corte A, Bancone C, Quarto C, Dialetto G, Covino FE, Scardone M et al. Predictors of ascending aortic dilatation with bicuspid aortic valve: a wide spectrum of disease expression. Eur J Cardiothorac Surg 2007;31:397-404.

3. Schaefer BM, Lewin MB, Stout KK, Gill E, Prueitt A, Byers PH, et al. The bicuspid aortic valve: an integrated phenotypic classification of leaflet morphology and aortic root shape. Heart 2008;94:1634-1638.

4. Park CB, Greason KL, Suri RM, Michelena HI, Schaff HV, Sundt TM 3rd. Fate of nonreplaced sinuses of Valsalva in bicuspid aortic valve disease. J Thorac Cardiovasc Surg 2011;142:278-284.

Controversies in coronary artery surgery 08:15 Hall D

Advanced hybrid closed chest revascularization: An innovative strategy for the treatment of multivessel coronary artery disease

N. Bonaros, T. Schachner, J. Bonatti

Hybrid Coronary revascularization (HCR) combines the use of internal mammary artery (IMA) grafting and percutaneous intervention (PCI). Minimally invasive or totally endoscopic placement of IMA grafts and PCI using drug eluting stents fulfill both requirements of the perfect coronary revascularization strategy, namely less invasiveness and longer durability of the intervention. The most common strategy to perform HCR is the surgical revascularization of the anterior left ventricular wall using the left IMA, combined with a percutaneous intervention of a non LAD target (conventional hybrid revascularization-CHR). This strategy can be used to treat single and double vessel disease in patients with low to medium SYNTAX scores. In this study we evaluated the perioperative and midterm outcomes of advanced hybrid revascularization (AHR) for the treatment of multivessel coronary artery disease. This was defined as the combination of single or multivessel (MV) totally endoscopic coronary artery bypass grafting (TECAB) with single or multivessel PCI (Figure 1). Using this technique we can achieve complete revascularization of multivessel coronary disease without disturbing the sternum integrity.

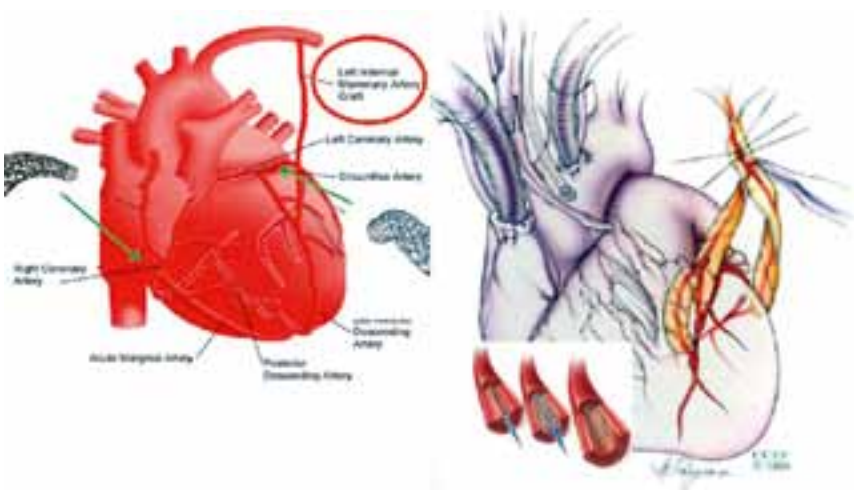

Figure 1. Advanced hybrid revascularization in multivessel coronary artery disease by means of single-vessel TECAB and single vessel PCI (left) or multivessel TECAB and single-vessel PCI.

At this study of the Innsbruck Medical Uiversity and the University of Maryland, 90 patients after AHR were compared to 90 CHR patients in terms of perioperative and mid-term outcome. The outcomes of the three different AHR options (MV-TECAB+PCI, MV-PCI+TECAB, MV-TECAB+MV-PCI) were further compared (Figure 2). Risk factors for major adverse cardiac events related to the hybrid revascularization strategy were calculated.

The authors found no difference in mortality (1 vs 0%, p=0.316) and myocardial infarction (3 vs 2%, p=0.195) between CHR and AHR respectively. As expected, the duration of operation was in average 60 min longer in the AHR than that in CHR. However the incidence of conversions, the length of ICU-stay and the length of hospital stay were similar between the groups. There was no difference in follow-up survival (96 vs 100%, p=0.091, Figure 3), Freedom from angina (both 94%, p=0.844, Figure 4), PCI Target Vessel Revascularization (3 vs 4%, p=0.563), TECAB Target vessel revascularization (0 vs 3%, p=0.135), and MACCE (14 vs 13%, p=0.601) between CHR and AHR at 24 months.

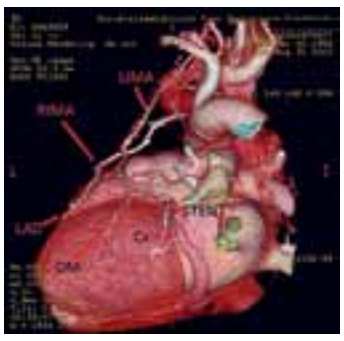

Figure 2. Example of advanced hybrid revascularization for double vessel disease: totally endoscopic coronary surgery with RIMA to LAD, LIMA to OM and PCI of the circumflex artery.

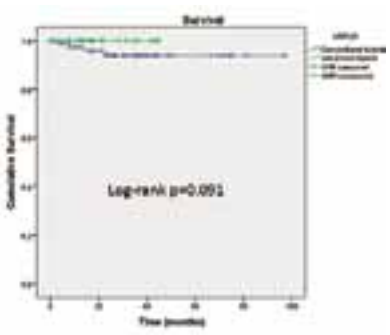

Figure 3. Kaplan-Meier curves for survival between patients with advanced and conventional hybrid revascularization.

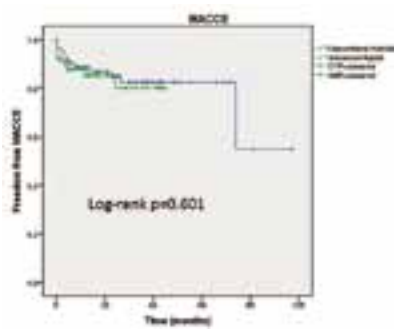

Figure 4. Kaplan-Meier curves for MACCE between patients with advanced and conventional hybrid revascularization.

No differences were detected between the three variations of AHR in perioperative outcome, mid-term survival, freedom from MACCE, and reintervention.

Neither the number or type of TECAB/PCI targets, nor the sequence of interventions were significant predictors for the development of MACCE at follow-up.

Although the technique was used in highly selected patients, this retrospective two-center study provides for the first time very promising results of complex hybrid revascularization. AHR yields comparable results to CHR and can be taken into consideration as a sternum sparing technique for the treatment of MV-coronary artery disease in selected patients.

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Continued from page 14

Clinical Anatomy Session

14:15 Session 1: Clinical anatomy of the coronary arteries
Rondo
H. Muresian, Bucharest

14:15 **Clinical anatomy of the coronary arteries** *Horia Muresian*

16:15 Session 2: Clinical anatomy of the aortic and mitral valves
Rondo
H. Muresian, Bucharest

16:15 **Clinical anatomy of the mitral and aortic valves for surgeons and interventionalists** *Horia Muresian*

Abstracts

16:15 Transcatheter aortic valve implantation: Expanding indications and techniques
Hall E2
Moderators: J. Kempfert, Leipzig; T. Modine, Lille

Learning objectives
- To evaluate alternative approaches.
- To discuss expanding indications.

16:15 **Transcatheter aortic valve implantation in patients with ascending aortic dilatation: safety of the procedure and mid-term follow-up of 100 patients** *B. Rylski*
Discussant: G. Weiss

16:30 **Transapical aortic valve implantation in patients with and without severe calcification of the ascending aorta: different preoperative characteristics but no difference in outcome** *S. Buz*
Discussant: A. Maitland

16:45 **Transcatheter aortic valve implantation combined with coronary artery stenting: a simultaneous approach** *A. Penkalla*
Discussant: W. Wisser

17:00 **Transcatheter aortic valve implantation reduces grade of concomitant mitral and tricuspid valve regurgitation and pulmonary hypertension** *M. Wilbring*
Discussant: S. Salizzoni

17:15 **Mini-thoracotomy direct aortic self-expanding transcatheter aortic valve implantation: A single-centre experience** *G. Bruschi*
Discussant: G. Wimmer-Greinecker

17:30 **Transcatheter aortic valve implantation through carotid artery access under local anaesthesia** *A. Azmoun*
Discussant: T. Walther

Abstracts

16:15 Film I
Hall F1
Moderators: D. Barron, Birmingham; J. Braun, Leiden; M. Erasmus, Groningen

16:15 **Applications of glutaraldehyde-fixed pericardium in complex mitral valve repair** *J. G. Castillo*
Discussant: J. Seeburger

16:30 **Surgical approach to a huge cardiac hydatid cyst of the interventricular septum** *M. Koudieh*
Discussant: J. Cremer

16:45 **Repair of bicuspid aortic valve with autologous pericardium: preventing pericardial tears** *P. Urbanski*
Discussant: G. El Khoury

17:00 **Aortic root and intervalvular fibrous body reconstruction for active prosthetic valve endocarditis** *E. Suenaga*
Discussant: M. Grabenwöger

17:15 **Transcatheter aortic valve and valve-in-valve implantation in a beating stenotic bicuspid and tricuspid porcine aortic valve: intracardiac endoscopic view** *G. Gelpi*
Discussant: T. Walther

Abstracts

16:15 Cardiac potpourri
Hall F2
Moderators: A. Jeppsson, Gothenburg; O. J. Liakopoulos, Cologne; M. Misfeld, Leipzig

16:15 **Low-dose warfarin throughout pregnancy in patients with mechanical heart valve prostheses: a meta-analysis** *A. Hassouna*
Discussant: K. Brehm

16:30 **Transcatheter valve implantation for native mitral valve disease: another milestone by the heart team** *I. Manoly*

16:45 **In vivo tissue-engineered small diameter "biotube"** *K. Kanda*
Discussant: J. Kluin

Continued on page 18

Blood management 08:15 **Hall F1**

Blood conservation strategies in cardiac surgery: more is better

Dimitrios V Avgerinos, William DeBois, Arash Salemi *Weill Cornell Medical Center, New York, NY, USA*

Recent data show that up to 50% of heart procedures require blood transfusion, which can have adverse long- and short-term outcomes for the patient. This led to the updated 2011 STS/SCA guidelines in an attempt to adopt more effective blood conservation techniques. However, application of these guidelines is compromised by confusion concerning indications and risks of transfusion, as well as fear of litigation. In this environment, driven further by the recent global economic crisis, it is not unexpected that many institutions have adopted initiatives and algorithms to reduce blood transfusions in cardiac surgery. Our approach to improve transfusion requirements is in accordance with such initiatives and with the STS/ACS 2011 guidelines. Our program is easy to implement, but requires a multi-disciplinary effort from surgeons, cardiologists, anesthesiologists, perfusionists, intensivists, and nursing staff.

Our cardiac surgery database at the New York Presbyterian – Weill Cornell Medical Center in New York City was reviewed retrospectively, comparing outcomes from two different time periods, after the implementation of a more effective two-fold blood conservation strategy beginning in March 2012: more aggressive intraoperative autologous donation (IAD) based on a newly constructed nomogram, and the use of a shorter length circuit of the cardiopulmonary bypass (CPB) which allowed for lower fluid volume as a prime. The method of retrograde autologous priming (RAP) was the same for both time periods.

A total of 1126 patients (Group 1) were studied in a 12-month period (March 2012 – February 2013) after the implementation of the new strategy, and compared to 3758 patients (Group 2) of the previous 36-month period (March 2009 – February 2012). There was a significant reduction in the % change of the intra-operative hematocrit between Group 1 and 2 (14% vs. 28%, p=0.01), with an increase in the mean IAD volume (655ml vs. 390ml, p=0.02) and a reduction in the CPB prime volume (1000ml vs. 1600ml, p=0.03). Group 1 required significantly less blood transfusions in the peri-operative period (29% vs. 49%, p=0.02) and had significantly reduced post-operative rates of respiratory failure (3% vs. 7%, p=0.03), pneumonia (1% vs. 3.1%, p=0.01), chest tube output (350ml vs. 730ml, p=0.01), reoperation for bleeding (1.2% vs. 2.5%, p=0.04), and length of stay (6.1 days vs. 8.2 days, p=0.05).

In conclusion, the present study shows that a three-way blood conservation strategy with aggressive IAD use, low CPB prime, and effective RAP, along with standard cell saver techniques is effective in cardiac surgery. Furthermore, permissive anemia is safe and does not contribute to the incidence of adverse outcomes. The avoidance of blood transfusion may contribute to the reduction of risks of post-operative complications and long-term mortality. There is an imperative need, more than ever, for a randomized trial that would compare the current common practice of blood transfusion in cardiac surgery with a comprehensive program of blood conservation like the one adopted by our institution.

Dimitrios Avgerinos

Mediastinum 14:15 **Hall P**

18-fluorine fluorodeoxyglucose positron emission tomography in the pretreatment evaluation of thymic epithelial neoplasms: a "metabolic biopsy" confirmed by ki-67 expression

Andrea Viti[1], Luca Bertolaccini[1], Antonio Cavallo[1], Mirella Fortunato[2], Andrea Bianchi[3] and Alberto Terzi[1] *1: Thoracic Surgery Unit, Santa Croce e Carle Hospital, Cuneo, Italy. 2: Pathology Service, Santa Croce e Carle Hospital, Cuneo, Italy. 3: Nuclear Medicine Service, Santa Croce e Carle Hospital, Cuneo, Italy.*

The role for 18Fluorine Fluorodeoxyglucose positron emission tomography/ computed tomography (18F-FDG PET/CT) in the preoperative work up of Thymoma has been evaluated by several studies in the last years[1,2]. In our previous experience, we employed 18F-FDG PET/CT in the preoperative work up for thymomas, identifying the ratio between SUVmax of the tumor and mean SUV of mediastinum, so called T/M Ratio, as a predictor of risk group according to WHO. In particular a T/M ratio greater of 2.75 was correlated with high-risk thymomas (A, AB, B1 defined as low risk group and B2 and B3 defined as high risk group)[3]. The description of metabolic activity with T/M ratio avoids the bias derived from the use of the SUV_{max}, that is the most common predictor of malignant behaviour, but is susceptible to distorting factors such as blood glucose level of the patient, uptake time, respiratory motion. Also technical factors (inter scanner variability image acquisition and reconstruction parameters) could alter the SUVmax. The T/M ratio could reduce the variability introduced by all those "non-tumor" dependent factors, therefore allowing a more precise match of data. We decided to correlate the metabolic behaviour of the tumor, depicted by the T/M ratio, with Ki-67 to suggest a biological basis for the imaging observation.

Ki 67 emerged as an important histologic marker of proliferation and aggressiveness in a variety of solid tumors. Ki-67 Labelling Index (LI), defined as the fraction of Ki-67 positive cells within the examined tumor sections, is linked with the histology and biological behaviour of thymomas[4].

Our study is a retrospective analysis of prospectively collected data between January 2006 and December 2012. We focused only on tumor which undertook complete resection or debulkyng, because of the possibility of intra-tumoral variation of histology described for thymomas, and because in those cases an adequate amount of tissue was granted for immunohistochemical staining. The sample was composed of 23 consecutive patients who underwent PET CT for an anterior mediastinal mass and subsequently underwent surgical resection for Thymoma (Figure 1). Thymic Carcinomas were excluded because of their different oncological and clinical behavior.

Among 23 study patients (14 males, nine females; mean age: 52 ± 11 years) there were 17 low-risk thymomas (three A, nine AB, five B1) and six high-risk thymomas (five B2, one B3). Transverse diameter varied from 2.5cm to 12cm (mean: 5.80 ± 2.20cm). Masaoka-Koga Stage was I in nine cases, II in 12 cases, III in four cases. Low-risk thymomas showed a mean SUVmax of 4.01 ± 1.51, and a mean T/M Ratio of 1.91 ± 0.45. High-risk thymomas showed a mean SUV_{max} of 7.60 ± 2.98, and a mean T/M Ratio of 3.73 ± 0.95. The difference between T/M ratio proved to be significant between low-risk and high risk tumor (p = 0.001).

Ki-67 LI resulted significantly higher in High Risk Thymomas (p = 0.0002) and showed a strong correlation with WHO classification (ρ 0.624). This implied a strong correlation between T/M Ratio and Ki-67 LI (ρ: 0.675; Figure 2), proving the possibility of PET CT to act as a "metabolic biopsy" and to predict aggressiveness and clinical behaviour of TENs.

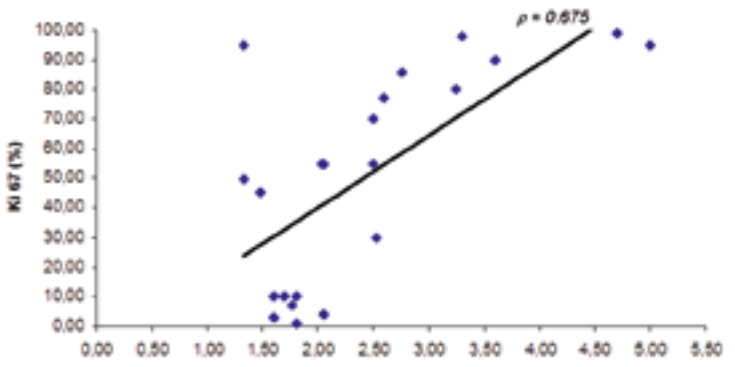

Figure 2. Plot of linear correlation between T/M ratio and Ki-67 Label Index (Ki-67 LI) (ρ 0.675).

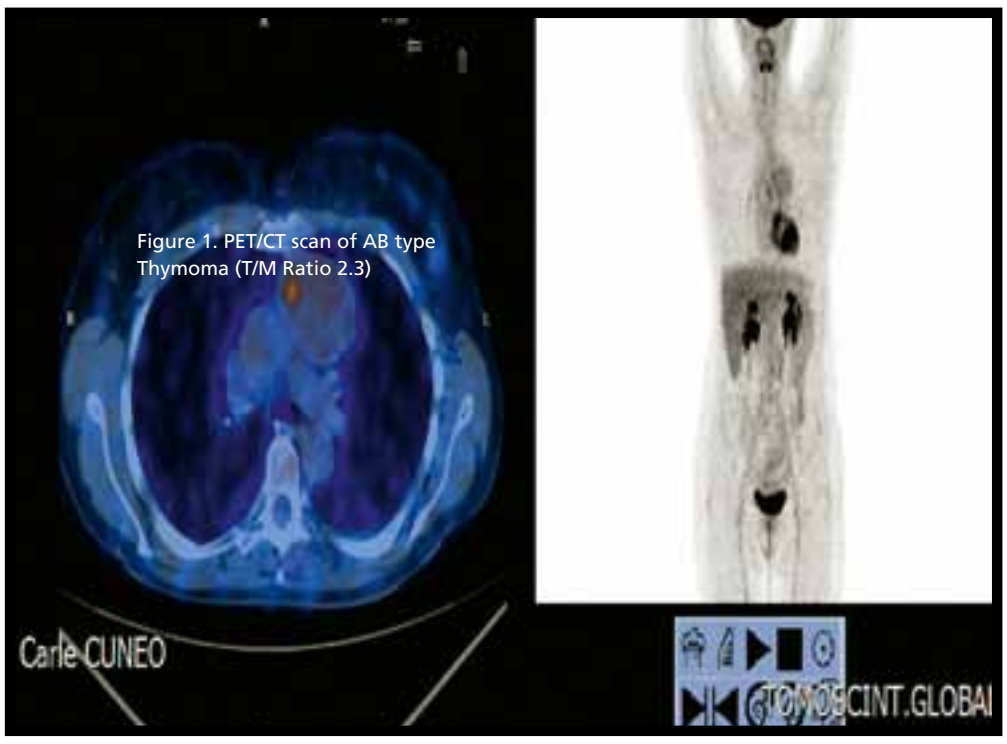

Figure 1. PET/CT scan of AB type Thymoma (T/M Ratio 2.3)

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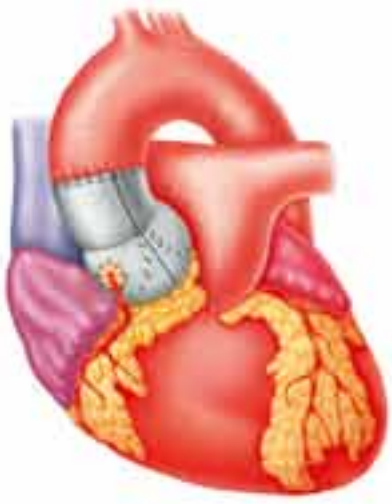
VASCUTEK SYMPOSIUM

Monday 7 October 2013
12.45 – 14.00hrs, Hall I

Innovative Product Designs & Evolving Surgical Techniques

Chairman: Professor Roberto Di Bartolomeo, Italy

12.50 - 12.55 Introduction by Professor Roberto Di Bartolomeo



12.55 - 13.15 Dr Allan Stewart, USA

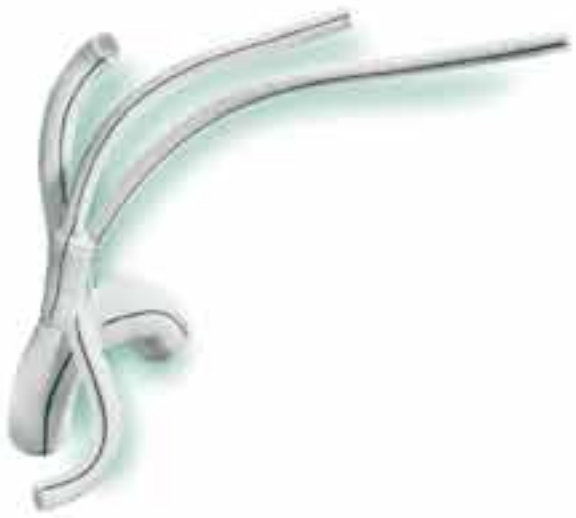
- Valve-Sparing Root Replacement: Why the Gelweave Valsalva™ Graft is Superior to "in theatre" Tailored Grafts

13.15 - 13.35 Professor Axel Haverich, Germany

- The Elephant Trunk Procedure - Concept, Development and Implementation of the Technique in Hannover

Professor Malakh Shrestha, Germany

- Latest Treatment and Development of the Frozen Elephant Trunk Procedure using the Vascutek Thoraflex™ Hybrid device



13.35 - 13.55 Dr Joseph Bavaria, USA

- The Zone 0 Hybrid Arch Operation: Technique, Indications and Results

14.00 Close

VASCUTEK
TERUMO

Continued from page 16

17:00	**Comparison of intermittent cold versus intermittent warm blood cardioplegia in 2200 adult cardiac surgery patients**	*K. Trescher*
		Discussant: L. Noyez
17:15	**Global trends in mortality from thoracic aortic disease from 1995 to 2010 and correlations with cardiovascular risk factors**	*A. Meduoye*
		Discussant: P. Kolh
17:30	**Triple valve surgery through an upper mini-sternotomy**	*P. Risteski*
		Discussant: F. Bakhtiary

Abstracts

16:15	**Complications: Escape routes I**	
Hall H		
	Moderators: J. S. Coselli, Houston; M. Josa, Barcelona	
16:15	**Transapical aortic valve (JenaValve) implantation for severe aortic insufficiency and aortic aneurysm**	*F. Schlingloff*
		Discussant: L. Van Garsse
16:30	**Transcatheter aortic valve implantation for pure severe native aortic valve regurgitation in an inoperable patient**	*A. Rastan*
		Discussant: O. Wendler
16:45	**Minimally invasive catheter-based mitral valve replacement: hybrid strategy for high-risk patients**	*C. Haller*
		Discussant: J. Kempfert
17:00	**Pseudo-aneurysm of the right internal mammary artery in a patient with sternal wound infection**	*S. Datta*
		Discussant: M. Codispoti
17:15	**Giant aneurysms of saphenous vein grafts: presentation of two uncommon cases and surgical management**	*A. Zientara*
		Discussant: M. Antunes
17:30	**Repair of left main coronary occlusion and annular disruption following transcatheter aortic valve replacement**	*D. Watson*
		Discussant: M. Versteegh

Focus Session Hall D

16:15	**Hot news from on-going clinical trials**	
Hall D		
	Moderators: M. J. Mack, Plano; F. Mohr, Leipzig	
16:15	**Update on the Partner II trial: Sapien versus surgical aortic valve replacement for intermediate risk patients**	*W. Brinkman*
16:27	**Update on the SurTAVI trial: Corevalve versus surgical aortic valve replacement for intermediate risk patients**	*P. Serruys*
16:39	**EXCEL: non-inferiority for coronary artery bypass graft versus percutaneous coronary intervention in patients with left main disease?**	*A. P. Kappetein*
16:51	**Syntax II: Syntax II score as basis for a new trial**	*P. Serruys*
17:03	**Reshape: Mitraclip versus medical treatment in ischemic mitral regurgitation. The role of the surgeon**	*O. Alfieri*
17:15	**Synergy CircuLite: test of new generation assist devices**	*A. Simon*
17:27	**HYSTORI (HYbrid vs Stenting optimal revascularization): European multicentre randomised trial**	*A. Repossini*
17:39	**Wrap Up**	*M. Mack*

Focus Session

16:15	**End-stage heart failure – long-term/permanent support**	
Hall E1		
	Moderators: M. De Bonis, Milan; J. Pepper, London	
16:15	**The size of the problem**	*N. Van Mieghem*
16:25	**Discussion**	
16:30	**Long-term counter-pulsation**	*A. Simon*
16:40	**Discussion**	
16:45	**Solution for right ventricle failure**	*G. Gerosa*
16:55	**Discussion**	
17:00	**Future of long term support: Get rid of the driveline: Future of transcutaneous energy transfer**	*J. Lahpor, Utrecht*
17:10	**Discussion**	
17:15	**Can long term support be cost-effective?**	*R. Osnabrugge*
17:25	**Discussion**	
17:30	**Results of long term support**	*G. Wieselthaler*
17:40	**Discussion**	

Continued on page 20

Coronary Artery Bypass Graft 1 14:15 Hall D

Long-term results of minimally invasive direct coronary artery by-pass (midcab): 10 years experience and follow-up

Alberto Repossini *Cardiac Surgeon, University of Brescia, Italy*

Well established therapeutical options for LAD revascularization are conventional sternotomic bypass grafting on pump or off-pump (OPCAB), minimally invasive direct coronary artery bypass (MIDCAB) and percutaneous coronary intervention (PCI) either with bare-metal stents (BMS) or drug eluting stents (DES).

Unregardless of the most recent guidelines [1] strongly advocating a surgical revascularization vs PCI (evidence I vs II) in case of proximal LAD lesions, in real life PCI is still considered the patients' preferred choice, mainly for its reduced invasiveness.

MIDCAB, initially proposed by Kolessov in 1967 [2] and reintroduced in clinical practice in 1995 by Benetti and Ballester [3] has gained wide acceptance, but it is seldom considered the method of choice for LAD surgical revascularization in isolated lesions or as a part of a hybrid strategy. MIDCAB, eliminating the need for sternal incision, aortic manipulation and cardiopulmonary bypass (CPB), while achieving the same results in terms of patency of conventional surgery [4-5] should be considered the perfect operation for LAD revascularization.

From 1997 to 2013, we performed 910 MIDCAB procedures. In this paper we consider the first 420 pts operated between 1997 and 2002 with 10 years follow-up.

Patients have been assessed into different clinical/therapeutical groups:

- MIDCAB group (256 pts): true single vessel disease (LAD) or functional single vessel disease;
- MIDCAB+OMT group (78 pts): multivessel disease with functional incomplete revascularization and optimal medical treatment;
- HCR (86 pts): multivessel disease with functional complete revascularization (hybrid coronary revascularization treatment).

Perioperative mortality was 0.9%. Ten years follow-up was 88.6 % complete: 6,2% of cardiac related mortality and 22% of non cardiac mortality were reported. LIMA graft patency rate was 96.8 %.

Kaplan-Meier analysis for cardiac related mortality showed actuarial survival of 93,6% (Figure 1). Analysis for freedom from LIMA MACCE was 89,6%.

A comparison between the two groups of multivessel disease patients (HCR vs MIDCAB+OMT) for MACCE and a separated analysis for target vessel revascularization (TVR) other than LAD were achieved. Freedom from MACCE survival at 10-years performed with log-rank test showed no statistically significant difference (MIDCAB+OMT: 56,1% v/s HCR: 60,3%; p=0,8), however freedom from repeated TVR other than LAD was significantly higher in MIDCAB + OMT group (MIDCAB+OMT: 84,3% v/s HCR: 70,7%: p=0,045) (Figure 2). New generation stents will probably reduce this incidence.

Only a few cardiac surgery centers even today consider MIDCAB as a first choice approach for LAD revascularization advocating many reasons such as technical difficulty, low incidence of patients with isolated proximal LAD lesions or lack of cooperation with the referring interventional cardiologists. Nevertheless, very good results in terms of feasibility, safety, efficacy and recently data on long-term follow-up are now available. Our study provides probably one of the longest follow-up on a large series of MIDCAB operations.

We strongly recommend MIDCAB to address proximal LAD lesions, since its advantages and patency rates are well established and validated on time.

The very low operative risk and complications recommend MIDCAB even in high risk patients with MVD disease in association with optimal medical therapy or as a part of a Hybrid Strategy.

References

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[5] Repossini A, Moriggia S, Cianci V, Parodi O, Sganzerla P, Arena V. et al.; The LAST operation is safe and effective: MIDCABG clinical and angiographic evaluation; Ann Thorac Surg. 2000; 70:74-78.

The univentricular heart 10:15 Hall K

Improving early outcomes following hybrid procedure

Patients with single ventricle and systemic outflow obstruction

Christian Pizarro *Alfred I duPont Hospital for Children, Wilmington USA*

Ryan Davies, Wolgang Radtke and Christian Pizzaro (right)

Current management of patients with single ventricle physiology and systemic outflow obstruction includes different options, extending from surgical palliation and cardiac transplantation to biventricular repair in some. The hybrid procedure has become an accepted management strategy in this scenario, particularly for those patients considered at high-risk for mortality following the Stage I Norwood procedure, those in whom a decision between single or biventricular pathway has not been made or those waitlisted for transplantation. Although the hybrid approach has been used at many institutions worldwide for nearly a decade with encouraging outcomes, little data exist regarding variables which could inform patient selection. A recent report from the SVR trial, on patients with hypoplastic left heart syndrome randomized to receive a modified BT shunt or a conduit from the RV to the PA, provided a detailed analysis of non-modifiable patient factors which have a significant influence on mortality.

We reviewed our institutional experience over the last decade (2003 and 2012) with the hybrid procedure, in an attempt to define patient and /or procedure related variables which were associated with operative mortality following the initial hybrid palliation.

Our experience includes thirty-four patients who underwent hybrid palliation usually in the first week of life with a median weight of 2.5kgs. While nearly half of them had aortic atresia, emergency intervention due to hemodynamic instability or shock was performed in nearly 25%. We found that non-modifiable patient related factors including extreme low birth weight and presence of aortic atresia had a significant effect on hospital mortality. More importantly, the interaction between the presence of aortic atresia and weight under 2.5kgs was almost universally fatal.

We conclude that despite the "lesser magnitude " of the hybrid intervention by virtue of avoiding exposure to cardiopulmonary bypass as well as myocardial and possible brain ischemia, hospital mortality remains high. While these findings are not surprising, they represent a disappointing fact, particularly considering that many centers are using the hybrid strategy in this patient population hoping that outcomes could be improved. On the other hand patients with antegrade through the aortic valve appear to do well and can clearly benefit from the hybrid strategy, particularly those who are affected by other medical conditions which require resolution.

JOTEC®

PURE EXPERIENCE

Treatment of Complex Thoracic Aortic Disease: Today and Tomorrow

Lunch Symposium
Monday 7th October 2013, 12:45 – 14:00 h, Austria Center Vienna, Hall P

Chair: Martin Grabenwöger, Kazimierz Widenka

- E-vita open prosthesis "The Bologna experience"
  Davide Pacini
- Experience in E-vita open surgery
  Kazimierz Widenka
- A simplified FET technique using a modified E-vita open
  Giampiero Esposito
- Progress in aortic arch surgery
  Heinz Jakob

Visit us at our booth no. 29

SOLUTIONS FOR VASCULAR DISEASE

Continued from page 18

Focus Session

16:15 Challenges of cardio-vascular surgery in the developing economies

Room 1

Moderators: W. J. Gomes, Sao Paulo; C. Mestres, Barcelona; O. Victal, Guadalajara Jalisco

16:15 Report of PASCaTS survey on cardio-thoracic surgery in sub-Sahara Africa (SSA) *C. Yankah*

16:30 New cardio-vascular services in Africa. Where and how? *P. Simon*

16:45 Training of cardiothoracic surgeons – need for standardisation *M. Guida*

17:00 New technologies in emerging countries. The cost factor *F. Jatene*

17:15 Management of acute myocardial infarction in developing countries. An evidence-based expanded role for coronary artery bypass graft *W. Gomes*

Thoracic

Abstracts

08:15 Oncology I: video-assisted thoracoscopic surgery/sleeve resections

Hall I

Moderators: W. Klepetko, Vienna; P. B. Rajesh, Birmingham;

08:15 Video-assisted thoracoscopic surgery sleeve lobectomy with bronchoplasty: an improved operative technique *Y. Li*
Discussant: P. Rajesh

08:30 Robotic lobectomy for lung cancer: evolution in technique and technology *F. Melfi*
Discussant: R. Milton

08:45 Bronchial sleeve resection after induction therapy for treatment of non-small-cell lung cancer: effect on bronchial healing *M. Schiavon*
Discussant: D. Mathisen

09:00 Should males ever undergo wedge resection for stage 1 non-small-cell lung cancer? A propensity analysis *N. Mediratta*
Discussant: P. Ciriaco

09:15 Does sleeve lobectomy really lead to a better perioperative outcome than pneumonectomy in the treatment of non-small-cell lung cancer? *A. Zuin*
Discussant: P. De Leyn

09:30 Laser resection in the treatment of lung metastases: analysis of our first 100 cases and review of the literature *S. Sanna*
Discussant: K. Athanassiadi

Abstracts

08:15 Non-oncology I

Hall P

Moderators: A. Sihoe, Kowloon; T. Walles, Wuerzburg

08:15 Vacuum-assisted closure therapy in thoracic surgery: a preliminary report *S. Sanna*
Discussant: G. Kocher

08:30 Surgery in pulmonary tuberculosis *R. Santosham*
Discussant: D. Subotic

08:45 The association of body mass index and outcomes after major lung resection *M. Ferguson*
Discussant: tba

09:00 Comparison of 102 patients with complicated and intact pulmonary hydatid cysts: comprehensive evaluation of specifications and surgical methods with long-term results *A. Balci*
Discussant: A. Sihoe

09:15 A new surgical procedure for palmar hyperhidrosis: is it possible to perform endoscopic sympathectomy under intravenous anaesthesia without intubation? *H. Tang*
Discussant: G. Rocco

09:30 The role of preoperative intrathecal diamorphine injection in thoracic surgery: single-unit experience *M. Zakkar*
Discussant: C. K. C. Choong

Professional Development

08:15 Leadership

Room 33

Faculty: P. Newman, London; G. Kitchingman, London

See page 41 for programme details

08:15 Non-technical skills for surgeons

Room 1

Faculty: S. Paterson-Brown, N. Maran; Edinburgh

See page 42 for programme details

Continued on page 22

Aviation medicine and cardiac surgery 14:15 Room H

Aviation medicine and cardiac

Major Dr Thomas Syburra
Swiss Air Force Flight Surgeon Squadron 14,
Cardiac Surgery, Royal Brompton Hospital, London

Thomas Syburra

Aim

Establish a committee for common guidelines on Aviation Medicine and Cardiac Surgery (AMCS) for pilots, in accordance with the current flight crew licensing regulations (International Civil Aviation Organization ICAO, European Aviation Safety Agency EASA, UK Civil Aviation Authorities CAA, US Federal Aviation Administration FAA).

Background

Within the EACTS, we are aware of the actual lack of coordination between our current surgical guidelines and the aeromedical regulations in most of the manuals for aviation medicine. In particular, the recent progress in surgical techniques are substantially extending our possibilities, but one has still to keep the 1% safety rule in mind whilst planning and conducting the operation in order to make later license revalidation possible. To promote optimal management of pilots undergoing cardiac surgery (bypass grafting / valvular surgery / aortic surgery / congenital heart surgery), I aim to set up a dedicated specialist's committee within the EACTS, as a Swiss Air Force Major and flight surgeon myself. I have presented the current results and our experience within the Swiss Air Force and the UK Royal Air Force at the 2013 NATO European Flight Surgeons Science and Technology Organization Technical Course in Ramstein Air Force Base, Germany, and the feedback was encouraging.

My intention is to involve ICAO/EASA/CAA/FAA executive delegates from the beginning into a joint committee. Thanks to their expertise, I aim to reach a clean takeoff into the elaboration of common EACTS-ICAO/EASA/CAA/FAA guidelines on flight crew licensing after cardiac surgery.

Worldwide, EACTS is the first cardio-thoracic society to make the step towards aviation medicine and their aviation safety agencies.

Mechanism of flight crew licensing regulations

EASA is releasing at regular intervals their new Notice of Proposed Amendments (NPA's) on the medical part of their regulations body. The NPA's are the common route to review existing regulations before EASA amends and publishes any current regulation, and they are published ahead to seek for the advice of the specialist's bodies.

As a matter of synergy, I aim to establish within EACTS and together with our CAA, RAF and Swiss Air Force delegates, a dedicated reviewer's board and permanent committee on Aviation Medicine and Cardiac Surgery AMCS. The permanent AMCS committee shall then review the cardiac related NPA's and submit its review to EASA prior to the release of new editions on a yearly base. The AMCS reviewer's board shall include all 2013 panel delegates and chairmen.

The ICAO's and EASA's heads of guideline making have approved such an approach and are supporting it thoroughly.

Definition of Aviation Medicine

*In DeHart RL, Davis JR: **"Fundamentals of Aerospace Medicine: Translating Research into Clinical Applications"** 2002; 3rd Rev; Lippincott Williams and Wilkins USA Editors. ISBN 978-0-7817-2898-0*
Also in: en.wikipedia.org/wiki/aviation_medicine

Aviation medicine, also called flight medicine or aerospace medicine, is a preventive or occupational medicine, in which the patients/subjects are pilots, aircrews, or persons involved in spaceflight. The specialty strives to treat or prevent conditions to which aircrews are particularly susceptible, applies medical knowledge to the human factors in aviation and is thus a critical component of aviation safety. A military practitioner of aviation medicine may be called a flight surgeon and a civilian practitioner is an aviation medical examiner.

This discipline endeavours to discover and prevent various adverse physiological responses to hostile biologic and physical stresses encountered in the aerospace environment. Problems range from life support measures for astronauts to recognizing an ear block in an infant travelling on an airliner with elevated cabin pressure altitude. Aeromedical certification of pilots, aircrew and patients is also part of aviation medicine.

Every factor contributing to a safe flight has a failure rate. The crew of an aircraft is no different. Aviation medicine aims to keep this rate in the humans involved equal to or below a specified risk level. This standard of risk is also applied to airframe, avionics and systems associated with flights.

Atmospheric physics potentially affect all air travellers regardless of the aircraft. As humans ascend through the first 9,100–18,300m (30,000–40,000ft), temperature decreases linearly at an average rate of 2°C per 305m (1,000ft). If sea-level temperature is 15°C, the outside air temperature is approximately -56°C at 10,700m (35,000ft). Pressure and humidity also decline, and aircrew are exposed to radiation, vibration and acceleration forces, the latter also known as G-forces. Aircraft life support systems such as oxygen, heat and pressurization are the first line of defence against most of the hostile aerospace environment. Higher performance aircraft will provide more sophisticated life support equipment such as G-suits to help the body resist acceleration, and pressure breathing apparatus or ejection seats or other escape equipment.

Aeromedical examinations aim at screening for elevation in risk of sudden incapacitation, such as a tendency towards myocardial infarction, epilepsy or the presence of metabolic conditions which may lead to hazardous condition at altitude. The goal of the aeromedical examination is to protect the life and health of pilots and passengers by making reasonable medical assurance that an individual is fit to fly. Other screened conditions such as colour blindness can prevent a person from flying because of an inability to perform a function that is necessary. These specialized medical exams consist of physical examinations performed by an aviation medical examiner or a military flight surgeon, the doctors trained to screen potential aircrew for identifiable medical condition that could lead to problems while performing airborne duties. In addition, this unique population of aircrews is a high-risk group for several diseases and harmful conditions due to irregular work shifts with irregular sleeping and irregular meals, usually carbonated drinks and high energy snacks, as well as work-related stress. Somehow quite similar to cardiothoracic surgeons, indeed.

In the field of aviation medicine, the 1% rule is a risk threshold that is applied to the medical fitness of pilots. The 1% rule states that a 1% per annum risk of medical incapacitation is the threshold between acceptable and unacceptable. In other words: applying this 1% rule would result in an airline pilot being denied a medical certificate if their risk of a medical incapacitation, such as myocardial infarction, arrhythmias or stroke, was determined as being greater than 1% during the year.

This 1% rule began in the late 1980s and early

27th EACTS conference, Vienna 2013

Monday 7 October

14:15 Aviation and cardiac surgery

Moderators: John Pepper, Tom Syburra

14:15 The size of the problem: why should we be interested? *Stuart Mitchell, UK Civil Aviation Authority*

14:27 Flying after cardiac surgery *Thomas Syburra, Swiss Air Force Squadron 14 and Royal Brompton Hospital*

14:39 Adjusting the operation to the occupation *Ulrich Rosendahl, Royal Brompton Hospital:*

14:51 Cardiology in military aircrew *Ed Nicol, UK Royal Air Force cardiology*

15:03 Personal stories from pilots *Denis Bron, Swiss Air Force Aero-medical Institute*

15:15 Panel discussion *All speakers on podium (30min)*

surgery

1990s in a series of British and then European aviation cardiology workshops. The application of this 1% rule has subsequently spread beyond the domain of aviation cardiology to all potential causes of medical incapacitation.

The reasoning that was used in the development of the original aviation medical 1% rule is well described in *Flight Safety and Medical Incapacitation Risk of Airline Pilots* [Mitchell SJ, Evans, AD: Flight Safety and Medical Incapacitation Risk of Airline Pilots. Aviation, Space and Environmental Medicine 2004;75(3):260-8. PMID 15018295].

The application of the 1% rule is controversial, though. The civil aviation regulatory authorities of some nations employ such numerical risk threshold while others do not. Of those that use numerical risk criteria there are differences in the levels of measured / calculated risk that are applied (1% per annum vs. 2% per annum) There is also debate concerning the application of population statistics to an individual pilot and utility and validity of the risk screening tools that are used by the civil aviation regulatory authorities.

The use of the 1% rule for setting limits for aircrew incapacitation risk is re-examined in their paper. Human failure (medical incapacitation) is compared with acceptable failure rates in another safety-critical system, the aircraft engines. The expected number of cardiovascular incapacitations occurring in flight was modelled by applying an age-related cardiovascular incapacitation risk to the pilot population. The effect on flight safety of relaxing the maximum acceptable incapacitation risk on estimated incapacitation rates in two-pilot operations was also modelled, taking into account a likely increase in the number of pilots who would be allowed to continue to fly with a known medical condition. It seems that the model overestimates cardiovascular incapacitation risk and, therefore, provides a cautious estimate. If the maximum acceptable cardiovascular risk is increased, the model predicts a disproportionately small increase in the number of such incapacitations in flight.

The evidence suggests that the incapacitation risk limits used by some states, particularly for cardiovascular disease, may be too restrictive when compared with other aircraft systems, and may adversely affect flight safety if experienced pilots are retired on overly stringent medical grounds. States using the 1% rule should consider relaxing the maximum acceptable sudden incapacitation risk to 2% per year.

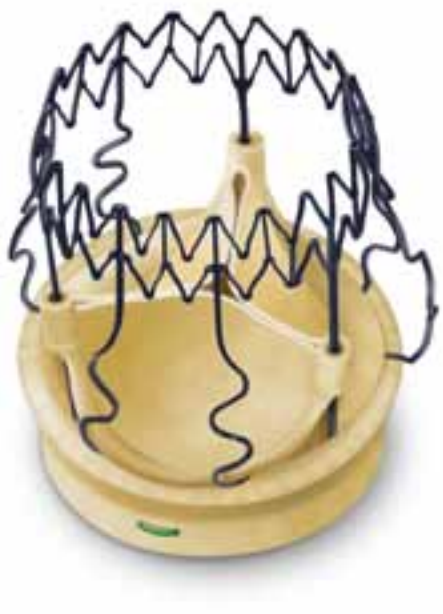
SORIN GROUP

The Sorin Perceval S sutureless valve: shorter operative procedure leads to improved clinical recovery vs stented pericardial valves.

One of the major advantages of the Sorin Perceval S sutureless valve is the ease and speed of implantation, leading to significantly shorter cross-clamp and cardio-pulmonary bypass times (1). We questioned whether a shorter operative procedure also leads to measureable differences in clinical recovery after the operation.

In order to compare the clinical outcome in patients after AVR with the Perceval S valve, we performed a retrospective, matched case-control study. In total, 53 patients who received a Perceval S bioprosthesis at the University Hospitals Leuven, were matched against a similar cohort of 53 patients (control group) receiving a stented pericardial valve (only elective surgery; no emergencies, redo or endocarditis cases). Matching was performed based on age (within a 1y limit), gender and operation-type (isolated AVR of AVR+CABG). The mean logistic Euroscore was higher for Perceval patients (12.8 ± 7.8) then for the control group (9.7 ± 5.5; p=0.02). Concerning operation-type, 31 patients had single AVR while 22 patients had AVR+CABG in each group. In both groups, mean age was 79y and 40% were males. Note that our physicians on ICU were unaware of the exact type of bioprosthesis that was implanted, which means that they were unbiased in their post-operative treatment strategy.

The mean cross-clamp and CPB times in Perceval patients were 24.8 ± 9.4 and 56.7 ± 24.3 minutes respectively, compared to



67.3 ± 17.8 and 100.0 ± 25.6 minutes in the control group (both p <0.0001). As a consequence of this shorter procedure, a significantly lower amount of cardioplegia and other crystalloid fluids were administered during CPB: a reduction of 43% and 38% respectively (both p<0.001). The procedure time (skin-to-skin) and the total OR time (total time spent in the operating room) were both significantly lower in the Perceval group: reduction of 21% and 22% respectively (both p<0.01). Perceval patients were significantly shorter intubated postoperatively (p=0.01) and showed a 49% reduction in total hours spent on ICU. During ICU stay, the use of blood products (red blood cells, plasma and platelets) was clearly lower in the Perceval group, however these differences did not reach statistical significance. All patients in both groups were discharged alive, but the total hospital stay was 30% shorter in the Perceval group (p=0.03).

Within this matched cohort of elderly and fragile patients, the significantly shorter cross-clamp and CPB-times of the Perceval S sutureless valve, have beneficial clinical consequences. Shortening the procedure leads to faster recovery and less resource consumption, not only in the operating room but also during further hospital stay.

References.

(1) Flameng W, et al. Effect of sutureless implantation of the Perceval S aortic valve bioprosthesis on intraoperative and early postoperative outcomes. J Thorac Cardiovasc Surg 2011;142:1453-7.

Continued from page 20

Abstracts

10:15 Oncology II: Adenocarcinoma

Hall I

Moderators: K. Athanassiadi, Athens; P. E. van Schil, Edegem;

10:15 **Limitations of Cox regression for survival analysis in thoracic surgery** *M. Poullis*
Discussant: M. Lucchi

10:30 **In the new adenocarcinoma classification, the histopathological finding "invasion" reflects the presence of isolated tumour cells** *S. Funaki*
Discussant: C. K. C. Choong

10:45 **Surgical management of pulmonary adenocarcinoma presenting as pure ground-glass nodule** *S. H. Choi*
Discussant: P. van Schil

11:00 **Prognostic factors and clinical outcome of patients with peripheral N0 adenocarcinoma** *L. Luzzi*
Discussant: M. Dusmet

11:15 **Adenosquamous carcinoma of the lung: prognostic factors and outcomes** *D. Galetta*
Discussant: F. Melfi, Pisa

11:30 **The feasibility of segmental resection in lung cancer with ground glass opacity** *H. Iwata*
Discussant: R. Schmid

Continued on page 34

Surgery for prognosis – Part II, aortic valve disease 14:15 Room E1

The effect of aortic valve prosthesis type on long-term outcome

Johanna Takkenberg *Erasmus University Medical Center, Rotterdam, The Netherlands*

Johanna Takkenberg

Outcome after aortic valve replacement is determined by many interrelated factors concerning the patient and the type of prosthesis that is implanted. Interpretation of the literature is complicated because most reports concern non-randomized descriptive studies of heterogeneous patient populations operated during multiple decades. This hampers translation of knowledge to the unique 21st century patient who is sitting in your office and asks: "Doctor, what valve prosthesis is best for me?". In order to answer this question, we need to assess three things: (1) what is the anticipated survival of this unique patient after implantation with either valve type?; (2) which valve-related events are likely to occur in this patient after implantation with either valve type?; and (3) what are the preferences of the well-informed patient?

According to a several recent reports, long-term survival of nonelderly adults after implantation with a mechanical prosthesis or bioprosthesis is comparable. This implies that for most patients survival is not a driver of the choice for a particular prosthesis. However, valve-related events are. Prosthetic aortic valve selection represents the devilish dilemma of the choice between anticoagulation-related complications with mechanical prostheses versus a possible reoperation later in life with a bioprosthesis. The occurrence of these complications is determined by several patient-related factors, among which patient age is the most important. Using prognostic models such as microsimulation, we can assess age- and gender-specific life time risks of the different valve-related events. For example, a 55 year old male has approximately 36% chance to experience one or more major bleedings during the remainder of life with a mechanical prosthesis. The same 55 year old male has a 37% risk of needing a reoperation with a bioprosthesis, due to structural valve deterioration. Given this information, what valve type would you choose?

The 2012 EACTS/ESC Valvular Heart Disease Guidelines stress the need to consider informed patient preferences in prosthetic valve selection, given the value-sensitive nature of the decision: A young and active patient may prefer a 90% risk of a reoperation with a bioprosthesis over the burden of anticoagulation therapy with a mechanical prosthesis, while other patients will do anything to avoid a potential reoperation. The concept of informed shared decision making will play an increasing role in 21st century prosthetic valve selection, but several hurdles, such as statistical illiteracy and our inability to adequately assess patient preferences, still need to be taken. Decision aids may be of help in this respect, to optimize decision making.

Aviation medicine and cardiac surgery 14:15 Room H

Cardiology in military aircrew

Ed Nicol (RAF) *Royal Brompton Hospital, London, UK*

It is a widely held belief that the military, and especially military aircrew, are a fit and healthy population. On the whole this is true, however mandated annual medicals, including an ECG, can detect findings such as murmurs or abnormal ECGs at a much younger age, and far earlier in their clinical course than in their civilian counterparts.

If these findings are then linked to the physiological demands that are placed on military aircrew, particularly those flying high performance, single seat aircraft or low-level tactical or 'search and rescue' rotary roles, it can be seen that even so called 'benign' pathology may have significant ramifications. The whole essence of cardiological practice in military aviation medicine is risk mitigation. Sudden incapacitation is an obvious threat to flight safety but failure to complete the mission can also put lives on the ground at risk. Conditions that cause sudden and unpredictable incapacitation might appear self-evident; however those that appear less clinically relevant need to be considered depending on the specific aviation environment that the patient operates within. A condition that causes even minor distraction at the wrong moment can have catastrophic consequences for the pilot, his crew and those on the ground.

Specific physiological demands that can or have a direct cardiovascular effect, or increase myocardial oxygen demand include high G (+Gz) forces, pressure-breathing and the rigours of air combat manoeuvres and low level night flying. Additional stressors of military life also need to be taken into consideration given that military aircrew may be living in field conditions, often have disrupted sleep patterns and could be operating in extreme climactic conditions with an effect on hydration status. Immediate access to usual specialist medical care cannot be relied upon in an operational setting.

Significant +Gz forces result in blood pooling and decreased venous return, usually in a time frame that overwhelms the carotid baroreceptor response to prevent a fall in cardiac output. The compensatory increase in heart rate driven by this baroreceptor is usually too slow to counter the effects of the +Gz force and even if timely, the counter effect is inevitably too weak to fully offset the changes in preload. The effect of Gz is significantly exacerbated in air combat manoeuvres where the vector may change rapidly (i.e. +Gz causing blood pooling in the feet vs. –Gz causing pooling towards the head). Increasing +Gz is also arrhythmogenic and may cause an increase in ectopy, SVT or even complete AV dissociation. Whilst this is often inconsequential in fit individuals, those with pre-existing arrhythmias, even those that are deemed relatively benign in a +1Gz terrestrial environment, are more difficult to assess let alone dismiss in a high Gz environment.

Military aviation cardiologists must consider the effects of this environment on the potential for arrhythmogenesis, pre-existing occult coronary heart disease, valvular heart disease or conditions such as cardiomyopathies or undiagnosed congenital heart disease.

So how does a military aviation cardiologist manage occult or clinical cardiovascular disease in practice without becoming too risk averse and grounding highly trained and expensive assets?

All clinical cardiology should be treated using best civilian practice and national/international guidelines. Additional testing may well be required before an occupational decision can be made with regards to any flying restrictions or limitations and these may require extensive investigations to determine the risk of the condition in the specific flying environment. In challenging cases this may involve environmental assessment in either a human centrifuge or hypobaric chamber.

As a general rule of thumb minor disease is often compatible with continued flying, albeit with potential restrictions such as 'unfit solo flying' or "unfit high +Gz". When disease progresses to moderate levels (i.e. 50% coronary stenosis or moderate valvular lesions), it is usual that patients cease military flying due to the potential flight safety risk. Severe disease is universally incompatible with military flying duties.

Whilst aviation cardiology is a small specialty, military aviation cardiology is even more so. Close collaboration with military occupational aviation medicine physicians and a detailed understanding of the military aviation environment is mandatory; a close working relationship with civilian aviation colleagues highly desirable and the confidence in making challenging and potentially career changing decisions, often without an evidence base is essential. The result is a fascinating, exciting and rewarding career.

Ed Nicol

Complications: Escape routes I 16:15 Hall H

Transcatheter Aortic Valve Implantation for pure severe native aortic valve regurgitation

Ardawan J Rastan *Heart Center Rotenburg, Germany*

Transcatheter aortic valve implantation (TAVI) until today is approved to treat severe and symptomatic native aortic valve stenosis. However with more experience and more routine in clinical application further TAVI indications are discussed in specific clinical scenarios on a compassionate use basis. Beside the valve-in-valve concept which is well accepted so far, the transcatheter treatment of symptomatic pure aortic valve regurgitation is considered in selected patients. Having gained more clinical experience, some TAVI devices seemed to be eligible for this rare indication and for patients who were deemed surgically inoperable.

We here report on a 74-year old woman with highly symptomatic pure aortic valve regurgitation and enlargement of the left ventricle (enddiastolic diameter 70mm). She was wheelchair bound for years because of severe rheumatoid arthritis. Being Jehova´s witness she also refused any blood product transfusion. Weighing 35 kg she was considered to be truly inoperable. We discussed this in detail with the patient and she agreed to be treated by transcatheter aortic valve technologies. To verify the suitability for TAVI, we performed computed tomography and transesophageal echocardiography. The CT revealed a trileaflet aortic valve with no calcifications. The native annulus was measured by 23.1mm. TEE demonstrated a central regurgitation with a vena contracta of 7mm. As a result of the rheumatic disease all leaflets were involuted at the free margin site. For treatment a 25mm JenaValve transcatheter aortic valve implantation system was favoured. The JenaValve consists of a biological porcine valve mounted on a self-expanding Nitinol stent. Feeler guided anatomically correct positioning and clipping fixation on the native leaflets provide potential advantages compared to current TAVI systems.

The operation was performed using intraoperative rotational CT angiography to confirm preoperative findings. A 25mm valve was implanted uneventful with preballooning and no phase of rapid ventricular pacing using a standard implantation protocol. Total blood loss was 90ml only. Radiation time was 4.7 min with use of 57ml contrast dye. Intraoperative performance of the Jena valve demonstrated no valve regurgitation and an invasive gradient 0mmHg (Figure 1).

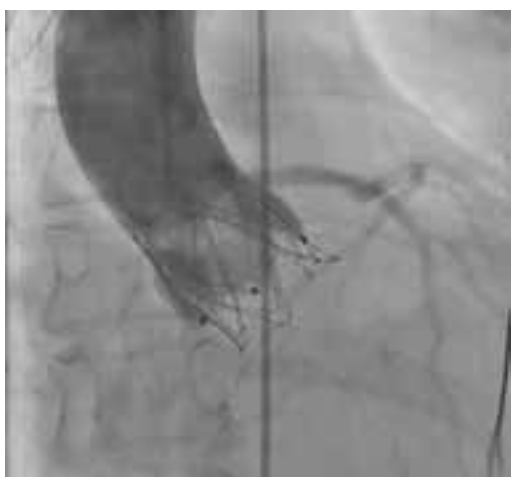


Figure 1: Intraoperative root angiography after transapical implantation of a 25mm JenaValveTM in a severe native aortic valve insufficiency demonstrating no residual regurgitation.

Postoperative course was uneventful. Postoperative plasma hemoglobin levels were identical to preoperative value (10.1 g/dl). Patient was discharged on POD 6. One year after surgery she is a good clinical status and limited by the underlying rheumatic disease (NYHA II).

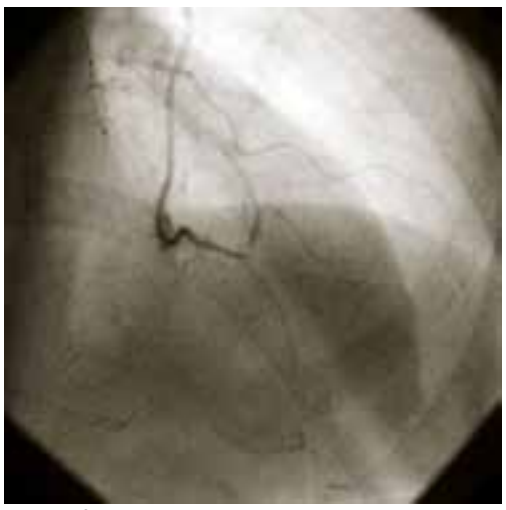
Based on the early experience, compassionate use of TAVI with the JenaValve TAVI device seems to be valuable alternative to treat pure native aortic regurgitation in patients with a prohibitively too high risk for conventional aortic valve surgery. Because of the specific stent characteristics the JenaValve stent design offers potential advantages for this indication.

How to recycle a misused LITA

Continued from page 1

coronary artery disease; the LITA was perfectly patent and looking at the vessel course it was evident that it had been harvested only from the 4th to the 6th intercostal space. Trans-thoracic echo showed severe aortic stenosis. The patient was scheduled for double coronary artery bypass grafting and aortic valve replacement. Since the LITA appeared to be perfectly functioning and only partially harvested, we decided to use the LITA for the LAD and the saphenous vein (SV) for the marginal branch. After median sternotomy first of all we identified the LITA-LAD anastomosis. The LITA was than harvested as a pedicle from the coronary anastomosis to the 4th intercostal space and then from the 1st to the 4th intercostal space: in this tract the vessel still appeared in its original anatomical position, following its normal course. Special care was used at the level of the 4th intercostal space, the LITA hinge point, because here the vessel was stuck to the sternum; a #15 blade was used to separate the arterial graft from the internal chest wall, being scissors or cautery too dangerous for the purpose. At the end of the harvesting the LITA was available full-length for a new coronary anastomosis. A composite Y-graft was achieved between LITA and the SV; cardiopulmonary bypass was started and the anastomosis between the SV and the marginal branch performed. The LITA was detached from the site of the previous anastomosis on the LAD and its distal part was removed because of walls thickening. After closure of the old anastomotic site, we went on with LAD incision about two centimeters distally to the previous one where we performed the new LITA-LAD anastomosis. The last part of the operation was aortic valve replacement with a bio-prosthesis #19.

The chance of reusing the LITA at the time of redo surgery is very useful. The vessel must be uninjured and it must be stenotic only in the peri-anastomotic area. Coronary angiogram must be carefully analyzed in order to identify the length of previous LITA harvesting (the shorter the harvesting, the easier will be recycling). The procedure is technically challenging but it gives the patient all the advantages of the LITA long-term patency.



Frame from pre-operative angiography: it is evident the hinge point between the short harvested LITA segment and the course of the unharvested LITA.

How to handle the ischemic mitral valve 08:15 Hall E2

Mitral valve annuloplasty versus mitral valve replacement for ischemic mitral regurgitation: hemodynamic and functional capacity comparison

Carlo Fino, Paolo Ferrero, Emilia D'Elia, Attilio Iacovoni *Ospedale "Papa Giovanni XXIII", Bergamo, Italy*

Left to right: Carlo Fino, Paolo Ferrero, Emilia D'Elia, Attilio Iacovoni

Functional ischemic mitral regurgitation (FIMR) is associated with poor outcome. Mitral valve annuloplasty (MVA) and mitral valve replacement (MVR) combined with coronary artery bypass grafting (CABG) surgery represent the most common surgical strategies, for the treatment of these challenging group of patients. However, the impact of these two different approaches on mitral hemodynamic performance and functional capacity remains controversial.

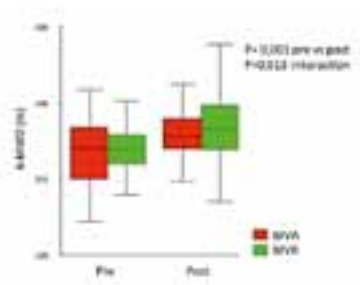
Exercise Doppler echocardiography has became a reliable method for evaluating the haemodynamic performance in patients with valve disease At the same time, six minute walking test (6-MWT) represents a powerful test to predict mortality and morbidity in patients with heart failure from any etiologies.

To this regard our study, developed in collaboration with Dr. Julien Magne (University of Liege, Department of Cardiology) and the Bristol University, is aimed to compare hemodynamic and functional exercise capacity of patients with FIMR, undergoing MVA or MVR associated to CABG surgery.

We evaluated 74 propensity score matched patients (37 patients for MVA and 37 patients for MVR) who preoperatevely received a resting echocardiography and six minute walking test (6-MWT). In the postoperative period these patients underwent exercise echocardiography, along with 6-MWT.

Indexed effective orifice area significantly increased from rest to exercise in both groups, but to an higher extent in the MVR group (see Figure). Mitral peak and mean gradients significantly increased, from rest to exercise, in both groups but in a higher extent in the MVA group. Also SPAP was, at exercise, significantly higher in MVA group, when compared to MVR.

At the multivariate analysis, performing MVA and postoperative exercise SPAP were found to be independent predictors of decreased postoperative exercise capacity. Mitral annuloplasty, by inserting a prosthetic ring, fixes the posterior leaflet, leaving untreated the subvalvular apparatus. This mechanism contributes to further restrict the systo-diastolic motion of the mitral valve and may explain the presence of functional mitral stenosis, which worsen during exercise.



Conversely, the independence of the prostheses from subvalvular tethering, may explain the higher increment of indexed effective orifice area observed in MVR group.

In patients with FIMR, MVA may results in a lower hemodynamic performance,when compared to MVR. Also, the findings of our study suggest that the functional mitral stenosis created by insertion of the ring it-self, may negatively impact the exercise capacity. On the other hand, the worse hemodynamic and functional perfomance of MVA, seems to be related to the lack of surgical correction on the subvalvular tethering with this technique, as compared to MVR.

Awaiting the results from ongoing trials, MVR with preservation of subvalvalur apparatus could be an alternative surgical option.

Controversies in coronary artery surgery 08:15 Hall D

Simultaneous hybrid carotid stenting and coronary bypass surgery vs. concomitant open carotid and coronary bypass surgery: a pilot, feasibility study

Slobodan Mićović *Cardiovascular Institute Dedinje, Belgrade, Serbia*

Despite the acknowledgment of its significance, treatment options for the significant carotid artery disease in the patient undergoing CABG remain controversial. Overall, two protocols are widely used: staged procedure, CAS or CEA followed by CABG (2-4 weeks later), and simultaneous CAS/CEA with CABG. However, either of these proved not to be superior.

Recently, more data are available for the fourth option – the simultaneous, combined approach of CAS and CABG. We performed prospective, randomized, feasibility, pilot study with an aim to compare the early postprocedural results of simultaneous hybrid CAS and coronary bypass surgery vs. concomitant CEA and CABG. This single center study was done between April 2011 and June 2012. All patients were followed for 30 days after the procedure. Primary end point was defined as combined incidence of stroke and death 30 days after surgery.

Overall, 20 patients (Group 1 CAS/CABG- 10 patients, and Group 2 CEA/CABG- 10 patients) were included in the study. CAS was successful in all cases. Average clamping time for the CEA group was 21.5 + 7.7 minutes. CABG using cardiopulmonary bypass was done in 19/20 patients, while one patient had off-pump surgery.

During follow-up period, two primary end point events occurred, both in CEA/CABG group. One patient died due to sepsis and one patient developed stroke four days after CEA/CABG. On the other hand, no death/stroke occurred in CAS/CABG group (p= 0.631). Also, there was no difference in the blood loss, and in the duration of mechanical ventilation and the period spent in hospital and ICU.

Our study is, to our knowledge, first randomized, prospective trial comparing efficacy and safety of two treatment approaches for carotid disease, percutaneous and surgical, in the setting of combined treatment with coronary artery bypass surgery. Combined CAS/CABG treatment has been described in other studies and has recently emerged as a valid treatment option. In the SHARP study, which included 101 patients, early incidence of death, stroke and MI was 4%, similar to our study. Nowadays in general, patients are older, with more diffuse coronary artery disease, have higher SYNTAX score and are more often symptomatic. These factors endorse simultaneous carotid and coronary interventions as a choice of treatment. However, combined procedure carry an increased risk of morbidity and mortality (Levy et al.). With the introduction of carotid stenting a new options became available. Advantages of this approach include immediate awareness of the procedural result in an awake patient; shortening of the hospital stay and less invasiveness. It is important to notice that everyday technology improvement in stent design and structure might influence further result in a positive way towards CAS.

Finally, results of this pilot study encouraged us to proceed with further randomization. Our study has shown that hybrid procedure of carotid stenting and coronary surgery is safe and feasible in experienced centers and has similar early postprocedural results with standard combined carotid and cardiac surgery. However, further, multicenter, randomized trials comparing these two approaches are mandatory before assessing the real value of this procedure.

Transcatheter aortic valve implantation: Expanding indications and techniques 16:15 Hall E2

Transcatheter aortic valve implantation through carotid artery access under local anesthesia

Alexandre Azmoun *Marie Lannelongue Hospital, Le Plessis Robinson, France*

Transcatheter aortic valve implantation (TAVI) has emerged as a current new evidence-based treatment alternative for patients with symptomatic severe aortic valve stenosis and a high operative risk. Transfemoral access is nowadays considered as the least invasive access and is therefore the most widely used access in TAVI. However, given the high burden of vascular disease in TAVI candidates, some patients do not have adequate iliofemoral artery access and consequently require alternative access routes such as transapical, transaxillary or transaortic approaches.

However, these alternatives accesses require general anesthesia, orotracheal intubation, (ministernotomy, thoracotomy or left ventricular cannulation) and may be unsuitable for some frail patients with severe respiratory or ventricular dysfunction, having previously undergone CABG procedure, with heavily diffused calcified ascending aorta (porcelain aorta) or severe axillary/subclavian artery calcification or tortuosity.

That said, in candidates for TAVI with unfavourable femoral access and for whom other access routes are unsuitable, the common carotid artery (CCA) could represent another transarterial access route. We report here our series of 19 consecutive patients undergoing TAVI through CCA approach under local anesthesia with neurologic status monitoring. The purpose of this investigation was to report our clinical experience of transcarotid TAVI and to assess its feasibility and safety.

From November 2008 to September 2013, 361 patients underwent TAVI at our institution. Nineteen of them (14 men) mean age 82.2 ± 6.2 years, EuroSCORE 23.7 ± 10.8, STS score 25 ± 12, were unsuitable for usual approaches and underwent TAVI through CCA access under local anesthesia. Pre-operative CT assessed suitable carotid artery anatomy. Common carotid cross-clamping test allowed verifying patient's neurological status stability. An 18F or 20F sheath inserted into CCA down into the ascending aorta was used for the delivery catheter. Valve implantation procedures were as usual. After sheath removal, CCA was surgically purged and repaired. Feasibility and safety endpoints (VARC-2) were collected up to 30 days.

Transcarotid insertion of the delivery sheath was successful in all cases (8 right, 11 left) and accurate deployment of the device was achieved in 18 patients (4 Edwards SAPIEN XT® and 14 Medtronic CoreValve®). There was one intra-operative death by annulus rupture during pre-implant balloon valvuloplasty and one in-hospital death due to multisystem organ failure. There was no myocardial infarction, stroke or major bleeding. Third-degree atrioventricular block requiring pacemaker implantation occurred in 3 patients. No vascular access-site, access-related or other TAVI-related complication occurred. Echocardiography control assessed good prosthesis' functioning with none, mild and moderate paravalvular leak in respectively 8, 9 and one patients. Patient ambulation was immediate after TAVI and hospital stay was 4.6 ± 2.3 days.

TAVI through CCA access under local anesthesia is feasible and safe. It allows continuous neurological status monitoring with low risk of stroke, bleeding, vascular access-site and access-related complications, and immediate patient ambulation. It appears to be a valuable alternative access for patients who cannot undergo transfemoral TAVI.

Film I 16:15 **Hall F1**

Trancatheter aortic valve and valve in valve implantation in a beating stenotic bicuspid and tricuspid porcine aortic valve: intracardiac endoscopic view

Guido Gelpi *L. Sacco University General Hospital, University of Milan, Milan, Italy*

Interactions between transcatheter aortic valve frame and native valve calcifications are unpredictable. Paravalvular leak and prosthesis ovalization are some of the possible consequences of this interaction but none of them have been directly visualized before.

We perform a step by step transcatheter aortic valve implant in a bicuspid and a tricuspid calcified porcine aortic valves.

The procedures are performed on the Transcatheter Valve Platform. The system houses an entire porcine heart with an aortic calcific stenosis and dynamically pressurizes the left ventricle with a pulse duplicator, replicating real haemodynamic conditions, with high aortic pressure drop and a reduced opening area. Thanks to a 5mm fiberscope directly inserted in the left ventricle and the ascending aorta, intracardiac images of the step by step TAVI procedures are recorded.

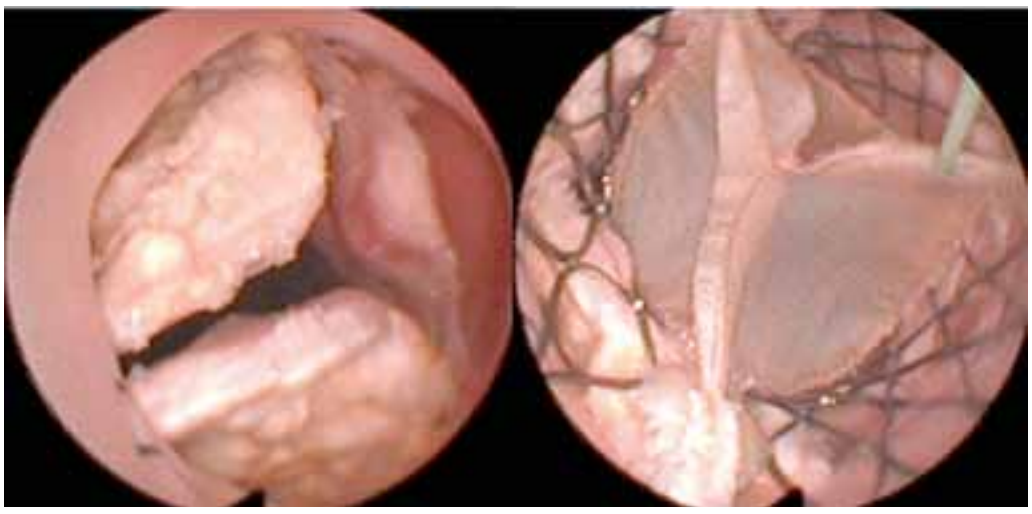


Figure 1. On the left, intracardiac view of a calcified porcine stenotic aortic valve from the aortic side. On the right intracardiac view of a transcatheter aortic bioprosthesis implanted in the same valve showing its interaction with native calcifications.

In the first case the implantation is performed in a bicuspid calcified aortic valve. The video shows the ovalization of the implanted transcatheter bioprosthesis visualized from the apex of the left ventricle. This deformation has been made more evident by the deployment of the transcatheter valve in a heart that previously underwent a mechanical mitral valve implantation. The asymmetric shape assumed by the transcatheter valve is probably due to the different resistances along the annular perimeter encountered by the prosthesis in its radial expansion. Moreover, the video highlights the extreme importance of the height of the valve deployment in case of a concomitant mechanical mitral valve.

In the second case the TAVI is performed in a tricuspid calcified aortic valve. The procedure is recorded step by step from the ventricle and the aortic sides. After the full deployment of the transcatheter valve, the intracardiac view shows the presence of a stunned leaflet of the bioprosthesis. As in real case, the main reason of the stunned leaflet is the non perfect expansion of the transcatheter valve. We try to restore the function of the leaflet with balloon post-dilatation but the result, as visualized in the video, is suboptimal. Therefore, we decide to deploy a new transcatheter valve in the previously implanted one achieving a perfect result. Intracardiac images allow to better understand one of the possible causes of a postprocedural aortic insufficiency and to directly visualize the interaction between the frames of the two transcatheter aortic valves.

Transcatheter aortic valve implantation: Expanding indications and techniques 16:15 Hall E2

Transcatheter aortic valve replacement in patients with ascending aortic dilatation: the procedure's safety and mid-term follow-up

Bartosz Rylski *Hospital of the University of Pennsylvania, Philadelphia, USA*

In patients with critical aortic stenosis and ascending aortic aneurysm undergoing open aortic valve replacement, the current American College of Cardiology Foundation guidelines recommend concomitant procedure when the diameter of the ascending aorta is greater than 4.5cm. Since transcatheter aortic valve replacement (TAVR) became an alternative for high-risk patients, more and more patients undergo TAVR and their ascending aorta dilatation, if present, remains untreated. TAVR does not enable concomitant or simultaneous ascending aortic intervention. The aim of the present study was to evaluate the safety of TAVR in patients with ascending aortic dilatation and their mid-term follow-up.

Among 1143 patients with severe aortic stenosis screened for TAVR at The Hospital of the University of Pennsylvania, a cohort of 457 patients met the inclusion criteria. Of these, a total of 98 patients (71% males, median age 85.0 ± 7.0 years) were diagnosed with concomitant ascending aortic dilatation (4.0 – 5.0cm). An additional 2 patients had an ascending aortic diameter greater than 5.0cm. The distribution of aortic diameter in all patients classified for TAVR is depicted in Figure 1.

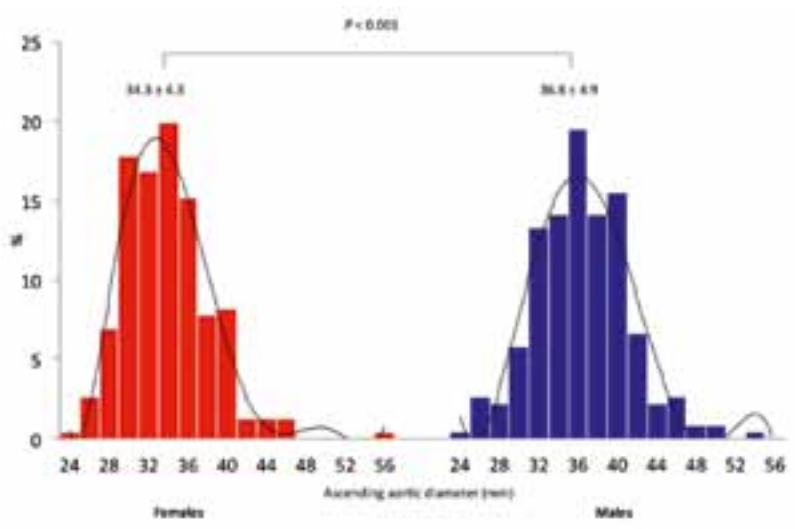


Figure 1. Distribution of ascending aortic diameter in patients who underwent TAVR.

We observed no iatrogenic dissection in patients with dilated ascending aorta. Intraoperative aortic rupture occurred in one patient with mildly dilated ascending aorta. One-year survival rates in patients with dilated and non-dilated ascending aorta were 65/75 (87%) and 201/242 (83%, P = 0.573). The mean ascending aortic diameter remained stable at 4.1 ± 0.3 and 4.7 ± 0.3cm in patients with mild and moderate dilatation, respectively, with a median follow-up of 14 months after TAVR. Two patients with aortic diameter of over 5cm survived the procedure and expired 7 and 20 months after TAVR due to tumor and heart failure, respectively.

Results of this study lead us to several conclusions. Ascending aortic dilatation is diagnosed in almost one fourth of patients treated with TAVR. In current high-risk patients with aortic stenosis classified for TAVR procedure who have accompanying ascending aortic dilatation (4.0 – 5.0cm), TAVR can be performed safely with a very low intra-procedural risk of adverse aortic events. The concomitant ascending aortic dilatation does not affect the mid-term survival in the TAVR population. However, caution should be advised when in the future one extrapolates these results to patients with aortic valve insufficiency, bicuspid aortic valve or other risk factors for poorer quality of the ascending aorta.

Bartosz Rylski

Hot news from on-going clinical trials 16:15 Hall D

RESHAPE

Mitraclip versus medical treatment in ischemic mitral regurgitation. The role of the surgeon

Ottavio Alfieri *S. Raffaele University Hospital, Milan*

The RESHAPE HF is a prospective, randomized, multicenter trial designed to compare the MitraClip system (MCS) plus optimal standard of care therapy with optimal standard of care therapy alone for the treatment of clinically significant functional mitral regurgitation (FMR) in patients with NYHA functional class III or IV chronic heart failure.

Although more than 10,000 patients have been treated with the MCS, most of whom at high surgical risk, the effectiveness of the procedure in patients with FMR and heart failure has not been definitely documented. The ability of the single-arm, high risk registries to provide adequate and relevant data is limited by the unclear population studied and the lack of an appropriate control group.

The primary endpoints of the RESHAPE HF study are all-cause mortality and recurrent heart failure hospitalizations. Several secondary and additional endpoints have been identified, and, importantly, also health economic data will be collected.

Although surgery is the standard of care in degenerative mitral regurgitation, in FMR this is not the case. As a matter of fact, many patients with FMR are quite unattractive surgical candidates, since almost invariably they have poor left ventricular function and often they present with multiple comorbidities, which elevate their risk of morbidity and mortality to an unacceptable level that ouweights the benefits of surgery. If the MCS, which has been already proven to be safe, is providing an effective therapeutic option under these circumstances, reducing the all-cause mortality and the rehospitalizations for heart failure, the decision- making process is expected to be greatly facilitated.

In the daily practice nowadays, due to the lack of data from randomized trials, the use of the MCS is still controversial, although in many Institutions the percutaneous edge to edge repair is considered a reasonalbe palliation for inoperable or high-risk patiens refractory to optimal medical therapy, with favorable anatomic features and expected life expectancy more than one year.

Surgeons should be aware, however, that quite a number of patients with FMR and ischemic cardiomyopathy can be optimally treated with CABG and mitral valve repair (mostly undersized annuloplasty) or mitral valve replacement.

Even when surgical revascularization is not an option, mitral repair for FMR can be beneficial and conveniently offered to selected patients. Factors affecting the effectiveness and the durability of mitral valve repair in such a clinical context have been clearly identified, and this information is crucial in choosing the strategy of care.

In summary, mitral valve surgery and the MCS can play a complementary role in the treatment of FMR. The RESHAPE HF study is only expected to provide scientific evidence that the MCS is advisable and better than the medical treatment alone when mitral valve surgery is not considered a reasonable therapeutic option.

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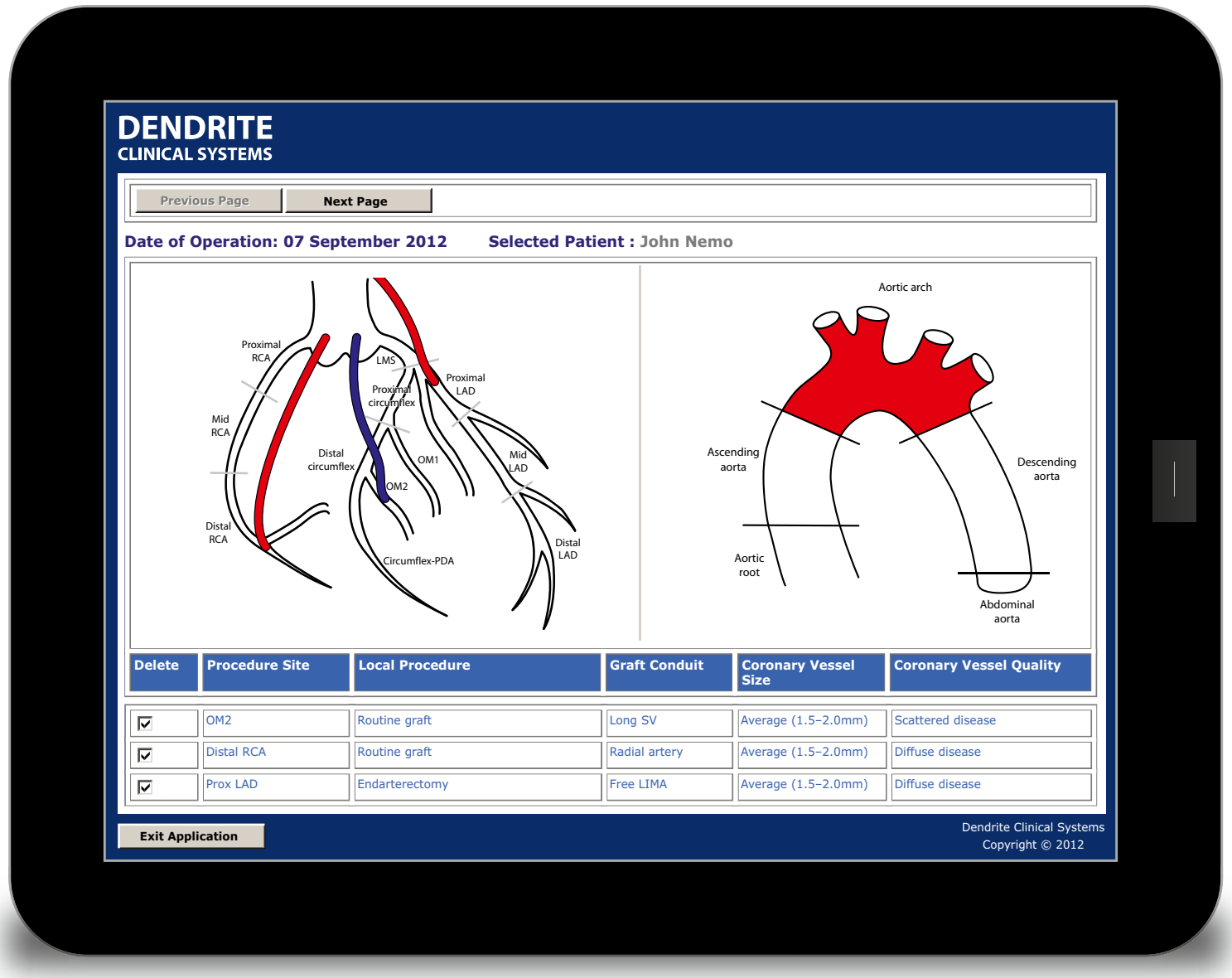

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Non-Oncology II 16:15 **Hall I**

The usefulness of three-dimensional computed tomography simulation for port-access thoracoscopic surgery in children and adolescents

Hirohisa Kato, Hiroyuki Oizumi, Megumi Nakamura, Hiroshi Ota, Takashi Inoue, Hikaru Watarai, Mitsuaki Sadahiro *Second Department of Surgery, Yamagata University, Yamagata City, Japan*

Objectives

Minimally invasive surgery is in demand, particularly for children and adolescents. While thoracoscopic surgery (TS) is one such modality, it is technically difficult and sometimes requires conversion to an open thoracotomy given the small thoracic cavity of children. Three-dimensional computed tomography simulation (3DCTS) is useful in adult TS. We introduced 3DCTS in July 2009 to evaluate its utility in children and adolescents. This report evaluates the usefulness of 3DCTS methods and techniques of port-access TS in children and adolescents by comparing it with TS before the introduction of 3DCTS.

Methods

Between July 1994 and February 2013, 25 patients (<20 years of age) underwent TS. The median age of the patients was 15 years at the time of surgery (range, 10 month–20 years). 3DCTS entails three-dimensional computed tomography angiography (3DCTA; Figure 1), pleurography, and image overlay. We recorded multi-detector CT images from 1.0-mm data slices after injecting an iodinated contrast medium, and saved the Digital Imaging and Communications in Medicine data on a computer server. We used workstations or a client viewer for image analyses and determined pulmonary arteriovenous anatomy, pleural dimensions, and thoracic cavity structure by using a 3-D volume-rendering method; the surgeon processed the 3-D images within five minutes of their capture, and performed this in real time in the operating room. The operations using 3DCTA were performed while comparing and contrasting the simulation images with real-time conditions in the surgical field, by rotating and resizing the 3DCT images. In the operation using pleurography, the precise location of the tumor could be inferred via triangulation by measuring the distance from the apex or bottom of the pleura, the fissure between pulmonary lobes, and specific structures of the thoracic cavity such as vertebrae, ribs, and diaphragm before and during the operation (Figure 2). Image overlay was used to decide port sites. A commercially available liquid crystal projector was mounted directly onto the surgical light arm so that the reconstructed images could be projected directly onto the patient's skin (Figure 3). The clavicle, lower costal edge, and iliac crest were used as reference points to fit the image to the patient. We evaluated the TS success rate before and after the introduction of 3DCTS.

Results

TS using 3DCTS was performed in 12 cases. The number of patients before and after the introduction of 3DCTS were as follows: 6 and 3 with metastatic lung tumors, 3 and 3 with congenital anomalies including cystic adenomatoid malformation, bronchial atresia and pulmonary sequestration, 1 and 3 with benign tumors, 1 and 2 with mediastinal tumors, and 1 and 1 with pyothorax. Surgical procedures included wedge resection, segmentectomy, lobectomy, extirpation, and debridement. 3DCTA was used for all of the congenital anomaly cases, and pleurography was used for 2 of the metastatic lung tumors. The rate of TS success without thoracotomy was 62% before the introduction of 3DCTS and 100% after ($p<0.05$).

Conclusions

3DCTS is useful and enables the surgeon to safely perform port-access TS in children and adolescents without the need for thoracotomy.

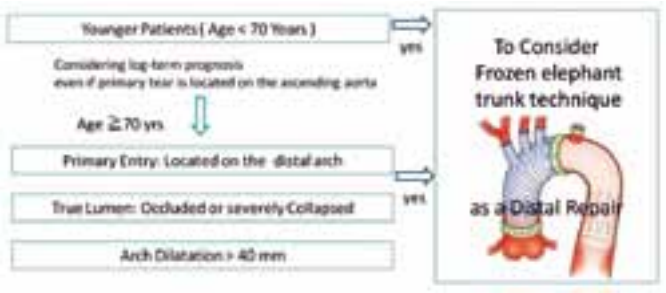
Proximal aortic surgery – extending to the descending aorta 14:15 **Hall G**

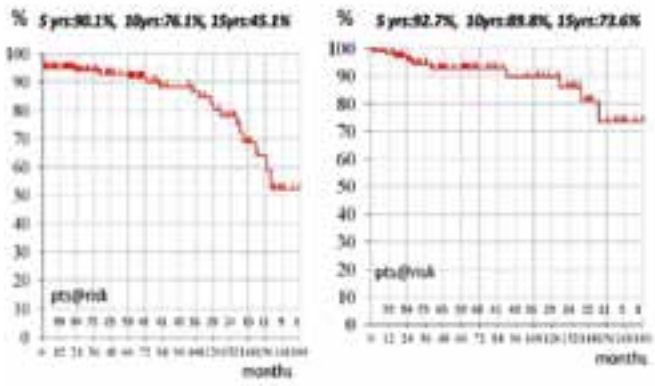
Long-term results of the frozen elephant trunk technique for acute type A aortic dissection from a 15-year experience

Akira Katayama *Hiroshima City Asa Hospital, Hiroshima, Japan*

Objective

The aim of this study is to evaluate prophylactic repair of the descending aorta using the frozen elephant trunk (FET) technique for acute type A aortic dissection (AAAD) with consideration for long-term prognosis.





Methods

Between 1997 and 2012, 120 consecutive patients (mean age: 64.4 years) underwent total arch replacement with FET for AAAD. There were 36 patients with an entry on the descending aorta, 68 patients younger than 70 years old, and eight patients with Marfan syndrome. Preoperative morbidity consisted of 23 patients with stroke, 10 patients with coronary ischemia, and nine patients with visceral ischemia. A stent graft whose diameter was determined by intraoperative measurement was inserted under trans-esophageal echographic guidance.

Results

Seven patients (6%) died in hospital. Early morbidity included four strokes and one spinal cord injury. Computed tomography before discharge demonstrated complete thrombosis of true lumen on a stent graft in 115 patients with a mean 26.0mm diameter before discharge and 27.5mm 1 year after operation compared with a mean 27.8mm diameter of stent graft. In the long-term follow-up (mean period: 104.6 months), 12 patients died of non-aortic events and five distal aortic re-operations were required using endovascular stent grafting to the descending aorta including one case with new tear formation. No patients had patent false lumen on the stent graft according to the last follow-up computed tomography. The 10-year survival rate was 75% and the overall 10-year re-operation free rate on the thoracic aorta was 93%.

Conclusion

A FET technique resulting in excellent aortic remodeling on the downstream aorta could improve the long-term outcome for AAAD.

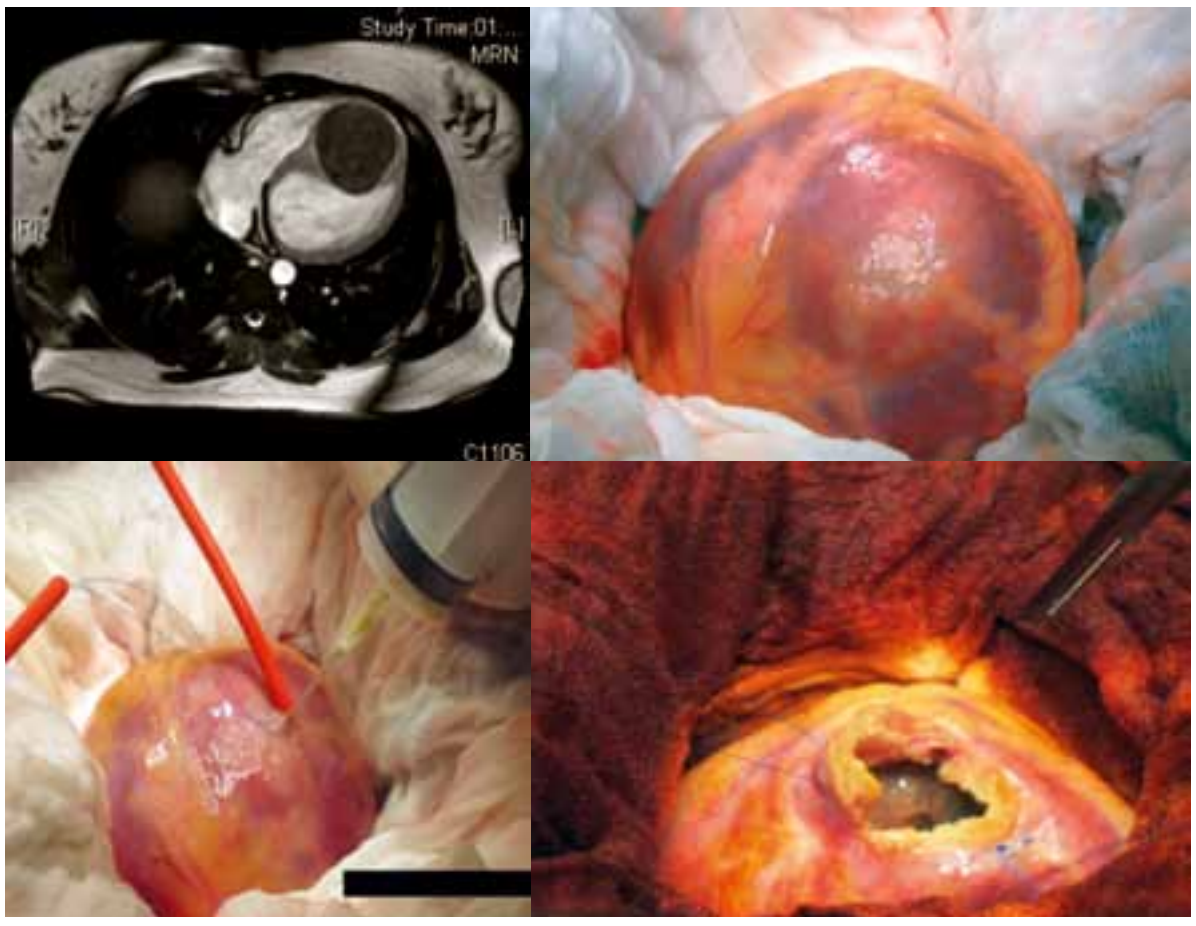
Film 16:15 **Hall F1**

Surgical approach to huge cardiac hydatid cyst of the interventricular septum

Mohammed S. Koudieh, Sameeh Iawand, Ahmed H Omar, Haliah Z. Alshehri *Prince Salman Heart Center, King Fahad Medical City, Riyadh, Saudi Arabia*

Mohammed S. Koudieh

Cardiac Echinococcosis is a rare but potentially fatal condition. Exposure to dogs in endemic areas is the usual cause of the disease. The presenting symptoms depend on the size and the location of the cyst and can be from no symptoms to heart failure. The cysts are frequently located in the left or right ventricle but involvement of the interventricular septum is exceptional. We describe a case of a 29-year-old woman presented with palpitation and generalized T wave inversion in the electrocardiogram. Transthoracic echocardiography, cardiac magnetic resonance imaging and contrast-enhanced computed tomography showed huge hydatid cyst that originated from the interventricular septum. Patient was started on Albendazol tablets and surgical excision using the direct approach to the cyst on cardiopulmonary bypass was done after five days of treatment. She had an uneventful post operative recovery and was continued on Albendazol tablets for four months. The film will show the details of the technique used.



The univentricular Heart 10:15 Hall K

Management of early Fontan failure: a single institution experience

Michael O Murphy, Andrew C Glatz, David J Goldberg, Lindsay S Rogers, Chitra Ravishankar, Susan C Nicolson, James Steven, Stephanie Fuller, Thomas L Spray and J William Gaynor *The Cardiac Center, The Children's Hospital of Philadelphia, Pennsylvania.*

The aim of the study was to analyse the incidence and outcomes of Early Fontan Failure in a large contemporary cohort of palliated patients.

A retrospective, single center study of all patients undergoing primary Fontan from 7/1/1995 to 12/31/2009 was performed. Early Fontan Failure was defined as death, need for extracorporeal membrane oxygenation, Fontan takedown to superior cavopulmonary connection or transplantation within 30 days of the Fontan procedure. The incidence and outcomes were summarized with descriptive statistics, and risk factors for early Fontan failure were identified.

A total of 592 patients underwent primary Fontan procedure during the study period; 67% had a dominant right ventricle. An extra-cardiac conduit was used for Fontan completion in 61% with the remainder having a lateral tunnel. Early Fontan failure occurred in 11 patients (1.9%), all of whom had ECC. Extracorporeal membrane oxygenation was used in five patients, five had Fontan takedown, and two had heart transplantation. 5/11 or 46% study subjects died as opposed to an overall mortality for primary Fontan of 0.8%. Among patients who had Fontan takedown to a superior cavopulmonary connection, long-term survival was 80%. By univariate analysis, elevated ventricular end-diastolic pressure (9.5 ± 3.3 v. 7.4 ± 2.7mmHg, p=0.019), and total circulatory support time (99 ± 33 v. 71 ± 23 minutes, p=0.001) were risk factors for early Fontan failure. The mean follow-up for the six hospital survivors was 5.9 years. There was one late transplant-related death. Of the four surviving patients who had Fontan takedown to a superior cavopulmonary connection, three underwent subsequent Fontan completion and one underwent biventricular repair.

Early Fontan failure is rare in the current era, but is associated with significant mortality. High filling pressures and a prolonged intraoperative course are risk factors for early Fontan failure. Of the management strategies available, Fontan takedown to an intermediate pathway appears to be associated with the best outcomes.

This study reports the pre-operative characteristics, operative course and mid term outcomes of a large contemporary series of single ventricle patients having relatively standardised, staged palliation in a large volume centre focusing on the incidence, management and outcomes of Early Fontan Failure. The incidence of Early Fontan Failure was low as compared with other series and there was high usage of rescue strategies using the full armamentarium available to treat Early Fontan Failure.

Not having had prior superior cavopulmonary connection, use of extra-cardiac conduit, high preoperative ventricular end-diastolic pressure and prolonged support times were found to be risk factors for Early Fontan Failure. Survival rates amongst affected patients were high compared to other series with the best survival seen in patients who underwent Fontan takedown. Most patients who had Fontan takedown as treatment for Early Fontan Failure were able to Fontan completion at a latter date with good mid-term survival.

Basic Science regeneration 08:15 **Hall 12**

Paracrine factors of PMBC and regeneration

Hendrik Jan Ankersmit
Consultant Surgeon of the Department of Thoracic Surgery, Vienna, Austria

Experimental stem cell therapy and consecutive clinical trials have evidenced only marginal effect and is currently under critical appraisal (Wollert et al. Nat Rev Cardiol. 2010) Besides initial ill controlled experiments (Orlic et al. Nature 2001) it is currently accepted that "paracrine factors" derived from "stem cells" do cause effects seen in multiple experimental settings (heart, skin, inflammation, stroke and spinal cord inury).

In 2005 the "The Dying Stem Cell Hypothsis" was established, namely that therapeutic stem cells are already undergoing apoptosis when applied, thence induce immunomodulation with the result of attenuation of post-infarction inflammation (Thum et al. JACC 2005).

In 2005-8 we utilized an experimental rodent myocardial infarction model and treated animals with apoptotic peripheral white blood cells (PBMC) suspensions. This treatment caused homing of FLK+/ c-kit+ cells in the early phase after AMI and restored long-term cardiac function (Ankersmit et al. EJCI 2009). We consecutively tested the hypothesis whether cultured medium (CM; Aposec™) derived from apoptotic PBMC has an effect on prevention of AMI induced remodelling in a porcine AMI model. We were able to show that Aposec™,derived from 1x109 PBMC, was able to attenuate significantly myocardial scarring and microvascular obstruction in the acute phase of porcine AMI (as determined by fMRI). In vivo and vitro experiments revealed that Aposec™ caused a)cytoprotection; b) anti-inflammation; c)pro-angiogenesis; d)inhibition of platelet aggregation and e)vasodilation (Lichtenauer et al. BRC 2011; Hoetzenecker et al. BRC 2012; Hoetzenecker et al. EHJ 2013; Mildner et al. PLOSone 2013). Recently we utilized the same concept and injected Aposec™ in the latent phase of porcine AMI via NOGA catheter. In this experimental setting we were able to demonstrate that Delta Ejection Fraction (EF) and cardiac index (CI) was significantly increased as compared to control treatment (Pavo et al. late breaking trial, ESC, 2013). We therefore feel confident that paracrine factors derived from PBMC can be utilized in the treatment of hypoxia induced inflammation (eg. AMI, stroke, myocarditis). We conclude from our data that stem cells and their derivatives can be exchanged by PBMC secretome. What are the advantages of PBMC derived CM? a) easily obtainable raw material (PBMC) for production of CM; b) minimal or no antigenicity owing to protein only content and c) "off the shelf" utilization in the clinical setting of AMI and other indications.

Outlook of invention: Our results evidence that CM derived from PBMC (Aposec™) was efficacious in relevant hypoxia induced experimental animal models. We have identified a GMP facility and regulatory hurdles are currently overcome. Toxicology and human Phase I&II studies will commence in 2014.

Above scientific insight was patented (WO2010070105-A1) and led to the formation of a spin off company (www.aposcience.com) and was funded by the private-public Christian Doppler Society (www.cdg.at). This case history clearly evidences that active surgery, within the University Setting (Medical University of Vienna, MUW), and inventive research can become reality when the structure of the department, leadership attitude and colleagues support ideas that are considered 'deviant' at first sight.

Oncology II: Adenocarcinoma 10:15 **Hall I**

Feasibility of segmental resection in lung cancer with ground glass opacity

Hisashi Iwata, Koyo Shirahashi, Yoshimasa Mizuno, Hirotaka Yamamoto, and Hirofumi Takemura
Department of General and Cardiothoracic Surgery, Graduate School of Medicine, Gifu University, Gifu, Japan

Abstract

Objectives: Recently, lung segmental resection has been increasingly performed in patients with lung cancer. In this study, the results of radical segmentectomy (RS) and palliative segmentectomy (PS) were compared.

Methods: Of 151 patients who underwent segmentectomy (82 men, 64 women; mean age, 65.4±12.1 years), segmentectomy was performed to remove a non-small cell primary lung cancer in 87. Radical segmentectomy was performed for pure ground glass opacity, >50% ground glass opacity and diameter <2cm, <10mm solid tumour. Palliative segmentectomy was performed in patients with poor lung function, relapse, or at high risk for surgery.

Results

The characteristics of radical segmentectomy were compared with those of palliative segmentectomy for pathological stage I. The mean age of radical segmentectomy cases (67±10 years) was significantly younger than that of palliative segmentectomy cases (73±9 years; p=0.018). Tumour size was significantly smaller in radical segmentectomy cases (15±5mm) than in palliative segmentectomy cases (22±9mm; p<0.001). The tumour standardized uptake value of 18F-fluorodeoxyglucose positron emission tomography was significantly lower in radical segmentectomy cases (1.2±1.6) than in palliative segmentectomy cases (5.9±6; p<0.001). The mean duration of drainage was shorter in radical segmentectomy cases (2.5±0.7 days) than in palliative segmentectomy cases (3.8±2.5 days; p=0.004). Overall five-year survival was higher in radical segmentectomy (100%) than in palliative segmentectomy (66.0%; p=0.02). Five-year disease-free survival was higher in radical segmentectomy (100%) than in palliative segmentectomy (51.4%; p=0.01). Recurrence was detected in eight palliative segmentectomy patients; 10 palliative segmentectomy cases showed tumour with ground glass opacity and survived without recurrence.

Pre-and post operative characteristics of patients with pathological stage I

RS, radical segmentectomy); PS, palliative segmentect

	RS (n=34)	PS (n=41)	P value
Age	67±10	73±9	0.01
Size of tumor (mm)			<0.00
Range	6-25	3-40	
Median	15±5	22±9	
FDG-PET (SUV)	1.2±1.6	5.9±6.0	<0.00
CEA (ng/ml)	2.8±5.8	5.1±5.4	0.01
Tumor location			<0.00
Outer 1/3	32	24	
Central	2	17	
Histology			0.00
Adenocarcinoma	33	30	
Others	1	11	
Chest tube duration (days)	2.5±0.7	3.8±2.5	0.00

Figure 1

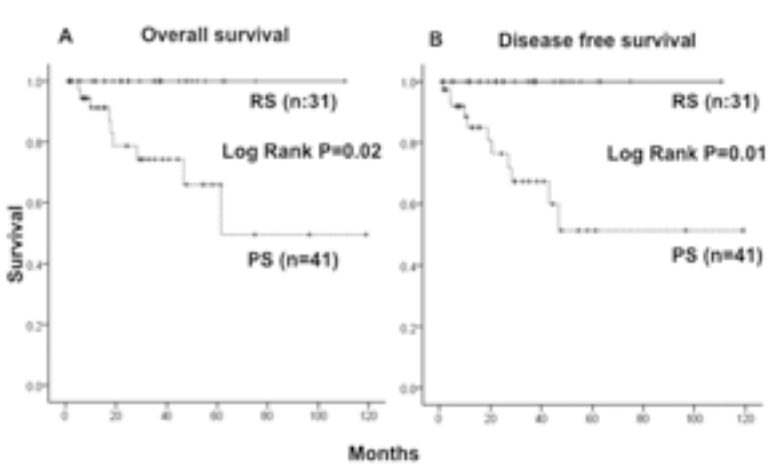


Figure 2

Hisashi Iwata

Conclusions

Our radical segmentectomy is feasible for stage I lung cancer with pure ground glass opacity or >50% ground glass opacity and diameter <2cm, located peripherally to keep the surgical margin anatomically.

Thoracic Experimental 10:15 **Hall P**

Human isolated perfused lung models demonstrate compensation of pulmonary vasoconstriction in response to re-oxygenation

Priyadharshanan Ariyaratnam *Hull and East Yorkshire Hospitals NHS Trust, UK*

Acute rises in pulmonary artery pressures following cardiopulmonary bypass remain a thorn in the side of cardiac surgeons and intensivists alike as it is a very difficult entity to manage and carries a significant morbidity and mortality burden. Surprisingly, little is known about the mechanisms by which this phenomenon occurs.

Ischaemia-reperfusion injury has become the trendy area of investigation to explain much of the pathophysiology surrounding cardiac surgery. Despite this, the contribution of ischaemia-reperfusion to pulmonary abnormalities has received considerable less attention. Moreover, as well as a reperfusion element from the re-establishment of the pulmonary circulation after cardiopulmonary bypass, there is the added element of re-oxygenation as ventilation is returned to the hitherto quiescent lung.

In addition, temperature is known to affect the tone of systemic arteries in animal models but has not been studied in human models nor its effects discerned in the pulmonary circulation. However, there have been clinical reports that deep hypothermia causes pulmonary hypertension upon rewarming.

We looked at the contribution of hypoxia-reoxygenation and hyperoxic reperfusion not only in isolated human pulmonary arteries but also isolated perfused human lung models. Further to this, we investigated the role that deep hypothermia and rewarming have on pulmonary artery pressures.

The set-up for the isolated human perfused lung model is shown in Figure 1 (n=6). The set-up for the isolated human pulmonary rings utilised pulmonary artery tissue harvested from healthy portions of high order pulmonary arteries from patients with lung cancer, placed in organ baths (n=18).

From the isolated pulmonary rings, we show that hyperoxic vasoconstriction appeared to be dependent on both extracellular calcium influx and intracellular calcium release from the sarcoplasmic reticulum (Figure 2). Deep hypothermia (17C) reduced the responsiveness of pulmonary arteries to stimulants compared to arteries maintained at 37°C. However, rewarming from deep hypothermia did not precondition arteries to a greater degree of responsiveness.

From the isolated perfused lung models, neither hypoxia nor hyperoxia in the ventilator or perfusate translated into any significant changes in pulmonary artery pressures. At deep hypothermia, pulmonary artery pressures were unresponsive with stimulation whereas rewarming caused a reactivation of the stimulatory pathways.

Our results, whilst showing that hypoxia-reoxygenation affects the tone of pulmonary arteries in isolation, demonstrate that there appears to be compensatory mechanisms at the whole lung level to cushion these changes. Hence, pulmonary artery pressures following cardiopulmonary bypass are unlikely to be affected by hypoxia-reoxygenation or deep hypothermia.

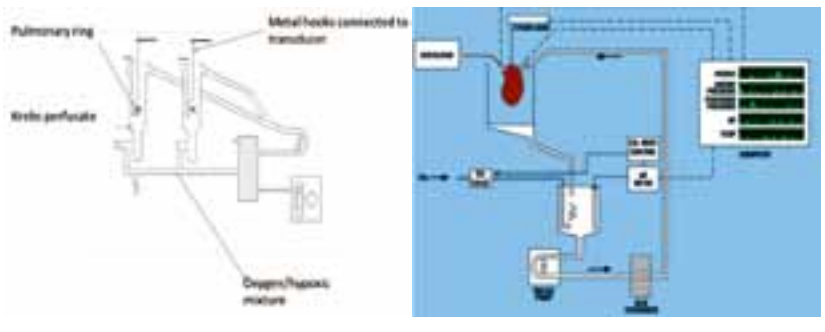


Figure 1: Left; Isolated vessel system and, right; Isolated perfused lung system

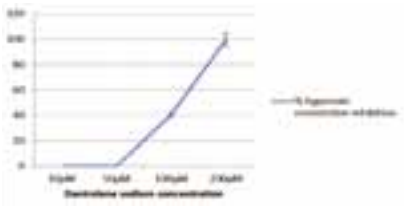


Figure 2: Dantrolene inhibition of hyperoxic constriction

Priyadharshanan Ariyaratnam

Our models may also be of considerable value for those involved in ex-vivo lung perfusion in transplantation as it demonstrates that varying the conditions of human lungs in an ex-vivo environment has varying physiological effects at both the tissue and organ level which may influence donor lung optimisation prior to transplantation.

The project is a collaboration between the cardiothoracic department (under Mr Loubani) and the department of Academic Medicine (under Professor Alyn Morice).

Cardiopulmonary bypass – improving outcome in marginal patients 14:15 Hall F2

Advanced heart and lungs protection perfusion technique for valves surgery

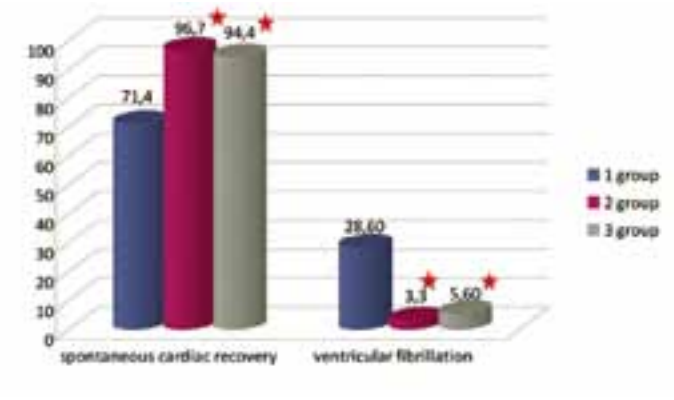


Figure 1. Types of cardiac recovery in patients after aorta declamping
*Significant difference (p≤0.05) compared with first group

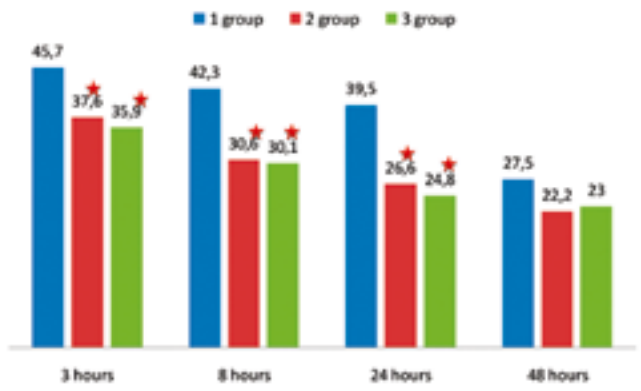


Figure 2. CK MB (U/L) after surgery in patients
*Significant difference (p≤0.05) compared with first group

Figure 3. Oxygenation index (PaO2/FiO2) during operation in patients

V V Pichugin, A P Medvedev, A B Gamzaev, N Y Melnikov, E V Sandalkin, V A Chiginev *Nizhny Novgorod State Medical Academy; Cardiac and Vascular Surgery Centre; Nizhny Novgorod, Russian Federation*

Cardioplegic cardiac arrest with the subsequent ischemic – reperfusion injuries is connected with considerable cytokines release and neutrophil activation and the developing of the system inflammatory response syndrome leads to development of an inflammation of a myocardium, leucocytes activation and release of heart enzymes.

Ischemic-reperfusion injuries and CPB also correlate with flow reduction on the bronchial arteries, bringing to low-flow lungs ischemia. Lungs have bimodal blood supply from pulmonary and bronchial arteries with an extensive network of anasthomosis; however, during CPB, these organs are purely dependent on bronchial arteries to provide the 5% of whole-body oxygen uptake that is necessary even under hypothermic conditions. Result is development of a regional inflammatory response, leading to a significant accumulation of albumin, lactate dehydrogenase, neutrophils, and elastase in the bronchoalveolar lavage fluid.

Based on these facts, methods of prevention of these complications, in particular performance of operations on "beating heart" in the conditions of continuous coronary perfusion and pulmonary artery perfusion in combination with lungs ventilation were developed. Hypoventilation during CPB is responsible for development of microatelectasis, hydrostatic pulmonary edema, poor compliance, and higher incidence of infection. Therefore, combined lung ventilation and perfusion during CPB may have a beneficial role in preserving lung function by limiting platelet and neutrophil sequestration and attenuating the thromboxane 2 response to CPB.

The aim of the study was to evaluate constant coronary perfusion and "beating heart" in combination with pulmonary artery perfusion and "ventilated lungs" technique for advanced heart and lungs protection in valves surgery.

After ethical approval and written informed consent 69 patients undergoing valves surgery with normothermic CPB were randomized in three groups. First group (control, 21 patients) – crystalloid cardioplegia and no lung ventilation/perfusion technique were used, second group (30 patients) – constant coronary perfusion in condition of "beating heart" and no lung ventilation/perfusion technique were used, third group (18 patients) – constant coronary perfusion in condition of "beating heart" with perfusion of pulmonary artery and lungs ventilation technique were used. Patients of all three groups had no significant differences on time of cardiopulmonary bypass and an aorta cross clamping. Clinical (types of cardiac recovery after cardioplegia; postischemic cardiac rhythm disturbances; doses of inotropes), functional (myocardial contractility function), investigation of myocardial damage markers (CK MB level), oxygenation index and lung compliance were performed for comparative evaluation of effectiveness of this technique.

CK MB level was evaluated within three hours (I), 8 hours (II), 24 hours (III) and 48 hours (IV) after end of surgery. All investigations were made by "Cobas Integra 400/400" biochemical analyzer. Statistic analysis was made by STATISTICA-6.0 program.

The rate of spontaneous cardiac recovery was higher and doses of inotrops were lower in second and third groups (Figure.1).

Myocardial contractility function was better preserved in second and third groups of patients (acceleration aortic flow and peak speed of flow were significantly higher after bypass).

The post operative levels of CK-MB were lower than in control group. Three hours after surgery CK-MB level in second and third groups was lower by 38,1% and 33,3%; 8 hours after surgery lower by 45,9% and 47,7%; 24 hours after surgery lower by 42,0% and 42,6% and lower by 29,7% and 27,4% 48 hours after surgery compared to control group respectively (Figure 2).

Normalization of CK-MB level was registered earlier in second and third groups (within 24 hours), than in control (more than 48 hours) group. Oxygenation index and lung compliance were significantly higher in third group after bypass (Figure 3).

Conclusion

Our technique improved myocardial and lungs protections in patients but larger prospective randomized trials are needed to definitively assess the protective effects of this technique.

Mediastinum 14:15 Hall P

Trancervical thymectomy with partial sternal split in the treatment of myasthenia gravis

Alberto Oliaro, Pier Luigi Filosso, Enrico Ruffini, Alberto Sandri, Francesco Guerrera
University Of Torino, Torino, Italy

Alberto Oliaro

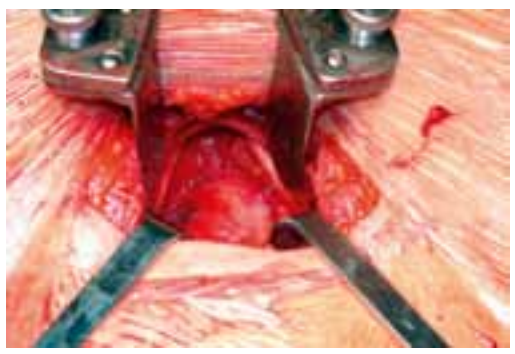


Figure 1

The surgical resection of thymus is recognized to be a possible option in the treatment of Myasthenia Gravis (MG), but optimal surgical approach is not yet established. In fact, it may vary between video-assisted thymectomy to complete median sternotomy, according to the surgeon's preference and experience.

The research to a minimally invasive approach to thoracic diseases has recently become increasingly popular amongst thoracic surgeons, because of patients general low morbidity, improved cosmetic results and less degree of surgical trauma. Video assisted thoracoscopy (VATS), in a monolateral or bilateral approach, thymectomy has also been recently proposed, characterized by an increase in term of operation time and in surgical costs.

At the Department of Thoracic Surgery of the University of Torino (Italy) thymectomy with a partial sternal split, through a simple cervicotomy, using the "Maggi's retractor", has been performed as routine operation since 1990's. During the last 20 years we operated with this approach 370 MG patients, of which 305 where non-thymomatous ones. The latter were retrospectively reviewed, and represent the objective of this mono-institutional study.

The aim of the paper was to evaluate if this surgical approach could guarantee a satisfactory results on MG clinical response, in terms of Complete Stable Remission (CSR) parameter (according to the Myasthenia Gravis Foundation of America-MGFA-classification).

Complete clinical follow-up was available in 142 patients. All these patients received a cosmetic operation (cervicotomy associated with partial sternal split through the same small cutaneous incision) (Figure 1); a single small mediastinal drainage is placed at the end of intervention, and usually removed in 1st postoperative day. Patients are commonly discharged from the hospital on the third postoperative day.

No important morbidities and perioperative mortality were observed in our series. Pathological examination revealed: thymic hyperplasia in 66%, normal thymus in 7% and thymic atrophy in 27% of cases, respectively. Mean duration disease was 107.8 months (range 1–360 months); after a median follow-up period of 9.77 ± 4.44 years (range 1–20 years), 139 patients (97.6%) experienced a clinical improvement, with a CSR achieved in 52 (36.6%). Univariate analysis revealed that age at operation ($p < 0.01$), gender ($p < 0.01$), duration of disease ($p < 0.01$), postoperative immunosuppression ($p < 0.01$) significantly influenced CSR.

In conclusion, the surgical approach we propose seems to be as effective as other mini-invasive ones for thymectomy, in terms of clinical MG response, being however lesser surgically invasive, ensuring a satisfactory cost/benefit ratio in terms of postoperative hospital stay and costs reduction.

Connective tissue disease and bicuspid aortic valves 10:15 Room G

Endovascular therapy in patients with genetically triggered thoracic aortic disease: applications and short- and mid-term outcomes

Ourania Preventza
Baylor College of Medicine and Cardiovascular Surgery, Texas Heart Institute, Houston, Texas, USA

Conditions classified as genetically triggered thoracic aortic diseases include Marfan syndrome, Loeys-Dietz syndrome, Ehlers-Danlos syndrome, Turner syndrome, bicuspid aortic valve (BAV) with and without known family history of thoracoabdominal aortic aneurysm (TAAA), BAV with coarctation, other aneurysms and dissections of the thoracic aorta not due to trauma in patients ≤ 50 years of age, and familial thoracic aortic aneurysms and dissections (FTAAD). Complications involving the aorta are common in these patients and redo sternotomies and redo thoracoabdominal incisions in these individuals make the traditional surgical repair difficult. In our study we examined the short- and mid-term outcomes of various endovascular applications in such patients.

Between January 2003 and July 2013, 60 patients were treated for genetically triggered thoracic aortic disease. Inclusion criteria used:thoracic aneurysm or dissection not due to trauma in a patient aged 50 years or less (n=30), bicuspid aortic valve and coarctation (n=11), Marfan syndrome (n=10), bicuspid aortic valve with thoracic aneurysm (n=4), Loeys-Dietz syndrome (n=3), familial thoracic aneurysm or dissection (n=3), and genetic mutations (n=2). Some patients met more than one inclusion criterion. Forty-one patients (68.3%) were treated with only endovascular stent grafting. Nineteen patients (31.7%) underwent a hybrid procedure with open proximal or total arch replacement and concomitant endovascular stenting of the aortic arch or the descending thoracic aorta. Endoprostheses were used off-label, and this was explained to all patients. Initial technical success was 100%, and ultimately, endovascular therapy was successful in 48 of 58 surviving patients (82.8%). Six patients (10.3%) required repeated endovascular procedures in the same aortic segment, and four of them (6.9%) required endograft removal. In-hospital mortality was 3.3% (n=2), and neurologic events occurred in two patients. The median follow-up was 2.3 years, and the overall survival during follow-up was 94.8%. According to this study, our recommendations are the following: When an endograft is being considered for patients with Marfan syndrome, Loeys-Dietz syndrome, Ehlers-Danlos syndrome, Turner syndrome, or FTAAD, we recommend that the proximal and distal landing zones be inside Dacron grafts to prevent further progression of the disease in either end of the endograft and to increase the durability of the stent graft. In the case of symptomatic acute type III aortic dissection, a stent graft can be the first line of treatment, provided that the patient remains under rigorous surveillance. In patients with BAV who are undergoing concurrent open surgical repair for aortic regurgitation, aortic stenosis, or ascending aneurysm, aortic coarctation can be potentially resolved at the same time with an endovascular repair.

In conclusion, the treatment of genetically triggered thoracic aortic disease is challenging and complex, and current endovascular therapy has certain applications for those individuals with multiple prior cardiovascular procedures. Long-term studies and further refinement of the current endovascular technology is extremely important if endovascular stent grafting is to become so routine in this patient population that it competes with traditional open surgical repair.

Non-Oncology II 16:15 Room I

Inception of a full-robotic, totally-endoscopic thoracic surgery programme in a European unit with initial results

Jean-Marc Baste and Christophe Peillon
Rouen University Hospital, France

Minimal invasive approach in thoracic surgery is more and more popular. New guidelines for lung cancer management published this year by Detterbeck et al[1] advocate VATS lobectomy for early stages after 20 years of debate.

Robotic platform is presented as a tool for improving security and feasibility of minimal invasive approach which is recognized to be less traumatic with better short term outcomes.

Robotic procedures are widespread in different specialities as urology and gynaecology with success, even if the proof of benefits compared to conventional minimal invasive approach are difficult to find. The main asset is the reproducibility of procedures allowing more practitioners to offer minimal invasive approach to their patients.

After many years of experience in general surgery it seems that one key point for implanting a robotic programme is the volume of cases done by year. Under a certain threshold of procedure the inconveniences of the robot go beyond the advantages, and the opponents underline the explosive cost with low patient benefits.

In the thoracic field, the issue is mainly security, due to the dissection of great vessels and a great diversity of procedures with the risk of major uncontrolled bleeding.

However recent publications from essentially North America[2–4] have shown the feasibility and security of robotic procedures. In all these series the number of cases are high, following the advice of colleagues.

The problem in Europe is due to the organisation of medical care with a lot of heavy-, low- and middle-load departments, with a shared robotic platform used essentially by urologists and gynaecologists. This issue is highlighted by pionneers, such as Franca Melfi[5], who had to struggle hard to exist in a multidiscplinary hospital.

So, access of the platform is difficult and the selection of easy cases to start can take a long period of time which we know now is not good for setting a robotic programme especially in the thoracic field.

The aim of our work is to show how to set up a programme in low volume department. We have looked back at our training experience and reviewed our results.

Prior to starting the clinical programme, progressive and well organised training achieves good results, even in a low volume centre.

Robotic education is the corner stone in robotic clinical programme success and will allow more surgeons to start minimal invasive surgery. Academic qualifications should be proposed by academic department. The future of robotics in the thoracic field is bright because robotic platform will offer new devices and new ways of teaching with simulators, facilitating the adoption of minimal invasive thoracic surgery[6].

Jean-Marc Baste and Christophe Peillon

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Non-Oncology I 08:15 Hall P

Comparison of 102 patients with complicated and intact pulmonary hydatid cysts

Comprehensive evaluation of specifications and surgical methods with long term results

Akın Eraslan Balci, Mehmet Oğuzhan Özyurtkan, Muharrem Çakmak* *Euphrates University Hospital, Elazig, Turkey; *State Training and Research Hospital, Diyarbakır, Turkey*

The main surgical techniques in the treatment of pulmonary echinococcosis are cystotomy alone, cystotomy and capitonnage, enucleation, pericystectomy and pulmonary resections. There is limited number study that compares the complicated and uncomplicated lung hydatid cysts surgery. In this retrospective study, complicated and uncomplicated cysts are being compared.

Between 2000-2013 years, the records of 102 patients who had been operated for lung parenchymal cysts were reviewed retrospectively. Complicated hydatid cyst ratio was 52% (53/102). Infected and/or perforated hydatid cysts and cysts that previously underwent an operation were accepted as complicated hydatid cysts (Figure 1 and 2). A cyst was considered to be ruptured when the cyst cavity included fluid and/or air as well as taking a history of membrane expectoration. Criteria for cyst infection were fever, purulent sputum, pericystic inflammation, radiologic findings of pneumonitis and leukocytosis. Of patients, 85.3% (87/102) was symptomatic. Most prominent symptom was fever (n:19, 18.6%). Chest pain (n:17, 16.7%), dyspnea (n:16, 15.7%), dry cough (n:15, 14.7%), membrane/cyst fluid expectoration (n:11, 10.8%), hemoptysis (n:9, 8.8%) were following. Most prominent diagnostic method was postero-anterior chest x-ray.

Of 102 patients, 80 (78.4%) had underwent CT examination additionally. Causes for CT examination were diagnosis for complications in 46 (57.5%), search for small cysts in bilateral cyst cases in 16 (20%), planning for surgery in 10 (12.5%), differential diagnosis in 8 (10%) patients (Table 1).

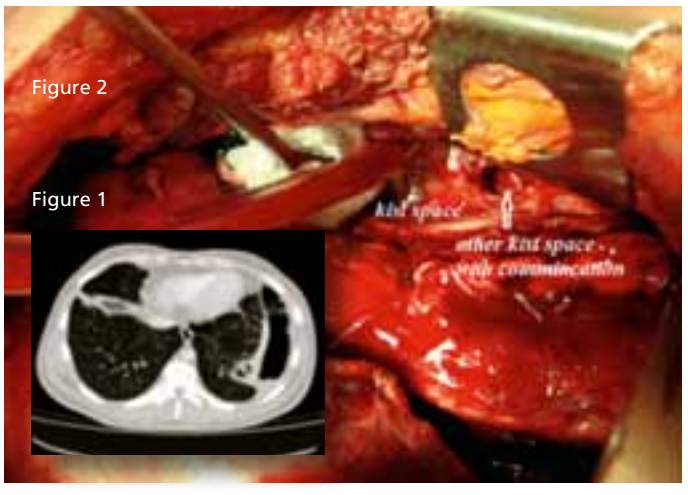
Table 1. Most prominent CT findings of 46 patients with complicated hydatid cysts*

Pleural air-fluid level	13 (28.3)
Intra-parenchymal abscess	12 (26)
Pleural thickening	11 (23.9)
Mass-like lesion with parenchymal infiltration	5 (11)
Camalote (water lily) sign	3 (6.5)
Crescent sign	2 (4.3)
Total	46 (100)

*Numbers in parenthesis show the percents

Complicated hydatid cysts needed more operation time (p<0.05) and more frequent CT examination (p<0.05); underwent less number cystotomy (p<0.05) and enucleation (p<0.05), more number decortication (p<0.05) operations; their hospital stay and follow-up time were longer (p<0.05) than uncomplicated hydatid cysts. Although resection ratio was more in complicated group, this was not statistically important. Morbidity, mortality, reoperation and cyst recurrence ratios were not different

When convenient operative approach and postoperative management executed morbidity, mortality and re-operation rates do not show higher ratios in complicated group. Otherwise complicated hydatid cysts need more difficult preoperative preparation and intraoperative measures; longer postoperative management and follow-up. Presenting findings of lung hydatid cyst may be changing due to more complicated hydatid cysts occurred.



EACTS Academy Programme 2014

EACTS
European Association For Cardio-Thoracic Surgery

Course Title	EACTS Domain	Course Director(s)	Dates / Location
Fundamentals in Cardiac Surgery: Part I	Acquired Cardiac Disease & Congenital Heart Disease	W J Brawn, Birmingham & J Pepper, London	3-7 February Windsor, UK
Advanced Module: Open and Endovascular Aortic Therapy	Vascular Disease	M Czerny, Zurich & E Weigang, Berlin	19-21 March Windsor, UK
Thoracic Surgery: Part I	Thoracic Disease	M Dusmet, London	31 March - 4 April Windsor, UK
Advanced Module: Coronary Surgery with Special Focus on Off-Pump Coronary Artery Bypass Surgery	Acquired Cardiac Disease	P Sergeant, Leuven	14-17 April Windsor, UK
Fundamentals in Cardiac Surgery: Part II	Acquired Cardiac Disease & Congenital Heart Disease	W J Brawn, Birmingham & J Pepper, London	2-6 June Windsor, UK
Advanced Module: Congenital Surgery	Congenital Heart Disease	W J Brawn, Birmingham & T Ebels, Groningen	27-31 October Windsor, UK
Advanced Module: Heart Failure: State of the Art and Future Perspectives	Acquired Cardiac Disease	G Gerosa, Padua & M Morshuis, Bad Oeynhausen	10-14 November Windsor, UK
Thoracic Surgery: Part II	Thoracic Disease	P Rajesh, Birmingham	2-5 December Windsor, UK
Functional Mitral and Tricuspid Regurgitation	Acquired Cardiac Disease	J Pepper & K M J Chan, London	21-22 February Windsor, UK
Minimally Invasive Techniques in Adult Cardiac Surgery	Surgical Manpower & Training (SMTP) Committee	P Sardari Nia, Maastricht	April The Netherlands
Minimally Invasive Techniques in Adult Cardiac Surgery	Surgical Manpower & Training (SMTP) Committee	P Sardari Nia, Maastricht	June Tehran, Iran
Cardiothoracic Master Class in Surgical Maze IV for Atrial Fibrillation Therapy	Acquired Cardiac Disease	T Weimar, Stuttgart	24 June Windsor, UK
Advanced Aortic and Mitral Valve Reconstructive Surgery	Acquired Cardiac Disease	J Pepper, & P Punjabi, London	4-5 July Windsor, UK
The Hypoplastic Left Heart	Acquired Cardiac Disease	W J Brawn, Birmingham	15-16 July Windsor, UK
Chest Wall Diseases	Thoracic Disease	M Yuksel, Istanbul	19-21 November Windsor, UK
Valve Sparing Aortic Root Replacement & Aortic Valve Repair	Acquired Cardiac Disease	E Lansac, Paris & J R Sádaba, Pamplona	28-29 November Windsor, UK
Leadership and Management Development for Cardiovascular and Thoracic Surgeons: Part II	General	J L Pomar, Barcelona	26-28 February Windsor, UK
IACTS-EACTS Joint Workshop	Acquired Cardiac Disease	P Sergeant, Leuven & K Sarkar, Calcutta	20 February Kerala, India

Foundation Courses · Specialist Courses · Professional Development Courses · Co-Branded Educational Activities

Non-Oncology I 08:15 **Hall P**

Surgery in pulmonary tuberculosis

Rajan Santosham
Thoracic, Santosham Chest Hospital, Chennai, India

With effective chemotherapy and early diagnosis, the role of surgery in pulmonary tuberculosis has come down. In the pre chemotheraphy era various collapse procedutres were carried out. Out of which, thoracoplasty is still done in selected cases.

This study is a retrospective analysis of 8,991 cases operated in the last 43 years for pulmonary tuberculosis.

The various indications for surgery are Massive Hemoptysis, Broncho- Tracheo esophageal fistula, Tubercular cavities and destroyed lung, Aspergilloma, broncho stenosis with distal infection and bronchiectasis, Empyema, Suspected Carcinoma, Acquired pulmonary arterio venous fistula.

The surgical procedures done were commonly Thoracoplasty, pneumonectomies, lobectomies, segmental resections, Decortication, tracheo bronchial sleeve resections,Tracheo- broncho esophageal fistula repair.

Out of the 8991 cases which we operated for tuberculosis, there were 72 (0.8%) early deaths and 189 (2.1%) late deaths. Cause of death was bleeding which post operatively could not be managed by re-thoracotomy and packing the cavity, acute respiratory failure, progressive disease and fulminant infection. Per operatively we had 5 (0.05%) deaths due to uncontrolled bleeding from pulmonary artery tear. 30 (0.33%) patients had post operative respiratory failure and four among them died subsequently. 122 (1.36%) patients had progressive tuberculosis disease, cachexia and death.

Most of the patients did not return for follow-up after completion of anti tuberculosis treatment. So the cause of late deaths in a few patients who came for follow-up regulary even after completion of anti tubercular treatment were because of Cor pulmonale predominantly and other causes of death like cardiac causes and malignancy.

In our study, bronchopleural fistula developed in 719(7.99%) cases. Most healed with intercostal drainage. Out of these 164 (1.8%) patients needed surgery.130 patients needed thoracoplasty, 22 needed omentoplasty and remaining 12 patients needed intercostal muscle flap closure.

In our study completion pneumonectomy was done in 32 (0.36%) cases because of recurrent hemoptysis and infection. Bilateral resections were done in 16 (0.18%) patients, out of which 4(0.04%) were done in same sitting and 12(0.13%) in staged procedure after 3 months. Bilateral resections were done in young patients with good respiratory reserve and localized disease on both sides without obstructive airway disease. We did segmental resections in 821(9.13%).

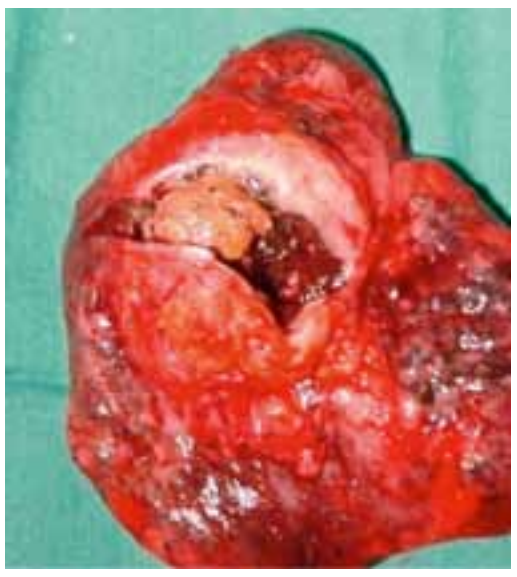
Empyema as a complication without bronchopleural fistula is infrequent and mostly effectively managed with an intercostal drain.

With the development of cardiac surgery, monitoring, safe anaesthesia, pediatric fibre optic bronchoscope for placement of double lumen tubes, liberal use of high frequency ultrasound cutting instrument, staplers for bronchial stump, post operative pain management with epidural analgesia, post operative physiotherapy and removal of retained secretions early by bronchoscopy have improved the results over the years.

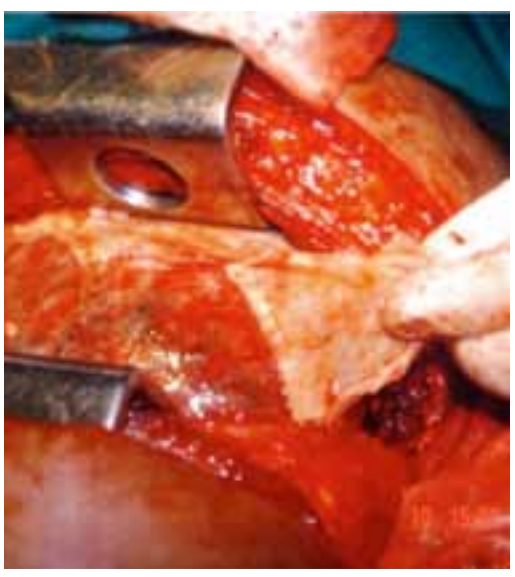
PTB is essentially a medical disease. Surgery comes into play only in selected situations as explained. The surgeon has to be very careful in choosing cases for surgical management weighing the benefits of surgical versus medical management.

Rajan Santosham

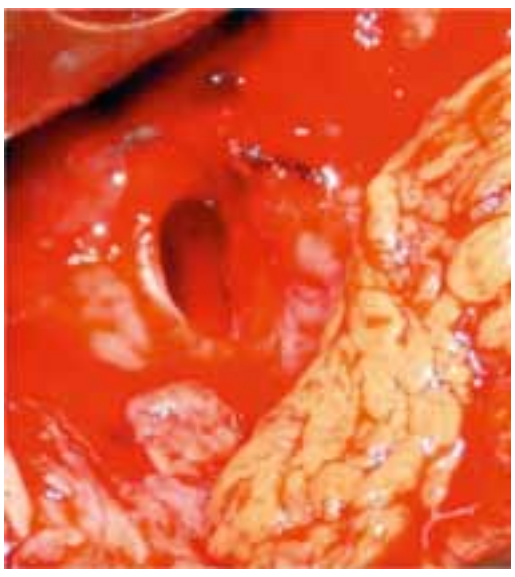
Aspergilloma



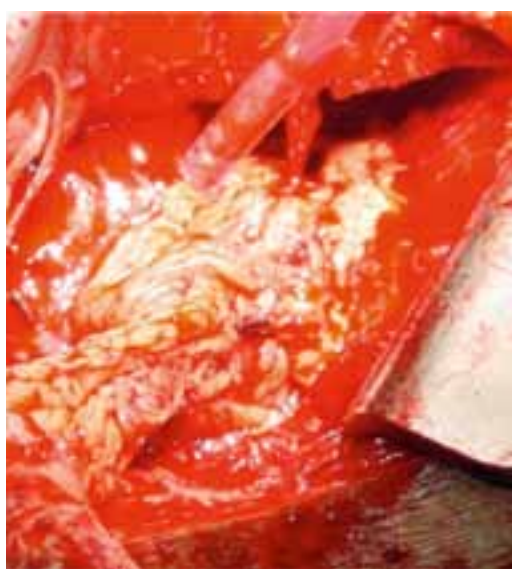
Decortication



Broncho pleural fistula



Omental closure



Arrhythmia I 08:15 **Hall F2**

Thoracoscopic stand-alone left-appendage amputation in long-standing non-valvular atrial fibrillation

Toshiya Ohtsuka, Mikio Ninomiya, Takahiro Nonaka, Motoyuki Hisagi. *Tokyo Metropolitan Tama Medical Center, Tokyo Japan.*

Objective

We retrospectively evaluated thoracoscopic stand-alone left-atrial appendage (LAA) amputation performed in selected non-valvular atrial fibrillation (NVAF) patients.

Methods

Thoracoscopic stand-alone LAA amputation and the subsequent anticoagulation-less follow-up was offered to the patients with ablation-refractory NVAF who had been at a high risk of thromboembolisms though intolerant of systemic anticoagulation therapy. In the right recumbent position, the LAA was via for ports (Fig. 1) amputated (Fig. 2) under thoracoscopic and transesophageal-echocardiographic guidance, employing a cut-and-staple device (EZ45G Endoscopic Linear Cutter, Ethicon Endo-Surgery, Cincinnati, OH, USA). With Patients' consent, three-dimensional enhanced computed tomography of the left atrium was taken three months after surgery to evaluate completeness of the amputation. Plasma atrial natriuretic peptide concentration was examined and the quality of life was assessed by the Japanese version of the EQ-5D preoperatively and one-year-postoperatively.

Results

Patients

Starting in 2009, 60 long-standing NVAF patients (37 men and 23 women, mean age: 74.0 years, mean CHA2DS2-Vasc score: 4.4) were treated and followed up. Forty-three had had previous thromboembolisms, 31 had experienced anticoagulation-related hemorrhagic events (cerebral in three, esophageal or gastro-intestinal in 28) and seven patients had had impaired renal functions. Anticoagulation was intolerable or difficult in all the patients. The major cause was hemorrhagic side effects (cerebral bleeding in three, esophageal or gastro-intestinal bleeding in 28). One male patient chose the LAA amputation because he suffered transient ischemic attacks immediately after warfarin was reduced to prepare for an oncological treatment, which had been therefore deferred. Eight patients had been put on aspirin to care concomitant arteriosclerotic diseases: arteriosclerosis obliterans in the leg in three, left vertebral artery stenosis in one, carotid endarterectomy in two, mid-cerebral artery revascularization in one, and coronary artery bypass grafting in one.

Surgery

The operation (mean operative time: 38 min, conversion to mini-thoracotomy in four patients) caused no mortality and no major complications. Intraoperative transesophageal echocardiography visualized a spontaneous echo contrast in 51 LAAs and successfully navigated complete resection of the LAA (Fig. 3).

Follow-up

Three-month-postoperative three-dimensional enhanced computed tomography was obtained from 24 patients and confirmed complete LAA closure. During the follow-up period (mean: 20 ± 12 months, range: one to 51 months), despite discontinued anticoagulation, none developed thromboembolic symptom and necessitated re-anticoagulation. Four patients died of malignant diseases. The plasma atrial natriuretic peptide was significantly reduced (p=.007) by 25.1% on average, 38.5% the greatest drop, but none developed heart failure postoperatively. The mean quality-of-life score significantly went up from 0.676 to 0.739 (p=.008).

Toshiya Ohtsuka

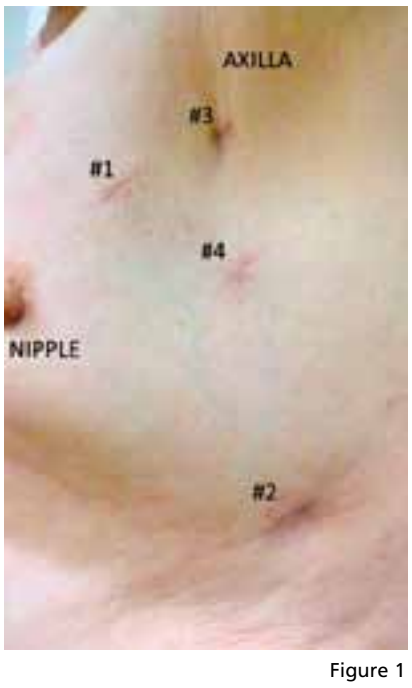


Figure 1

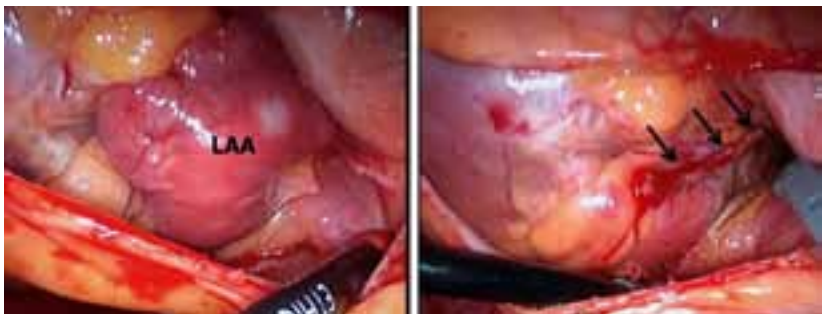


Figure 2

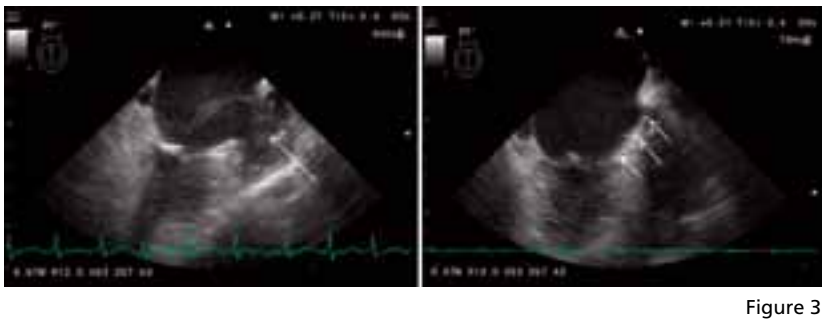


Figure 3

Conclusions

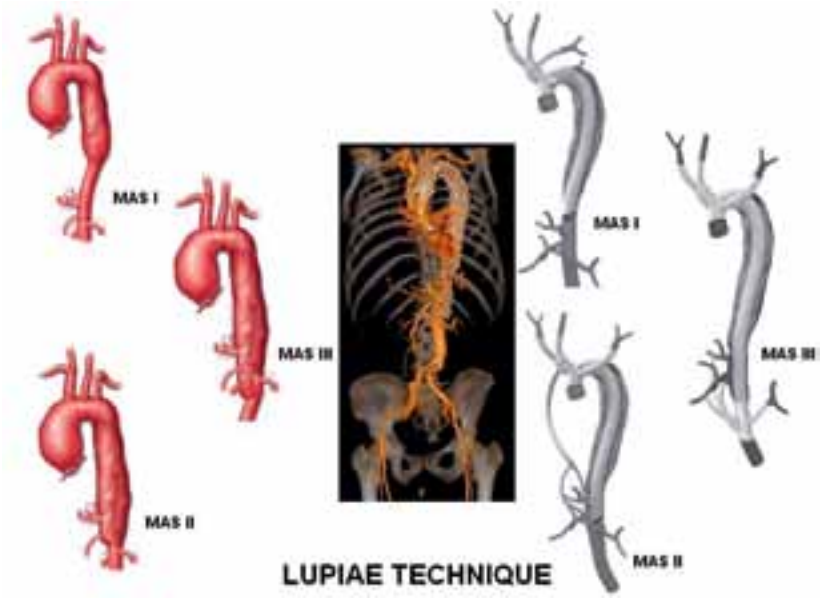
Thoracoscopic stand-alone LAA amputation is simply, safely and completely achievable, employing our technique. Although plasma atrial natriuretic peptide drops, the early clinical outcomes suggest that this should become a viable option to prevent thromboembolisms in the selected NVAF patients, allowing them to quit anticoagulation and improve the quality of life.

Proximal aortic surgery – extending to the descending aorta 14:15 Hall G

Hybrid multi-step approach to Mega Aortic Syndrome: the Lupiae technique

Giampiero Esposito *Humanitas Gavazzeni Clinic, Bergamo, Italy.*

Mega Aortic Syndrome (MAS) can be defined as an extensive aneurismal dilatation of the ascending aorta, arch and thoracoabdominal aorta. The incidence of MAS is 2.2 to 10 per 100,000 and the five-years mortality is 100% if MAS is not treated. The most common ethiologies for MAS are myxomatous degeneration of the aortic wall and cystic medial necrosis. In addition patients with Marfan syndrome or chronic aortic dissection with expanded false lumen can be included in this definition. Several classic surgical techniques have been described for treatment of MAS but the incidence of mortality and morbidity (stroke, spinal cord injury, renal and visceral ischemia) remains high. In the last ten years hybrid surgery has been proposed as a viable alternative to traditional surgery with encouraging data in terms of mortality and morbidity. We present the mid-term results of our original hybrid multi-step technique (Lupiae Technique) to treat patients with this MAS. From November 2005 to November 2012 one hundred-eighteen patients with MAS underwent surgical repair of thoracic and thoraco-abdominal aneurysms with Lupiae technique. 55 patients presented chronic aneurysms and 63 patients with Type A acute dissection. 83 patients underwent ascending aorta and arch replacement with a Multibranched Dacron Graft prosthesis plus epiaortic vessels re-routing (Thoracic Lupiae Procedure). 20 patients had the Thoracic Lupiae Procedure plus partial visceral debranching (coeliac trunk and superior mesenteric artery) through a partial laparotomy in the same surgical step. 15 patients underwent firstly Thoracic Lupiae procedure followed by a second laparotomic surgical stage with complete visceral debranching (coeliac trunk, superior mesenteric artery and renal arteries) and abdominal aorta replacement using a Custom Made Multibranched Dacron graft prosthesis. All survived patients with chronic aneurysms and 34/63 patients with Type A dissections underwent after one to two months to endovascular stentgrafts implantation to exclude the residual segment of diseased aorta. In-hospital mortality was 8.4%. No patients had stroke or spinal chord injury. The incidence of temporary renal failure was

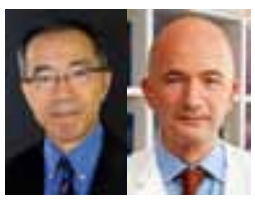


5.0%. No patients presented endoleaks immediately and at follow-up CT scans the patency of epiaortic and visceral by-pass was 99.8%. Seven years follow-up demonstrate a 2.7% (three patients) mortality. These mid-term results showed that the Multi-step Lupiae hybrid technique is a safe and effective option for the treatment of patients with MAS, achieving the complete exclusion of thoraco-abdominal aneurysms with a low risk of paraplegia and endoleaks.

Reflections on aortic valve repair 14:15 Hall E2

Long-term outcome of valve-preserving root replacement for patients with aortic dissection: a propensity score-matched analysis

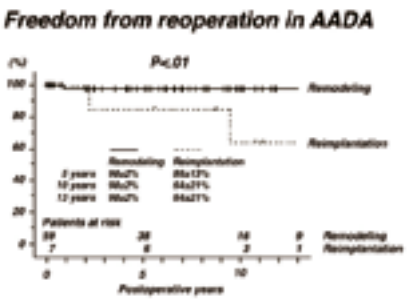
Takashi Kunihar and Hans-Joachim Schäfers *University Hospital of Saarland, Homburg, Germany*



Acute aortic dissection type A (AADA) frequently involves aortic root with or without aortic valve regurgitation (AR). The Bentall operation has become standard for root replacement in patients with connective tissue disease or preexisting root dilatation. It implies, however, lifelong need for anticoagulation and the risk of potential valve-related complications. Valve-preserving root replacement is thus increasingly used in AADA. We have applied both root remodeling and valve reimplantation in AADA and compared the long-term results of the two techniques for patients with or without AADA.

Since 1995, 762 patients underwent valve-preserving root replacement, of whom 66 patients with AADA (< 2 weeks from onset, 55±17 years, 53 male) underwent either remodeling (n=59) or reimplantation (n=7). Initially remodeling was chosen for dilated roots and preserved aortoventricular junction (< 29mm), and reimplantation in dilated aortoventricular junction. Since 2008 all individuals underwent remodeling. A control group of patients with valve-preserving root replacement in stable aneurysm (n=66) war generated using propensity score matching. Pre- and intraoperative patient's characteristics were comparable between the groups except longer duration of the procedure in the AADA patients.

Re-exploration for bleeding was 15% in the AADA patients and 11% in the control patients (P=.44). Early mortality was 7.7% in the AADA patients (2.9% since 2002) and 1.5% in the control patients (P=0.09). Actuarial survival at 13 years of the AADA patients (66±7%) was significantly lower than that of the control patients (87±5%) (P=0.02). When early deaths were excluded, there was no significant difference (71±7% vs. 88±5%, P=0.10). Freedom from AR≥II° at 13 years was lower in the AADA patients (78±8%) compared with the control patients (88±5%) (P=0.27). Freedom from reoperation at 13 years was similar (AADA: 92±5%, control: 87±6%,



P=0.83). All of the initial operations of reoperated patients were performed before 2004, when the effective height was measured routinely. Analyzing only the AADA patients, duration of myocardial ischemia was significantly shorter in remodeling (95±25 min) than in reimplantation (125±17 min) (P<.01). Reimplantation was associated with inferior late valve stability at 13 years compared to remodeling (AR≥II°: 64±21% vs. 80±9%, P=0.07, reoperation: 64±21% vs. 98±2%, P<0.01, respectively). Multivariate Cox's proportional hazard's model could not identify an independent predictor for late AR≥II° or reoperation

In 2000 we published our experience of valve-preserving root replacement for AADA and found improved mid-term stability of aortic valve function without an increased operative risk. Meanwhile only limited reports with regard to valve-preserving root replacement for AADA have been available with contradictory findings because of the small number of patients, the limited follow-up period, different surgical strategies, and the absence of a control group. With adequate volume and follow-up of patients and appropriate statistical analysis we could clearly show that valve-preserving root replacement could provide similar quality of valve stability for the AADA patients compared to the non-AADA patients without an increased operative risk. Reimplantation required longer myocardial ischemia without a benefit of improved valve and root stability, which seems consistent with our previous report with a total of 430 patients (14.2% was AADA patients).

Experimental session – from bench to bedside 16:15 Hall G

Anatomical and computational variables to track the clinical evolution of Type B aortic dissections

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Introduction

Management of type B aortic dissection remains medical unless complications such as unremitting pain, malperfusion, and aneurismal evolution occur. Analysis of aortic anatomical and rheological variables may help stratifying patients into risk groups and guide prompt treatment. In patients with patent false lumen (FL), baseline imaging variables are related to complex hemodynamic variables such as flow patterns in the true and false lumina and intraluminal pressure. We aimed at identifying any anatomical predictor of dissection hemodynamics and clinical events in patients with type B aortic dissection and patent false lumen.

Methods

Computational analysis was performed starting from the admission and follow-up thoraco-abdominal contrasted CT scans. Three-dimensional geometry was reconstructed from each patient's CT images and semi-automatic threshold-based segmentation of the aortic lumen from the ascending aorta, through the aortic arch and supra-aortic vessels, ending at iliac bifurcation was performed. Multiple re-entry tears were reconstructed in the 3D aortic models. The following imaging variables were assessed by two readers: entry tear size, entry tear location, number and size of re-entry tears, true and false lumen sizes and ratio, and aortic size at different levels. After 3D aortic reconstruction, a computational mesh was created by discretization of the aortic domain into a set of small elements to evaluate flow features in dissected aortas. FL pressure index [(FL pressure/TL pressure) x 100] and FL flow rate [(FL flow/TL flow+FL flow) x 100] were computed.

Results

We evaluated 26 patients with type B aortic dissection and patent false lumen. Of these, 7 (27%) developed acute complications during the hospitalization. Nine (35%) patients developed thoracic aneurysm at mid-term follow-up and 10 (38.4%) were uncomplicated. No mortality was reported. At univariate analysis, FL flow was strongly related to entry tear location and size. Multivariate analysis showed that entry tear height was the sole independent determinant of FL flow (P=0.046; OR=1.180; 95% CI: 0.023-2.338). When analyzing occurrence of clinical events, reduced TL area was the only independent determinant of acute complications (P=0.034; OR=0.971; 95% CI: 0.095-0.1). Additionally, increased FL area was the sole independent determinant of chronic aneurismal evolution (P=0.016; OR=1.006; 95% CI: 0.945-0.998).

Comments

The importance of entry tear size in patients with type B aortic dissection can be explained by computationally-derived hemodynamic variables. The greater is the proximal entry tear, the higher is the chance the FL will remain patent and perfused with high flow, independently by other anatomical variables. This condition may lead to acute collapse of the TL or aneurismal evolution of the FL. When FL perfusion persists, the anatomical variables that seem to be more significantly related to clinical evolution are TL and FL size. In particular, small minimal TL area and large FL area at time of diagnosis are predictors for acute complications and aneurismal evolution at follow-up.

Conclusion

Hemodynamic variables such as FL flow %, derived by computational analysis, and anatomical variables, such as entry tear height, TL area, and FL area, derived by CT imaging reconstruction at time of diagnosis of type B aortic dissection, should be considered simultaneously for risk stratification and optimization of intervention timing.

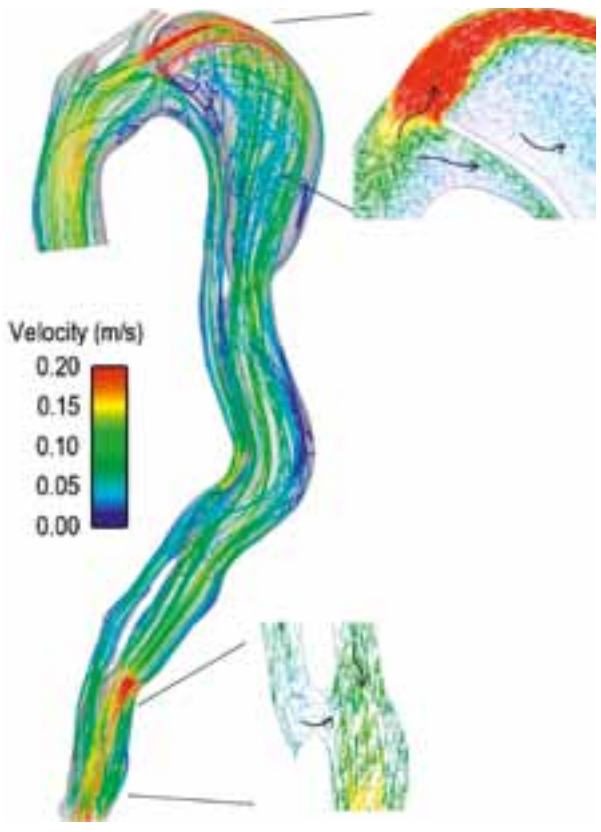


Figure 1 Velocity streamlines of high blood flow over one cardiac cycle in a representative patient with Type B AoD complicated in aneurysm evolution.

Continued from page 22

Abstracts

10:15 Thoracic experimental
Hall P
Moderators: R. Schmid, Berne; T. Walles, Wuerzburg;

Learning objectives
- Translational research in thoracic surgery.
- To discuss laboratory research to clinical application.

10:15 **A new strategy in the treatment of chemoresistant lung adenocarcinoma via siRNA specific silencing of SRF, E2F1, SURVIVIN, HIF and STAT 3** *M. G. Stoleriu* *Discussant: T. Walles*

10:30 **Can sympathetic nerve damage be reversed?** *M. Erol* *Discussant: G. Rocco*

10:45 **Transfected autologous fibroblasts on an acellular dermal scaffold proliferate in host bronchial tissue and enhance bronchial anastomotic healing in a rodent model** *E. Roessner* *Discussant: G. Kocher*

11:00 **Mesenchymal stem cells in the treatment of chronic fistula of the main bronchus** *I. Polyakov* *Discussant: H. J. Ankersmit*

11:15 **Significant increase in circulating tumour cells in pulmonary venous blood during surgical manipulation in patients with primary lung cancer** *M. Hashimoto* *Discussant: G. Friedel*

11:30 **Human isolated perfused lung models demonstrate compensation of pulmonary vasoconstriction in response to reoxygenation** *P. Ariyaratnam* *Discussant: K. Hotzenecke*

Focus Session

10:15 Work-in-progress abstract session
Room 1
Moderators: M. Siepe, Freiburg; A. Sihoe, Kowloon

Learning objectives
- Residents can present the projects that are working on and ask the audience for cooperation.

See page 47 for programme details

The Presidential Address

11:50 Talent or Training
Hall D
J. L. Pomar, Barcelona

Abstracts

14:15 Chest wall
Hall I
Moderators: H. K. Pilegaard, Aarhus; M. Yuksel, Istanbul

14:15 **Primary chest wall chondrosarcomas: results of surgical resection and analysis of prognostic factors** *G. Marulli* *Discussant: E. Fadel*

14:30 **Minimally invasive repair of pectus carinatum** *M. Yuksel* *Discussant: tba*

14:45 **Management of malignant chest wall tumours: a multidisciplinary approach improves outcomes** *V. Rogers* *Discussant: tba*

15:00 **Rib tumours: a 15-year experience** *T. Sakellaridis* *Discussant: tba*

15:15 **Treatment alternatives for traumatic rib fractures: comparison of operative fixation and conservative approach** *A. Balci* *Discussant: M. Samano*

15:30 **Chest wall tumours and prosthetic reconstruction: a comparative analysis of functional outcome** *G. Leuzzi* *Discussant: F. Rea*

14:15 Mediastinum
Hall P
Moderators: E. A. Rendina, Rome; M. Zielinski, Zakopane

14:15 **Thymectomy in myasthenia gravis: proposal for a predictive score of postoperative myasthenic crisis** *S. Margaritora* *Discussant: M. Lucchi*

14:30 **Comparison between trans-sternal and video-assisted thoracoscopic thymectomy for thymoma** *I. Manoly* *Discussant: G. Marulli*

14:45 **18-fluorine fluorodeoxyglucose positron emission tomography in the pretreatment evaluation of thymic epithelial neoplasms: a "metabolic biopsy" confirmed by Ki-67 expression** *A. Viti* *Discussant: K. Athanassiadi*

Continued on page 36

Surgery for prognosis – Part I, mitral valve disease 10:15 Hall E1

Perfusion strategies in minimally invasive mitral surgery

Paul Modi
Liverpool Heart and Chest Hospital, Liverpool, UK.

Perfusion strategies, in particular direct aortic antegrade vs retrograde femoral arterial, during minimally invasive mitral surgery and whether the retrograde approach is associated with a higher stroke rate is a hot topic at the moment. In 2010, things weren't looking great for mini mitral surgery when Dr J Gammie's Chamberlain memorial paper published in the Annals compared 24000 sternotomy mitral procedures to 4000 less-invasive ones from the STS database and concluded that the risk of stroke was 1.96x higher for a mini mitral. However, this was an imperfect offering for two reasons - it used femoral cannulation as a surrogate for less-invasive mitral surgery and, in an operation that has a learning curve of 75-125 procedures with better results in surgeons who do at least two cases per week, the median number of cases per year in the participating US centres was only 3.

This was followed up in 2011 by the ISMICS consensus statement on minimally invasive versus open mitral surgery which reported a similar increase in risk of stroke by 1.79x for mini mitral surgery. However, this meta-analysis was largely based on observational studies with potential confounding from baseline differences and little to no data on the use of CO2 insufflation or pre-operative aortic screening. The difference also seemed to be driven by a higher stroke rate in the endoclamp group but due to a lack of heterogeneity it was not possible to conclude this. An earlier meta-analysis by Modi et al from 2008 published in EJCTS actually suggested no difference in stroke rate between the two perfusion techniques.

However, is this a case of where there's smoke there's fire? The following year saw a string of publications from groups that had used both techniques and evolved from retrograde to antegrade perfusion. The New York University group came up with two important papers, first in 2011 concluding that retrograde perfusion was a risk factor for neurological events in a heterogeneous group of patients but only in patients older than 50 years of age; and then in 2012 they drilled down into the retrograde group for primary mitral repairs and found that only high-risk patients with aortic disease had an increased risk of stroke. In 2013, Mattia Glauber's group suggested that the risk of stroke with retrograde perfusion was higher than previously published, with a 4.28x increase in risk.

So what is the answer, is retrograde perfusion bad? Well, given the data, one would have to conclude that it probably is in the severely atherosclerotic aorta, which makes sense really. But, as the risk factors for degenerative mitral valve disease are mostly different from those of atherosclerosis, this is probably relatively few patients. Those patients with risk factors for atherosclerosis should have screening of the descending thoracic aorta with TOE and ascending/abdominal aorta/iliofemoral system with CT. Whether mural calcification alone in the descending aorta increases the stroke risk with retrograde perfusion is unknown, whereas clearly intraluminal debris will do. Thus, assuming patients with significant aortic atherosclerotic disease are identified and perfused antegradely, there is no evidence in my opinion that retrograde perfusion alone leads to higher stroke rates.

Complications: Escape routes I 16:15 Hall H

Saphenous Vein Graft Aneurysms: A growing complication?

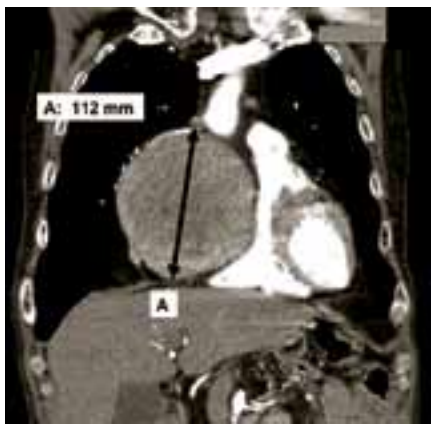
Alicja Zientara *Department Cardiac Surgery, Triemli City Hospital Zurich, Switzerland*

Saphenous vein graft aneurysms (SVGAs) are a rare complication after coronary artery bypass grafting (CABG) and occur predominantly 10-20 years after the procedure at an estimated rate of <1%. The precise incidence remains difficult to define because of the asymptomatic appearance. Ramirez et al. found out that although the first SVGA case was reported in 1975, more than one third of available reports were published after 2005. This increased reporting in recent years could be explained by higher life expectancy of CABG patients and increasing use of diagnostics like CT scan.

Regarding the etiology different mechanisms including atherosclerotic degeneration, vessel wall ischemia and changes in wall stress after the transposition of the vein into arterial circulation are discussed. The size of the aneurysm correlates with adverse events like mechanical complications.

In a short period of time we operated two patients with giant SVGAs as incidental findings on the CT scan. Both underwent a CABG 18 years before and had comparable cardiovascular risk factors.

To decrease the risk of massive hemorrhage upon sternotomy we cannulated the right subclavian artery and right femoral vein in both patients. The first patients' operation was planned as an off-pump CABG. Upon surgical entry the aneurysm (98x104mm) ruptured which led to the decision of continuing the operation as an on-pump beating-heart procedure.



SVGA

Both cases should raise the awareness of this uncommon complication. As a consequence of a better follow-up, a longer life expectancy and the increasing use of diagnostic investigations a growing number of patients with SVGAs and their complications will continue to be identified and treated what emphasizes the presence and importance of the topic. Although, with the development of percutaneous techniques and endovascular approaches and without a consensus on the optimal therapy, our experience shows that the surgical management of SVGAs can be savely performed by means of CPB reducing the risk of hemorrhage, especially in case of giant SVGAs compressing further structures. The question about a treatment algorithm including the surgical strategy, indication for operation and follow-up, might be answered by ageing population and improved survival of CABG patients.


Alicja Zientara

Aortic disease in infancy and adulthood 08:15 Hall G

Bicuspid aortic syndrome

Ruggero De Paulis *European Hospital, Rome, Italy*

Bicuspid aortic valve (BAV) is a common congenital heart abnormality affecting 0.5% to 2% of the population. Central to the pathology of a BAV is the malformation of the commissures and the adjacent parts of the two corresponding cusps forming a raphe. However, it is now clear that BAV should not be considered an isolated finding. In fact, with bicuspid aortic syndrome we tend to identify a series of malformation in the normal development of the aortic valve, aortic root, and ascending aorta sometimes involving the aortic arch. For a long time the attention has been focused just on the typical malformation of the aortic valve while the aortic dilation was considered an associated disease just like the one sometimes present with the tricuspid valve. However, with time the incidence of this association along with the characteristic histology of the aortic wall have definitely indicated that the aortic dilatation is part of the disease and require a special attention as well as a different type of approach in term of surgical timing and treatment. Indeed bicuspid aortic valve is often associated not only with aortic dilatation but with various anatomical findings like dissection, cystic medial necrosis and coartation. In some aspects, abnormalities in the wall of the ascending aorta seem to resemble the same kind of degenerative changes that occur in patients with Marfan syndrome and are almost always present in patients with coartation of the aorta.

Bicuspid aortic is associated with aortic enlargement in 50% of individuals. The etiology of the concomitant aortopathy is controversial; there is an "hemodynamic hypothesis" where the altered blood flow across the valve might be considered the direct cause of aortic enlargement (possibly by flow-induced activation ofmmPs), in part explaining the different sites of aortic dilatation depending on the type of bicuspid malformation (no, 1 or 2 raphe) or on the different orientation of the valve opening; and there is a "genetic hypothesis" supported by the evidence that aortic enlargement may be already present at an younger age, that dissection may occur at smaller diameters, that exist family clusters and some mutation in specific genes. Without going too much into details it is clear that both etiologies play a role and our efforts should be focused in identifying those subgroups at higher risk. In fact, although concomitant repair of the ascending aorta is a relatively safe procedure, it still carries a 2.7 times higher risk as reported in the STS database.

The type of aortopathy also plays a role and is therefore important to distinguish those having a proportional higher risk. As an example, a predominant involvement of the aortic root (cluster III) might require an approach similar to Marfan patient with a more radical and earlier surgical treatment. Furthermore, given a different involvement of the root in the various aortic clusters, the question remains when and how the root should be replaced. In the cluster I where the tubular aorta is typically dilated and the ST junction is preserved, there is evidence that is safe not to replace the root if is maximal diameter is less than 45mm. However, in those situations where the dilated ascending aorta involves the ST junction and enters the root (cluster II) a more aggressive approach, whether a substitution of the NC sinus or of the whole root is justified. It goes without saying that the Bentall procedure is the choice in case of valve stenosis while valve-sparing procedures are increasingly performed in the presence of a normal functioning or a regurgitant valve.

Recognition of the key elements in this BAV aortopathy syndrome of having a hemodynamically normal bicuspid aortic valve and an enlarged ascending aorta should lead to a more careful evaluation of the aorta irrespective of bicuspid aortic valve stenosis or regurgitation severity.

Thoracic Experimental 10:15 Hall P

Significant increase in circulating tumor cells in pulmonary venous blood during surgical manipulation in patients with primary lung cancer

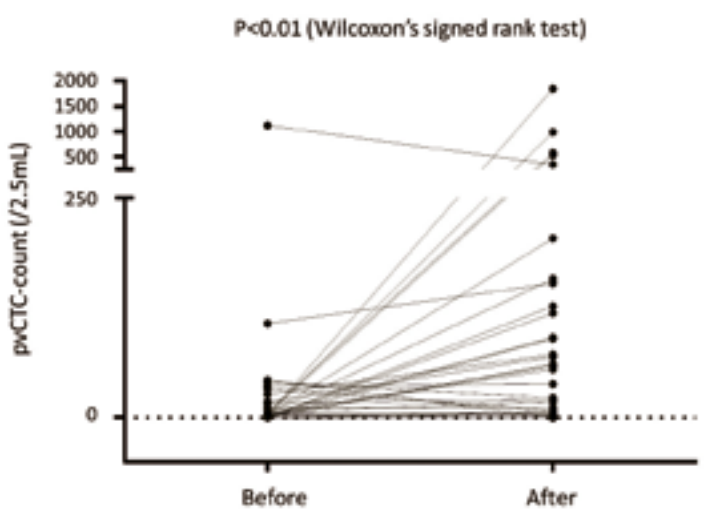
Masaki Hashimoto[1], Fumihiro Tanaka[2], Kazue Yoneda[1], Teruhisa Takuwa1, Seiji Matsumoto[1], Yoshitomo Okumura[3], Nobuyuki Kondo[1], Seiki Hasegawa[1]
1, Department of Thoracic Surgery, Hyogo College of Medicine, Nishinomiya, Japan; 2, Department of Surgery (Chest Surgery), University of Occupational and Environmental Health, Kitakyusyu, Japan; 3, Itami City Hospital, Itami, Japan

Does the surgical manipulation accelerate spillage of tumor cell in primary lung cancer? According to previous our studies (Okumura Y, et al. *Ann Thorac Surg* 2009; Tanaka F, et al. Clin Cancer Res 2009), we showed a large numbers of Circulating Tumor Cells (CTCs) were detected in drainage pulmonary venous blood of most patients with resectable primary lung cancer. A large number of tumor cells originating from the primary tumor may pass through the drainage pulmonary vein (PV) and it may develop distant metastases. We conducted the prospective study to assess changes in CTCs in drainage pulmonary vein (PV) during lung cancer surgery.

A total of 30 consecutive peripheral-type primary lung cancer patients who underwent lobectomy under thoracotomy were included. For each patient, 2.5mL blood was sampled from the lobar PV of primary tumor site before and after surgical manipulation for lobectomy. CTCs were quantitatively examined with the CellSearch system.

Before surgical manipulation, CTCs were detected in PV blood in the majority of patients (22/30, 73%), although CTCs were detected in the peripheral blood in only two patients (7%). The median number of CTCs in PV before surgical manipulation (prePV-CTCs) was 4.0 cells/2.5mL, and there was no significant correlation between prePV-CTCs and any clinic-pathological characteristic including tumor size, progression or histologic type.

After surgical manipulation, that is at the time of completion of lobectomy, PV-CTCs significantly increased (median postPV-CTCs, 60.0; P<0.001). Increase in postPV-CTCs was associated with microscopic lymphatic tumor invasion; PV-CTCs count significantly increased for tumor with positive lymphatic invasion (pre and postPV-CTCs, 4.0 and 90.5, respectively; P=0.006), but not for tumor without lymphatic invasion (pre and postPV-CTCs, 3.5 and 7.0, respectively). The increase in pvCTC-count was not significantly associated with any other clinico-pathological factor including histology, primary tumor site, or nodal status.In the sequence of vessel interruption (PAβPV or PVβPA), pvCTC-count increased regardless of the sequence of vessel interruption, but the increase was significant in PA-first patients but not in PV-first patients




Masaki Hashimoto

In conclusion, we first showed a direct evidence of significant increase in tumor cells in drainage PV during lobectomy for lung cancer, suggesting that spillage of tumor cells can be accelerated by surgical manipulation. The clinical significance of the presence of tumor cells in PV blood and of the significant increase in tumor cells in PV blood during surgery remains unclear, which should be assessed by long-term follow-up of patients included in the present study. Furthermore, the clinical impact of the sequence of vessel interruption during lobectomy should be evaluated in future randomized studies.

Experimental session – from bench to bedside 16:15 Hall G

Stem cell therapy for the treatment of aortic aneurysm in mice

Narita Y, Yamawaki-OgataA, Fu X-M, Araki Y, Oshima H, Usui A. *Nagoya UniversityGraduate School of Medicine, Japan*

Objectives

Aortic aneurysm (AA) is a silent but progressive life-threatening disease involves rupture. It develops on the background of aging, atherosclerosis and chronic inflammation. Surgical repair is effective treatment for prevention of rupture. However, the surgery for thoracic and thoraco-abdominal AA is still invasive associated with high mortality and morbidity. So we have to improve surgical strategy and investigate alternative treatment. Recently, molecular pathology of AA is getting clarified, and control of the chronic inflammation is crucial for AA development. Meanwhile, the mesenchymal stem cell (MSC), can be obtained from adult population, has a potential to accumulate into


Yuji Narita

the site of injured tissue, as well as, potential of immunosuppression and anti-inflammation. Therefore we hypothesized that the MSC can regulate AA development. We have previously reported that bone marrow derived (BM-) MSC would be an effective therapeutic tool for prevention of AA development. This study is the first report for treatment of atherosclerotic already-formed AA by intravenous injection of BM-MSCs in mouse.

Methods

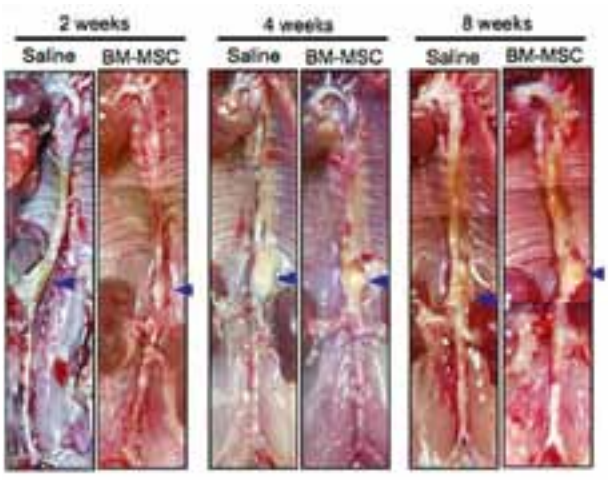
Aged (6-8M) apolipoprotein E deficient mice were induced with AA by angiotensin II (ATII)-infusion through subcutaneous osmotic mini-pumps. After 28 days, 1 × 106 BM-MSCs (in 0.2 mL saline) or 0.2 mL saline was injected via tail vein. Mice were sacrificed and aortic tissues were evaluated two, four and eight weeks after injection, respectively.

Results

Diameters of infradiaphragmatic aorta were expanded by ATII-infusion at day 28. After treatment, the BM-MSC group's incidence of AA reduced at 2 weeks (BM-MSC 40% vs saline 100%, P < 0.05), and aortic diameter reduced at 2 and 4 weeks (two weeks; 1.40 vs 2.29mm, P < 0.001, four weeks; 1.73 vs 2.32mm, P < 0.05), respectively. The enzymatic activity of matrix metalloproteinases (MMPs) reduced in the BM-MSC group at two weeks in the following manner: active-MMP-2: 0.28 vs 0.45 unit/mL, P < 0.05; and active-MMP-9: 0.16 vs 0.34 unit/mL, P < 0.05. The BM-MSC group inhibited infiltration of F4/80 positive M1 macrophages into the aortic wall, and preserved destruction and degradation of medial elastin lamellae. Inflammatory cytokines were down-regulated in the BM-MSC group at two and four weeks (IL-6: 2 weeks; 1475.6 vs 3399.5 pg/mL, P < 0.05, 4 weeks; 2184.7 vs 3712.8 pg/mL, P < 0.05, MCP-1: 2 weeks; 208.0 vs 352.7 pg/mL, P < 0.05), and those for IGF-1 and TIMP-2 were up-regulated in the BM-MSC group at 2 weeks (IGF-1: 4.7 vs 2.0 ng/mL, P < 0.05; TIMP-2: 9.5 vs 4.0 ng/mL, P < 0.001).

Conclusion

The BM-MSC-treated mice were associated with regression of AA at two weeks, suggesting that BM-MSC intravenous injection might be a new nonsurgical therapeutic strategy for preventing rupture and treatment of AA.



Caption

Establishing institutional TAVI service: "The Berlin structured educational training program"

Miralem Pasic
Deutsches Herzzentrum Berlin, Berlin, Germany

The institutional learning curve of the TAVI program is a very sensitive phase. However, the experience from the Deutsches Herzzentrum Berlin showed that TAVI can be introduced into clinical practice without increased morbidity and mortality rate during the learning curve. They started a program in April 2008 using different approaches, primarily transfemoral and transapical delivery systems using balloon-expandable bovine pericardial tissue tranascatheter heart valves. The outcome of transapical aortic valve implantation was very favourable and already reproducible during the learning curve. The overall 30-day mortality rate in their first consecutive 500 patients undergoing transapical TAVI was 4.6% and was 4.0% for patients without cardiogenic shock. Throughout the study period, no significant change was seen in the 30-day mortality rate and no difference in survival rate when stratified by surgeon. They established the program and trained the team according to their structured educational training program.

"The Berlin program" is an institutional structured educational training program from The Deutsches Herzzentrum Berlin that enables implementation of a new procedure – such as TAVI – into clinical practice without increased morbidity and mortality rates during the learning curve. The Berlin program may also be used as a basis for any new device introduction into clinical practice. It was developed by a senior team member (Professor Miralem Pasic) commissioned to introduce and establish TAVI at Deutsches Herzzentrum Berlin. The program consists of four main parts: general principles, team building, team education and training, and institutional clinical and procedural policies. Coordination between the members of the team (cardiologists, anaesthesiologists, surgeons) was made uniform and standardized for the procedure, with clearly defined roles for each member. Standard commands and standard steps for new, unexpected situations were established.

After every implantation, the whole team analyzed the course of the procedure and complications, and identified possible weak points of the procedure. The program also includes several control mechanisms, eg, occasional external proctoring. Additionally, following a chain of steps spontaneously generates further procedural improvements and optimizes the overall outcome. The program has also had a global positive effect on the local institutional environment, awaking awareness of existing latent conditions and active failures, identifying them and inducing their correction, which has led to general clinical improvement.

The members of the Berlin-TAVI team believe that their favourable results already achieved during the learning curve are mostly the result of training the team to work together before starting the clinical program. This resulted in the creation of strict procedural standards at the begining of the program. Their extensive experience was reported in 40 peer-review publications and the analyses of their first consecutive 500 transapical procedures and the precise description of the program was recently published in two articles in the JTCVS[1,2]


Miralem Pasic and the TAVI team

References

1. Pasic M, Unbehaun A, Dreysse S, Buz S, Drews T, Kukucka M, Mladenow A, D'Ancona G, Hetzer R, Seifert B. Introducing trans-apical aortic valve implantation (part 1): effect of a structured training program on clinical outcome in a series of 500 procedures. J Thorac Cardiovasc Surg 2013;145:911-8.

2. Pasic M, Unbehaun A, Dreysse S, Buz S, Drews T, Kukucka M, Mladenow A, Hetzer R, D'Ancona G. Introducing transapical aortic valve implantation (part 2): institutional structured training program. J Thorac Cardiovasc Surg 2013;145:919-25.

Continued from page 34

15:00 **Is sacrificing the phrenic nerve during thymoma resection worthwhile?** *S. Hamdi*
Discussant: R. Schmid

15:15 **Transcervical thymectomy with partial sternal split in the treatment of myasthenia gravis** *A. Oliaro*
Discussant: D. Subotic

15:30 **Treatment strategies in the management of severe complications following slide tracheoplasty in children** *J. L. Anton-Pacheco*
Discussant: D. Mathisen

16:15 **Non-oncology II**
Hall I
Moderators: G. Rocco, Naples; W. Weder, Zurich

16:15 **Uniportal thoracoscopic bullectomy for recurrent primary spontaneous pneumothorax: is uniportal surgery without the use of special devices feasible?** *S. H. Kim*
Discussant: G. Rocco

16:30 **An emphysema multidisciplinary team is an integral part of a successful lung volume reduction surgery programme** *I. Oey*
Discussant: P. van Schil

16:45 **The usefulness of three-dimensional computed tomography simulation for port-access thoracoscopic surgery in children and adolescents** *H. Kato*
Discussant: tba

17:00 **Inception of a full robotic, totally endoscopic thoracic surgery programme in a European unit and initial results** *J. Baste*
Discussant: F. Melfi

17:15 **Extracorporeal membrane oxygenator support for complex tracheobronchial procedures** *G. Lang*
Discussant: H. J. Ankersmit

17:30 **Pulmonary hypoplasia** *T. Eshmuratov*
Discussant: D. Mathisen

Congenital

Focus Session

08:15 **Aortic disease in infancy and adulthood**
Hall G
Moderators: W. Brawn, Birmingham; M. Czerny, Zurich

Learning objectives
- Towards a better understanding of cause and effect in aortic disease in different periods of life.

08:15 **Embryogenesis of the aorta – normal and abnormal developmental patterns** *A. Gittenberger-de Groot*

08:35 **Abnormalities of the aortic root and their management** *J. Pepper*

08:55 **Bicuspid aortic valve syndrome** *R. De Paulis*

09:15 **Management of the adult with coarctation and recoarctation** *T. Resch*

09:35 **Conclusion**

Professional Development

08:15 **Leadership**
Room 33
Faculty: G. Kitchingman, London; P. Newman, London

See page 41 for programme details

08:15 **Non-technical skills for surgeons**
Room 1
Faculty: S. Paterson-Brown, N. Maran; Edinburgh

See page 42 for programme details

Abstracts

10:15 **The univentricular heart**
Hall K
Moderators: A. Amadeo, Rome; D. Anderson, London

10:15 **Older age at the time of the Norwood procedure is a risk factor for early postoperative mortality** *E. Sames-Dolzer*
Discussant: T. Jones

10:30 **Worse early and late outcomes for hypoplastic left heart syndrome after the extracardiac conduit Fontan procedure in the Australia and New Zealand populations** *A. Iyengar*
Discussant: R. Ohye

10:45 **Improving early outcomes following the hybrid procedure for high-risk hypoplastic left heart syndrome: defining risk factors** *C. Pizarro*
Discussant: D. Anderson, London

11:00 **Does forward pulmonary blood flow influence the outcomes of the bidirectional Glenn procedure?** *Q. Chen*
Discussant: L. Galletti

11:15 **Management of early Fontan failure: a single-institution experience** *M. Murphy*
Discussant: T. Ebels

Continued on page 38

Ventricular remodelling 14:15 Hall F1

Non-heart transplant surgical approaches with left ventricular restoration and mitral valve operation for advanced ischaemic cardiomyopathy

Y Cho, S Shimura, A Aki, H Furuya, S Odagiri, K Okada, and T Ueda *Tokai University School of Medicine, Japan*

Objectives

The aim of this study is to assess long-term outcomes of non-heart transplant surgical approaches to advanced ischaemic cardiomyopathy (ICM), including left ventricular restoration (LVR) and mitral valve operation.

Methods

Since September 2002, 102 consecutive patients (age 65 ± 8, 18 female) with advanced ICM (ejection fraction (EF) < 40%, left ventricular end-systolic volume index (LVESVI) > 60ml/m^2) were treated using non-heart transplant procedures. A total of 84 patients with asynergy of large scar exceeding 35% of left ventricular (LV) perimeter underwent LVR, and 30 patients with greater than moderate mitral regurgitation (MR) underwent mitral valve operation such as annuloplasty (n = 23) and valve replacement (n = 7). Patients were divided into four groups according to their INTERMACS profiles: Profile 1-2 (the highest levels of clinical compromise; n = 9), Profile 3-4 (n = 40), Profile 5-6 (n = 32), and Profile ≥ 7 (n = 21). We compared the four groups, looking at survival, major adverse cardiac and cerebrovascular event (MACCE), NYHA status, LV volume, and function, in terms of EF and pulmonary artery pressure (PAP).

Results

The overall eight-year survival including three hospital deaths (2.9%) was 64.3% without sudden death due to arrhythmia. A total of 99 survivors showed significant improvement in NYHA, from 2.9 to 1.4. The LVESVI was significantly reduced, from 104.1ml/m^2 to 61.4ml/m^2 (41% volume reduction) (P < 0.0001). The mid-term changes in the LV function showed a significant increase in EF, from 32.1% to 40.4% and a significant reduction in PAP, from 34.5mmHg to 27.3mmHg (P < 0.0001). Seven-year survival in patients with Profile 1-2, 3-4, 5-6, ≥7 were 50.0%, 57.2%, 60.3%, 95.2%, respectively (P = 0.13) (Fig.). Freedom from MACCE at five years in patients with Profile 1-2, 3-4, 5-6, ≥7 were 29.6%, 47.0%, 67.2%, 95.2%, respectively (P = 0.0067). The improvements in NYHA status were significantly greater in patients with higher levels of clinical compromise than in patients with lower levels clinical compromise with significant changes between two INTERMACS profiled groups (P < 0.05). There was no significant difference in LV volume reduction and functional improvement among the four groups. Patients with Profile ≥7 had significantly better survival at seven years (odds ratio (OR) 0.11, P = 0.046) (Fig. 1) and freedom from MACCE at five years (OR 0.053, P = 0.0066) compared with patients with Profile 1-2.

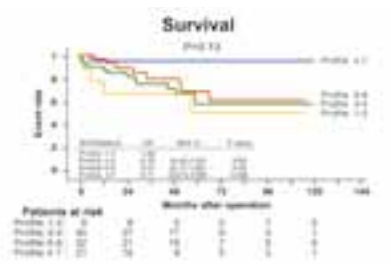


Figure 1

Conclusions

Our non-heart transplant surgical approaches with LVR and mitral valve operation for advanced ICM yielded excellent long-term outcomes in terms of survival and NYHA status, even in patients with higher level of clinical compromise who might be candidates for heart transplantation or LVADs. Risk factor analyses for survival and MACCE recommend earlier surgical approach, particularly for patients with lower levels of clinical compromise such as INTERMACS profile ≥7. Our data also provide a benchmark against which long-term outcomes of the heart transplant regime, particularly destination therapy with LV assist devices, can be compared.

Left ventricular assist devices I: Improving outcome 10:15 Hall E2

Comparison of post-transplantation outcomes in patients bridged with Thoratec Paracorporeal Ventricular Assist Device versus the Heartmate II ventricular assist device

Marian Urban

The number of patients bridged to transplantation with mechanical assist devices has been steadily increasing over the years. Little is known about differences in post-transplantation morbidity, mortality and survival in patients successfully bridged with pulsatile versus continuous-flow assist devices. We compared post-transplantation outcomes of patients supported with Thoratec Paracorporeal Ventricular Assist Device (PVAD) with those supported with HeartMate II.

The Program of Mechanical Circulatory Support at Institute for Clinical and Experimental Medicine in Prague was instituted in 2003 with the first implantation of Thoratec PVAD system. In total 55 of these mechanical devices were implanted over the years. In 2006 this device was gradually discontinued, being replaced with newer generation, axial-flow, fully implantable Heart Mate II pump. As of date of this manuscript, 113 of these pumps were implanted.

During the study period (2008 – 2010) 37 patients were transplanted from Thoratec PVAD and 61 patients from Heart Mate II ventricular assist devices. Baseline demographic, clinical and laboratory variables are shown in Table 1. Patients bridged with Heart Mate II were supported for 283.2 ± 196.2 days versus 741 ± 47.1 days of support with Thoratec PVAD (p < 0.01). Despite various duration of support both systems were equally successful in normalization of end-organ function before transplantation. There were also no significant differences in baseline donor characteristics and ischemic time between study groups as shown in Table 2.

Marian Urban

Early graft loss (death before discharge from the hospital or retransplantation) was 18.9% in Thoratec PVAD and 9.8% in HeartMate II patients (p=0.229). Ischemic time (OR 1.029, CI 1.003 – 1.057, p = 0.029) was found to be an independent predictor of early graft loss in multivariate analysis.

Median time of follow-up was 71 (range 1 – 110) months in Thoratec PVAD and 22 (range 1 – 56) months in HeartMate II and totaled 166 patient-years in patients supported to transplantation with Thoratec PVAD and 112 patient-years in patients bridged with HeartMate II. We were not able to detect any differences in the rate of major post-transplant complications such primary graft failure, renal failure or infection between the groups.

Eleven additional patients died after being discharged from the hospital with the median survival of 12 months (range 2 – 78). The causes of death were infection (three patients), malignancy (two patients) and cardiac allograft vasculopathy (two patients). One patient died of chronic graft failure due to recurrence of idiopathic cardiomyopathy (lipomatosis). In three patients the cause of death was unknown. Actuarial one-year survival was 90% ± 4% in HMII and 73% ± 7% in PVAD group (p = 0.01) (Figure 1). Post-transplant renal failure (HR 8.922, CI 1.469 – 54.201, p = 0.017) was identified as risk factors for decreased one-year survival.

In conclusion our data demonstrate equivalent rates of early graft loss and post-transplant complications in patients bridged with Thoratec PVAD and HeartMate II devices. One-year survival was significantly decreased in patients transplanted from Thoratec PVAD in comparison to HeartMate II.

Table 1: Patients' characteristics at implantation

	Thoratec PVAD (n = 37)	HeartMate II (n = 61)	p-value
Demographics			
Age, years	46.5 ± 12.9	49.2 ± 12.1	0.314
Gender, male	30 (81.1%)	54 (88.5%)	0.307
BSA, m-2	1.93 ± 0.2	1.96 ± 0.2	0.632
BMI	25.0 ± 3.4	25.1 ± 3.8	0.932
Risk Factors			
Diabetes	9 (24.3%)	12 (19.7%)	0.586
Hypertension	7 (18.9%)	18 (29.5%)	0.244
COPD	6 (16.2%)	8 (13.1%)	0.671
Previous Stroke	4 (10.8%)	13 (21.3%)	0.183
Etiology of HF			
Non-ischemic	26 (70.3%)	40 (65.5%)	0.631
Ischemic	11 (29.7%)	21 (34.4%)	
Medical acuity			
INTERMACS I-II	32 (85.5%)	34 (55.7%)	0.02
INTERMACS III-V	5 (13.5%)	27 (44.3%)	
Blood Chemistry			
Creatinine, µmol/L	158.8 ± 75.3	134.7 ± 81.6	0.184
GFR, mL/min/1.73 m2	72 ± 32	75 ± 39	0.755
Bilirubin, µmol/L	43.9 ± 34.5	28.9 ± 19.6	0.02
Hemodynamics			
Cardiac index	1.7 ± 0.3	1.8 ± 0.4	0.529
CVP,mmHg	14 ± 6	11 ± 5	0.05
mPAP,mmHg	40 ± 11	41 ± 11	0.671
PCWP,mmHg	29 ± 7	29 ± 8	0.727
TPG,mmHg	11 ± 7	12 ± 6	0.591
PAR, Wood unit	3.4 ± 3.0	3.7 ± 1.9	0.712

BSA: body surface area; BMI: body mass index; COPD: chronic obstruction pulmonary disease; HF: heart failure; INTERMACS: The Interagency Registry for Mechanically Assisted Circulatory Support; GFR: glomerular filtration rate; CVP: central venous pressure; mPAP: mean pulmonary artery pressure; PCWP: pulmonary capillary wedge pressure; TPG: trans – pulmonary gradient; PAR: pulmonary artery resistance

Table 2: Patients' characteristics at transplantation

	Thoratec PVAD (n = 37)	HeartMate II (n = 61)	p-value
Donor age, years	32.4 ± 10.5	38.1 ± 10.7	0.011
Donor gender male	86.5%	77%	0.252
Ischemic time, min	151.4 ± 42.0	144.4 ± 61.7	0.518
Donor cause of death			
Stroke	21.6%	46.7%	0.068
Trauma	75.7%	50%	0.068
Hypoxia	2.7%	1.7%	0.068
Other	0%	1.7%	0.068
Recipient Donor Sex mismatch	10.8%	14.8%	0.761
Creatinine, µmol/L	84.9 ± 27.8	96.1 ± 28.8	0.06
GFR, mL/min/1.73 m2	135 ± 52	111 ± 31	0.004
Bilirubin, µmol/L	27.9 ± 19.9	14.2 ± 8.6	<0.01
Sensitized	5/34 (14.7%)	23/59 (39%)	0.014
VAD Duration, days	74.1 ± 47.1	283.2 ± 196.2	<0.01

GFR: glomerular filtration rate; VAD: ventricular assist device

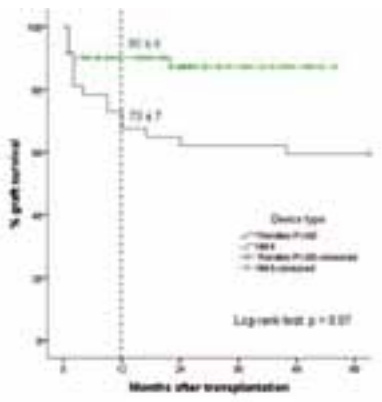


Figure 1: Actuarial one-year survival of all patients stratified by device type

Coronary artery bypass graft 1 14:15 **Hall D**

Is there a future for hybrid coronary revascularisation?

Ivy Susanne Modrau *Aarhus University Hospital, Skejby, Denmark*

Hybrid coronary revascularisation (HCR) is commonly defined as planned minimal invasive off-pump left internal mammary artery (LIMA) bypass to the left anterior descending (LAD) artery integrated with percutaneous coronary intervention (PCI) to non-LAD vessels. Current revascularization guidelines recommendations for HCR are based on weak evidence as no randomized trial data exist some 17 years after its introduction[1,2]. Regardless of the shortcomings of the studies published to date, safety and feasibility of the approach has been demonstrated in numerous reports. The opponents of HCR argue that complete surgical revascularization ascertains optimal long-term symptom relief and survival benefit in patients with stable multivessel disease. They apprehend additional expenses, risks and logistic problems associated with performing two procedures.

Regardless of these arguments further development of HCR is inevitable. Driven by industry and technology, new generations of coronary stents reduce the need for repeat intervention after PCI. The current European revascularization guidelines favour PCI in patients with one- or two vessel disease without involvement of the proximal LAD[1]. Moreover, a large proportion of patients with non-emergent multivessel disease eligible for coronary surgery according to current guidelines is treated by PCI[3]. The PCI:CABG ratio varies considerable between different hospitals and appears to be primarily influenced by the recommendation of the cardiologist performing the diagnostic catheterization[4]. The least-invasive treatment is inherently appealing to patients and cardiologists due to accelerated recovery, reduced discomfort and short-term complications.

In contrast to the rapid innovation and improvements occurring in PCI, the prevailing surgical revascularization approach in Europe and the United States has remained unchanged through centuries. It involves an on-pump LIMA to LAD graft and stripped vein grafts to the non-LAD vessels. Consequently, the incidence of risks such as stroke, vein graft dysfunction, sternal and leg wound infections remains unaltered.

Substantial evidence indicates that the LIMA to LAD graft is main determinant of the beneficial effect of surgical revascularization. Moreover, the paradigm of complete anatomical revascularization in all patients with multivessel coronary artery disease is currently challenged. A functional revascularization approach guided by measurement of fractional flow reserve (FFR) has been shown to improve outcome in patients treated by PCI[5]. The beneficial effect of FFR guidance on survival could not be on confirmed for surgical revascularization[6]. However, increasing evidence from surgical studies indicate that incomplete anatomical revascularization does not influence mortality in the presence of a LIMA graft protecting the anterior wall[7,8]. In fact, inserting more than one graft into the non LAD-systems may even impair long-term outcome[9].

It is safe to assume, that the dispute between the proponents of complete surgical revascularization versus PCI versus HCR will cease in future, as individualized treatment is the future perspective. Treatment will be recommended by the heart team, based on detailed individual clinical, anatomic and functional considerations. Last but not least, the final choice of treatment should include the individual expectations and hierarchy of outcomes of our patients.

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Chest wall 14:15 **Hall I**

Rib tumors. A 15-Year Experience

Timothy Sakellaridis, Stylianos Gaitanakis, Anastasios Piyis
General Army Hospital, Athens, Greece

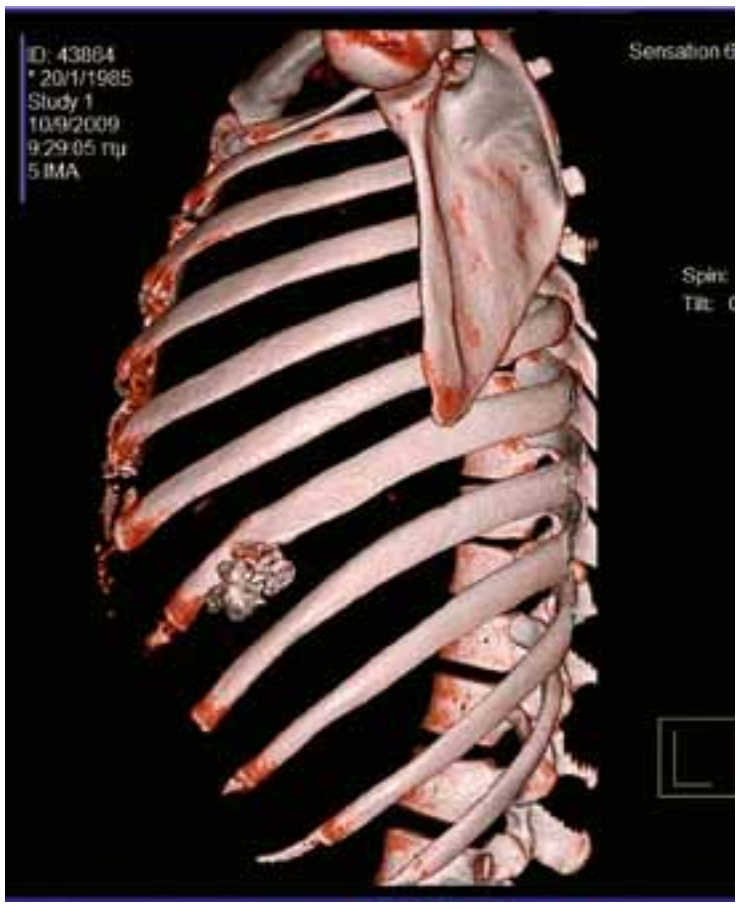
Rib tumors are rare, with an incidence of less than 1% in the population. Primary tumors of the rib comprise 5-7% of all primary bone neoplasms but make up 50% of bony malignant tumors and the majority of benign bony tumors of the chest wall. Malignant tumors of the rib are commoner, with metastatic involvement or direct invasions from adjacent malignancies such as breast cancer, lung cancer, mesothelioma and mediastinal tumor, being the commonest. When metastases are excluded, tumors arising from the rib are as likely to be benign as malignant.

A retrospective study of 91 patients with rib tumors treated in our Department during the period 1998-2012, was conducted to review their clinical, radiological, and pathological features, the difficulties in differentiating benign from malignant tumors, as well as the early and long-term results of surgical management. Patients with lung, pleural, breast and skin carcinomas invading the chest wall were excluded from this study. Patients with known rib fracture and radiologic findings of hyperplasia due to callus formation were also excluded from the study. Benign lesions had 64 patients (70.33%) and malignant tumors 27 patients (29.67%). Within the benign cohort, posttraumatic fibro-osseous lesion/dysplasia, osteochondromas, fibrous dysplasia and enchondroma (Figure), were among the most customary diagnosis. Within the malignant cohort, metastatic lesions had 13 patients (48.15%), with the remaining 14 patients having primary malignant rib tumor. All patients were treated surgically with wide excision of the tumor and the diagnosis was established histological. No perioperative mortality was reported. All of our patients with benign rib lesions, in whom follow-up was possible, are alive; the overall survival in the malignant cohort is 55.56%.

The clinical presentation or rib tumors vary. Asymptomatic patients diagnosed incidental after routine examination as part of screening; or for investigation of an unrelated condition, are generally few. Mostly, patients present with palpable enlarging mass, pain or neurological signs and symptoms. History of prior malignancy may suggest the etiology of rib tumor. If the lesion is palpable, rate of growth over time can also be ascertained. Rapid increase of the tumor size, involvement of surrounding tissues and cortical destruction, although they are not pathognomonic, they suggest malignancy.

Rib abnormalities are often initially identified on chest radiography. However; CT and MRI is valuable in determining boundary of tumor and detecting invasion to the adjacent organs, nerves and vessels, radionuclide bone scan to rule out bone metastasis and to distinguish whether the lesion is primary rib tumor or not. PET/CT can be used in evaluating patients with rib tumors, especially in staging. The role of fine-needle aspiration biopsy or/and non-excisional biopsy remains controversial.

Because of their rarity and often benign presentation, rib tumors can present both a diagnostic and therapeutic dilemma. Rib tumors should be considered malignant until proven otherwise, due to its difficulty to differentiate benign from malignant preoperatively. The objective of surgical intervention is wide excision with free margins and if needed, reconstruction with either soft tissue transposition or with the use of alloplastic materials.



Mediastinum 14:15 **Hall P**

Treatment strategies in the management of severe complications following slide tracheoplasty in children

Juan L. Antón-Pacheco *Hospital U. 12 de Octobre, Madrid, Spain*

Congenital tracheal stenosis (CTS) is a very uncommon obstructive malformation of the airway usually caused by complete tracheal rings. Although CTS is classically associated with significant mortality, increasing experience with different surgical and endoscopic techniques has remarkably improved the outcome of these patients. Slide tracheoplasty (STP) has become the surgical procedure of choice for the treatment of CTS by the majority of tracheal teams and pediatric airway units worldwide. The aim of our study is to focus on the different surgical and endoscopical treatment alternatives when dealing with severe complications after STP.

We have carried out a retrospective study of patients with symptomatic CTS admitted in our institution, between January 1997 and January 2013, surgically treated by means of STP. The following variables were evaluated: Demographics, preoperative tracheal stenosis characteristics, associated anomalies, and outcome measures.

Figure 1. Severe tracheal stenosis following slide tracheoplasty

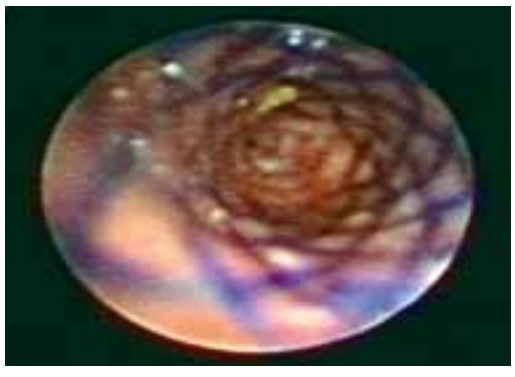


Figure 2. Biodegradable polydioxanone stent placed in the trachea of the same patient

The main outcome variable was a severe postoperative complication that required surgical or endoscopical treatment (more than two balloon dilations, airway stenting, or lasertherapy). These complications were classified into three main categories: (1) tracheal re-stenosis at the anastomosis causing symptoms and leading to reintervention; (2) incomplete tracheal reconstruction with a residual stenosis not addressed at the initial surgical procedure; and (3) significant anastomotic dehiscence that required either reoperation or stenting.

Fourteen patients (eight boys and six girls) with a mean age when operated of 8.7 months (range, 1–43 months) were included in this study. Eleven patients (78%) showed a long segment CTS (more than 30% of total tracheal length) and a right upper lobe tracheal bronchus was present in 5 (35%). A left pulmonary artery sling was detected in nine cases (64%). Three patients (21%) showed severe postoperative complications that required surgical or endoscopical treatment, and one of each fell into one of the three different categories outlined above. These complications were managed as follows: Tracheal resection of a re-stenotic segment; laser division followed by balloon dilation of a residual stenosis; and placement of a biodegradable endotracheal stent in an extensive tracheal narrowing. The other 11 patients did not show significant postsurgical complications and remain asymptomatic from a respiratory standpoint. There was no mortality in the series with a mean follow-up of 6.3 years (range, two months–16 years).

In conclusion, management of children with CTS remains challenging. STP seems to be the preferred surgical technique due to its effectiveness, reliability and versatility. Nevertheless, severe complications may occur and diverse endoscopic and surgical alternatives must be considered in the setting of a multidisciplinary team approach. Biodegradable airway stenting is a new and promising technique when a long and severe post-surgical tracheal stenosis is present, and other treatment alternatives have failed.

Continued from page 36

11:30 **Technical challenges of heart transplantation in children after failed univentricular palliation**
A. Iyengar
Discussant: M. Griselli

Focus Session

10:15 **Work-in-progress abstract session**

Room 1

Moderators: M. Siepe, Freiburg; A. Sihoe, Kowloon

Learning objectives

- Residents can present the projects that are working on and ask the audience for cooperation.

See page 47 for programme details

The Presidential Address

11:50 **Talent or Training**

Hall D

J. L. Pomar, Barcelona

Professional Challenges

14:15 **Session 1: The problem of tricuspid valve regurgitation in the biventricular and univentricular heart I**

Hall K

Moderators: E. Belli, Le Plessis-Robinson; G. Stellin, Padua

Learning objectives

- To understand the complex morphology of the tricuspid valve and methods

of repair or the need for replacement in the current era.

14:15 **Morphology of the abnormal tricuspid valve** *A. Cook*

14:30 **Clinical, echocardiography and non-invasive evaluation of the tricuspid valve and right ventricle** *P. Ewert*

14:45 **Ebstein's anomaly in adults: modified cone reconstruction of the tricuspid valve carries promising outcome** *M. Rabot*
Discussant: V. Tsang

15:00 **Various repair techniques to correct tricuspid valve incompetence in Ebstein's anomaly and their impact on long-term ventricular function and functional outcome** *R. Hetzer*
Discussant: J. V. Comas

15:15 **Mid-term outcome of neonatal tricuspid valve plasty for pulmonary atresia and intact ventricular septum: towards biventricular repair** *H. Ito*
Discussant: P. Vouhe

15:30 **One and a half ventricle repair in association with tricuspid valve repair for Ebstein's anomaly and failing right ventricle** *E. Prifti*
Discussant: V. Hraska

16:15 **Session 2: The problem of tricuspid valve regurgitation in the biventricular and univentricular heart II**

Hall K

Moderators: P. Del Nido, Boston; E. Jokinen, Helsinki

Learning objectives

- To understand the complex morphology of the tricuspid valve and methods of repair or the need for replacement in the current era.

16:15 **When do we replace the tricuspid valve and with what?** *R. Daly*

16:35 **Management of tricuspid regurgitation in univentricular heart** *R. Ohye*

16:55 **Has the cone repair for Ebsteins Anomaly relegated other repairs to history?** *R. Lange*

17:15 **Indications and timing of surgery – are they changing in view of newer surgical repair options** *V. Tsang*

17:35 **Round table discussion**

Vascular

Focus Session

08:15 **Aortic disease in infancy and adulthood**

Hall G

Moderators: W. Brawn, Birmingham; M. Czerny, Zurich

Learning objectives

- Towards a better understanding of cause and effect in aortic disease in different periods of life.

08:15 **Embryogenesis of the aorta – normal and abnormal developmental patterns** *A. Gittenberger-de Groot, Leiden*

08:35 **Abnormalities of the aortic root and their management** *M. Prapa*

08:55 **Bicuspid aortic valve syndrome** *R. De Paulis, Rome*

09:15 **Management of the adult with coarctation and recoarctation** *T. Resch, Malmö*

09:35 **Conclusion**

Continued on page 40

Proximal aortic surgery – extending to the descending aorta 14:15 Hall G

The frozen elephant trunk technique for the treatment of complicated type B aortic dissection: mutlicentre early experience

Gabriel Weiss *Hietzing Hospital, Vienna*

Providing effective treatment for complicated type B aortic dissection (AD) is challenging, especially if the aortic anatomy is contraindicated for thoracic endovascular aortic repair (TEVAR). The aim of the present study was to examine a multicentre experience in the treatment of complicated type B AD with the frozen elephant trunk (FET) technique.

From January 2005 to March 2013, data from 465 patients who had undergone treatment with the FET technique were collected in the database of the international E-vita open Registry. From this cohort, 57 patients who underwent surgery for type B AD were included in the present study. Their mean age was 58 ±12 years, and 72% had a chronic dissection. All operations were performed in circulatory arrest and bilateral cerebral perfusion. Follow-up examinations and evaluation of the aorta by computed tomography scans or magnet resonance imaging (MRI) were performed by physicians before discharge, at 6 and 12 months postoperatively, and annually thereafter. The mean follow-up for the 49 surviving patients was 23 ± 19 months.

The in-hospital mortality rate was 14% (8/57). Stroke and spinal cord injury occurred in six (10%) and two patients (4%), respectively. The rate of immediate false lumen thrombosis at the level of the stent-graft was 75% (40/53) and increased to 97% (41/42) during the follow-up period (23 ±19 months). Distally, at the level of the abdominal aorta, the FL remained patent in 50% (21/42) of patients. Six patients (12%) required a secondary endovascular intervention because of progression of the disease in the distal thoracic or thoracoabdominal aorta. In these cases, the distal portion of the E-vita open prosthesis offered an ideal landing zone for additional stent-graft extensions. The one- and three-year survival was 81% and 75%, respectively.

In conclusion, the FET technique is a feasible therapeutic option for complicated type B AD if TEVAR is contraindicated. The procedure results in a low rate of reoperation to the downstream aorta, which may be due to the high rate of FL thrombosis. One major goal of the FET technique seems to be achieved by inducing complete thrombosis of the FL and initiating a remodelling process of the aorta in the majority of patients, at least to the distal end of the stent-graft. In contrast to conventional surgery of the descending aorta via a lateral thoracotomy, the FET technique provides simultaneous treatment of the ascending aorta and aortic arch, without increasing the risk of the intervention.

Gabriel Weiss

Experimental session – from bench to bedside 16:15 Hall G

Intrathecal injection of human umbilical cord blood stem cells attenuates spinal cord ischaemic compromise in rats

Gustavo Judas *Heart Institue (Incor), University of Sao Paulo, Brazil*

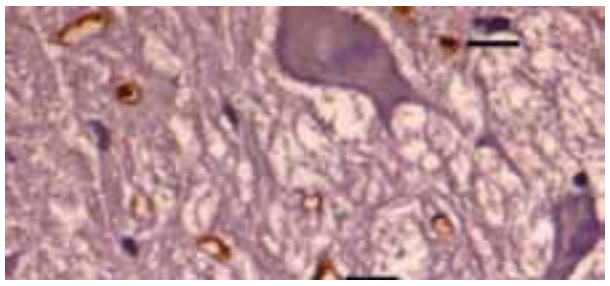
Despite various surgical adjuncts and pharmacological interventions, paraplegia remains a devastating and unpredictable complication after thoracic and thoracoabdmoninal aortic surgeries. With the advent of stem cells, and its the potential to induce nervous tissue regeneration processes, several models for treatment, mainly in spinal cord injury, have been proposed.

Umbilical cord blood is an alternative and a rich source of human stem cells. Because of its greater availability and weak immunogenicity, these cells are specially suitable candidates for use in spinal cord disorders. Human umbilical cord blood stem cells (HUCBSC) have proven to be more advantageous than bone marrow-derived and other stem cells types in terms of cell procurement, storage, and transplantation. HUCBSC have already been used to improve motor function in rats with spinal cord contusion. Despite the fact that these were capable of mitigating brain damage caused by ischemia, they have never been used in ischemic disorders of the spinal cord.

We performed an intrathecal injection of unfractioned HUCBSC, 30 minutes before and after an endovascular occlusion, at the left subclavian artery level, of the descending thoracic aorta in rats. Due to the similarity between the vascular anatomy of rat and human spinal cords, this model simulates the interruption of blood flow to the spinal cord, which can occur during a descending thoracic aortic surgery. Additionally this delivery route is an easily reproducible method and allows multiple injections, which could be useful to ascertain time–window therapy.

In our experimental study, we found that HUCBSC, intrathecally injected in a spinal cord ischemia rat model, were able to engraft and survive in the lesion area, at least for four weeks, as showed in the respective photogram (staining with the human membrane marker CD45+RO). Moreover, when they were administrated 30 minutes after the ischemia, provided a better neurologic outcome, which did not occur when cells were injected before.

Human umbilical cord blood is one of the potentially useful sources of cells for therapy of spinal cord ischemia. Nevertheless further exploration is needed to ascertain issues such as the optimal therapeutic window time, the optimal amount of cells and the most appropriate cell type to be used for functional recovery. Our study is one step toward using HUCBSCs based therapy to treat spinal cord ischemia in humans as a complication of descending thoracic aorta cross-clamping.



Human umbilical cord blood stem cells CD45*(black arrow) in ischemic spinal cord in rats

Arrhythmia I 08:15 Hall F2

Continuous Event recorder monitoring to compare efficacy of left- vs. biatrial lesion set in patients undergoing concomitant surgical ablation for atrial fibrillation

Simon Pecha *University Heart Center, Hamburg, Germany*

In patients receiving surgical atrial fibrillation (AF) ablation use of various lesion sets with different success rates has been reported in literature. However all of these results have been obtained by discontinuous rhythm monitoring, including 24h Holter- or 12 lead ECG. This makes comparison of success rates difficult as the sensitivity of these rhythm-monitoring strategies is limited. In this study we therefore used continuous rhythm monitoring to accomplish a more accurate comparison of the efficacy of a left- and biatrial lesion set and to address the question whether a biatrial lesion set in patients with persistent AF is worthwhile to be considered.

Between 07/2008 and 12/2011 66 patients with persistent AF underwent concomitant surgical AF ablation with biatrial lesion set and subcutaneous Eventrecorder (ER) implantation. Results and outcomes were compared to a propensity score matched cohort of 66 patients with left-atrial lesion set and ER implantation. ER interrogation was performed at 3,6 and 12 months follow-up. Successful ablation was defined as an AF-Burden <0.5%. Mean patient's age was 70.2 ± 7.4 years, 70.3 % were male. No major ablation related complications occurred. One-year survival rate was 95.7% without statistically significant differences between groups. The overall sinus rhythm conversion rate was 57.3% and 65.1% after 3 and 12 months follow-up respectively. Patients in the biatrial group had slightly higher sinus rhythm rate (62.3% vs. 52.3% p=0.22) three months postoperative. At 12 months follow-up in patients with biatrial lesion set, statistically significant higher sinus rhythm rate was observed (74.4% versus 55.8%; p=0.026) (Fig.1). The mean AF burden in patients with failure of ablation was 15% in biatrial- and 21% in left-atrial group at 12 months follow-up (p=0.030).

Continuous rhythm monitoring by subcutaneous ER implantation was safe and feasible. In patients undergoing biatrial ablation, statistically significant higher sinus rhythm rate was observed at 12 months of follow-up.

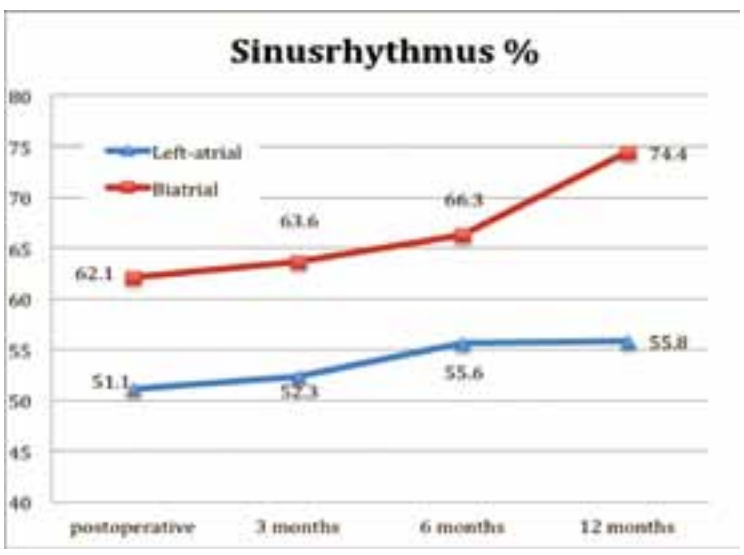


Figure 1. Sinus rhythm rates during follow-up

Arrhythmia I 08:15 **Hall F2**

Two-staged hybrid treatment of persistent atrial fibrillation: short term single centre results

Vojtěch Kurfirst
Hospital of České Budějovice, Czech Republic

Atrial fibrillation (AF) represents the most common arrhythmia with higher incidence in aging population and it is associated with increased mortality, risk of stroke and exacerbation of heart failure. The pharmacologic treatment of AF remains challenging with long term failure rate reaching 85%. Catheter ablation as a first-line treatment for patients with drug refractory AF has variable results with single-procedure success rate ranging from 16% to 84%. In persistent form of AF the success rate decreases with a necessity for repeat procedures and higher economic costs. In these patients, the left atrium is often enlarged with fibrotic remodelling and transvenous endocardial approach and creation of linear lesions is sometimes challenging. The other important point, especially of treatment of persistent AF is exclusion of the left atrial appendage (LAA), which is not routinely closed during the catheter ablation procedure.

Surgical treatment of AF has shifted in last decade towards the minimally invasive procedure using endoscopic instruments to isolate pulmonary veins (PVs), create linear lesions and occlude the LAA on the beating heart. Although this approach achieves higher arrhythmia-free event rate after single procedure then catheter ablation, the transmurality cannot be always guaranteed and the mitral isthmus line as well as the tricuspid isthmus line also cannot be created from the epicardium.

The hybrid procedure combines the surgical and the catheter ablation and overcomes the shortcomings of these two approaches and as increased success rate could be expected, it can potentially lower the hospital costs.

Methods: Thirty patients with persistent and long-standing persistent AF underwent surgical thoracoscopic radiofrequency (RF) ablation procedure under settled protocol (pulmonary veins isolation, box lesion, isthmus line lesion, dissection of the ligament of Marshall, left atrial appendage occlusion with epicardial clip) followed by transcatheter RF ablation 3 months later. In this session, electrical mapping of left atrium was performed and incomplete isolation lines were finished. Mitral and cavotricuspid isthmus ablation lines were performed during this session as well (Fig. 1).

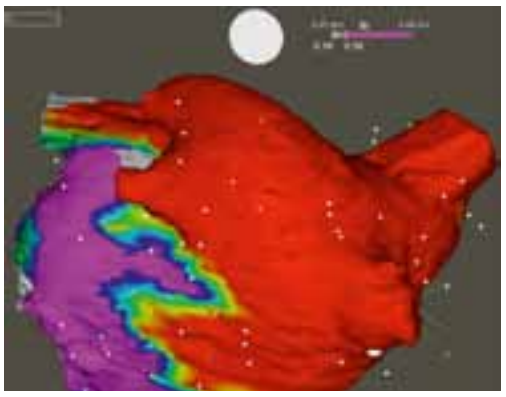


Fig. 1 Box lesion with bidirectional block evaluated during catheter ablation. Colour-coded bipolar voltage map of the left atrium is showing complete abolition of the electrical signals from all four pulmonary veins and posterior wall (depicted by red colour with recorded voltage < 0.1 mV), while inferior and lateral parts of the atrium remain electrically active (violet colour). The border zones of ablation lines are clearly depicted as yellow areas.

Results: Preoperative mean duration time of AF was 33 ± 27 months with 17 % patients with persistent and 83 % patients with long-standing perstistent AF. Mean size of left atrium was 48 ± 5mm. The complete surgical ablation protocol was achieved in 96.7% of patients, with no death, early stroke or pacemaker implantation in the early postoperative period. In 63.3 % of patients, left atrial appendage was occluded with epicardial clip. The endocardial touch-up for achievement of bidirectional block of PVs was neccessary in 10 patients (33.3 %) and of box-lesion in 20 patients (66.7 %). Freedom from atrial fibrillation was 76.7 % after surgical ablation and 93.3 % after completed hybrid procedure

Conclusion: The sequential, two-staged hybrid strategy (surgical thoracoscopic ablation followed by catheter ablation) is feasible and safe with high post procedural success and seems to represent the optimal treatment with low risk load and potentially long-term benefit for patients with persistent and long standing persistent form of atrial fibrillation. In our opinion, the future of treatment of persistent AF is in cooperation of surgeons with electrophysiologists, where we can bring the best of each methods to increase the success rate and the complacence and quality of life of our patients.

Transcatheter aortic valve implantation: Expanding indications and techniques 16:15 Hall E2

Transcatheter aortic valve implantation reduces grade of concomitant mitral- and tricuspid valve regurgitation and pulmonary hypertension

Manuel Wilbring*, Sems-Malte Tugtekin, Mike Ritzmann, Sebastian Arzt, Torsten Schmidt, Klaus Matschke, Utz Kappert, Konstantin Alexiou
*University Heart Center Dresden, Dresden, Germany; *Corresponding author*

The development of TAVI has induced profound changes in treatment of valvular heart disease. Clinical success and encouraging results induced a more courageous implementation of the TAVI-concept in clinical everyday-life and allowed continuous expansion of potential fields of application.

A frequent subgroup are high-risk patients suffering from aortic valve stenosis and concomitant moderate or more severe mitral (MR) and/or tricuspid (TR) regurgitation. An impaired survival of those patients undergoing conventional multiple valve surgery is well described. Concerning this particular subgroup, it seems that the cardiac surgeon got into a double windmill-situation. One option is to perform a surgical high-risk multiple valve procedure, which might not be promising in this high-risk subgroup. The other option is performing TAVI as a compromise solution, accepting non-treatment of concomitant atrioventricular regurgitation with a potentially impaired outcome.

The present analysis assessed the impact of concomitant MR and TR in patients undergoing transcatheter aortic valve implantation on clinical and long-term outcome. Since 2008, 615 patients underwent TAVI at our institution, hereby 386 using a transapical approach with the Edwards SAPIEN™ bioprosthesis. Out of these, 116 (30.1%) presented with concomitant moderate or more severe MR/TR. Intra- and posthospital course, change in MR/TR-grade, right ventricular systolic pressure (RVSP) and tricuspid annular plane systolic excursion (TAPSE) were particularly analyzed. Outcomes were compared with transapical (TA)-TAVI-patients without concomitant MR/TR. Mean follow-up time was 471±391 days, which equated a total of 135 patient-years.

We observed a significant reduction of MR (2.1±0.2 to 1.5±0.7;p<0.01) and TR (1.9±0.5 to 1.5±0.7;p<0.01). Likewise RVSP decreased significantly from 46±16mmHg to 39±15mmHg (p<0.01), TAPSE only by trend (21.9±7.3mm to 19.5±5.5mm;p=0.07). After 3-6 months, 68.9% of the patients were at NYHA functional class I or II, 25% at class III. 6.0% downgraded to class IV. A reason for remaining in NYHA III or downgrading to NYHA IV could not be detected. Obviously no impact of grade of MR/TR, LVEF, TAPSE or RVESP on outcome or NYHA-class was found. Three patients (2.6%) died during primary hospital-stay. Estimated 1-, 2-, 3- and 4-years survival was 76.7%, 75.6%, 68.3% and 50.6%, which was on the whole comparable with the remaining TA-TAVI-patients (p=0.784).

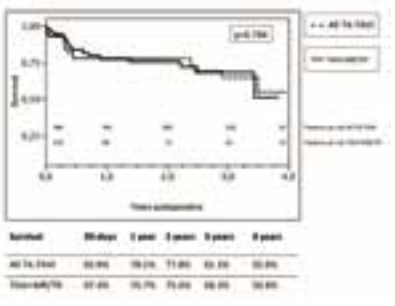


Figure 1 Kaplan-Meier survival curve for all TA-TAVI-patients and the study-group (TAVI+MR/TR). No significant differences concerning survival-rates were determined.

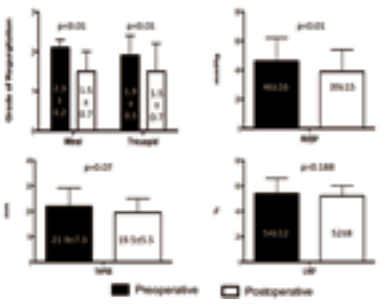


Figure 2 Pre-/Postoperative change of grade of mitral / tricuspid regurgitation, RVESP, TAPSE and LVEF. A significant reduction in grade of MR, TR and RVESP was observed.

Summing up, TAVI in patients with concomitant moderate or more severe MR/TR provides comparable results to TA-TAVI in general. We observed a significant reduction of concomitant MR, TR and pulmonary hypertension after TAVI. The context between mortality and pre-/postoperative grade of MR is not that much clear, meanwhile we could not clearly identify a significant impact on outcome. This finding is oppositional to surgical aortic valve replacement, where concomitant moderate MR has been demonstrated to be an independent risk factor for mortality. The present series demonstrate feasibility and efficacy of TAVI in presence of concomitant moderate or more severe MR/TR. Presence of moderate or more severe MR/TR seems not be a contraindication for TAVI. Nonetheless, we observed a significant amount of patients not experiencing an improvement in NYHA-class. Larger studies are needed to identify patients not benefiting from TAVI in this clinical configuration.

How to handle the ischemic mitral valve 08:15 **Hall E2**

Valvular and subvalvular repair of chronic ischaemic mitral regurgitation: mid-term follow-up

Giampiero Esposito *Humanitas Gavazzeni, Bergamo, Italy*

Functional mitral regurgitation in patients with chronic ischaemic cardiomyopathy denotes abnormal function of normal leaflets due to left ventricular enlargement and remodeling which cause the tethering of structurally normal mitral valve leaflet resulting in MR. Undersized mitral valve annuloplasty is the most commonly performed operation in these patients but different studies have shown mitral regurgitation recurrence up to 30% in one year mainly because of further dilatation of the left ventricle. For this reason we have proposed a complete remodeling of the mitral valve apparatus based on the following steps:

1 Complete myocardial revascularization
2 Plication of the infarcted area on the postero basal wall reducing the antero-posterior diameter of the left ventricle.
3 Cut and transfer technique addressing the anterior leaflet (AL)secondary chordae in order to reduce the tethering forces determing the "seagull sign" effect on the echocardiography, preserving in the meantime the continuity between the mitral annulus and the left ventricle.
4 Posterior papillary muscle relocation: reducing the tethering of the mitral leaflets due to the apical displacement of the posterior papillary muscle (PPM) by its repositioning closer to the mitral annulus.
5 True-sized complete ring implantation

From 2008 to 2011, 53 patients with moderate to severe IMR and severe mitral tethering (tenting area >2.5cm^2 and tenting height >8mm) underwent mitral repair and CABG with the "cut and transfer" technique plus PPM relocation. Ten patients underwent also infarct plication performed in presence of aneurysmatic scar of the LV post-lateral wall documented in the pre-operative cardiac MRI. The approach to the mitral valve and the subvalvular apparatus has been performed through the left atrial roof.

Firstly we performed the "cut and transfer" technique where the tethered secondary chordae of the anterior leaflet (AL), originating from the PPM apically displaced as consequence of the ischemic damage, are cutted at its ventricular insertion and transferred on the free margin of A2.

The relocation of the PPM was then performed using 4/0 Goretex double armed suture stitched to the fibrous portion of the PPM reinforced with pledgets and passed through the mitral annulus in correspondence of the posterior commissure. Sizing of the mitral ring was decided according to the intercommissural distance. After complete semi-rigid ring implantation the correct lenght of the PPM relocation was evaluated by hydrodinamic saline test. We use intra-operative TOE to exclude residual MR and to evaluate the reduction of the tenting height.

Follow up ranged between 12 and 48 months.

No patients experienced cerebro-vascular accidents. One patient died because of ARDS. NYHA class improved from 3.4 +/- 0.5 to 1.4 +/- 0.6. No significant MR was found in 42 patients (80,7%) whereas nine patients (17.3%) were found with mild MR. one patient was found with severe MR in the follow-up and underwent mitral valve replacement.

Our experience shows that in patients with IMR and severe leaflets tethering a tailored approach to the mitral-ventricular complex can achieve very satisfactory results in term of prognosis, symptoms improvement and mitral repair durability.

Continued from page 38

Professional Development

08:15 Leadership

Room 33

Faculty: G. Kitchingman, London; P. Newman, London

See page 41 for programme details

08:15 Non-technical skills for surgeons

Room 1

Faculty: N. Maran, S. Paterson-Brown

See page 42 for programme details

Abstracts

10:15 Connective tissue disease and bicuspid aortic valves

Room G

Moderators: T. Carrel, Berne; T. Kuntze, Bad Berka

Learning objectives

- Towards a better understanding of phenotypes, genotypes and the resulting clinical consequence.

10:15 **Outcome of aortic surgery in patients with Loeys-Dietz syndrome primarily treated as having Marfan syndrome** *F. Schoenhoff*
Discussant: O. Preventza

10:30 **The Tirone David procedure for bicuspid aortic valve disease: should valve commissure/cusp geometry be manipulated?** *F. Kari*
Discussant: H. Schäfers

10:45 **Endovascular therapy in patients with genetically triggered thoracic aortic disease: applications and short- and mid-term outcomes** *O. Preventza*
Discussant: G. Weiss

11:00 **The ascending aorta with bicuspid aortic valve: a phenotypic classification with potential prognostic significance** *A. Della Corte*
Discussant: M. Grabenwöger

11:15 **Correlation between systolic transvalvular flow and proximal aortic wall changes in bicuspid aortic valve stenosis** *E. Girdauskas*
Discussant: M. Misfeld

11:30 **The influence of bicuspid aortic valves on the pressure in the ascending aorta: a porcine ex vivo model** *A. Juraszek*
Discussant: E. Girdauskas

Focus Session

10:15 Work-in-progress abstract session

Room 1

Moderators: M. Siepe, Freiburg; A. Sihoe, Kowloon

Learning objectives

- Residents can present the projects that are working on and ask the audience for cooperation.

See page 47 for programme details

The Presidential Address

11:50 Talent or Training

Hall D

J. L. Pomar, Barcelona

Abstracts

14:15 Proximal aortic surgery – extending to the descending aorta

Hall G

Moderators: H. G. Jakob, Essen; R. Di Bartolomeo, Bologna

Learning objectives

- To develop a thorough understanding how specific aortic pathology emerges and to learn upon the recommendations and options of treatment.

14:15 **Paraplegia risk after frozen elephant trunk implantation: is it real?** *M. Grabenwöger*

14:30 **Endoluminal landing zone identification for stent graft deployment in the descending aorta** *K. Tsagakis*
Discussant: P. Tozzi

14:45 **The frozen elephant trunk technique for the treatment of complicated type B aortic dissection: early multicentre experience** *G. Weiss*
Discussant: S. Gunaydin

15:00 **Hybrid multi-step approach to mega-aortic syndrome: the Lupiae technique** *G. Esposito*
Discussant: P. Oberwalder

15:15 **Long-term results of the frozen elephant trunk technique for acute type A aortic dissection from a 15-year experience** *A. Katayama*
Discussant: K. Tsagakis

15:30 **Total aortic arch replacement with the frozen elephant trunk technique in acute type A aortic dissection: are we pushing the limits too far?** *F. Fleissner*
Discussant: T. Schachner

Continued on page 42

Non-oncology I 08:15 **Hall P**

Does the obesity paradox exist for lung cancer resection?

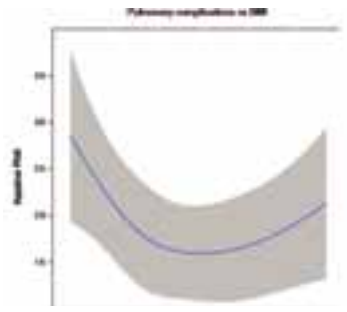
Mark Ferguson

Mark Ferguson *University of Chicago, US*

Obesity is a growing health hazard in the West, particularly in the United States. Despite the many health concerns associated with obesity, one potential advantage of being overweight is improved outcomes from serious problems such as heart failure, ARDS, and cardiac surgery. This has led to the so-called 'obesity paradox.' The reported effects of obesity on lung cancer surgery are inconclusive.

Surprisingly, little information is available on the effects of being underweight on outcomes after major lung surgery. This is despite the fact that weight loss is associated with immunologic impairment, frailty, and impaired wound healing.

On Monday, October 7, Dr. Mark Ferguson of the University of Chicago will present his findings on the



relationship of BMI to results of major lung resection. He and his colleagues examined outcomes in nearly 1400 patients over more than 3 decades.

In their dataset the incidence of obesity more than doubled during the 3 decades of study. They identified no important negative impact of obesity on outcomes after lung resection after adjustment for other predictors. In fact, patients who were overweight/obese had a lower incidence of cardiovascular complications than those who were not overweight/obese (OR 0.72).

In contrast, being underweight had a substantial negative impact on postoperative complications. This was most evident for pulmonary complications, which were 2.5-fold higher than for patients who were normal weight or overweight/obese. It's not clear whether the negative impact of being underweight was associated with recent weight loss or being chronically underweight.

BMI likely serves as a surrogate for more specific predictors of outcomes such as sarcopenia. According to Dr. Ferguson, "Among our obese patients there was likely a subset of patients who had sarcopenic obesity and experienced increased complications compared to those who were merely obese. Differentiating between these subsets could unmask the 'obesity paradox' among patients undergoing major lung resection."

BMI, sarcopenia, frailty, immunologic status, and nutritional status are elements that cardiothoracic surgeons have paid insufficient attention to in evaluating patients. Improving methods of characterizing risk factors such as weight loss, sarcopenia, and obesity will likely help surgeons more accurately predict surgical risk.

Ventricular remodelling 14:15 **Hall F1**

Personalised surgical repair of left ventricle aneurysm with Computer Assisted Ventricular Engineering (CAVE)

Istvan Hartyanszky

Istvan Hartyanszky *Semmelweis University, Budapest, Hungary*

The number of patients with end stage heart failure due to ischemic heart disease continues to increase annually. Nowadays heart transplantation is the best therapeutic option with good long-term results. However, due to the scarcity of donor organs, alternative therapies are needed. One of these could be the surgical ventricle reconstruction of a dilated left ventricle, although this procedure may carry the risk of significant complications.

Difficulties such as inaccurate delineation of the transmural necrosis of the myocardium, or immature aneurysms can lead to suboptimal postoperative left ventricle geometry and volume. Moreover, these operations are currently performed intuitively and without a comprehensive quantitative analysis and planning that would make clinical success significantly more predictable.

Although the STICH trial was meant to be a milestone in ventricle reconstruction it led to unfavourable results for surgical ventricle reconstruction. Several critical aspects have been raised against STICH study recently. First, during such a complex operation neither patient selection nor selection of surgical approach or surgical procedure were based on objective criteria. Second, gadolinium enhanced MR scan was not routinely used to confirm evidence of myocardial scar tissue, to measure its area or define its location. Third, the average ventricular volume reduction was only 19%.

The aim of our study was to use modern imaging techniques, computational models and surgery to create a new combined approach to minimize these problems. With our tool, the surgeon would be able to prospectively assess individual patient risk and subsequently propose and plan a personalised surgical procedure resulting in best possible restoration of cardiac function. The project therefore aims to improve the success of a complex cardiac surgical procedure which has until now largely depended on the experience of the individual surgeon.

With our new combined approach, we were able to fulfill all the conditions we set for a prospective computer aided decision making system. First of all we tried to learn from the mistakes of STICH trial and based our decision making on images from gadolinium enhanced cardiac MR to have exact data on myocardial viability. We could standardize patient selection. With computational methods we were able to identify those patients who would benefit from surgical ventricle reconstruction. Moreover, with prospective planning we could help intraoperative decision making, delineate all procedural steps on the patient's three-dimensional systolic heart model. Systolic planning of the resection line made postoperative systolic geometry and contractility more accurate and effective, making this complex procedure more safe. We were able to increase left ventricle function, patients functional state, and decrease long-term mortality.

The limitations of our study are the low number of patients and the single surgeon experience. Our plan is to make CAVE procedure more reproducible by creating a fully automatized computer platform.

The CAVE method is applicable in nearly all cases of left ventricular aneurysms. Furthermore, it can be effective in ischemic cardiomyopathy, where the left ventricular restoration was previously contraindicated by the lack of a discrete edge between the myocardium and aneurysm. Our study is the first prospective, imaging-based clinical study of ventricular reconstruction.

Session 2: How to handle the ischemic mitral valve 08:15 **Room E2**

Is mitral valve replacement a valuable option in the treatment of ischaemic mitral regurgitation?

Jayenthan Karunanantham *Papworth Hospital NHS Foundation Trust, Cambridge, UK*

The optimal treatment for ischaemic mitral regurgitation has yet to be established. It is clear that coronary artery bypass grafting alone in patients with at least moderate ischaemic mitral regurgitation is a suboptimal treatment option. Undersizing annuloplasty as described by Bolling et al in 1998, is now a frequently used technique to repair the mitral valve in combination with surgical revascularisation in these patients.

In the current era, the survival rates of this population of patients with ischaemic mitral regurgitation are improving. In addition, reverse remodelling of the left ventricle after mitral valve repair is unpredictable in this group. Hence, there is an increasing need for re-intervention on the mitral valve at a later date with the inherent risks associated with reoperation.

It remains to be determined whether mitral valve replacement (MVR) is associated with an increased risk of early and late mortality when compared to reductive mitral valve annuloplasty (MVA).

In our study, we analysed a total of 732 patients undergoing coronary artery bypass grafting and mitral valve surgery at our centre. Propensity score matching was used to adjust for confounding factors. Logistic and Kaplan Meier analysis were used to investigate the impact of MVR versus MVA on early and late mortality and need for repeat mitral valve surgery. Data are presented as odds ratio (OR), hazard ratio (HR) (confidence intervals – CI).

A total of 248 patients receiving MVA were matched with 248 patients receiving MVR and all baseline characteristics were well balanced in the matched sample. MVR did not increase perioperative (OR 1.097; 95% CI 0.573-2.099) or late death (HR 1.01; 95% CI 0.69-1.47). The need for repeat mitral valve surgery was significantly lower after MVR (HR 2.1; 95% CI 1.1-4.4), without any difference between biological and mechanical prostheses (HR 0.9; 95% CI 0.6-3.4).

We found that MVR represents a valuable option in the treatment of ischaemic mitral regurgitation, as it is associated with a reduced need for repeat mitral valve surgery when compared to MVA, without increasing the risk for early or late mortality.

Floor plan

Booth	Company Name
138	3-D Matrix Europe
24	A&E Medical Corporation
144	AATS – American Association for Thoracic Surgery
126	Abbott Vascular International
8	ACUTE Innovations
46	Admedus
19	Advancis Surgical
51	Andocor NV
9	APACVS – Associaton of Physician Assistants in Cardiovascular Surgery
93	Asanus Medizintechnik
88	AtriCure Europe
122	B Braun Surgical
27–28	Baxter Healthcare
69	Berlin Heart
67	BioCer Entwicklungs
139	Biointegral Surgical
61	Biomet Microfixation
17	BioVentrix
7	C R Bard
81	Cardia Innovation
37	CardiaMed
101	Cardio Medical
158–9	Carmat
92b	Chase Medical
150–3	CircuLite
157	Clear Catheter Systems
106–7	Cook Medical
12	CorMatrix Cardiovascular
74b	Correx
58	Cryolife Europa
136	CTSNet
20	De Soutter Medical
98	Delacroix-Chevalier
97	Dendrite Clinical Systems
	EACTS-Euromacs
148	EACTS – The European Association for Cardio-Thoracic Surgery
112	Edwards Lifesciences
111	Estech
73	Ethicon – Johnson & Johnson Medical
130	Eurosets

Booth	Company Name
1	Fehling Instruments
91a	gebemed Deutschland
35	Gebrueder Martin
75	Geister Medizintechnik
3	Genesee BioMedical
32	GEOMED Medizin-Technik
92a	Global Communication
146	Gunze
82	Hamamatsu Photonics Deutschland
49	Heart and Health Foundation
52	Heart Hugger/General Cardiac Technology
124	HeartWare
91b	ImaCor
83	Integra
145	ISMICS – International Society for Minimally Invasive Cardiothoracic Surgery
140	Jena Valve Technology
29–30	JOTEC
63–64	Karl Storz
95–96	Lepu Medical Technology
99	LSI Solutions
5	Mani
59	Maquet Cardiopulmonary
22	Master Surgery Systems
147	MDD Medical Device Development
53	Medafor
74a	Medex Research
84	Medistim
90	Medos Medizintechnik
60	Medtronic International Trading
154–5	MiCardia Corporation
23	NeoChord
86	On-X Life Technologies
16	Oxford University Press
11	PCR
25	Peters Surgical
156	Posthorax
68	Praesidia
34	Qualiteam
65	Redax
62	RTI Surgical
33	Rumex International
102–4	Scanlan International

Booth	Company Name
10	SHVD – The Society for Heart Valve Disease
77	Siemens, Healthcare Sector
108	Smartcanula
114	Sorin Group Italia
116	St Jude Medical
31	Starch Medical
137	STS – The Society of Thoracic Surgeons
21	Sunshine Heart
79	Symetis
128	Terumo Europe Cardiovascular Systems
132	Thoratec Corporation
66	Tianjin Plastics Research Institute
4	Tianjin Welcome Medical Equipment
80	Transonic Europe
105	ValveXchange
26	Vivostat
15	Wexler Surgical
149	Wisepress Online Bookshop
6	WL Gore & Associates
18	WolfVision
50	WSPCHS – World Society for Pediatric and Congenital Heart Surgery

Continued from page 40

Abstracts

16:15 Experimental session – from bench to bedside

Hall G

Moderators: C. Hagl, Munich; K. Kallenbach, Heidelberg

Learning objectives

- To get a better understanding how basic science translates into clinical practice.

16:15 **Decellularised aortic and pulmonary allografts implanted in sheep: morphological evidence of cell self-repopulation** *M. Della Barbera*
Discussant: J. Holfeld

16:30 **Stem cell therapy for the treatment of aortic aneurysm in mice** *Y. Narita*
Discussant: I. Dimarakis

16:45 **Intrathecal injection of human umbilical cord blood stem cells attenuates spinal cord ischaemic compromise in rats** *G. Judas*
Discussant: E. Quintana

17:00 **Real and imaginary aortic diameter: implications for dissection, rupture and aneurysm formation** *M. Poullis*
Discussant: D. Pacini

17:15 **Computational flow analysis can be used to predict outcome of type B aortic dissection** *G. D'Ancona*
Discussant: W. Schiller

17:30 **Gender-related changes in aortic geometry throughout life** *B. Rylski*
Discussant: M. Czerny

Simulation Session

08:30 TEVAR Pre-case planning course with OsiriX and case simulation

Room Y7

Learning objectives

The objective of the course is to teach the participants how to:

- import images from a CT scan
- view one or multiple series of images from a study
- navigate through the most important commands and toolbars
- customise toolbars
- use the main analysis and measurement tools
- precisely perform the measurements with the MultiPlanar Reconstruction

Display (MPR) and 3D volume rendering

- export images, videos or DICOM files
- practice a full pre-case planning
- execution of the pre-case planning in virtual simulator.

Simulation Session

08:30 TEVAR for TAA and type B-dissection with the Valiant Captivia stent graft

Room Y10

Session 1: The problem of tricuspid valve regurgitation in the biventricular and univentricular heart I
14:15 Hall K

Ebstein's Anomaly - Indications and timing of surgery Are they changing in view of newer surgical repair options?

Victor T Tsang
Great Ormond Street Hospital, London, UK

Ebstein's anomaly is a rare congenital abnormality of the tricuspid valve characterised by downwards displacement of the septal and posterior leaflets into the right ventricle and consequent atrialisation of a portion of the right ventricle. This defect may present at any age and has a variable natural history related to the severity of the lesion. There are various surgical approaches to repairing Ebstein's anomaly, including valve replacement with bioprosthesis. The Cone reconstruction technique, introduced in 2007 by Da Silva and colleagues, is a novel approach involving delamination and rotation of the tricuspid valve cusps to create a cone, the vertex of which faces the right ventricular apex. This technique has the potential to restore full coaptation of valve tissue and optimise distribution of cusp stresses by creating a central blood stream across the new tricuspid valve.

The Cone reconstruction seems superior to traditional surgical techniques as this method restores the functional anatomy of the right heart inflow tract, and it is associated with low hospital mortality. Used exclusively for Ebstein patients since 2009 in our own institution, we have seen that in mid-term follow-up there is a clear decrease in tricuspid regurgitation after the Cone procedure. Post-operative left ventricular volumes are significantly increased whereas right ventricular volumes are reduced. The NYHA class of patients has clearly improved and we have observed a trend for better results in objective exercise testing. Thus far we have not had any mortality associated with the procedure. These results are in line with colleagues' experiences elsewhere in the world, however longer-term follow up remains to be reported as we all gather experience with this new technique.

As the Cone operation appears to offer a safe and efficient treatment option for Ebstein's anomaly we can pose the question: should we liberalise the indication for surgical correction of this lesion? When patient presents with subjective symptoms and the traditional triad of cyanosis, right heart failure and arrhythmia, the recommendation is to offer surgery. But what about the patient who is asymptomatic but has moderate regurgitation and morphology suitable for Cone correction? It could be argued that even a relatively competent tricuspid valve is better than the Ebstein's circulation. Should we operate, or are we taking an undue risk in a stable patient?

Some assistance may be obtained from cardiopulmonary exercise testing. It has been shown previously, that patients who are consistently limited by a chronic congenital cardiac condition do not realise themselves that their performance is not at full capacity. These patients consider the limited state as normal, and thus are incorrectly labelled "asymptomatic". Objective exercise testing may offer insight into how well the patient's physiology and performance corresponds to healthy peers. The obvious limitation in a pediatric population is the fact that full co-operation in this setting cannot be guaranteed before late childhood.

We often find that the management strategy whether to operate or not is formulated in the clinics of attending physicians who decide whom to refer for surgery. When a patient is referred to surgeons, there are usually grounds to operate. The number of patients with no or mild symptoms who could benefit from the Cone surgical correction may be larger than we think. However, before seeking them out, we must have the discussion of whether our confidence in the new repair technique surpasses the obvious operative risks for a patient who at present is considered asymptomatic.

In the advent of a new surgical approach, the decision of when to operate is often based on experience and concept rather than evidence, as long-term results of this operation remain to be seen.

Connective tissue disease and bicuspid aortic valves 10:15 Room G

Outcome of Aortic Surgery

Patients with Loeys-Dietz Syndrome Primarily Treated as having Marfan syndrome

Florian Schoenhoff,
Thierry Carrel *University Hospital Berne, Berne, Switzerland*

Florian Schoenhoff (left) and Thierry Carrel

In 2005 Bart Loeys and Hal Dietz described a group of patients that exhibited certain phenotypic features characteristic of Marfan syndrome (MFS) but showed significant overlap with other connective tissue diseases such as the vascular form of Ehlers-Danlos syndrome (vEDS). Loeys and Dietz were able to identify the causative mutation, a defect in the gene encoding for TGFß receptors TGFBR1 and these patients have since been classified as having Loeys-Dietz syndrome (LDS). The cardiovascular component in these patients was reported to be very aggressive and in the initial reports patients frequently dissected at an early age and frequently below the accepted surgical threshold of 5cm for patients with MFS. Due to the phenotypic overlap with MFS, we hypothesized that a certain percentage of patients treated in our center in the past as having MFS, indeed had LDS.

We analyzed data from 68 consecutive patients that underwent surgery from 1995 until 2007 under the assumption of having MFS before retrospectively being screened for LDS when genetic testing became available. These patients were followed until 2013 and underwent a total of 115 aortic surgeries.

In our population of patients diagnosed with MFS based on clinical criteria and mutation analysis of the FBN1 gene before the advent of TGFBR1/2 testing, 17% of patients have been retrospectively diagnosed as having LDS. In our series, LDS patients did not dissect earlier, did not dissect more frequently and did not have a higher need for re-interventions than MFS patients.

These results do not necessarily contradict the data that has already been published, it may rather be proof for a wider phenotypic spectrum within the LDS population than previously thought. It has been suggested that in LDS the aortic arch is more prone to dilation than in MFS patients and that more aggressive arch repair should be considered. In the current series, using a liberal approach towards a short circulatory arrest to perform a hemi-arch replacement, the rate of secondary total arch replacements did not differ between LDS and MFS patients.

The need for total aortic replacement in MFS is pre-dominantly driven by the occurrence of type B dissection and as the rate of type B dissection did not differ between LDS and MFS patients this seems to be true for the LDS patient population as well. The number of LDS patients has been constantly increasing most likely due to a growing awareness for this patient population, i.e. not that many LDS patients are missed anymore. The initial description of LDS as a subset of patients within the MFS spectrum with a rapid progression of aortic disease has highlighted the need for identifying specific patient populations in patients with genetically-mediated aortic disease.

Recently, new mutations in patients sharing phenotypic features with LDS such as Smad3, TGFB2 and TGFB3 have been identified and it is likely that this will continue. Our data stresses the importance of genetic testing to accurately diagnose the patient but also shows that a negative mutation analysis certainly does not rule out the presence of a connective tissue disease.

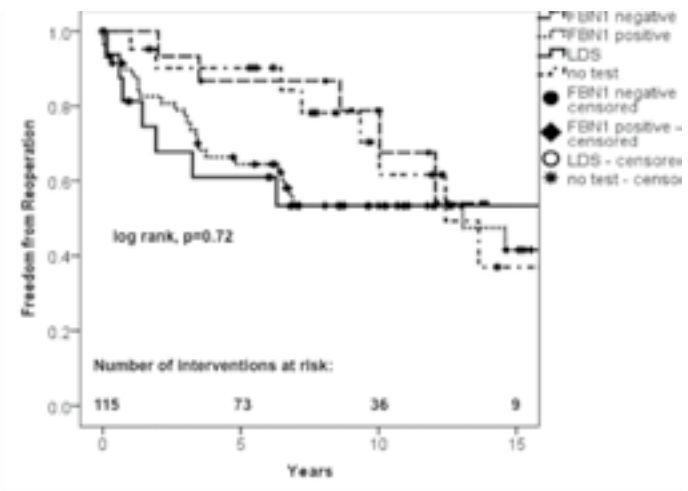


Figure 1: Kaplan-Meier graph showing no significant differences regarding freedom-from-re-operation in LDS patients compared to patients with or without confirmed FBN1 mutations

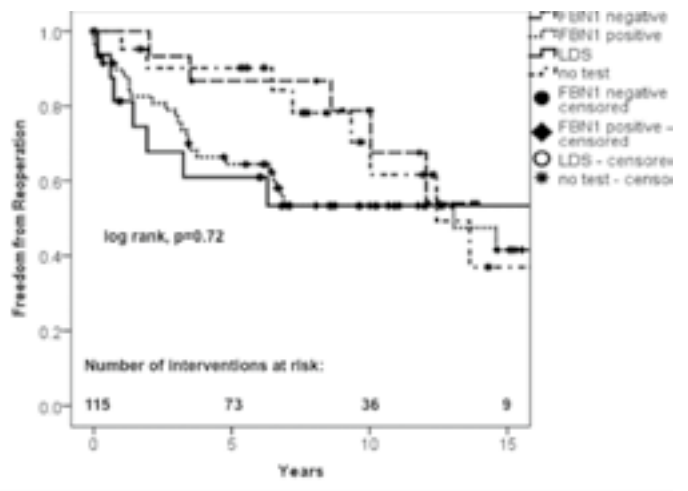


Figure 2: Kaplan-Meier graph showing no significant differences regarding survival in LDS patients compared to patients with or without confirmed FBN1 mutations

Film I 16:15 **Hall F1**

Repair of bicuspid aortic valve with autologous pericardium: preventing pericar-dial tears

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

A defect of the bicuspid aortic valve is always caused by cusp pathology, regardless if it is a stenosis or insufficiency. Because degeneration of the bicuspid aortic valves occurs earlier, these patients are younger at surgery and frequently fulfill the general selection criteria for valve repair. In many of them, the cusp free margins remain uncal-cified, which ensures the technical feasibility of repair, including repair of the entire cusp body. Such repair, as well as a majority of other bicuspid aortic valve defects, requires the use of some material for the repair. Autologous pericardium is used most frequently for cusp repair. This again is burdened by the risk of tearing the tissue at the suture line, especially, when the stitches are localized at the high stress points.

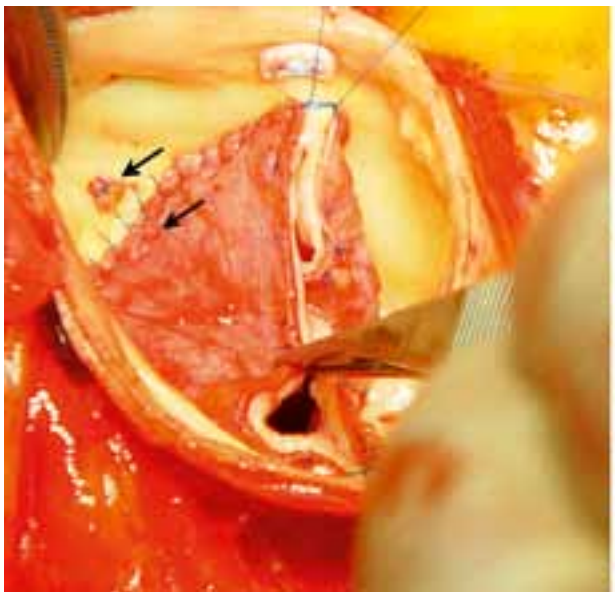


Figure 1

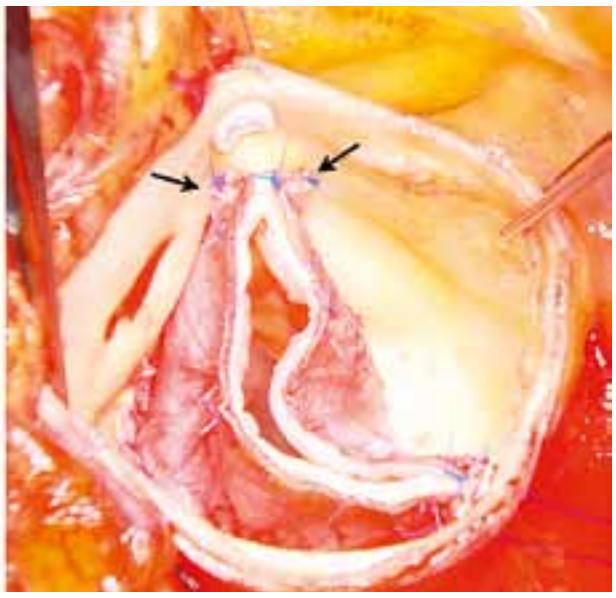


Figure 2

Paul Urbanski

First, we abandoned suturing the pericardium with the thin and fragile cusp tissue (e.g., after excision of the raphe). Currently, we correct the cusps along their free margins or, if appropriate; we replace the entire cusp body with pericardial patches, using the annulus, the cusp free margin, and the commissures as a frame for the repair. This technique enabled the extension of indications, even for repairing severely changed and calcified cusps. The frame consisting of the annulus, the cusp free margin and the commissures allows an easy size determination of the neo-cusps. To achieve an ana-tomical height of the cusps in the symmetrical bicuspid (180°) aortic valve, the pericar-dial patches are trimmed at the straight line connecting the tops of the commissures. To ensure the proper height of the cusps in asymmetrical (120°) valves, an adjustment of the cusp height in accordance to the distance between the commissures and the midline dividing the aorta to equal semicircles is necessary (Fig.1).

However, also after repair of the entire cusp bodies using the frame of native commis-sures and cusp free margins, tissue tears were still observed occasionally at the points of highest stress. To prevent these tears, additional pericardium-armed stitches were introduced to reinforce the tissue at the critical points of the suture lines (Fig. 2). Four 5-0 polypropylene U-stitches over small pericardial patches are placed at the tops of the annular suture line reinforcing the commissures The stitches cross each other by passing from the neo-cusp through the aortic wall diagonally to the opposite side or to the outside of the aorta. The suture lines are also secured at the nadir of the annulus by further 2 additional stitches. These sutures pass the edge of the neo-cusp from the aortic to ventricular side and go back through the annulus to the aortic side. They are knotted then over a pericardial patch at the aortic side of the annulus (Fig.2)

After establishment of the additional reinforcement, no more tears were observed after 90 subsequent repairs of bicuspid aortic valve. The technique presented is feasible for repairing complex pathologies of bicuspid aortic valve containing calcified stenosis. The reinforcement of the suture line with additional stitches seems to sufficiently pre-vent pericardial tears.

Aortic valve replacement: long-term outcomes 10:15 **Hall F1**

A propensity matched analysis of outcomes and long-term survival in stented versus stented valves

Blake Shultz *Spectrum Health, Michigan, USA*

Large numbers of stentless and stented valves are utilized every year for aortic valve replacement. Few comparative studies exist in the literature. Many of these studies utilized small cohorts and chose to focus on hemodynamic performance rather than long-term survival and clinical outcomes. Our study analyzed the clinical outcomes and long-term survival in a large cohort of 4,153 patients over two decades. Propensity score matching identified 823 pairs using 12 independent variables: incidence of operation, smoking status, renal failure, hypertension, diabetes, peripheral vascular disease, cerebrovascular disease, chronic lung disease, ejection fraction, gender, age and valve status.

The two groups were well matched, demonstrating no differences in all 12 variables. There were no significant differences found between the groups for post-operative mortality, stroke, atrial fibrillation, renal failure or ventilation time (p > 0.05). Stented valves showed a higher instance of post-operative bleeding 2.2% vs 0.8% (p<0.001). One, five, and 10 year survival was 94.9%, 81.3%, and 60.8% for stented valves and 95.3%, 84.4%, and 62.3% for stentless valves and did not differ significantly (p=0.45). Figure 1 shows a Kaplan-Meier curve delineating the long-term survival of our patients. There is a slight divergence in the curves between two and eight years with survival in the stented slightly better, however by log rank test there is no difference in survival (p=0.45).

Although prior studies have reached conflicting conclusions regarding the hemodynamic superiority of stentless versus stented valves, our results indicate that the 30 day clinical outcomes, and long term survival of the two valves do not differ. There was a slightly higher incidence of GI complications (3.8% vs 1.4%, p = 0.07) and post-operative bleeding in the stented valve group, however this did not affect length of ICU or post-op stay. Many prior studies have either been small scale randomized studies or large scale studies looking at individual valves, not comparative studies such as ours. Many of those comparative studies that do exist have been small or not propensity matched. Therefore, the large scale, propensity matched design of our study provides a powerful method of analyzing these valve types that has been rare in prior literature.

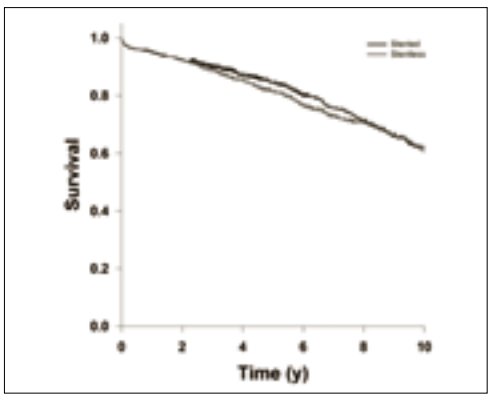


Figure 1. Kaplan-Meier survival curve predicting long term survival of patients within the stented and stentless cohorts. Comparison using the log-rank test gave a p-value=0.45.

In conclusion, both stented and stentless valves offer excellent 30-day results and long term outcomes. Either valve is an excellent choice for aortic valve replacement.

End-stage heart failure – long-term/permanent support 16:15 **Hall E1**

End-stage Heart Failure – Long term permanent support

Nicolas M. Van Mieghem
Thoraxcenter, ErasmusMC, Rotterdam The Netherlands

Heart failure remains a formidable challenge in contemporary cardiology affecting a significant portion of the (adult) population. Since the prevalence of HF seems proportional to age, the aging Western population is expected to generate an ever-growing pool of HF patients despite considerable efforts in primary and secondary prevention.

Data from the Framingham Heart Study suggest a HF prevalence of 0.8% in patients age 50 to 59 years, increasing to 6 - 8% in patients age 80 – 89 years. In addition, at age 40 the overall lifetime risk of developing HF is 20%! Importantly optimized treatment strategies for patients with acute myocardial infarction, valvular heart disease and congenital heart disease result in improved mid- and long-term survival. Consequently HF may affect patients at younger age that could require more advanced therapies to improve quality of life and life expectancy.

In this latter cohort of relatively younger patients with end stage HF, heart transplantation has been the ultimate rescue since Christian Barnard pioneered the first heart transplant in 1967. Over time patient prognosis after heart transplantation has steadily improved with currently median survival rates exceeding 10 years.

The Achilles heel of this strategy is obviously the scarcity of heart donors. But even worse, Europe is facing an even shrinking donor supply, resulting in excessive waiting lists for transplantation. With this background ventricular assist devices have become essential tools as bridge to transplantation or even destination in selected patients.

The International Society of Heart and Lung Transplantation (ISHLT) reported the use of LVAD as bridge to transplantation in up to 20% of new transplant recipients. LVADs can also be used to assess potentially reversible medical conditions and other organ dysfunctions that would otherwise preclude a heart transplant.

A plethora of ventricular assist devices exists from short-term pulsatile (Intra-Aortic Balloon Pump, PulseCath iVAC 2 or 3L), centrifugal (Impella 2.5 and 4L, Extracorporeal Membranous Oxygenation or ECMO) and axial (TandemHeart) percutaneous ventricular support devices with variable performance, complexity and risks to even more sophisticated durable pulsatile (Thoratec, Novacor, Heartmate XVE, Abiomed TAH), axial (Heartmate II, Jarvik 2000), centrifugal (HeartWare HVAD, Levacor, DuraHeart, Evaheart) or combined axial/centrifugal (Synergy by CircuLite) surgically implanted assist devices.

Given the considerable costs associated with the use of VADs and the current economic reality in the Western world, clinical outcome of long-term support and the complex yet inevitable cost-effectiveness debate become relevant. This time and age tenets of fundamental economics play a major role in current and future treatment strategies for patients with end stage heart failure.

Thoracic experimental 10:15 **Hall P**

A new strategy in the treatment of chemoresistant lung adenocarcinoma via siRNA specific silencing of SRF, E2F1, Survivin, HIF and STAT 3

Mircea Gabriel Stoleriu[1], Volker Steger[1], Migdat Mustafi[1], Martin Michaelis[2], Jindrich Cinatl[3],Wilke Schneider[1], Andrea Nolte1, Julia Kurz[1], Hans Peter Wendel[1], Christian Schlensak[1], Tobias Walker[1] *[1]Department of Thoracic and Cardiovascular Surgery, University Medical Center Tuebingen, Germany, [2]School of Biosciences, Department of Cell Biology, University of Kent, Canterbury, UK [3]Department of pediatric cancer and virus research, Frankfurt am Main, Germany*

According to the actual treatment strategies of lung cancer, the current therapeutic regimen based on chemotherapy, radiotherapy and surgery nowadays represents an individualized, multidisciplinary concept. One of the most important obstacles in the treatment of NSCLC is the development of chemoresistance with negative consequences in the effectiveness of the treatment and consecutively in the overall survival rate. In our study, we examined a new therapeutic alternative in the treatment of multiresistant lung adenocarcinoma via siRNA specific silencing of six crucial molecules involved in lung carcinogenesis (SRF, E2F1, Survivin, HIF 1, HIF 2 and STAT 3).

In order to reproduce the siRNA transfectability in vitro and to facilitate a similarity to *in vivo* situations, we examined the chemoresistance of three different chemotherapy agents on the A549 cell lines under standard conditions at 37°C and 5% CO2. The chemoresistance against Vinflunine, Vinorelbine and Methotrexate was induced artificially. 105 A549 cells were transfected two hours at 37°C with specific siRNA targeting SRF, E2F1, Survivin, HIF 1, HIF 2 and STAT 3 in a non-viral manner.

Another 2x104 A549 cells were seeded 24h prior transfection to facilitate the CASY analysis. The efficiency of siRNA silencing was evaluated via qRT-PCR, whereas the surviving cells after siRNA transfection as predictor factor for tumoral growth were analyzed with a CASY cell counter 3 days after transfection.

The response of the analyzed resistant adenocarcinoma cells after siRNA transfection was concentration dependent at both 25nM and 100nM.

In the selected resistant A549 cell lines, the siRNA specific transfection lead to a reduction of gene expression up to 85% after transfection with siRNA targeting SRF, STAT3 and Survivin in the Vinflunine group, up to 88% after siRNA transfection targeting STAT 3 in the Vinorelbine group and up to 84% after SRF- siRNA transfection in the Methotrexate group.

The Casy analysis showed a very accurate suppression of adenocarcinoma cells in Vinorelbine, Vinflunine and Methotrexate groups up to 82%, with significantly better results in comparison to the control group.

Our study proposes a new alternative in the treatment of (multi-)resistant NSCLC in the context of a multimodal individualized cancer therapy. In our opinion, siRNA might represent an important tool to knockdown various oncogenes and tumor suppressor genes involved in lung carcinogenesis, as well as a very productive platform for advanced molecular nanotechnology. For this reason, current efforts are directed to increase the plasma stability of the siRNA and to advanced genetic engineering processes in order to substantially increase the effectiveness and the applicability of the siRNA based technology *in vivo*.

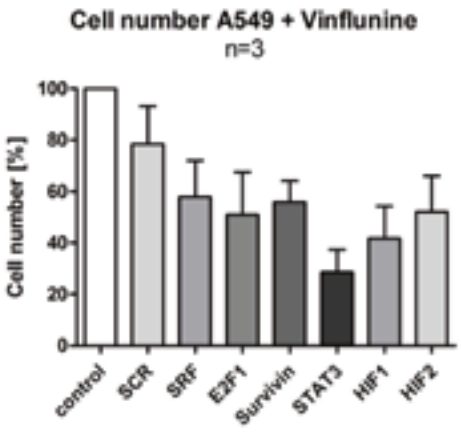


Figure 1: Percentage of viable cells three days after transfection with specific siRNA targeting E2F1, HIF 1, HIF 2, SRF, STAT 3 and Survivin, compared with untransfected cells, set to 100% in A549 cell lines treated with Vinflunine

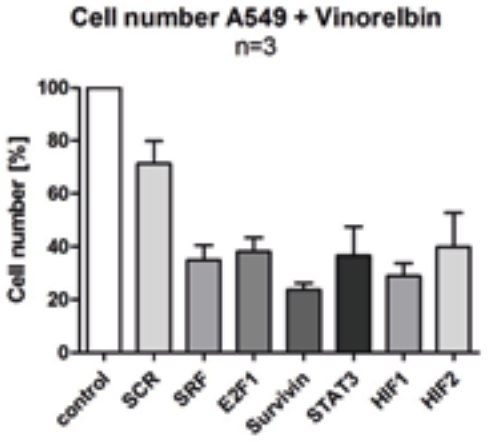


Figure 2: Percentage of viable cells 3 days after transfection with specific siRNA targeting E2F1, HIF 1, HIF 2, SRF, STAT 3 and Survivin, compared with untransfected cells, set to 100% in A549 cell lines treated with Vinorelbine

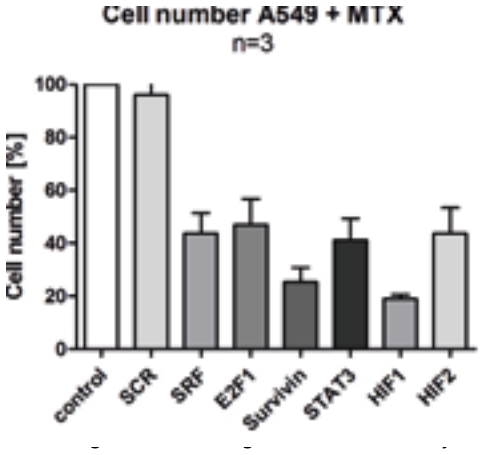


Figure 3: Percentage of viable cells 3 days after transfection with specific siRNA targeting E2F1, HIF 1, HIF 2, SRF, STAT 3 and Survivin, compared with untransfected cells, set to 100% in A549 cell lines treated with Methotrexate

Relative expression of A549 chemoresistant cell lines after specific transfection with corresponding siRNA

Specific siRNA	E2F1	HIF1	HIF2	SRF	STAT3	Survivin
Vinflunine resistant cells	---	-	---	---	---	---
Vinorelbine resistant cells	--	-	--	---	---	---
Methotrexate resistant cells	-	-	--	---	---	--

Table 1: Relative expression of specific siRNA targeting E2F1, HIF 1, HIF 2, SRF, STAT 3, and Survivin 24h after transfection. (-) modest reduction of gene expression (0-33%), (--) moderate reduction of gene expression (34-66%), (---) accurate reduction of gene expression (67-100%)

Surgery for prognosis – Part II, aortic valve disease 14:15 **Hall E1**

Valve disease in child-bearing age women

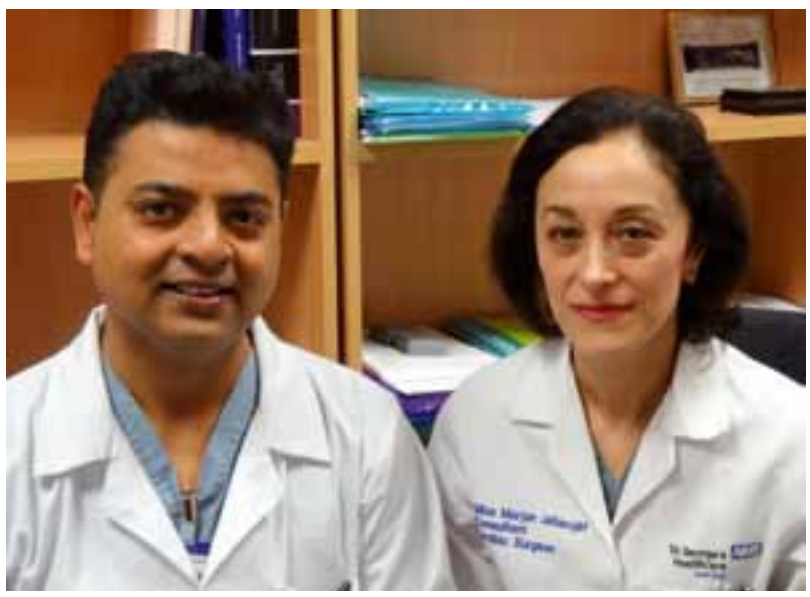
Gopal Soppa, Marjan Jahangiri, St. George's Hospital, University of London

Cardiac disease is the most important cause of maternal mortality. Literature on the subject is limited and almost entirely made up of case series. ESC guidelines on the management of heart disease in pregnancy is based on case reports and series.

The predominant cardiovascular conditions present during pregnancy include, hypertension (8%), congenital heart disease in the Western world (75-80%) and rheumatic valvular disease in less developed countries (56-90%).

If the valve choice is being considered in child bearing age women, using tissue valves, anticoagulation is avoided. However, the need for re-operation in patients less than 30 years old may be 50% at 10 years. The disadvantage of mechanical valve is the necessity for anticoagulation. Warfarin needs to be avoided during the first trimester and replaced with unfractionated heparin, due to its teratogenic effects. Some believe that warfarin can be given at low dose, since its detrimental effect is dose related. Even with a strict control of anticoagulation, the risk of thrombosis varies between 5-10% during pregnancy.

Physiological changes occurring during pregnancy include increase in heart rate and size by 30-50%, increase in plasma volume by 40% and decrease in systemic vascular resistance. Furthermore, there is increased hypercoagulability due to increase in fibrinogen levels, increased platelet adhesiveness and decreased fibrinolysis.



Gopal Soppa and Marjan Jahangiri (right)

If cardiac surgery is indicated during pregnancy, the health of both the mother and foetus must be considered and that well-being of the mother takes precedence. If surgery is indicated, ideally, it should be performed towards the end of the 2nd /start of the 3rd trimester. By this period, organogenesis is completed, but the cardiovascular changes in the mother are not complete and there will be less haemodynamic disturbance during cardiopulmonary bypass compared with later weeks in pregnancy.

If cardiac surgery is deferred to middle or end of 3rd trimester, there is always the danger of decompensation and need for urgent or emergency surgery with its associated higher risks.

Cardiopulmonary bypass is associated with a maternal mortality rate of 3-15% and a foetal mortality of 20-30%. Because of the increase in cardiac output, red cell mass, and oxygen consumption during pregnancy, the standard approach to cardiopulmonary bypass (i.e. haemodiluted, nonpulsatile and low flow) might be detrimental. Bypass performed at 35 degrees C will avoid foetal arrhythmia and uterine contractions. Using pulsatile instead of non-pulsatile flow, decreases uterine contractions and reduces placental vasoconstriction. The mechanism of which may be mediated by nitric oxide. With full maternal and foetal monitoring and attention to bypass, particularly use of pulsatile perfusion and avoidance of vasoconstrictors, the risks to both the mother and the foetus can be minimised.

Aortic valve repair in patients with unicuspid aortic valve by bicuspidization with augmentation using pericardium

Hiroaki Takahashi, Hans-Joachim Schäfers *University Hospital of Saarland, Homburg/Saar, Germany*

Aortic unicuspid valve is a very rare congenital lesion. The characteristic feature is one fully developed commissure, mostly in the posterior position and two rudimentary commissures. The height of those rudimentary commissures is very low and the insertion is under the level of the coronary ostias. It is known that this unicommisural UAV leads to aortic regurgitation or stenosis early in life.

Valve replacement has been the treatment for unicuspid aortic valve morphology. When valve replacement becomes necessary, the choice of valve substitutes is difficult because patients with UAV may require intervention earlier than other valve morphologies.The purpose of this study was to analyze the outcome after unicuspid aortic valve repair by bicuspidization with augmentation using pericardium.

Between May 2002 and December 2012, 144 patients (34 female, mean age: 26.2 ± 13.2 years, range: 3 to 59 years) underwent unicuspid aortic valve repair. At the time of surgery the predominant hemodynamic abnormality was stenosis in 17(12%), combined dysfunction in 70 (48%), and regurgitation in 57cases (40%). Balloon valvuloplasty had been previously performed in 22 patients for congenital aortic stenosis. Three patients had undergone previous surgery on the aortic valve (commissurotomy: n=4; Ross operation: n=1). Other previous cardiovascular procedures were: coactation repair (n = 5), and relief of left ventricular outflow tract obstruction (n = 1).

Unicuspid valves were treated by bicuspidization with augmentation using pericardium and constructed two normal commisures. Concomitant operations included, aortic root remodeling in 23 patients, partial aortic arch replacement in 11, resection of subaortic stenosis in 5, mitral valve repair in 2, tricuspid valve repair in 1, and coronary bypass in 2. A retrospective analysis of clinical and operative data, predictors for aortic valve reoperation was performed. Mean follow-up was 28.1 ± 23.7 months.

There was no hospital mortality. Actuarial survival was 97% at 3 and 5 years. During the follow-up, 23 patients required aortic valve reoperation. Finally, eleven underwent a Ross procedure, 5 mechanical aortic valve replacementn. The time between repair and aortic valve replacement ranged from one month to 8.8 years (median 3.3 years). Freedom from aortic valve reoperation at 2 and 5 years was 89% and 84%. Freedom from aortic valve replacement at 2 and 5 years was 95% and 89%.

Unicuspid aortic valve can be treated by bicuspidization. The functional early results of the bicuspidizated aortic valve are good. By using this method, aortic valve replacement could be avoided in most patients with unicuspid aortic valves. However, further follow-up will be necessary.

Cardiac potpourri 16:15 **Hall F2**

Comparison of intermittent cold versus intermittent warm blood cardioplegia

K. Trescher, A. Gleiss, M. Boxleitner, W. Dietl, H. Kassal, C. Holzinger, B.K. Podesser *LK St.Poelten, Austria*

For most surgeons intermittent hypothermic potassium-enriched (blood) cardioplegia is still the gold standard for both elective and emergency cases. However, since its introduction in the 1950s several studies have shown disadvantages of hypothermia. Therefore in the 1970s and 80s warm blood cardioplegia and warm heart surgery were introduced with promising results in both experimental and clinical trials. Although since then several clinical trials have been carried out to compare short term and long term outcome of warm versus cold cardioplegia there is still no agreement over the optimal temperature for cardioplegia.

In our study retrospective data of 2200 patients undergoing different procedures of adult cardiac surgery under similar cardioplegic regimes and surgical strategies were evaluated.

The objectives of this study were (1) to compare early postoperative outcome between intermittent cold and intermittent warm blood cardioplegia in patients undergoing different cardiosurgical procedures; and (2) to identify a subgroup of patients who benefits from either strategy.

Methods

2188 patients were retrospectively divided into 5 groups according to the procedure performed: coronary artery bypass surgery (CABG,n=1203), aortic valve surgery (AVR,n=374), mitral valve surgery (MVR,n=151), combined AVR+CABG (n=390), and combined MVR+CABG (n=70). Myocardial protection was performed by intermittent cold (n=1578) or intermittent warm (n=610) blood cardioplegia. In logistic regression models the effect of cardioplegia on 30-day mortality, IABP/ECMO support, transient neurological deficit, stroke, renal failure, new-onset atrial fibrillation, and troponin t release in peripheral blood was tested. The effect of cardioplegia was modified by age, logistic EUROSCORE, crossclamp-time, ejection fraction, and op-status elective versus urgent/emergent.

Results

At comparable baseline demographic and intraoperative data we did not see any difference between warm and cold cardioplegia concerning clinical outcome; i.e. 30-day mortality (OR:0.70; 95% CI:0.39-1.23; P=0.22), IABP/ECMO support (OR:0.60; 95% CI:0.23-1.55; P=0.29), transient neurological deficit (OR:0.90; 95% CI:0.65-1.24; P=0.54), stroke (OR:0.79; 95% CI:0.401.54; P=0.49), renal failure (OR:1.07; 95% CI:0.57-1.99; P=0.82), and atrial fibrillation (OR:0.96; 95% CI:0.77-1.18; P=0.71) in all 5 groups. Troponin t release, however, was significantly lower in patients operated on with warm cardioplegia. There was no different effect of cardioplegia between groups. In urgent/emergency surgery cold cardioplegia resulted in a significantly higher 30-day mortality (OR:3.03; P=0.02) compared to warm cardioplegia.

Concluding from these data in elective cardiac surgery there is no difference in short-term clinical outcome between warm and cold cardioplegia independent of the procedure performed. The subgroup of patients, however, who have to be operated on under urgent or emergency conditions seem to benefit from the use of warm cardioplegia indicated by a lower 30-day-mortality compared to cold cardioplegia. Seventyfive percent of these patients had to undergo cardiac surgery due to acute coronary syndrome. Therefore, warm cardioplegia might be an option to improve postoperative outcome especially in patients with recent MI or ongoing ischemia.

-Oncology I: video-assisted thoracoscopic surgery/sleeve resections 08:15 **Hall I**

Does sleeve lobectomy really lead to a better perioperative outcome than pneumonectomy in treatment of non-small cell lung cancer (NSCLC)?

Andrea Zuin
University of Padua, Padua, Italy

In pulmonary centrally located tumours, pneumonectomy and sleeve resection, as alternative, are still considered as the most appropriate surgical procedures.

Pneumonectomy is still associated with a significant risk for perioperative morbidity, with a reported complication rates of 38% to 59%, and a 30-day or in-hospital mortality of 3% to 12%,.

Sleeve lobectomy were initially considered as an alternative surgical management of central tumours in patients with inadequate cardio-pulmonary function to permit a pneumonectomy.

Several studies suggested that sleeve resection could be used in the management even of those patients with sufficient pulmonary reserve.

Purpose of this study is to evaluate and compare the perioperative outcome in patients submitted to pneumonectomy and sleeve lobectomy for NSCLC.

From January 2008 to December 2012, 198 consecutive patients underwent pneumonectomy (n. = 134) or sleeve lobectomy (n. = 64) for NSCLC.

Operative mortality for the 134 pneumonectomies was 3% (4 patients); operative mortality after sleeve lobectomy was 1.5% (1 of 64 patients) and was not significantly different.

Postoperative complications occurred in 35.1% (47 of 134) of patients submitted to pneumonectomy and in 37.5% (24 of 64) of patients after sleeve lobectomy (p=0.75).

In pneumonectomy group there was no side-related differences (p=0.58), while after sleeve lobectomy, left side was identified as negative prognostic factor (p=0.014).

In both groups, risk factors analysis correlated age, preoperative pO2, preoperative predicted FEV1, body mass index (BMI) and neoadjuvant chemotherapy as significant prognostic variables to mortality and morbidity.

In pneumonectomy group, univariate analysis identified chronic liver diseases, peripheral vascular diseases, lenght of surgery and blood loss as significant prognostic factors related to postoperative complications.

In sleeve lobectomy group, univariate analysis found that chronic liver diseases and left-sided procedures were significantly correlated to perioperative morbidity; multivariate analysis confirmed the prognostic significance of the same factors.

Sleeve lobectomy, initially restricted to patients with limited pulmonary function, nowadays is considered as the operation of choice also in patients without compromised lung function and a convincing alternative to pneumonectomy.

In this series, mortality after pneumonectomy and sleeve lobectomy was 3% and 1.5%, respectively, while morbidity was 35.1% and 37.5%, respectively, which were similar and comparable with that reported in literature.

Our in-depth analysis of pre-, intra- and postoperative variables identified several risk factors related to morbidity and mortality in both groups (age, preoperative pO2, neoadjuvant chemotherapy, preoperative predicted FEV1, chronic liver disease, peripheral vascular disease, blood loss), but the comparison between the two study population did not show significant difference in the perioperative outcome.

In conclusion, sleeve lobectomy presents many well-recognised advantages on pneumonectomy in terms of preserved lung function, oncological results and long-term quality of life; therefore, in patients with anatomically appropriate lung cancer, regardless cardio-pulmonary status, a parenchyma-sparing procedure like sleeve lobectomy, rather than a pneumonectomy, should always be performed.

However, from our findings, with appropriate selection and perioperative care, pneumonectomy may present with an acceptable and comparable postoperative outcome, maintaining its fundamental role in surgical management of centrally located NSCLC.

Basic science regeneration 08:15

Adult mesenchymal stem cell therapy complements ischaemic preconditioning

Mohammed Yasin *London Chest Hospital, UK*

Mohammed Yasin

Ischaemic preconditioning is the most powerful cardioprotective strategy discovered in the last 25 years. More recently, adult stem cell therapy has promised both regenerative and non-regenerative benefits in acute myocardial infarction. I have previously reported that adult stem cell delivery upon reperfusion can attenuate myocardial reperfusion injury to an extent that is comparable to ischaemic preconditioning. Since both adult stem cell delivery at reperfusion and ischaemic preconditioning target the injury caused by reperfusion, I investigated whether ischaemic preconditioned hearts might have further benefit by treatment with adult bone marrow derived mesenchymal stem cell therapy upon reperfusion, in an animal model of acute regional myocardial ischaemia and reperfusion injury. I demonstrated that the cardioprotection afforded by adult mesenchymal stem cell therapy and ischaemic preconditioning was far superior to that by either strategy alone. Moreover, the magnitude of the reductions in myocardial infarct size were comparable to sham animals i.e. hearts that had not been subjected to acute regional myocardial ischaemia and reperfusion.

Previously, I have reported that adult bone marrow stem cell therapy upon reperfusion is cardioprotective by phosphatidylinositol-3 kinase/Akt signaling and glycogen synthase kinase-3βinhibition. This survival signaling pathway has also been reported to be central to the cardioprotection mediated by ischaemic preconditioning. There is mounting evidence for stem cell derived paracrine factors and phosphatidylinositol-3 kinase/Akt signaling in ischaemic cardiomyocytes. I then questioned how ischaemic preconditioning mediated phosphatidylinositol-3 kinase/Akt signaling in the absence of stem cell derived paracrine factors?

Endogenous stem cells can home into an ischaemic myocardium by signaling between stromal cell derived factor-1 (SDF-1) and its cognate receptor chemokine receptor type 4 (CXCR4). Endogenous stem cells are, however, maintained within the bone marrow by the endothelial and stromal cellular lining of the bone marrow stem cell niche, which constitutively expresses SDF-1 to interact with CXCR4 expressed by the stem cells. During myocardial ischaemia, an elevation of SDF-1 expression in the heart intravasates to create an SDF-1 gradient for trafficking of mobilised endogenous stem cells from the bone marrow stem cell niche to the heart.

An important mechanism to directly disrupt the CXCR4 and SDF-1 interaction is by increased stem cell expression of CD26. CD26 is a type II transmembrane glycoprotein with extra-membranous dipeptidyl peptidase-4 activity to cleave and inactivate SDF-1.

Thus, I next investigated whether myocardial ischaemic preconditioning modulated the endogenous bone marrow stem cell CXCR4 and CD26 phenotype. Ischaemic preconditioning increased endogenous bone marrow stem cell expression of CD26 by six folds and expression of CXCR4 by 10 folds. The modulatation in endogenous stem cell CD26 and CXCR4 expression by ischaemic preconditioning may cause massive mobilisation of endogenous stem cells, which at least in part might explain how ischaemic preconditioning complements the cardioprotection afforded by adult bone marrow derived mesenchymal stem cell therapy.

Safer Operating Surgery (SOS) for high-performing teams in the operating room

Introducing the role of human factors and non-technical skills to improve outcome and reduce error.

This three hour interactive workshop will use short lectures, small group discussions, video scenarios and an audience response system to discuss the role of Human factors in adverse events in the operating room. It will go on to show how improving the non-technical skills of the operating team can reduce errors and improve outcome.

Monday morning 7th October

Introducing the NOTSS (nontechnical skills for surgeons) system for understanding, observing and rating surgeons non-technical skills in the operating room. (90mins)

This short 1.5 hour interactive session will introduce the NOTSS taxonomy of non-technical skills for surgeons. The faculty include two surgeons and one anaesthetist who are all members of the Royal College of Surgeons of Edinburgh Patient Safety Board and part of the 'NOTSS' training team. They have an extensive research and clinical background in the teaching and training of in the operating room. This short 90 minute workshop will demonstrate how these skills can be observed, rated and used to provide constructive feedback.

The faculty:

Mr Simon Paterson-Brown

- Consultant General and Upper GI Surgeon, Royal Infirmary of Edinburgh, UK
- Chairman Patient Safety Board, Royal College of Surgeons of Edinburgh

Dr Nicola Maran

- Consultant Anasthetist, Royal Infirmary of Edinburgh, UK
- Past Director of the Scottish Simulation Centre
- Member Patient Safety Board, Royal College of Surgeons of Edinburgh

Mr Graham Sunderland

- Consultant General and Colorectal Surgeon, Southern General Hospital, Glasgow
- Clinical Director of Surgery Greater Glasgow and Clyde Health Board.
- Member Patient Safety Board, Royal College of Surgeons of Edinburgh.

Cardiopulmonary bypass – improving outcome in marginal patients 14:15 Hall F2

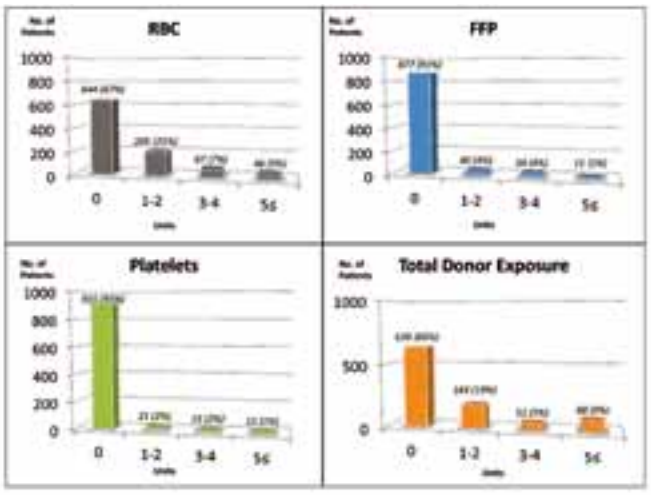
Biocompatible perfusion strategy is safe and associated with excellent clinical outcomes and reduced blood transfusions in a contemporary series of patients undergoing coronary artery bypass grafting – a two-center study

Oz M. Shapira[1], Amit Korach[1], Frederic Pinaud[2], Abeer Dabah[1], Yusheng Bao1, Jean Jacques Corbeau[2], Jean-Louis de Brux[2], and Christophe Baufreton[2] *Department of Cardiothoracic Surgery, Hebrew University, Hadassah Medical Center, Jerusalem, Israel[1], Department of Cardiac Surgery, University Hospital of Angers, Angers, France[2]*

The use of cardiopulmonary bypass (CPB) in coronary artery bypass grafting (CABG) surgery affords the opportunity to achieve the most important goals of this operation – complete revascularization, and precise performance of the anastomoses in a bloodless and motionless field. This translates into improved patient survival and reduced rates of adverse cardiac events.

However, the use of CPB is associated with side-effects inherent to the pathophysiology of this technology which involve a mechanical pump, blood-foreign surface interaction, blood-air interface and micro-embolization. The end results include systemic inflammatory response, coagulopathy and organ dysfunction.

To attenuate these pathophysiological phenomena we developed a comprehensive biocompatible perfusion strategy (BPS) in the mid 1990`s, that was adopted shortly thereafter by our collaborators in Angers, France. The components of our BPS include tip-to-tip, closed-system heparin-coated CPB circuits with a membrane oxygenator and no cardiotomy reservoir; low systemic anticoagulation (target ACT=250-300 sec); reduced CPB prime volume, strict avoidance of blood stasis within the CPB circuits; near-normothermic (34-36ºC) perfusion; routine use of a cell saver and anti-fibrinolytics, and strict thresholds for blood products



transfusion. We have previously shown that this strategy was safe and associated with improved clinical outcomes after CABG.

Since these reports, the profile of patients referred for CABG has fundamentally changed to include older patients presenting with acute coronary syndromes and multiple comorbidities.

This study re-assessed the safety and efficacy of our BPS in 964 (83% males, mean age 66±11 years) consecutive patients undergoing isolated CABG between 2008 and 2012. Data were prospectively entered into a Departmental database, using the American Society of Thoracic Surgeons Adult Cardiac Surgery Database definitions and collection tool. The study endpoints included 30-day mortality, morbidity and the incidence and magnitude of allogeneic blood transfusions.

The patients` baseline profile was typical of patients referred for CABG nowadays. Notably, 36% of patients were diabetics, 40% had left main disease, 57% had prior MI, 29% had prior PCI and many had been on aspirin, a second antiplatelet agent or heparin. A large proportion of patients were operated non-electively. Thirty-day mortality (1.4%), stroke (0.9%), myocardial infarction (1.3%) and reoperation for bleeding (4.2%) were low and within the STS predicted rates. The low rates of major complications translated into short time on the respirator, and short ICU and hospital length of stay. Two thirds of the patients did not receive any allogeneic blood product during their admission. Patients requiring transfusions were exposed to a very small number of donors. Independent predictors of mortality included left main disease and preoperative anti-arrhythmics and immunosuppressives. Independent predictors of allogeneic transfusions included advanced age, small body surface area, female gender, low preoperative hematocrit and low LVEF. Advanced age, priority of surgery, study site and dual anti-platelet therapy were not predictors of mortality or blood transfusions.

This study re-affirms that our BPS is safe and effective. It is associated with excellent clinical outcomes and reduced allogeneic blood transfusions. This study is also a prime example of a fine inter-institutional collaboration using a comprehensive clinical database as a tool for quality assurance.

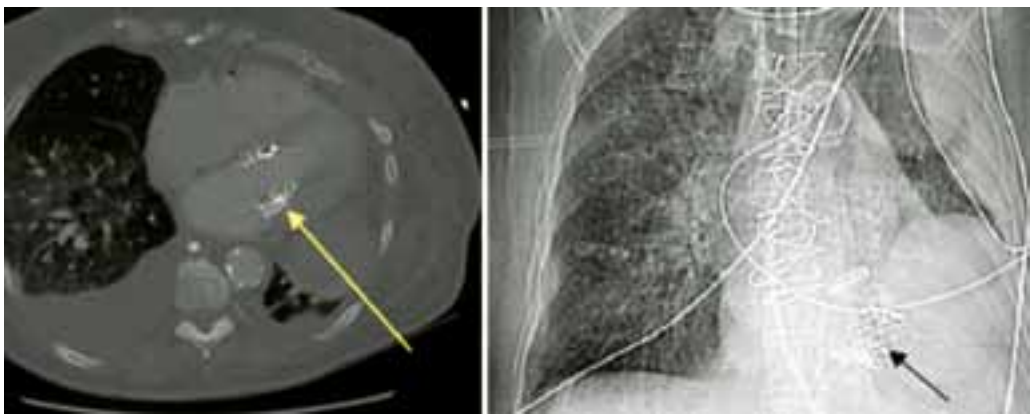
Cardiac potpourri 16:15 Hall F2

Transcatheter valve implantation in mitral valve disease...lessons learnt from the Heart Team

Imthiaz Manoly, Sarah-Louise McAnelly, Vaikom Mahadevan, Bernard Clarke, Ragheb Hasan *Manchester Heart Centre, Central Manchester University Hospitals, UK*

Imthiaz Manoly

Transcatheter aortic valve implantation (TAVI) has been shown to be a safe and feasible alternative to conventional surgery for those patients previously thought too high risk for open heart surgery and recent NICE guidelines support this. The last decade witnessed the concept of "the heart team" with the integration of cardiologists and surgeons. This case is the first to demonstrate the successful implantation of a Trans-catheter bio-prosthesis valve at a mitral position for native mitral stenosis through a transapical approach in a high risk patient.



Case presenation

A 70 year old lady who presented with severe pulmonary oedema due to severe mitral stenosis. During her stay she went into type II respiratory failure, she was intubated and admitted to CITU.

She had previously undergone a mechanical aortic valve replacement, coronary artery bypass grafts, an endarterectomy for calcification of the ascending aorta and a lower lobe lobectomy. A trans-oesophageal echo revealed severe mitral stenosis and coexisting moderate mitral regurgitation with a valve area measuring 0.9cm2 and mean gradient of 7mmHg. Her calculated EuroscoreII was 34.9%. At a multidisciplinary team meeting it was agreed that conventional surgery or balloon valvuloplasty would be too high risk quoting an operative risk of 50%. With the approval of her family, permission was requested from the MHRA to attempt to replace the valve using a transcatheter procedure. A 29mm Edward Sapien XT Trancatheter aortic bioprosthesis was successfully implanted through an anterior mini thoracotomy over the apex. Post procedure transoesophageal echocardiogram showed correct placement of the valve within the native valve with mild MR. She was haemodynamically stable and was transferred to Intensive care unit and discharged home once stable. Six months post-op she is currently doing well.

Discussion

Only a few have attempted to adapt transcatheter technique for a mitral position and of these bioprosthesis were already in-situ (valve in valve). This is mainly due to the difference in anatomy of the mitral valve and the rarity of mitral stenosis. At present transcatheter procedures are indicated only for those with significant co-morbidities due to the lack of data for long term outcomes. With further development and research transcather valvular implantation may become the gold standard for most valvular replacements reducing the need for open surgery.

Conclusion

This case illustrates the value of the Multi- disciplinary team approach to healthcare. By combing the knowledge and skills from different areas of medicine outcomes that were once seen as unfeasible can be achieved, enhancing patient care and prognosis.

Thoracic experimental 10:15

From Russia with… regenerative medicine

(Mesenchymal stem cells in the treatment of chronic fistula of the main bronchus)

A. Kovalenko, I. Gilevithch, I. Pashkova, V. Porhanov, I.Polyakov, N. Narijnii, V. Danilov *Regional Clinical Hospital, Krasnodar, Russia*

Treatment for patients with chronic bronchial fistulas is multimodal and does not always mean a standard method of cure. We believe thoracic surgeons acquired one more way to treat this pathology.

News about this novelty came from Krasnodar, Russia. A group of thoracic surgeons, Regional Clinic Hospital # 1 – Cardiothoracic Surgery Center, under the guidance of well-known professor Vladimir Porhanov, employed mesenchymal stem cells to treat chronic fistulas of the main bronchi.

'In 2011 Kuban State Medical University and Regional Clinic Hospital # 1 – Cardiothoracic Surgery Center won a so called Mega-grant of Russian Government,' said Dr. Igor Polyakov, the coordinator of this project.

'The ultimate goals of this grant were formation of an artificial synthetic trachea seeded with patient stem cells and its further transplantation to involved patients, and, creation of clinical and scientific laboratories for regenerative medicine and broad residency training in this area.'

These challenges were solved (four tracheas have been transplanted): application of genuine stem cells in patients with tracheal and main bronchus defect closures was one of the directions encouraged by the above-mentioned project. And owing to a fast growth of interest among our colleagues to stem cells employment in various spheres of medicine, not only scientific interest but clinical application of obtained results were found in focus of the formed team of researchers and surgeons.

This technique is not a know-how, Professor Paolo Macchiarini (Karolinska Unstitutet, Stockholm, Sweden) used the basic scheme and technology while transplanting artificial cadaveric trachea. Some new developed details allowed adapting technology in patients with exceptionally severe pathology, and particularly in those patients who were unable to response to any other methods of treatment.

And, to say in a few words: colloid solution from own mesenchymal stem cells had been cultivated for a certain period of time, then viability of cells was checked and for several days they have been implanted into the area with a fistula or tracheal

Focus (regenerative) doctors team: (from left to right): A. Kovalenko, I. Gilevithch, I. Pashkova, V. Porhanov, I.Polyakov, N. Narijnii, V. Danilov

defect, and, simultaneously, for several days growth factors of new cells have been administered as well and we monitored cell growth markers. Results were evaluated every 2-4 weeks. In all patients resistant to therapy fistulas closed in terms to 3-5 months. It was a foreseen but unexpectedly good results for five patients.

A number of new techniques appear in the toolkit of thoracic surgeons and they grow as a result of diligent work of researchers and practitioners, and it is especially pleasant to know that new technologies come from Russia, its small cities which are far from the traditional innovative centres located in the capital.

We would like to wish further successful and fruitful job to Krasnodar surgeons under the guidance of Professor Vladimir Porhanov.

EACTS
European Association For Cardio-Thoracic Surgery

28th EACTS Annual Meeting

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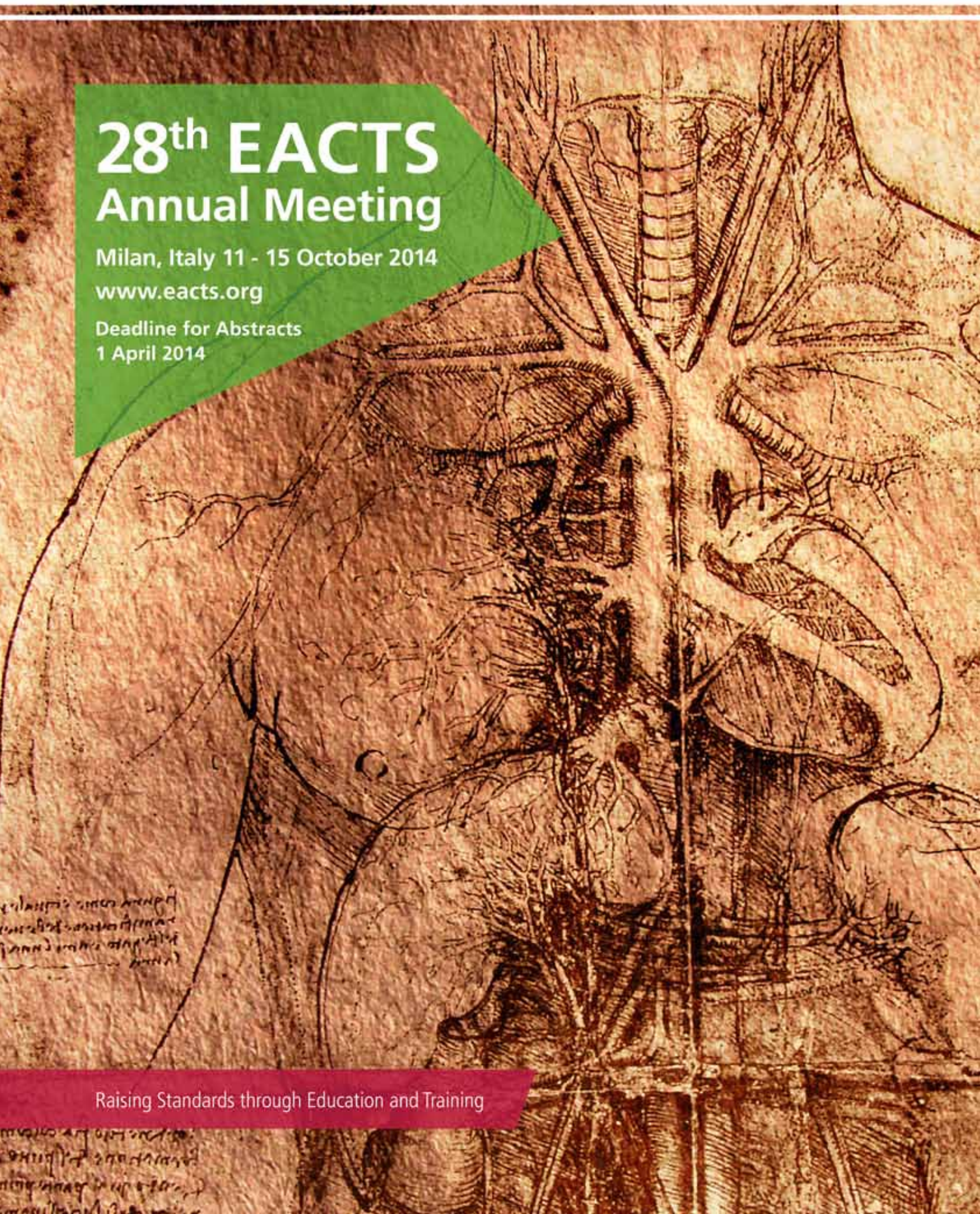

Raising Standards through Education and Training

Coronary artery bypass graft 1 14:15 Hall D

Benefits CABG on ischemic heart failure: From the CREDO-Kyoto PCI/CABG Registry Cohort-2

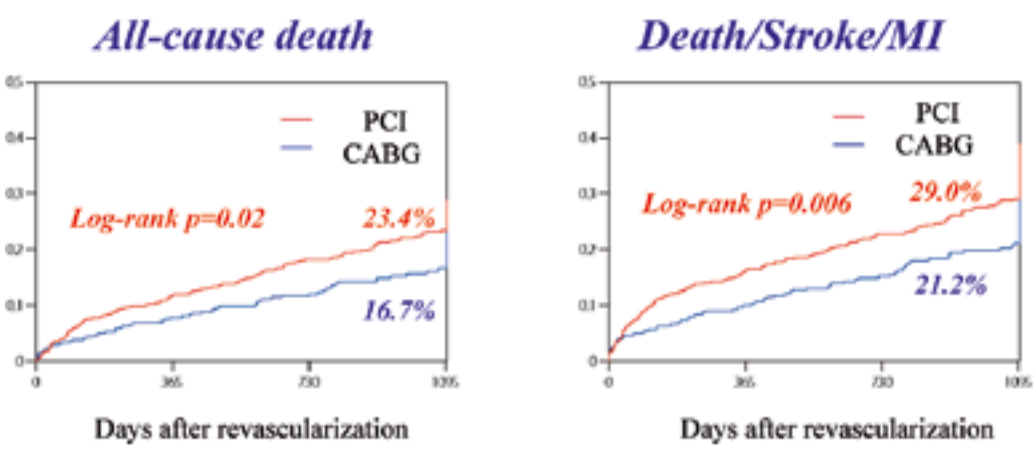

Figure 2: 3 month all cause mortality

	PCI n=812	CABG n=421	p value
Age (years)	71.8±10.7	69.3±9.5	<0.01
Male	522 (64%)	286 (68%)	0.20
LVEF (%)	46.0±15.1	46.1±14.7	0.34
3 vessel disease	378 (47%)	256 (61%)	<0.01
Left main disease	76 (9.4%)	131 (31%)	<0.01
Proximal LAD disease	519 (64%)	385 (91%)	<0.01
SYNTAX Score	26.8±10.2	32.2±10.5	<0.01
No. of treatment lesions	1.8 ±0.9	3.2 ±1.0	<0.01

Figuire 1: Patient characteristics

Akira Marui
Kyoto University, Kyoto, Japan

CABG is the gold standard therapy for patients with advanced multivessel and left main coronary artery disease. The Surgical Treatment of Ischemic Heart Failure (STICH) trial for patients with severe left ventricular dysfunction confirms the benefits of CABG in patients with ischemic cardiomyopathy. However, few reports were available regarding the benefit of percutaneous coronary intervention (PCI) in patients with ischemic heart failure. In addition, five-year outcomes of SYNTAX trial revealed that patients with more complex coronary lesions benefit more from CABG than PCI. Thus, we sought to investigate the impact of CABG compared with PCI on early and late outcomes in patients with heart failure with advanced coronary artery disease in Japan.

The CREDO Kyoto Cohort-1 and -2 are large multicenter registries in Japan enrolling over 25,000 patients undergoing primary PCI or CABG. In the CREDO-Kyoto Registry Cohort-1, we have reported the outcomes comparing PCI with CABG in the era of bare-metal stent. Now in the present study, we identified 1233 patients with multivessel and/or left main disease with a history of heart failure (ACC/AHA stage C or D), of 15,939 patients with primary myocardial revascularization enrolled in the CREDO-Kyoto Registry Cohort-2. There were 812 patients received PCI with DES and 421 CABG. We used propensity-score analysis to adjust the differences in baseline characteristics of patients undergoing PCI or CABG.

Akira Marui

Preprocedural LVEF was not different between PCI and CABG (46.0 ± 15.2% vs. 46.1 ± 14.7%, p=0.34; Table), but the CABG group included more patients with triple-vessel and left main disease (p<0.01 each). SYNTAX Score was significantly higher in the CABG group (26.8 ± 10.2 vs. 32.2 ± 10.5, p<0.01). Unadjusted 30-day mortality and in-hospital mortalities were not different between PCI and CABG (1.4% vs. 2.4%, p=0.43 and 3.7% vs. 3.6%, p=0.91, respectively). Regarding long-term outcomes, the incidence of hospital readmission for heart failure was higher after PCI than CABG (hazard ratio [95% confidence interval]; 1.67 [1.07-2.59], p=0.02). Most importantly, adjusted mortality after PCI was significantly higher than CABG (1.68 [1.10-2.56], p=0.02, Figure). Specifically, the incidence of arrhythmia-related death was far higher after PCI (9.57 [1.92-47.7], p=0.01). The incidence of composite of death, stroke, and myocardial infarction was also higher after PCI (1.82 [1.25-2.66], p<0.01. Stratified analysis using the SYNTAX score demonstrated that risk for death was not different between PCI and CABG in patients with low (<23) SYNTAX score (0.87 [0.37-2.05], p=0.75), whereas those with intermediate (23 to 32) and high (≥33) SYNTAX score, risk for death was significantly higher after PCI than that after CABG (2.01 [1.13-3.57], p=0.02 and 2.35 [1.16-4.78], p=0.02).

In conclusion, in patients with heart failure with advanced coronary artery disease, CABG was better option than PCI because CABG was associated with better survival benefit and quality of life, particularly in more complex coronary lesion stratified by the SYNTAX score.

Arrhythmia I 08:15

Maze surgery normalizes left ventricular function in patients with lone atrial fibrillation

Alberto Pozzoli[a], Maurizio Taramasso[a]; Mikel Kamami[a]; Giovanni La Canna[a]; Paolo Della Bella[b]; Ottavio Alfieri[a] and Stefano Benussi[a] *Cardiothoracic Surgery Department[a], Arrhythmia Unit and Electrophysiology Laboratories[b], San Raffaele University Hospital, Milan, Italy.*

In the era of catheter ablation, we face in our clinical practice very-highly symptomatic AF patients, who are either refractory to multiple percutaneous ablations or very unlikely to benefit from it. One of the more troubling aspects following ineffective transcatheter ablations, particularly the extensive atrial ablations for persistent AF, is the appearance of persistent atrial tachycardias, leading to left ventricular (LV) dysfunction caused by high ventricular rate, also named tachycardiomyopathy, and can be totally reversed only by conversion to sinus rhythm. Seen the disappointing results of aggressive percutaneous treatment in persistent AF forms, ablative surgery is generally the only treatment option alternative to ablation of the atrioventricular (AV) node and permanent pacemaker implantation in these young symptomatic patients. The maze procedure proved to treat AF with still unequalled excellent long-term results (up to 20 years), and is today easier and safer thanks to latest generation ablation devices[1-2]. Thus, the purpose of this study is to report the clinical and functional outcomes achievable with maze surgery in patients with persistent and long-standing persistent lone AF, even if affected by LV dysfunction.

With this purpose, we studied a total of 39 patients who underwent biatrial maze surgery using bipolar radiofrequency and crioenergy for lone refractory AF. Mean age was 51±10, 36 (92%) patients were male. There were 22 (57%) patients with long-standing persistent AF. Further, the majority of them (35 patients, 89%) had previous transvenous ablations (median=2; range, 0÷8). By definition, no patient had concomitant structural heart disease. A minimally-invasive maze operation, via right minithoracotomy and right groin cannulation, was adopted in 22 patients (57%).

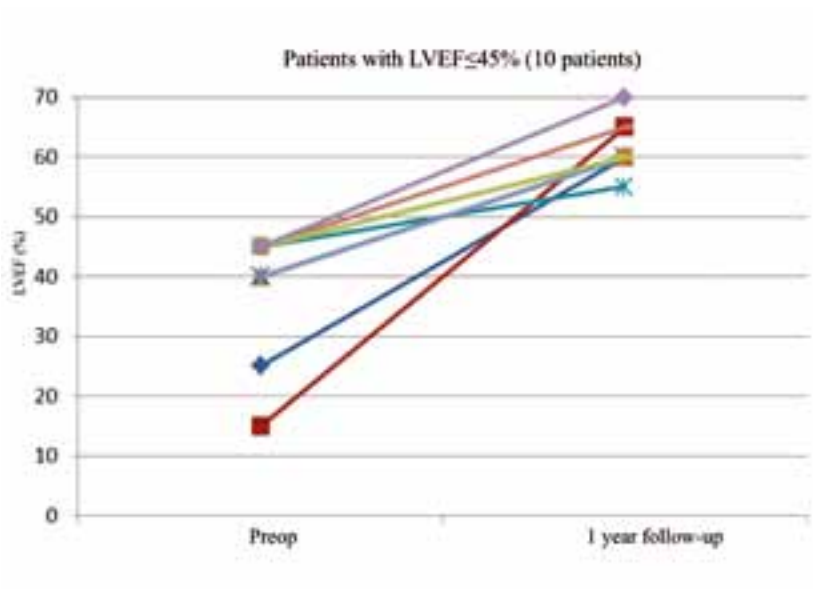

Figure 1: Success with antiarrhythmic drugs

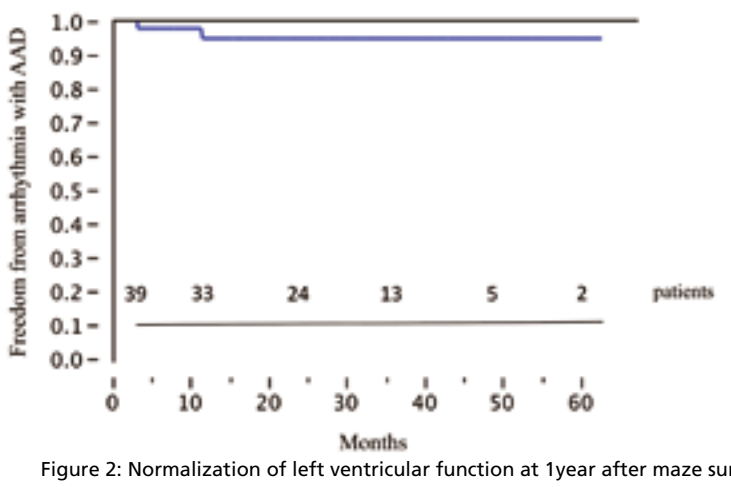

Figure 2: Normalization of left ventricular function at 1year after maze surgery in patients with LVEF minor 45%.

The main outcome of our study is that maze surgery yields excellent outcomes in the very challenging context of symptomatic refractory persistent lone AF. Overall, freedom from atrial arrhythmias was obtained in 37 patients (94.8%) (Figure 1), while the success off antiarrhythmic drugs was 80% (after a mean follow-up of 29.4±14.2 months). More, after maze surgery LVEF recovered significantly in the overall group (p<0.0001) and this improvement was particularly evident in those patients with significant impairment of LVEF due to tachycardiomyopathy (26% in our series) (Figure 2). Basically LV function normalized in all cases, with no exceptions. Most patients became asymptomatic after maze surgery, with a consistent improvement of quality of life and AF-related symptoms.

The 2006 ACC/AHA/ESC Guidelines for the Management of patients with AF postulated that drug-refractory, symptomatic recurrent AF should be given catheter ablation, the maze operation, or atrioventricular (AV) nodal ablation and pacing[3]. Although this last strategy might be effective in controlling palpitations in elderly patients, ablation of the AV node and pacemaker implantation does not restore left ventricular function and exercise capacity as effectively as ablation-mediated sinus rhythm recovery.

Actually, maze surgery compares favorably also with catheter ablation. A retrospective analysis of AF ablation experience at the Mayo Clinic revealed that freedom from recurrent AF after maze surgery was three times more effective, without increasing procedural risks, when compared to catheter ablation (87% success at five years after maze and 28% after catheter ablation, off-antiarrhythmic drugs)[4].

In conclusion, maze surgery grants excellent outcomes, performed at any stage of the disease, with symptoms relief and negligible risk. It provides a complete reversal of AF-related myocardial dysfunction and is therefore a convenient alternative to His bundle ablation and lifelong pacemaker dependency. It should be considered the first alternative to transcatheter ablation for young refractory symptomatic AF patients. A state of the art competence in maze surgery should definitely be available within a dedicated Arrhythmia Team, to manage persistent refractory AF patients appropriately, according to a patient-centered treatment strategy.

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Transcatheter aortic valve implantation: Expanding indications and techniques 16:15 Hall E2

TAVI combined with coronary artery stenting: a simultaneous approach

Adam Penkalla on behalf of the Berlin TAVI-Team
Deutsches Herzzentrum Berlin, Berlin, Germany

The TAVI program at Deutsches Herzzentrum Berlin began more than five years ago. Our core TAVI team consists of five surgeons of three different generations, two cardiologists, and two anesthesiologists. Our team offers all types of access to the aortic valve. The final selection of the therapeutic strategy is made on a case-by-case basis and is solely determined by our guiding principle of choosing the strategy that is "best for the patient".

About two-third of patients referred for transcatheter aortic valve implantation (TAVI) have coronary artery disease (CAD). There is no established strategy of how to treat concomitant CAD in these patients. When TAVI eliminates severe aortic valve stenosis, medical treatment of CAD might be sufficient.

Another therapeutic option is percutaneous coronary intervention (PCI). This can be done in a double-stage manner before or after TAVI or in a simultaneous, single-stage treatment of both pathologies.

The prevention of postoperative myocardial infarction without increasing the risk of the procedure is our primary aim in performing simultaneous PCI and TAVI. We treat only the most significant coronary lesion(s) that put a large myocardial area at risk.The coronary lesion should be technically suitable for clear-cut PCI and the coronary intervention should be performed with a very high chance of success.

The combined, single-stage approach treats both pathologies at the same time without the need for further interventions. Whereas during double-stage procedure, if PCI is performed first the patient is at risk for decompensation while aortic stenosis is left untreated. However, if TAVI is performed first, the incidence of post-procedural myocardial infarction may be elevated due to untreated CAD.

Furthermore, severe aortic stenosis should be considered as the most proximal coronary artery stenosis because it impairs systemic and myocardial perfusion. TAVI eliminates aortic valve stenosis and improves myocardial perfusion even in patients with concomitant CAD.

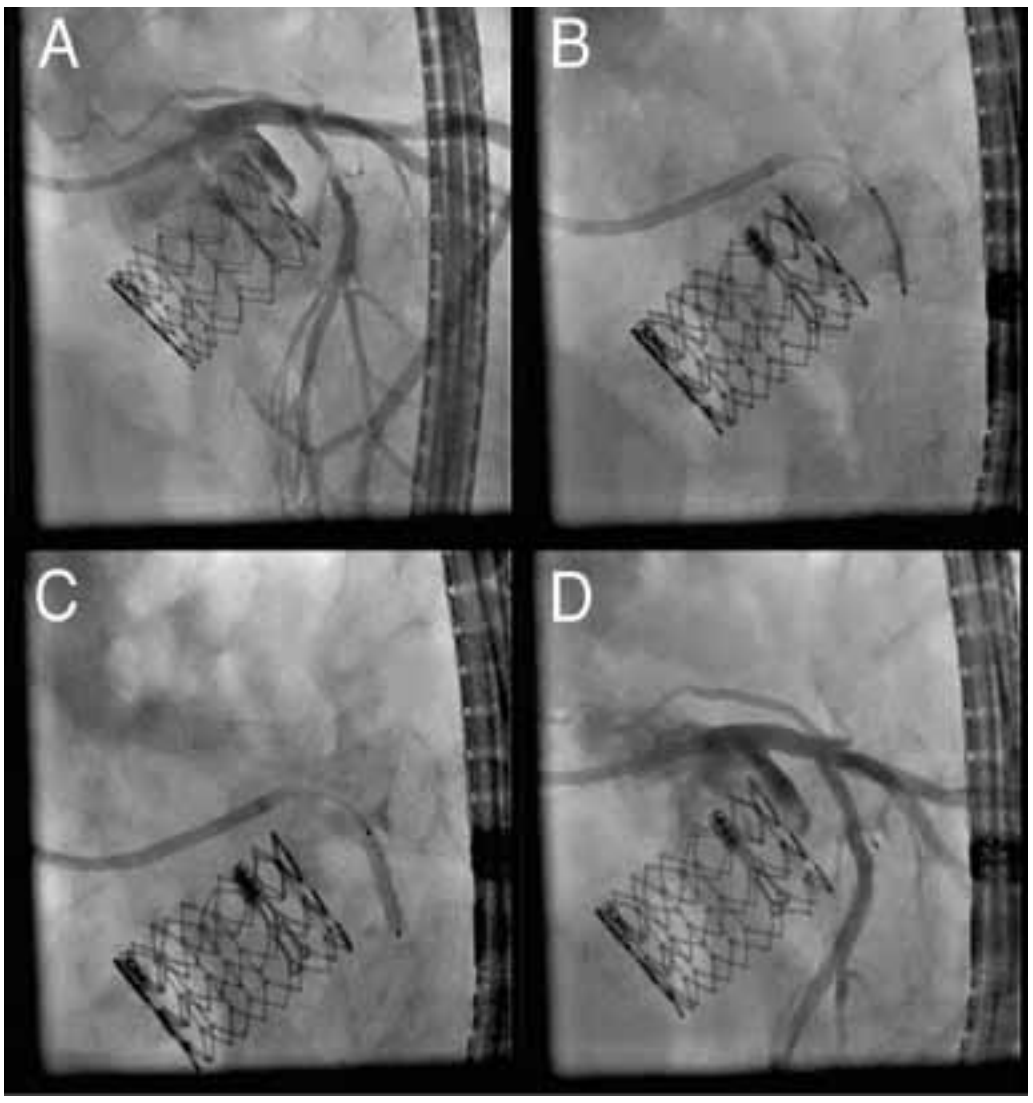


Figure 1: Combined, single-stage TAVI and PCI in a 98-year old male patient with high-grade stenosis of the proximal left anterior descending coronary artery (Improvement of total syntax score from 7 to 0 points).

Adam Penkella

The purpose of our study was to evaluate the outcome in the follow-up up to five years in 80 high-risk patients who underwent a transapical TAVI procedure and simultaneous elective PCI. This study group represents about 11% of all transapical TAVI procedures performed at Deutsches Herzzentrum Berlin from April 2008 until August 2013.

We show that a simultaneous, single-stage approach with combined elective PCI and TAVI is feasible and safe. It has become our primary choice for treatment of high-risk surgical patients referred for transcatheter aortic valve implantation with concomitant CAD.

Basic science regeneration 08:15

CD133 positive BMSCs are lost within minutes after intramyocardial injection

A. Martens, A. Rotaermel, S.Rojas-Hernandez, H. Baraki, M. Shrestha, U.Martin, A.Haverich, I.Kutschka *Hannover Medical School, Germany*

Andreas Martens and Alexander Rotaermel

Background: Intramyocardial injection of autologous CD133 positive bone marrow derived stem cells (BMSC) has been investigated in several clinical trials as a method to regenerate myocardial tissue in ischemic heart disease. However, so far intramyocardial BMSC transplantation has not led to meaningful clinical benefits.

Organ distribution of mononuclear cells (MNCs) has been investigated in animal models before, but distribution of CD133 positive BMSCs, which are considered to be endothelial progenitor cells (EPCs), has not been specifically addressed so far. In addition, we have developed a fast and effective way to monitor early organ distribution of intramyocardially injected cells by macroscopic fluorescence and bioluminescence imaging. We investigated the early distribution of human CD133 positive BMSCs in a murine myocardial infarction model.

CD133/CD34 double positive BMSCs were separated by FACS sorting from sternal bone marrow aspirates retrieved from cardiac surgery patients (n=39; 143±38ml). Cells were labeled with a fluorescent cell membrane dye and injected into the ischemic anterior left ventricular wall of LAD-ligated mice. Injections were either performed beating heart *in vivo* or into non-beating explanted organs. 10 minutes post injection organs were analyzed by macroscopic fluorescence bioimaging (IVIS).

Our data shows that isolation of CD133 positive BMSCs from sternal bone marrow of cardiac surgery patients is a practicable way to provide a sufficient amount of cells for experimental as well as clinical studies. Bone marrow aspiration and isolation techniques were successfully refined and cell yield now averages approximately 1.0 x 10 6 CD133/CD34 double positive cells per bone marrow aspiration with a cell vitality of >90%.

If CD133 positive BMSCs are intramyocardially injected in an aqueous solution (e.g. phosphate buffered saline = PBS), they are rapidly washed through capillaries into the pulmonary circulation. This is even true for injections performed into non-beating hearts (Figure 1A). Injection into beating hearts results in fast and almost complete cell loss from the injection site despite LAD occlusion (Figure 1B). Less than 10% of the originally isolated cells were detectable within the heart 10 minutes after injection. In contrast to former studies performed by our group using cell aggregates (e.g. IPSC derived "cardiac bodies", ~ 300µm), we were not able to histologically identify solid "cardiac grafts" of CD133 positive cells within the myocardium emphasizing their "fugitive" character.

Myocardial stem cell therapy by direct injection of autologous BMSCs (e.g. CD133 positive EPCs) is hampered by an extensive and immediate cell loss through drainage into the pulmonary circulation. New delivery methods have to be devised to increase cardiac retention of stem cells to maximize their local effects. We will investigate retention of CD133 positive BMSCs when delivered in viscose solutions and/or large cell aggregates.

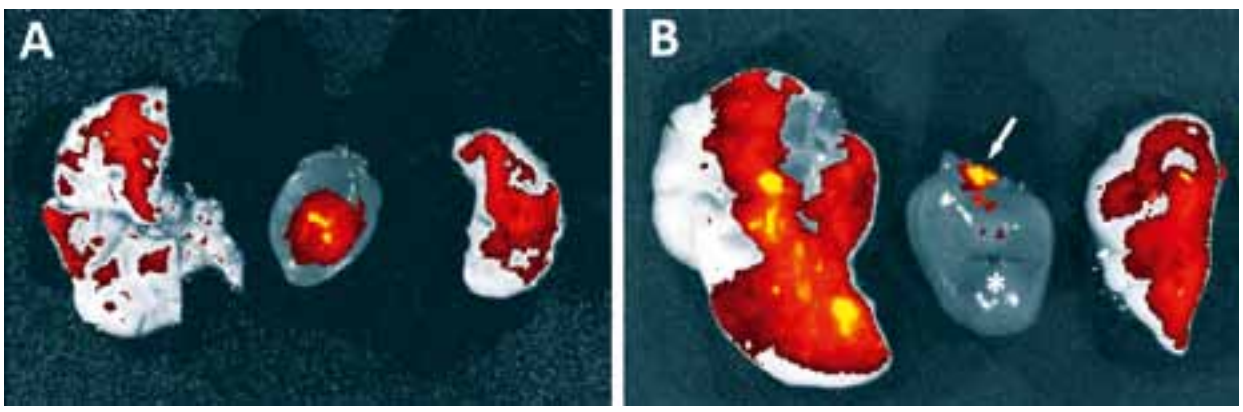


Figure 1: Organ distribution 10 minutes after intramyocardial injection of CD133 positive BMSCs: A: injection into non beating hearts ex vivo after LAD ligation: Injected cells accumulate at the injection site but are also partially washed into the lungs. B: injection into beating hearts in vivo after LAD ligation: cells are not visible at the injection site (*) adjacent to the LAD ligation but accumulate in the lungs as well as in the right atrial appendage (arrow) through venous drainage from the myocardium.

Session 2: The problem of tricuspid valve regurgitation in the biventricular and univentricular heart II 16:15 Hall K

Has the Cone Repair for Ebstein`s Anomaly Relegated other Repair Techniques to History?

Rüdiger Lange
German Heart Center Munich at the Technical University Munich, Germany

Tricuspid valve repair in patients with Ebstein´s anomaly is technically challenging. Previous surgical concepts are mostly ineffective in restoring a durable valve function. Therefore, specifically tailored repair is warranted. Former methods aimed mainly at repair of the valve in its displaced position without detachment and relocation of leaflets. Historically, the majority of patients presenting with Ebstein`s disease at the German Heart Centre Munich underwent a monocusp plasty. Attachment of the tip of the papillary muscle to the "true annulus" (Sebening stitch) enabled a monocusp repair with the enlarged anterior leaflet. The first one to describe extensive leaflet detachment and reconstruction of a "new" valve in a plicated and de novo annulus was Alain Carpentier who was recently followed by others.

Da Silva in Sao Paulo, Brasil, introduced a technique targeting the Ebstein valve in an even more specific way. Extensive mobilization of the displaced posterior and septal leaflets, together with parts of the anterior leaflet is followed by reattachment to the "true" tricuspid annulus. To support valve competency, the leaflets are arranged in a "cone" shape fashion in order to maximize coaptation of the leaflets which are displaced deeply into the right ventricle. The atrialized RV is plicated in a longitudinal fashion and the valve ring in a vertical fashion..Few cases have been reported worldwide, but there are indications that the functional results are excellent and the repair durable. Since 2011 twenty patients underwent the Da Silva Cone repair at the German Heart Center Munich, Germany. Early results in regards to valvular function and ventricular remodelling are very promising.

In the upcoming presentation, we review commonly used repair techniques and highlight the results of the Da Silva Cone rapair. We believe that the Da Silva Cone repair will replace previous surgical techniques in the future.

Aortic valve replacement: long-term outcomes 10:15 Hall F1

Aortic Valve: a single-centre Ten-years experience

Andrea Mangini[1,3], Monica Contino[1], Claudia Romagnoni[1], Massimo Lemma[1],Guido Gelpi[1], Paolo Vanelli[1], Simone Colombo[1]and Carlo Antona[2] *[1]Cardio-Cerebro-Vascular Department, "L. Sacco" University General Hospital, Milan, Italy, [2]Università degli Studi di Milano, Milan, Italy, [3]Dipartimento di Elettronica, Informatica e Bioingegneria (DEIB) Politecnico di Milano, Milano, Italy*

Aortic Valve Repair (AVR) is a good alternative to aortic valve replacement, especially for young people, because of its important advantages: no need of anticoagulation, aortic root physiology respect, absence of prosthetic material and lower endocarditis rates.

At Luigi Sacco University l Hospital we began our experience on AVR almost 10 years ago. From January 2003 to January 2013 235 patients affected by aortic valve regurgitation, pure or associated to root dilatation, were treated with a combination of the principal leaflet repair techniques and, when necessary, sparing procedures. All patients were submitted to pre and post-operative trans-thoracic echocardiography and to pre and post-repair trans-esophageal echocardiography.

We standardize our technique dividing the procedure in 4 different moments: 1) valve analysis (commissural exposure sutures; central stitch); 2) leaflets repair (free margin shaving, leaflet plicature, leaflets resection, free margin remodeling/ reinforcement, leaflet resection followed by patch repair); 3) aortic functional unit repair (sparing techniques, interleaflets triangles reshaping, sino-tubular junction plicature); 4) aortic functional unit stabilization (free margin reinforcement, functional aortic annulus stabilization).

218 patients were enrolled in our study and during the year 2012 we reassessed the majority of them by echocardiography and a cardiologic evaluation.

The mean follow up (FU) is 1250.61 [515,25-1975,25] days. At 9.24 years the survival is 91.8±4.3% (6 death at FU, 2 for cardiac causes, 4 for non cardiac reasons); freedom from reoperation is 94.5±2.5% (6 aortic valve replacement); freedom from aortic regurgitation (AR)>2 is 92.9±2.8%. We analysed by univariate methods the influence of left ventricle and ARFU dimensions on FU outcomes to be able to build a Cox model: the only hazard ratio statistically relevant on the freedom from AR>2 was the left ventricle end-diastolic diameter (LVEDD).

The echocardiographic data analysis shows the following features. After the surgical procedure the ejection fraction has a slight but significant reduction completely restored at FU. The left ventricle diameters and volumes are reduced continuously, except for LVEDD that shows a significant reduction between pre-operative and post-operative followed by a new increase at FU but still statistically different comparing the pre-operative one.

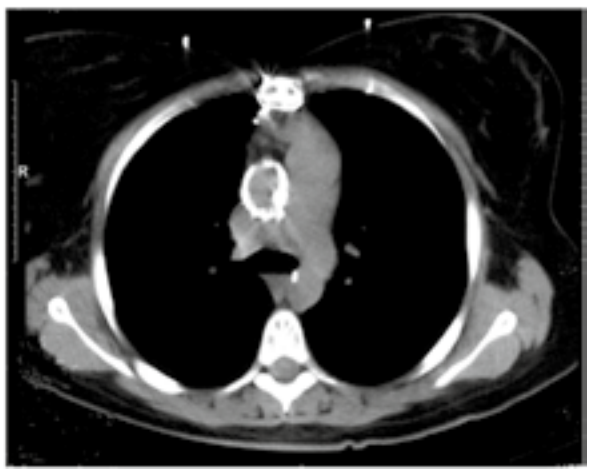
Also the virtual basal ring diameter had an immediate reduction followed by a new increase not any more statistically different from the pre-operative value. The sino-tubular junction undergoes after surgery a diameter reduction that is maintained at FU. Aortic root and ascending aorta dimensions decrease in a statistically significant way after surgery and at FU result substantially stable. The pressure drop increases after the repair with a significant p but decreases at FU to pre-operative values (p not significant).

In conclusion, the emerging results appear globally positive, so that AVR establishes as a good alternative to bioprosthesis. These data constitute an important incentive to pursue along this way. Particular attention must be paid in patients selection and in anatomical and echocardiographic analysis in order to identify predictive factors for success/failure of the valve repair.

Transcatheter aortic valve implantation: Expanding indications and techniques 16:15 Hall E2

Transapical aortic valve implantation in patients with and without severe calcification of the ascending aorta: different preoperative characteristics but no difference in outcome

The Berlin TAVI Team,
Deutsches Herzzentrum Berlin, Berlin, Germany



The consequence of growing numbers of elderly patients who require aortic valve replacement is an increase in complicating factors, such as atherosclerotic disease of the ascending aorta. Approximately 2% of patients requiring cardiac surgery and one third of patients over the age of 80 years have severe (significant) calcification of the ascending aorta.

One fifth of these patients will present with extreme diffuse, circumferential calcification of the proximal aorta, so-called "porcelain aorta". The presence of calcification in the ascending aorta is a challenge for every heart surgeon and represents a risk factor for outcome after conventional aortic valve replacement. TAVI is an off-pump technique which does not involve manipulation of the aorta and a potential alternative to other known techniques used in the presentation of calcified aorta. Our recently published paper demonstrated favorable results after TAVI in patients with severe calcified ascending aorta compared to results of conventional technique published in the literature [1].

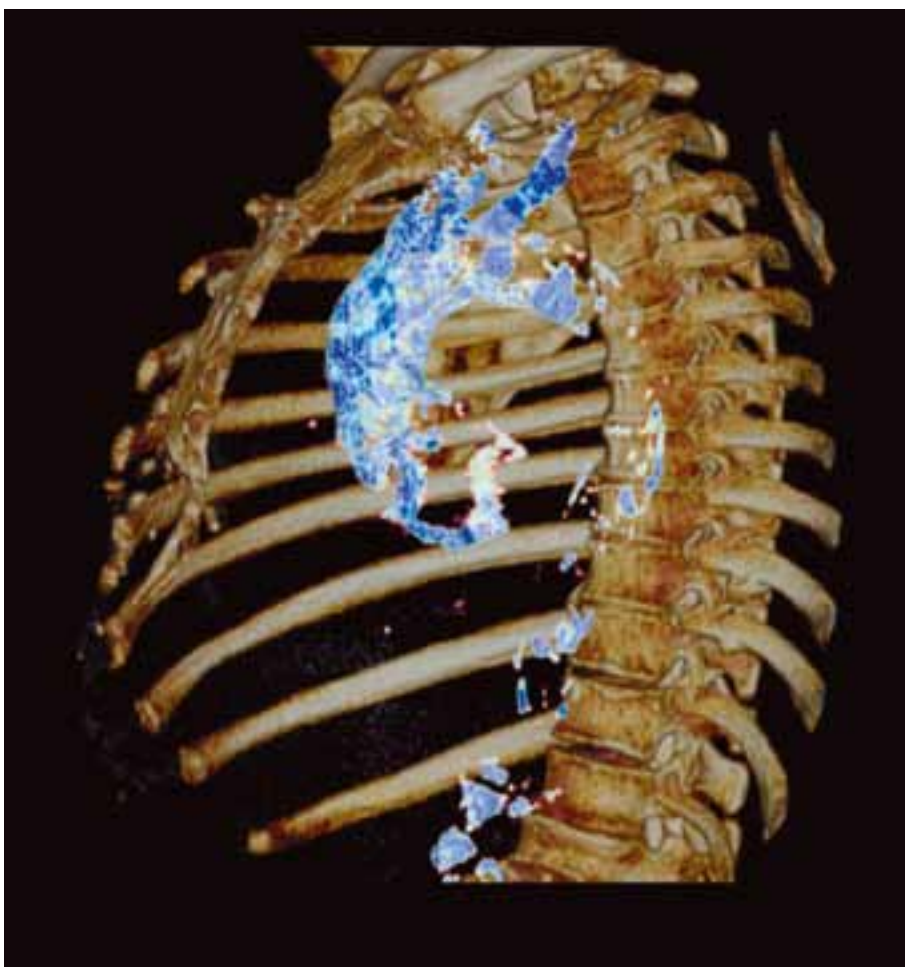
In this study, we evaluated the baseline characteristics and postoperative outcome of patients with severe calcification and without calcification of the aorta who presented for transapical aortic valve implantation. The main question was whether severe calcification represents a risk factor for intervention. Calcification of the aorta was analyzed by preoperative CT scan in patients undergoing transapical TAVI. The proportion of patients with severe calcification of the ascending aorta was about 14%. Compared to patients without aortic calcification, the patients with severe calcification had different baseline characteristics. These patients had significantly more preoperative renal failure, peripheral arterial disease, neurological deficit and previous cardiac surgery. Lung function was also more restricted in these patients.

Given these comorbidities, the logistic Euroscore and STS mortality score were significantly higher in this group. Nevertheless, the perioperative outcome including 30-day mortality did not differ between the groups. Despite the presence of rigid aortic wall, no valve dislocation occurred. Postimplantation, the rate of aortic regurgitation was similar with no signs of regurgitation over 55% in both groups. Univariate analysis showed that severe calcification was not a predictor for long-term mortality and postoperative stroke. Out of all patients with severe calcification, only one suffered a stroke in postoperative course.

In conclusion, severe calcification of the ascending aorta represents a risk factor for outcome after conventional aortic valve replacement. In contrast, transapical TAVI can be performed without surgical risk and severe calcification of the ascending aorta has no negative influence on perioperative outcome and long-term survival after transapical TAVI.

Reference:

Buz S, Pasic M, Unbehaun A, Drews T, Dreysse S, Kukucka M, Mladenow A, Hetzer R. Trans-apical aortic valve implantation in patients with severe calcification of the ascending aorta. Eur J Cardiothorac Surg. 2011 Aug;40(2):463-8.



Risk scores and outcome reporting 10:15 **Hall F2**

Performance of the EuroSCORE II in a large US database: Implications for TAVI

Ruben L. Osnabrugge *Dept. Cardio-Thoracic Surgery, Rotterdam, The Netherlands*

Ruben Osnabrugge

Risk models are essential for clinical decision-making, benchmarking of clinical practices, and patient-selection in clinical trials. Several scores are currently used in cardiac surgery, such as the original EuroSCORE which predicts 30-day mortality after cardiac surgery. At the EACTS annual meeting in Lisbon 2011, the EuroSCORE II was launched, which was derived from 23000 patients who underwent cardiac surgery in 43 countries in the year 2010. The goal of the EuroSCORE II was to enhance performance and increase applicability to contemporary cardiac surgery.

The new score performs better than the original score, but validation studies have been limited to European datasets. With increasing transatlantic research collaboration and the potential to use the EuroSCORE II also in the U.S. however, knowledge on the performance and comparability of the score in North-American patients is essential.

In a collaborative effort, researchers from the Erasmus University Medical Center in Rotterdam and the leadership of the Virginia Cardiac Surgery Quality initiative (VCSQI) compared the performance of the EuroSCORE II with the Surgeons Predicted Risk of Mortality (STS-PROM) model in a statewide multicenter U.S. database (>50,000 patients), and also explored implications for patient selection for transcatheter aortic valve implantation (TAVI). Results show that overall the STS-PROM model, which contains over 40 variables, was better calibrated (observed versus expected mortality,O:E=0.77 versus O:E=0.66 for the EuroSCORE II; figure) and was superior in discriminating patients that were likely to survive from those who were more likely not to survive during the first 30 days (AUC=0.80 versus AUC=0.66 in the EuroSCORE II;p<0.001). Nevertheless, the performance of the EuroSCORE II, comprising 18 variables, was satisfactory compared to the STS-PROM in non-CABG procedures. In patients undergoing aortic valve replacement, both scores performed similarly.

Ongoing transcatheter versus surgical aortic valve replacement trials (PARTNER II and SURTAVI) are enrolling at patients with an estimated 4-10% risk of mortality. The results of the current study imply that these trials are actually enrolling patients with an estimated 30-day mortality risk of 3.0-7.5% (EuroSCORE II) or 2.8-7.0% (STS-PROM), potentially leading to overtreatment with an investigational device. Therefore, risk decision-making should not solely be based on risk scores, but should comprise multidisciplinary heart team discussions.

Connective tissue disease and bicuspid aortic valves 10:15 **Room G**

Correlation between systolic transvalvular flow and proximal aortic wall changes in bicuspid aortic valve stenosis

Evaldas Girdauskas
Central Hospital Bad Berka, Germany

The optimal treatment of patients with bicuspid aortic valve (BAV) disease and ascending aortic dilatation is still controversial[1]. BAV disease has been shown to be a very heterogeneous disorder with different types of BAV-associated aortopathy (i.e., BAV phenotypes). Individual BAV phenotypes may be caused by unique pathogenetic mechanisms and may require tailored surgical approaches. Hemodynamic factors have been proposed to play a major role in the development of aortopathy in the patients with BAV stenosis[2]. The aim of our current study was to prospectively evaluate systolic transvalvular flow patterns and the associated proximal aortic wall lesions in the patients with BAV stenosis.

A total of 48 consecutive patients with BAV stenosis who were referred to our hospital for aortic valve replacement (AVR) with / without concomitant proximal aortic replacement from January, 2012 through February, 2013 were enrolled. Preoperative cardiac phase-contrast cine-magnetic resonance imaging (MRI) examination (Siemens Avanto 1.5 T scanner) was performed in all study patients Detailed analysis of function sequences and real-time phase-contrast imaging was used to detect the area maximal flow-induced stress in the proximal aorta (i.e., segment of aortic circumference which was in direct contact with the flow-jet) and the exact distance (cm) between aortic valve plane and the area of maximal flow-induced stress in the proximal aorta. These MRI data were used to guide the sampling of aortic tissue during surgery.

Based on preoperative MRI, two aortic specimens were collected during AVR surgery for each patient. The first aortic specimen (so-called jet-sample) was obtained from the area of maximal flow-induced stress, as identified by MRI analysis. The second sample (i.e., control-sample) was collected from the opposite aortic wall. All specimens were evaluated by two experienced pathologists who were blinded to the collection site of aortic specimens (i.e., jet-sample vs. control-sample).

Semiquantitative histological grading scale, published by Bechtel et al.[3], was used for the grading of aortic wall lesions. Aortic wall changes were graded based on seven histological criteria (i.e., each from 0 to 3+) and were summarized in a histological sum-score. Histological sum-score (0 to 21+) was separately calculated and compared between both aortic samples (i.e., jet-sample vs. control-sample).

Eccentric transvalvular flow-jet hitting proximal aortic wall could be identified in all 48 (100%) patients with BAV stenosis (Figure 1). The area of maximal flow-induced stress was located at the lateral or posterior wall of the greater curvature of ascending aorta in 98% of study patients. Mean histological sum-score was significantly higher in the jet-sample vs. control-sample (i.e., 4.1±1.8 vs. 2.2±1.5, respectively) (p= 0.02). None of the study patients had higher histological sum-score value in the control-sample as compared to the jet-sample. Eccentric transvalvular flow- jet has been identified as a predictor of higher histological sum-score in the jet-sample vs. control-sample (i.e., OR 9.4, 95% C.I. 2.3-19.7).

In conclusion, our current study demonstrates a strong correlation between the systolic pattern of transvalvular flow-jet and the asymmetric proximal aortic wall changes in the BAV stenosis patients.

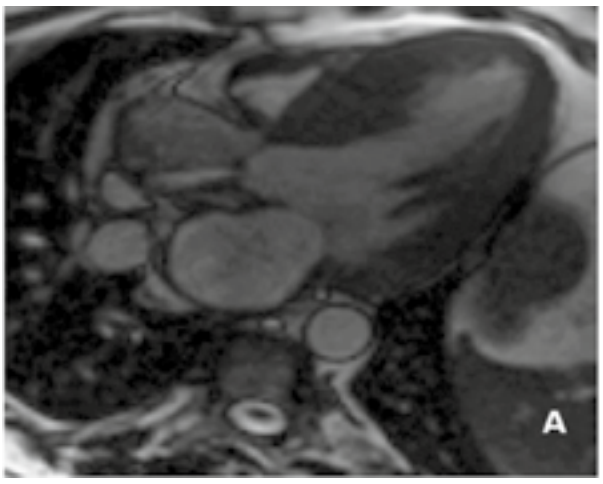


Figure 1: Visualization of the systolic transvalvular flow-jet in cardiac MRI; Eccentric flow-jet directed towards right- posterior segment of the ascending aorta in the oblique sagittal view (A) and coronal view (B)

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Challenges of cardio-vascular surgery in the developing economies 16:15 Room 1

Management of AMI in developing countries: An evidence-based expanded role for CABG

Walter Gomes *San Paulo, Brazil*

Timely reperfusion therapy in ST-segment elevation myocardial infarction (STEMI) is the mainstay of treatment, and primary percutaneous coronary intervention (PCI) is the preferred reperfusion option. However, particularly in large urban centers and rural areas, a significant portion of these patients will not receive optimal treatment. Pharmacoinvasive strategy has emerged as an alternative for patients admitted to primary care centers, based in a combination of prehospital intravenous thrombolytic therapy and early systematic coronary angiography.

The recent STREAM trial reported that prehospital fibrinolysis with timely coronary angiography resulted in effective reperfusion in patients with early STEMI, providing clinical outcome similar to that with primary PCI. CABG was performed in more patients in the fibrinolysis group (4.7% vs 2.1%) and accounted for end-point reduction in the pharmacoinvasive group, driven largely by heart failure and shock. Furthermore, suggested that complete surgical coronary revascularization among the patients undergoing fibrinolysis might have an favorable effect on long-term mortality.

As part of a municipal program of primary care for STEMI in the city of São Paulo, patients admitted to primary municipal emergency facilities or rescued by the Emergency Mobile Healthcare Service were submitted to prehospital fibrinolysis and subsequent coronary angiography at the São Paulo Hospital of Federal University of São Paulo 3 to 24 hours after thrombolysis.

In this analysis, 336 patients submitted to thrombolysis and coronary angiography between May 7, 2012 and July 29, 2013 were retrospectively reviewed by a Heart Team to decide the best medical decision for each patient, following the guidelines, and based on the coronary artery anatomy, number and localization of coronary artery stenosis, TIMI flow grade and patient clinical presentation for adequacy of both PCI and CABG. In this way, in 17% of this population CABG was regarded the appropriate indication for improving prognosis. However, ad hoc primary angioplasty was performed in all of them.

Incremental evidences reinforces the beneficial role of CBG in the AMI early phase. And expansion of pharmacoinvasive strategy affords time to the Heart Team to make and apply the best therapeutic decision for improving patient's prognosis.

Surgeons are compelled to cope with this changing scenario, as still remains controversial the best strategy and timing for operating patients in the AMI early phase. The risk of bleeding related to surgery must be balanced against the risk of recurrent ischemic events associated to discontinuation of antiplatelet therapy.

Off-pump CABG (OPCAB) is an attractive technique as it has been demonstrated to reduce operative bleeding and transfusion, also OPCAB through left anterolateral thoracotomy is suggested to further decrease operative bleeding.

Meticulous surgical technique should be employed in this setting. Skeletonized internal thoracic artery dissection minimize tissue trauma and reduce blood loss, and antifibrinolytics has been demonstrated to decrease perioperative bleeding. Newer antiplatelet drugs may also help overcome some of these shortcomings. Above all, surgeons must be serene and strive to attain rigorous hemostasis before closure. Therefore, the implementation of Heart Team decision-making process becomes mandatory to provide to patients the appropriate treatment in this setting of the acute phase of STEMI.

Aortic disease in infancy and adulthood 08:15 Hall G

Embryogenesis of the aorta-normal and abnormal developmental patterns

Adriana C Gittenberger-de Groot
LUMC, Leiden, the Netherlands

During embryogenesis the arterial vessels connected to the primary heart tube acquire a number of cell types that are essential for the formation of a sustainable vascular wall. These great vessels should be optimally equipped ensuring a proper distribution of blood to the systemic and pulmonary circulation. The unseptated aortic sac connects the heart tube to a bilateral system of dorsal aortae by the pharyngeal or aortic arch arteries. The latter arteries appear sequentially from 1 to 6 with a developmentally missing fifth artery.

During development this bilateral system is remodeled into a left aortic arch while the right 6th artery and the distal right dorsal aorta (alpha segment) regress and disappear. This remodeling process takes place while the initial endothelial lined vessels are already surrounded by smooth muscle cells (SMCs). Several populations of embryonic mesodermal cells contribute to the SMCs that form the media of the vessels. The SMCs derive from the neural crest cell populations, the mesoderm of the anterior second heart field and, within the pericardial sac, from the arterial epicardium (EPDCs). In normal remodeling of the aortic arch selective apoptosis plays an important role and it has been shown that hypoplasia to atresia of a normally required segment (e.g. the fourth or B segment of the left and right aortic arch) are related to abnormal apoptosis patterning.

These abnormalities seem to be related to abnormal neural crest or second heart field contribution and /or interaction. The cause can be a genetic mutation within a cell population but it and can also be triggered by abnormal haemodynamic flow patterns. Recent evidence supports an epigenetic cause for congenital heart disease as also genetic methylation defects are seen to underlie down regulation of non-mutated essential morphogenetic genes. An important factor

for understanding aortic arch and vessel wall malformations is the asymmetric distribution of the second heart field population. This population is important for the characteristic repositioning of the pulmonary and aortic orifice and their respective arteries (rotation on the basis of a pulmonary push process) and may play a role in development of double outlet right ventricle and transposition of the great arteries (TGA).

The above mentioned cell types are not only important for the development of the wall of the great arteries but also contribute to the myocardial outflow tract, the septation of the great arteries and outflow tract as well as to semilunar valve formation. This reflects on a number of cardiac malformations. For instance in TGA not only the great arteries are dispositioned but also the morphology of the aortic and pulmonary wall is not normal.

Another example refers to coarctation of the aorta where the characteristic wall of the ductus arteriosus is incorporated in the constriction. This leads to a locally abnormal aortic wall structure. Sometimes the developmental deficiency may lead to clinical symptoms and pathology in the adult life as seen in isolated bicuspid aortic valve and the accompanying abnormal aortic wall that is prone to dilation.

The above examples have repercussions on the choice of surgical repair and palliation procedures and the ensuing expectancy on how normal the postsurgical anatomy and physiological outcome may be. Examples are the choice for Ross procedures, management of neo-aortic orifice dilation, preventive aortaplasty in BAV and the choice for end-to-end or subclavian flap procedures in relieving aortic coarctation.

The above research data are based on a long-term and fruitful collaboration between the Dept of Thoracic Surgery (Prof Mark Hazekamp), Pediatric Cardiology (Prof Nico Blom, Dr Regina Bökenkamp) and Anatomy and Embryology (Prof Marco DeRuiter, Prof Robert Poelmann, Dr Monique Jongbloed and Dr Margot Bartelings) of the Leiden University Medical Centre (LUMC) the Netherlands.

Treatment of rheumatic valve disease. Repair vs replacement 14:15 Room 1

Management of mitral and aortic valve disease

Taweesak Chotivatanapong, *Central Chest Institute of Thailand, Nonthaburi, Thailand.*

Mitral Valve

Rheumatic valvular heart disease remains the major problem in Thailand, SE Asia and many developing countries. The problem is not only in the number of patients but also of how to offer the best care for them. Many of them are young, females who need to have baby, poor medication compliance and live in rural area with suboptimal health care system. All of these factors render MV repair a preferred alternative treatment.

However, to achieve good results in rheumatic mitral repair, surgeons need to understand the effect of rheumatic inflammation on normal mitral valve complex and dynamics both in diastolic and systolic function. In diastole, the valve have to be fully opened. The mitral orifice is not spherical but instead elliptical with maximal opening in the middle. Normal pliability and length of leaflets and chords are crucial for this function. In sytole, the anterior leaflet must close tightly with posterior leaflet. The line of closure must occur in the inflow of mitral orifice and thus no obstruction of LVOT. The mitral valve have to maintain protective mechanisms of maximal coaptaion to minimize stress upon the chords and ensures excellent durability.

The strategy of rheumatic MV repair is the same as Carpentier's principle, ie, restoration of type I movement, good coaptation and annular remodelling. However, in rheumatic valve, tissue retraction, thickening with calcification of both leaflets and chords are not uncommon findings. These differences in valve pathology demands surgeons to use different approaches and techniques. The main focus is to restore both good quality and quantity of tissue for good coaptation. Several techniques have proved to be effective and reproducible for this purpose. Autologous pericardium is effective for tissue repair. Chordal repair is another important step. This can be done successfully either by native chordal transfer or neochordal replacement with PTFE suture. Annular remodelling with appropriate type of valve ring is perhap the final key step for success. Annular deformity is not uncommon and usually rigid ring is effective to correct this problem.

Although Rheumatic mitral repair has become more successful recently, however, in elderly patients with severe valve pathology and high associated comorbidity, valve replacement with bioprothesis should be a better surgical option.

Aortic valve

Although aortic valve repair has gained more popularity recently, its role in rheumatic setting is less favorable compare to rheumatic mitral repair. Current improvement in design and manufacturing of both mechanical and bioprosthetic valve has resulted in better function and durability. Aortic valve replacement is thus used more frequently than repair in rheumatic aortic valve. In situation with combined aortic and mitral valve disease, evidence has proved that MV repair and AVR is better than double valve replacement when MV repair is feasible.

In selected cases of young patient with isolted rheumatic aortic valve complicated with infective endocarditis, Ross procedure can be used as another good alternative.

In conclusion, in rheumatic valve disease, MV repair has become a preferred operation with better successful rate and results. For aortic valve, AVR with appropriate prosthetic valve remains the main mode of treatment.

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- Introduction
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