EACTS Daily News
European Association For Cardio-Thoracic Surgery
The official newspaper of the 26th EACTS Annual Meeting 2012
Saturday 27 October

In this issue

Welcome to Barcelona

Welcome to the 26th Annual Meeting in Barcelona. The main theme of this year's event is "Quality Improvement" and was chosen to highlight that improving the quality of care is an on-going process and needs to be integrated in our daily routine.

Quality improvement demands a multidisciplinary view, subsequently, this year there will be joint sessions of the EACTS domains included in the programme. For example, the Postgraduate Course on Sunday will start with a plenary session of all four domains.

Adult Acquired Cardiac Domain

The Adult Acquired Cardiac Domain programme will include sessions on RV failure, multiple valves surgery and how to optimise coronary revascularization. The Postgraduate Course includes sessions on valves, coronary and left heart failure. Long-term results, various approaches, new trial updates and guidelines will be presented and discussed.

On the Wednesday morning there will be Wetab sessions on AV sparing and beating heart coronary revascularization, and a session on hybrid approach in arrhythmia.

Vascular Domain

The Domain of Vascular Diseases' Postgraduate Course includes sessions on active infective aortic disease and controversies of open and endo approaches. The scientific programme will include professional challenge sessions on aortic arch disease and focussed sessions on aortic trauma. The Wednesday morning includes simulators for TEVAR and a Wetlab for residents dedicated to aortic surgery.

Peiter Kappetein

Thoracic Domain

Minimally invasive thoracic surgery will be one of the themes of Thoracic Diseases' Techno College. Thoracic trauma, Oncology and Empyema are the topics for Sunday's Postgraduate Course sessions. A focussed session on acute and chronic pulmonary embolism will also be included with the domain of acquired cardiac disease.

The topics for the Wednesday morning professional challenge session are: lung metastases, benign disease of oesophagus, sarcoma, and postoperative complications after lung resection.

Congenital Domain

The Congenital Domain has organised a programme based around the successful 2011 meeting. At the Techno-College, the Congenital Domain will focus on the medical and surgical intervention management of cardiac arrhythmia's in congenital heart disease. The cardiology medical management will be outlined; the investigation of arrhythmia's and the cardiac intervention and surgical management will be detailed.

The Post-Graduate day will feature a early morning plenary session with the other domains to cover aspects of quality improvement, cost effectiveness and research with determination of outcome utilising databases.

Professional Challenge Session

In the Professional Challenge sessions, specific problem cases, in particular complication cases, will be presented. The design of these sessions facilitates interaction and discussion on controversial topics. On Monday and Tuesday we shall have several sessions, including a Professional Challenge session titled 'Is there a place for staged repair of Fallots Tetralogy?' with our medical colleagues and cover medical, cardiac catheter intervention techniques and surgery.

Focused Session

The Focused Sessions will include a video demonstration, followed by a keynote lecture and conclude with presentations that allow delegates to leave the sessions with a greater understanding of how to solve a particular problem. Sessions will include the complex transposition of the great arteries, morphology, diagnosis and operative techniques. This will include videos of the procedures and a review of current global outcomes.

EACTS

If you appreciate what the EACTS presents during this event and you want to support the work of the Association I encourage you to visit the EACTS booth and become a member. Membership fee is low and you will receive the European Journal of Cardio-Thoracic Surgery and the Interactive CardioVascular and Thoracic Surgery Journal, as well as a reduced rate for the Annual Meeting. This application can be done through the Web site of the EACTS (ww.eacts.org) or at the EACTS booth in the exhibition area.

At the booth you will also find information on our new courses that we are going to organize throughout 2013.

We thank our industry partners for their continued support of the meeting, and all the presenters who have taken the time to contribute to this year's *EACTS Daily News* newspaper.

It is a great pleasure to welcome you in Barcelona and we are honoured and delighted with your presence at this conference. We hope the information and techniques presented to you here will be of great interest. Barcelona offers a cosmopolitan feel in a city with atmosphere, wonderful shopping facilities, museums, specialty shops, and restaurants.

I hope you enjoy the meeting and all this wonderful city has to offer.

Pieter Kappetein

EACTS General Secretary

• Techno College 2012 • Techno College 2012 • Techno College 2012 • • Techno College 2012 • Techno College 2012 •

Techno College 2012

Volkmar Falk Klinikdirektor *Klinik für Herz- und Gefässchirurgie, Universitätsspital Zürich, Switzerland*

The Techno College continues to provide an overview of the latest developments in the field of cardiovascular and thoracic surgery. This year's Acquired Cardiac Disease programme will feature interesting live cases both in humans and pre-clinical work in animals, high-quality video presentations and talks presented by some of the most innovative leaders in the field.

Techno College was the first meeting ever to present a TAVI case live and continues to promote and present emerging technologies for the treatment of aortic valve disease. This also includes access related device development and alternative implant technology.

This year there will be a focus on new imaging modalities and robotic assistance, as well as new technology for sutureless coronary anastomosis, a field that after a period of limited development may regain some interest. The rapid evolution of smaller mechanical circulatory assist devices, transapical implantation of LVADs and alternative surgical heart failure treatments will be discussed.

Finally, the latest developments for mitral valve repair and replacement will be covered, including, but not limited to, new approaches for percutaneous mitral annuloplasty and facilitated surgical repair techniques.

Saturday 27 October

Techno College

07:00–17:00 **Registration**

Acquired Cardiac Disease

Loctaion Rooms 115/117

Organisers: New Technology Committee

08:05 **Session 1 Aortic valve replacement**

Moderators: E Ferrari, Lausanne; H Treede, Hamburg; T Walther, Bad Nauheim

- **Transapical closure** *V. Thourani, Atlanta*
- **Transapical aortic valve implantation: What's new in 2012?** *T. Walther, Bad Nauheim*
- **Live-in-a-box video presentations:**
- **Aortic valve repair using a geometric annuloplasty ring** *D. Mazzitelli, Munich*
- **Transaortic transcatheter aortic valve implantation** *N. Moat, London*
- **Transfemoral transcatheter aortic valve implantation** *A. Linke, Leipzig*
- **Live surgery:**
- **Transaortic transcatheter aortic valve implantation** *V. Bapat, London*
- **Transapical aortic conduit** *S. Hofmann, Bad Rothenfelde; M. Billion, Bad Rothenfelde; J. Gammie, Baltimore*

10:10 **Coffee**

10:40 **Session 2: Imaging/robotics/coronary artery bypass surgery**

Moderators: V. Falk, Zurich; T. Folliguet, Paris; M. Mack, Dallas

- **Remote robotic catheter guidance for endovascular procedures** *N. Cheshire, London*
- **Real-time holographic 3-D imaging for cardiac interventions** *A. Kaufman, Yokneam*
- **Advanced imaging and image fusion for valve therapies** *M. Enriquez-Sarano, Rochester*
- **External mesh for vein grafting** *E. Ferrari, Lausanne*
- **Totally endoscopic coronary artery bypass in 2012** *J. Bonatti, Baltimore*
- **Live-in-a-box video presentations:**
- **External mesh for vein grafting** *D. Taggart, Oxford*
- **Live surgery:**
- **Transapical transcatheter aortic valve implantation with rotational angiography** *J. Kempfert, Leipzig*
- **Zero ischemia anastomotic device, animal case** *M. Buijsrogge, Utrecht; D. Stecher, Utrecht; S. Jacobs, Zurich*
- **Sutureless valve implantation** *M. Borger, Leipzig*

13:15 **Lunch**

14:15 **Session 3: Heart failure – devices**

Moderators: G. Gerosa, Padova; M. Slaughter, Louisville; G. Wimmer-Greinecker, Bad Bevensen

- **Innovation Award presentation**
- **Transapical left ventricular assist device implantation** *M. Slaughter, Louisville*
- **Total artificial heart – where are we?** *P. Jansen, Vélizy Villacoublay*
- **Extra-aortic counterpulsation system** *R. Cecere, Montreal*
- **Intramural wall augmentation of the failing ventricle** *G. Feltrin, Padova*
- **Live-in-a-box video presentations:**
- **Minimally invasive left ventricular assist device implantation** *G. Gerosa, Padova*
- **Biventricular assist device implantation focus on right ventricular assist device** *M. Strüber, Leipzig*
- **New device for less invasive ventricular enhancement** *A. Wechsler, Philadelphia*

15:50 **Coffee**

16:20 **Session 4: Mitral valve surgery**

Moderators: F. Maisano, Milan; P. Perier, Bad Neustadt/Saale; H. Vanermen, Aalst

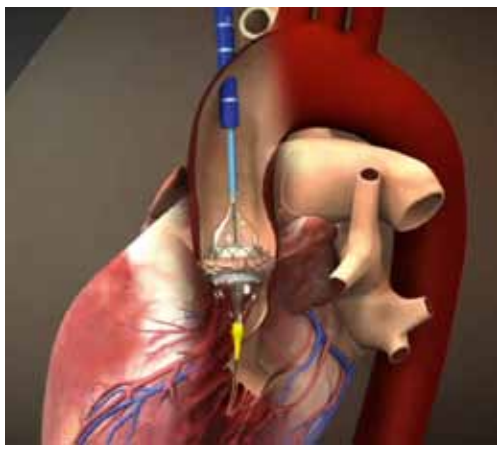
- **Long-term adjustable mitral annuloplasty** *M. Czesla, Stuttgart*
- **First-in-man transfemoral transcatheter mitral valve replacement** *TBA*
- **Septalisation of the anterior tricuspid papillary muscle in association with an annuloplasty: a new concept for the treatmant of tricuspid regurgitation** *J. Couetil, Paris*

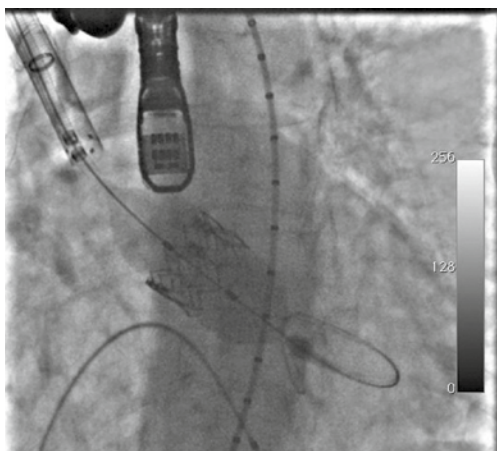
Continued on page 4

Acquired Cardiac Disease Session 1 Aortic Valve Replacement Rooms 115/117 08:05-10-10

Alternative Surgical Access for TAVI – Transaortic and Subcalvian

Vinod Bapat *Department of Cardiothroacic Surgery & Cardiology, Guy's and St. Thomas' Hospital, London, UK.*





Aortic Stenosis (AS) is a major cause of cardiovascular morbidity and mortality in the elderly. There has been a marked growth in TAVI especially over the last two years, 2011-2012 with it now being approved in around 50 countries including the United States of America.

TAVI is performed via two approaches, Transapaical (TA) and Transfemoral (TF) route. Medtronic CoreValve can only be implanted through the TF approach whilst Edwards Spaien valve can be implanted through either the TA or the TF route. As the latter is less invasive it is preferred over the TA approach.

Despite the short-term results of both TA and TF approaches being comparable in centres performing a large number of such cases, the TA approach has been found to be more invasive in nature. In comparison to the TF approach, the TA approach has 3 main drawbacks, which may contribute to the increased morbidity and mortality in these patients

1. Complication of the access site: Apical rupture and Delayed pseudoaneurysm formation
2. Complication of thoracotomy: Interference with postoperative respiratory dynamics
3. Complication of purse string suture: Effects on left ventricular function

Apical rupture remains a dreaded complication being associated with a higher mortality and a lower one-year survival rate. Despite increasing experience and availability of smaller delivery systems (22-26 French), apical tear and rupture still occur and are mainly due to the poor quality of the cardiac tissue where the purse string is placed. Intra-operative and or immediate postoperative left ventricular apical rupture/bleeding are not uncommon being associated with poorer outcome. TA approach and apical venting can also lead to late pseudoaneurysm formation. Furthermore TA approach cannot be used for implanting CoreValve.

This led to development of two alternative access routes with the aim of reducing morbidity and mortality; Transaortic (TAo) approach and Subclavian approach.

TAo approach can potentially overcome issues associated with TA approach as it entails purse-strings on the aorta as opposed to the left ventricle. Aortic cannulation is performed on nearly every open heart surgery and has proven to be safe. The Aorta is an elastic structure and hence the chances of immediate or delayed complications are less. In addition it is a technique with which surgeons are familiar and hence will have a shorter learning curve. Furthermore, TAo route can also be used for implanting CoreValve. Although the TAo approach was initially used to treat patients not suitable for TA approach it has slowly grown in popularity and is now preferred over TA in many centres. This is reflected in the development of a dedicated delivery system for TAo, Ascendra plus for Edwards Sapien XT valve and a dedicated delivery system for Medtronic Corevalve to be released soon. It is now conceivable that TAo may become the preferred approach over TA, especially if there is a shift in using this technology in lower risk patients thus enabling them to live longer following the procedure.

Although the Subclavian route was explored for CoreValve implantation as early as 2007 it was only used when the TF approach was not possible. Increasing experience in this approach has seen its popularity grow comparable with that of the TF approach in some centres such as Italy. Improvements in delivery systems such as smaller calibre and improved manoeuvrability will indeed increase its application in future.

Since performing the first successful case with Sapien valve through TAo approach our effort has been to standardise the procedural steps in order to make the procedure easily reproducible.

I will be demonstrating a case at techno-college using the new Ascendra plus system and will also discuss the operative steps in detail.

DO NOT MISS - DO NOT MISS - DO NOT MISS - DO NOT MISS - DO NOT MISS - EACTS Quality Improvement Programmes - Sunday 28th October

EACTS Quality Improvement Programme: an update

Domenico Pagano
Chair of the EACTS QUIP Task Force

The Sunday Plenary session at this year annual meeting in Barcelona, is dedicated to Quality Improvement Programmes. High profile International speakers will discuss the various aspects of setting up, running and the impacts of these programmes.

The European Association for Cardio-Thoracic Surgery's Quality Improvement Programme (QUIP) members will meet for the first time. Since its launch several areas of work have been identified.

The Network for Outcomes Research has enrolled 12 Units across Europe. This group will collaborate in several research areas including the design of a risk stratification score in Cardiac surgery. The database and Outcome Data Publishing group will present the programme of work for the next year. The education group will share initiatives for trainees and allied professionals.

We aim to enrol several other working groups and constitute networks to develop work streams in other quality improvement areas.

We will soon implement a self-nomination leadership programme to invite members to join the QUIP and contribute to its development. I look forward to meeting you in Barcelona.

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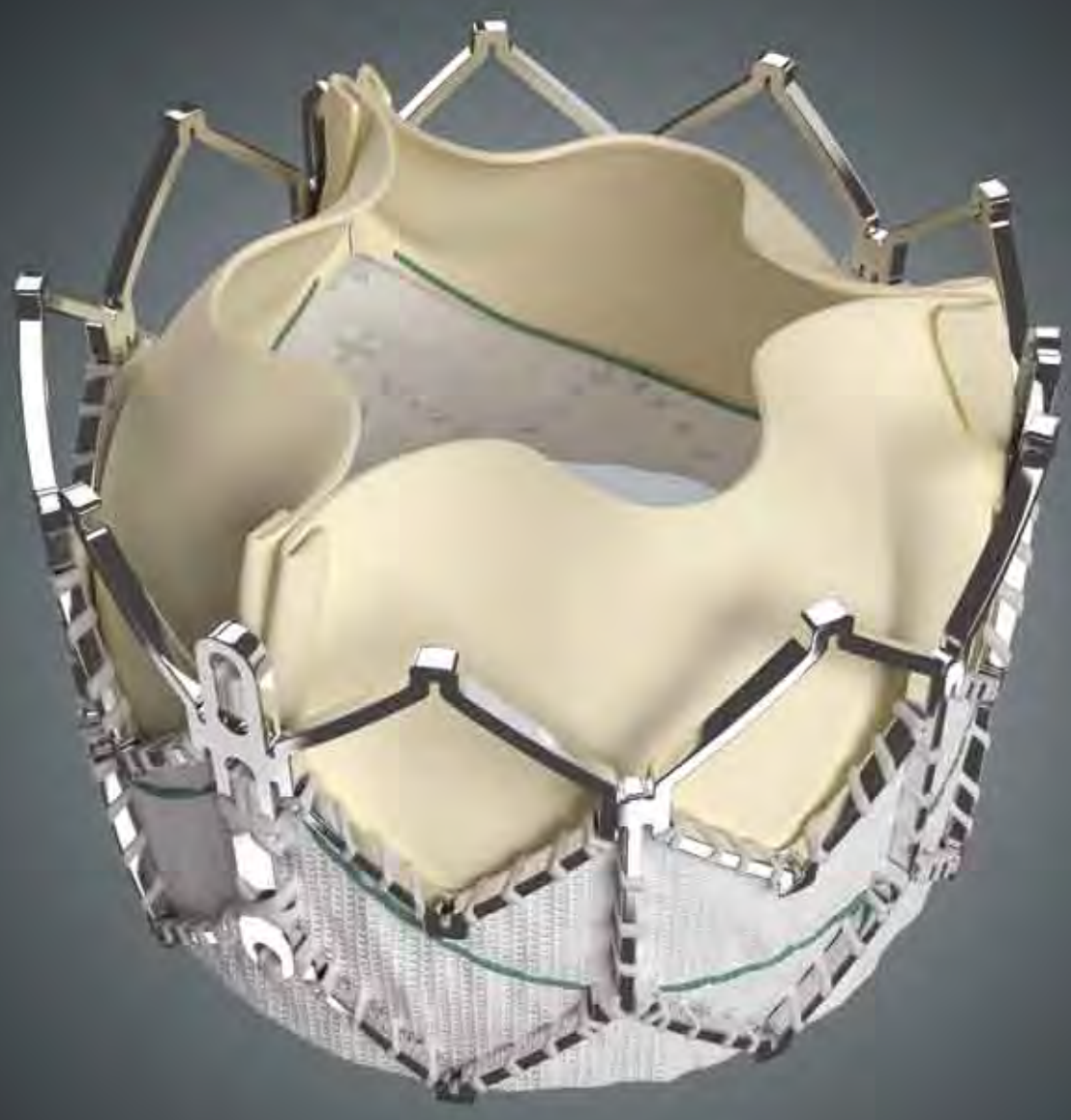

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Continued from page 2

	Live-in-a-box video presentations:	
	New atrial fibrillation ablation device	*C. Muneretto, Brescia*
	Sutureless transatrial mitral band implantation	*H. Vanermen, Aalst*
	Sutureless transfemoral mitral band implantation	*F. Maisano, Milan*
	Transapical off-pump mitral valve repair	*G. Speziali, Pittsburgh*
	Live surgery:	
	Mitraclip procedure	*J. Seeburger, Leipzig*
18:10	**Session ends**	

Congenital Heart Disease

Rooms 111

Organisers: Congenital Heart Disease Domain

13:30	**Medical and surgical intervention and mangement of cardiac arrythmias in congenital heart disease**	
	Moderators: W. Brawn, Birmingham; C. Schreiber, Munich; P. O. Myers, Boston	
13:30	**Embryonic conduction tissue and possible morphological substrates for arrhythmias**	*M. Jongbloed, Leiden*
14:00	**Postoperative arrhythmias in tetralogy of Fallot: incidence, risk stratification and role of catheter ablation**	*G. Hessling, Munich*
14:30	**Can we change our surgical technique to reduce the incidence of arrhythmias?**	*V. Hraska, Sankt Augustin*
15:00	**Heart failure, resynchronization, ICD – an update from the Europides registry**	*J. Janousek, Prague*
15:30	**Coffee**	
15:50	**Magnetic catheter navigation for treatment of arrhythmias in congenital heart disease**	*K. Pedersen, Copenhagen*
16:20	**Is there a rationale for right-sided MAZE in morphologic substrates such as Ebstein's disease or tetralogy Fallot?**	*S. Tsao, Chicago*
16:50	**Risk factors for "Fontan" arrhythmias, interventional strategies and limitations**	*S. Tsao, Chicago*
17:30	**How a surgeon can treat "Fontan" arrythmias – to cook or to freeze?**	*M. Haw, Southampton*
18:00	**Session ends**	

Thoracic Disease

Rooms 113

09:00	**Minimally invasive thoracic surgery: advanced procedures**	
	Organisers: Thoracic Disease Domain	
	Moderators: P. Darteville, Paris; P. Licht, Odense	
	Session 1: VATS lobectomy	
	Summary of different available techniques	*D. Gossot, Paris*
	Robotic lobectomy: different techniques	*B. Park, Hackensack*
	Technique and Edinburgh experience	*W. Walker, Edinburgh*
	Technique and Innsbruck experience	*T. Schmid, Innsbruck*
	Long-term results	*P. Sardari Nia, Breda*
	Danish experience	*P. B. Licht, Odense*
	The first completely portal robotic pulmonary resection using a new operative telesurgical system (Telelap ALF-X) on ovine model: a step towards the future?	*A. Lococo, V. Larocca, F. Marino, F. De Filippis, F. Lococo, S. Gidaro, Italy*
	Session 2	
	Anaesthesia for robotic surgery	*F. Guarracino, Pisa*
	Different techniques for minimally-invasive mediastinal surgery	*K. Kernstine, Duarte*
	Robotic resection of mediastinal tumours: live-in-box and results	*M. Lucchi, Pisa*
	VATS resection of mediastinal tumours: live-in-box and results	*M. Zielinski, Zakopane*
	Robotic/VATS resection of mediastinal tumours:	
	Pro	*J. Rückert, Berlin*
	Con	*P. Dartevelle, Le Plessis Robinson*
	Live surgery	
	Moderators: A. Mussi, Pisa; E. Rendina, Rome; R. Schmid, Berne	
	VATS lobectomy, subxyphoidal approach	*A. Yilmaz, Nieuwegein; M. C. Ambrogi, Pisa*
	Robotic lobectomy	*F. Melfi, Pisa, R. Schmid, Berne*
	Robotic resection mediastinal tumour	*F. Melfi, Pisa; R. Schmid, Berne*
17:00	**Session ends**	

Acquired Cardiac Disease Session 2 Imaging/Robotics/CABG Room 115/117 **10:40-13:15**

External eSVS Mesh for vein grafting

Enrico Ferrari *University Hospital of Lausanne, Switzerland*

In coronary artery bypass graft surgery, the great saphenous vein is commonly used as a conduit to supply blood flow and provide complete grafting in more than 80% of surgeries, this in spite of the fact that the patency of the vein graft is approximately 80% at one year post-operative and 50% at 10 years post-operative.

A reason why saphenous vein grafts are useful conduits in coronary revascularization, is the fact that are easy to be harvested by assistant surgeons or vein nurses also in case of emergency procedures (the harvesting of arterial conduits requires more accuracy and time). Moreover, the use of the vein is often necessary due to the limited supply of arterial sources for conduit, these having superior patency. To address this deficit in coronary revascularization surgery, the eSVSMesh (Kips Bay Medical) was developed. The device is a knitted Nitinol flexible weft mesh that externally supports the vein graft (figure): this device provides a downsizing of the vein graft up to 30% of the vein diameter and prevents the expansion of the graft under arterial pressure to no more than 8%. Consequently, the flow velocity into the vein graft increases while the pressure applied against the wall of the vein graft decreases.

These effects provide improved flow patterns leading to a more "arterial like" healing (the so-called arterializations of a vein conduit). The external support given by the mesh prevents endothelial injury under acute systemic pressure, preventing intimal damage which can lead to the development of intimal hyperplasia, vein graft thrombosis and arthrosclerosis.

During the last three to four years, early animal experiments (in primates and sheep) confirmed significantly decreased accumulation of thrombus and atherosclerotic debris in mesh treated grafts at six months post-operative. From a technical point of view, prescribed measurements for the mesh sizing and precise surgical technique to include the eSVSMesh and the vein wall in both proximal and distal anastomosis are mandatory in order to prevent twists, torsions and tensions applied on the meshed vein. In particular, the vein graft has to be prepared with a true "cobra head"-like proximal and distal end for the anastomosis, and veins with double wall thickness equal to or less than 1.4mm and outside diameters smaller than 2mm from 3.6mm to 7.0mm can have the eSVS Mesh applied (the eSVS Mesh is available in three sizes: 3.5mm, 4.0mm and 4.5mm).

Early results in humans, showed that use of this device did not negatively impact early vein graft patency in the immediate post-operative period, found to be 95%. After a "first in man" randomized trial, the eSVS Mesh received the CE Mark approval in Europe in 2010.

Of note in this limited trial, vein grafts patent at one year, showed no angiographic change at three years indicating that the most common cause of graft failure, the vein atherosclerotic disease, was impeded. In our cohort of 28 patients treated with the Mesh from 2009 to 2012, we did not remarked postoperative myocardial infarction, major cardiovascular events and stroke; we had one re-thoracotomy for bleeding, and all patients were discharged from the hospital in good conditions. During the mid-term follow-up recall (mean time: 21 months), patients were not re-operated and they were on NYHA class 1. Long-term patency data is pending.

Enrico Ferrari

External eSVS Mesh

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Acquired Cardiac Disease Session 2 Imaging/Robotics/CABG Rooms 115/117 **10:40-13:15**

Live video box presentation: External mesh for vein grafting

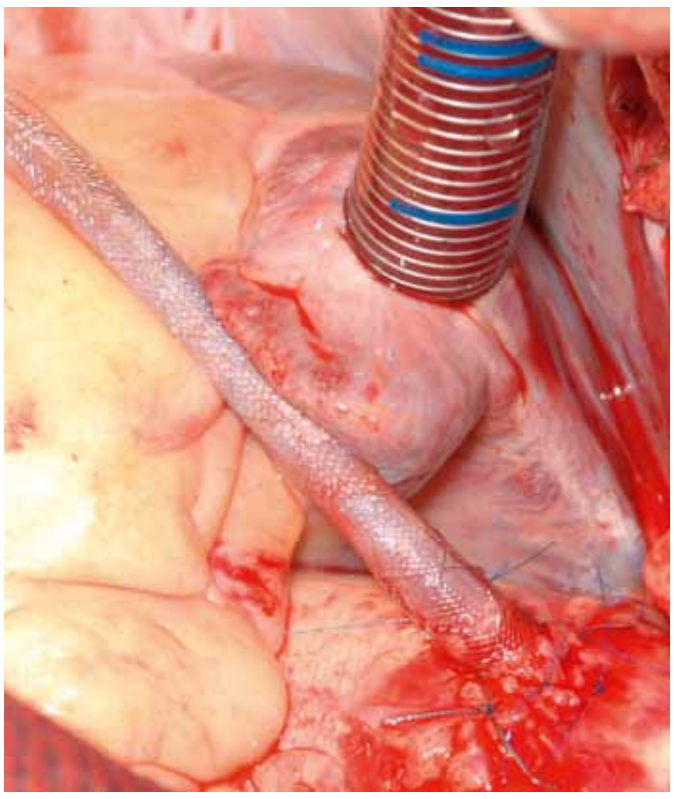
David Taggart
Radcliffe Hospital, Oxford, UK, an advisor to VGS and PI for the VEST Trial

Coronary artery disease (CAD) is the leading cause of death in the U.S and Europe and recent studies (eg SYNTAX) have confirmed that CABG remains the treatment of choice for severe CAD. While most patients receive a single internal mammary artery (IMA) only around 5-10% receive two IMAs or additional arterial grafts. Most conduits are still Saphenous Vein Grafts (SVGs) because of their abundance and ease of harvest and use. However their main disadvantage is relatively poor long term patency compared to IMA grafts with graft failure in as many as 20% of veins within the first year and in as many as 50% at 10 years and with further significant disease in half of the remaining patent grafts. SVG failure carries important adverse clinical sequelae (including myocardial infarction, re-interventions and death).

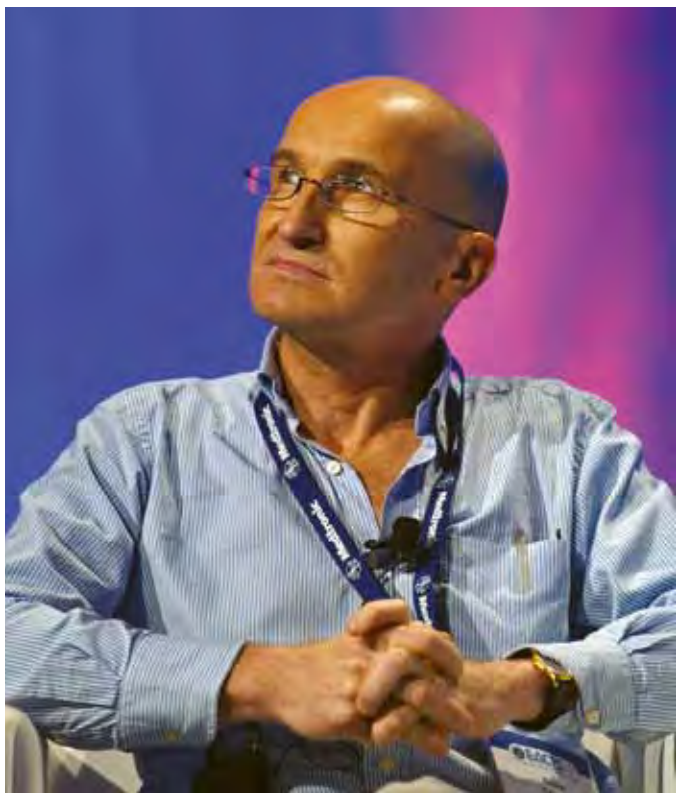
Vein graft disease begins with diffuse neo-intimal tissue proliferation which develops in 75% of grafts within one year of implantation. Subjected to the arterial circulation, the vein graft is exposed to a "new" mechanical environment with relatively high pressures and shear stress. In the first few weeks, shear induced remodeling occurs which leads to luminal enlargement. This is followed by a later phase characterized by wall tension induced remodeling which results in wall thickening (intimal hyperplasia) and stiffening. In addition to the diffuse intimal hyperplasia, the luminal irregularities of the native vein and its valves are the main triggers for aggressive focal intimal hyperplasia which carries higher risk for vein graft failure.

Preventing vein graft dilation and reducing its luminal irregularities and wall tension by using an external stent therefore has the potential to mitigate intimal hyperplasia and to reduce high failure rates in vein grafts. However, previous attempts at external support of vein grafts have been unsuccessful for a variety of reasons. VGS FLUENT, a novel external support device for SVG's, is a cobalt chrome braid, with a unique combination of different types of wires which provide it with axial plasticity and radial elasticity. The axial plasticity allows the surgeon to fixate the FLUENT in situ at the desired length and diameter and to cover the entire SVG, without using glue, sutures or other changes which may compromise graft patency. The radial elasticity of the FLUENT makes it crush and kink resistant and provides the SVG with beneficial biomechanical properties by reducing wall tension and the diameter mismatch with the host artery and preventing non uniform dilation and the formation of lumen irregularities.

A CABG study in sheep demonstrated the FLUENT's safety along with outstanding efficacy in reducing intimal hyperplasia, preventing vein graft dilation/deformation and eliminating thrombus formation. Following these successful animal studies the FLUENT has been evaluated in a randomized controlled study (Venous External Support Trial) in the UK which recruited 30 patients in Oxford and Brompton/Harefield who in addition to an IMA graft to the LAD, required grafts to the Right Coronary Artery and the Circumflex Artery. Patients were randomized for one vein graft to receive the stent and the other to act as a control. Patients will now undergo 12 months angiography, IVUS and OCT to compare the experimental and control grafts' patency, lumen uniformity and plaque volume (intimal and medial hyperplasia). If the external stent successfully reproduces the findings in the sheep model it will have major implications for clinical practice.



Vein graft to right coronary artery covered with the Fluent Stent



David Taggart

Acquired Cardiac Disease Session 1 Aortic Valve Replacement Room 115/117 **08:05-10-10**

Direct aortic TAVI

Neil Moat *Royal Brompton and Harefield Trust, London UK*

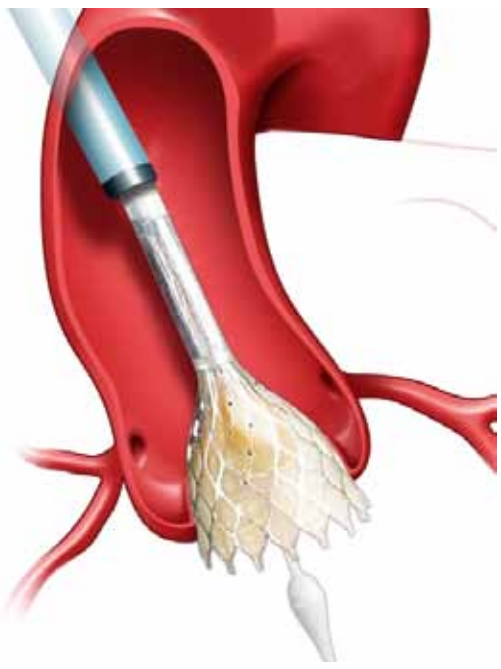
Trans-catheter aortic valve implantation (TAVI) was developed as an alternative to surgical aortic valve replacement (SAVR) in high risk patient populations with severe symptomatic aortic stenosis. A substantial body of data now exists demonstrating good clinical outcomes following TAVI with over 60,00 implants. The Medtronic CoreValve System (Medtronic Inc, MN, USA) has mainly been implanted via a transfemoral (TF) or subclavian (SC) approach both of which requires peripheral arterial access and cannulation. In some patients the peripheral vasculature are unfavorable, because the presence of small vessel size, severe atherosclerosis, tortuosity and/or calcification, rendering either of these approaches to be contraindicated or to have an increased risk of vascular complications. In addition the above approaches are relatively contra-indicated in patients who have a horizontal ascending aorta (or "vertical" plane of the aortic annulus) due of difficulties in accurately positioning the implant. The commonest alternative approach has been a transapical approach using with the Edwards SAPIEN series of valves (Edwards Lifesciences, CA, USA) but this also has a number of specific procedure related complications.

The Direct Aortic (DA) approach for TAVI was developed using the Medtronic CoreValve System with the FIM cases performed in 2008/9 by Lange (Munich), Moat (London), and Bruschi (Milan). Subsequently Bapat (London) adapted this approach for the Sapien system.

Today, a multi-centre European experience of 142 patients in 15 different centres will be presented utilising the DA approach for TAVI using the Medtronic CoreValve. The patients were a very high risk population with a mean logistic EuroSCORE of 27.8, and with peripheral vascular disease and prior CABG present in 85.9% in 27.4% of the cohort respectively. Pre-op MSCT imaging is essential/mandatory prior to a Direct Aortic approach in order to define the intrathoracic location of the ascending aorta, the degree of aortic root angulation, location of calcifications, the distance between the aortic annulus and also define the proposed cannulation site. Half of the procedures were performed via a mini-sternotomy and half through a mini-thoracotomy (2nd right intercostal space). There was a striking learning curve with a marked improvement in outcome in patients implanted after January 2011.

This study demonstrates that direct aortic access is a feasible approach for TAVI with the self-expanding Corevalve prosthesis. These initial results with this technique are encouraging given the very high risk patient cohort treated (with a particularly high incidence of concomitant vascular disease) and also the fact that this series includes each unit's initial experience and early learning curve with the DA approach. The specific techniques required for this approach (i.e. access to and cannulation of the ascending aorta are very familiar to cardiac surgeons.

1 Alegría-Barrero E, Chan PH, Di Mario C and Moat NE: Direct aortic transcatheter aortic valve implantation: a feasible approach for patients with severe peripheral vascular disease. Cardiovasc Revasc Med 2012;13: e 5-7.
2 Bruschi G, De Marco F, Botta L, Cannata A, Oreglia J, Colombo P et al: Direct Aortic Access for Transcatheter Self-Expanding Aortic Bioprosthetic Valves Implantation. Ann. Thorac. Surg 2012; 94: 497-503.



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Acquired Cardiac Disease Session 1 Aortic Valve Replacement Rooms 115/117 08:05-10-10

Apical Conduit: An Alternate Aortic Stenosis Treatment

Michael Billion and Steffen Hoffmann *Oberarzt Herzchirurgie, Schüchtermann-Schiller'sche Kliniken, Bad Rothenfelde, Germany*

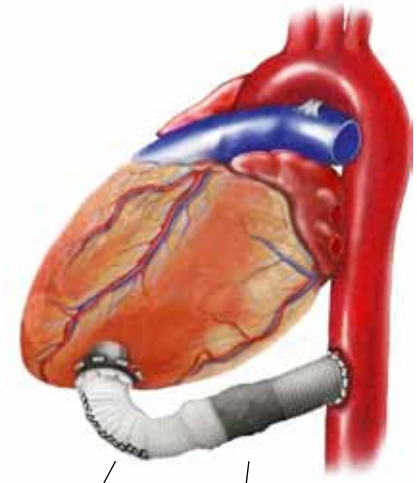
Clinicians today have more options than ever for treating aortic stenosis (AS) in the ageing population. Even so, a significant number of patients have physical conditions and co-morbidities that rule out both AVR and TAVI. We wish to share our experience with a procedure historically known as apico-aortic conduit, and more recently as aortic valve bypass (AVB).

AVB has been used successfully for over 30 years to treat high risk patients with aortic stenosis. The concept is simple. Instead of replacing the stenotic native valve, AVB bypasses the obstruction to left ventricular outflow. A second outflow tract to the left ventricle is implanted near the apex. Blood exits the left ventricle through both the stenotic native valve and the AVB conduit. About 2/3 of blood flow passes through the prosthetic valve, and 1/3 through the native valve.

AVB provides permanent relief from outflow tract obstruction without any manipulation of the diseased native valve, and without the use of cardio-pulmonary bypass (CPB). This reduces the occurrence of embolic events. The heart's conduction center also remains undisturbed, eliminating the potential risk of subsequent pacemaker implantation. Patient prosthesis mismatch and paravalvular leak are also not possible.

Although AVB had been performed successfully for many years, the clinical procedure remained technically challenging. Placement of a conduit into the apex can result in significant blood loss. Correx (Waltham, MA, USA) has developed a complete AVB Kit, which includes an implant set and an Applicator. The implant set consists of a Valved Conduit and LV Connector. The Valved Conduit contains a 23mm porcine aortic valve. The AVB Kit enables AVB to be performed via a small left thoracotomy (usually not longer than 10-12cm) on a beating heart without CPB. The significant improvement in the system is provided by the Correx Applicator, which simultaneously cuts and captures a tissue plug as the LV Connector is implanted into the apex. Hemostasis is maintained throughout. The Applicator provides surgeons with improved control, precision and repeatability for both forming the hole in the apex and inserting the connector.

AVB has generally been reserved for high-risk patients considered inappropriate for conventional AVR, such as frail elderly patients, and patients with a calcified ascending aorta, or patent coronary bypass grafts. The patients we have done to date are elderly, typically NYHA Class III, and with contraindications for TAVI such as low coronary ostia, small or large annuli, or a degenerated bioprosthetic valve that does not allow a valve-in-valve approach. In our experience patients do well, returning to normal life and are typically NYHA Class I or II.



Steffen Hofmann (left) and Michael Billion

Even in these times of TAVI and AVR, some patients remain ineligible for treatment. AVB can be an effective supplemental treatment option for these patients.

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Acquired Cardiac Disease Session 2 Imaging/Robotics/CABG Rooms 115/117 **10:40-13:15**

New zero ischemia coronary anastomotic device – the Elana clip

Figure 1a

Figure 1b

Figure 2

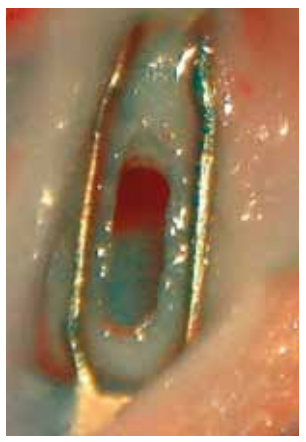

Figure 3

David Stecher and Marc P. Buijsrogge *University Medical Center Utrecht, Utrecht, The Netherlands*

To facilitate minimal access or closed chest CABG, a simplified alternative for hand-sutured anastomosis has to be developed. To be presented at the Techno College this is a completely new coronary anastomotic device, which is fundamentally based on a Excimer laser-assisted nonocclusive (zero ischemia) anastomosis (ELANA) technique (FDA-approved for clinical application in neurosurgery).

In the last two years, we have been working on ameliorating the concept of a simplified nonocclusive coronary bypass construction. Our experimental studies with a predecessor prototype connector have demonstrated simple, safe and reliable application. Excellent patency and limited intimal hyperplasia was demonstrated in an acute rabbit model,[1] and an ongoing porcine CABG survival study (follow-up 6 months). However, mounting of the bypass graft onto the connector still required conventional stitching, and the prototype was only suitable for relatively large coronaries. Despite mentioned limitations, these animal studies showed an initial prove of this interesting concept.

To counteract above mentioned limitations, we recently redesigned the concept into a completely new, downsized (suitable for coronaries up to 2.0mm diameter) and sutureless coronary clip connector. The current connector (see Figures 1a and 1b), consists of two sharp forks (one for sutureless mounting of the graft and the other for insertion into the coronary artery) connected by a spring at the back of the device. The spring actively compresses vessel walls of both graft and coronary artery, prior to the arteriotomy. Subsequently, a laser catheter (see Figure 2) is introduced into the connector, which is used to laser-cut the arteriotomy (0.8 x 2.0mm), and so opens the anastomosis. As a result, the anastomosis is constructed in a totally nonocclusive (zero cardiac ischemia) manner, and without any time-constraint.

This new prototype coronary anastomotic device is presented at this years´ Techno College in an off-pump porcine CABG LITA-LAD model. At this moment we are initiating an off-pump porcine CABG survival study to further evaluate the long-term effects of this new concept.

This coronary anastomotic device, and especially the concept of a nonocclusive zero ischemia bypass construction, has intrinsic potential for minimally invasive or endoscopic CABG.

Figure 1 Prototype coronary anastomotic clip connector. 1a) Opened by the applicator (not fully shown). 1b) Closed position. The upper fork for mounting of the graft. The lower fork for insertion into the coronary artery. The spring at the back of the device actively compresses both forks, and hence both vessel walls, prior to the arteriotomy.

Figure 2. Laser catheter. The tip of the catheter fits exactly into the coronary anastomotic connector (Figure 1) and opens the anastomosis.

Figure 3. The anastomosis, view from inside the LAD.

Reference

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Congenital - Medical and surgical intervention 13:30-18:00 Room 111

CRT and ICD in congenital heart disease: an update from the Euripides registry

Jan Janoušek *Children's Heart Centre, University Hospital Motol, Prague, Czech Republic*

Arrhythmias and heart failure are the two most common causes of morbidity and mortality late after surgery for congenital heart disease.

Besides advances in the medical therapy, in the late 90th of the last century cardiac resynchronization therapy (CRT) emerged as a new option for the management of dyssynchronous heart failure, a previously poorly recognized entity. Based on restoration of intra- and inter-ventricular synchrony, CRT leads to immediate improvement of contraction efficacy, decrease in myocardial oxygen consumption and long-term structural, functional and cellular reverse remodeling. Numerous large randomized studies in adults with ischemic and idiopathic dilated cardiomyopathy have confirmed positive CRT effects on both heart failure

morbidity and mortality. In patients with congenital heart disease CRT has been applied to various structural and functional substrates including conventional pacing-induced dyssynchrony, systemic right or single ventricle failure and even pulmonary ventricular dysfunction. Implantation techniques had to be adapted to special anatomies and epicardial or mixed lead systems have been used frequently.

Limited evidence from three larger retrospective reports and several smaller series confirmed CRT efficacy in this special population and identified both super-responders as well as patients with low likelihood of a positive effect. Temporary CRT has been successfully used for the treatment of acute heart failure after congenital cardiac surgery with spectacular effects in selected patients enabling weaning from cardiopulmonary bypass. Altogether, CRT opened a new era of so called re-timing of the heart as one of major principles of heart failure therapy.

Sudden cardiac death caused by ventricular arrhythmias is a late consequence of surgery for congenital heart defects. Pre-operative hypoxemia and pressure and volume overload leading to myocardial fibrosis as well as surgical scarring are two main components of arrhythmogenic substrates. The most common tachycardia mechanism is a reentry around a central obstacle, frequently a ventriculotomy scar. The incidence of ventricular arrhythmias increases with age thus being mainly a problem of adults with congenital heart disease.

Treatment should include hemodynamic assessment with correction of potential residua and intraoperative cryoablation and/or ICD implantation. Catheter ablation using advanced 3-D mapping has been shown to be successful in selected patients. ICDs have also been effectively used for primary prevention of sudden cardiac death in tetralogy of Fallot. Risk stratification schemes are, however, not available for other lesions, including transposition of great arteries after the atrial baffle procedure – a frequent cause of sudden cardiac death in the congenital heart population.

The Euripides registry (European Registry for ICD and CRT Devices in Pediatrics and Adults with Congenital Heart Disease, www.euripides-registry.eu founded by the AEPC, ESC and German Competence Network for Congenital Heart Disease, is a follow-up database of pediatric and congenital heart disease patients subjected to the ICD and/or CRT therapy. The main goal is to gather data on efficacy and complications in various patient groups. Web-based pseudo-anonymized data entry and yearly reporting are the main attributes. All contributers may use the data for scientific purpose.

Thoracic Disease Minimimally Invasive Thoracic Procedures: Advanced procedures Room 113 **09:00-17:00**

VATS lobectomy: a critical reflection

Peyman Sardari Nia
Academic hospital Maastricht, Netherlands

During the past 30 years a new wave of surgical approaches has been introduced entitled as "minimal invasive" or "minimal access" techniques. The rationale of these new developments is to reduce the surgical trauma, therefore reducing the postoperative complications, hastening the recovery (reducing ICU and hospital stay), improving the cosmetic results, stimulating the quicker return to workforce, improving the quality of life and treating patients unfitted for conventional treatments.

The opponents of these new developments would argue that implementation of these new techniques have brought new expenses, prolonged the procedures, made the procedures more difficult (because of the lack of tactile evaluation and loss of depth perception) and introduced new kinds of complications.

Regardless of the arguments by opponents or proponents further introduction and developments of these new techniques are inevitable, because of the multiple drives for their use in clinical practice. Indeed, it is driven by patients as new population of patients demand the same procedures through smaller incisions. It is driven by industry and technology, as new developments and devices enable and force us to operate in the conditions that were not possible before. It is driven by surgeons as innovations stimulate their career development. And finally it is driven by new patient-care (mythical) philosophy that for reducing the postoperative complications rates and hastening recovery, one must abandon the open procedures.

VATS lobectomy was first described in the early 1990s and ever since multiple studies have been published to test the operative, short-term and long-term results. There are seven systemic reviews evaluating the results of VATS lobectomy compared to thoracotomy1-7. Of all the studies published to date only three are small RCTs and the remainder is nonrandomized.

Evaluation of the results of these studies is difficult as the quality of data and studies vary considerably. The first issue surfaces when we consider the diversity of techniques used. Regardless of what we might define as VATS lobectomy, the techniques described in literature show considerable variability. The variability exists in the size of utilization thoracotomy, the use of rib spreading, the use of monitor and surgical approach to lobectomy itself. The evaluation of the results of each technique is complicated by the fact that in half of the studies published to date important information regarding the technical data is missing.

Also the fate of converted cases is variable as in some studies these patients are excluded, in some included in thoracotomy group and in some others included in VATS group. These converted cases conceal the difficult and the complicated cases and form another confounding element in interpretations of the results.

The heterogeneity in patient population of VATS and thoracotomy group is also an issue that should be considered. The patients subjected to thoracotomy have more advanced stage, more comorbid conditions, have more centrally located tumors, have undergone more pre-operative chemo-radiation and have more diseased lungs8. Surely, only in a RCT we could control for all these possible confounders.


Peyman Sardari

But the most troubling issue in my opinion is the nodal staging. The treatment of lung cancer is nowadays a multimodality approach based on TNM-staging. Because of this, the cornerstone of treatment is correct determination of TNM-classification. The nodal staging is the Achilles' heal of surgical oncology of the lungs. Without nodal staging we can easily disregard four decades of surgical research.

The systematic intra-operative nodal staging will enables us to tailor a multimodality treatment based on pathological TNM staging. Regardless where the tumor in the lung is located the sampling or dissection of nodal station 7 is central to any nodal sampling9 and is an indicator whether a systematic nodal sampling/dissection has been performed. Unfortunately, only two of seven systematic reviews published to date have evaluated the nodal staging. Only 14 studies provided the number of nodes sampled and only 2 provided the number of stations sampled. No comparative study to date has provided any data regarding which stations are sampled in VATS and thoracotomy group. The limited data to date indicate that with VATS more nodes but fewer numbers of stations are sampled.

Regardless of the shortcomings of the studies published to date, the multiple studies have provided evidence that it is save and feasible to perform lobectomy through VATS with acceptable operative mortality. It has been shown that intra-operative complications are increased in VATS group but the postoperative complications; especially the rate of pulmonary complications is significantly reduced in VATS group. The data regarding the drain leakage, air leakage, postoperative pain and length of hospital stay is somehow conflicting. But most importantly, the overall survival of VATS patients is at least the same as patients treated by thoracotomy.

Some would argue that it is not important whether a suboptimal nodal staging is performed or not, but what matters is the overall survival of patients treated with VATS lobectomy. Others would argue that in large group of patient the superior overall survival (positive oncological effect of VATS) of VATS would even out the effect of suboptimal nodal staging, but for individual patient this would mean wrong tailoring of treatment modality.

The battle between opponents and proponents of VATS lobectomy would cease in future, as the future perspective of treatment of lung cancer is the individualization of treatment. Treatment based on anatomic extension of the disease complemented by individual biologic profile of the tumor. Within the surgical treatment this individualization will also play an important role. The operative technique being chosen based on detailed individual clinical and anatomic considerations, rather one surgical technique being used for one disease.

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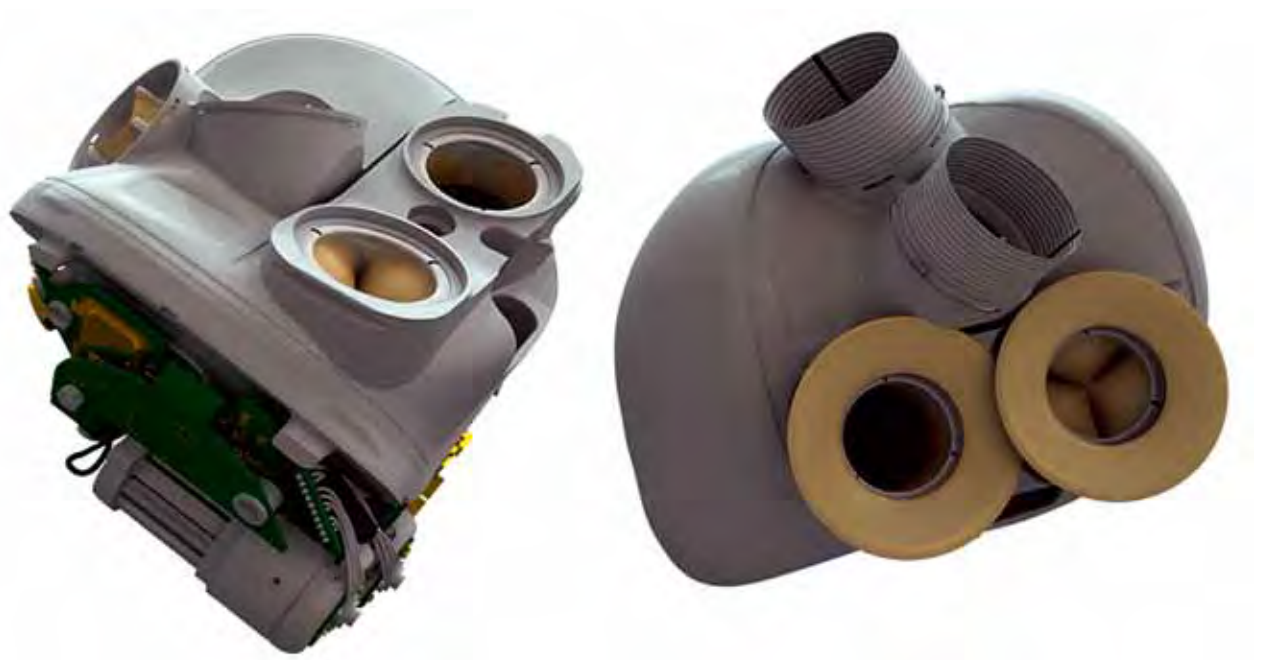
Acquired Cardiac Disease Session 3 Heart Failure Devices Rooms 115/117 **14:15-15:50**

Bioprosthetic total artificial heart – where are we?

Piet Jansen, *CARMAT SA, Velizy, France*



Piet Jansen

While the number of available donor hearts remains stagnant, improvements in technology, patient selection and patient outcomes have spurred the utilization of mechanical circulatory support devices to treat end-stage heart failure. For patients suffering from irreversible biventricular heart failure and for whom a heart transplant is unavailable, total artificial heart (TAH) implantation as destination therapy is becoming a viable option.

The CARMAT Bioprosthetic Total Artificial Heart

The CARMAT TAH project was initiated by Professor Alain Carpentier and a group of engineers from the European Aeronautic Defense and Space Company (EADS). The design objective is to develop a bioprosthetic TAH with biocompatible blood-contacting surfaces to reduce thrombo-embolic complications, with an auto-adaptive physiologic response to the patient needs to increase quality of life, in order to provide a true alternative to heart transplantation.

The CARMAT TAH contains two "ventricles", each comprising a blood compartment and an activation liquid compartment, separated by a hybrid membrane. The hybrid membrane is made of bovine pericardial tissue on the blood-contacting surface. The fixed surface of the blood compartment is covered with ePTFE. Electro-hydraulic pumps move silicon fluid deploying the hybrid membrane in a systolic and diastolic phase. The prosthesis' stroke volume (30-65ml) and beat rate (35-150 per minute) adapt automatically in response to changes in preload, which are detected by pressure sensors located inside the device. The pulsatile blood flow ranges from 2 to 9 litres per minute with flow adjustment on the right side to correct for the bronchial shunt. Bioprosthetic valves at the inlet and outlet of each blood compartment maintain forward flow. A bioprosthetic interface to the atria remnants was developed to ease the implantation procedure. The prosthesis is partially surrounded by a flexible compliance bag. A percutaneous driveline delivers power to the prosthesis and serves as communication channel.

Anatomic fit study with 3D virtual implants

Since TAHs are placed in orthotopic position, it is important to assess the anatomic compatibility before the implantation. Thoracic CT-scanning is part of the work-up for potential donor heart recipients and we have used this technology to create a 3D visualisation of the chest. A virtual model of the CARMAT TAH was created to replace the native heart. The position of the TAH relative to the surrounding tissues and structures can then be analysed. CT-scan analysis of 110 patients demonstrated that the device would fit in 84% of males and 18% of females. If the distance between the vertebrae at T10 and the sternum exceeds 130mm, the probability of anatomic fit was 93%.

Haemocompatibility

The haemocompatibility of the TAH blood-contacting surfaces was confirmed by exposure to circulating human blood during in vitro studies, showing limited consumption of fibrin, limited thromboxane B2 release and platelet adhesion, and minor blood cell depositions on the surfaces.

Animal implants

In preparation of the first-in-man clinical study and as part of the surgical training program, a series of short-term animal implants (Charolais calves, 100-110 kg) was performed to validate the implantation technique and to document the interaction of the TAH in a biological environment up to 48 hours. Implantation procedure times were similar to those for heart transplantation. The TAH generated pulsatile flow ranging from 7-8.5 liters per minute, with arterial pressure 120/70mm Hg, venous oxygen saturation 90%, indicative of normal physiologic conditions.

These pre-clinical findings will be validated in upcoming clinical studies of the bioprosthetic Carmat TAH.

CTSNet stand at EACTS – An ideal opportunity to update your individual profile page

CTSNet (www.ctsnet.org), the leading source of online resources dedicated to cardiothoracic surgery and the major hub of the international online community of cardiothoracic surgeons and allied health care professionals, is very pleased to be exhibiting at the 26th EACTS Annual Meeting in Barcelona.

In addition to being the main access point to the specialty's key journals and a huge repository of outstanding text-based and multimedia clinical resource, CTSNet houses individual profile pages or "homepages," as they are popularly known, for over 45,000 cardiothoracic surgery professionals, 34,000 of whom are surgeons. CTSNet's participants are located all over the world, but, interestingly, European-based surgeons and allied health professionals make up a staggering 38 percent of the CTSNet community!

As you might expect, CTSNet's individual profile pages are very heavily trafficked, making it essential that you keep your contact information and profile photograph fully up to date. To keep yourself accessible to your colleagues and patients alike, and to sustain CTSNet as the vital community of cardiothoracic surgery professionals, specialty-dedicated associations, and industry groups that it is, it is critical that you regularly update your CTSNet profile. Please visit the CTSNet Stand (number 37) in the Exhibit Hall to create or update your profile – CTSNet staff and volunteers will be very happy to assist you!

When you stop by the CTSNet Stand, it will also be a good opportunity for you to learn about CTSNet's new initiatives, including its recent move to Chicago, Illinois, USA, where The Society of Thoracic Surgeons is now providing management services to the organization, the migration of ctsnet.org to a new software platform, and the recent expansion of CTSNet Journal and News Scan activities. We would also love to hear your feedback on what you most enjoy about CTSNet, and new directions that the CTSNet Board of Directors should consider taking the organization and the website in the coming years.

The mission of CTSNet is "to advance education and collaboration in the global cardiothoracic surgical community through Internet resources." With your ongoing participation, we can help ensure that CTSNet remains the principal venue on the web where cardiothoracic surgeons go to learn about new techniques, connect with their colleagues, and stay apprised of the latest research on devices and procedures. We look forward to seeing you at Stand 37!

Estech Launches Next Generation Technology, the COBRA Fusion™ Ablation System for Surgical Cardiac Ablation

Estech, a leading provider of minimally invasive cardiac ablation devices, launches its COBRA Fusion™ Ablation System. This breakthrough technology is the first of its kind device utilizing a unique suction application and innovative electrode configuration to gently pull the tissue targeted for ablation into the device and out of the path of circulating blood. The COBRA Fusion overcomes the most significant challenge faced in minimally invasive epicardial ablation, the cooling effect of blood inside the heart, and reproducibly creates transmural lesions on a beating heart.

The COBRA Fusion incorporates proprietary Versapolar™ technology — an exclusive innovation that delivers both bipolar and monopolar radiofrequency (RF) energy. The new device is powered by Estech's patented temperature controlled radiofrequency (TCRF) energy which continuously monitors and maintains tissue temperature at target levels throughout the procedure. TCRF avoids the need for multiple applications that other technologies often require and ensures that tissue temperatures remain within a safe and effective range.

James L. Cox, M.D., the pioneer and creator of the Cox-Maze procedure stated: "I have had the recent opportunity to observe the clinical use of this new device in several patients. The historical problem of attaining atrial wall transmurality reliably in a beating, working heart by applying ablative energy from the epicardium only, appears to have been solved with this new device."

Dr. Cox added: "The ability to involute the atrial wall into the ablation device itself using suction allows for the application of radiofrequency energy to both sides of the involuted tissue, thereby creating reproducible transmural and contiguous linear lesions for the first time off-pump. Moreover, the device is small enough to fit through a standard port, using an endoscopic port-access approach. I believe that this device represents a significant addition to the surgeon's armamentarium in the field of cardiac ablation."

The COBRA Fusion is the result of several years of research and development and has been extensively tested in several labs including the prestigious research lab at Washington University in St. Louis. Ralph J. Damiano, M.D. stated: "We have evaluated this new device in our animal lab and were very impressed with the results. It is an innovative device that has the potential to facilitate minimally invasive surgical ablation. It is likely to advance the field by improving lesion formation on the beating heart."

About Estech

Estech develops and markets a portfolio of innovative medical devices that enable cardiac surgeons to perform a variety of surgical procedures, while specializing in minimally invasive and hybrid ablation. The company's COBRA line comprises a number of first-ever technologies invented, developed, and brought exclusively to the cardiac ablation market by Estech. These include temperature-controlled RF energy delivery, Versapolar™ devices that provide both bipolar and monopolar energy, suction-applied tissue contact, and internally-cooled devices which provide superior ablation performance compared to other ablation systems. For more information, please visit: www.estech.com.

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DESIGNED TO PERFORM BUILT TO AMAZE

Estech COBRA Fusion™ Ablation System

When we set out to design the new COBRA Fusion, our goal was to create a new standard of performance for the treatment of Atrial Fibrillation. The result is a uniquely adaptable and effective platform that you have to experience to believe.

The first and only device with proprietary Versapolar™ technology, **COBRA Fusion can deliver both Bipolar and Monopolar energy.** Powered by patented TCRF (Temperature Controlled Radiofrequency), Fusion incorporates a unique suction design that eliminates the heat sink effect, enabling surgeons to create reproducible transmural lesions and return patients to normal sinus rhythm.

Designed to deliver better outcomes – that's the power of Fusion.

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The Estech COBRA Fusion is intended to ablate cardiac tissue during cardiac surgery using radiofrequency (RF) energy when connected directly to the Estech Electrosurgical unit (ESU). The Estech COBRA Fusion may be used for temporary cardiac pacing, sensing, recording, and stimulation during the evaluation of cardiac arrhythmias during surgery when connected to a temporary external cardiac pacemaker or recording device. Estech does not promote off-label use of its products and their use is at the discretion of the cardiac surgeon. Estech is undertaking an IDE clinical trial and subsequent PMA submission to obtain a specific atrial fibrillation indication. In Europe, the Estech COBRA RF ablation products are CE marked with an indication for the treatment of atrial fibrillation by ablating cardiac tissue during surgery. Refer to the Instructions for Use (IFU) for detailed information on device description, instructions, contraindications, warnings and precautions.

Acquired Cardiac Disease Session 4 Mitral Valve Surgery Rooms 115/117 16:20-18:10

Live video box presentation: Sutureless transfemoral mitral band implantation

Francesco Maisano
Insituto Scientifico San Raffaele, Milan, Italy

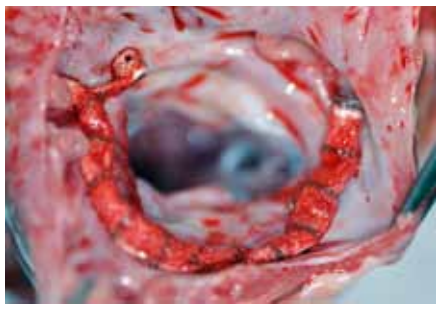
As surgeons we know how crucial is the role of annuloplasty in mitral repair.

For 10 years now, transcatheter techniques are under development, but a reliable annuloplasty device is still lacking. Several technologies have been used in the past to remodel the annulus. The first approach has been the insertion of devices in the coronary sinus to obtain a partial remodeling of the posterior annulus. Of three devices under clinical evaluation, only one, the Carillon device, achieved CE mark and is now available for clinical use. However, coronary sinus approach has several limitations, including the risk of coronary injury and vein perforation, but more importantly its efficacy is not the same degree of surgical annuloplasty. Other technologies have been used to treat annular dilatation and deformation, but only one category of devices is based on a solid surgical background: the direct annuloplasty devices.

There are currently three devices under this category: the Mitralign, the GDS Accucinch and the ValtechCardio Cardioband. This year we report the First in man implantation of Cardioband devices during open-heart procedures. The Cardioband is a Dacron band similar to a surgical band designed for partial annuloplasty with two important features: the device is implanted with a sutureless approach, and it is adjustable after the implant, under echo guidance. These features have allowed the

development of a fully transfemoral approach, with excellent reproducibility and efficacy in preclinical trials. The Cardioband (figure) is implanted with multiple anchors along the mitral annulus, from trigon to trigon, under echo guidance. Once the full implant has been released, the band is shortened under echo guidance until mitral regurgitation is corrected and sufficient coaptation is achieved.

At TechnoCollege this year we are going to demonstrate videos on direct approach Cardioband in humans, as well as animal model demonstrations of percutaneous implant. The Cardioband is the closer to surgical rings percutaneous device under development. Its introduction in clinical practice may fuel further expansion of transcatheter procedures in clinical practice. The device has been developed by surgeons and interventional cardiologists working together for the common objective of better treating challenging patients, with a more efficient therapy, to gain outcomes closer to surgical standards. The role of surgeons in the future of these devices is bright, since transcatheter mitral procedures are increasingly performed by surgeons. Surgeons have a strong background in mitral anatomy and imaging of the mitral valve, which makes them ideal operators in this field. It is fundamental that surgeons are exposed to these new transcatheter technologies before the introduction in clinical practice, to be involved early and actively.



The Cardioband implant concept: a posterior annuloplasty band delivered with a transcatheter approach (far left); CardioBand in an acute animal implant, the band is totally equivalent to a surgical ring (middle); the Cardioband transferal delivery system (above)

Congenital - Medical and surgical intervention Room 111 13:30-18:00

Postoperative arrhythmias in Tetralogy of Fallot: incidence, risk stratification and role of catheter ablation

Gabriele Hessling *Klinik für Herz- und Kreislauferkrankungen, Deutsches Herzzentrum München, Munich, Germany*

Arrhythmias are a significant factor for late morbidity and mortality in patients after surgery for Tetralogy of Fallot (TOF). The prevalence of atrial (AT) or ventricular tachycardias (VT) increases significantly with age up to 40% in 45-55 year old postop TOF patients; it is also associated with the number of previous surgeries. Among a variety of factors, atrial enlargement seems to play a significant role for the development of atrial arrhythmias whereas left ventricular diastolic dysfunction is a significant risk factor for the development of VT.

The risk of sudden death among postop TOF patients is estimated in the range of 2 % per decade; again systemic left ventricular dysfunction seems to play a major role among factors such as non-sustained VT on Holter, ventriculotomy incision or a QRS width of > 180 ms. Catheter ablation is the therapy of choice for AT with a success rate of > 90%. The cavo-tricuspid isthmus and the lateral RA wall related to the atriotomy scar are critical conduction corridors in 85% of AT circuits in TOF. Ventricular tachycardia is often due to macro-reentry in the right ventricle and also amenable to catheter ablation. Different anatomical conduction barriers in the right ventricle have been identified that can be successfully ablated. At our center, we use remote magnetic navigation for VT ablation which seems to significantly reduce fluoroscopy time. However, implantation of an ICD is still the treatment of choice for sustained VT leading to hemodynamic compromise.

At the German Heart Center Munich our electrophysiological team is treating arrhythmias of all ages. One of our special interests is the treatment of complex arrhythmias in postoperative congenital heart disease patients with a clinical and research focus on remote magnetic navigation (RMN) in this patient population.

Gabriele Hessling

Acquired Cardiac Disease Session 2 Imaging/Robotics/CABG Room 115/117 **10:40-13:15**

Live Case

Transapical TAVI using the Symetis ACURATE TA device and rotational Angiography Imaging (DynaCT)

Jörg Kempfert *Consultant Cardiac Surgery, Kerckhoff Clinic, Bad Nauheim, Germany*

Today, the technique of transcatheter aortic valve implantation (TAVI) can be considered as first-line therapy for elderly high-risk patients with severe aortic stenosis. In addition to the transfemoral access, the antegrade transapical approach (TA-AVI) is well established and has been proven to be very safe. However, until recently, only one device was available for TA-AVI.

The ACURATE TA (Figure 1) device has been specifically designed for the transapical approach and consists of a self-expanding nitinol stent housing a regular surgical porcine valve. Three different sizes allow for treatment of patients with an aortic annulus diameter ranging from 21mm up to 27mm. The valve is implanted using a sheath-less delivery catheter (Figure 2) after initial balloon-valvuloplasty using a unique 2-Step technique:

After loading of the valve into the delivery catheter (no excessive "crimping" is required due to the TA approach) the device is inserted into the left ventricle via the apex and advanced under fluoroscopic guidance. Anatomical rotation can now be obtained by aligning the device commissures to the native aortic valve.

Step 1 is performed by simply rotating the knob at the delivery catheter and will release the "stabilization arches" (meant to prevent tilting of the valve) followed by the "upper crown" (distal part of the stent body) still above the native calcified leaflets. After removal of a safety pin the device is now ready for full deployment during Step 2. Slight tension is applied on the delivery catheter to embrace the calcified leaflets by the upper crown and compress the tissue at the annular level while fully releasing the stent body. The operator will feel a "tactile feedback" during this manoeuver.

Based on promising results within a 90 patients CE-mark trial, the device is commercially available in Europe since September 2011 with currently more than 200 commercial implants have been performed. The ACURATE TA device highlights a steep learning curve due to its implantation technique, low rates of new AV-blocks and has demonstrated outstanding results in regard to residual paravalvular leaks.

Jörg Kempfert

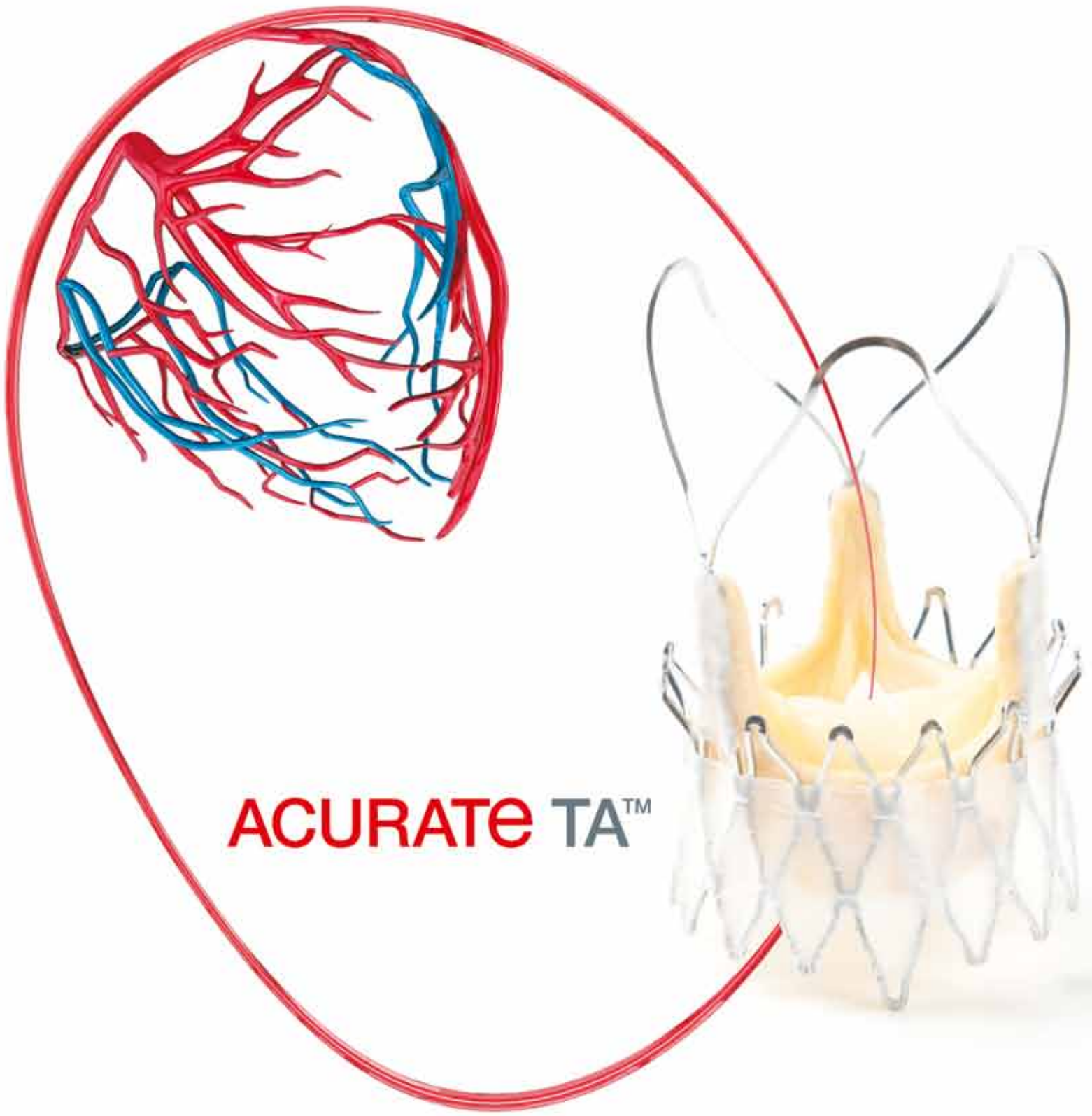
Figure 1: Symetis ACURATE TA prosthesis

Figure 3: Siemens Syngo ValveGuide software prototype

Figure 2: ACURATE TA delivery system (sheath-less)

The live case focuses on the implantation technique of this new TA-AVI device supported by enhanced imaging using the latest prototype version of the Syngo ValveGuide DynaCT software (Siemens). This exciting imaging tool facilitates the acquisition of a CT-like root model on the table with minimal requirements of contrast dye (15ml). After automatic online segmentation a graphical guidance tool suggests the most optimal C-arm angulation to obtain a perpendicular view onto the aortic annulus. In addition the system provides clear visualization of the native commissures easing anatomical rotation of devices (Figure 3).

Ease of use to match your expertise



The ACURATE TA™ puts you firmly in control.

Its distinctive design and unique technology compliment your skills to facilitate successful implantation. You can confidently guide the valve into place and feel when the correct positioning has been achieved.

The ACURATE TA™ gives you the precision and control needed for consistently successful TAVI and improved patient outcomes.

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Thoracic Disease Minimimally Invasive Thoracic Procedures: Advanced procedures Room 113 **09:00-17:00**

VATS lobectomy: summary of different available techniques

Dominique Gossot *Head of Thoracic Department, Institut Mutualiste Montsouris, Paris, France*

Although the first video-assisted lobectomy was performed 20 years ago, the technique is far to have reached maturity. There are so many different reported techniques that one can almost say: "one surgeon– one technique". Actually, variations are not only about access (video-assisted or thoracoscopic with utility incision or full thoracoscopic without utility incision) but also about the type of imaging system, of scope (0° viewing or oblique viewing or use of a deflectable endoscope), of instrumentation (conventional or endoscopic or robotic). Differences also rest on the number of ports – ranging from a uniportal access[1] up to the use of four trocars[2] – and the operative strategy itself. Some advocate a classical posterior approach with a dissection similar to the one performed by thoracotomy with identification and isolation of PA branches in the fissure[3], while many appeal to the anterior approach that is easier and faster since dissection of the pulmonary artery branches within the fissure can sometimes be neglected[4].

We will give an overview of the several reported techniques with their advantages and limitations. Eventually, it appears that most techniques of video-assisted and thoracoscopic lobectomy – when compared to open surgery – encompass a part of compromise. Compromises are related either to the hindered vision during some steps of the procedure, or to the lack of degrees of freedom of instruments which do not always allow accurate movements, or to the number or location of ports that may limit reaching some targets. The consequences of these compromises are especially visible for lymph node dissection that is not always as radical and systematic than it uses to be during open surgery. Recently Boffa et al. have evaluated lymph node dissection by open and video-assisted approaches in 11,500 lung resections for cancer and demonstrated a significant variability in the completeness of peribronchial and hilar lymph node dissection[5]. Now that video-assisted and thoracoscopic major pulmonary resections are accepted as a valid alternative to thoracotomy and that their number is raising worldwide, understanding what we are talking about becomes essential. We cannot expect a standardization of techniques but at least a standardization of definitions.

References:

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Dominique Gossot

Thoracic Disease Minimimally Invasive Thoracic Procedures: Advanced procedures Room 113 **09:00-17:00**

VATS resection of mediastinal tumors: live-in-box and results

Marcin Zieliński[1], Wojciech Czajkowski[1], Paweł Gwozdz[1], Tomasz Nabiałek[2], Artur Szlubowski[2], Juliusz Pankowski[3] *[1]Department of Thoracic Surgery, Pulmonary Hospital, Zakopane, Poland: [2]Department of Anesthesiology and Intensive Care, Pulmonary Hospital, Zakopane, Poland: [3]Department of Pathology, Pulmonary Hospital, Zakopane, Poland*

Doctor Marcin Zielinski and colleagues from the Pulmonary Hospital, Zakopane, Poland described their experience regarding the use of video-assisted-thoracic surgery (VATS) resection of mediastinal tumors. They used several VATS techniques for resection of the mediastinal tumors. The standard VATS utilizes 1-4 small incisions used for VATS ports optionally combined with 3-7 centimeter utility incision without retraction of the ribs to limit the intensiveness of the postoperative pain. The other types of VATS approach utilize subxiphoid incision and cervical incision with elevation of the sternum or the procedures combining those approaches. Transcervical extended approach utilizes a typical a 5-8 centimeters collar incision in the neck. The critical technical point enabling a wide access to the chest is an elevation of the sternal manubrium with a special retractor (modified Rochard frame, Asculap-Chifa Company). A bilateral visualization of the laryngeal recurrent and vagus nerves is usually performed to avoid injury of these structures. A subxiphoid transverse is performed over the insertion of the xiphoid process to the sternum with optional resection of this process. A sternal retractor connected to the firm frame with a double traction mechanism (a modified Munster system, Rochard frame, Aesculap-Chifa, Nowy Tomysl, Poland) was inserted under the manubrium and the lower angle of the sternum to elevate it several centimeters to provide access to the anterior mediastinum.

From 1.9.2000 to 20.9.2012 there were 258 minimally invasive operations for the mediastinal tumors. There were 17 typical VATS unilateral procedures for the various types of tumors, mainly localized in the lower and posterior mediastinum. The patients with early stage thymomas and the other thymic tumors were operated on with use of the transcervical-subxiphoid-VATS approach or subxiphoid-unilateral VATS. In the vast majority of patients (186 patients) the extended transcervical approach was used, mainly for the tumors localized in the superior mediastinum, including primary mediastinal tumors (anterior, middle and posterior mediastinum), mediastinal cysts, ectopic mediastinal goiters and mediastinal metastases of the thyroid cancer and the other types of cancer. There was no mortality and 5% morbidity. In 3 patients operated on with transcervical approach conversion to sternotomy was necessary due to the technical reasons. There was a complete radical tumor resection in 249 (96.5%) patients and in nine patients with extensive tumors non radical resection was performed. The authors concluded that the minimally invasive VATS techniques combining standard intercostal, transcevical and subxipoid approaches proved to be highly effective in resection of the mediastinal tumors.

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Accelerometer sensors can improve monitoring of LV contractility

Per Steiner Halvorsen
Oslo University Hospital, Oslo, Norway

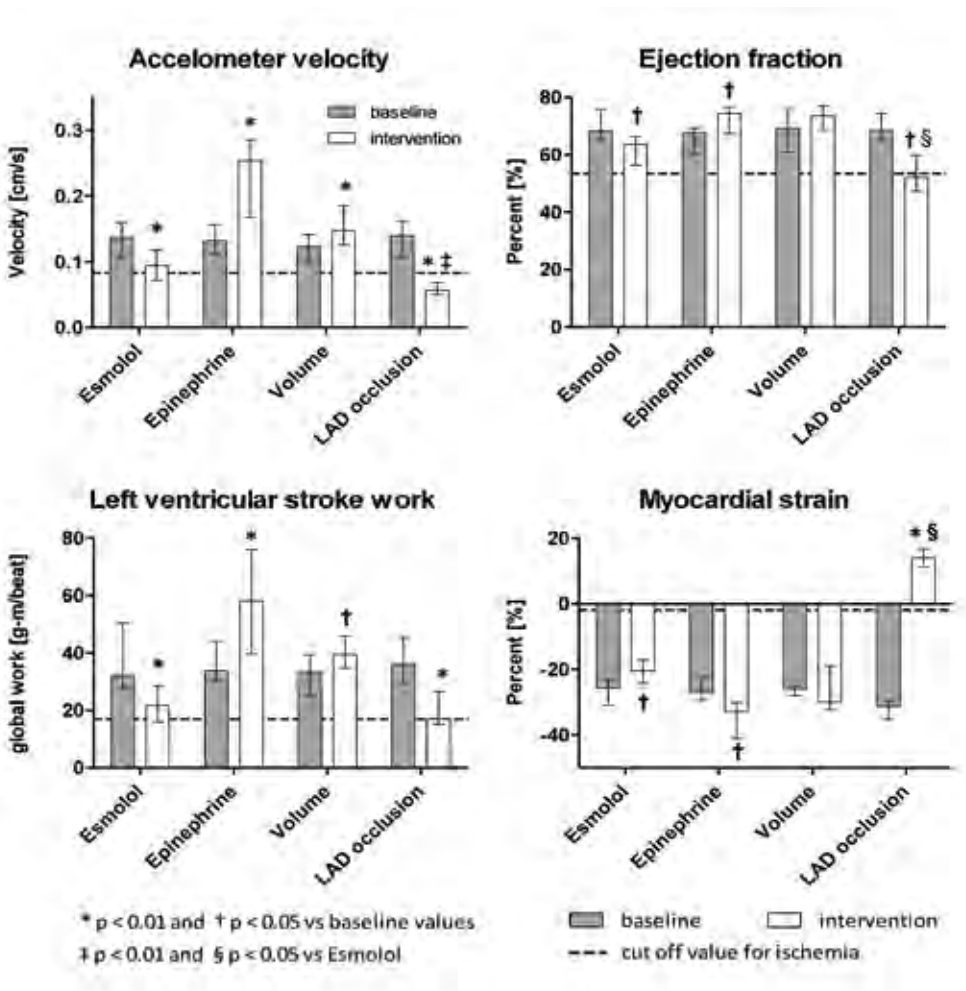
Cardiac 3-axes accelerometers can be used to detect adverse clinical outcomes earlier than routine clinical parameters. Accelerometers are motions sensors which can register heart wall accelerations, velocities or displacements continuously in three dimensions (3-axes accelerometers). The sensor includes a mass of piezoelectric material, which changes its voltage when the heart moves or accelerates. This can be used to measure heart wall motions, which are linked to LV contractility, and is the base for measuring LV contractility with echocardiography. LV function during different phases of the cardiac cycle can be identified by combining ECG and accelerometer signals. Our innovation is a combined temporary pacemaker lead and a miniaturized 3-axes accelerometer, which is attached to epicardium like ordinary temporary pacemaker leads during surgery and withdrawn postoperatively, when there is no need for further monitoring of the patient. Signals from the sensor will be processed and displayed in real time on an external monitor and give an alarm when deviations from normal activity are detected.

A trend in cardiac surgery is that the patient population is getting older and sicker and complex surgery is performed in more and more patients with severe LV failure. A major disadvantage for available clinical parameters assessing LV contractility, such as the LVSW by a pulmonary artery catheter and ejection fraction by echocardiography, is that continuous beat to beat analysis cannot be performed. In addition, the use of echocardiography postoperatively is resource demanding and impractical. Improved monitoring is therefore needed. A promising possibility is that the information obtained from cardiac accelerometers may be used to predict and avoid adverse clinical outcomes earlier than changes in clinical parameters would otherwise indicate. This would allow physicians an opportunity for earlier intervention. In particular this may be relevant in the setting of cardiac surgery were most patients receive temporary pacemakers leads, which can also be used for hemodynamic monitoring and for guidance of treatment in the vulnerable perioperative period. In experimental and clinical studies we have shown that measures from accelerometers can be used to assess global and regional left ventricular function accurately, even during regional myocardial ischemia induced by coronary artery occlusion (figure). The accelerometer measures provided similar information as echocardiography and can be used as markers of myocardial contractility by correlating to LVSW (R=0.81), LV ejection fraction (R=0.80) and LV dP/dt (R=0.73). The method enables differentiating ischemia from global changes in contractility with excellent sensitivity (94%) and specificity (92%). The technique also allowed much earlier diagnosis of myocardial ischemia than ECG and hemodynamic monitoring, and thus has an advantage compared to other emerging device technologies.

Erik Fosse (left) and Per Steinar Halvorsen

Our invention has important implications in diagnosing and monitoring of cardiac surgery patients. We envision permanent wire less accelerometers may be implanted during surgery, which after hospital discharge can give continuous clinical information (heart rate, arrhythmias, ventricular performance and occurrence of ischemic events) during daily activities. This offers promise for better and earlier diagnosis and treatment. Our findings are also highly relevant for the increasing number of patients treated for cardiac arrhythmias and heart failure with ICD and biventricular pacemakers. Treatment with such devices has recently shown to reduce mortality by 50% in severe heart failure patients.

The figure describes the relationship between different parameters for LV contractility during interventions on global and regional LV function. The dashed line represents the cut-off values for the detection of myocardial ischemia during LAD occlusion (obtained by ROC analysis). Accelerometer velocity represents peak systolic circumferential velocity in the LV apical anterior region, the same region which circumferential myocardial strain by echocardiography was obtained.



Sorin Group acquires CalMed

After the announced acquisition of a complete cannulae product portfolio specifically designed for minimally invasive cardiac surgery in 2011, Sorin announced in July 2012 the acquisition of Californian Medical Laboratories Inc. (CalMed).

The CalMed Labs. acquisition is part of the Sorin Group commitment to continuously provide high quality and innovative products to meet clinicians' needs in the Cardiac Surgery Community.

CalMed Labs. is an US Company based in Costa Mesa California developing, manufacturing and distributing a full range of cannulae, catheters and accessories for cardiac surgery cannulation.

CalMed Labs. products are approved by Food and Drugs Administration (FDA) in US and CE marked for commercialization in European Countries. CalMed Labs. is present worldwide in 45 different countries.

By expanding our product offering, Sorin Group has, with CalMed Labs. products, strongly reinforced its market visibility providing Cardiac Surgeons an extremely competitive product offering for conventional cardiac surgery to insightfully fulfill all the clincian's requests.

CalMed Labs. product portfolio includes a broad range of products:

- Extracorporeal Circulation Cannulae
- Myocardium Protection
- Fluid Management
- Beating Heart Procedure

Venous Cannulae are manufactured using an outstanding monolithic design, high flexible tubing with no-kinking problems, the Tri-Stage cannula, specifically designed for vacuum assistance usage, provides superior venous drainage in a small size and with less space intrusion in the operative field, smooth, atraumatic tip allows for easy insertion with fewer traumas.

CalMed Labs. exhibits an excellent offering for myocardium protection suitable for adult and pediatric patients, conventional and minimally invasive cardiac surgery, with the Aortic Root Long Needle providing extra length in order to easily reach the aortic arch from a lateral incision.

In the intracardiac and pericardial sumps Calmed has extremely competitive products, with a mention of note to the most known and unique design of the pericardial sump ATRATM Sump which has a wire-wound tip encapsulated in a plastic cover with lateral holes to provide better and continuous drainage. The spring provides weight and flexibility to the sump, while flexible silicone like tubing aids proper positioning. A flexible metal spring, encapsulated with a fluted plastic cover, offers safety: no more entangled tissue to the spring.

CalMed Blower/Mister devices, available in three different configurations, are specifically designed for beating heart procedures used primarily to clear blood and other fluids from the anastomotic sites such as the vein grafts. Shafts terminate in either a soft, atraumatic distal tip or a square cut end, often referred to as a "Frazier" tip. Dual peelable tubes to improve device handling, provided with adjustable roller clamp for precise saline mixture setting.

With the acquisition of CalMed Labs., Sorin Group has reinforced its commitment to provide high-quality products and services for cardiac surgery in order to meet the needs of the cardiac community, and adding this product line further strengthens Sorin Group's leadership position.

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

For further information, please contact us at info.cp@sorin.com or visit www.sorin.com

• Techno College Award Nominee 2012 •

Initial experience with the Jetstream Pathway device for femoro-popliteal disease

Imran Javed, Venkatesh Ramaiah, David Terry, Julio Rodriguez and Matt Nammany
Arizona Heart Institute, Phoenix, Arizona, USA

Objectives

To report safety and efficacy of Jetstream Pathway rotational atherectomy/thrombectomy device for the treatment of femoro-popliteal arterial lesions with special emphasis on rate of re-intervention and intervention free period.

Materials and methods

The duration of the study was from March 2008 to November 2009 (21Months). The total number of patients was 86. There were 55 (64%) males and 31 females (36%). Age range was 36 to 87 years.

All patients underwent Pathway Atherectomy during this time period regardless of their previous status were included. Re-intervention in the same limb after atherectomy was endpoint of the study.

Results

TLR (Target Lesion Revascularization) was 15% in patients during follow up period. Re intervention was more common in first three months after first intervention. It was more common in TASC II type B lesions and mostly managed by balloon angioplasty.

Conclusion

The JetStream Pathway device with thrombectomy and aspiration capabilities has added advantages to femoro-popliteal atherectomy. Adjunctive stenting remains very low in this difficult segment. Long term follow up will definitely be needed for durability and patency.

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New dedicated aortic retractor and calibrated cusp sizers to facilitate aortic valve repair procedures

Mohammad Bashar Izzat
Damascus University School of Medicine, Syria

Mohammad Bashar Izzat

Wider implementation of aortic valve repair techniques is limited by the difficulty in recognizing aortic cusp and root geometric alterations which are responsible for aortic valve malfunction, and which need to be adequately corrected in order to restore aortic valve competence. Up till now, surgeons had to make these difficult decisions and the necessary crucial adjustments based solely on eye-balling and expertise. Our objective was to develop the necessary devices that would facilitate intra-operative decision-making and guide selection and implementation of appropriate aortic valve repair techniques.

The Spring retractor; for optimal exposure of aortic valve components (figure 1)

The concept of this device was to join three retraction blades by inter-connecting circular springs in order to generate equivalent radial traction and maintain the natural shape of the aortic root. Retractor blades were designed to apply pressure towards the bases of the sinuses, hence providing optimal exposure and working space on aortic cusps. The self-retaining design of the retractor ensures its stability during surgery. A dedicated applicator was also developed to help compress and deploy the retractor in place (figure 2).

Figure 1

Figure 2

Figure 3

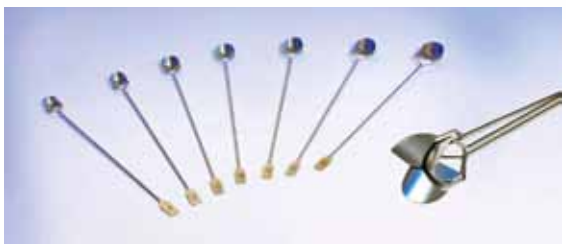
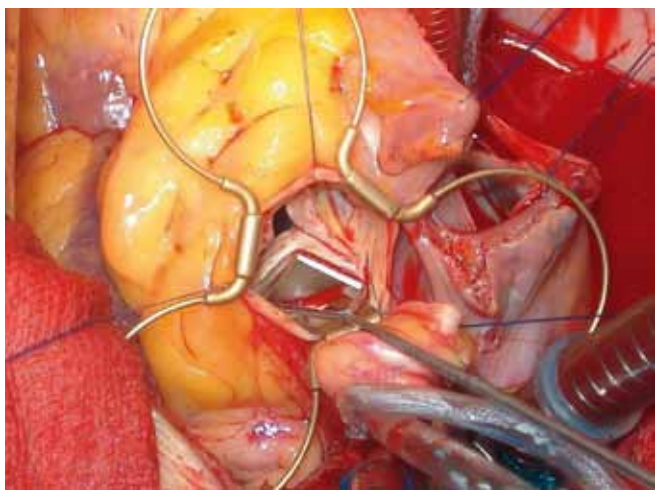


Figure 4



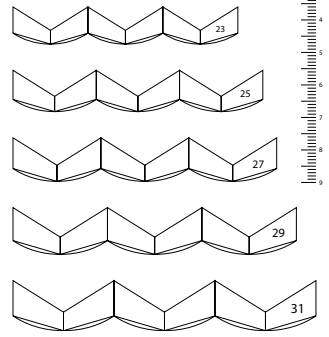


Figure 5

Calibrated cusp sizers; a reference device for aortic valve assessment (figure 3)

A mathematical 3-D model of the intact aortic valve and root was constructed, and was used to manufacture representations of single aortic cusps in a "steel leaf" form. This design was replicated to correspond with a range of proposed aortic root diameters.

These calibrated cusp sizers can be used to assess the geometry of aortic cusps intra-operatively. The sizer that corresponds with the root-height and cusp attachment line is selected (figure 4). A cusp is considered to have normal geometry if it corresponded well with the selected sizer, while it is considered to be either "prolapsed" or "retracted" if its free-edge length and inner surface area were either stretched out or retracted, respectively. Matching root diameter values are used to identify the presence of aortic annular dilatation.

A cutting platform to facilitate cusp augmentation

A mathematical 2-D model of three connected cusp coaptation surfaces was constructed, and was replicated across the same range of proposed aortic root diameters (figure 5). This model was used to manufacture a dedicated cutting platform which can be used to fashion precise pericardial strips for tri-leaflet cusp augmentation.

Epilogue

Clinical experience has shown that the Spring retractor facilitates visual valve assessment and provides superior surgical access compared with standard manual retractors. Also, the calibrated cusp sizers were valuable in identifying the exact alterations in cusp and root geometry, selecting appropriate repair techniques, and restoration of the natural correlation between various aortic valve components.

It is noteworthy that this approach towards our objective was analogous to that attributed for the success and wide adoption of mitral valve repair techniques. The simplicity and reproducibility of this approach is likely to assist in its dissemination, and may further increase the percentage of aortic valves that are repaired as compared to current practice.

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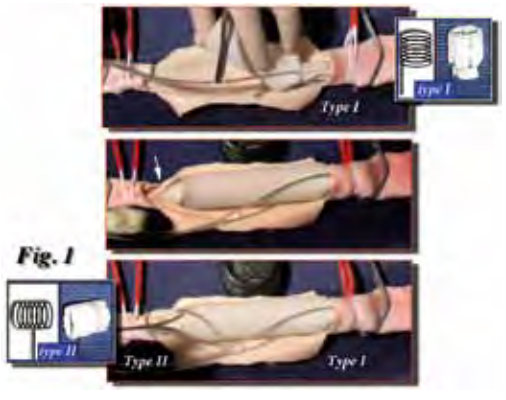
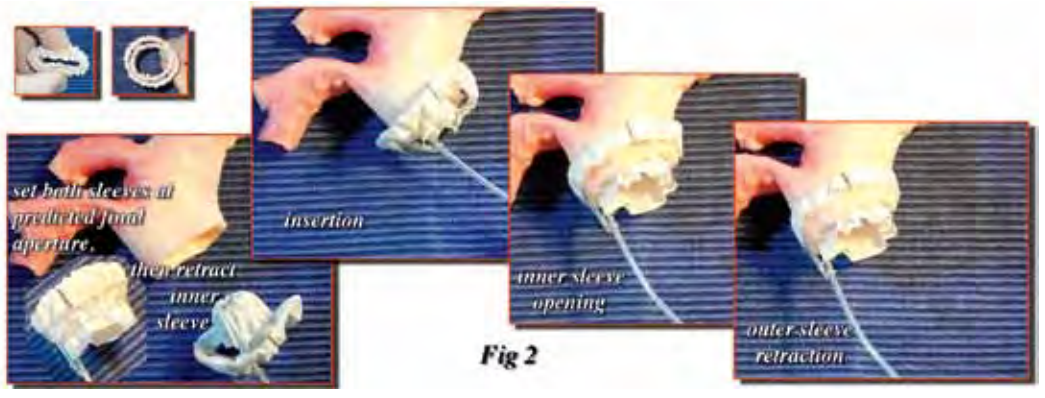
Easier, quicker and more efficient aortic-prosthesis anastomosis





Stefano Nazari *Fondazione Alexis Carrel, Basiglio, Italy*

Open thoracic aorta prosthetic substitution still carries significant mortality and serious complications risk, in particular to CNS. Risk is mostly correlated to the length of clamping/circulatory arrest time, i.e. essentially to the time required for vascular anastomosis construction.

We developed devices for easier, quicker and more efficient aortic-prosthesis anastomosis based on a new working principle: i.e. compression of vascular stump between inner (nitinol wireframe) and outer structures (external ligature or nitinol wireframe) instead of sewing with full-thickness perforation of the vessel wall.

The device consists of loops of nitinol wires, wrapped within a Dacron fabric and connected to a prosthesis end (Type I and III). The nitinol wire loops can be expanded and tightened by activating a removable guide in such a way that device varies its diameter, while maintaining a regular cylindrical shape. This allows the easy and quick insertion of the retracted device into the vascular stump and then its expansion to perfectly fit with the vessel diameter. Haemostasis and permanent device fixation are provided by external ligature/suture.

Three main models (Type I, II and III) applying the same working mechanism, but with different configurations, allow to fit with all aorta segments as well as special conditions of use.

Device type I, previously connected with a tube graft end, is used for the first anastomosis, either proximal or distal; device type II is then used for the second anastomosis after having tailored the graft tube at its appropriate lenght (Fig 1 & video1 http://www.fondazionecarrel.org/2012eactstechaw/video1.html).

Device type III is ideally used for anastomosis in dissection cases, allowing in particular to include even the concavity of arch (Fig 2 & video2 http://www.fondazionecarrel.org/2012eactstechaw/video2.html).

Single graft layer type I devices for small diameters (6-14mm) can be used for supraortic trunks (Fig 3 & video3 http://www.fondazionecarrel.org/2012eactstechaw/video3.html)

The regularly expandable configuration of the ring allows to solve all the insertion, positioning and stability problems of the 70ies intraluminal prosthesis. That makes performing anastomosis a very simple task, which can be carried out in seconds vs the 10-15 min per anastomosis at best required with hand suture.

The aortic wall being not perforated by the suture, the coupling is immediately blood-thigh ("air-tight" in fact! See seal test at http://www.fondazionecarrel.org/2012eactstechaw/video2.html) and then independent by the integrity of the physiological coagulation mechanisms

In summary favourable effects on complications rate, particularly in aortic arch substitution, related to circulatory arrest, hypothermia and CNS perfusion and dissection layers reconstructions can be expected due to:

1 dramatic reduction of the time required for completing aortic prosthetic anastomosis because of a) great simplification of anastomosis technique (video1), which is performed at once with b) double strip graft vascular stump buttressing (video2) and c)"air-tight" sealing dissection layers reapproximation
2 easy and quick supraortic trunks anastomosis with single layer devices type I previously prepared on the main tube graft (video3).

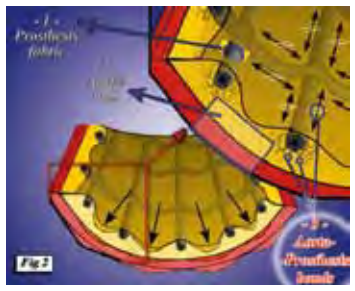
Anastomosis immediate blood-tightness not dependent on coagulation integrity may predictably decrease intra- and postoperative blood losses. Use of these devices may also enhance mininvasive access in prosthetic open substitution of any aortic segments.

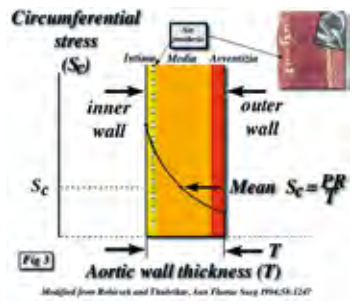
Reference and details

1 See project 1 at http://www.fondazionecarrel.org/eacts2012.html or in "New approaches to aortic aneurisms treatment and prevention" Intechopen, free download at http://www.intechopen.com/books/front-lines-of-thoracic-surgery/new-approaches-for-treatment-and-prevention-of-thoracic-aorta-aneurysms)

Endovascular net prosthesis for prevention of aneurysm formation in Marfan and other genetic disorders or for very early stabilization of other aneurysms

Stefano Nazari
Fondazione Alexis Carrel, Basiglio, Italy





The relative slowness of aneurysm formation and progression to rupture indicates that the decrease in the strength of the arterial wall under the aneurysm formation threshold may be very gradual and limited. Consequently one can imagine that measures to increase, even moderately, the mechanical strength of the arterial wall, for example by means of a dacron fabric network, should be successful in preventing aneurysm formations and thus its complications (dissection and rupture), without necessarily requiring complete prosthetic substitution.

The experimental hypothesis is based on the fact that the net prosthesis positioned and maintained in stable contact with the aortic walls (fig 1-A) is spontaneously, gradually covered by the neo-intima (fig 1-B) (as constantly happens with all tube graft currently in use), invaded by fibroblasts and thus stably associated to the aortic wall (fig 1-C).

A significant advantage of this approach is that, if the net mesh is appropriately dimensioned, it may be expected that the blood flow through the collateral branches is not significantly affected (B-arrows), thus allowing application in all aortic tracts overcoming limitations of current endovascular techniques; moreover this may be the only method theoretically able to fully prevent spinal cord ischemic injury.

The structural properties of the aortic wall associated to the intraluminal net prosthesis rely on three factors (fig 2): -1) the structural properties of the net prosthesis, -2) the structural properties of the aortic wall, -3) the strength of the bonds between the aortic wall and the net prosthesis, based substantially on fibroblastic invasion of the net fabric and its permanent integration with aortic wall.

Given the structural adequacy of the net prosthesis (1) (polypropylene thread diameter 0.5mm, mesh 5x5mm) and its mechanical effect of fractioning the aortic wall in the small area of the net mesh (2), crucial to this model is aorta-prosthesis bond (3). In fact if this link is sufficiently strong and stable in the time, it can be hypothesized of being able to stabilize aortic wall and prevent dilatation even independently from the true diameter of the "net" prosthesis, which could not be further distended after that their meshes have been firmly integrated into the aortic wall. The practical consequence is that the precise equivalence between diameter of the net prosthesis and aortic diameter would not be necessary; the prosthesis in fact could be significantly redundant in respect to the effective aortic diameter, thus allowing for its easier adaptability to geometrical irregularity of vascular wall, without consequences on its efficiency in keeping stable aortic diameter.

Interestingly enough in this model the endovascular net prosthesis provides aortic wall mechanical support just where the mechanical stress is higher, and thus just where it's most needed both to prevent further dilatation and to avoid partial (dissection) or total rupture, with the minimal amount of prosthetic material (approximately ≤1/6th of current endoprosthesis volume).

References and details

1 Project 2 at http://www.fondazionecarrel.org/eacts2012.html and in at "New approaches to aortic aneurisms treatment and prevention" Intechopen, free download at http://www.intechopen.com/books/front-lines-of-thoracic-surgery/new-approaches-for-treatment-and-prevention-of-thoracic-aorta-aneurysms)

NeoChord completes enrollment for 'TACT' clinical trial

Acute and chronic results using NeoChord's sternal-sparing, beating-heart, mitral valve repair system to implant artificial chordae tendinae are encouraging.


John Seaberg

NeoChord, a medical device company focused on minimally invasive mitral valve repair, has completed enrollment for its ongoing 'TACT' (Transapical Artificial Chordae Tendinae) clinical trial in Europe.

"The 30-patient TACT trial now has numerous patients showing one- and even two-year durability of repair with clinically significant reductions in mitral regurgitation. Acute procedure success rates in the second half of the trial were 94% with excellent early durability results. These combined results suggest that NeoChord will make a strong contribution in the evolving field of mitral repair," said John Seaberg, Chairman and CEO, NeoChord.

"We are very pleased that we have successfully concluded enrollment into our TACT trial, as these patients suffering from mitral regurgitation are potentially avoiding the complications and trauma associated with traditional open-chest surgery performed on a stopped heart," added John Zentgraf, VP of R&D (vice president of research and development) at NeoChord. He added that "We look forward to conducting additional studies via the TACT Registry in Europe commencing in early 2013."

"Follow-up visits at 12 and 24 months post-op confirm that the vast majority of patients operated on using the NeoChord technology continue to show resolution or significant reduction of mitral regurgitation up to two years after the procedure," said Giovanni Speziali, M.D., a cardiac surgeon who is the primary inventor of the NeoChord device. "These results compare favorably to those obtained with traditional surgical repair of severe mitral regurgitation," said Dr. Speziali. He added that "I am very pleased with the progress we have made in both patient selection and procedure methodology."

The NeoChord procedure was developed to treat mitral prolapse caused by ruptured or elongated chordae tendinae — the primary cause of degenerative mitral regurgitation —– via minimally invasive implantation of artificial chordae tendinae. The technology was developed by Dr. Speziali, University of Pittsburgh Medical Center, along with Richard Daly, M.D., a cardiac surgeon from Mayo Clinic, and Charles Bruce, M.D., cardiologist, also of Mayo Clinic. The technology is licensed exclusively to NeoChord Inc.

Based in Eden Prairie, Minn., NeoChord is a privately held medical technology company focused on advancing the treatment of mitral regurgitation. The Company expects to commercialize a surgical device for minimally invasive mitral valve repair via surgical implantation of artificial chordae tendinae. Degenerative mitral regurgitation occurs when the leaflets of the heart's mitral valve do not close properly, usually due to rupture or elongation of the chordae tendinae (chords) that control the leaflets' motion. During pumping, the "leak" in the mitral valve causes blood to flow backwards (mitral regurgitation) into the left atrium, thereby decreasing blood flow to the body. Mitral regurgitation is a progressive disease that left untreated can result in atrial fibrillation, congestive heart failure, and death. For more information, visit: www.NeoChord.com. The NeoChord device is an investigational device and is not available for commercial use.

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Cardiac E learning module

Dr A Sampath Kumar
Editor in chief of the Asian Cardiovascular and Thoracic Annals.

Sampath Kumar

This E learning module is computer based training. It incorporates a live surgical video of MVR performed by the author describing the steps, an animation that explains the steps and adds a three dimensional view for the student and finally a practice session.

In the practice session the student has to pick up the correct instrument, go to correct spot and perform the actual movement using the mouse. This way, the student can practice many times and learn each step of the surgery without fear. It helps to build confidence in low volume centres where hands-on training may be deficient in numbers. It is particularly useful for the shy and relatively unskilled student to hone their skills without any complications.

It is also useful for the qualified surgeons who wish to learn to perform this operation. It is the ideal virtual training tool for all cardiovascular training programs. The steps of surgery for MVR are standard and this module explains how to for both mechanical and Tissue valves. This is exclusively for teaching purposes and can be purchased by the student, teacher, qualified surgeon or institution.

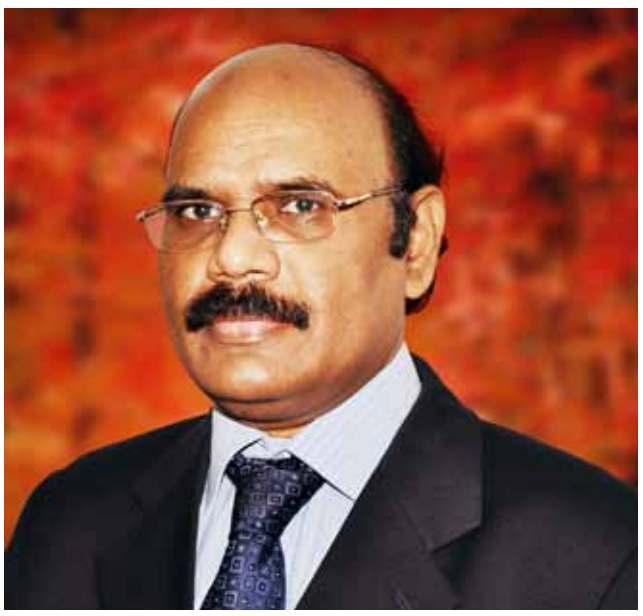
The singular advantage is that the operation can be seen, studied and performed a number of times until one gains confidence to be able to reproduce the steps in a real life situation. The three parts are interconnected, while performing a step of the operation the student can view the same in the video. It speeds up the learning of skills and steps.

It is particularly useful when this surgery is not performed routinely or frequently. The surgeon can then quickly refresh his skills to follow the steps. It can also be displayed in the operating room while performing the operation.

Reduction of sternal wound infection

Using modified pedicle bilateral internal thoracic artery harvest technique using mammary artery surgical platform (MASP)

Dr Lokeswara Rao Sajja *Star Hospitals, Hyderabad, India*



Lokeswara Rao Sajja

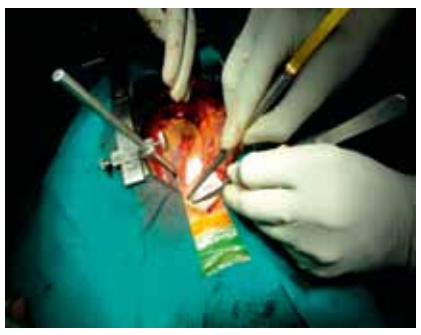
Coronary artery bypass grafting surgery is the best method of treatment for multivariate coronary artery disease. Left internal thoracic artery is universally accepted as the best conduit in CABG. Use of bilateral internal thoracic arteries in CABG is associated with better long-term and event free survival. However, only 4% of patients undergoing CABG receive two internal thoracic arteries due to a perceived higher incidence of sternal wound infection following BITA harvest particularly in diabetics and also the associated technical difficulty in BITA grafting.

To address the problem of sternal wound infection following bilateral ITA harvest, a modification of pedicle harvest of ITA was developed by Dr Lokeswara Sajja of Star Hospitals, Hyderabad, India, which is a simple and reproducible technique. The main stay of the technique is to divide the harvested ITA 1 cm proximal to its bifurcation, so that the luminal communication between the musculophrenic and superior epigastric arteries is preserved.

The principle of sparing of communicating musculophrenic and superior epigastric arteries to the chest wall and preservation of pericardioacophrenic artery facilitates the development of substantial collateral blood flow to the sternum in the absence of ITAs through anterior intercostal and sternal branches of ITA. The preservation of blood supply of the sternum via the collaterals reduces sternal ischemia and thereby reduces the incidence of sternal wound infections. About 380 patients (206 diabetics) received BITA grafting using this modified pedicle harvest technique. The incidence of deep sternal wound infection in BITA group was 0.52% and superficial infection was 1.65% which was comparable to that of single ITA group – deep infection 0.69% (p value 0.838) and superficial 1.64% (p value 0.994).

When two internal thoracic arteries are used in CABG, these grafts are used either as two in situ grafts or as a 'Y' graft constructed using in situ LITA or free RITA grafts. The technical difficulty of constructing a "Y" graft is overcome by use of a novel device called mammary artery surgical platform (MASP) which was designed, developed and patented by Dr Sajja. MASP device was used in construction of 'Y' grafts in about 50 patients. MASP contains a rectangular 5.5 X 4.5 cm platform made up of stainless steel and a cylindrical rod with a diameter of 6mm which is attached to the platform, which keeps the platform at a desired depth in the mediastinum. The in situ left and free right ITAs are placed on the MASP platform and this facilitates a meticulous and faster construction of 'Y' graft without the transmission of pulsations of the heart and aorta to the anastomotic area. It reduces the time taken for the construction of 'Y' graft by 25%.

Intra-operative image of BITA harvest and mammary artery support platform



The use of this modified BITA harvest in conjunction with the MASP device would facilitate the wider acceptance of BITA grafting in CABG.

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Bronchoscopic instillation of autologous platelet-rich plasma for massive hemoptysis at the Lung Center of the Philippines

Plugging the Leak

Armand Gregorio C. Sarmiento and Jose Luis Danguilan *Department of Thoracic Surgery and Anesthesia, Lung Center of the Philippines, Quezon City, Philippines*

Pulmonary tuberculosis is common in developing countries like the Philippines. At the Lung Center of the Philippines, a tertiary hospital for lung and other chest diseases, patients presenting with hemoptysis are quite common. Most of these patients have the sequelae of a previously treated pulmonary tuberculosis like bronchiectasis and pulmonary aspergilloma. During a three-year period, 103 lung resections were performed for hemoptysis secondary to post-tuberculous bronchiectasis. In a nine-year period, 111 consecutive patients underwent lung resection for complex symptomatic pulmonary aspergilloma with 95% of these patients presenting with hemoptysis.

Although lung resection is the surgical treatment of choice, the patient has to be stabilized first by various methods – fiberoptic bronchoscopy-guided blockade of the involved segmental bronchus with vena caval balloon catheters or bronchial blockers, bronchoscopy-guided application of glue or topical hemostatic tamponade therapy using oxidized regenerated cellulose when we ran out of balloon catheters.

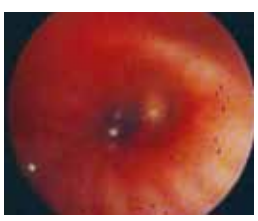
In our pilot study of eight patients with massive hemoptysis, bronchoscopy-guided instillation of 10mls of autologous platelet-rich plasma (PRP) divided into three batches (Fig. 1) was used to plug the involved bronchus. Excluded were patients who were septic, those who were intubated for acute respiratory failure from aspiration of blood, and those with a recent myocardial infarction or stroke. The PRP was infused by a plastic catheter through the suction channel of the fiberoptic bronchoscope; the bronchoscope was retained for five minutes following infusion. Likewise, the second and third batches of PRP were infused in the same manner. Hemostasis was then confirmed bronchoscopically. Recurrence of massive hemoptysis was monitored whether massive, non massive or no hemoptysis at all for seven days. The cessation of massive hemoptysis was noted to be instantaneous (Fig. 2) and all except one patient had two recurrences of massive hemoptysis. Two patients later underwent definitive lung resections later.

Platelets are known to perform multiple functions during injury and tissue repair and one of these is to initiate the body's response to a normal sequence of events that provide clotting and healing of the damaged tissue. Platelets may be considered as "autologous biomaterials" distinguishing them from synthetic "biomaterials" like oxidized regenerated cellulose which we also used previously. Acceleration of the wound healing process requires proper preparation of the specimen to yield a product with minimal red blood cells (RBC) and with platelet concentration that is four to five times above the baseline value. The use of PRP in the bleeding bronchial segment has been shown to be feasible in this pilot study. Furthermore, the procedure can be repeated. Of course, the definitive treatment for massive hemoptysis is still lung resection.

In conclusion, this method can be added to the armamentarium of the thoracic surgeon and pulmonologist in developing countries who deal with hemoptysis on a daily basis.

Fig 1. Autologous platelet rich plasma (PRP) used for bronchial instillation

Fig. 2: Clotted blood formed in the bronchus after instillation of autologous PRP



Temporary caval stenting for routine use

Ludwig K. von Segesser *Department of Surgery, CHUV, Lausanne, Switzerland*

Temporary caval stenting has been identified as most promising approach for improving venous drainage during remote access CPB for minimally invasive cardiac surgery, complex cardio-thoracic procedures, and ECMO. As a matter of fact, up to 50% higher flows can be achieved with the self-expanding smartcanula® (Fig. 1) introduced through relatively small peripheral veins into the caval axis and the right atrium. In addition, it was shown be experimental and clinical studies, that longer self expanding cannulas providing caval support for a longer distance provided even better venous drainage.

In order to make these performance increases available for routine use, a new synthetic smartcanula "P" was devised for venous drainage by temporary caval stenting in cardio-pulmonary bypass. For this design, specific fibers with memory effect are extruded, braided, and mounted to 3/8 sleeve that allows for connection to the venous line.

The 43cm long synthetic smartcanula® "P" designed for central cannulation and routine use requires a 30F access orifice and opens up to 45F (Fig. 2) within the right atrium and the caval axis. As a result, its venous drainage performance equals that of a 56F two stage venous cannulas with gravity drainage alone. Furthermore, atrial chatter can be reduced, as the venous blood can enter the cannula lumen at any point and localized cannula orifice occlusion due to excessive negative pressure can be avoided (Fig. 3). More on www.smartcanula.com

Fig. 1: Despite a small access orifice, the self-expanding smartcanula takes advantage of its increase in luminal diameter and provides superior drainage

Fig. 2" The new smartcanula "P" is designed for performance increases in central cannulation and routine use

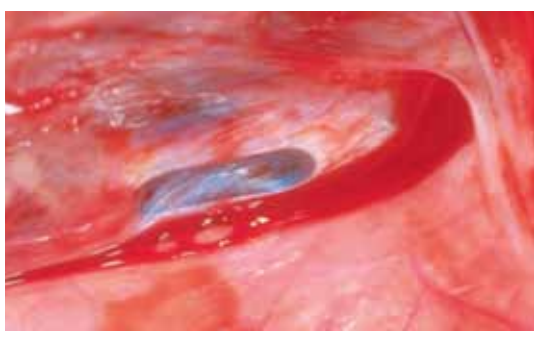


Fig. 3: Cannula orifice obstruction due to excessive negative pressure can be avoided by the "wall-less" smartcanula design

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Suction-assisted bioglue application for reinforcement of suture line – new haemosthatic technique in aortic surgery

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Zan Mitrev

The main problem in aortic surgery is adequate homeostasis with less bleeding. Using BioGlue for reinforcement of aortic suture line tissue, some of haemostatic problems could be resolved.

Our haemosthatic technique of suction-assisted bioglue application on aortic suture lines impregnates prostheses and aortic wall, reinforcing it and closing the needle holes. Technically elegant, this procedure requires only cell saver suction, adding approximately 30s to surgery's duration. There are no bleeding complications during surgery.

The main purpose of this technique is to achieve adequate haemostasis intra-operatively, with less bleeding and less blood loosing complications postoperatively.

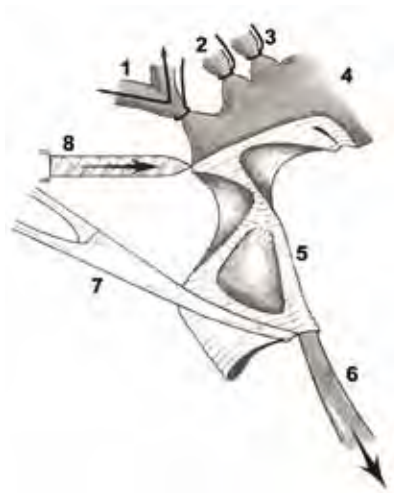
Suction assisted BioGlue technique was used in 215 consecutive patients (145 male and 70 female, age 57+/- 5 years) from 2006 to July 2012. After preparation of the operating field, reconstruction of dissected or thinned layers and opening of distal aortic anastomosis were performed, reinforcing the suture line with previous cut strips from the Albograft prosthesis (Biomateriali Srl; Brindisi, Italy). Bioglue Surgical Adhesive (Cryo-Life, Inc, Kennesaw, GA) was applied on the outside of the anastomosis while applying suction from the inside of the prosthesis using catheters from cell server suction, thus forcing the bioglue to impregnate the suture line, reinforcing it and closing the needle holes. The tissue surface was always kept dry and bloodless (Figures 1, 2). At the end distal anstomosis is explored from inside with removal of all bio-glue excess on the suture line. The proximal suture line is reinforced with the application of bioglue on the outside of the suture line while applying suction from the inside using a needle placed proximally to the aortic cross clamp and connected to the cell-server suction (Figures.3, 4). All patients were finalized in a conventional way.

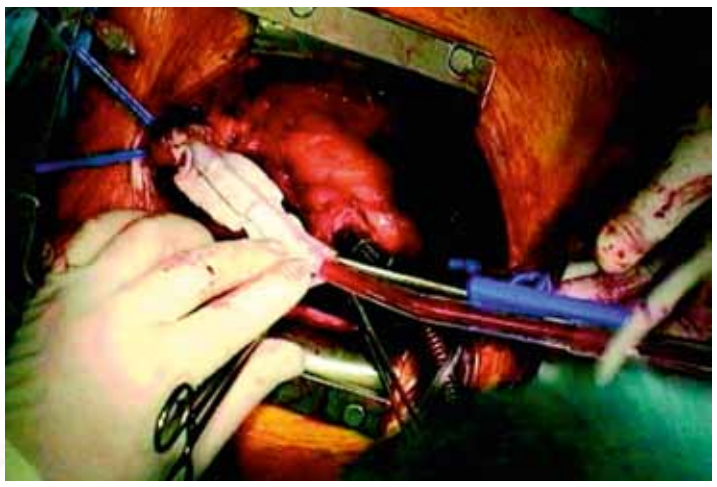
The most common underlying pathologic conditions were aortic dissections (155 patients) and aortic aneurysms (60 patients). The procedures carried out were aortic root reconstruction- Tyrone David (66 patients), ascending aorta replacement (64), ascending aorta with a hemiarch replacement (44) and ascending aorta and aortic arch replacement with reimplantation of the cranial vessels (41). The indications for suctional BioGlue reinforcement of the suture lines were haemostatic in 164 patients, tissue adherence in 21, and tissue strengthening in 30. The hospital mortality was 3.8% (eight patients). The mean postoperative blood loss at 12 hours was 402ml, with the duration of drainage of 2+/-0.9 days. Average blood transfusion needed 2+/-0.9 per patient, plasma 2+/-1.5 and trombocyte concentrate 0,1% per patient. Average inhospital stay was 6+/- 1.5 days.

Conclusion

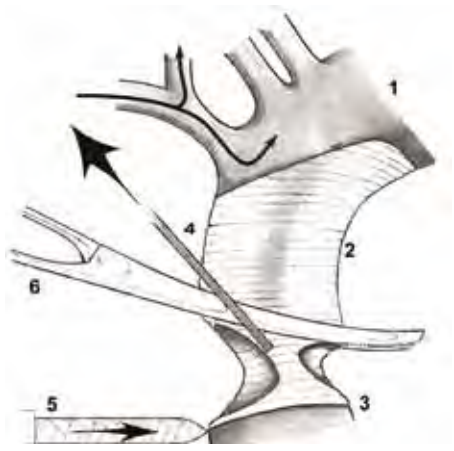
This new haemostatic technique is simple, safe and does not prolong the cross-clamping time. Suction assisted bioglue application with cell-server ensures excellent haemosthatic reinforcement of the aortic suture line even while patients are still under complete heparinization. Reduction in blood usage due to less postoperative bleeding is achieved. There is objective shortage of in-hospital stay, as well as low mortality rate.

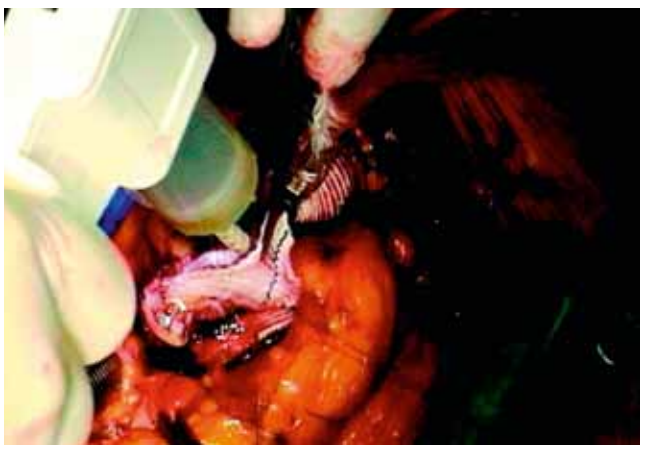
Sweet little nothings – great clinical benefit.





Figures 1 and 2: Suction-assisted application of bioglue on the distal aortic suture line via catheters from the operative field suction. 1 sneared brachiocephalical trunk, 2 sneared left common carotidal artery, 3 sneared left subclavian artery, 4 aortic arch, 5 vascular Dacron prosthesis, 6 catheter of cell server suction, 7 clema, 8 BioGlue aplicator





Figures 3 and 4: Suction-assisted application of bioglue on the proximal aortic suture line via a needle connected to the house suction and placed proximal to the aortic cross clamp. (1 aortic arch, 2 vascular Dacron prosthesis, 3 proximal anasthomosis, 4 needle placed proximally to the aortic cross clamp and connected to the cell-server suction, 5 BioGlue applicator, 6 clema)

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The EACTS New Technology Committee would like to thank the following organisations for their educational grants in respect of this year's Techno-College:

Edwards Lifesciences, Medtronic, Abbott Vascular, Correx, BioVentrix, HeartWare, NeoChord, St Jude Medical, Symetis, BioStable Science and Engineering, Estech, Sunshine Heart, Valtech Cardio and Kips Bay Medical.

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Selective cerebro-myocardial perfusion under mild hypothermia: primary repair for aortic coarctation with ventricular septal defect

Huiwen Chen *Department of Heart Center, Shanghai Children's Medical Center, Shanghai, China*

Deep hypothermic circulatory arrest (DHCA) and selective antegrade cerebral perfusion (SACP) strategies have been proposed in coarctation of the aorta (CoA) and hemodynamically significant ventricular septal defect (VSD) repair. Controversy still exists on the use of deep hypothermic circulatory arrest (DHCA) and selective antegrade cerebral perfusion (SACP) on postoperative recovery. Selective cerebro-myocardial perfusion (SCMP) under mild hypothermia has been used in our institution avoiding hypothermia and heart arrest.

One hundred and ten consecutive patients undergoing anatomic reconstruction of CoA with VSD closure between January 1999 and July 2011 were retrospectively reviewed. Patients repaired under continuous cerebral and myocardial perfusion technique with mild hypothermia (32°C) (group A, n=60) were compared with those repaired under DHCA (18°C) and SACP (group B, n=50). In group A, single arterial cannulas perfusion technique (figure 1) was used in 45 (75%) patients , and a dual arterial cannulas perfusion technique (figure 2) was used in 15 (25%) patients. Preoperative data were similar in both groups.

There were no hospital mortalities in Group A, compared with two (4%) in Group B. Compared to Group B, Group A had shorter myocardial ischemic time and cardiopulmonary time, fewer delayed sternal closures, shorter time to extubation, lower postoperative lactate levels, and fewer patients with low cardiac output requiring ECMO or multi-organ failure. During the postoperative course, there were no clinical or electrical neurologic events in either group. The mean length of follow-up for group A was 5.2 ± 3.2 years, and for group B, it was years 7.5 ± 3.1 years (P = 0.048). There was one late death in group B. There was no late death in group A. The actuarial survival for the two groups was similar (100% for group A vs 96% for group B, P= 0.264) (figure 3).The freedom from all types of cardiac reintervention was 96.7% in group A and 89.6% in group B (P=0.688) (figure 4). All patients were free from neurologic symptoms.

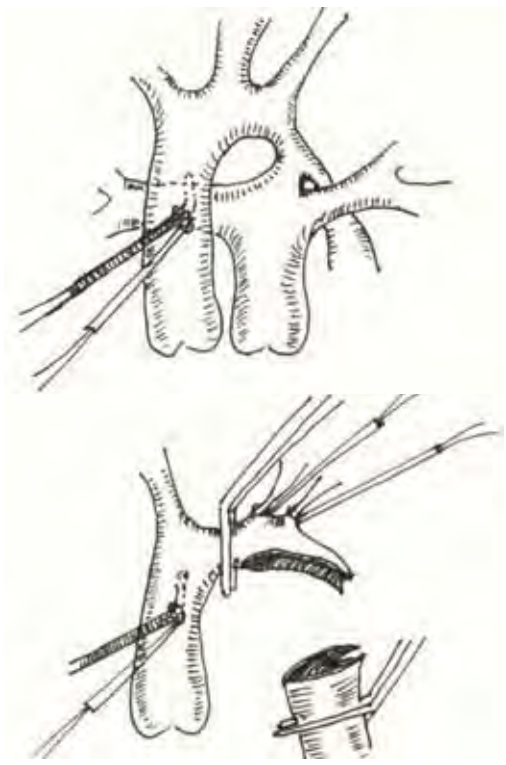


Figure 1

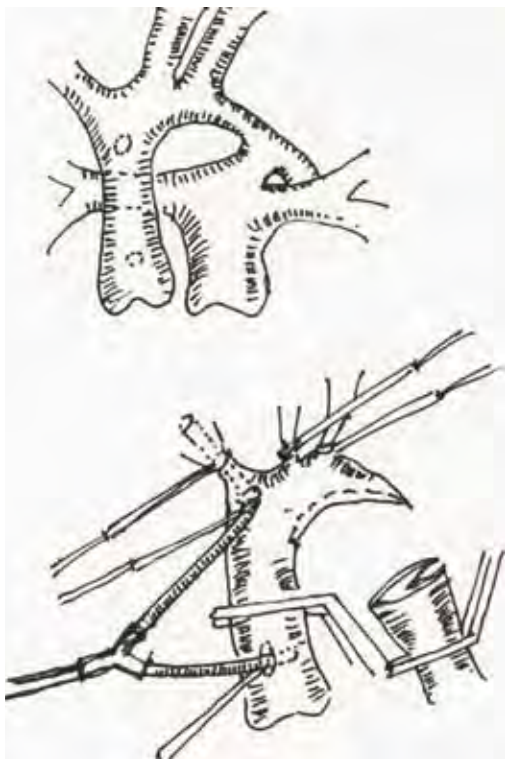


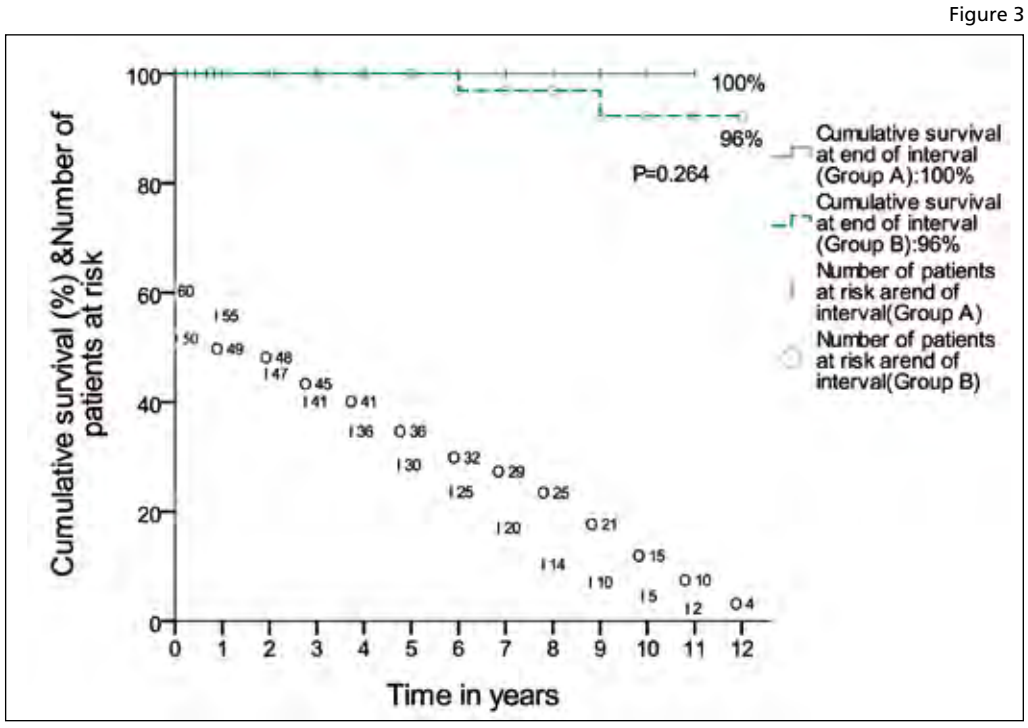
Figure 2

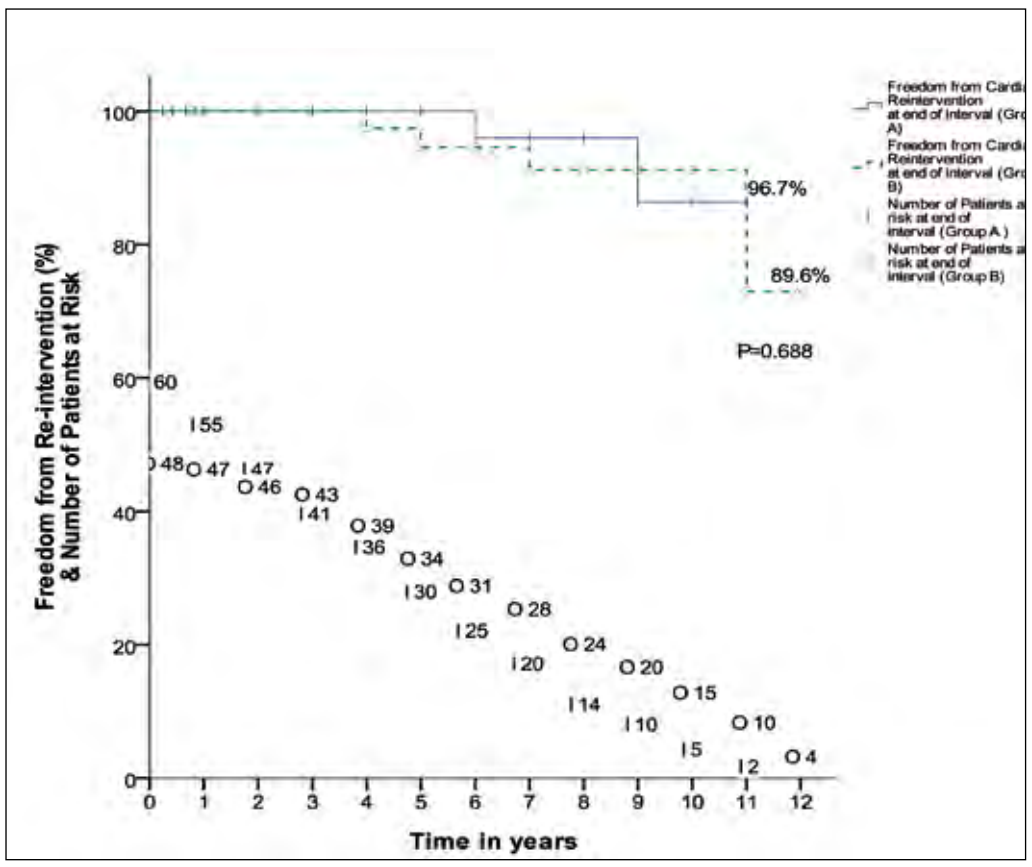
Huiwen Chen

Although possible effects of our technique on neurologic outcomes still need to be clarified, our perfusion strategy using continuous cerebral and myocardial perfusion with mild hypothermia for repair of CoA with VSD was associated with reduced postoperative recovery time and complications. This strategy is feasible and safe, and should be considered as one of choices for patients with this complex anomaly.

Figure 4

Figure 3





The Jurdham procedure

Unrestricted optimal endocardial left ventricular lead positioning for cardiac resynchronization therapy

Jorge de Paz *Presidente Perón Hospital, Buenos Aires, Argentina*

Cardiac resynchronization therapy (CRT) is indicated in heart failure patients with dilated miocardipathy, low left ventricle ejection fraction (EF) and left bundle branch block, that remain in NYHA class III – IV despite optimal medication. Therefore, CRT is the last resource for those patients to significantly improve their quality of life. Although this therapy is very efective, about 30% of the patients are "non responders", meaning that there is no improvement in their evolution. The success of CRT requires the implant of the LV lead in an adequate region, (tipically in the posterior / lateral aspect of LV), The standard approach requires the insertion of a LV pacing lead into one of the coronary sinus tributaries. However, failure to deliver a coronary sinus lead has been reported in up to 15% of attempts. Post-implant dislocation of the lead, non-capture or phrenic nerve stimulation also reduces effective LV stimulation . Although surgical insertion of epicardial leads is considered the standard alternative, this is not without morbidity and technical limitations. Endocardial left ventricular pacing solves this problems, avoiding the dificulties and limitations of CS and epicardial insertions. Once the lead is placed in the LV cavity, it can be easily directed to almost any place in the ventricle providing an unrestricted access to the optimal stimulation regions. Pacing and sensing parameters, both acute and chronic are similar to those of the right ventricle implant and there is no phrenic nerve stimulation.

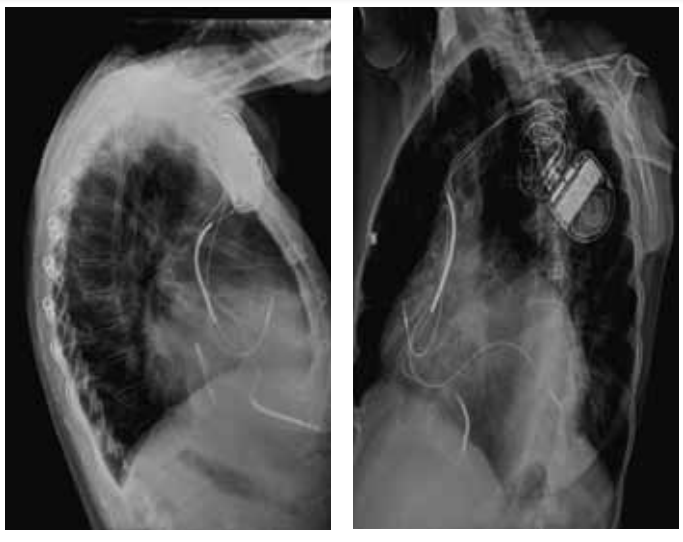


Fig 1: The Jurdham procedure. Lateral and LAO view of the leads placement. Note the position in the mid posterolateral aspect of the LV lead.

In the recent past years, different techniques have been described for implanting the LV endocardial lead via an atrial transseptal approach. However, they remain complex and difficult, requiering a considerable expertice from the operator and precluding the widespead utilization of this approach.

The technique we describe here, the Jurdham Procedure provides a simple and straightforward way to achive that goal. It consists basically in performing a femoral- approach standard transseptal puncture with a 13F Mullins sheath, that is advanced to the LV cavity. Then, an active fixation endocardial lead is inserted through the sheath and fixed in the desired place into the LV. An important point is that the sheath is inserted through a snare previously placed in the inferior vena cava through a subclavian vein. Once the lead is in place, a "pulling thread" is attached to the IS-1 proximal distal pin. The Mullins sheath is withdrawn up to the level of the snare, and the proximal end of the lead is advanced into the sheath until it exits the distal end. At that point, the "pulling thread" is snared, and the snare catheter is withdrawn through the subcalvian vein, pulling the proximal end of the lead until it exits the vein. The right atrial and ventricular leads are the inserted and all the leads are connected to the CRT device.

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Patient-specific surgical simulator for the positioning of surgical instruments for robotic thoracic surgery

Andrea Moglia *EndoCAS , Center for Computed Assisted Surgery, Pisa, Italy*

Andrea Moglia

Virtual reality surgical simulators were pioneered by Richard Satava in the early 90s. This marked the advent of computer science into surgical training. First commercial surgical simulators were proposed for laparoscopic procedures. Since then, other solutions were proposed for other surgical specialties. However there are no surgical simulators for thoracic surgery on the market.

Despite the widespread clinical acceptance of surgical robotics into several specialties since its introduction in 2000, only in 2010 the first virtual reality simulators for surgical robotics did appear. Simulators based on virtual reality may help novice surgeons to get more confidence with surgical robotics, thus shortening the learning curve. The da Vinci Skills Simulator by Intuitive Surgical (Sunnyvale, United States) is useful to familiarize with the maneuverability of the masters' interface, camera and clutching control of the da Vinci robot, as confirmed by our experience in more than 100 participants.

The simulator of the future will be based on three key aspects: the surgical robot, the patient specific anatomy, and the surgical procedures. We present a novel simulator based on patient specific anatomy to help thoracic surgeons to find an appropriate placement of robotic arms, a crucial task in the pre-operative phase because of the constraints imposed by the thoracic cage. In fact in cardiothoracic robotic surgery the correct trocar positioning is mandatory to avoid collisions of instrument-arms.

We present a virtual reality simulator in which the patient specific anatomy is reconstructed starting from radiological datasets of CT (Computed Tomography) images, then processed by our custom segmentation pipeline. The raw anatomy is optimized using commercial software for 3D modeling. The simulator, developed with an open-source programming library for graphics and haptic applications, integrates the patient specific anatomy and surgical robotic arms. A couple of haptic interfaces provides control of the arms. Thus, the user can experience also force feedback, currently unavailable with both the da Vinci robot and the da Vinci Skills Simulator.

A preliminary version of the simulator was tested by five surgeons. Port placement feature was rated 3.6 out of 5, while the simulator usability (how intuitive it was perceived) 3.8 out of 5.

The developed simulator can be used to simulate the placement of trocars for minimally invasive surgical procedures. It can be useful in thoracic surgery for the correct positioning of the trocars, which is crucial to avoid collisions of robotic arms. Additionally it can be adapted to any present (da Vinci) or future surgical robot.

BioVentrix

Reviving the role of SVR in the era of STICH and early PCI

Andrew S Wechsler *Department of Cardiothoracic Surgery. Drexel University College of Medicine, Philadelphia, USA*

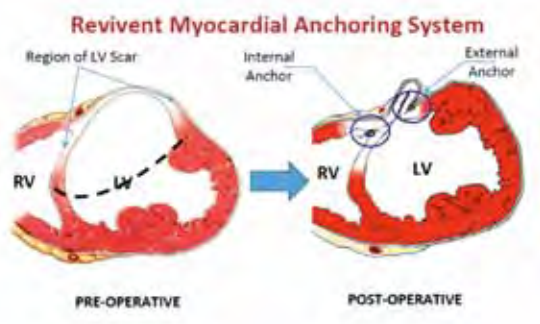
Patients with systolic heart failure are generally managed with conventional therapy that includes diuretics, beta blockers and angiotensin inhibitors. There is a subset of patients that experience heart failure following acute antero-septal myocardial infarction in association with dilated (remodeled) left ventricles and akinetic or dyskinetic scar. When end systolic volume index (ESVI) exceeds 60ml/m^2, survival is reduced despite medical therapy. In spite of flawed STICH conclusions to the contrary, surgical options continue to be employed to restore such hearts to more normal size, improve functional class and enhance longevity.

Percutaneous coronary intervention (PCI) to open acutely occluded arteries, particularly the left anterior descending, has greatly reduced the morbidity associated with anterior myocardial infarction by preserving myocardial tissue. However, an important number of patients undergo remodeling despite intervention. This likely reflects delay in intervention relative to the onset of ischemia, occasional inability to open the infarct related vessel, microcirculatory embolization and low reflow phenomena. According to a study by Savoye et al, "… recent improvements in AMI management do not abolish LV remodeling, which remains a relatively frequent event after an initial anterior wall AMI"[1]. Another study showed a 30% occurrence rate of remodeling despite early PCI.[2] These patients had a worse prognosis than those who did not remodel. In many instances, emphasis is placed on the reduced ejection fraction which leads to defibrillator implantation and/or resynchronization therapy without addressing potentially correctable pathologic left ventricular morphology.

The Dor operation has proven highly successful for the management of appropriate patients but the procedure is highly invasive by its nature and involves cardiopulmonary bypass, a left ventriculotomy, patch placement (which is also akinetic) and frequently a period of ischemic arrest.[3] Cardiologists have reluctance to refer patients for this procedure until late in their clinical state and early intervention is uncommon despite the functional limitations of patients and their natural history to experience progressive dilatation.

We have addressed this problem by developing a method for ventricular volume reduction and reshaping designed to be performed without cardiopulmonary bypass and on beating hearts. No ventriculotomy is performed and scarred myocardium is excluded from the left ventricular chamber, including the involved ventricular septum. In our first 22 patients followed for six months, using a technique demonstrated by video at this year's Tech-Con, ESVI was reduced 35% and end diastolic volume index reduced 30%. Moreover, patients experienced significantly improved functional class, quality of life and six minute walk.

The operation is performed by transmyocardial placement of "anchors" across the affected left ventricle and



interventricular septum such that tightening of the anchors pulls the left ventricular free wall against the left side of the interventricular septum. (See figure below courtesy of BioVentrix, Inc., San Ramon, CA.)

This procedure provides effective ventricular restoration in a less invasive manner and should result in broader referrals of patients from cardiologists given its reduced risks and efficacy.

References:

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3. Dor V. Left Ventricular Reconstruction: The Aim and the Reality After Twenty Years. J. Thorac Cardiovasc Surg: 2004; 117-120.

Integrating 3D echo into the Hybrid OR for SHD interventions with Philips EchoNavigator

Niels Nijhof, Pascal Cathier, Maikel Hendriks, Cherif Sahyoun, Prithi Ravindar, Lynette Ward, Onno Wink *Philips Healthcare*

Treatment of structural heart disease (SHD) represents a growing opportunity for cardiac surgeons and interventional cardiologists. With increasing device availability, an expanding number of structural heart diseases are projected to be treated percutaneously. However, catheter based treatment of SHD procedures like complex ASD closure, TAVR, mitral valve clipping, left atrial appendage (LAA) closure, and paravalvular leak closure remain challenging to perform. Long procedures times and steep learning curves are frequently mentioned as barriers for entrance.

Proper image guidance is crucial to enable less invasive approaches. Several imaging technologies are presently available to guide the surgeon and the interventionalist. In addition to live X-ray guidance, TEE and particularly live 3D TEE are rapidly becoming the imaging modality of choice for many of these procedures because it provides critical insights into soft tissue anatomy.

To adequately visualize and appreciate the relationships between the various imaging modalities remains a tremendous challenge. Therefore, the interaction between the surgeon or interventional cardiologist and the echocardiographer is a crucial factor in attaining procedural success. EchoNavigator is an innovative technology from Philips that combines live (3D) TEE with live X-ray in an intuitive way. This new imaging technology aims to help improving the communication between echocardiographer and the surgeon and/or interventionalist, increase confidence and anatomical awareness, assist in guidance, and increase procedural efficiency.

Figure 1 illustrates a typical screenshot of the new integrated X-ray and Echo solution during a mitral valve clipping procedure. The EchoNavigator engine automatically detects the orientation and position of the Echo volume and relates the information to the X-ray image. This technology enables the integration and alignment of the X-ray image (lower panel right) with the 3D-Echo (lower panel left) allowing for an easier orientation while also supporting additional multiple real-time views: the echo view as reconstructed by the echocardiographer (upper panel right) and a free 3D image that can be manipulated by the surgeon and/or interventionalist from the table site (upper panel left). The C-arm view on the 3D-Echo volume follows movements of the X-ray gantry in real time.

Annotations can be defined to mark soft tissue anatomy in 3D-Echo and are registered to and superimposed on the live X-ray image. The markers provide context to the X-ray image and can be used to support catheter guidance.

By bringing live X-ray and live 3D-Echo together in this new EchoNavigator modality, a novel image guidance method is created that aims to help to overcome some of the obstacles for new catheter based SHD procedures.

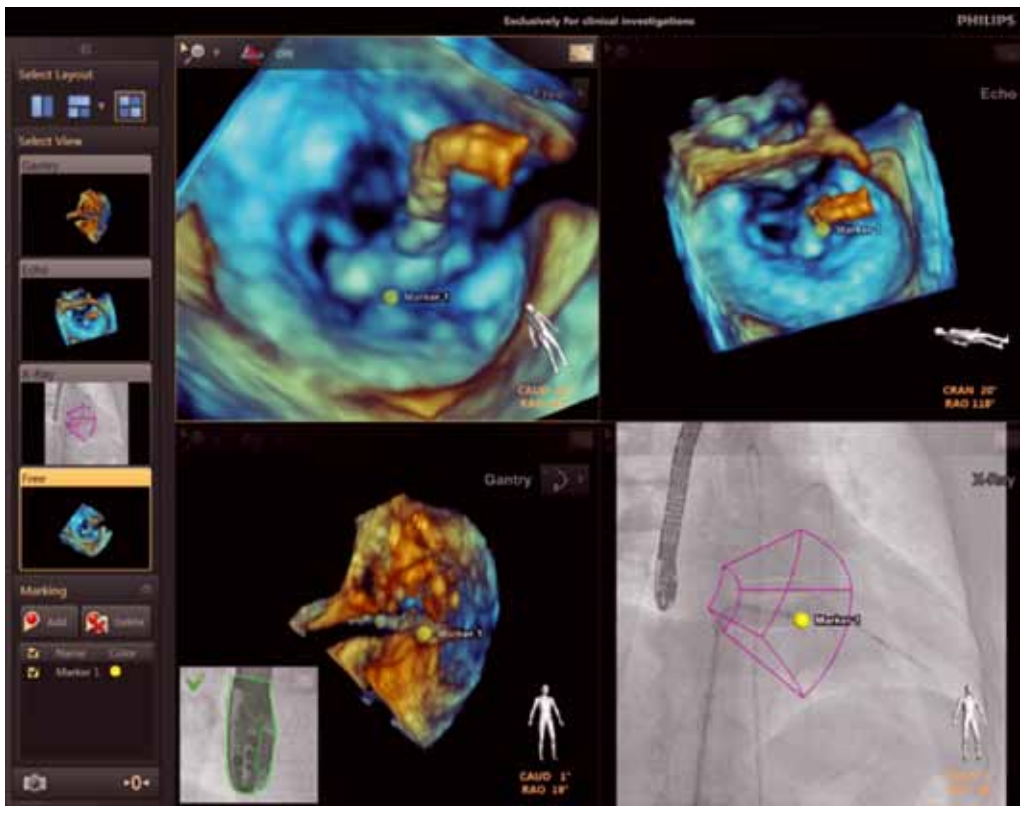

Figure 1 Philips EchoNavigator integrated imaging modality

Figure 2 EchoNavigator R&D team

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Promising surgical options for CABG with a new shelf-ready, synthetic, biodegradable, small-calibre vascular graft

Beat H. Walpoth *Geneva University Hospital, Faculty of Medicine, Geneva, Switzerland*

Nowadays most CABGs and peripheral revascularisation procedures are carried out on an urgent basis and therefore especially when autologous graft materials are diseased or have been used in previous surgeries, shelf-ready, alternative graft material is required. Despite intense research over many decades, no suitable clinical, shelf-ready, small calibre, synthetic graft is available.

We developed small diameter vascular grafts made of slow degradable poly(e-caprolactone) nanofibers obtained by electrospinning (Figure 1). The process was optimized by a factorial design approach that led to reproducible grafts with inner diameters of 2mm and 4mm, respectively. Fibre sizes, graft morphology, and the resulting tensile stress and tensile strain values were studied as a function of various parameters in order to obtain optimal vascular grafts for implantation after gamma sterilization. The influence of polymer concentration, solvent, needle-collector distance, applied voltage, flow rate, and spinning time has been studied. Consequently, an optimized vascular graft was implanted as an abdominal aortic or carotid substitute in more than 100 animals (rats and pigs) for periods up to two years (Figure 1). Our new synthetic, biodegradable small-calibre, nano-fibre electro-spun polycaprolactone graft shows no aneurysms, better patency, compliance and biocompatibility with faster endothelialisation, less intimal hyperplasia and calcification compared to the clinically used ePTFE graft after long-term implantation in the rat aorta (Figure 2). Despite degradation, our graft maintains good mechanical characteristics, growth potential, and tissue regeneration with specific cells, adequate angiogenesis and extra-cellular matrix formation (Figure 1-right panel: Morphological analysis of PLC grafts. (A) SEM image of the lumen of the PCL graft after explantation showing complete endothelialization. (B) Longitudinal section of the graft wall showing homogenous cellular infiltration giant cells on the periphery (arrows; HE staining, 100x magnification). (C) Immunohistochemistry anti CD31 labeling endothelial cells on the luminal side (200x magnification). (D) Elastin deposition in the neo-intimal layers is revealed in blue and collagen deposition is revealed in green by a Miller-Masson staining (200x magnification).

Thus, such a novel *in situ* tissue-engineered graft, using the body as bio-reactor, may become a better, cheaper and clinically widely applicable method for future cardiovascular applications.

In contrast, other tissue engineering methods have been used for the development of better vascular grafts such as cell sheet techniques or *in vitro* cell seeding with the possibility of using different autologous patient-derived or stem cells which are aimed at reconstituting the three basic layers of a vessel. The disadvantages of this method are the time, manpower and cost required to mature such a vascular graft in a bio-reactor. This approach has been shown to be scientifically successful. However, so far neither large-scale applications nor shelf-readiness are available.

Our graft could therefore cover this clinical need with the advantages of easy manufacturing in all shapes and sizes, sterilisation, storage and especially at an affordable price which would enable also patients in developing countries to profit from such revascularisation procedures. Additionally, the growing potential of our graft is given due to the fact that it degrades over time and the patient's own tissue regenerates a 'neo-vessel' in the appropriate size. Thus, such a novel *in situ* tissue engineered graft could become a future option for clinical applications such as coronary artery or peripheral bypass grafting.

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Damiano Mugnai[1], Sarra de Valence[2], Wojciech Mrowczynski[1], Jean-Christophe Tille[3], Xavier Montet[4], Robert Gurny[2], Michael Moeller[2], Afksendiyos Kalangos[1] *Departments of 1Cardiovascular Surgery, 3Pathology and 4Radiology University Hospital of Geneva; Dept. of 2Pharmaceutics & Biopharmaceutics EPGL, University of Geneva; Switzerland.*

Figure 1

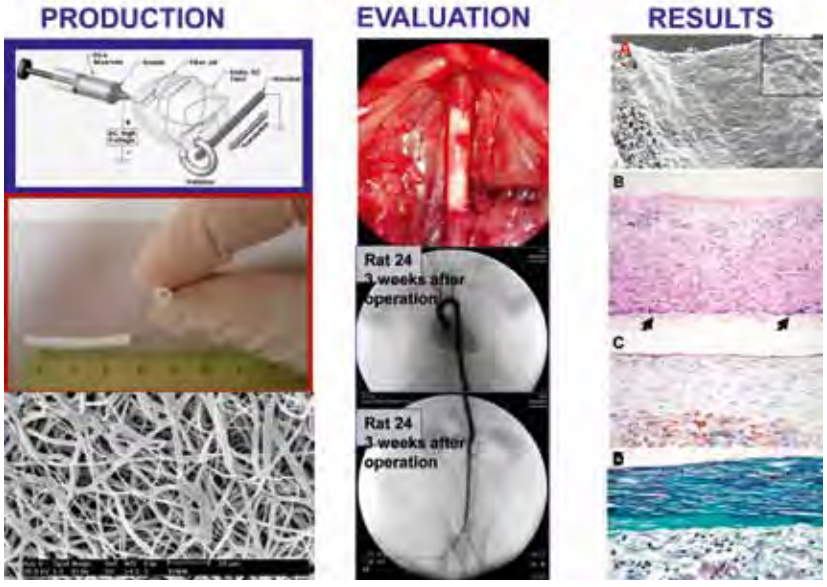


Figure 2

PCL vs. ePTFE grafts at 15 months

	PCL (n=8)	ePTFE (n=6)	P<
Patency (%)	100	67	ns
Endothelialization (%)	98	93	ns
Compliance (%)	8.2	5.7	0.01
Calcification (%)	7.0	15.8	0.04
Intimal Hyperplasia (µm)	47.2	62.2	0.09
Cellular Ingrowth (%)	31.4	11.3	0.001

EACTS Events

Advanced Module: Heart Failure

State of the Art and Future Perspectives

12–17 November 2012 – 2 days of wetlabs

EACTS House, Windsor, UK

Course Directors: G Gerosa, Padua; M Morshuis, Bad Oeynhausen

The course will be organised in 10 modules:

1 Epidemiology/Pathology;
2 Diagnostic/Imaging;
3 and 4 Optimal Medical Therapy/IC ; Resynchronization;
5 Cardiac Surgery (Indications, Techniques, Results);
6 Heart Transplant (Indications, Techniques, Results)
7 VADs/TAH (Indications, Techniques, Results);
8 HTx/VADs in Paediatric Population;
9 Stem Cells Regenerative Medicine;
10 Wet Labs/Live in a Box/Group Projects

Course Objectives:

To update knowledge of theoretical and technical issues of surgery for heart failure.

Leadership and Management Development for Cardiovascular and Thoracic Surgeons

20– 23 November 2012

EACTS House, Windsor, UK

Course Directors – J L Pomar, Barcelona

The Leadership and Management Development Course is an intensive five-day programme in two parts with a three day initial training session followed by a further two days of training scheduled six months later. The course will utilise a mix of pre and post programme activities and each delegate will be tasked with exploring leadership best practise during the break between the two parts of the programme.

Course Objectives:

Improve, enhance and maximise your leadership attributes

Thoracic Surgery Part II

3rd – 7th December 2012

EACTS House, Windsor, UK

Course Directors – P Rajesh, Birmingham

- The course programme includes:
- Tracheal Surgery
- Tracheobronchial injuries
- Tracheal-main bronchus obstruction;
- Esophagus Cancer – Staging, preoperative;
- Oesophageal cancer;
- Thoracoscopic technique;
- Mesothelioma treatments;
- Metastatic disease;
- Chest wall reconstruction;
- Case presentations.

Course Objectives:

To gain more insight and up-to-date knowledge on different aspects of thoracic surgery related to tracheal, pleural, mediastinal and oesophageal disease.

Chest Wall Diseases 28–30 November 2012

M Yuksel *Course Director, Istanbul; EACTS House, Windsor, UK*

Chest Wall Interest Group (CWIG) is a group belonging to the EACTS Thoracic Domain. It was founded during The Second International Nuss Procedure Workshop held in Istanbul in June 2009.

We have set out to establish a channel of communication across different continents with a view to allow the exchange of knowledge among those experienced practitioners who are studying, developing and innovating methods to treat chest wall diseases. In June 2010, we got together again in Izmir, for The Third International Workshop on the Minimally Invasive Repair of Pectus Deformities under the custody of EACTS. The Workshop was a great success and we had the chance to discuss the future projections of the CWIG.

Our next important meeting in the calendar was The Fourth International Chest Wall Interest Group Workshop on Chest Wall Diseases which was held in Istanbul on June 22 – 23, 2012, under the custody of EACTS, with the participation of 35 invited faculty from around the world.

Now we want to reach a broader spectrum of residents, specialists and academicians, thus we are organizing a workshop on "Chest Wall Diseases" in Windsor, UK, at EACTS House, 28-30 November 2012.

The main subjects are Congenital Chest Wall Deformities, Chest Wall Resection and Reconstruction, Thoracic Outlet Syndrome and Sternal Dehiscence.

The Learning Objectives are; Learning the indications, techniques and follow up of minimally invasive and open surgery in pectus deformities; Learning the alternative treatments –surgical and nonsurgcal- for pectus deformities; Learning chest wall resection and reconstruction techniques in chest wall diseases; Learning the surgical techniques in thoracic outlet syndrome and Learning the treatment options –surgical and nonsurgical- in sternal dehiscence.

The Target Audience is; Thoracic Surgery Residents, Specialists and the Academicians working in the field of Thoracic Surgery.

We very much look forward to welcoming you to Windsor.

To register for this course please visit: www.eacts.org/academy/specialist-courses/chest-wall-diseases.aspx

Regards,

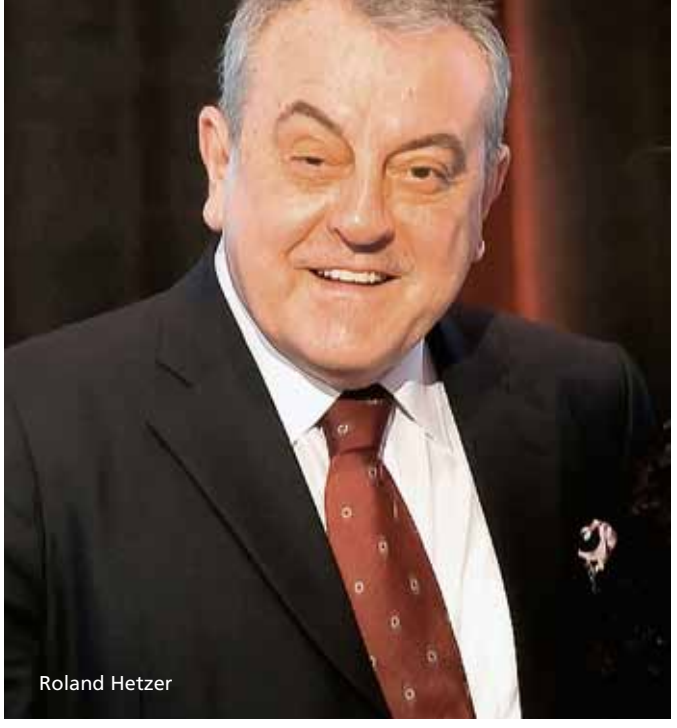
Professor Mustafa Yuksel

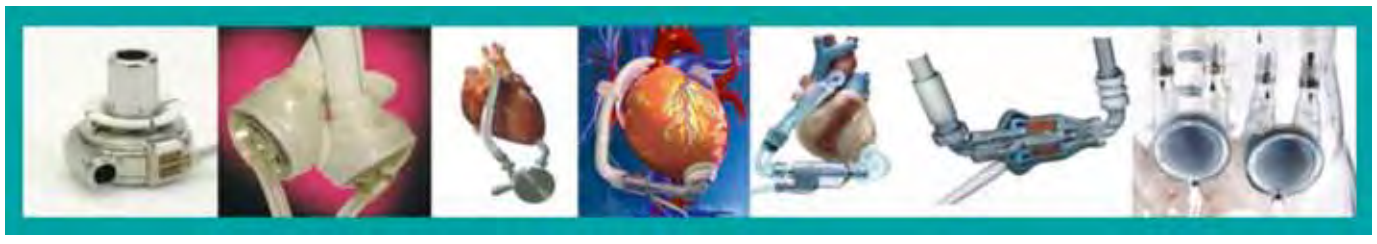
Euromacs welcomes its 100th member

Roland Hetzer

The board of Euromacs is proud to announce that its 100th member has been registered. Moreover, we are glad a that, coincidentally, our 100th member is Pieter Kappetein, and we cordially welcome him in our association. During the last year, Pieter Kappetein, on behalf of the board of the EACTS, has taken the initiative to try to harmonize the modus operandi of the different registries in Europe. Most governors of these registries are EACTS members themselves. Thus, one important point in the exchange of thoughts, between the registries and the EACTS, has been the necessity to open up the boards of the different registries for other EACTS members, and to create greater transparency. Pieter Kappetein has been instrumental in promoting a closer relation between Euromacs and the EACTS. It is foreseen that during our Annual Meetings in Barcelona, an important step will be set into the direction of close and intense cooperation of Euromacs and the EACTS. As there is an enormous overlap between the aims of organisations, specifically when promoting scientific research, it is only natural that our associations should amalgate. The board of Euromacs looks forward to a fruitful cooperation with Pieter Kappetein.

euromacs
European Registry for Patients with Mechanical Circulatory Support e.V.


Roland Hetzer



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European Association For Cardio-Thoracic Surgery

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European Association For Cardio-Thoracic Surgery

27th EACTS

Annual Meeting

Vienna, Austria

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