EACTS European Association For Cardio-Thoracic Surgery

Daily News

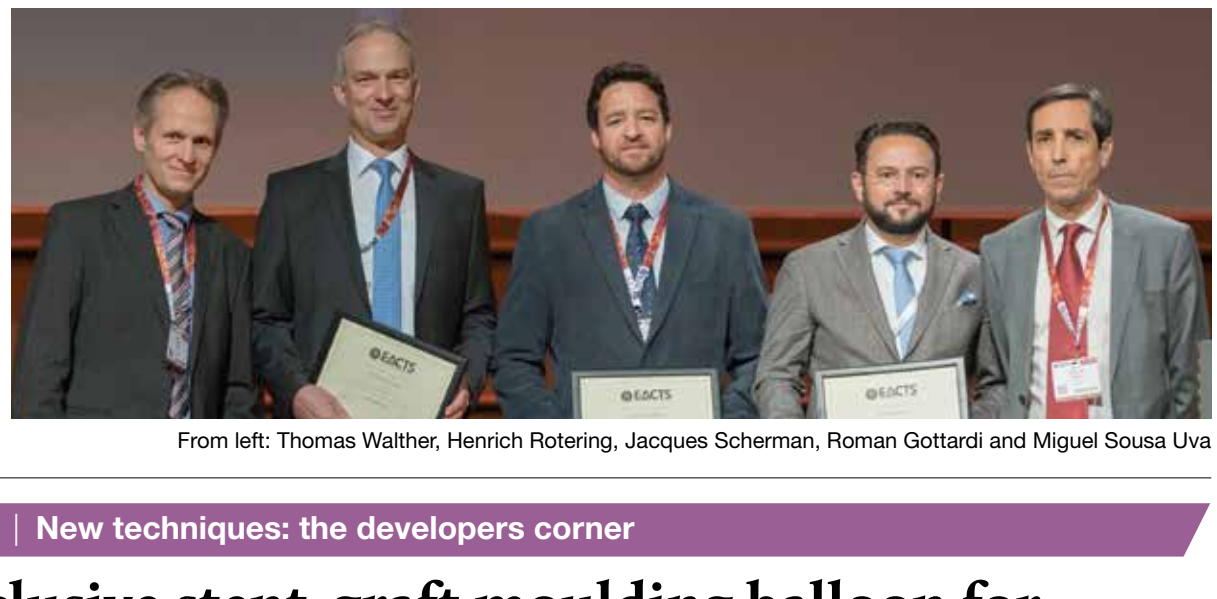
The official newspaper of the 31st EACTS Annual Meeting 2017 **Issue 2** Sunday 8 October

In this issue

Saturday hosts the EACTS Techno-College Innovation Award

The 2017 recipients of the Award were selected during the 'New techniques: the developers corner' session on Saturday afternoon.

Congratulations to this year's winner, Roman Gottardi, and runners-up Jacques Sherman and Henrich Rotering. Read on to learn more about their Award-winning work.

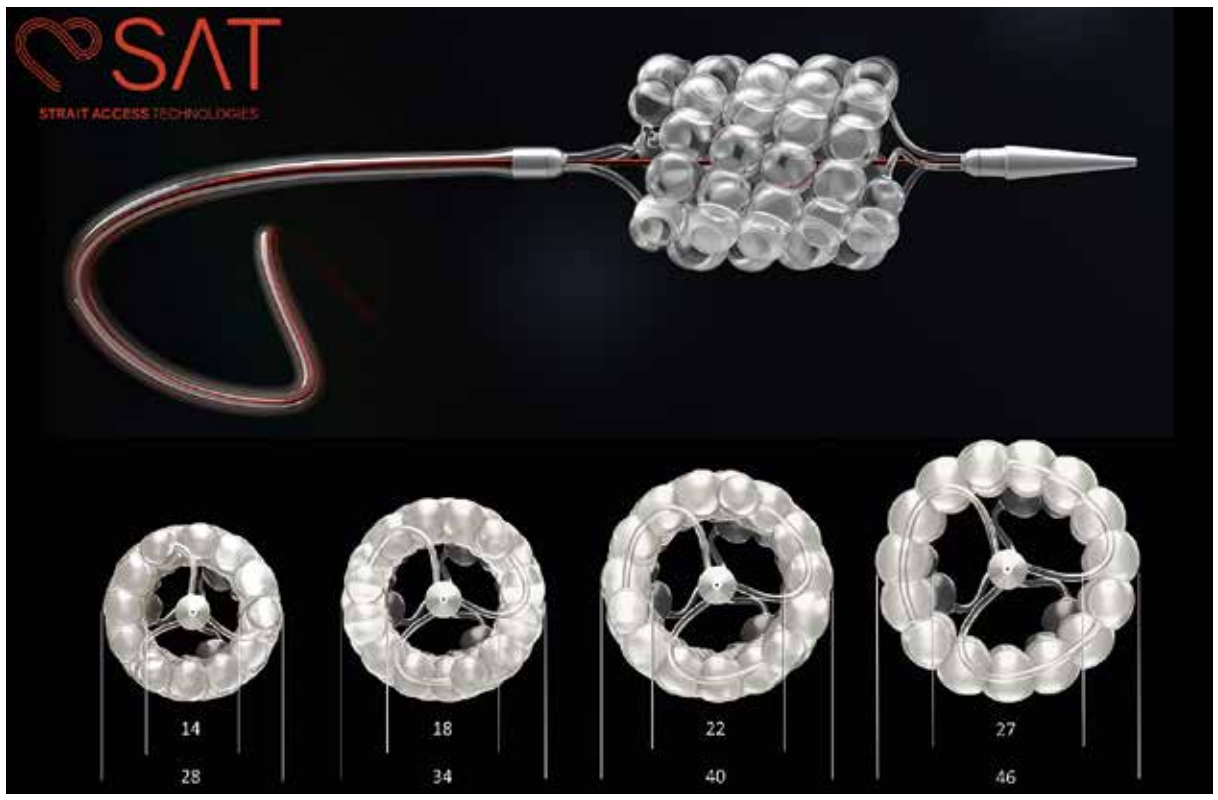


From left: Thomas Walther, Henrich Rotering, Jacques Scherman, Roman Gottardi and Miguel Sousa Uva

Cardiac | Techno College | New techniques: the developers corner

A truly non-occlusive stent-graft moulding balloon for thoracic endovascular aortic repair (TEVAR)

R. Gottardi[1], E. Mudge[2], M. Czerny[3], R. Seitelberger[1], H. Schröfel[3], J. Scherman[2], D. Bezuidenhout[2], P. Zilla[2] 1. Department of Cardiac Surgery, Paracelsus Medical University of Salzburg, Salzburg, Austria; 2. Chris Barnard Department of Cardio-Thoracic Surgery and Strait Access Technologies, University of Cape Town, Cape Town, South Africa; 3. Cardiovascular surgery, University Hospital Freiburg, Freiburg, Germany



(Strait Access Technologies)

Thoracic endovascular aortic repair (TEVAR) has become the therapy of choice in various thoracic aortic pathologies. One major downside of these procedures is endoleaks, namely type 1 and type 3 endoleaks. In the majority of cases endoleaks can be prevented or treated by conforming the stent-graft to the aortic wall to prevent or treat a type 1 endoleak, or by conforming two stent-grafts to each other to prevent or treat a type 3 endoleak. This moulding is usually done using a fully-occlusive compliant balloon catheter to even out any pleats or folds in the fabric of the stent-graft. A drawback of such balloons is that they block blood flow and therefore require a means to lower cardiac output to prevent displacement of the balloon or even worse – migration of the stent-graft. As stent-grafts are increasingly used within the thoracic aorta, the aortic arch and even in the ascending aorta, moulding these stent-grafts without occlusion and the risk of displacement is needed more than ever. There is one commercially available balloon

Continued on page 2

Cardiac | Techno College | New techniques: the developers corner

A truly non-occlusive stent-graft moulding balloon for thoracic endovascular aortic repair (TEVAR)

Continued from page 1

that is not fully occlusive but due to its triangular shape, it does not provide circular moulding of the stent-graft. As a consequence, we came up with the idea of a circular, truly non-occlusive balloon catheter for the moulding of thoracic aortic stent-grafts.

Roman Gottardi (right) with Lead Engineer of the project Teddy Mudge

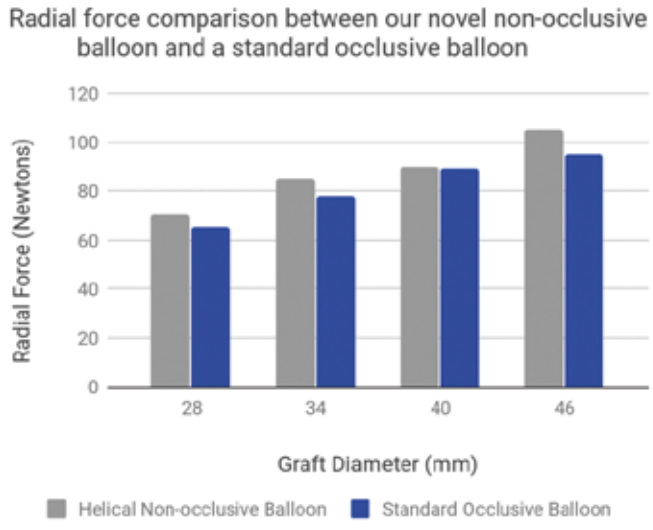


Figure 2. Comparison of radial force between the novel non-occlusive TEVAR balloon catheter and a standard fully-occlusive balloon catheter

Novel balloon design

The team that developed this novel, helical, fully non-occlusive TEVAR balloon catheter (Figure 1) is made up by two cardiac surgeons from the Paracelsus Medical University in Salzburg, two cardiac surgeons from the Universitätsherzzentrum Freiburg - Bad Krotzingen, and an engineering team at Strait Access Technologies (SAT). SAT is a South African company from Cape Town that primarily focuses on transcatheter valve therapies for rheumatic valve disease in developing countries. Based on SAT's non-occlusive balloons for valvuloplasty and valve deployment, we adapted their balloon design for use in TEVAR. In contrast to SAT's non-compliant high pressure balloons, the TEVAR balloon catheter needed to be highly compliant, with a large diameter range such that it could be used with all commercially available thoracic stent-grafts. To meet these user requirements, the newly developed balloon catheter design consists of three highly compliant, beaded balloons that are helically wound to create a large central lumen when inflated. The beaded balloons are unique in that they utilise a circumferential lengthening effect that translates into a large outer balloon diameter, along with a large inner lumen, throughout a wide range of diameters. Moreover, this mechanism allows for a significant diametric growth of the balloon, while maintaining minimal longitudinal growth of the balloon itself. The balloon catheter has a working outer diameter ranging from 28 mm to 46 mm, which covers most of the commercially available sizes of thoracic stent-grafts. An inner diameter of at least 14 mm up to 27 mm allows for ample blood flow without a pressure drop distal to the inflated balloon. The balloon catheter comes with an integrated inline introducer sheath which has an outer diameter of 21 Fr (6.3 mm) and prevents damage to the balloon during insertion and retrieval. In preclinical tests the balloon catheter has shown that it does not hinder blood flow during inflation, moulding and deflation in a pulsatile mock circulation loop. Also, no pulse-synchronous movement of the balloon – as seen with other fully occlusive balloons – could be observed during inflation and deflation. Therefore, lowering of cardiac output will not be required and the risk of displacement of the balloon or the implanted stent-graft will be mitigated.

Additional beneficial features of the helical TEVAR balloon are: (1) due to its helical structure it requires less fluid to be injected which results in shorter inflation and deflation times; (2) the lack of occlusion makes it possible to mould the stent-graft for a longer time period, which could turn out to be beneficial in the prevention or the treatment of type 1 and type 3 endoleaks.

Conclusion and outlook

To our knowledge this is the first circular, fully non-occlusive balloon catheter designed for the prevention and treatment of type 1 and type 3 endoleaks after TEVAR. At this stage we have completed all preclinical tests with excellent results (Figure 2) and are currently preparing all documentation for clinical trials and CE mark application. We are looking forward to the first clinical application.

Cardiac | Techno College | New techniques: the developers corner

Cold Atmospheric Plasma (CAP) and advanced Negative Pressure Wound Therapy (NPWT) – An option for complicated wounds in cardiac surgery

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H. Rotering, S. Martens, A. Dell'Aquila Department of Cardiothoracic Surgery, Division of Cardiac Surgery, University Hospital Münster, Münster, Germany.

Deep surgical wound infections are still a severe problem for all patients. They are associated with prolonged hospital stay and higher morbidity, translating into higher hospital costs and OR-resources. The main problem and the challenge are the infection itself and the adherent biofilm on chronic implants. Due to lack of alternatives the first considerations were made for patients with infected assist-devices formerly implanted as destination therapy.

It could be shown that cold atmospheric plasma (CAP) respectively the induced reactive oxygen species are able to destroy different kinds of bacteria regardless to their resistance profile even when they are protected by a layer of biofilm.[1] Furthermore CAP promotes fibroblast migration in the tissue and stimulates different types of human cells which are important for the wound healing process like endothelial cells and cells of the immune system.[2] Due to its gaseous condition CAP is – in comparison to a rinsing solution – able to penetrate deeper into the tissue.

To secure treatment success the wound is closed afterwards by a special wound dressing, using a foam – i.e. following the meaning of Negative Pressure Wound Therapy (NPWT) – with an underlay of carbon cloth. This carbon cloth material has been proven to bind macromolecules like the matrix metalloproteases (MMP-2, MMP-9)[3] and is able to immobilise bacteria. Owing to a faster cleaning process, the changing intervals of the wound dressings could be reduced.[4]

The first results for patients with infected LVAD-systems were very promising, so that the treatment concept with CAP was adopted as add-on therapy for deep sternal wound infections. It

Continued on page 4

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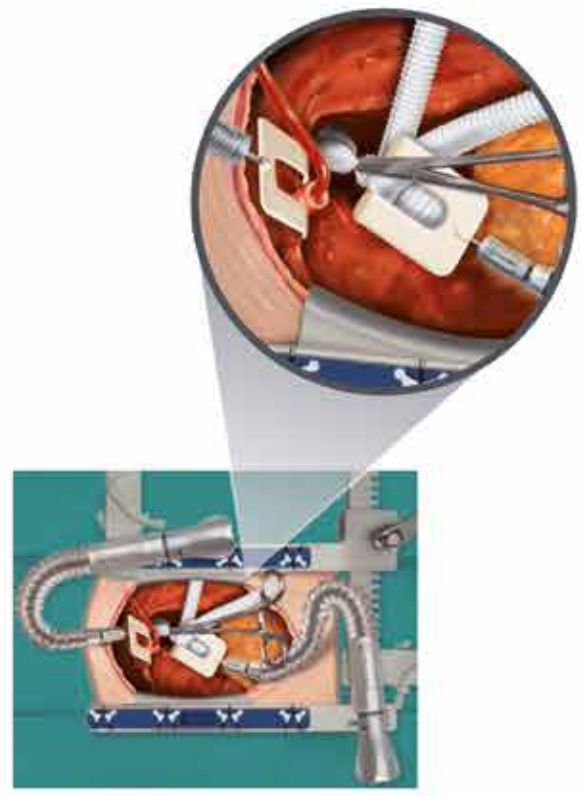
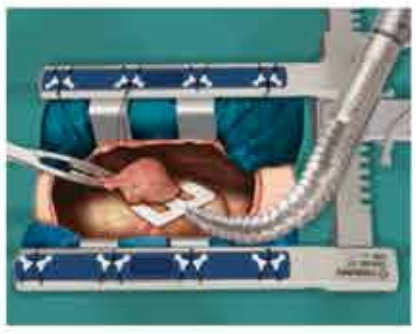


Assistant™ used to expose the carotid artery 2nd Assistant™ retracts the innominate vein to expose the remaining arch vessels



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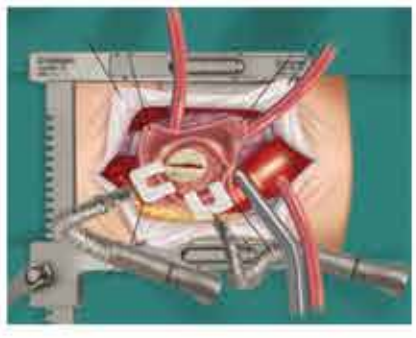
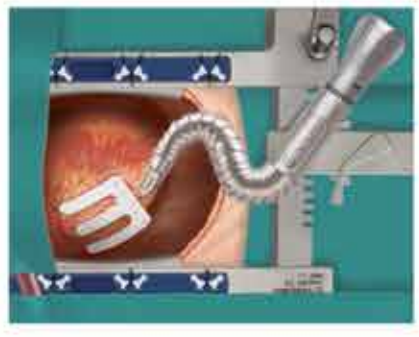


Assistant™ used for retraction of atrial wall for mitral valve exposure



Assistant™ used to expose the right coronary artery area during On-Pump CABG

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Cardiac | Techno College | New techniques: the developers corner

Cold Atmospheric Plasma (CAP) and advanced Negative Pressure Wound Therapy (NPWT) – An option for complicated wounds in cardiac surgery

Continued from page 2

could be shown that this concept offers a new option as a tissue and sternal saving approach. There was, up to now, no need for an omentum majus or muscle flap plastic.

Overall the combination therapy of cold plasma and advanced negative pressure wound therapy offers a new option for complicated wounds because of its good compatibility, and without known contraindications.

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3. Modulation of MMP-2, MMP-9 and Elastase by Zorflex VB-K Sterile Activated Carbon Dressings, Report Perfectus Biomed: July 21, 2015.
4. Rotering H. Advanced NPWT for infected wounds in long-term implants. Vivano Spectrum 1/2016

Figure 1. LVAD-Driveline infected with pseudomonas aeroginosa

Figure 2. After surgical debridement CAP treatment usually performed three times a week here with the Adtec MicroPlaSter

From left: Olga Gräber, Agnes Brenner, Heinrich Rotering

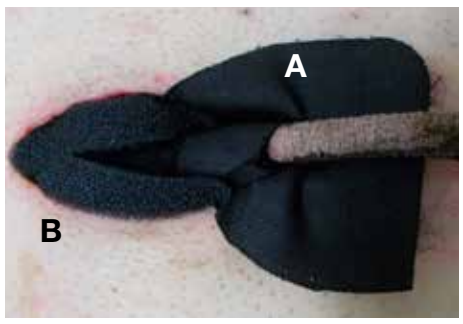


Figure 3. Securing treatment success with advanced NPWT: A) underlay of carbon cloth; 2) NPWT foam

Figure 4. Result after nine weeks of treatment

Cardiac | Techno College | New techniques: the developers corner

Transcatheter valve with hollow-balloon for rheumatic aortic incompetence

Jacques Scherman[1], Braden van Breda[2], Harish Appa[2], Carel van Heerden[2], Chima Ofoegbu[1], Deon Bezuidenhout[1,2] and Peter Zilla[1,2] 1. Chris Barnard Division of Cardiothoracic Surgery, University of Cape Town, South Africa; 2. Strait Access Technologies (SAT), Cape Town, South Africa

The challenge

During the past decade, TAVI has revolutionised our approach to heart valve disease. Whilst calcific aortic valve disease remains the dominant underlying pathology for patients in need of a heart valve replacement in the first world, rheumatic heart disease (RHD) still accounts for the majority of patients in need of a heart valve intervention in developing countries and emerging economies.[1] Tragically, the majority of these patients have limited or no access to cardiac surgery.[2] Moreover, given the unique differences between calcific degenerative and rheumatic pathologies, positioning and placement of a TAVI device for RHD require several considerations, which include the absence of a fluoroscopic footprint for placement and the absence of calcium deposits for anchorage.

A solution

Taking this into consideration, we have developed a non-occlusive, self-homing TAVI system which can be inserted even in the absence of sophisticated imaging equipment (Figure 1). Its unique design features include self-locating retractable balloon trunks for easy positioning, a hollow balloon that obviates the need for rapid ventricular pacing – as cardiac output is maintained throughout deployment – and a temporary balloon valve that prevents backflow through the hollow balloon during inflation. This allows for a slow and controlled implantation of the TAVI.

A supra-annularly anchoring TAVI stent design (Figure 2) secures the valve in non-calcified, compliant roots utilising the entire native leaflet body. The

Cardiac | Techno College | New techniques: the developers corner

issue of valve durability in these typically younger 'rheumatic' patients is addressed by the use of special heparinised polymer leaflets and alternatively by de-cellularised, triple cross-linked pericardium.

Following successful proof of concept studies in an acute large-animal model[3], a pre-clinical chronic animal study has been commenced to evaluate valve performance and outcomes up to five-months following implantation. At this year's EACTS Techno College we present a Live-in-a-Box implantation in a juvenile sheep model to demonstrate the ease of implantation of this novel non-occlusive, self-locating TAVI system.

Mid-term experience

The ex-vivo performance of the SAT polymer valve has been extremely promising, having already achieved more than 600 million cycles in fatigue testing. This is further supported by eight-week sheep explants demonstrating pristine polyurethane leaflets, with further chronic animal implants ongoing.

Previous attempts to use polyurethane for heart valves were unsuccessful due to material degradation. Our accelerated in-vivo degradation studies show impressive resistance of the polyurethane used in the SAT TAVI (Figure 3a).

Calcification studies comparing our leaflet materials with conventional glutaraldehyde fixed pericardium show 40x lower calcification in our pericardial and total abolition of calcium in our polyurethane leaflets (Figure 3b).

Conclusion

Not only in the developing world, but also in emerging economies such as China and India, rheumatic heart disease still accounts for the major burden of disease in patients needing heart valve interventions. We have demonstrated that polymeric TAVIs are feasible as an appealing, cost-effective solution. Furthermore, we demonstrated that compliant or non-calcific aortic roots can be treated with TAVIs by using self-anchoring stent designs implanted with a non-occlusive self-locating delivery system.

The timing of this award is particularly exciting for us. As we celebrate the 50th anniversary of the first heart transplant in Cape Town in a few weeks time – with the who's who in cardiac surgery attending – it gives us a major boost to our spirits to see that 50 years on, the University of Cape Town is still part of the cutting-edge developments in our fast moving field.

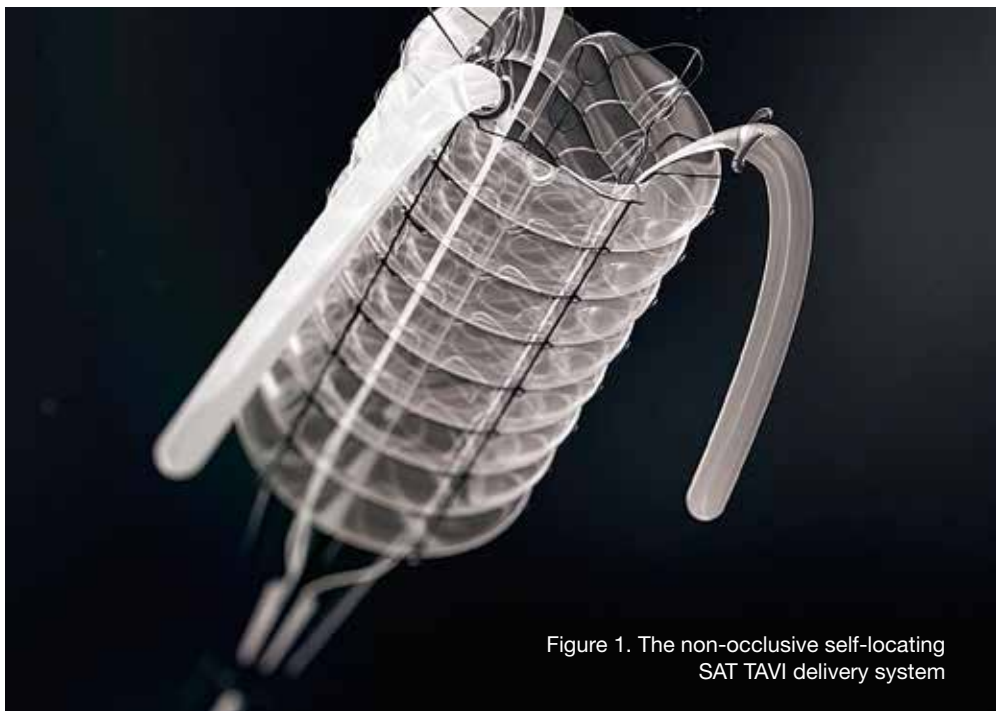


Figure 1. The non-occlusive self-locating SAT TAVI delivery system

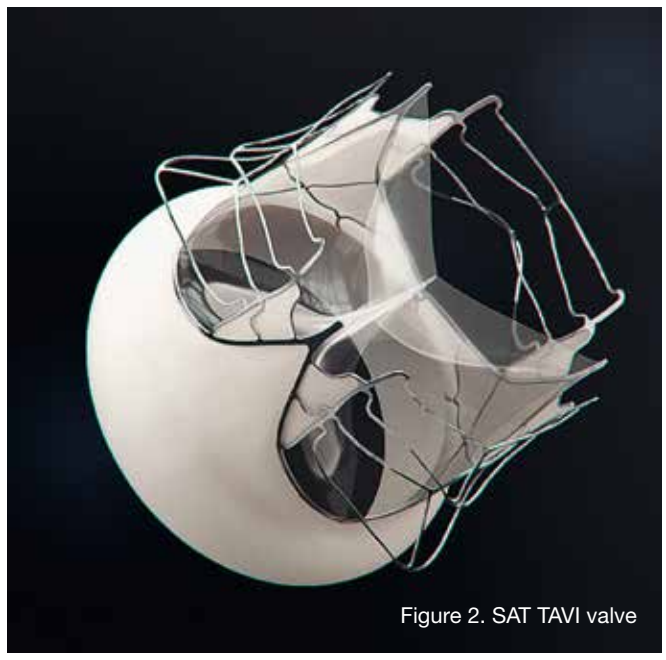


Figure 2. SAT TAVI valve

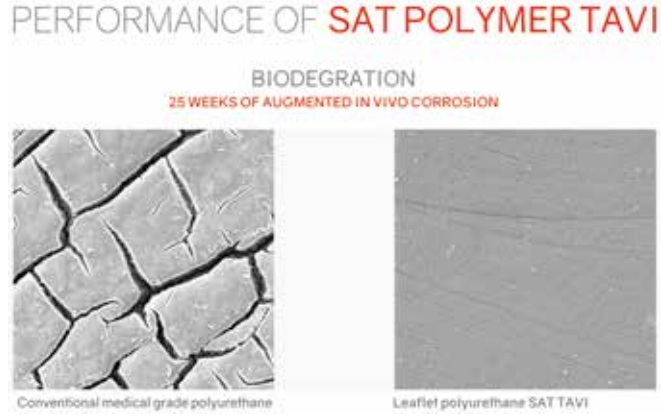
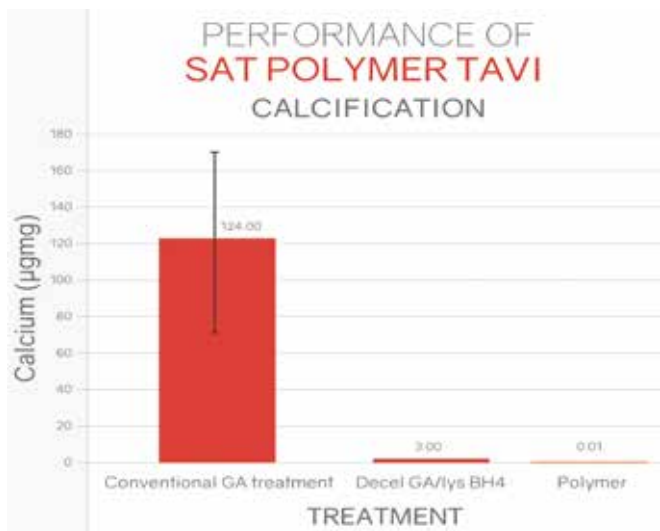


Figure 3a. Mid-term experience showing superior degradation resistance of the leaflet polymer over conventional polyurethane.

Figure 3b. Mid-term experience



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Cardiac | Rapid Response | Coronary artery bypass graft: Miscellaneous, robotics and off-pump

Robotic totally endoscopic coronary bypass with distal connectors: Mid-term outcomes at a single academic institution with an experienced team

Husam H Balkhy, Sarah Nisivaco, Dorothy Krienbring, Mackenzie McCrory, Hiroto Kitahara Brooke Patel, Susan Arnsdorf University of Chicago Medicine, Chicago, IL, USA

Robotic assisted coronary bypass (CABG) is an evolving technique. It most commonly involves using the daVinci robotic technology to harvest the left internal mammary artery after which the anastomosis to the coronary target is completed using a traditional hand sewn approach via left mini-thoracotomy. Very few programmes perform totally endoscopic CABG with robotic assistance. Our technique, which we developed in 2007 involves a totally endoscopic robotic assisted, off-pump beating-heart approach using an anastomotic connector (min-stapler); the Flex A device. This device has been available for use in the US since 2006 and has been vital to the development of our minimally invasive coronary practice. The use of the endowrist stabiliser attached to the robotic arm facilitates the totally endoscopic approach and this allows the harvesting and use of both internal mammary arteries.

In this paper, which we are presenting at this year's EACTS meeting, we review our experience with this technique after moving to a new academic institution with the same team.

Between 1/2007 and 4/2017, 530 robotic totally endoscopic connector coronary bypass procedures were performed. Of these, the last 264 (from July 2013) were performed at the new academic institution. The same team (console surgeon and patient-side assistant, and clinical nurse) made the transition with the aim of reproducing the same operative approach and results. Intra and post-operative outcomes as well as mid-term clinical outcomes were presented. Clinical follow-up of 98% of patients was conducted by telephone interview at a mean of 17 months. Angiographic patency data was available for 32% of patients (mostly those undergoing hybrid revascularisation) at a mean of 152 days.

The mean age was 65.4 years, and 73% of patients were male. Patients were not highly selected and the mean STS score was 2.05 (0.17-28.0). There were 105 (40%) single-vessel, 136 (51%) double-vessel, and 23 (9%) triple-vessel TECAB procedures; so 60% of procedures were multi-vessel TECABs. Bilateral IMAs were used in 139 (53%) patients. Conversion to sternotomy occurred in 1 patient (0.38%). The mean hospital length of stay was 3.11 + 1.36 days and the mortality was 1.5%. Hybrid revascularisation was performed in 99 (37.5%) patients of which 57 were complex hybrids (i.e. multivessel grafting in addition to PCI). The graft patency was evaluated for 85 patients (145 grafts) at a mean of 152 days. LIMA (93) and RIMA (52) graft patency was 96.8% and 96.2% respectively. At 17 month follow-up the cardiac mortality was 3.5% and freedom from MI or repeat coronary intervention was 94%. No patients underwent repeat coronary surgery, and 11 patients underwent repeat PCI of which only 6 (2.3%) were to a previously bypassed TECAB target.

We conclude that robotic beating heart TECAB with the Flex A distal anastomotic connector is safe and reproducible. It can be performed with excellent short and mid-term outcomes as long as careful attention to detail is undertaken by an experienced team.

Cardiac | Focus | Work life balance in cardio-thoracic surgery

"We are the best and therefore we want the best to join us: Work-life Balance in cardiothoracic Surgery"

Malakh Shrestha
Div. of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Germany

Others may not agree but we, the cardiothoracic surgeons, think it is the best profession in the world. Everybody agrees this profession is very demanding, not only involving long working hours but also at odd hours of the day. This has lead our profession having a "family un-friendly " image. As if this were not enough, the residency/training takes up to 10 years. Perhaps because of this reason, traditionally, cardiothoracic surgery has been heavily male-dominated.

Of course, there have been women surgeons in our field, but up until now they have only been "exceptions". Even the experiences between male and female residents regarding their family life have been different. More male surgeons have family and children compared to women. Whether direct or indirectly, women surgeons have felt an overwhelming peer pressure to hold off having children until they have completed training. This is important because, nowadays, the medical schools throughout the western world are heavily dominated by female students. Only a minority of female graduates choose to take up a "surgical career" let alone a cardiothoracic surgical one. In addition, the younger generation of male or female doctors are also looking for "work-life balance" and therefore choosing NOT to join our field.

"We want the best possible talent to join our profession, irrespective of the gender and ethnicity. Clearly our profession should be a meritocracy, but at the same time we have to adapt with the changing times."

Malakh Shrestha

We want the best possible talent to join our profession, irrespective of the gender and ethnicity. Clearly our profession should be a meritocracy, but at the same time we have to adapt with the changing times.

The objective of this session is to discuss this problem and try to find objective solutions. To do this, we also need to know what the young generation want. We have invited couple of young residents, one each from Europe and USA, as well as a medical student to tell us how the younger generation think. We also have an esteemed panel of "seniors" including the presidents of the "big three" organisations: the EACTS, AATS and the STS. So please do attend this session and join in the lively discussion.

Making the most out of life in cardiothoracic surgery

First to speak during the work-life balance session will be Miia Lehtinen, who works at the University of Helsinki, Finland, the Department of Surgery, Kymenlaakso Central Hospital, Kotka, Finland, and the Karolinska Institutet, Stockholm, Sweden. She will be tackling an important question: is there life outside of cardiothoracic surgery?

Dr Lehtinen spoke to *EACTS Daily News* to give a glimpse of some of the main messages she will be sharing with the audience.

Why have you been asked to talk about work-life balance?
I'm currently undergoing the Finnish training program for cardiothoracic surgery. I am trying to bring in a resident's point of view, how it feels to be a beginner in the field, and how the 'wave' can totally sweep you into this interesting medical field. I don't cover family life in my presentation – surgeons have a lot of other things in their life that they need to balance.

I will talk about the kind of dilemmas current residents and surgeons in the field have regarding work-life balance and some examples of how these issues have been solved.

Please tell us about your own work, importantly how long it takes, and how much of an impact it has on the rest of your life?
I'm undergoing a so-called common surgical trunk, a preparatory phase for my cardiothoracic training, covering all different surgical fields. I work approximately 50-60 hours per week. It's a preparatory phase in many ways: you learn your basic surgical skills, you get to know the surgical field you're aiming for, and you start to understand the life that you will be living for the rest of your days – it's hectic but rewarding.

Could you describe the work-life balance as a trainee?
An important part of the residency period is to learn how to deal with the equation of work plus leisure. As many residents jump directly from a relatively free and flexible university life – with a lot of extra-curricular activities – into the strict and quite rigid world of surgical departments, issues easily arise.

"Cardiothoracic surgery attracts residents who have a very romantic image of the field – but it is actually very hard work."

Miia Lehtinen

What are the dangers/ warning signs that indicate work-life balance has gone a bit wrong?
Usually you hear it from your closest friends and family very readily – if you miss too many engagements. Perhaps you don't know what's happening in your family's life any more. That should raise some red flags. Most importantly, there are danger signs if you don't enjoy your work anymore.

What do you think makes this a particular problem amongst the cardiothoracic community? Is there a certain type of person who does this job?
It's an intense field of medicine, with the constant risk for life-threatening complications with immediate effect. The work is both physically and mentally demanding. As my professor, Karl Lemström at the University of Helsinki puts it: this is a lifestyle – and the best field of medicine.

Can you give an example of someone who's got the work-life balance right?
I know a couple of colleagues who have small children at home (in other words, they cannot get much sleep and have a full hullabaloo in their free time). Yet still they are very passionate about their job and perform their work extremely well with calmness and a smile on their faces.

Conversely, when can it go wrong?
In some countries, the field of cardiothoracic surgery is very "trendy" for some reason, because of television shows, perhaps or good marketing, maybe even some surgeons who are regularly in the media spotlight.

"The work is both physically and mentally demanding ... this is a lifestyle – and the best field of medicine."

Miia Lehtinen

Cardiothoracic surgery attracts residents who have a very romantic image of the field – but it is actually very hard work. This field is not just heroic actions after which you go home when the clock hits 4pm; heroic actions require long, inevitable work hours. This, as I've seen, causes controversies.

What advice would you give anybody who feels that things are not going well?
I don't know if things get better with time in the job, but I see this a lot among my resident colleagues. I guess it's natural that there are times in everyone's career path when it feels as if things have come to a standstill. No individual skill progress occurs, and one feels frustrated.

During those times, you can a) try to recall or look up cases that really made your heart leap and remind yourself about why you love this field so much; b) take a step back and find a hobby to get you distracted (adults can also have hobbies!); c) talk to a peer who understands your field and pour it all out; d) just take some time off for relaxation (physicians tend to skip their holidays too easily).

Be realistic: don't try to arrange engagements for too many days a week. Try with one day first and scale up from there. It's pointless to add your stress load by taking on hobbies which you then miss or have to cancel because you got carried away with your work – again.

How can employers/ hospitals/institutions help with this quest?
By providing enough challenges and possibilities for individual development to keep things interesting, and by taking each employee as an individual with their own personal needs – for example allowing flexibility in working hours, or even part-time working if possible.

The 'Work life balance in cardiothtoracic surgery' session takes place Sunday at 14:00–15:30 in Hall G2.

Congenital | Rapid Response | Congenital Rapid Response

Usefulness of super flexible 3D-printed heart model in the field of congenital heart surgery

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Remarkable improvement of surgical outcomes of congenital heart disease in the current era forces young consultant surgeons to perform complex biventricular repair (BVR) and/or neonatal open-heart surgery with low mortality and morbidity, from the beginning of their career. In particular, biventricular repair is often hesitated due to intra-cardiac anatomical complexity even in patients whose ventricles are balanced and well-functioning.

Current development of 3D printing technology based on multi-slice computed tomography (MSCT) enabled creation of 3D heart models of congenital heart disease, which is useful as an educational or training tool for students and residents. With improvements to their flexibility and shortening of the manufacturing period, now they are expected to be available for preoperative simulations of complex congenital heart surgery. We developed original 3D heart models and now created super flexible models, which were made of polyurethane resins, using stereolithography as printing technology and vacuum casting as manufacturing method.

Between March 2015 and August 2017, a total of 20 tailor-made 3D-printed heart models were created for preoperative surgical simulation. All operations were performed by a young consultant surgeon (T.H.) who had neither experiences of complex BVR, nor neonatal open heart surgery until then. Fundamental diagnoses were double outlet right ventricle (DORV) in seven patients, atrioventricular discordance (AVD) and transposition of great arteries (TGA) or DORV in five patients, d- TGA with intramural coronary running in one patient, interrupted aortic arch with left ventricular outflow tract obstruction in one patient, hypoplastic left heart complex in one patient, pulmonary atresia, ventricular septal defect, and major aorto-pulmonary collateral arteries in one patient, and functionally single ventricle in four patients. Median age at operation was 1.4 years (range, 0.1-5.9).

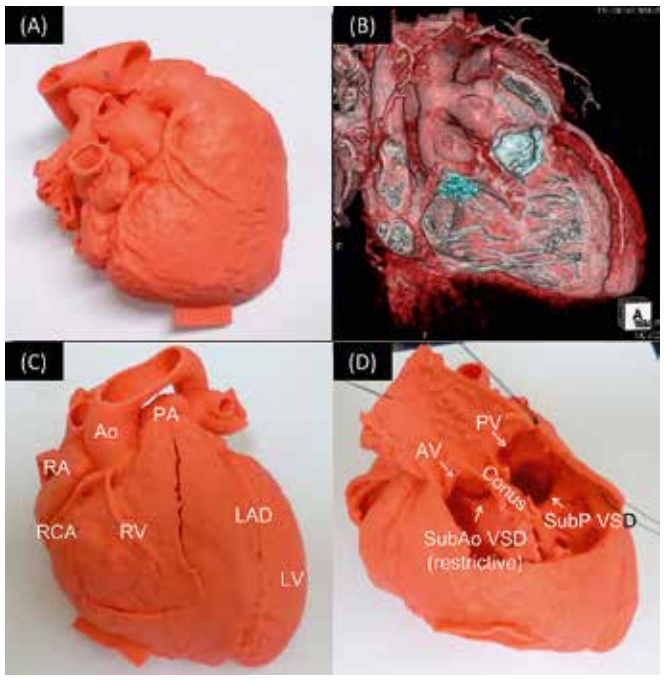


Figure 1. Double intraventricular reroutings for DORV (Double committed VSDs) s/p PAB (13 months).

During the median follow-up period of 1.3 years (0.1-2.5), no mortality was observed. Two patients with DORV and subpulmonary VSD underwent arterial switch operation (ASO) and intra-ventricular rerouting. Three patients with subaortic VSD, two patients with remote VSD, and a patient with subpulmonary VSD and pulmonary stenosis underwent intra-ventricular rerouting combined with right-ventricle to pulmonary artery conduit (Rastelli). Of them, a patient had restrictive subaortic VSD and subpulmonary VSD underwent double intra-ventricular reroutings (Figure 1). All five patients with AVD and TGA/DORV, including two patients with situs inversus, underwent double switch operation (Senning + ASO in 2, Senning + Rastelli in 3) (Figure 2). For a patient with AVD, DORV, VSD, coarctation of the aorta status post coarctation repair and pulmonary arterial band, whose intra-ventricular rerouting was successfully performed through mitral valve and pulmonary valve with an ePTFE patch, because it was hard to explore through right ventriculotomy (Figure 3).

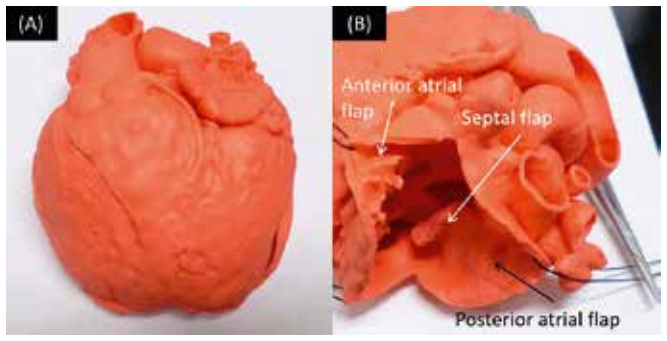
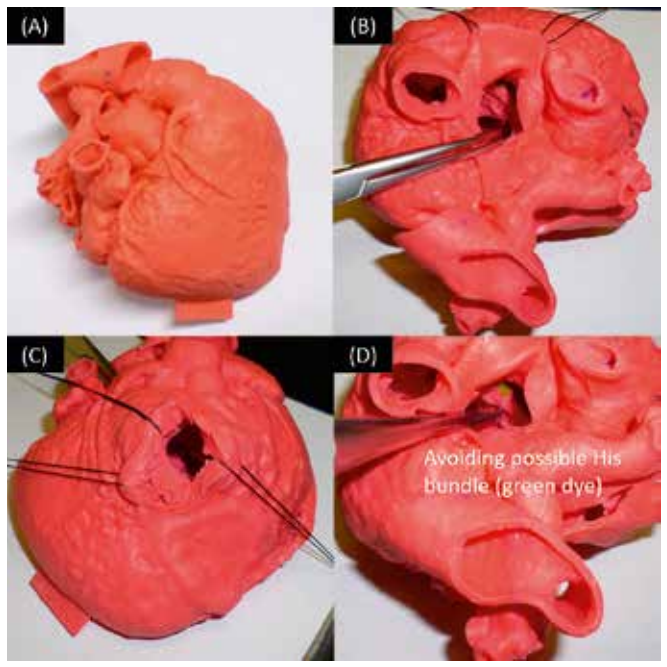


Figure 2 (above). Senning part simulation for SI, mesocardia, ccTGA s/p PAB, BTS*2 (43 months).

Figure 3. Simulation of intraventricular rerouting through PV for AVD, DORV, VSD, CoA s/p EDA + PAB (13 months).



The median cardiopulmonary bypass time and aortic cross clamp time were 345 minutes (110-570) and 114 minutes (35-293). All patients were free from surgical heart block or systemic ventricular outflow tract obstruction.

Surgical simulation using 3D heart models allowed a newly-fledged consultant surgeon in the field of congenital heart surgery to perform complex biventricular procedures or neonatal/early infantile open-heart surgeries without mortality.

EACTS

EACTS Francis Fontan Fund for Education

J Rafael Sádaba Complejo Hospitalario de Navarra, Pamplona, Spain

It is part of the EACTS mission to advance education in the field of cardiac, thoracic and vascular interventions. EACTS is the leading educational organisation for cardiac and thoracic surgery in Europe, and among the best in the world. The EACTS Annual Meeting is the largest of its kind worldwide, and its educational value is undisputable. The EACTS Academy, launched in 2012, offers a high quality educational programme to suit a range of levels, from trainee through to experienced surgeon.

As of January 2018, and because of the application of the MedTech Europe (MTE) code of conduct, industry will cease the direct support for healthcare professionals to attend scientific and educational events organised by third parties. Nevertheless, industry will continue to organise their own educational activities, and will be able to fully support attendance of health care professionals there. Events organised by industry are already strictly regulated, and will continue to be so under the new MTE code. That being said, these activities will arguably be designed to promote and market their own products, with the danger of conveying biased education. In this context, EACTS remains devoted to the continued provision of high-value education through its different educational initiatives, and in expansion of its educational portfolio.

The EACTS Francis Fontan Fund for Education has been created to support educational opportunities, foster professional development and promote lifelong learning in cardiac and thoracic surgery for its members. Our aim is to support these educational activities in a transparent and fair manner, and subject to strong governance procedures.

In times of uncertainty about the future of postgraduate education, our vision is to make independent and high-quality education accessible to EACTS members. Once again, despite the MTE code of conduct, it is expected that major companies will remain committed to support medical education, and will continue working closely with scientific societies and professional congress organisers (PCO) to find optimal ways of doing so, while ensuring full compliance with the new code.

The Fund will seek and attract funding to support the educational portfolio of EACTS with the aim of financially supporting courses run by the Academy in Windsor and elsewhere, as well as a number of grants and fellowships organised by EACTS. The Fund will enable partnership with industry to promote independent education in cardiac and thoracic surgery.

The activities of the Fund are organised by the Francis Fontan Fund Steering Committee, which is primarily responsible for strategy and fundraising. A subgroup of the Steering Committee will form the 'Executive Committee', which deals with the 'grant-giving' activities. The Fund has already supported four grants. Two of them, in collaboration with the organisers of the Birmingham Review Course in Cardiothoracic Surgery, are aimed at surgeons taking the EBCTS examination.

Another two grants have been supported for members from South America to attend the STS/EACTS Latin America Cardiovascular Surgery Conference in Cartagena (Colombia). For 2018, and through an Educational Grant from AtriCure, the Fund will support an Atrial Fibrillation Fellowship for two members. This fellowship will be advertised during this Annual Meeting.

More information on the EACTS Francis Fontan Fund for Education can be found at: http://www.eacts.org/the-association/francisfontanfund/

Cardiac | Abstract | LV restoration and hypertrophic cardiomyopathy surgery – Healing the LV

Hybrid transcatheter left ventricular reconstruction for treatment of ischaemic cardiomyopathy: Preliminary results

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Remodelling of the left ventricle (LV) after a myocardial infarction (MI) results in an increase in volume, and reduction in ejection fraction (EF). Transmurality of the infarction determines whether or not a true LV aneurysm will result.[1] LV reconstruction procedures have demonstrated favourable remodelling of the dysfunctional myocardium. The Surgical Treatment for Ischemic Heart Failure (STICH) trial, in which CABG alone was compared with a combined procedure CABG and LV reconstruction, however failed to demonstrate a difference in all-cause mortality or rehospitalisation for heart failure.[2] One of the critical comments to this trial was that the average LV-volume reduction in the patients that underwent the combined procedure was only 19%, while prior reports of more than 5,000 patients demonstrated that approximately 40% of LV volume reduction was needed for clinical improvement.[3]

We present the preliminary results of a novel, multicentre, hybrid transcatheter technique to reconstruct the remodelled LV by plication and exclusion of the scar, and reduction of the excess volume, resulting in decreased wall stress and increased EF. The technique relies on micro-anchoring technology (Revivent TC™ System, BioVentrix Inc. San Ramon, CA, USA). The LV is reconstructed by plication of the fibrous scar.

Dr Klein (right) and Dr Agostoni

This is achieved by implantation of a series of internal and external micro anchors brought together over a PEEK (poly-ether-ether-ketone) tether to form a longitudinal line of apposition between the LV free wall and the anterior septum. Internal anchors are deployed by transcatheter technique on the right side of the ventricular septum through the right internal jugular vein. Paired external anchors are advanced through a left sided mini-thoracotomy and deployed on the LV epicardium. A specialised Force Gauge is used to bring these 'RV-LV' anchors together under measured compression forces. 'LV-LV' anchor pairs through the LV apex beyond the distal tip of the RV complete the reconstruction. Patients were considered eligible for the procedure when they presented with symptomatic heart failure (NYHA-class ≥ II) and ischaemic cardiomyopathy (EF<40%) after anteroseptal myocardial infarction. It was mandatory that patients had a dilated LV

Figure 1. Internal and External Anchor (above), and drawing of final results (below)

with a scar in the anteroseptal wall and apex of ≥ 50% transmurality.

Between October 2016 and April 2017, nine patients (8 males, 1 female; mean age 60 ± 8 years) were operated on in two Dutch centres. Procedural success was 100%. On average 2.6 anchor-pairs were used to reconstruct the LV. Comparing echocardiographic data pre- and directly postoperatively, LVEF increased from 28 ± 8% to 40 ± 10% (change +43%, P < 0.001) and LV-volumes decreased: LVESVI 53 ml/m² ± 8 ml/m² to 30 ± 11 ml/m² (change -43%, P < 0.001) and LVEDVI 75 ml/m² ± 23 ml/m² to 45 ± 6 ml/m² (change -40%, P = 0.001). In one patient, a RV perforation occurred which necessitated conversion to full sternotomy. One patient underwent a postoperative revision because of RV restriction. Hospital mortality was 0%.

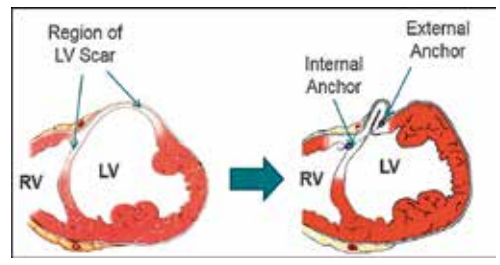

Figure 2. Drawing of plicated anterolateral scar onto interventricular septum

Hybrid transcatheter LV reconstruction is a promising novel treatment option for patients with symptomatic heart failure and ischemic cardiomyopathy after anteroseptal myocardial infarction. Early results demonstrate that the procedure is safe and results in significant improvement in EF and reduction in LV volumes.

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Thoracic | Focus | Pleural empyema management

Management of empyema thoracis in children

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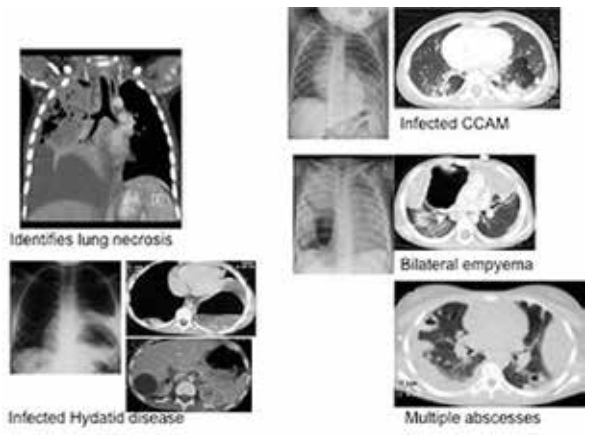

Figure 1: Value of CT scan with IV contrast in empyema

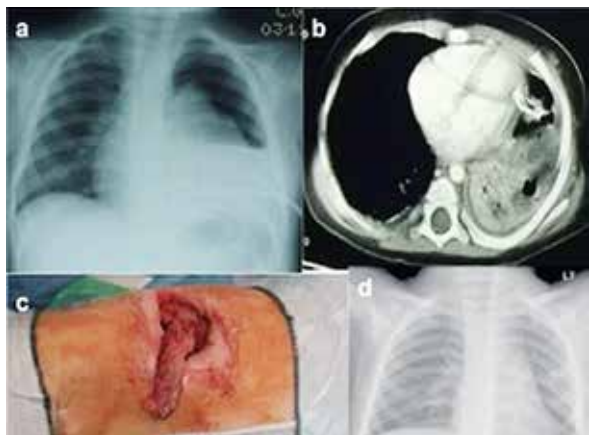

Figure 2: Broncho-pleural fistula management and outcome with serratus anterior digitation pedicle flap. a) Chest x-ray and b) CT scan demonstrating pyo-pneumothorax with necrotic pneumonia, c) Raised serratus anterior digitation flap before insertion, d) One-month follow-up chest x-ray showing lung expansion.

Empyema thoracis is the collection of purulent material within the pleural cavity, most commonly as a result of bacterial lobar pneumonia. Studies have shown that despite vaccinating children with the 7-valent pneumococcal vaccine (PCV-7) post-pneumonic empyema admissions have continued to rise (3.5 cases/100,000 in 1996–1998 to 7.0 cases/100,000 children in 2005–2007), while hospitalisations for pneumonia fell. Empyema can also result following penetrating injury, oesophageal rupture, secondary infection of contused lung and haemothorax, post-lobectomy space, sympathetic effusion of acute pancreatitis or sub-phrenic abscess.

The severity of symptoms and respiratory compromise in children varies depending on the extent of the lobar consolidation and rapidity with which pus accumulates within the pleural space. Radiological investigations confirming the diagnosis could either be ultrasound or CT scan with IV contrast or both. CT scan is preferable as it identifies lung and mediastinal pathology (Figure 1) however, not feasible in all.

The management principle of empyema is to drain adequately so as to achieve full expansion of the lung. Inadequate management of empyema is the major cause of morbidity and mortality and leads to its progression into an organised state.[1] Surgical drainage is either using video-assisted thoracoscopic (VATS) techniques or muscle sparing mini-thoracotomy by breaking all the loculation, debriding fibro-purulent material and releasing trapped lung under direct vision.

Our large study has shown that VATS in managing childhood empyema is effective with low complication rate and reduced hospital stay.[2] Relatively conservative management entails Pigtail catheter insertion usually under general anaesthesia, and fibrinolytics instillation to break loculations and drain empyema. The clinician should actively monitor the progress and identify failures early so that principle aims of management strategy can be achieved. Indications for surgery include: 1) Failure of chest tube drainage, antibiotics and fibrinolytic; 2) persisting sepsis, collection; 3) complex empyema with significant lung pathology; 4) delayed presentation with pleural peel and trapped lung; 5) pyo-pneumothorax – broncho-pleural fistula at presentation.

Complex empyema is a terminology coined when associated with lung pathology, such as necrotic pneumonia, lung abscess, and bilateral disease or associated with infected pre-existing congenital lung lesion, parasitic or malignant pathology. Surgical management of necrotic pneumonia associated with broncho-pleural fistula is challenging. We have described a serratus anterior digitation pedicle flap onto the leaking necrotic lung parenchyma through a muscle sparing thoracotomy, in addition to achieving debridement and releasing the trapped lung.[3] This management has shown to be very effective with minimal morbidity resulting in full expansion of lung, and avoided lobectomy[4] (Figure 2).

Resection of the necrotic lung in presence of infection is difficult and fraught with significant post-operative morbidity and even mortality. It is very difficult to distinguish recoverable lung parenchyma in a consolidated and collapsed lung from necrotic lung. We recommend subsequent resection of congenital lung lesion after managing acute empyema. Bilateral empyema requires bilateral effective drainage and monitoring to ensure full expansion takes place.

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* Sabashnikov A, et al. outcomes in patients receiving HeartMate II versus HVAD left ventricular assist device as a bridge to transplantation. Transplant Proc, 46, 1469-1475 (2014).

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Cardiac | Focus | The 2017 EACTS/ESC Guidelines on Valvular Heart Disease

New Guidelines put greater emphasis on the Heart Team and TAVI

New 2017 EACTS/ESC Guidelines on Valvular Heart Disease[1] have expanded the number of patients eligible for Transcatheter Aortic Valve Implantation (TAVI), but the decisions on which method to use must be taken by the Heart Team, says Helmut Baumgartner, Professor of Cardiology/Adult Congenital Heart Disease at the University of Muenster, Germany.

Professor Baumgartner is one of the lead authors of the EACTS/ESC Guidelines, as well as moderator for a dedicated session, held this afternoon, that will delve deeper into the meat of the new recommendations, and the rationale behind them.

Indications for TAVI have been expanded in the new Guidelines, and the role of the Heart Team is given much greater emphasis. The Guidelines spell out that available data from randomised controlled trials, and large registries in elderly patients at increased risk of surgery, show that TAVI is superior in terms of mortality in extreme-risk patients, non-inferior or superior to surgery in high-risk patients and non-inferior (or even superior) to surgery when transfemoral access is possible in intermediate-risk patients.

Professor Baumgartner, an ESC chairperson, said the new recommendations on TAVI reflect the results of five recent randomised controlled trials. Speaking to *EACTS Daily News*, he said: "In 2012, the guidelines just recommended that TAVI was suitable for patients not suitable for surgery, but this has changed in line with the RCT evidence. New data from these trials has found there are a wide range of both high and intermediate-risk patients who could benefit from TAVI, so the indications for it have been expanded.

"The favourable results of TAVI have been reproduced in multiple large-scale nationwide registries supporting the generalisability of outcomes observed in RCTs. This favours the use of TAVI over surgery in elderly patients at increased surgical risk who are suitable for femoral access."

The guidelines also stress, though, that the TAVI evidence is based on trials in patients with a mean age of 80 years, and the recommendations cannot be applied to those below 70-75. Broadly speaking, younger patients have more bicuspid valves which may have worse TAVI results than tricuspid valves, and there is no long-term data on the durability of TAVI.

"In younger patients there must still be a critical risk of surgery before considering TAVI," explained Professor Baumgartner.

However, he emphasised that the final decisions on whether to perform SAVR (Surgical Aortic Valve Replacement) or TAVI (including the choice of access route) should be made by the Heart Team after careful individual evaluation. This was another key recommendation in the Guidelines.

The Heart Team approach is particularly advisable in the management of high-risk patients, and is also important for other sub-sets, such as asymptomatic patients, the Guidelines state. "The choice of SAVR or TAVI is not simply based on a risk score or age. The Heart Team must weigh the risks and benefits of both procedures, particularly in the intermediate-risk situation," continued Professor Baumgartner. "Discussion should include age, co-morbidities, anatomy and associated lesions of the heart or ascending aorta that should be addressed at the time of valve intervention as well as outcomes of the centre for surgery and transcatheter intervention.

"I am anticipating a lot of discussion about this recommendation as this is the surgeons' congress, and in the surgical community it will mean a lot of change in the years to come."
Helmut Baumgartner

"We have included a long table in the guidelines citing the clinical characteristics, anatomical and technical aspects as well as other cardiac conditions that require consideration in making these decisions. These are complex decisions, and they should made by the Heart Team, with experts from cardiac surgery, cardiology, and anaesthiology at the core."

Other health professionals – including GPs, geriatricians and heart failure, electrophysiology or intensive care specialists – may also be consulted if needed, he said.

"I am anticipating a lot of discussion about this recommendation as this is the surgeons' congress, and in the surgical community it will mean a lot of change in the years to come."

Professor Baumgartner said the guidelines place much greater emphasis on surgeons and cardiologists working together as members of Heart Teams, and this reflects the increasing range and complexity of valve-based surgical and interventional techniques.

The new recommendation says heart valve treatments should be performed in a Heart Valve Centre with expertise in VHD, staffed by multi-disciplinary teams with competencies in valve replacement, aortic root surgery, mitral, tricuspid and aortic valve repair, as well as transcatheter, aortic and mitral valve techniques including re-operations and re-interventions.

The Heart Team must meet on a regular basis and work with standard operating procedure. It must also have imaging services, including 3D and stress echocardiographic techniques, perioperative TOE, cardiac CT, MRI and positron emission tomography CT.

Regular consultation between non-invasive cardiologists, surgeons and interventional cardiologists is also recommended. Backup services including other cardiologists, cardiac surgeons, intensivists and other medical specialities are also required. Data should also be audited and results made available internally and externally.

Professor Baumgartner highlighted the fact that it is still recommended that TAVI procedures should only be performed in centres with both departments of cardiology and cardiac surgery on site. Even though the complication rate has markedly decreased, and the conversion rate to surgery has become low, this is required for safety reasons, particularly when considering that indications for TAVI have been expanded to lower risk patients.

"Another reason why cardiology and cardiac surgery should be on site is that the decision process has become quite complicated and requires both specialties. Finally, outcome has been shown to be volume dependent and this is another reason to centralise the care of these patients."

The guidelines state that a Heart Valve Centre should also have structured training programmes, that both surgeons and cardiologists performing any valve intervention should undergo focused training as part of their local board certification, and that learning new techniques should take place through mentoring to minimise the effects of the "learning curve".

Another key change in the Guidelines includes a recommendation that novel oral anticoagulants (NOACs) should be considered as an alternative to Vitamin K antagonists in patients with AF who also have aortic stenosis, aortic regurgitation and mitral regurgitation. NOACs are still contraindicated in patients with mechanical valves and in mitral stenosis.

Other new recommendations cover when to intervene in asymptomatic valve disease.

The guidelines have a condensed format with key points at the end of each section and they are harmonious with a simultaneously published chapter on VHD in the ESC Textbook of Cardiovascular Medicine for more background information.

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Cardiac | Abstract | Risk score

Role of Heart-Team discussion on treatment selection and outcome of patients with complex cardiac disease: a blind decision-making study

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The concept of the Heart Team was born more than 60 years ago, but only recently has it been increasingly adopted, now receiving a class IC recommendation from both European and North American guidelines for coronary artery and heart valve disease. However, while some studies have showed safety, efficacy and even possibly improved outcomes of Heart Team-based decisions, the evidence on the impact of a Heart-Team approach on clinical decision making is still limited. The goal of our study was to investigate this aspect and in particular whether treatment choice for a variety of cardiac diseases made by the Heart Team is different of that made by a single cardiac surgeon or cardiologists prior to Heart Team discussion.

At our institution, Heart Team meetings are held daily for one hour before starting other clinical activity and is open to all members of the Cardiovascular Science Department (including clinical and invasive cardiologists, echocardiographers, cardiac and vascular surgeons, cardio-anaesthetists). The Team meets in a large room with facilities for remote conferences and three large plasma screens for display of imaging, an ideal setting for this purpose. In this study we randomly select 100 patients in the period from September 2015 to June 2016 who were presented separately to a cardiac surgeon and a cardiologist the day before the Heart Team. The two physicians anonymously and independently expressed a choice for the patient's treatment (surgical, percutaneous, hybrid or medical therapy) or indicated if additional investigations were necessary and the day later the case was discussed by the Heart Team. The final treatment received by the patients, and in-hospital patients' outcomes were then recorded.

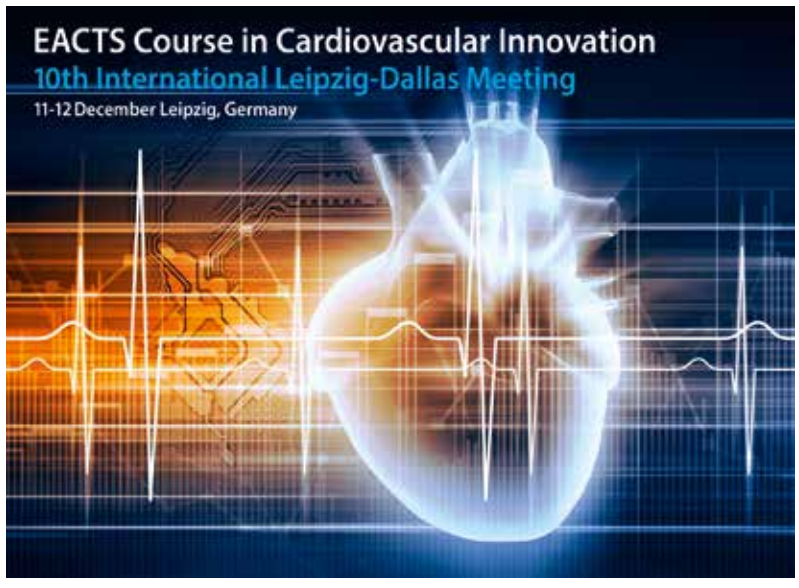
Professors Crea (left) and Massetti

Concordance on treatment recommendations between cardiac surgeon and cardiologist was found in 51% of cases, while the Heart Team confirmed the cardiac surgeon's decision in 66% of cases and the cardiologist's decision in 56% of cases. Concordance between cardiac surgeon, cardiologist and Heart Team was achieved in 43% of cases. General consensus was less frequent in patients with higher risk profile and in patients with aortic valve stenosis, while it was more frequent for patients with coronary artery disease. Heart Team decision was implemented in 95% of cases and all patients were discharged alive from hospital.

Our study demonstrates that a Heart-Team approach substantially influences clinical decision making. Further studies are warranted to test the effects of a strategy guided by the Heart-Team approach as compared to current practice on long-term outcome of complex cardiovascular patients.

EACTS

The EACTS Course in Cardiovascular Innovation



The EACTS Course in Cardiovascular Innovation was established in the late 1990s under the leadership of Professor Friedrich Mohr at the Leipzig Heart Center, Germany. The course was originally entitled "Latest Techniques in Cardiac Surgery," before its name was changed to the more well-known "Leipzig-Dallas Meeting". While organising these series of meetings, Professor Mohr and Dr Michael Mack teamed up to focus on two important aspects in the field of structural heart disease: innovation, and the Heart-Team concept.

As with previous incarnations of this meeting, the EACTS Course in Cardiovascular Innovation will focus on the newest and most promising techniques used to manage structural heart disease. This EACTS Academy course represents a unique opportunity to get insights into the latest developments in modern cardiac surgery and interventional cardiology from leading experts in these fields. As in the years before, the programme is a mixture of live operations / procedures combined with didactic lectures and lively discussions that are designed to encourage close interaction between experts and audience. Up to 20 live procedures have been planned and will be interspersed between lectures and debates from internationally-recognised experts in the field of structural heart disease.

The venue for this year´s meeting will be a historic hall that has been newly renovated, within walking distance of downtown Leipzig. The location enables meeting delegates to experience the dynamic and vibrant city of Leipzig during its ornate Christmas festivities. The city is also known as the hometown of Sebastian Bach and the original site of protestor demonstrations that led to the fall of the Berlin wall.

The EACTS Cardiovascular Innovation programme begins with successive sessions on atrioventricular valve disease, first focusing on innovative open surgical and transcatheter techniques to treat mitral valve disease and then on tricuspid valve disease management. The final session of the first day will focus on surgical and interventional procedures for ischaemic heart disease. The previous tradition of a lively social programme will be kept alive at this year's meeting with a party and live music at the well-known Moritzbastei at the end of the first day of the programme.

The second day of the programme will start out with a session on the latest treatments of arrhythmias and heart failure. This will be followed by a session on aortic disease with live open surgical and endovascular procedures. The topic of the last session of the meeting will be aortic valve disease, focusing on recent advancements in conventional and transcatheter aortic valve procedures.

A distinguished international faculty will be sure to make the EACTS Course in Cardiovascular Innovation a worthwhile learning experience for all delegates. Registrants will be encouraged to interact and connect with experts from all fields of structural heart disease.

The EACTS Academy is looking forward to welcoming you to the Leipzig Heart Center on December 10–11, 2017. Professor Michael Borger and his team will work hard to continue the unique spirit of previous Leipzig meetings and to make this course a truly valuable experience for all who attend.

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EACTS Clinical Guidelines Committee Report 2016–2017

Miguel Sousa Uva Chair of EACTS Guidelines Committee

Miguel Sousa Uva

Epidemiology Research Fellows (from left to right) András Durko, Daan Thuijs, Stan Antonides and Milan Milojevic.

Guidelines summarise the available studies in a systematic fashion, and provide a grading of the evidence and a set of recommendations. Guidelines have been criticised for a variety of reasons, including (to name but a few): a lack of evidence to support many of its recommendations, taskforce members' relations with the industry, applicability only to a very selected population (the populations included in randomised trials, when they exist), applicability only to the healthcare systems of rich countries, and the failure to take into account patients' values.

In reality, guideline limitations reflect the shortcomings of the studies upon which they are based. We know that observational studies, meta-analyses and even randomised trials have limitations. Although we recognise some of these limitations, such as the low level of evidence supporting many recommendations in surgery, it should be stressed that guidelines or expert consensus documents are useful in primary decision making, helping busy physicians in their daily practice. In addition to this initial orientation, guidelines provide, when available, the references of the studies that support them, thus allowing doctors to analyse the original papers.

In the last years, we have witnessed an improvement in the number and the quality of guidelines in which EACTS has been involved. A major step forward was taken in 2015 when EACTS published its Methodology Manual, setting out the rules for guidelines development.[1]

Since last year's Annual Meeting in Barcelona, several guidelines and expert consensus statements have been published. In November 2016, EACTS published an important clinical statement on Guidance for the Provision of Adult Cardiac Surgery.[2] The first guideline for the Management of Transposition of the Great Arteries was published in January 2017.[3] An expert consensus statement on the prevention and Management of Mediastinitis was also published in early 2017.[4]

In July 2017, the ESC-EACTS Standards defining a 'Heart Valve Centre' were published.[5] In August 2017, two new guidelines were released during the ESC annual congress: the ESC/EACTS Guidelines for the Management of Valvular Heart Disease[6], and the 2017 ESC Focused update on Dual Antiplatelet Therapy in Coronary Artery Disease, developed in collaboration with EACTS.[7]

In October, during the EACTS Annual Meeting in Vienna, two new EACTS Guidelines will be released: the 2017 EACTS Guidelines on Perioperative Medication in Adult Cardiac Surgery and the 2017 EACTS/EACTA Guidelines on Patient Blood Management. Following the EACTS Methodology Manual, we incorporated a research fellow with expertise in epidemiology for an independent critical analysis and grading of the literature. I believe the research fellow interaction with the Taskforces of the Perioperative Medication in Adult Cardiac Surgery and Patient Blood Management Guidelines was probably one of the key elements in achieving two successful and trustful documents.

Several ongoing documents will be published in 2018:

1. Adult Domain

- EACTS Expert Consensus Paper on Long-term Mechanical Circulatory Support
- EACTS/EBCP/EACTA Expert Consensus Paper on Safety and Standards of CPB in Europe

2. Thoracic Domain

- ERS/EACTS/ESTRO Guideline for the Management of Pleural Mesothelioma
- ERS/EACTS Expert Consensus Statement on the Management of Malignant Pleural Effusion

3. Vascular Domain

- EACTS/ESVS Expert Consensus Statement on the Treatment of Aortic Arch Pathologies

4. Congenital Domain

- Expert Consensus Paper on the Diagnosis and Management of Truncus Arteriosus

Several new projects are also in the pipeline:

- EACTS Expert Consensus Paper on ECMO for Acute Heart Failure and Cardiac Arrest
- EACTS Expert Consensus Paper on ECMO for post-cardiotomy failure
- EACTS Consensus Paper about frailty assessment before cardiac interventions
- EACTS-ASTS European Ground Glass Opacities Guidelines
- Under consideration is a joint STS/EACTS/AATS Guideline on Type B Aortic Dissection
- Under consideration is a joint EACTS/AATS/STS on Valve Labelling

Finally, the Guidelines Committee is renewing itself during the EACTS Annual Meeting in Vienna. We thank all those who contributed to this important endeavour. First, surgeons who are stepping down, and a special thanks to Rianne Kalkman for her support as administrative coordinator. Anders Jeppsson, from Gothenburg, Sweden has been nominated as new Guidelines Committee Chair and four new Guidelines Committee members will replace members who finish their term during this Annual Meeting. We wish them all the best.

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Cardiac | Focus | 2017 EACTS Guidelines on Valvular Heart Disease

Risk assessment and imaging in valvular heart disease

Nicolas M Van Mieghem, a cardiologist at the Department of Interventional Cardiology, Thoraxcenter, Erasmus Medical Center, Rotterdam, the Netherlands, gives his insights on the role of imaging and risk assessment in valvular heart disease during today's session on the 2017 EACTS Guidelines on Valvular Heart Disease.

Can you give us some background to your presentation?

During the European Society of Cardiology meeting in Barcelona in August, new joint Guidelines were issued by the European Society of Cardiology and the European Association of Cardiothoracic Surgery. Valvular heart disease is a dynamic space in cardiology and cardiac surgery. Updated Guidelines have been eagerly awaited because of the ongoing revolution of catheter-based valve therapies and progress in imaging.

"There was a time that 2D-echocardiography was the only imaging tool at hand. Now 3D-echocardiography and multi-slice computed tomography have become essential for proper procedural planning in transcatheter aortic valve implantation."

Nicholas M Van Mieghem

What are the key recommendations in the Guidelines on risk assessment and imaging?

Inherent limitations of risk score models are put in perspective. The current Guidelines strongly advocate setting up local Heart Teams that include cardiologists, imaging specialists, cardiothoracic surgeons, but also anaesthesiologists and geriatricians. The concept of Heart Valve Centres is new. The new Guidelines endorse these Heart Valve Centres as being institutions providing expert care encompassing the total spectrum of valvular heart disease. These Heart Valve Centres must also incorporate internal audit processes and monitor outcome data up to one year after the procedure. I believe the ESC/EACTS take a strong position in favour of centralised care. This dynamic space of valvular heart disease requires scrutiny to avoid uncontrolled adoption and inappropriate use.

I will discuss the importance of newer imaging modalities. There was a time that 2D-echocardiography was the only imaging tool at hand. Now 3D-echocardiography and multi-slice computed tomography have become essential for proper procedural planning in transcatheter aortic valve implantation, and will expand towards the mitral and tricuspid space in due time.

Can you underline why imaging and risk assessment are now even more important in the light of the new guidelines?

Risk assessment is important because we need to be able to provide the right care to the right patient. Traditional surgery has a long track record and remains the benchmark for newer techniques.

Clearly, transcatheter aortic valve implantation has the intrinsic capacity to improve patient care in view of hospital stay, quality of life and patient satisfaction. And the new guidelines open up TAVI for patients at lower operative risk. That said, it is too early to just treat all patients with aortic stenosis with TAVI. Younger patients without significant comorbidities and a long life expectancy still need surgical aortic valve replacement.

On the other hand, elderly patients may be good candidates for TAVI. Randomised trials are underway to determine the value of TAVI and SAVR in patients at low risk. More specifically, these studies will follow up study participants up to 10 years including echocardiography assessments by an independent core laboratory to study bio-prosthesis durability. These trials are essential to move the field forward. But until these studies are finalised, surgery is the therapy of first choice for true low-risk patients.

"Updated guidelines have been eagerly awaited because of the ongoing revolution of catheter-based valve therapies and progress in imaging."

Nicholas M Van Mieghem

Imaging is important because anatomical features may impact a patient's operative risk, and help select the right treatment strategy. Also, 3D imaging modalities may improve procedural execution both in the catheterisation laboratory and in the surgical theatre.

Could you give us an overview of the significance of the PARTNER Trial and its implications for imaging and risk assessment?

A sub-study of the first-generation PARTNER trials (Cohort A and B), has taught us an important lesson. Yes, TAVI is a game changer for patients who are truly inoperable, and TAVI can be an alternative to surgery in patients who are at high operative risk. However, PARTNER-I also underlined a more disturbing reality: up to 50% of patients either died or had no improvement in their quality of life at one year after the intervention. These are sobering findings that urge for improved risk assessment. We as physicians need to improve our skillset to be able to identify the patient who will not benefit from a valve intervention, whether catheter-based or surgical. Futility is an important concept that needs our attention in everyday practice.

Can you spell out what the latest advice is on using EuroSCORE I, EuroSCORE II and STS?

EuroSCORE I has no more value in contemporary practice, but it can be helpful for research purposes to have a sense of comparison in terms of patient risk between contemporary studies and older studies. The Society of Thoracic Surgery (STS) risk model and the EuroSCORE II are more accurate models for clinical use, but should always be put into perspective by a Heart Team discussion. A multi-disciplinary Heart Team should have the final word in the decision-making process in combination with the patient's perspective.

Will Heart Teams be able to bring a more holistic approach to risk assessment – moving away from using scoring in isolation and taking other factors into consideration such as quality of life/overall life expectancy?

The Heart Team is the only way to integrate all facets of a patient's clinical picture. No risk model is all-inclusive. The Heart Team has an overview of the entire clinical profile, information from multi-modality imaging and insights into local experience and expertise. In my centre we have a daily Heart Team discussion, and a weekly focused discussion on valvular disease involving cardiothoracic surgeons, (interventional) cardiologists, imaging specialists, anaesthesiologists and geriatricians. This heart team structure has its own challenges, but once established, it will improve patient care. I am aware that the Heart Team culture is not yet the reality in many institutions. Yet, the current guidelines strengthen the Heart Team concept and I would strongly recommend clinicians follow the guidelines in this regard.

"We as physicians need to improve our skillset to be able to identify the patient who will not benefit from a valve intervention, whether catheter-based or surgical."

Nicholas M Van Mieghem

Can you outline the importance of echocardiography and its uses?

Echocardiography is still the core imaging modality for the diagnosis of any valvular heart disease. The data obtained from 2-dimensional echocardiography in terms of anatomical dimensions, Doppler echo for blood flow velocities and colour-flow imaging are embedded in the guidelines to help define severity of valvular heart disease. The advent of three-dimensional transthoracic and transoesophageal echocardiography has only strengthened the value of echo in all aspects of the valve clinic.

What other imaging techniques are useful, and how can they be used in risk assessment?

Apart from standard transthoracic echocardiography, exercise and Dobutamine stress echocardiography may help solve conundrums such as low flow, low gradient, severe aortic stenosis or dynamic mitral regurgitation. Cardiac magnetic resonance imaging has become a valuable albeit logistically more challenging alternative for patients with poor echogenicity. And multi-slice computed tomography might become more important in catheter based technologies. Clearly, there is a lot of research ahead of us!

What is your key take-home message?

The dynamic space of valvular heart disease needs a multi-disciplinary approach to control and help canalise the diversity, and guarantee that every valve patient will get the best possible treatment – regardless of whether it is by knife or by catheter.

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The CONNECT system features improved interoperability. Our planned upgrade to HL7 functionality will enable bi-directional exchange of medical data with hospital information systems. This includes the ability to securely import, export and query patient data and export selective offline case data—all with an easy-to-use graphical user interface.

CONNECT's advanced capabilities can help clinicians minimize transcription errors and bias and focus more on the patient and circuit.[1] The CONNECT system also maximizes traceability, minimizes liability and improves clinical practice.[2] Additionally, the advanced software functionality of its GDP Monitor fully empowers Goal-Directed Perfusion (GDP) guidelines, which allows for a trending of critical patient parameters aimed at reducing the occurrence of Acute Kidney Injury in patients undergoing cardiac procedures.

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Cardiac | Focus | Optimal antithrombotic management in patients undergoing CABG; What have we learned…?

DAPT in CABG: which, when, and how long?

The latest on dual antiplatelet therapy (DAPT) in coronary artery bypass grafting (CABG) will be presented today by Anders Jeppsson (Department of Cardiothoracic Surgery, Sahlgrenska University Hospital, Gothenburg, Sweden), who explores the evidence and unanswered questions in this patient population. The 2017 European Society of Cardiology (ESC) focused update on DAPT in coronary artery disease (CAD) was published in August this year, developed by a task force comprising members of the European Society of Cardiology (ESC) and European Association of Cardio-Thoracic Surgery (EACTS)[1].

Dr Jeppsson, who this year succeeds Miguel Sousa Uva as chair of the Clinical Guidelines Committee at EACTS, represented the organisation on the task force in the development of the focused update. The publication details current knowledge regarding the efficacy and safety of DAPT and risk stratification tools, as well as a review of evidence supporting DAPT use in percutaneous coronary intervention (PCI), cardiac surgery, and examining gender influence and special populations such as those with diabetes mellitus.[1]

While the focused update specifies that there is not currently any evidence of survival benefit or reduction in thromboembolic complications with DAPT in stable CAD patients undergoing CABG, in acute coronary syndrome (ACS) evidence exists in its favour. The task force recommends that the heart team estimates the individual bleeding and ischaemic risks, and guides the timing of CABG as well as antithrombotic management. For patients on aspirin needing non-emergent cardiac surgery, continuation of aspirin at a low daily regimen throughout the perioperative period is specified. For patients with existing coronary stents undergoing cardiac surgery, post-operative resumption of $P2Y_{12}$ inhibitor therapy is recommended to commence as soon as is deemed safe, and that DAPT continues until the recommended duration of therapy is completed. In ACS (non ST-elevation myocardial infarction (nSTEMI), ST-elevation myocardial infarction (STEMI) or unstable angina pectoris) patients on DAPT undergoing CABG but not requiring long-term oral anticoagulant therapy, resumption of $P2Y_{12}$ inhibitor therapy is recommended to recommence as soon as is deemed safe after surgery, and continuation up to 12 months is recommended.[1]

"Can we correlate the post-operative platelet function to a continuous bleeding risk and the need for treatment?"

Anders Jeppsson

The task force also recommends that, in patients on $P2Y_{12}$ inhibitors who need to undergo non-emergent cardiac surgery, postponing surgery for at least three days after discontinuation of ticagrelor, at least five days after clopidogrel, and at least seven days after prasugrel should be considered. In CABG patients with prior MI who are at high risk of severe bleeding (e.g. PRECISE-DAPT score of ≥25), discontinuation of $P2Y_{12}$ inhibitor therapy after six months should be considered. In addition, decisions on timing of cardiac surgery in patients who have recently received $P2Y_{12}$ inhibitors may be guided by platelet function testing. Patients at high ischaemic risk with prior MI and CABG, who have tolerated DAPT without bleeding complication, can be considered for treatment with DAPT for longer than 12 and up to 36 months.[1]

Dr Jeppsson co-authored an editorial in the *European Journal of Cardio-Thoracic Surgery* to accompany this focused update, which underscores its principle departures from previous guidance, as well as outstanding research needs.[2] Speaking to *EACTS Daily News*, he explained some of the changes that have emerged: "There is now evidence that we may stop ticagrelor (one of the new, more effective platelet inhibitors) three days before surgery instead of five days before. This is important because that basically saves two days of the patient waiting in the cardiology ward. This is also saving hospital resources, reducing the risk for events while waiting, and it is better for patients to have a shorter hospital stay. That is one of the more obvious changes in the new guidelines."

The editorial also highlights the lack of evidence in support of triple treatment (DAPT combined with anticoagulant) after CABG, as well as the lack of evidence supporting DAPT in stable CAD patients undergoing CABG; the latter lies in contrast to 2016 American College of Cardiology / American Heart Association (ACC/AHA) recommendations wherein DAPT is recommended in stable CAD to improve saphenous vein graft patency, drawing from limited evidence finding it superior to aspirin. "Those studies are very small," explained Dr Jeppsson. "With one exception (which is not included in the guidelines because it was reported after their writing), they are all done with clopidogrel – the older drug. It has actually not been tested (except in one small British study) as to whether it is beneficial to use ticagrelor instead of clopidogrel. But the task force found, in total, the quality and the size of these studies suggesting DAPT was not enough to make a recommendation to use it."

Evidence in support of the 2017 ESC focused update on cardiac surgery recommendations are level B or C – certainly, further dedicated studies are needed on numerous outstanding questions within the CABG population. "Most of the guidelines are based on expert opinion rather than randomised studies," said Dr Jeppsson. "There are a lot of C-level evidences, which means that they are not based on large datasets or randomised studies. Some of these studies will never be done; some may be done. But it is difficult to plan a study where there are clear recommendations (i.e Class I or IIa) in place in guidelines. We will have to live with some of these limited levels of evidence."

A key element in addressing these questions – expressly, understanding each patient's needs and delivering personalised therapy – is the platelet function test. Indeed, the update recommends this to be considered to aid the timing of cardiac surgery and corresponding $P2Y_{12}$ inhibitor cessation in patients with ongoing or recently stopped DAPT, in order to ensure as best as possible that bleeding complication risk is minimised while maximising protection against ischaemic events.

"We have pretty strong evidence that there is an association between the test results and the risk of perioperative bleeding," said Dr Jeppsson. "But that is limited to patients who are already on DAPT; it is not as if we can take any patient and investigate their platelet function.

"Another important issue is that, while we know something about the association between pre-operative platelet function and bleeding, we don't know anything about post-operative function and bleeding. So that is the next step. Can we correlate the post-operative platelet function to a continuous bleeding risk and the need for treatment?"

A more general issue mentioned in the ESC focused update is that of guidance implementation. Dr Jeppsson noted, for example, that while reinstitution of DAPT in ACS patients may improve outcome and is recommended in current revascularisation guidelines, it is often neglected after CABG. This suggests the need for a greater extent of monitoring – in the form of surveys and registries – in order to both ensure and encourage implementation. "In general, of course we need to have some kind of evaluation or assessment of how well they are implemented. And we are lacking those data on an international basis. There are some national registries – the SWEDEHEART registry[3], for example, which covers part of this, but not in total.

"We are now pretty good at writing guidelines but we need to implement them on a local, regional, national and international level."

Anders Jeppsson

"I think that is the next step. We are now pretty good at writing guidelines but we need to implement them on a local, regional, national and international level. One of the challenges now is how we should monitor that, and being able to show how this influences long-term outcome."

Conceivably, implementation rates differ across Europe and beyond, with possible influence from external, non-clinical factors. "The EACTS have a key position through their quality improvement programmes and their registry to actually investigate the implementation rates or the proportion of patients who are actually treated to current guidelines."

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INSIDE VIENNA

Where to go? What to do?

Stephansdom

SIGHTS

STEPHANSDOM

The main cathedral of Vienna needs little introduction. Take a lift to the top of its tower, and remember your camera: the views are stunning!

JOSEFSTADT / OLD GENERAL HOSPITAL

Baroque architecture abounds in Vienna's eighth district, and you can get lost in its charm just strolling around the small cafes, bars, galleries and independent shops.

But an unmissable sight is the old general hospital (**Allgemeines Krankenhaus der Stadt Wien**), a collection of buildings first founded in the 17th century. These include the **Narrenturm** – built in 1784 – the first building in continental Europe dedicated to the accommodation of patients with mental illness.

VISIT SOME QUIRKY HOUSING

One look at the **Hundertwasserhaus** apartment complex and you will see why its creator, whacky Austrian artist Friedensreich Hundertwasser (along with architect Joseph Krawina) apparently once said that "A right angle is a crime!".

Hundertwasserhaus

ACTIVITIES

THIRD MAN FILM TOURS

The Third Man is a 1949 post-World-War-II film noir, filmed in the ruins of Vienna, starring Orson Welles. An iconic part of the film is final scene is a chase through the Vienna sewers – and **3. Mann Tour** (www.drittemanntour.at) offer a fascinating trip down into the "underworld" of the sewers, including famous parts used in the film.

VISIT SOME FAMOUS ALUMNI

VIENNA CENTRAL CEMETERY

Burial grounds are not on the usual checklist for a city break, but the massive **Central Cemetery** serves as the final resting place for an ensemble of some of the most famous composers of all time. **Beethoven, Schubert and Strauss** all are located here.

However, because the Cemetery was so vast, and so far out of the centre when it opened in outer Simmering in 1874, it was quite unpopular, and thus it was decided that some notable names – including Beethoven – would be relocated to the site as Ehrengräber, honorary graves to bring in the punters!

ST MARX CEMETERY

Wolfgang Amadeus Mozart, although born in Salzburg, is undoubtedly the most famous resident of this Vienna burial site. Unfortunately, the exact location of his remains is unknown, but a fitting memorial stands prominently in his memory.

Surgical AF ablation: Time for a paradigm shift

In the field of atrial fibrillation (AF), making the right choices about who to treat, and how to treat them with surgical ablation, is the focus of AtriCure's symposium this year, entitled, 'Surgical ablation: Why, when and how in the face of an epidemic?'

The programme for the symposium was compiled by Timo Weimar, MD, a cardiac surgeon at Sana Cardiac Surgery, Stuttgart, Germany with a specialist interest in heart rhythm surgery. He told *EACTS Daily News* that the subject matter highlighted both the growing number of AF cases in the increasingly ageing population, and the increasing appetite to find the best evidence-based solution for any particular patient's AF needs. "In this symposium, we want to address how to implement the evidence that patients with AF do better when ablated surgically during concomitant cases. But importantly, we also need to know how to do this in clinical practice, being as effective and safe as possible," he pointed out. "AF is still often considered a minor co-morbidity. Since its efficacious treatment will pay off in a mid-term time frame but surgeons usually are 'measured' in 30-day outcome, there is still a way to go to change the mind-set that AF in many patients should be considered as important as other structural heart disease we treat."

Commenting on the subject matter covered by the symposium, Dr Weimar explained that the programme focuses on increasing awareness of the benefits related to surgical AF ablation. "Despite the evidence that led to a class I recommendation, there is still undertreatment of AF during cardiac surgery. When and why we should do it, and understanding the decision-making process, are central to maximising patient benefits." This will also be the topic of his talk at the symposium, including strategies to implement a successful AF programme and a good rationale for efficacious decision-making.

The lunchtime symposium features leading experts in the field of surgical AF ablation. Manuel Castellà, MD, Hospital Clinic Barcelona, Spain, who was part of the ESC/EACTS guidelines committee, will discuss the evidence behind surgical AF ablation with, 'It is not a lack of evidence: the rationale to treat AF'.

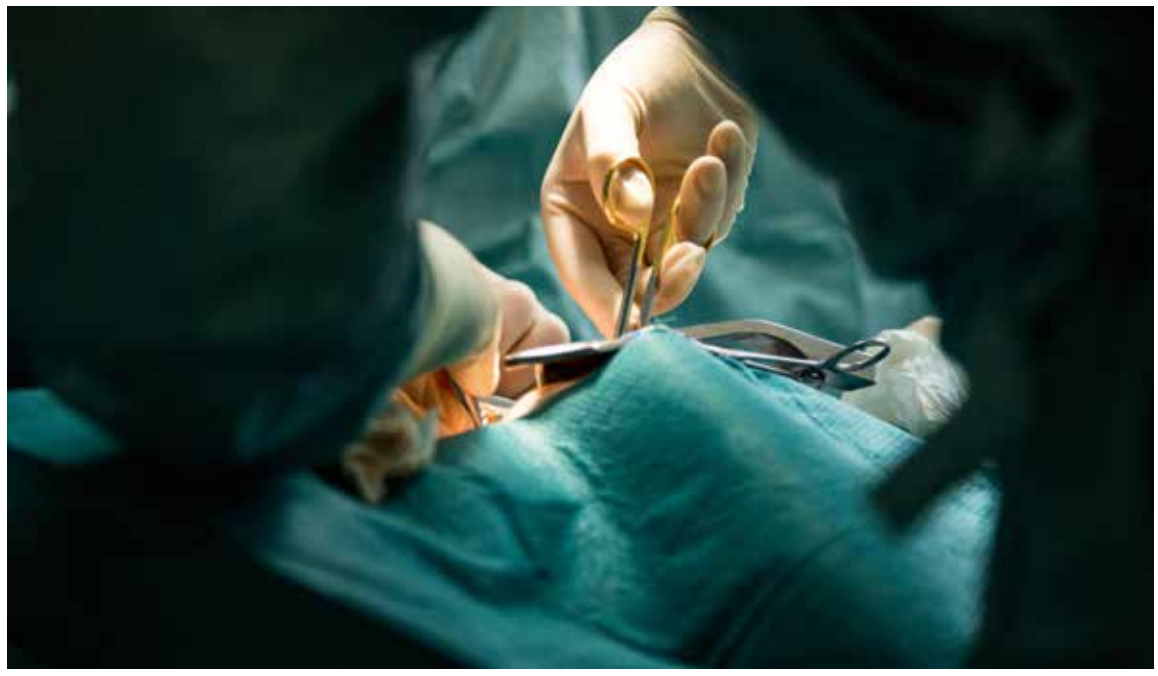
Referring to Dr Castellà's talk, Dr Weimar said that, "surgeons still easily find an excuse not to treat AF. Mainly they fear to add complexity and risk to their procedures, or question the potential benefit. Both can be countered best by education, training and peer to peer discussions, which all should be provided by this symposium."

Nicolas Doll, MD, also from Sana Cardiac Surgery in Stuttgart, will give a talk entitled, 'Lessons learned: how to implement technology to improve patients' outcomes.' Dr Doll will discuss how technology for surgical AF ablation has evolved. His talk will focus on the practical implementation of technology supported by live-in-a-box tutorials. Dr Doll explained: "Modern technology allows to create reliable lines of ablation and to efficaciously manage the left atrial appendage. The concomitant ablation has become a standard in my institution for patients with AF."

Guidelines support greater penetration of surgical AF ablation use

Stressing that greater consideration needs to be given to longer-term outcomes in this patient population, Dr Weimar said: "We know that with surgical AF ablation, patients have improved quality of life and we also potentially impact stroke risk, but we need to increase confidence among surgeons to perform this procedure."

Supporting his plea for greater uptake of surgical AF ablation are the Society of Thoracic Surgeons 2017 Clinical Practice Guidelines for the Surgical Treatment of Atrial Fibrillation,[1] published in early 2017. "These Class I recommendations should actually trigger the abandonment of questioning the proof that the benefit exceeds by far any potential risk we might add by an ablation. I would even take it a step further: Recent reports from the STS-Database even suggest that not performing an ablation in AF-patients with double or triple valve procedures is a predictor for perioperative mortality. It seems that we repeat history when we think of the early days when we decided to either fix the valve or perform CABG, because doing both was considered too complex. Until we found out that mortality was actually decreased by doing it simultaneously."



When and how to perform surgical AF ablation?

From the surgical perspective, there are different lesion sets that can be applied depending on the underlying pathology responsible for the AF. The lesion set chosen also depends on the primary procedure being performed. Discussing his upcoming talk, Dr Weimar said that he aims to give the audience an idea of the optimal approach in terms of the best possible success rate for a particular patient in the light of the primary procedure being carried out. "How is the decision made? What kind of lesions are applied, and what rate of success can be expected?" he remarked, reflecting on the questions he would be answering during his talk.

Concomitant surgical AF ablation

AF is present in approximately 35% of patients presenting for mitral valve surgery, and in 1% to 6% of adult patients undergoing other forms of cardiac surgery. If the AF is left untreated, the patient is subject to increased morbidity and mortality, and for this reason concomitant management of the arrhythmia is indicated in most patients undergoing cardiac surgery with pre-existing AF.[2] For example, in patients with preoperative AF undergoing CABG, 10-year survival was reduced by 24% compared with patients without AF.[3] On the other hand, if we add an ablation to CABG patients with AF, survival at one year is significantly higher.[4]

"This becomes also relevant in our mitral patients as well. The valve pathology might lead to anatomical- and electrophysiological remodelling of the atria, and this can lead to atrial fibrillation," explained Dr Weimar. "Since we also fix the valve which is a substrate for AF in addition to the ablation we can achieve exceptional results."

Surgical treatment of lone AF

Finally, Mark La Meir, MD, from the Academic Hospital Maastricht, the Netherlands, will discuss the 'AF heart team approach to optimise the treatment of AF patients.' Dr La Meir, an expert in the field of AF surgery, switches gears to the stand-alone AF patient and will discuss how to move to a Heart Team approach, and treat patients simultaneously with surgical and electrophysiological techniques. "The combination of both techniques, surgical and catheter ablation, should give difficult to treat patients with lone AF a very good option while keeping the procedure's invasiveness to a minimum," he pointed out. Besides insights in modern ways to treat lone AF, he will show a video where he ablates epicardially, while the electrophysiologist simultaneously checks the lines and adds ablations endocardially if necessary.

What is it all about?

Prior to the EACTS lunch symposium, Dr Weimar concludes "it is time to break with dogma, balance the evidence out there and consider all our possibilities to give the best possible outcome to our patients. It is our own responsibility as surgeons to gain the knowledge and training that it takes to achieve this goal. With a considerable prevalence in our cardiac surgery patient population this is also true for the treatment of AF."

The AtriCure lunch symposium will be held on Monday 9 October, 2017, at 12:45-14:00 in Room 0.31/0.32.

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Is the trip to the O.R. becoming a trip to the Cath Lab for ACS patients?

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Antonio Panza (left) and Severino Iesu

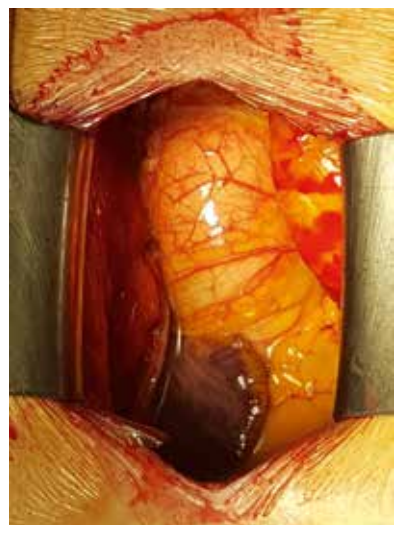

Figure 1. Full sternotomy through a 10 cm skin incision

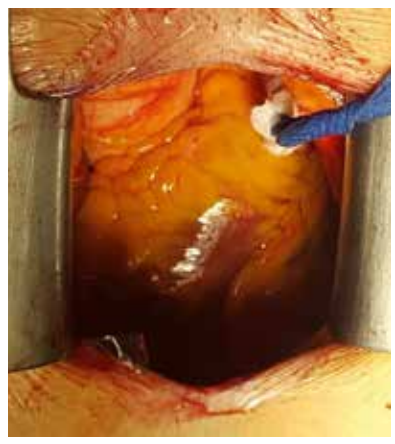

Figure 2. Enucleated heart

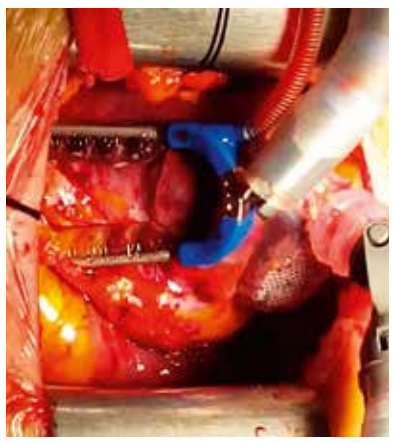

Figure 3. OPCAB

Recent studies have confirmed that surgical revascularisation is the gold standard treatment in multivessel coronary patients. However, very often the perception that PCI is a much less invasive procedure tips the balance in favour of the percutaneous choice. In our high volume OPCAB centre our effort has always been to reduce the invasiveness of surgery, objectively and subjectively. In order to compete with PCI invasiveness we adopted a composite surgical strategy which we called the **MORE** approach: **M**ininvasive + **O**PCAB + **R**apid SICU exit + **E**xtubation in operating room (O.R.)

We present the results of the MORE revascularisation protocol in acute coronary syndrome (ACS) patients.

From November 2016 to March 2017, 120 patients underwent OPCAB procedure for recent ACS. Criteria for enrolment into the MORE study were haemodynamic stability, no high-risk of bleeding and EF ≥ 45%. Criteria for OR extubation were: normothermia, good cardiac output and no evidence of bleeding. In 75 ACS patients (62%) the MORE protocol was attempted. Mean age was 64.4 years, 70% were male and mean EF was 52.6%.

The **MORE** approach involved: a lower partial or a full sternotomy through a 10 cm skin **M**inincision; complete **O**ff-pump revascularisation (preferable arterial and anaortic); **R**apid mobilisation: immediate patient/relatives interaction at arrival in the Surgical Intensive Care Unit (SICU), seated edge of bed after two hours, out of bed after four hours and same-day transfer to the Coronary Intensive Care Unit (CICU); **E**xtubation in the O.R.

Five patients failed O.R. extubation and 10 patients needed incision extension for poor coronary vessel exposure. The remaining 65 (86%) entered the MORE approach study. We did not register any operative mortality, perioperative MI or CV events. Mean graft/patient ratio was 2.8. At SICU arrival all patients were able to interact with their relatives. Early mobilisation allowed 60 (92%) patients to be seated edge-of-bed after two hours and 28 (43%) patients to be out of bed after four hours. In the afternoon, 55 patients returned to the CICU. This rapid SICU exit allowed 21 afternoon patients to be accommodated in the SICU bed, freed up by the morning cases. This offered economic benefits: taking up less 'valuable bed space' in the first operative day, and increasing the number of the surgical procedures as a result of an improved SICU bed availability.

We conclude that the MORE protocol allowed selected ACS OPCAB patients to be O.R. extubated, early mobilised and same-day discharged from the SICU. The minincision, avoiding excessive rib traction, reduced the postoperative pain and was a very well-accepted cosmetic bonus. The rapid SICU bed turnover allowed an overutilisation of our present logistic facilities. Moreover, the cardiologists favourably accepted to retake care/control of their ACS patients the same day of surgery.

Finally, the MORE protocol reducing objectively and subjectively the invasiveness of the coronary surgery may be considered a quite competitive option versus PCI.

However, the MORE approach is technically demanding and is advisable only in centres with high coronary surgery volumes and OPCAB expertise.

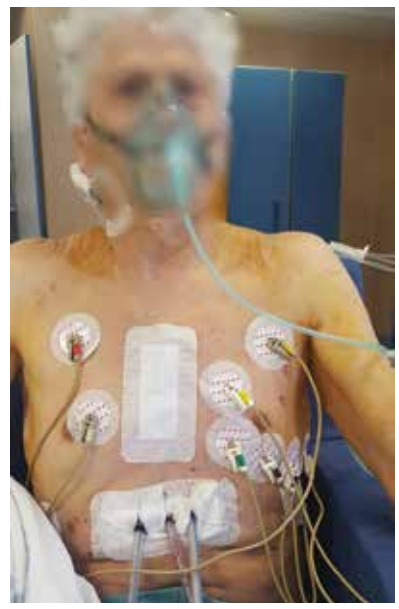

Figure 4. After two hours from OR exit, an 81 year-old quadruple OPCAB patient sitting at the edge of his bed

EACTS/PACT

The 5th EACTS and PACT Regeneration Meeting in Vienna: **Taking the Science to the Patient**

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1 Medical University of Vienna, Austria; 2 Insel Spital, Berne, Switzerland

For almost two decades, cell-based therapies have been tested in modern regenerative medicine to either replace or regenerate human cells, tissues, or organs. Especially in the field of acute myocardial ischemia (AMI), advanced therapeutic medical products (ATMPs, e.g. stem-cell) therapies have been advocated as novel therapy for the treatment of acute AMI in order to prevent cardiomyopathy.

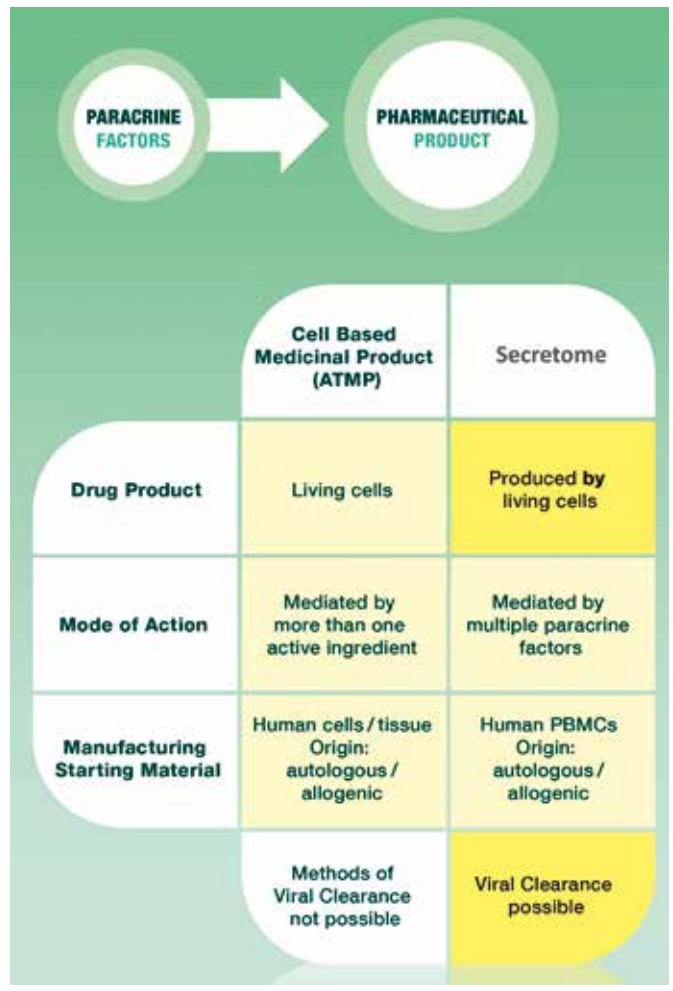
Recent meta-analysis has identified this assumption as flawed[1]. Despite this disconcerting publication, the field is thriving. Double blind, placebo controlled clinical trials are currently under way to prove to society efficacy in stroke, AMI, and multiple sclerosis – as such, the intravenous application of allogeneic mesenchymal stem cells was recently approved for the treatment of graft-versus-host disease in Japan[2]. The concept of allogeneic 'off the shelf' ATMPs have found wide regulatory approval, and currently multiple human 'proof of concept studies' (PoCs) are performed worldwide.

Of particular relevance to regulatory bodies is the fact that 'safety issues' and the 'reproducibility of production' of ATMPs are paramount to local- and supranational regulatory bodies. After these issues were resolved by scientists/companies, no objections were voiced against monitored clinical trials by the agencies. Another surprise to the basic researcher was the fact that regulatory bodies accepted the scientific findings that cell-based therapies have multiple mechanisms of action (MOA). Thence, the ATMP industry has set the foundation for a drug compound with multiple MOA, defined a toxicological pathway for these cell-based therapies, and initiated a constructive discourse with regulatory bodies in defining the safe path to clinical trials with patients of unmet need.

The exciting field of cell-based therapies is rapidly moving ahead. Currently we see that the 'cell-centric vision' is vanishing. Since 2005 it is accepted that the secretome or paracrine factors, rather than the cellular component, does foster mechanisms of tissue repair[3]. From 2011 onwards, the experimental work is heading towards the sole application of paracrine factors derived from mesenchymal stem cells (MSCs) or peripheral mononuclear cells (PBMCs). In those experiments, it has been shown that concentrated or lyophilised culture medium had similar capacities as cell based therapies in multiple preclinical disease models[4,5].

Under the direction of Professor Schmid, the EACTS has spearheaded a regeneration focus. This year we have prepared the 5th Regeneration Meeting in Vienna together with the Platform Of Advanced Therapy Austria (PACT Austria; www.pact.at), with the title "Taking the Science to the Patient". Clinicians, basic researchers, service providers, toxicologists and regulatory affairs will share their knowledge to the interested public. We welcome everybody who is interested in this exiting field.

The 5th EACTS and PACT Regeneration Meeting will take place from November 30 to December 1, 2017 in Vienna.



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1. Circ Res. 2016 Apr 15;118(8):1254-63. doi: 10.1161/CIRCRESAHA.115.307347
2. Int J Hematol. 2016 Feb;103(2):155-64. doi: 10.1007/s12185-015-1930-x. Epub 2016 Jan 12.
3. Nat Med. 2005 Apr;11(4):367-8.
4. Apoptosis. 2016 Dec;21(12):1336-1353.
5. Stem Cells Transl Med. 2016 Sep 22. pii: sctm.2016-0071. [Epub ahead of print]

Cardiac | Abstract | Improving transcatheter aortic valve implantation

Acute and six-month results of the Symetis ACURATE neo transapical multicentre trial

Lenard Conradi University Heart Center Hamburg, Department of Cardiovascular Surgery, Germany

The success story of transcatheter aortic valve implantation (TAVI) continues with ever increasing procedural volumes and the accumulation of promising mid-term outcomes in inoperable or high-risk patients with symptomatic, severe aortic stenosis. In the current focused update of the 2014 North American ACC / AHA Guidelines on valvular heart disease, TAVI may now also be considered in patients at intermediate risk for surgical aortic valve replacement. Mutual consent of an interdisciplinary heart team of cardiac surgeons and interventional cardiologists is still an indispensable prerequisite for the indication for TAVI.

The most commonly used access is the retrograde transfemoral (TF) route. Today, the majority of patients are eligible for TF TAVI, which can be performed in conscious sedation with an excellent procedural safety profile. However, a relevant share of patients treated by TAVI today – in particular the elderly, comorbid patient population – present with peripheral artery disease precluding them from a TF approach. For this subset, comprising approximately 20% of cases in Germany, the antegrade transapical (TA) approach is most commonly chosen. At present, only two device types are available for TA TAVI: the balloon-expandable Sapien valves (Edwards Lifesciences, Irvine, CA, USA) and the self-expanding ACURATE valves (Boston Scientific, MA, USA). The Boston Scientific TAVI system has recently been reiterated to include a novel 22 F outer diameter, low-profile, sheathless TA catheter compatible with the self-expanding, supra-annular ACURATE neo transcatheter heart valve (THV) which has been commercially available with a TF delivery system since 2014 and which allows implantation in an annulus range of 21–27 mm.

Acute and 6-month results of the ACURATE neo TA prospective multicentre study will be presented for the first time at the 2017 EACTS Annual meeting. The study was conducted at 7 German centres and included a total of 60 patients with a pronounced risk for surgery who were ineligible for a TF approach (mostly due to severe peripheral artery disease). Mean logistic European System for Operative Risk Evaluation (logEuroSCORE I) was 20.9±8.9% due to the presence of relevant comorbid conditions such as coronary artery disease in 71.7%, previous coronary artery bypass grafting in 18.3%, and chronic renal failure in 25.0%. Mean patient age was 79.8±4.7 years.

Procedural success was accomplished in 98.3% of patients. A truly minimally-invasive, non-rib spreading approach using soft tissue retractors only was used in 88.3% of cases. Apical access site complications occurred in one patient only. Overall procedural, 30-day and 6-month mortality rates were 1.7%, 8.3% and 15.0% respectively, most likely due to the increased risk profile of the patients. Functional results were excellent with no paravalvular leakage greater than mild observed in any patient, and a mean transvalvular gradient of 6.3±2.3 mmHg at six months.

This study demonstrated the safety and efficacy of TA TAVI using the novel low-profile ACURATE neo TA delivery system and the ACURATE neo THV. Favourable rates of device success and excellent haemodynamic results were accompanied by ease of implantability and a superior procedural safety profile. This TAVI system complements the current armamentarium for the treatment of high- or intermediate-risk patients with severe aortic stenosis. Results will be confirmed in the post-market CHANGE neo TA registry.

Figure 1. The Boston Scientific ACURATE neo transcatheter heart valve consists of a self-expanding nitinol frame and a trileaflet porcine pericardial valve. The novel, sheathless transapical delivery catheter has an outer diameter of 22F. (Images courtesy of Boston Scientific)

EACTS 2017 **Agenda**

Saturday 7 October

08:00	Translational and Basic Science Course – Theory and reality of university-based enquiry	0.31/ 0.32	Academy
08:00	Surgery at the crossroads	Hall A	Techno College
09:00	Update on the Thymus	Hall K1	Techno College
10:00	Translational and Basic Science Course – Cardiac: Alpha Gal and Bio valve Immunology	0.31/ 0.32	Academy
10:00	Imaging and 3D techniques	Hall A	Techno College
12:00	Translational and Basic Science Course – Thoracic: The tissue is the issue: Building translational…	0.31/ 0.32	Academy
12:30	1st International EACTS Ventricular Assist Device (VAD) Co-ordinators Symposium and anti-c…	0.11/ 0.12	Academy
13:30	New techniques: the developers corner	Hall A	Techno College
14:00	Translational and Basic Science Course – Cardiac: Repair medicine and Application: from expe…	0.31/ 0.32	Academy
14:00	Hands-on arterial switch operation – Congenital drylab	Hall K2	Advanced Techniques
16:00	Translational and Basic Science Course - Regulatory aspects of Innovation: What do we have to know as innovative surgeons	0.31/ 0.32	Academy
16:00	Transcatheter techniques and atrioventricular valves	Hall A	Techno College

Sunday 8 October

08:30	Getting to the root	0.11/ 0.12	Abstract
08:30	Translational and basic science course – when regulatory where overcome: Human trials	0.31/ 0.32	Academy
08:30	Challenges in patients with connective tissue disorders	Hall E1	Focus Session
08:30	Controversies on perioperative management of infant undergoing procedure	Hall F2	Focus Session
08:30	Making vein grafts great again	Hall G1	Focus Session
08:30	Optimal antithrombotic management in patients undergoing coronary artery bypass grafting; …	Hall G2	Focus Session
08:30	Pleural empyema management	Hall K1	Focus Session
08:30	Will mini aortic valve replacement become the gold standard?	Hall K2	Focus Session
08:30	Perfusion session 1: Heater cooler induced infections	0.14	Focus Session
08:30	Research in medicine: getting acquainted with a scientific meeting as a starting researcher	2.31	Focus Session
08:30	Young Investigator Award – Semi Final 1	Hall E2	Rapid Response
08:30	Coronary artery bypass grafting – a bit of science	Hall F1	Rapid Response
08:30	Arterial revascularisation after the ART trial	Hall D	Professional Challenge
08:45	Allied Health Professionals – Prevention and management of wounds	2.32/ 2.33	Focus Session
	Break		
10:15	Translational and basic science course – Discussion and outcomes	0.31/ 0.32	Academy
10:15	Innovative techniques for mitral valve therapy	Hall G1	Abstract
10:15	Left ventricular restoration and hypertrophic cardiomyopathy surgery – Healing the left ventricle	Hall K2	Abstract
10:15	Facing complications during and after emergent surgery for aortic dissection	Hall E1	Focus Session
10:15	Grown-up congenital heart 1	Hall F2	Focus Session
10:15	Current and future options in the treatment of aortic valve stenosis	Hall G2	Focus Session
10:15	End-stage emphysema management	Hall K1	Focus Session
10:15	Perfusion session 2: Improving perfusion	0.14	Focus Session
10:15	Allied Health Professionals – Quality improvement initiatives	2.32/ 2.33	Focus Session
10:15	Research in medicine: your manuscript as the next scientific breakthrough	2.31	Focus Session
10:15	Young Investigator Award – Semi Final 2	Hall E2	Rapid Response
10:15	Jeopardy	Hall F1	Rapid Response
	Cash lunch available		
12:00	Minimally invasive coronary artery bypass grafting	Hall D	Focus Session
12:00	Complications after endovascular aortic repair: new challenge for open surgery	Hall E1	Focus Session
12:00	Grown-up congenital heart 2	Hall F2	Focus Session
12:00	Hot topics in transcatheter aortic valve implantation	Hall G1	Focus Session
12:00	Mitral Repair – Decision making in mitral surgery: trying to fill the gaps in evidence!	Hall G2	Focus Session
12:00	Health care design; opportunities and challenges for the future	Hall K2	Focus Session
12:00	Perfusion session 3: Mechanical circulatory support – state of the art	0.14	Focus Session
12:00	Interdisciplinary competency training: Standardisation, assessment and risk reduction in the tra…	0.11/ 0.12	Focus Session
12:00	Allied Health Professionals – Abstracts	2.32/ 2.33	Focus Session
12:00	C. Walton Lillehei Young Investigator Award / EACTS/ LivaNova Cardiac Surgery Innovation A…	Hall E2	Rapid Response
12:00	The icing on the cake	Hall F1	Rapid Response
12:00	How to set up thoracic surgery research trials	Hall K1	Focus Session
14:00	Surgical Videos	Hall F2	Abstract
14:00	Short-term mechanical support	0.14	Abstract
14:00	Heart transplantation is still the best long-term option	0.31/ 0.32	Abstract
14:00	An old battlefield with casualties: infection of the aorta	Hall E1	Focus Session
14:00	What is new in left main disease	Hall G1	Focus Session
14:00	Work life balance in cardio-thoracic surgery	Hall G2	Focus Session
14:00	Update on chest trauma	Hall K1	Focus Session
14:00	Personalised external aortic root support	Hall K2	Focus Session
14:00	Evolution in bioprosthetic valve design	0.11/ 0.12	Focus Session
14:00	Allied Health Professionals – Hands on session	2.32/ 2.33	Focus Session
14:00	Research in medicine: the ultimate currency for every academic career?	2.31	Focus Session
14:00	Coronary artery bypass graft: Miscellaneous, robotics and off-pump	Hall F1	Rapid Response
14:00	The 2017 EACTS/ESC Guidelines on valvular heart disease	Hall D	Focus Session
14:30	The Quality Improvement Programme	0.49/ 0.50	Focus Session
	Exhibition Opens		
15:45	Thoracic Rapid Response 1	Hall E2	Rapid Response
15:45	Congenital Rapid Response	Hall F1	Rapid Response

Monday 9 October

08:15	Risk score	0.14	Abstract
08:15	Coronary artery bypass grafting: Factors effecting outcomes	0.31/ 0.32	Abstract
08:15	Late breaking clinical trials & evidence	0.49/ 0.50	Abstract
08:15	Robotics in general thoracic surgery	2.32/ 2.33	Abstract
08:15	Coronary problems	Hall F2	Focus Session
08:15	Endocarditis surgery	Hall G1	Focus Session
08:15	Work in progress	Hall G2	Focus Session
08:15	Anatomical segmentectomies	Hall K1	Focus Session
08:15	Ethical and surgical issues in organ transplantation	Hall K2	Focus Session
08:15	Research in medicine: increasing the impact of your study	0.11/ 0.12	Focus Session
08:15	EACTS/PASCaTS – Controversies in Rheumatic Heart Valve Surgery: Valve Selection	0.94/ 0.95	Focus Session
08:15	Rhythm issues	Hall E2	Rapid Response
08:15	Aortic valve repair	Hall F1	Rapid Response
08:15	A snapshot on transcatheter aortic valve implantation	Lnge 6	Postgraduate Education
08:15	Minimally invasive mitral and tricuspid valve surgery – standard of care?	Hall D	Professional Challenge
08:15	Challenges in the management of aortic arch diseases	Hall E1	Professional Challenge
	Break. Exhibition Halls		
10:15	Valves	Hall F2	Abstract
10:15	Lung cancer – controversies	Hall K1	Abstract
10:15	Conduction disturbances after aortic valve interventions	0.14	Abstract
10:15	Cardiac tumours	0.31/ 0.32	Abstract
10:15	Lung transplant advanced techniques	2.32/ 2.33	Abstract
10:15	The poor right ventricle in combination with tricuspid regurgitation	Hall G1	Focus Session
10:15	Rarities in cardio-thoracic surgery	Hall G2	Focus Session
10:15	Atrial fibrillation surgery in 2017	Hall K2	Focus Session
10:15	Statistics in medicine: 'learning the basics' for clinicians	0.11/ 0.12	Focus Session
10:15	Rapid deployment valves: New evidence & clinical cases discussion	0.49/ 0.50	Focus Session
10:15	SBCCV – Clinical, social and economic impact of the new valve technologies in southern hemisp…	0.94/ 0.95	Focus Session

Congenital | Vascular | Cardiac | Thoracic | Plenary | All

10:15	Coronary artery bypass surgery – latest updates	Hall E2	Rapid Response
10:15	Extra corporeal life support – Always a good solution	Hall F1	Rapid Response
11:50	Presidential Address	Hall D	Plenary
	Lunch. Exhibits. Satellite Symposia		
14:15	Management of miscellaneous aortic valve disease	Hall F2	Abstract
14:15	Minimally invasive aortic valve replacements	0.31/ 0.32	Abstract
14:15	Meet the Experts	0.94/ 0.95	Abstract
14:15	Chest wall	2.32/ 2.33	Abstract
14:15	How to approach the aortic valve in a dilated root	Hall E1	Focus Session
14:15	2017 Perioperative blood management guidelines	Hall G1	Focus Session
14:15	Nightmares in cardiothoracic surgery	Hall G2	Focus Session
14:15	Metastasectomy	Hall K1	Focus Session
14:15	Short-term mechanical circulatory support	Hall K2	Focus Session
14:15	Aviation medicine and cardiac surgery	0.14	Focus Session
14:15	Statistics in medicine: more advanced statistics for the clinician	0.11/ 0.12	Focus Session
14:15	Beating heart mitral valve repair	0.49/ 0.50	Focus Session
14:15	Awards Final	Hall E2	Rapid Response
14:15	Jeopardy Final	Hall F1	Rapid Response
14:15	News from the trials world	Hall D	Focus Session
	Break. Exhibition Halls		
16:00	Surgical management and outcomes	Hall F2	Abstract
16:00	Patient blood management to reduce surgical risk	Hall G2	Abstract
16:00	Oncology-preoperative assessment	Hall K1	Abstract
16:00	Light and shades of the arch	0.14	Abstract
16:00	Structural valve deterioration in aortic valve	0.11/ 0.12	Abstract
16:00	Coronary artery bypass grafting – Intraoperative graft flow assessment	0.31/ 0.32	Abstract
16:00	Non-Oncology pleura/ pneumothorax	2.32/ 2.33	Abstract
16:00	Bicuspid aortic valve repair as primary option in young patients	Hall E1	Focus Session
16:00	Catastrophic complications and super saves	Hall G1	Focus Session
16:00	The surgeons role in cardiac implantable electric devices	Hall K2	Focus Session
16:00	Beyond artificial chords	0.49/ 0.50	Focus Session
16:00	Aortic valve replacement in a nutshell	Hall E2	Rapid Response
16:00	Welcome to the machine – new concepts in ventricular assist device therapy	Hall F1	Rapid Response

Tuesday 10 October

08:15	"La terra di mezzo" The middle earth of aortic surgery	0.14	Abstract
08:15	Tricuspid valve: no longer forgotten	0.31/ 0.32	Abstract
08:15	Mitral valve surgery: Complex issues	0.49/ 0.50	Abstract
08:15	Ventricular assist device therapy – choose the treatment and deal with the complications	Hall D	Focus Session
08:15	PROs and CONs arena on aortic controversies	Hall E1	Focus Session
08:15	Outside the box of cardiothoracic surgery	Hall G2	Focus Session
08:15	VATS-lobectomy adoption rates – why aren't we all doing VATS and how can we improve this?	Hall K1	Focus Session
08:15	Everything on randomized trial design and data interpretation	0.11/ 0.12	Focus Session
08:15	Challenging issues in Fontan pathway: Part 1	Hall K2	Professional Challenge
08:15	Long-term follow-up after cardiac surgery	Hall E2	Rapid Response
08:15	Risk scores; indications, contraindications and side effects	Hall F1	Rapid Response
08:15	A snapshot on transcatheter aortic valve implantation	Lnge 6	Postgraduate Education
08:15	Improving outcomes of coronary artery bypass grafting	Hall F2	Professional Challenge
08:15	Cardiac crossroads: deciding between mechanical or bioprosthetic heart valve replacement	Hall G1	Professional Challenge
	Break. Exhibition Halls		
10:15	Oncology lymph nodes and staging	Hall K1	Abstract
10:15	The challenges of endovascular approach in thoracic aorta	0.14	Abstract
10:15	Ross / Homograft	0.31/ 0.32	Abstract
10:15	Sternal wound complications	0.49/ 0.50	Abstract
10:15	Oncology – Lung cancer: Outcome	2.32/ 2.33	Abstract
10:15	Complex mitral valve repair video session	Hall D	Focus Session
10:15	How far away are we from setting guidelines for arch surgery?	Hall E1	Focus Session
10:15	How to use coronary, valvular and aortic guidelines in clinical practice	Hall G2	Focus Session
10:15	Statistics in medicine: meta-analysis from start to finish	0.11/ 0.12	Focus Session
10:15	Challenging issues in Fontan pathway: Part II	Hall K2	Professional Challenge
10:15	Current developments in transcatheter aortic valve implantation	Hall E2	Rapid Response
11:50	Honoured Guest Lecture	Hall D	Plenary
	Lunch. Exhibits. Satellite Symposia **Residents Luncheon, Crystal Lounge, Level 1**		
12:45	Nightmare cases	Hall K1	Focus Session
14:15	Tetralogy of Fallot / Pulmonary atresia	Hall K2	Abstract
14:15	Surgical management of effective endocarditis: analysis of early and late outcomes 1	0.49/ 0.50	Abstract
14:15	Oesophageal Surgery	2.32/ 2.33	Abstract
14:15	Left atrial appendage occlusion when and how	Hall D	Focus Session
14:15	How to cope with the aberrant right subclavian artery (ARSA) in aortic surgery	Hall E1	Focus Session
14:15	2017 Perioperative medication guidelines	Hall F2	Focus Session
14:15	Everything you need to know about transcatheter mitral valve replacement	Hall G1	Focus Session
14:15	How to do it; Live in a box	Hall G2	Focus Session
14:15	Surgery for Stage IIIAN2 NSCLC	Hall K1	Focus Session
14:15	Statistics in medicine: from 'simple' multivariable models to complex	0.11/ 0.12	Focus Session
14:15	Alternative surgical approaches for aortic valve replacement	0.31/ 0.32	Focus Session
14:15	New aspects in mitral valve surgery	Hall F1	Rapid Response
	Break. Exhibition Halls		
16:00	Outcomes in arterial and off-pump coronary artery bypass grafting	Hall F2	Abstract
16:00	Growing needs: ablation, lead extraction and left atrial appendage- closure	Hall G1	Abstract
16:00	Improving transcatheter aortic valve implantation	Hall G2	Abstract
16:00	Preoperative assessment of lung cancer patients	Hall K1	Abstract
16:00	Coarctation	Hall K2	Abstract
16:00	Managing degenerated aortic prosthesis	0.11/ 0.12	Abstract
16:00	Controversies in left ventricular assist device therapy	0.31/ 0.32	Abstract
16:00	Surgical management of effective endocarditis: analysis of early and late outcomes 2	0.49/ 0.50	Abstract
16:00	Airway	2.32/ 2.33	Abstract
16:00	Secondary mitral regurgitation – still a surgical problem?	Hall D	Focus Session
16:00	The changing trend in the treatment of thoraco-abdominal aortic aneurysm	Hall E1	Focus Session
16:00	Is no-suture the future for aortic valves?	Hall E2	Rapid Response
16:00	Advances in mitral valve surgery	Hall F1	Rapid Response
16:00	Thoracic Rapid Response 2	0.14	Rapid Response

Wednesday 11 October

09:00	Outcome of mitral valve surgery	Hall G1	Abstract
09:00	Thoracic Case Session 1	0.49/ 0.50	Abstract
09:00	Nightmares in cardiac surgery	2.31	Abstract
09:00	Tricuspid valve: surgery for who, when and how	0.31/ 0.32	Advanced Techniques
09:00	Wetlab – Chest Wall Reconstruction & "Bronchial Sleeve Resections"	2.91	Advanced Techniques
09:00	Aortic root pathology	Hall D	Focus Session
09:00	Multi-arterial coronary revascularisation in coronary artery bypass grafting: State of the art an…	2.32/ 2.33	Focus Session
09:00	Introduction to mitral valve repair & Wetlab	Hall K2	Advanced Techniques
09:00	Controversies & Catastrophes in Adult Cardiac Surgery	Hall G2	Advanced Techniques
10:45	Innovative strategies for surgical AVR	Hall G1	Advanced Techniques
10:45	Surgical challenges in bicuspid aortic valve syndrome	Hall D	Advanced Techniques
11:00	Thoracic Case session 2	0.49/ 0.50	Abstract
11:00	Dealing with complex adult cardiac surgery including transplantation. Live-in-a-box	0.31/ 0.32	Advanced Techniques
11:00	Wetlab – Chest Wall Reconstruction & "Bronchial Sleeve Resections"	2.91	Advanced Techniques
11:00	When saphenous veins are a necessary choice use them wisely and for the appropriat…	2.32/ 2.33	Focus Session

General | Focus | Allied Health Professionals programme

‘Allied Health Professionals’ symposia featured today

Today’s series of Allied Health Professionals sessions will explore the key topics in the field. Speaking to *EACTS Daily News*, Richard Van Valen, a nurse practitioner at the Erasmus University Medical Center in Rotterdam, the Netherlands, gave a glimpse into the programme, its design and core aims.

What was the driving force in the development of the Allied Health Professionals programme? How important is it to foster exposure of Allied Health topics?
EACTS has recognised the role of allied health professionals in cardiac and thoracic surgery for many years. The group was established with help of former Secretary General Pieter Kappetein. We have the goal to become the main platform for the exchange of science and networking in the field of cardiothoracic surgery. Our motto has always been: “Great cardiothoracic surgery deserves great nursing”.

The group is, however, vulnerable. The amount of scientific output from this group is growing, but opportunities to share this knowledge and discuss it with peers and others are scarce, especially on an international level.

EACTS and our group have tried to help allied health by offering a programme and platform for this group. The price of the annual meeting has been lowered to accommodate those with limited budgets. What’s more, the chairs of the sessions have been briefed to get discussions started and to encourage delegates to participate.

There are three main lecture sessions (management of wounds, quality improvement, abstracts): can you offer a snapshot of each one?
Each year we have an abstract session. During this session scientific work is presented by the authors. The work has been assessed on originality and importance for allied health professionals. The best presentation is given with an award, presented by Professor Pomar, together with an unrestricted educational grant (made possible by Getinge).

Quality improvement is a session we have every year. We all strive to improve patient care. This year the emphasis is on implementing and training surgical care practitioners. Allied health professionals that are trained to assist surgeons in the theatre and to perform surgical interventions. For example, we have a Dutch physician assistant (Rianne Rijsdijk) who will present on her training to perform endoscopic vein harvesting. Together with her department, she managed to perform 100 procedures in 100 days. Another important topic is the changing view on the importance of treating atrial fibrillation. There are new guidelines, so what are the consequences for allied health professionals? The same goes for CABG surgery. The talk will not emphasise surgical techniques but rather the important topics for allied health.

Allied Health Professionals Programme (Sunday)

08:45–10:00
Prevention and management of wounds

10:15–11:45
Quality improvement initiatives

12:00–13:30
Abstracts

14:00–15:30
Hands-on session

The wound session gives an oversight on current guidelines, and options to reduce surgical site infections. Despite many efforts, the problem of wound infection remains. Patients often present with comorbidities that make the occurrence of an infection more likely. During this session, a surgeon will talk on her role, and the opportunities to reduce the number of infections (Dr Kieser from Canada), an infection specialist will talk on the choices that can be made to reduce the number of infections, for example which disinfectant should be used, and the importance of programmes instead of single interventions.

You will be talking about ‘Negative Pressure Wound Therapy on closed surgical wounds’. Can you give us a glimpse of the key talking points there?
My talk will look into the potential of negative pressure wound therapy as a preventative measure in high-risk patients. I will look at the current literature to ask the question whether this intervention on a closed surgical incision can help to prevent wound dehiscence and wound infections. It is clear that the use of these kinds of therapies results in significantly higher costs compared to conventional coverage of surgical wounds.

What can we expect from the fourth, ‘hands-on’ session? Are there particular topics hoped to be focused on particularly?
The hands-on session has been introduced to show delegates new treatment modalities in small groups, and to give them time to ask questions. The allied health group comprises many disciplines – from ward nurses to surgical care practitioners. Many of them have heard of new techniques but have no or very limited exposure to them. For example, use of ECMO has become more and more common in many hospitals. But how does it work, what are the indications, and what are the possible complications? With this in mind, product specialists from ECMO device companies will give short talks followed by simulation sessions.

“Without great allied health professionals, the great work of surgeons could not be performed, and pre- and postoperative management of patients would not be possible.”

Richard Van Valen

Another topic for the hands-on will be cardiac valves. How are they created, how do they look? Delegates will be able to gain knowledge in small groups guided by specialists.

What should attendees take away from these sessions, broadly speaking? Is there an overall goal in mind?
We want delegates to end the day with a feeling of pride that they belong to this important group. Without great allied health professionals, the great work of surgeons could not be performed, and pre-, peri- and postoperative management of patients would not be possible.

Nurses and others involved should take away that doing research and looking into evidence-based practice can and should be done by allied health professionals. We hope that they will see that offering their work to a European platform is possible, and leads to exposure for the individual, but also the whole group. We hope that they will encourage others to attend and will talk to management and surgeons on the importance of attending these kinds of meetings. The costs are often a problem for allied health professionals to attend. We, however, strongly believe attending these kinds of meetings leads to inspiration of healthcare professionals, and in turn will lead to improved patient care.

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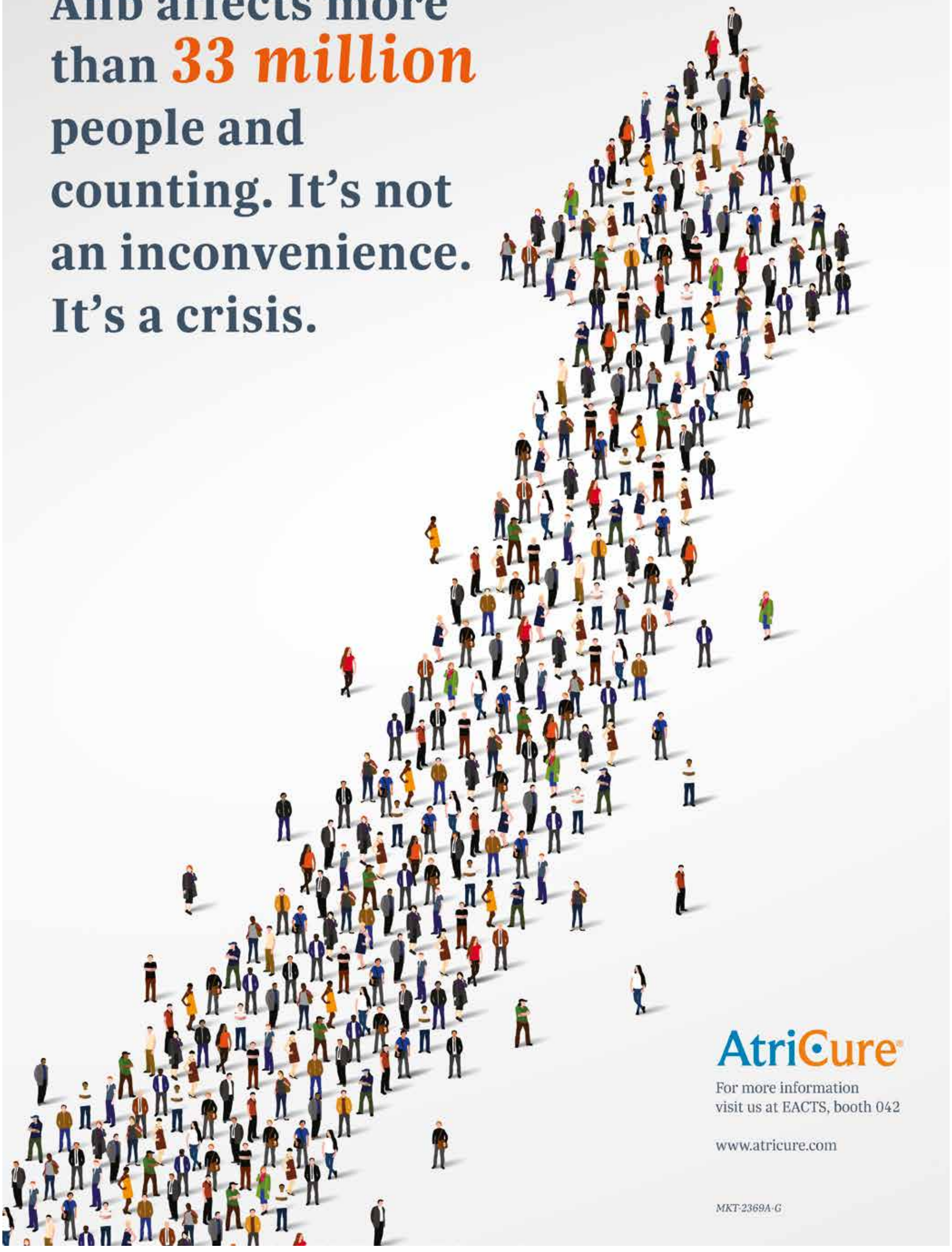

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Cardiac | Focus | Hot topics in transcatheter aortic valve implantation

What should be the approach to subclinical leaflet thrombosis in aortic valves?

Gregory Fontana is the national principal investigator for the Portico IDE study, an ongoing, prospective clinical trial to evaluate TAVR with either a Portico valve (St Jude Medical/Abbott, USA) or a commercially available valve. He will talk about a phenomenon he and colleagues uncovered that has had potentially profound consequences and sparked much debate in the field. "It has broad implications, and there's a lot of angst, passion and controversy attached to this, as well as a lot of consequences for industry," he said.

It all started when Dr Fontana and his colleagues noticed that a patient, whose procedure went well, woke up and clearly had a neurologic deficit. They scanned her, and found a rather unexpected effect. "We were pretty surprised to find one of the three leaflets wasn't moving properly. This was a curiosity," he said. "We didn't really understand what it was."

The engineers weren't able to reproduce the findings on the bench so, after conferring with collaborators on the trial, they decided to resume the study. "We couldn't explain the finding and, since hundreds and hundreds of valves had been implanted in Europe already with good results, and we were about a hundred patients into the trial in the US, we decided to resume enrolment after gaining approval from our data safety management board." Then, a few weeks later, during a routine echo it happened again.

We paused the trial, began to look in more detail at patients who'd been scanned, and discovered this was actually far more widespread than previously thought. "We were surprised to find that this asymptomatic abnormality of leaflet motion was pretty common in both the study valve and we also saw it in the control valves," said Dr Fontana. "So, we went to the US Food and Drug Administration [FDA] and discussed our findings. After a lot of study and consideration, it appeared to be a class effect and not a device-specific effect."

But the reasons behind the phenomenon puzzled the researchers. It appeared to be a completely different phenomenon than had ever been described – and far more prevalent – than early clinical symptomatic thrombosis of TAVI valves, for example. Interestingly, they noticed that patients on Coumadin, or one of the novel anticoagulants, did not experience this phenomenon – at least in this relatively small population study.

The finding caused ripples in the whole industry, because it occurred in all TAVI valves – and even surgical valves. "When we first presented it, physicians and companies were completely freaked out by the findings," he said. "It's one of the two top technologies in the cardiovascular medicine world in the last decade. Everybody was pretty concerned[1]."

He added: "I think that it's great that everyone was so concerned and this has led to a tremendous amount of effort and investment to understand it."

Since then, the FDA has mandated TAVI trials also study leaflet motion to gather more information on incidence and risk factors. For their part, Dr Fontana's group has looked at 1,000 patients with various valves and believe there's some sort of a patient-prosthesis interaction that leads to subclinical thrombosis of one or two of the leaflets, but does not cause a meaningful gradient across the valve. "We've learned a lot in the sense that we know it exists, we know it's a class effect and we are hopefully going to get a better understand why, where, and when it occurs," he said. And other investigators will be reporting data soon so there will be exciting updates during his session, there may be more questions than answers generated for the time being, added Dr Fontana.

The researchers know it is both prevented and treated by anticoagulation, for example. "If you see a patient with leaflet thrombosis and put them on Coumadin or one of the novel anticoagulants, this thrombosis goes away. That we do know," Dr Fontana explained.

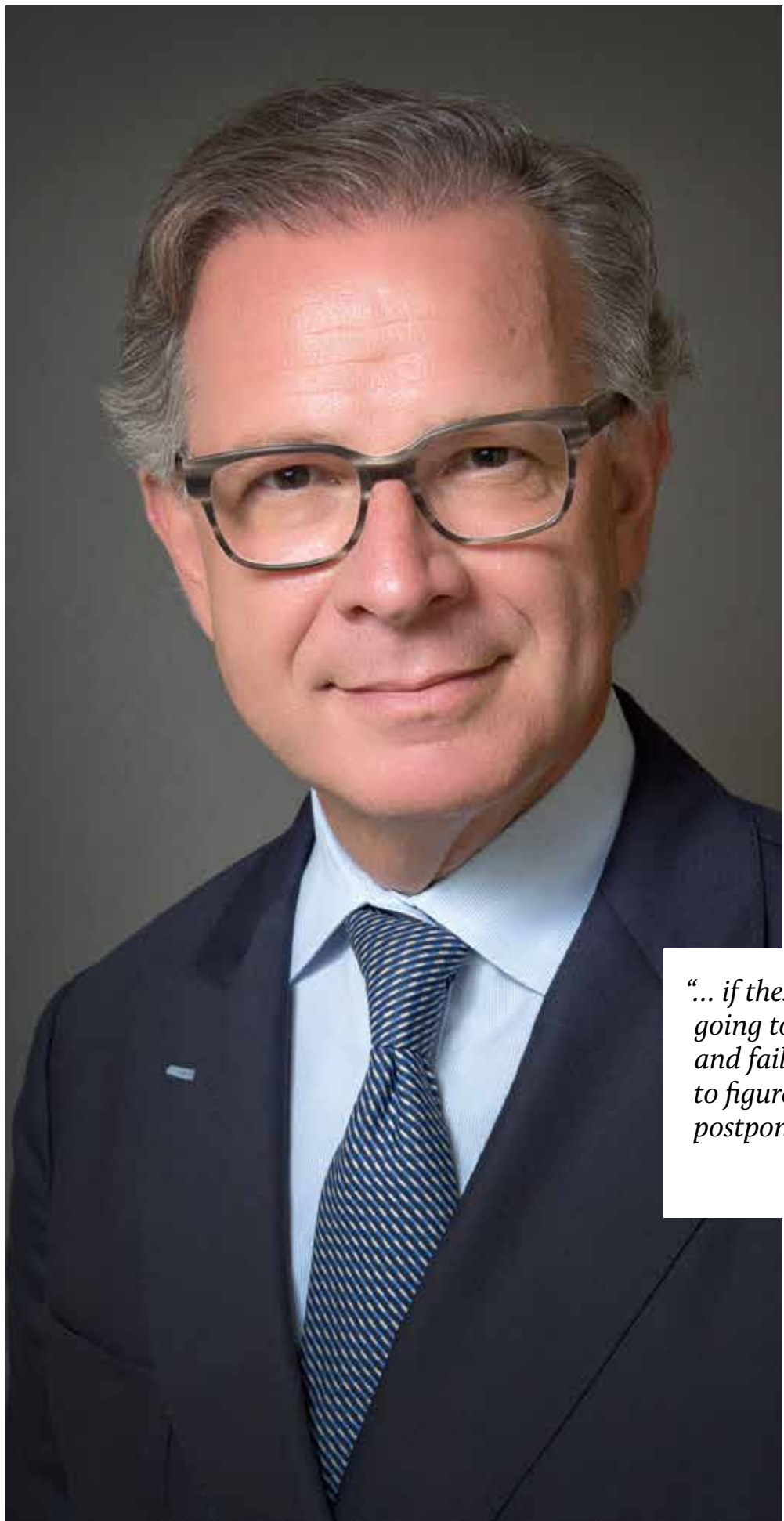
> *"When we first presented [these findings], physicians and companies were completely freaked out."*
>
> Gregory Fontana

What his group also now knows is that certain subgroups have a predisposition towards this phenomenon. "Those are patients with low cardiac output and low gradient, valves that seem to not be fully expanded and those treated with TAVI in SAVR. They have an increased risk of it happening," he explained.

What isn't known, however, are the long-term consequences. "We are not seeing a high number of patients coming in with very obstructed valves and in shock. Is one of the long-term consequences, perhaps, that patients develop an earlier degeneration of the valve?" said Dr Fontana. "We see that in the surgical valves. We see patients present within the first three years with thrombosis or within the first five to seven years with degeneration. Is this some sort of harbinger of early failure? We don't know."

The incidence varies between 4% and 30% in various valves. So, what's clear now we need to try to determine cause. The group has a number of theories, said Dr Fontana, such as whether it is some form of an immune system-stimulated thrombosis or is it flow related. "These are very important questions going forward," he added.

What is also interesting are the studies carried out on surgical valve registries in Denmark and the US. "It's quite relevant to EACTS," he said.



"Looking at surgical tissue valves in the aortic position, both studies – of many thousands of patients – indicated that if you anti-coagulated patients for the first six months or year after you put in their tissue valve, they had a better survival."

This may have profound consequences for anticoagulation. That's because although the makers of surgical valves recommend anticoagulation for at least six months, this is not common practice amongst most target patients, said Dr Fontana. "We haven't been doing that for the last 10 to 15 years because we've been operating on older and older patients and nobody wants to thin their blood when they are 80 or 90 years old and walk with a cane. That common practice has fallen by the wayside. There's a lot of interesting indications that this is a relevant phenomenon. We don't have the full understanding yet."

More information will hopefully mean new guidelines on anticoagulation, Dr Fontana underlined, but there are other guidelines that need to be updated too, he added. "There's a lot of passion and emotion around this topic but not much science, and not much agreement," he said. "Right now, the recommendations from the companies, professional societies, and regulatory bodies is dual antiplatelet therapy for TAVI valves. But trials, so far, suggest aspirin and another anti-platelet agents are neither preventative nor therapeutic. So, the current guidelines are inconsistent with our findings."

Similarly, the kinds of patients receiving these valves is changing. "Now with intermediate-risk and even low-risk patients receiving TAVI valves, doctors may be less concerned about starting patients on anticoagulation, so maybe we should use anticoagulation more liberally in these lower risk patients?" said Dr Fontana.

That's why it's now important to discover any clinical effects of the thrombosis. There wasn't a statistically meaningful increase in stroke and TIA in a small high-risk group. But it's vital to understand whether larger or younger populations might experience a statistically meaningful increase. "As we move into people who are living longer, intermediate-risk patients or low-risk patients – who may have the valve for decades – there is a real driver now to understand this, because if these valves are going to thrombose early and fail early, we want to figure out a way to postpone or pre-empt it."

So far there are two valves approved for intermediate risk, and some trials ongoing for low-risk patients. The anticoagulation approach to these groups must be determined, said Dr Fontana. "This is where people start to be a little bit more concerned around the anticoagulation strategy. What do we do with a frail person who is 85 or 90 years old versus the 65-year-old who is still working – a man or woman who has decades ahead of them?" he said. "You've got a risk-benefit balance in anticoagulation that is different in these two populations. It's a very, very important topic."

> *"... if these valves are going to thrombose early and fail early, we want to figure out a way to postpone or pre-empt it."*
>
> Gregory Fontana

And there are consequences for industry too, especially if it is established that one valve is more or less likely than another. "If one turns out to have higher incidence than the competition, that's huge. It's a multi-billion-dollar industry," concluded Dr Fontana.

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Multimedia Manual of Cardio-Thoracic Surgery (MMCTS)

MMCTS: Stay tuned for Techno-College and a new Editorial Board

The *Multimedia Manual of Cardio-Thoracic Surgery* (*MMCTS*), under the direction of the European Association for Cardio-Thoracic Surgery (EACTS), will be publishing Techno-College Live-in-a-Box video cases as online tutorials following this year's 31st EACTS Annual Meeting in Vienna.

In the past, Live-in-a-Box videos would appear only within the EACTS Media Library, and would be available only to those who attended the Techno-College sessions. This is changing. EACTS understands that it can be challenging for attendees to find time to make it to all of the presentations they want to see, so this year, *MMCTS* will make these cases freely available online to users worldwide.

In addition to publishing Techno-College tutorials, *MMCTS* is working systematically to commission new tutorials from other expert surgeons and create a comprehensive library of high-quality, narrated, and beautifully illustrated video tutorials, across all its domain sections: Core Skills, Cardiac, Congenital, Thoracic, and Vascular.

René Prêtre

Roberto Lorusso

New Editorial Board

MMCTS's Editors-in-Chief Drs Roberto Lorusso and René Prêtre have appointed a new Editorial Board of international experts in thoracic and cardiovascular surgery who will help to define the Manual's future direction and lead the drive to commission new tutorials across all cardio-thoracic surgery subject areas:

Bartosz Rylski from Herzzentrum in Freiburg will lead Core Skills. Piotr Suwalski (Central Clinical Hospital, Warsaw) is taking on Cardiac; Lorenzo Galletti (Papa Giovanni XXIII Hospital, Bergamo) will run Congenital; Lucile Houyel (Hôpital Marie-Lannelongue) will head Anatomy; and Tunc Lacin (Marmara University Hospital, Istanbul) will run Thoracic. Finally, Thomas Schachner, of Innsbruck Medical University, has agreed to lead Vascular.

Drs Lorusso and Prêtre are delighted to be able to welcome the new Board, and look forward to working with them.

Interactive Media Award: Best in Class – Medicine

A final piece of good news for 2017: Less than two months after launch, *MMCTS* and its production agency, Ashfield Healthcare, won an international award for excellence in design, functionality, professionalism, and standards compliance. The Interactive Media Awards were established in 2006 by the New York-based Interactive Media Council, and *MMCTS*'s Best in Class award recognises an almost perfect score (487 out of a possible 500 points) in all judging categories.

Are you interested in having your work published in the Multimedia Manual of Cardio-Thoracic Surgery? Please visit 'Contributing to MMCTS' at MMCTS.org to learn more.

Cardiac | Focus | Hot topics in transcatheter aortic valve implementation

A masterclass in how to tackle AR

Today's Focus session on transcatheter aortic valve implementation will feature a lecture by Gry Dahle, a specialist in cardiothoracic surgery at Rikshospitalet, at Oslo University Hospital, Norway. As one of the founder members of a catheter valve programme that began there nearly nine years ago, Dr Dahle has a very deep understanding of implanting transcatheter aortic valves for aortic regurgitation (AR). She'll spend the session talking in detail about the complexities and risks associated with using TAVI in this condition.

Today, AR causes 10.9% of all native valve disease, according to the European heart survey. "A bicuspid aortic valve is the most common congenital cause of AR, often associated with coarctation of the aorta or dilatation of the ascendens," she said.

"Aortic dissection type A and endocarditis are common causes in the adults in addition to aortic root disease, and the connective tissue disease patients are a special subgroup. The regurgitation will in the end cause dilatation of the ventricle," she added.

For TAVI there are many challenges, however, and this will be an important feature of her talk. "I'm going to focus on how to plan the procedure (evaluate patients), how we can to do the procedure properly and safely," she said.

The fact is, because calcification is usually absent in isolated AR, anchoring a TAVI valve is more challenging than in patients with aortic stenosis (AS). "It is more challenging to ensure the valve stays in place and how to see where the valve is docking. You cannot see the annulus because there are no calcium markers so it's very difficult to see where to place the valve," she explained.

Placing a valve in AS is easier: "You can have the calcium and you can see where you are going to have the annulus, to place the valve well. We must also avoid coronary obstruction."

AR patients are usually younger patients, too, and this in itself raises several questions when evaluating patients for the procedure. "Should you do TAVI in a 60-year-old? No, I don't think so," she said. "I think TAVI is expanding and the younger patients want TAVI with aortic regurgitation now. But they should not have it if they are 60 or even 70. We do not know the durability of TAVI valves. And there is an increased requirement for pacemaker implants in patients treated for AR."

"I want to focus on the problems you come across when you prepare for the patient with aortic regurgitation, the pitfalls, and which devices you can use."

Gry Dahle

She added: "It may be the best for the young patient to have a repair instead of bioprosthesis replacement. The patients should, if they do have to have a replacement, have a mechanical prosthesis."

Futhermore, with AR, valves may not be big enough. "The annuli tend to be bigger in AR than in AS. In addition, there is less calcification in AR than in AS and one has to oversize more, hence sometimes the TAVI valves tend to be too small," she said. "For AS we oversize by up to about 15%, for AR we need to oversize more – maybe 20% – and especially for the valves that have no arms, feelers or stabilisers. This because there is no calcium in the cusps."

Dr Dahle said she will focus on best approaches for patients who have been operated on before. "All re-do surgery is more complicated than primary (first-time) operations and may be of high risk," she said. "For patients that have already gone through the David procedure, supracoronary graft, Bentall procedure and valve repair with residual or recurrent AR, TAVI may be a good option and sometimes a way to postpone transplant," she said.

"In some cases, the TAVI approach may be most beneficial. Degenerated homografts tend to be very calcified in the conduit, and it can therefore be an advantage to place a valve inside the homograft."

Importantly, Dr Dahle will go into some detail about the different valves available during the session. "I want to focus on the problems you come across when you prepare for the patient with aortic regurgitation, the pitfalls, and which devices you can use," she said. There are many different options on the market; the devices that have so-called tactile feedback – including the Engager valve (Medtronic, USA), JenaValve, which is CE approved for regurgitation, and Acurate (Symetis, Switzerland; stabilizing arches) as well as the Lotus valve (Boston Scientific, USA) and the valve from Direct Flow Medical, that are repositionable and retrievable. The most recent valve to reach the market is the J-valve from China.

Dr Dahle intends to outline both the advantages and disadvantages of these different valves and those she has used successfully. "We have used some JenaValves successfully in native AR," she said. "We have also successfully used the Engager in degenerated homografts with regurgitation. The Symetis has also been used; we successfully implanted in degenerated homografts with regurgitation. and also in a patient with AR following surgery for aortic dissection with supracoronary graft. This we also did successfully with the Acurate Symetis and the Engager."

Gry Dahle

"It may be the best for the young patient to have a repair instead of bioprosthesis replacement. The patients should, if they do have to have a replacement, have a mechanical prosthesis."

Gry Dahle

Generally, however, AR should be taken more seriously than it is, she noted: "I think it is time to focus more on the patients with AR. We do not have strict 'guidelines' for when to do surgery for example. And we do not have strict criteria for echo findings and biochemical markers either. And indications for surgery are symptomatic patients."

This presents difficulties, as there are many questions to answer first, she added. "Maybe it is too late to operate after the ventricle dilates – and how does one define 'dilated'? And the patient is symptomatic – but how symptomatic? Do we operate too late on some patients?"

"The subject was discussed for the mitral valve before; if we operate earlier, a repair may be done then at least we are not replacing the valve. Then later if the repairs fail, maybe a catheter valve implantation may be the solution. Hence expanding the use of TAVI in aortic regurgitation."

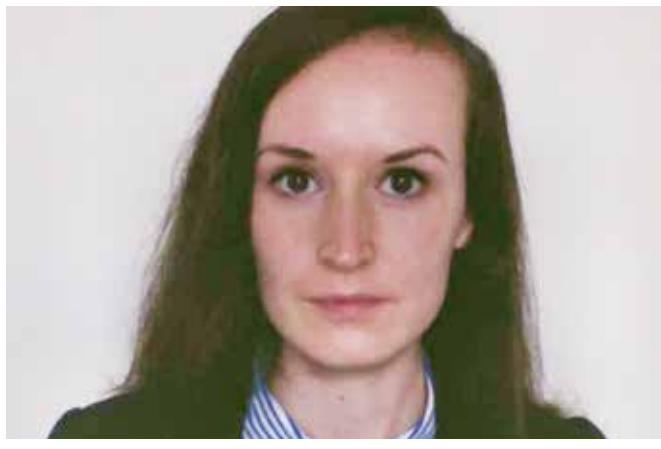
She continued: "We need more research in this field and I am highly interested in conducting a study together with cardiologists."

In fact, Dr Dahle says that this is precisely the focus of preliminary discussions currently at the centre in Oslo. "So far, I do not think there has been any revolutionary breakthroughs in AR. Specially designed valves are needed, and also more specific guidelines," she concluded.

Cardiac | Focus | Will mini aortic valve replacement become the gold standard?

Intra- and postoperative outcomes following rapid deployment aortic valve replacement compared with conventional surgery via standard and mini sternotomy

Darja Kremel, Anthony J Chambers, Renzo Pessotto Cardiothoracic Surgery, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom



Rapid deployment aortic valves are surgically implanted valves which use novel fixation techniques with minimal or no annular sutures. They have been developed to facilitate faster aortic valve replacement while allowing for the opportunity to carry out concomitant procedures in an increasingly elderly population with multiple comorbidities. This is a topical issue, as the percentage of patients over 80 undergoing cardiothoracic surgery has doubled over the past 20 years, while there has been a fivefold increase in the number of patients requiring concomitant CABG. While previous studies have found rapid deployment valves to be safe and efficacious in the clinical trial setting, few real-world data exist on their use. Moreover, the benefits of a minimally invasive approach to valve replacement via mini sternotomy remain controversial.

We carried out a retrospective observational study of all consecutive patients undergoing elective aortic valve replacement at a single centre in the UK between November 2014 and March 2017 (N = 550). Those undergoing emergency surgery or concomitant procedures were not eligible for inclusion. Our aim was to compare patient characteristics and perioperative factors across three groups of patients: Those undergoing standard aortic valve replacement via a full median sternotomy (FS-AVR) (n = 380), those undergoing standard aortic valve replacement with via a mini sternotomy (MINI-AVR) (n = 105) and those patients undergoing aortic valve replacement with a rapid deployment valve irrespective of approach (RD-AVR) (n = 65). 75% of operations in the RD-AVR group were carried out via mini sternotomy.

Looking at patient characteristics, patients in the RD-AVR group were – with a mean age of 77.6 years – significantly older than patients in the other two groups. RD-AVR patients had a mean Logistic EuroSCORE of 9.3, which was significantly higher ($p < 0.01$) compared with MINI-AVR but not compared with FS-AVR. Intra-operatively, mean aortic cross clamp time (50 ± 22 minutes for RD-AVR) and cardiopulmonary bypass time (68 ± 29 minutes for RD-AVR) were significantly shorter when compared with the other two groups at a p-value of < 0.01. Interestingly, aortic cross clamp time has been shown to be an independent predictor of severe cardiovascular morbidity in previous studies. Looking at post-operative outcomes, average length of ICU stay (mean 2.1 days for RD-AVR) and hospital stay (mean 9.1 days for RD-AVR) did not differ significantly between the three groups. Given that older patients with higher surgical risk may be expected to require a prolonged period of post-operative recovery, equivalence may in this context be regarded as a favourable outcome. Finally, there was no difference in early (30-day) mortality or major post-operative complications between the three groups.

In summary, our study demonstrates that the use of rapid deployment aortic valves facilitates efficacious surgical management of older and higher risk surgical patients with aortic stenosis, with equivocal morbidity and mortality compared with standard aortic valve prostheses. The current American College of Cardiology/American Heart Association guidelines recommend transcatheter aortic valve replacement for patients with surgical risk greater than 8% defined by the Society of Thoracic Surgery operative mortality prediction tool. It would be interesting to see whether surgical replacement with a rapid deployment valve could be considered as an alternative in the future.

Aortic cross clamp and cardiopulmonary bypass times in the RD-AVR group were significantly shorter, with three quarters of operations in this group carried out via mini sternotomy. While previous studies have consistently reported longer operating times with the mini sternotomy approach, our study suggests that the use of rapid deployment valves may facilitate replacement via this minimally invasive approach. Our study adds to existing literature by strengthening the external validity of previous findings through replication in a real-world setting. However, due to the relatively recent development of rapid deployment valves and their preferential use in the older patient population, it will be crucial to obtain data on their long-term performance in the future.

Cardiac | Focus | Evolution in bioprosthetic valve design

Regulatory process for approval of new valves

The regulations for ensuring the safety of prosthetic heart valves are changing in European Union due to the introduction of the new EU Medical Devices Regulation (MDR). The MDR, which will come into force over a phased transition period in the forthcoming years, represents a general tightening-up of the EU approval process of medical devices - including prosthetic heart valves.

"It is important for surgeons to have a basic understanding of regulatory processes," says Andras Durko, PhD fellow from Erasmus Medical Center, Rotterdam, the Netherlands, who will give an overview of the regulatory process of prosthetic heart valves here in Vienna. "For instance, with new heart valves appearing on the market, for which we don't have long-term data yet, it's good for surgeons to think about what they can and can't say about this when patients ask about their expected durability and safety."

There are over 500,000 types of medical devices and in-vitro diagnostic medical devices on the EU market.[1] With the increasing incidence of valvular heart disease due to an ageing population, it is predicted that 800,000 heart valve replacement operations will be performed per year globally by 2050.[1] Therefore the safety and durability of heart valve implants is more important than ever.

"The whole regulatory process of medical devices is becoming more stringent within the EU," explained Dr Durko.

One of the major differences between the US approval system and that of the EU is that, in the US, manufacturers have to apply to the FDA for registration, while in the EU, CE mark applications are assessed and approved by Notified Bodies – independent, third-party organisations - appointed by competent authorities in each Member State.

"One of the main changes will be that Notified Bodies will be more strictly regulated and overseen by the EU." said Dr Durko.

"Although we don't have a single, FDA-like central body controlling the medical device market in the EU, the new regulation introduces more central governance and oversight and moves more towards this direction."

However, Dr Durko said although MDR is legally binding and sets strict goals in terms of safety and efficacy for medical devices, harmonised standards also play a key role in how these goals can be met in real life in relation to specific devices, for instance prosthetic heart valves.

"Harmonised standards help to fill in the gaps regarding technical issues that are not possible to be directly regulated by the MDR."

Dr Durko said that one of the challenges for the future might be the regulation of bio-engineered valves. These valves are meant to be absorbed and replaced by the body's own tissue after implantation.

"With these type of prostheses, for instance it might be not that straightforward to assess durability or safety in the "classical sense", as the implanted prosthesis is expected to disappear from the body over a period of a time as a part of the normal process" he said.

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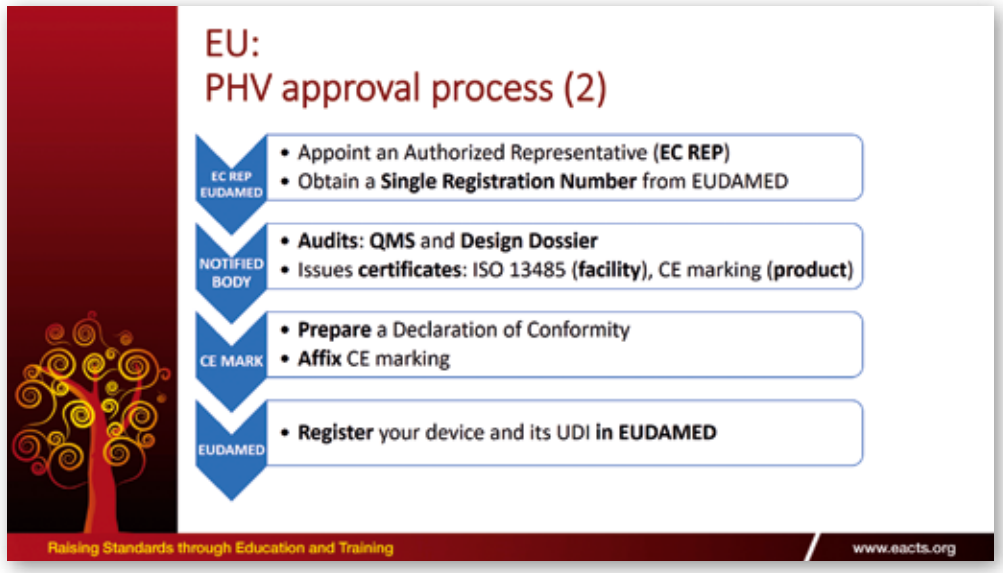

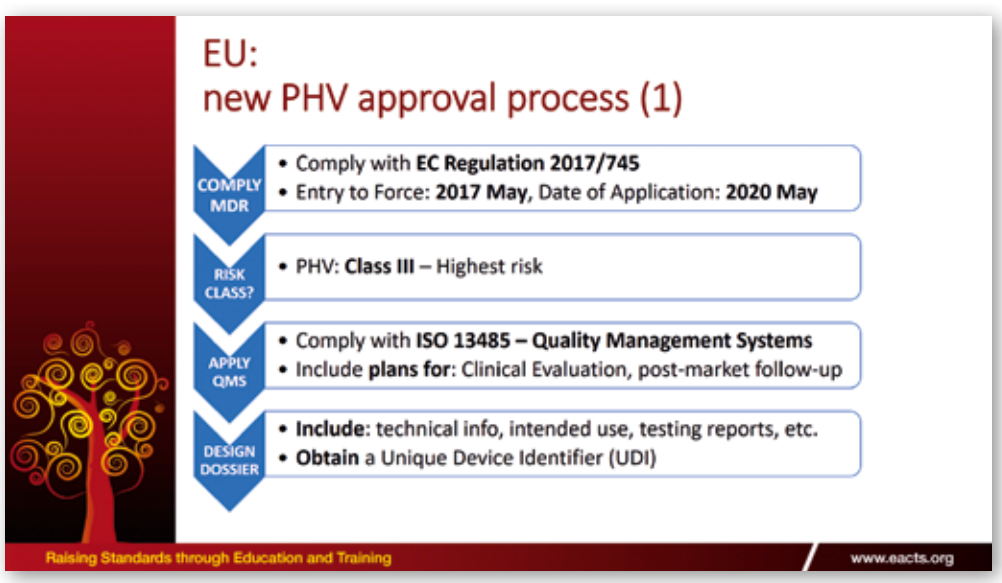

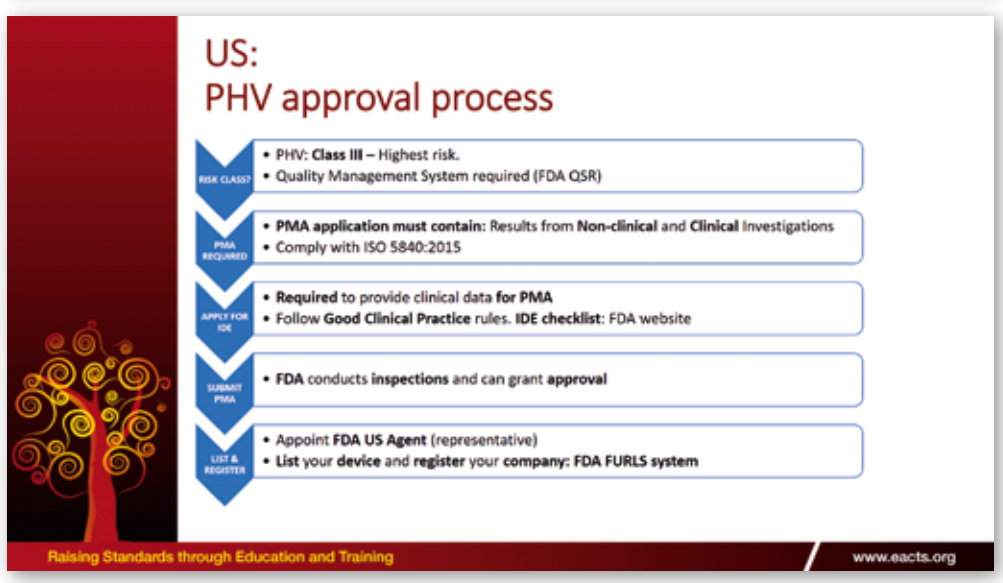

EACTS Academy

EUMS Raising standards in education and training in the growing field of mechanical circulatory support

The EUMS meeting has evolved over the past years to the largest European meeting focusing on all aspects of mechanical circulatory support. The 12th European circulatory support meeting under the umbrella of the EACTS academy will be hosted this year by the Heart and Diabetes center in Bad Oeynhausen, Germany. Course directors are Jan Gummert (HDZ NRW, Bad Oeynhausen), Pascal le Prince (La Pitie, Paris) and Volkmar Falk (DHZB, Berlin).

The three-day course covering all aspects of mechanical circulatory support will comprise interactive lectures, live-in-a-box cases and keynote presentations. The course will appeal to a wide target audience of cardiologists, heart failure cardiologists, emergency and ICU specialists (ECLS), cardiac surgeons, perfusionists, heart failure nurses and ventricular assist device (VAD) coordinators, medical industry representatives (cardiac devices including ECMO development and production), paediatric cardiologists and congenital heart disease surgeons.

If you are interested in learning more about the topics below, attendance at the 12th EUMS is critical for you!

- Organisation of a heart failure network
- Use of ECLS systems in emergency situations and in the ICU
- ECLS and VAD recommendations including published guidelines
- New surgical techniques for VAD implantation, as well as unusual solutions of complex surgical problems in VAD patients
- How to avoid long-term complications during VAD treatment
- The role and need for VAD coordinators
- The need for post-operative rehabilitation
- Review and learn about the latest developments and perspectives in the VAD field

One of the highlights will be the 'New technology session' in which device companies will present their newest developments in the field of mechanical circulatory support. We will also be holding the 2nd EUMS Rising Stars Quiz, so register your team now!

The 12th European Mechanical Circulatory Support Summit (EUMS)

29 November – 2 December, 2017
in Bad Oeynhausen

We look forward to welcoming you to Bad Oeynhausen where, in addition to the scientific sessions – with our excellent international faculty – you will enjoy the atmosphere of a lovely small German town with a traditional Christmas market.

For further information and to register: www.eacts.org/educational-events/programme/eums2017

Cardiac | Abstract | Coronary artery bypass grafting: Factors effecting outcomes

Does any saphenous vein graft lead to worse late survival after coronary bypass surgery: A cohort study of 51,113 patients?

Alistair Royse[1,2], Zulfayandi Pawanis[1,4], David Canty[1,2], Jared Ou-Young[1], David Eccleston[5], Andrew Ajani[5], Christopher Reid[3], Rinaldo Bellomo[6,7], Colin Royse[1,8] 1. Department of Surgery, The University of Melbourne, Melbourne, Australia; 2. Department of cardiothoracic surgery, The Royal Melbourne Hospital, Melbourne, Australia; 3. Department of Epidemiology, Monash University, Melbourne, Australia; 4. Universitas Airlangga Hospital, Airlangga Health Science Institute, Universitas Airlangga, Surabaya, Indonesia; 5. Department of Medicine and cardiology, The University of Melbourne, Royal Melbourne hospital, Melbourne, Australia; 6. Critical care, The University of Melbourne, Royal Melbourne Hospital, Melbourne, Australia; 7. Intensive care unit, Austin Health, Melbourne, Australia; 8.Department of Anaesthesia and Pain Management, The Royal Melbourne Hospital, Melbourne, Australia

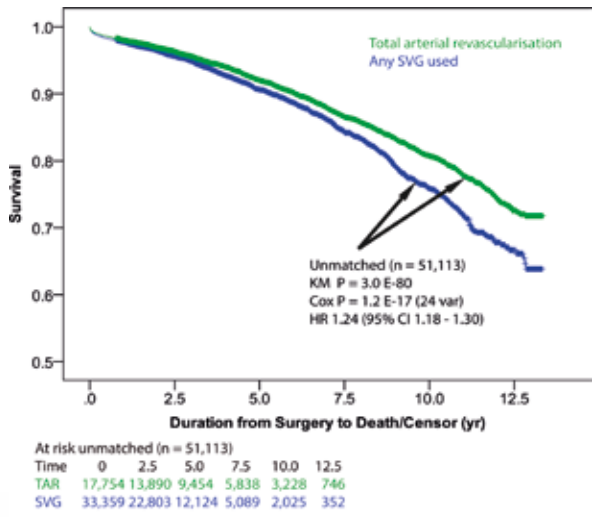

Figure 1. Survival plot for total arterial revascularisation vs. any use of saphenous vein graft (n = 51,113). SVG, saphenous vein graft; KM, Kaplan-Meier; Cox, Cox proportional hazards analysis; var, number of variables included in the analysis; HR, hazard ratio; 95% CI, 95% confidence interval.

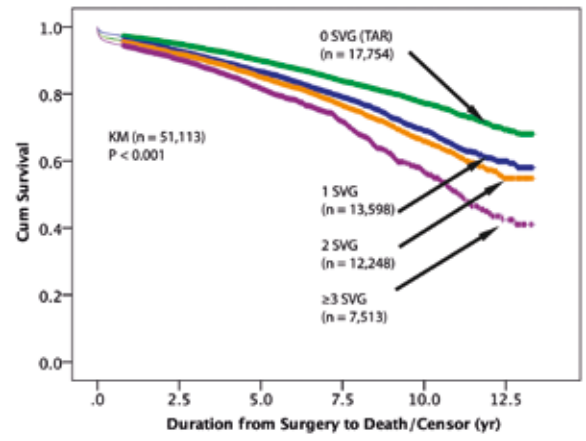

Figure 2. Survival according to number of saphenous vein grafts used. Per patient analysis of survival; TAR, total arterial revascularisation; SVG, number of saphenous vein graft anastomoses; KM, Kaplan-Meier.

The use of saphenous vein grafts (SVG) remains the mainstay of coronary surgery (CABG) despite numerous reports indicating better long-term patency and improved survival with the use of more arterial conduits. However, a recent study raised doubt as to whether a second internal mammary artery improves survival[1]. Yet we know that the long-term durability of SVG is relatively poor; and predictably so. One logical argument approach would be not to use any SVG, favouring exclusive use of arterial conduits, total arterial revascularisation (TAR). In the USA it is estimated that only 5% and in the UK only 10% of CABG patients receive TAR.

Since most patients require ≥3 grafts, the crucial hurdle seems to be the need to rely on alternative arterial conduits like the radial artery (RA) to achieve sufficient replacement of SVG. And a common view is that RA is perhaps no better than – or even worse than – SVG.

This study analyses all arterial conduits as being equal, including a lack of differentiation as to the target vessel grafted or the reconstruction method used. The two groups were: TAR or Any use of SVG (even a single graft), irrespective of the number of arterial grafts. The logic is, that if SVG is the predominant conduit that fails over time, then this is the most important factor in determining survival. Further, greater use of SVG should lead to incrementally reduced survival.

In an Australian registry, 51,113 primary CABG were identified and survival determined by linkage to the Australian Institute of Health and Welfare, national death registry. The first half of the data was dominated by contributing hospitals in Melbourne, which are known to have high rates of arterial conduit use relative to world rates. The second half of the study period saw additional centres contribute from centres elsewhere in Australia where there was less use of arterial conduits. Overall, about half of the grafts in the TAR group were performed with RA; whereas a quarter of the arterial grafts and one tenth of all grafts in the Any SVG group were constructed using RA.

Survival was worse if any SVG was used, P < 0.001 and mortality hazard ratio (HR) = 1.24, Figure 1. A propensity score matched cohort using 24 variables and calliper of 0.05 (n = 28,710) found a higher hazard for mortality with any SVG use of 1.22 (95% CI 1.15 – 1.30), P < 0.001. When patients with SVG were divided into 1, 2 or ≥ 3 SVG, there was a significant and incrementally worse survival compared to TAR, P < 0.001, Figure 2.

Any use of saphenous vein graft was associated with worse survival.

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Cardiac | Abstract | Structural valve deterioration in aortic valve

Thirty-five years follow-up of 2,005 conventional aortic valve replacements for aortic stenosis in the elderly

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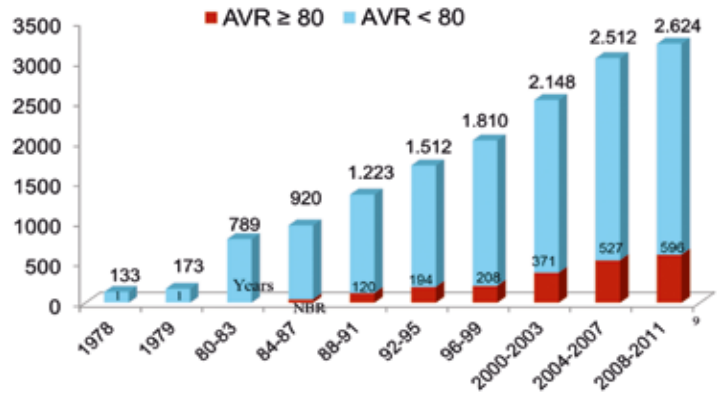

Figure 2. Actuarial survival of operated patients (green line) compared with a normal matched French population (blue line)

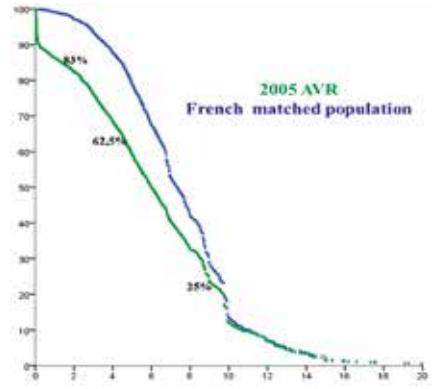

Figure 2. Comparison of survival curve in this study and a French matched population.

Aortic stenosis is the most frequent valvulopathy in industrialised countries. Its incidence increases with age and nowadays represents a major health concern in populations where life expectancy has increased regularly along the XXth century. Aortic valve replacement provides excellent long-term survival with functional improvement at a reasonable operative risk in the vast majority of patients. Consequently increasing numbers of elderly patients are referred for aortic valve surgery (Figure 1). Transcatheter aortic valve implantation (TAVI) has been developed in the last decade and offers an alternative to open-heart surgery with good immediate results in non-operable or high-risk patients. This recent and rapid development raises new concerns about the management of aortic stenosis in the elderly. Should everyone benefit from an aggressive therapy? How to decide between both strategies in fragile patients: conventional surgical replacement or a transcatheter approach? In order to answer these questions we reviewed our experience of aortic valve replacement in octogenarians since our first replacement in 1978.

2,005 patients, ≥ 80 years old, underwent AVR for aortic stenosis in our institution between 1978 and 2011. 1,009 patients (50%) had an associated extracardiac comorbidity and 650 (32%) coronary lesions. Valve replacement was the sole procedure in 1515 patients (76%); 396 (19%) had concomitant coronary artery bypass grafting. All data were prospectively collected at the time of surgery in our database, regularly updated by mailed questionnaire and phone contact.

Hospital mortality in the entire cohort is 8.6% but has decreased over the years from 6.2% in 1990 to 1.3% in 2016 for isolated AVR. Significant risk factors are COPD, chronic renal failure, advanced cardiac disease (left or right ventricular failure, NYHA IV, atrial fibrillation) and coronary disease. Long-term follow-up was 99.5% complete, (9 patients lost to follow-up), totalling 8,849 patient-years. 901 patients died at late follow-up with a median survival of 6.5 years, seven patients becoming centenarian. Apart from older age, main late causes of death were cardiovascular (20.5%), neurological (10.2%) and cancer (10.2%). Actuarial survival was 83%, 62.5% and 25% at 2, 5 and 10 years respectively. This survival compares favourably with a French matched population (figure 2). Above all, 90% of late survivors reported a patent functional improvement. Uni- and multi-variate analysis identified risk factors of late death as male gender, associated comorbidity, renal failure, advanced cardiac disease, atrial fibrillation and impaired ventricular function. Coronary lesions, associated cardiac surgery and small diameter prostheses (19 or 21 mm) did not impair long term survival.

Aortic valve replacement is effective for all age groups to treat aortic stenosis. Elderly people should not be denied surgery only because of their age as conventional aortic valve replacement provides for an excellent quality of life and restores life expectancy. Moreover, new surgical approaches, such as minimal invasive surgery and sutureless prosthesis, have been developed and may even improve the outcomes. Percutaneous valve implantation is to be considered in case of non-operable or high-risk patients. However, in light of these long term results, open-heart surgery remains, to date, the first choice treatment for aortic stenosis for the majority of patients.

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Cardiac | Professional Challenge | Arterial revascularisation after the ART trial

ART: a statistician's perspective

In a session that looks at arterial revascularisation after the ART trial, Nick Freemantle (Comprehensive Clinical Trials Unit, University College London, UK) considers the strengths and limitations of existing data on the topic, as well as examining what the likelihood of a positive ART trial result is at 10 years – and how, therefore, this might influence clinical decision-making.

Describing his background, Professor Freemantle began: "My comments are that of a statistician and clinical trialist, who has little understanding of the specific clinical context of this question, but expertise in the undertaking, appraisal and interpretation of observational and clinical research. So I am answering the question, 'what does the research evidence tell me' where 'me' refers to an experienced and skilled methodologist."

The ART trial commenced in 2004 with the aim of comparing 10-year survival rates associated with bilateral and single internal thoracic artery (BITA and SITA) grafting. The multicentre randomised trial enrolled 3,102 patients who were randomly assigned to either BITA or SITA groups. Interim 5-year results indicate no significant difference in survival between these groups.[1] The UK consortium of the British Heart Foundation, the Medical Research Council and the National Institute of Health Research supported the ART trial in view of the fact that observational studies are not sufficient to provide evidence for new technologies.

The use of single ITA (SITA) grafts is better established than BITA, with evidence demonstrating superior SITA patency relative to vein grafts. While the use of BITA grafts is supported by propensity-matched analyses, as well as the intuitive notion of it providing greater volume of patent circulation in the coronary system, its broad adoption has been hampered by a lack of randomised data, its greater procedural complexity, and the associated greater risk of sternal wound complications. As such, BITA grafting is not widely accepted, with <10% of European patients and <5% of North American CABG patients undergoing BITA procedures.[1]

"We should not be surprised, and we have seen this before."

Nick Freemantle

Data regarding the effects of BITA compared to SITA have been summarised in a number of meta-analyses. In 2014, Yi et al. conducted a meta-analysis of survival benefit of BIMA up to 10 years following CABG surgery. They included 9 studies, all of which propensity-matched, and a total of 15,583 patients (8,270 SITA versus 7,313 BITA). Other cardiac-related outcomes were not examined in the absence of coherent reporting between studies. The investigators found that BITA grafting appears to confer long-term survival benefit relative to SITA, with none of the studies showing poorer outcomes in the BIMA group.[2]

More recently, Buttar et al. assessed the short- and long-term outcomes associated with the use of BITA relative to SITA. In addition to long-term survival, they examined a number of short-term secondary outcomes such as in-hospital mortality, deep sternal wound infection, re-exploration for bleeding, cerebrovascular accident, myocardial infarction (MI), and revascularisation, as well as long-term outcomes including cardiac event-free survival, MI-free survival, and angina-free survival. Twenty-nine observational studies were included with a total of 89,399 patients. BITA was found to be associated with improved long-term outcomes, and reduced hospital mortality, cerebrovascular accidents and repeat revascularisation; BITA was, however, associated with increased incidence of deep sternal wound infection.[3]

Commenting on these data, Professor Freemantle noted that observational data only accounts for known biases, while omitting the complexity of perceptive factors that also go into clinical judgement. "The faith in BITA seems to follow the clinical enthusiasm and the observational studies, which were very optimistic about BITA.

"The observational studies seem consistently to show that patients do well. But there is a selection bias which is quite predictable (and referred to by Yi et al.[2]), in which patients more likely to do well are selected for BITA.

"The difference between the results of ART and the observational studies is striking. But we should not be surprised, and we have seen this before. The observational studies are open to substantial bias, and by design, well conducted randomised trials are not subject to bias."

Propensity score adjustments play a very important role in reducing bias

in observational data. Yet a condition of their proper application, explains Professor Freemantle, is that they make the exposure to treatment strongly ignorable as a source of information on risk – that is, having accounted for the propensity score, BITA patients are otherwise very similar to SITA patients.

But establishing the truth of this can be tricky. In 2013 Freemantle et al. explored the strengths and limitations of propensity-matched data, citing cases where propensity-matching has both succeeded and failed (such conclusions made possible by comparisons with robust randomised trials). The failed study was a propensity-matched analysis following the RALES trial[4], which found a mortality benefit of spironolactone in severe heart failure; the aim of the propensity-matched analysis was to replicate the RALES results using data from general practice records, so that reliable data relating to spironolactone and severe heart failure could be generated from real-world populations. While survival was found to be similar between the propensity-matched and the RALES cohorts, within the propensity-matched cohort spironolactone was associated with an increased mortality risk. A comparison of hazard ratios (HR) between RALES and the propensity-matched analysis (HR 0.70 (95% CI 0.60, 0.82), p < 0.0001, n = 1,663, events = 670; vs HR 1.32 (95% CI 1.18, 1.47), p < 0.0001, n = 4,412, events = 1,285) demonstrated their departure. Such failure is however an instructive reminder that propensity scoring accounts only for known confounders, and as such is at risk of including unknown bias in particular confounding by indication.[5]

Turning to the ART trial, Professor Freemantle addressed the importance of closely examining whether or not such unknown biases could be at play: "First, ART trumps the observational studies. It is a well conducted randomised trial based on quite large numbers of subjects. Second, trials which give 'the wrong answer' are often put to one side in favour of evidence that supports the favoured intervention. It is to the credit of EACTS that they are having a debate on this topic at the meeting in order to develop a useful debate about the strength of evidence and appropriate clinical reaction."

Asked whether power could be an issue for ART, particularly with regards to its unexpectedly high crossover rate, he continued: "These are issues in any trial of a surgical procedure. A large proportion in both groups received the randomised procedure – presumably those who did not were not deemed appropriate at the time of the intervention. Actually, there appears to be no power 'spent' on the interim analysis. So the results we see are quite nominal.

"It is to the credit of EACTS that they are having a debate on this topic at the meeting."

Nick Freemantle

"The power of a study is best described by its results on the primary outcome, and the confidence intervals are quite wide here – so there is some uncertainty. But the best estimate (the point estimate) is not in favour of BITA so any claim that the trial supported that intervention would be 'special pleading'."

Five years into the ART trial, 134 deaths (8.7%) had occurred in the BITA group and 130 (8.4%) in the SITA group (HR, 1.04; 95% CI, 0.81 to 1.32; p = 0.77). Ten years ought to draw in 164% more deaths, noted Professor Freemantle. Based on findings so far, he added, the likelihood of non-significance persisting at 10 years is 87.7%, with any statistical significance being more likely to favour the SITA group.[6]).

So how should the prospective patient handle this information? "Trials like ART are 'confirmatory – they intend to confirm the expected result," said Professor Freemantle. "In this case, from the power calculation for ART it was expected that the 10-year mortality would be 10% lower for BITA than SITA. The results at five years are not in line with those plans ([i.e.] 'futility' for the future results). This is not the expected result and should lead to some further thought about what happened, how we can interpret it and what to do next."

He concluded: "The [session] at EACTS is part of that debate. But for the comparison in ART, the results at five years give no support for a change in practice from SITA to BITA."

Professor Freemantle speaks in detail on the topic of propensity matching and randomised controlled trials in arterial revascularisation during the session 'Arterial revascularisation after the ART trial' taking place in Hall D at 8:30 this morning.

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Not so state of the ART: interim analysis "wake-up call" to surgical community

The interim analysis of the Arterial Revascularisation Trial (ART)[1,2] recently took the wind out of the sails of bilateral internal thoracic artery (BITA) grafting, with no significant differences found relative to single left ITA (LITA) grafting in coronary artery bypass grafting (CABG) patients. This is a stark departure from observational data to date, yet some have posited that the ART trial may not have been asking the right questions, with suggestions that further work needs to be done to put the issue to rest.[#2-6] Today, during a session that explores a variety of technical and evidence-related aspects of CABG, Mario Gaudino (Department of Cardiothoracic Surgery, Weill Cornell Medicine & New York – Presbyterian Hospital, New York, USA) summarises the methodological missteps in ART, and presents a new trial – ROMA[7] – that seeks to redress them.

In conversation with *EACTS Daily News*, Dr Gaudino explained that, until ART, only observational data supported the notion that multiple arterial grafts confer significant clinical benefits over single grafts. Randomised data have proven the superiority of arterial grafts over saphenous vein grafts, however, and there is some evidence of a protective effect of arterial conduits on the native coronary circulation.

Summarising the key methodological issues with ART, Dr Gaudino noted: its possibly erroneous sample size calculation based on outworn meta-analysis data spanning back to the 1970s; the high proportion of patients 70 years and older, with treatment age interaction approaching clinical significance; the high rate of radial artery (RA) grafting in the LITA group, especially amid recent evidence demonstrating that the RA is much less like the saphenous vein and very much more like the right ITA (RITA); and the high rate of crossover, especially in the BITA group.

Expanding on the subject of RA patency evidence, he said: "It has been proven in randomised trials that the RA patency rate is significantly better than that of the saphenous vein, and that it is similar to the RITA. In the ART trial, the randomisation was just related to the use of one or two ITAs. Nothing was said about the use of the other arterial grafts, particularly the RA, because at that time the evidence showing that the RA is very similar to the RITA was not so strong.

"What ended up happening in ART was that surgeons were using RA grafts in a large number of cases in the LITA group, thinking that the RA is something different from the RITA. But now we know that in doing that the ART trial was in fact comparing the BITA with LITA plus RA, and these are very similar (although not exactly the same). In almost 30% of the cases with LITA there is an RA. This is a major problem in terms of sampling and randomisation."

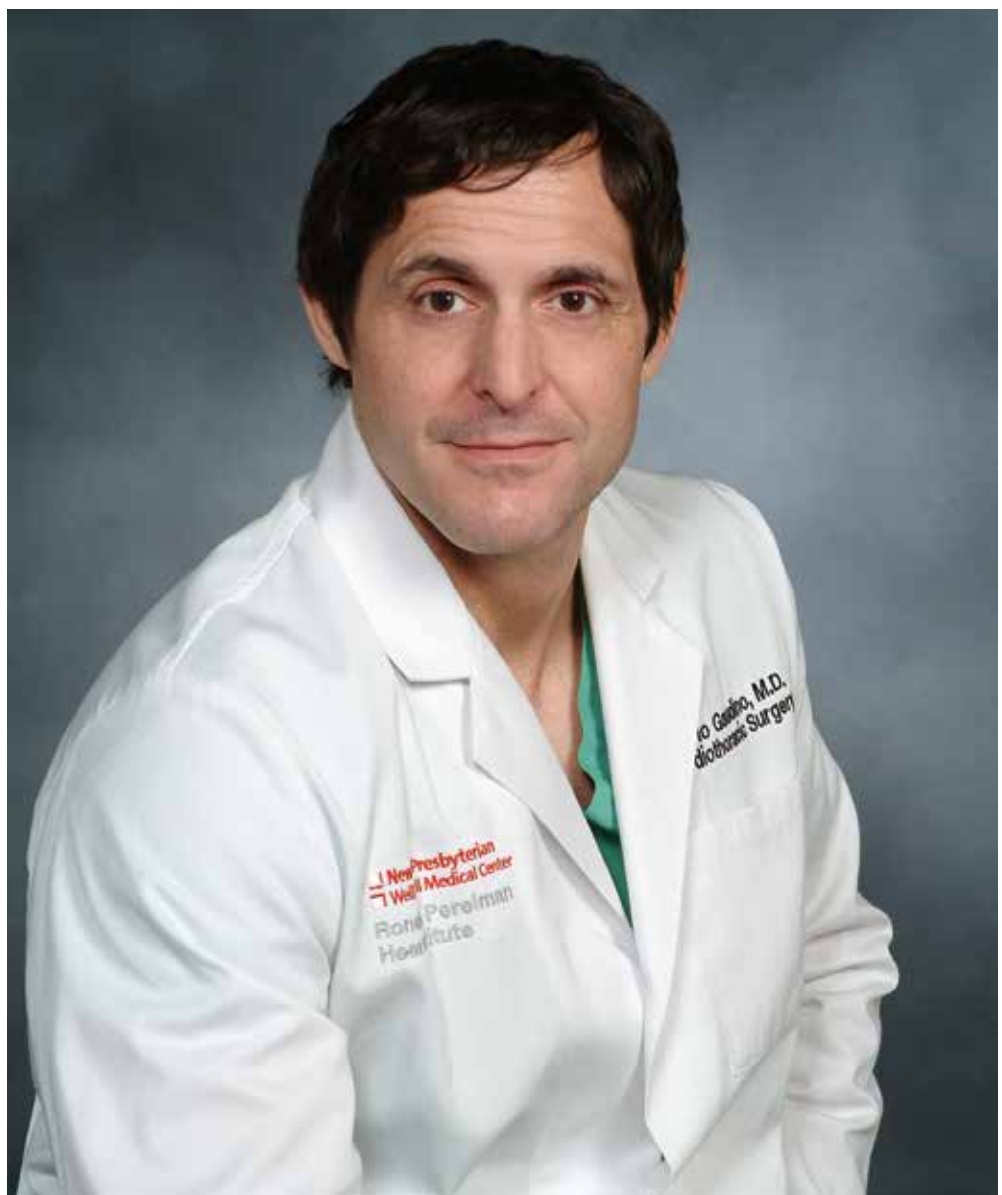
"In almost 30% of the cases with LITA there is an RA. This is a major problem."

Mario Gaudino

In a recent post-hoc analysis of the ART trial, principle investigator David Taggart (who will also present his thoughts on ART during this session) demonstrated that the addition of RA grafting in the LITA cases significantly improved outcome at five years.[8]

In contrast, continued Dr Gaudino, saphenous vein grafts are understood to deteriorate in an exponential manner, with late failure tending to begin at around 4-5 years. So could ART still turn around during its 5-10 year follow-up? "It is true that most of the events in the LITA group in the ART trial will be clustered in the second half of the follow-up," he said. "However, it is also true that the two groups are perfectly superimposable at five years. It is highly unlikely that, even considering the clustering of events in the second half of the follow-up, that ART will find a statistically significant difference at 10 years."

That randomised evidence departs so significantly from observational data has precedent: in obstetrics and gynaecology, for example, the role of oestrogen hormone replacement therapy (HRT) has dramatically changed over recent decades. In the 1990s, it was thought to provide benefit in reducing cardiovascular events and mortality in post-menopausal women. This notion was based on a large body of observational data that went on to be disproven by the Women's Health Initiative randomised trial, which found no benefit but harm in increased risks of coronary disease and breast cancer, resulting in a complete change in the guidelines and an almost complete abandonment of HRT use.[9]



With a similar situation following the ART trial – the BITA group being at greater risk of sternal wound complications than the LITA group – it is likely that guidelines on the use of second arterial grafts will change. Were the ART data more robust, explained Dr Gaudino, he would cease using BITA grafts, as any surgeon would. Yet in the face of a plethora of methodological questions, further work is demanded. "This is why ROMA is important," he said. "It is designed taking into consideration all of the limitations of ART."

Previous meta-analyses of decades of observational data have strongly supported the notion of a clinical benefit associated with the use of multiple arterial grafts, but the possibility of an intrinsic selection bias in the observational studies cannot be ruled out. There is evidence that, even in the propensity matched series, a treatment allocation bias was present, with healthier patients receiving multiple arterial grafts, explained Dr Gaudino[10].

Is there a possibility that we can identify those as-yet unknown biases that may have influenced observational studies to date? "The coronary patient is extremely complex. We summarise this patient in our data with, say, 20-25 variables. But those variables do not capture the whole complexity

Continued on page 32

Cardiac | Professional Challenge | Arterial revascularisation after the ART trial

Not so state of the ART: interim analysis "wake-up call" to surgical community

Continued from page 31

of the patient. The reason why the surgeon decides to use a treatment that he perceives as having better results in the long term compared to another treatment, is because he 'eyeballs' the patient and concludes that the patient will benefit. This may be because of frailty, or because of functional, social or educational status – there is no way you can propensity match all of this! So one reason for inconsistency in the ART trial may be that, in the observational studies, the better patients were getting BITA, and that is why they have longer survival. Only the randomisation process can get rid of this."

The upcoming ROMA trial, of which Dr Gaudino is principle investigator together with Stephen Fremes (ON, Canada), will enrol at least 4,300 subjects at more than 50 international centres in the US, Canada, Europe, and Asia. These patients will be randomised to either a single arterial graft (single ITA to LAD anastomosis, plus saphenous vein grafts in other target vessels) or multiple arterial graft (single ITA plus additional RA or second ITA, with additional saphenous vein or arterial grafts where required).

"The ART trial is a very healthy reminder of how we as scientists and surgeons cannot take things for granted."

Mario Gaudino

The primary outcome is a composite measure of death from any cause, any stroke, post discharge myocardial infarction and/or repeat revascularisation – in contrast to ART, in which death from any cause was the primary outcome. The investigators amended this on the basis of robust evidence indicating that non-LAD coronary circulation impacts outcomes such as myocardial infarction, repeat revascularisation, and angina, but not survival.

ROMA's secondary outcome is all-cause mortality. While there are similarities with ART, ROMA includes elective but not emergent cases, and excludes patients > 70 years of age.

ROMA is an event-driven trial, ruling out the possibility of it being under-powered.[7]

Following the disappointment in the results of ART, there nevertheless remains an opportunity to re-examine well-established methodological approaches with fresh eyes: "The ART trial is a very healthy reminder of how we as scientists and surgeons cannot take things for granted," said Dr Gaudino. "We always have to ask questions, to try to be critical of the evidence.

"I am a personal fan of David Taggart. We speak almost every week on the phone – he is a giant, a true mentor, and a personal friend. The ART trial as a great trial – despite all of the methodological limitations that I keep outlining. When the ART trial data was published I was one of the first in the world to know. David didn't tell me anything, but after the results were online, after less than one hour I had a PDF of the *NEJM* paper in my hands. I remember that when I read it for the first time, I was speechless – completely stunned.

"In our meetings discussing BITA, we knew that we had a ton of observational evidence in favour of it, and we saw the ART trial as the last detail to complete this picture, giving us the blessing of randomised evidence. All of a sudden, it was negative. Immediately after that I started looking back at all of my ideas and my assumptions, and I looked at them critically. And I realised that I had made mistakes."

One such error was ART's primary endpoint of mortality: "It is extremely difficult, in these last 25 years, to find studies that compare BITA with single ITA in terms of repeat revascularisation, freedom from angina, etc. The primary endpoint is always survival – and this is intrinsically wrong. This has been our mistake for 25 years.

"So I really welcome the ART trial as a wake-up call for the whole surgical community. The methodology that we were using in most research in the field of arterial grafting has been the same that Floyd Loop and the Cleveland Clinic were using in 1989. The methodological field has evolved a lot since then, but we didn't take advantage of that. That was wrong. In this sense, ART has really been a landmark trial. This is why I am really counting on ROMA. We need to bring coronary surgery into the new millennium.

"The most important contribution of the ART trial is to make all of us feel bad, and to make us understand that we have lost maybe 20 years because we have not been looking at the problem in the right way. Now, we have to go back to our labs, to work on a problem that all of us thought was solved."

Dr Gaudino presents 'ART confirms my clinical practice' during the session 'Arterial revascularisation after the ART trial', taking place in Hall D between 8:30 and 11:45 today.

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Cardiac | Focus | What is new in left main disease

Taking a closer look at EXCEL

Joseph F Sabik III is Chair of the Department of Surgery as well as Surgeon-in-Chief and Vice President for Surgical Operations at University Hospitals Cleveland Medical Center, the main teaching hospital at Case Western Reserve University. He oversees about 10 divisions of surgery – from colorectal to trauma and general surgery – in fact he oversees all surgery for an 18-hospital system in north-east Ohio, USA.

In today's focus session on 'What is new in left main disease', Dr Sabik will talk about his work on an important trial, the Evaluation of XIENCE versus Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization (EXCEL) trial that reported last year.[1]

EXCEL was a randomised trial for selected patients with left main coronary disease. Some were given percutaneous coronary intervention (PCI) with drug-eluting stents and others received coronary-artery bypass grafting (CABG).

Indeed, a previous trial, the Synergy between PCI with Taxus and Cardiac Surgery (SYNTAX) trial established precisely which kinds of patients should be randomised for such a trial. Syntax divided patients into three groups depending on their coronary complexity[2]; low complexity, intermediate or high. "In the Excel trial we only enrolled cases with coronary artery disease of low or intermediate anatomical complexity. The reason for that is that it was very clear from Syntax that if somebody has complex coronary artery disease, they do better with surgery," said Dr Sabik.

So far, Dr Sabik's group has presented the three-year outcome of EXCEL and reported some interesting results. "At three years there was no difference in the primary endpoint which was the combined risk of mortality or myocardial infarction. For patients, at three years there is no difference," he said.

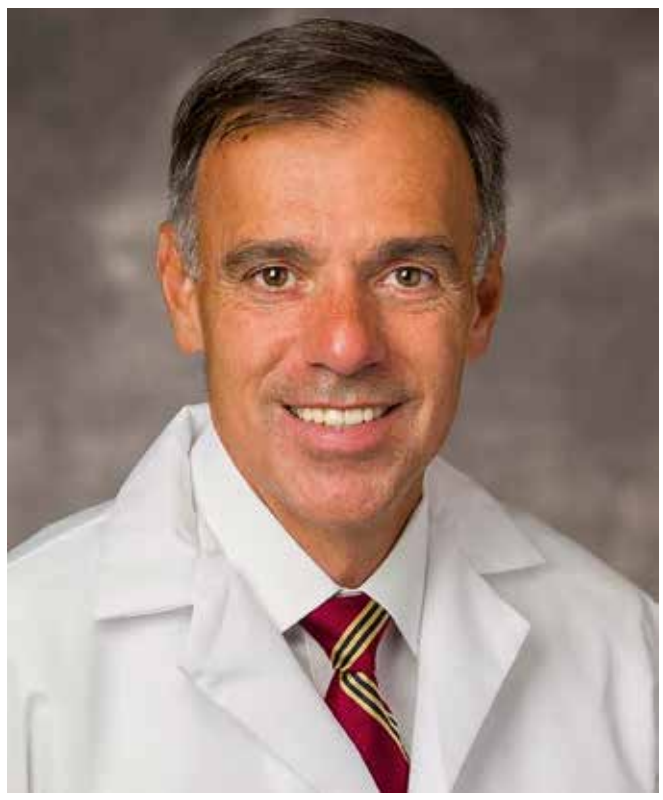
"We have very two very big, very important trials that have somewhat differing outcomes early on."

Joseph Sabik

The reason this is particularly interesting is that a parallel trial, called Noble – also to be presented during the session – did not see much of a difference between PCI and CABG at 30 days, but found a benefit of surgery over PCI for patients with left main disease at five years.

The discrepancy between the two findings has caused some debate across the community. But, said Dr Sabik, the jury still out on the ultimate findings of the EXCEL trial, which will be following its patients through to five years.

Certainly, if the results are analysed carefully, the signs are there: "I don't think the story ends there," said Dr Sabik. "If you look at the graph very carefully, at 30 days PCI actually did better than surgery,



and the reason for that is that there were more myocardial infarctions in the CABG patients in EXCEL.

"The curves cross at a little over two years and it seems like the events are occurring more commonly now in the PCI patients," he added. "And it's very possible that the curves will continue to separate so that the five-year results may be very different from the three-year results."

Dr Sabik stressed that more research is vital before drawing conclusions as to which intervention is better than the other, therefore: "You still need to be very careful, because the results are not completely in. A patient not only cares about the first 30 days but they really care about the long-term survival and the long-term quality of life. We need, as investigators, to continue to follow these patients and continue to report the results to the best of our ability. And as we get more information we can help guide our clinicians. But you can't base treatment on the early results of one trial.

"We have very two very big, very important trials that have somewhat differing outcomes early on," he went on. "We need to follow the patients from both trials to see what is going on. Is it true that the event rates continue to be higher in PCI than in surgery which would suggest that with time surgery would be better? Or do the curves parallel? We just need to learn more.

"We have to remember that surgery still is the standard of care for left disease," he said. "It may change, and there will be groups of patients that do just as well with PCI or surgery, but I believe the majority of patients will do better with surgery."

Dr Sabik added that it's important to remember that EXCEL is a small group of patients – a subgroup of a subgroup. "This is not the universe of left main disease," he said. "Probably half of the patients with left main disease have complex coronary disease. But that half is not even considered [in this trial]."

He reckons that in the end, trials are likely to conclude that surgery after five years is better. And that's to do with the durability of bypass grafts. "I am a surgeon so I have a bias and I have reasons to believe why surgery is better," he said.

"We have different ways of treating a patient depending on their anatomy and characteristics, and we will be able to decide in future which one is better for them."

Joseph Sabik

"When you put a stent in you treat the disease as it is today. But we know that in these patients just don't have disease in one location, they get disease in multiple areas in the artery," he explained. "If you use a bypass graft you treat the disease as it is today but also any other disease that may occur proximal to that graft. It's protective over the long run."

And of course, there will be undergoing discussions as to the benefits of both procedures; there may be some who may begin to argue that better medicines and better stents exist and so the benefit of surgery isn't so important. But not yet, said Sabik. "There is probably the odd patient that will benefit from PCI. It wasn't a home run for surgery and it wasn't a home run for PCI," he said. "We need to look at these procedures not as competitive but as complimentary. We have different ways of treating a patient depending on their anatomy and characteristics, and we will be able to decide in future which one is better for them."

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Cardiac | Focus | Secondary mitral regurgitation – still a surgical problem?

Does coronary artery bypass grafting alone correct moderate mitral regurgitation?

MA Deja Medical University of Silesia, Katowice, Poland

Indications for mitral repair in patients with moderate ischaemic mitral regurgitation remain controversial. While previous (2012) ESC/EACTS guidelines on the management of valvular heart disease gave it class IIa recommendation[1], it disappeared altogether from 2017 ESC/EACTS guidelines[2]. The indication remained in the ACC/AHA guideline after the 2017 Focused Update, however the quantitative criteria to recognise severe IMR have been increased back to ERO > 0.4cm^2 and regurgitant volume > 60ml/beat "to prevent unnecessary operation"[3].

The above changes followed the results of the CTSN randomised trial of moderate ischaemic mitral regurgitation[4], which failed to confirm improved negative left ventricular remodelling after mitral valve repair concomitant with coronary artery bypass grafting in comparison with coronary bypass surgery alone. At the same time, the guidelines seem to ignore the improved LV remodelling, and patients' functional capacity after mitral repair – visible in the RIME trial[5] – or improved survival after mitral valve repair observed in STICH trial patients[6].

Mitral annuloplasty cured mitral regurgitation in 90% of patients in the CTSN trial, and 96% of RIME trial patients as assessed by echocardiography 12-months postoperatively. Simultaneously CABG alone cured mitral regurgitation in up to 70% of the CTSN trial patients and in only 50% of the RIME trial cohort. The difference stems most probably from the different left ventricular volumes of the patients included in both trials, with end systolic volume indices being over 30% bigger in the RIME trial when compared to the CTSN (figure 1). Similarly, the LV end systolic volumes of patients included in STICH trial, in whom the survival benefit of adding mitral repair to CABG was visible, were even bigger than in those included in RIME trial, with additionally lower EF.

It appears therefore likely that CABG might cure ischaemic mitral regurgitation in less remodelled ventricles, while adding mitral surgery might be necessary when the disease (ventricular in its nature) is more advanced. There are few reports concentrated on patient characteristics allowing selection of those in whom CABG alone might significantly improve IMR. In their report, Penicka at al. indicated that the presence of a large extent of viable myocardium as assessed by SPECT, and less dyssynchrony between papillary muscles on echocardiography, predicts improvement of moderate IMR by isolated coronary artery bypass grafting[7]. Similar results were visible in the report of Kang et al. in which improvement of LV function and associated improvement of mitral regurgitation was best predicted by SPECT result[8].

A more recent paper by Sun at al. found ejection fraction, postero-inferior LV remodelling and a short time between myocardial infarction and operation to predict improvement of IMR. Mitral regurgitation was more likely to decrease after OPCAB in patients with EF > 37% operated within three months of MI[9]. All the above-mentioned reports are contrary to the current ESC/EACTS guidelines which recommend mitral repair for patients with higher (>30%) ejection fraction and support repair in low EF only in the presence of viability. Meanwhile I suggest, based on available data, that patients with lower EF, more remodelled ventricles and less viability are less likely to be cured by CABG alone, and therefore require more aggressive surgery.

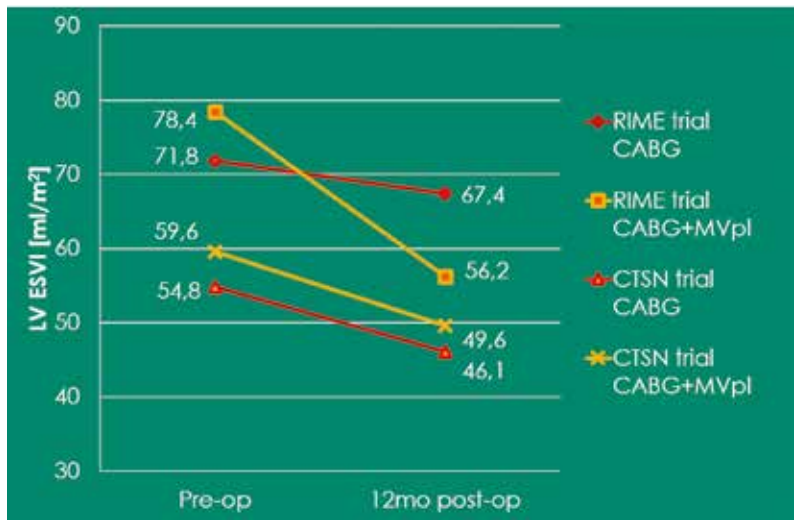

Figure 1. Left ventricular end systolic volume index before and 12 months after coronary artery bypass grafting with and without mitral valve repair observed in CTSN trial and in RIME trial.

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Cardiac | Abstract | Coronary artery bypass grafting: Factors effecting outcomes

Obesity Paradox and CABG

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Obesity is a global health challenge of epidemic proportions. The World Health Organization (WHO) estimates that the rate of obesity has doubled worldwide within the last three decades, and currently over 70% of American adults are either overweight or obese compared to fewer than 25% forty years ago. Although obesity is a well-established risk factor for cardiovascular disease, it has been suggested, paradoxically, that patients with established cardiovascular disease who are obese may have a more favourable short-term and long-term prognosis than the non-obese.

There are conflicting reports on the whether an obesity paradox exists in cardiac surgery. The aim of this study is to investigate whether an obesity paradox exists in CABG patients across the body habitus spectrum and, if present, define its temporality as well as determine if such an obesity paradox is attributable to improved cardiovascular and/or non-cardiovascular survival.

To achieve our study aims, we retrospectively reviewed three prospectively collected institutional Society of Thoracic Surgeons Adult Cardiac Surgery Databases. 15-year Kaplan Meir analysis in 7091 primary LITA-based CABG patients was performed, and repeated in five body mass index [BMI (kg/m^2)] sub-cohorts [Normal (18.5-24.99), Overweight (25-29.99), Obese I (30-34.99), Obese II (35-39.99) and Obese III (≥40)]. Mortality hazard ratios [HR (95%CI)] were derived via comprehensive multivariate competing risk Cox regression, accounting for BMI categories, for the overall (0-15 years), early (0-1 years), intermediate (1-8 years) and late (8-15 years) follow-up intervals, to relax the proportional hazards assumption. The regression analysis was repeated using BMI as a continuous variable. Mortality was classified into: any, cardiovascular (CV), and non-cardiovascular (Non-CV).

Our analysis revealed that obese patients were younger and had more co-morbidities (62.6% were diabetic, 90.5% had hypertension in the Obese III group). 15-year survival was improved in the Overweight and Obese I ($p < 0.001$) groups compared to Normal. Compared to Normal BMI patients, risk-adjusted 15-year mortality was significantly lower in the Overweight [HR = 0.88 (0.79-0.98)] and Obese I [HR = 0.88(0.78-0.99)] and was attributable to improved CV and Non-CV survival. Obese III patients showed worse survival [HR = 1.28 (1.06-1.55)] compared to Normal BMI patients and was associated with diminished CV survival [HR = 1.47 (1.08-2.00)]. The noted 15-year survival benefit among the Overweight and the Obese I was principally realised in the early and intermediate post-operative periods with no trend or significance in the late period (Table 1). Using BMI as a continuous variable, a BMI of 29kg/m^2 was associated with optimal long-term survival (Figure 1).

We conclude that our analysis identified a protective "obesity paradox" in the early and intermediate post-operative periods among Overweight and mildly obese (Obese I) patients which is driven by improved CV and Non-CV survival. Morbidly obese (Obese III) patients had a higher 15-year mortality which was attributable to elevated CV mortality in the early follow-up interval.

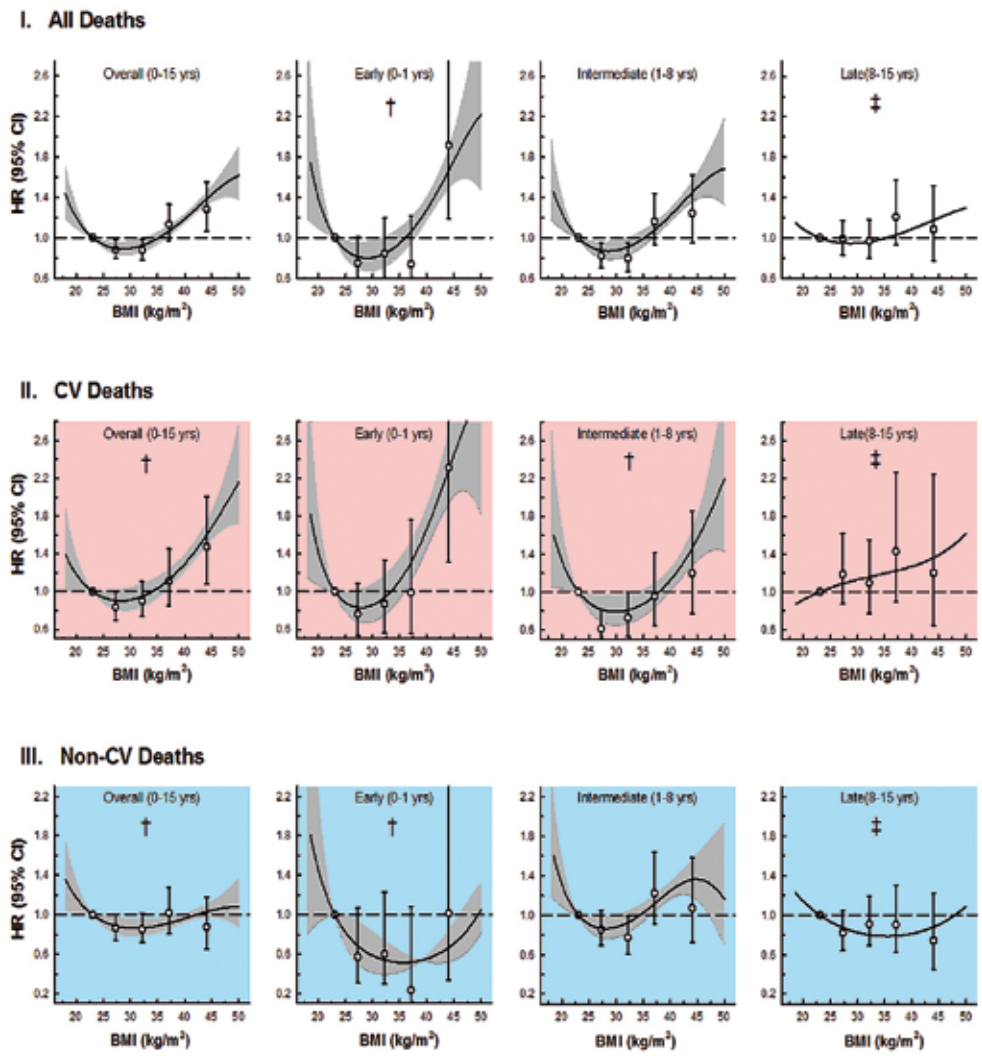

Figure 1. Association between BMI and mortality (all-cause, cardiovascular (CV), and Non-CV) across the BMI spectrum (BMI as continuous variable with cubic outcome association), for overall, and time-segmented follow-up periods, following multivariate competing risk regression. Shaded area: 95% confidence interval. Symbol with error bars = Hazard ratios with 95% Confidence intervals for BMI when categorised into body habitus groups ({left to right} Normal, Overweight, Obese I, II, III). Time periods were overall: 0-15 years; early: 0-1 years; intermediate: 1-8 years; late: 8-15 years.

Table 1: Overall and time-segmented risk-adjusted hazard ratios for all-cause and cause-specific mortality across body habitus (BMI) groups.

	PH Regression	Time segmented analysis		
	Overall (0–15 years)	Early (0–1 year)	Intermediate (1–8 years)	Late (8–15 years
All deaths	**HR (95% CI)**	**HR (95% CI)**	**HR (95% CI)**	**HR (95% CI)**
N (ref)	1	1	1	1
OW	**0.88 (0.79–0.98)**	**0.75 (0.56–1.00)**	**0.82 (0.71–0.96)**	0.99 (0.83–1.18)
Ob-I	**0.88 (0.79–0.99)**	0.84 (0.6–1.19)	**0.80 (0.67–0.95)**	0.97 (0.80–1.18)
Ob-II	1.13 (0.97–1.33)	0.74 (0.44–1.22)	1.16 (0.94–1.44)	1.21 (0.93–1.57)
Ob-III	**1.28 (1.06–1.55)**	**1.91 (1.19–3.06)**	1.24 (0.95–1.62)	1.08 (0.77–1.52)
CV Deaths				
N (ref)	1	1	1	1
OW	0.83 (0.7–1.00)	0.76 (0.53–1.09)	**0.61 (0.46–0.81)**	1.19 (0.87–1.62)
Ob-I	0.90 (0.73–1.10)	0.87 (0.57–1.34)	**0.73 (0.53–1.00)**	1.09 (0.77–1.55)
Ob-II	1.11 (0.85–1.45)	0.99 (0.56–1.76)	0.95 (0.64–1.42)	1.43 (0.90–2.27)
Ob-III	**1.47 (1.08–2.00)**	**2.31 (1.31–4.07)**	1.20 (0.77–1.86)	1.20 (0.64–2.24)
Non-CV Deaths				
N (ref)	1	1	1	1
OW	**0.86 (0.74–1.00)**	0.57 (0.31–1.07)	0.85 (0.69–1.04)	0.82 (0.64–1.04)
Ob-I	0.85 (0.72–1.01)	0.60 (0.30–1.23)	**0.77 (0.61–0.98)**	0.91 (0.69–1.19)
Ob-II	1.02 (0.81–1.28)	0.24 (0.05–1.08)	1.22 (0.91–1.64)	0.90 (0.62–1.30)
Ob-III	0.88 (0.65–1.18)	1.01 (0.34–3.04)	1.07 (0.72–1.58)	0.74 (0.45–1.22)

PH: Proportional Hazzard. Boldened fileds: Significant at 0.05 p-value

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Vascular | Abstract | Light and shades of the arch

Aortic elongation in aortic aneurysm and dissection: the Tübingen Aortic Pathoanatomy (TAIPAN) project.

Tobias Krüger, Rodrigo Sandoval, Mario Lescan, Alexandre Oikonomou, Wilke Schneider, Luise Vöhringer, Henning Lausberg, Fabian Bamberg, Gunnar Blumenstock, Christian Schlensak University Medical Center Tübingen, Germany

The ascending aorta diameter is still the only established morphological risk factor for Stanford-Type-A Aortic dissection (TAD). Last year in Barcelona we showed that dissected aortas – and more importantly aortas shortly before dissection (preTAD) – are significantly elongated compared to control aortas, and we hypothesised aortic elongation being another risk factor for TAD. In addition, we presented a score involving ascending aorta diameter and length (aortic valve, AV, to the brachiocephalic trunk, BCT) which was able to identify preTAD aortas better then diameter alone[1].

Currently, we studied ascending aorta elongation in patients with aneurysm (diameter ≥55 mm) and ectasia (diameter 45-54 mm) with the intention to further refine a high-risk morphology for TAD.

We analysed aortic dimensions using contemporary three-dimensional imaging (curved multiplanar reformats). Fife groups were compared: 259 healthy controls, 102 ectasia (45-54 mm), 38 aneurysm (≥55 mm), 17 preTAD (CT during two years before TAD) and 166 TAD patients.

The median ascending aorta diameter was 35 mm in the control group and it was larger ($p < 0.001$) in the preTAD (43 mm) and TAD (56 mm) groups. At the most 9.8% of the preTAD- and 32.5% of the TAD aortas met the 55 mm diameter threshold. This underlines that a diameter based prophylaxis must remain ineffective.

The median ascending aorta central line length from the AV to the BCT was 92 mm in the control group, 113 mm in the ectasia group, 120 mm in the aneurysm group and 111 mm and 118 mm in the preTAD and TAD groups (all $p < 0.001$ compared to the control group). A length of 120 mm was exceeded in 2% of the controls, 31% of the ectasia, 50% of the aneurysm, 24% of the preTAD group and 48% of the TAD group. The correlation between ascending aorta diameter and length was $r = 0.752$; therefore, both parameters must be examined separately.

The morphological features of our preTAD aortas were much more comparable with those of our ectasia then with our aneurysm group putting the ectasia patients in the focus of interest.

Certainly, patients with ascending aortic aneurysms are at a high risk of dissection, however, the prevalence of ascending aorta ectasia in the population is much higher, and that is why most dissections happen in ectatic aortas. This raises the question of which morphological parameters define a high-risk subpopulation within the ectasia cohort. Significant aortic elongation can be observed in aortas before and after dissection and in ectatic and aneurysmatic aortas. This and the pathophysiological plausibility of the concept are strong arguments that ascending aorta elongation is a risk factor for dissection. Our score considering both parameters, ascending diameter and length identified 23.5% of preTAD patients, significantly more than the diameter alone, and 31.4% of ectasia aortas were elongated. This renders the subpopulation of patients with ectatic (45-54 mm) and elongated (≥120 mm) ascending aortas a high-risk cohort for whom prophylactic surgery should be discussed.

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Cardiac | Focus Session | The poor right ventricle in combination with tricuspid regurgitation

Surgery for Ebstein diesease with poor right ventricle – lessons learned from congenital cardiac surgery

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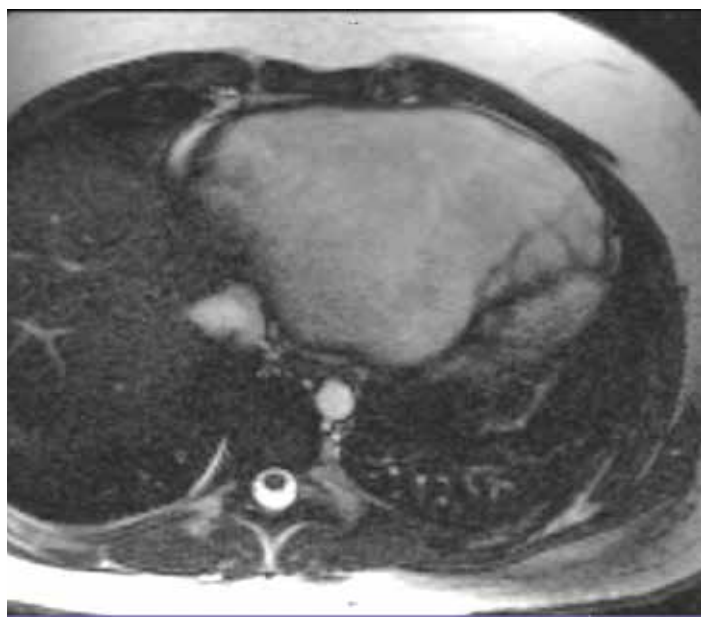
In 2004, the Cone technique for Ebstein's repair was introduced by Jose Da Silva. Since then, numerous patients have been treated in several institutions in the world with very good results. The operation is technically challenging and implies a respective learning curve. We adopted the Cone operation in 2010. Following the operation we found an increase of the left ventricular stroke volume and decrease of the right ventricular end-diastolic volume. The functional status of the patients improved significantly[1]. The favourable intermediate results let us feel confident of the newly adapted technique. However, we also encountered increasing referrals of patients in more advanced stage of the disease and in older age.

A subset of these older patients presented with a massively enlarged right ventricle. The right ventricular end diastolic volume (RVEDV) was measured by magnetic resonance imaging; the normal value for an adult is 153 ± 34 ml. A RVEDV > 400 ml is considered a severe dilatation[2]. Four of our patients presented with a RVEDD > 500 ml (the maximum value was 695 ml). Most of these patients with advanced disease were in NYHA class III. Despite the impaired heart function, the liver-function parameters were usually only mild to modestly elevated (isolated elevation of the γ-glutamyltransferase from upper normal value to 183 U/l, lab reference 5-40 U/l), and kidney parameters were in the normal range.

To prevent early postoperative right ventricular failure a residual ASD of 4-5 mm was left in all patients undergoing a Cone repair[3]. If the RV-function was borderline when weaning from the heart lung machine, a temporary extracorporeal membrane oxygenation (ECMO) was initiated. We were restrictive in the use of a cavopulmonary anastomosis as a concomitant procedure. Two of 37 patients after primary Cone repair died postoperatively, both were older patients (51 and 61 years) and presented with an enlarged RV preoperatively (RVEDV 440ml and 625ml). Causes of death were a complication caused by the ECMO-circuit and a sepsis.



In conclusion, patients with Ebstein anomaly can be operated with the Cone technique with excellent results. If referred too late however, the right ventricle is dilated and the operative risk is markedly increased[4].

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Vascular | Rapid Response | The icing on the cake

An ignored truth – Erectile dysfunction in aortic dissection patients

Fiona Meyer-Bockenkamp Hannover Medical School in Hannover, Germany

As modern day medicine evolves, follow-up care is gaining importance. After successful life-saving procedures, surgeons are frequently faced with questions regarding quality of life.

Follow-up care usually includes rehabilitation, medication, check-ups, and preparation for returning to the workplace or recreational activities.

General well-being and sexual health are important topics poorly examined during follow-up in our cardiovascular surgery postoperative populations.

However, when asked about it, many patients admit having difficulties with their sexual activities, as compared to their previous abilities, and express a wish to improve their situation.

It is known that medications such as beta-blockers, that are rountinely prescribed, impaire sexual function. In addition, there could be many other factors related to the aortic dissection and surgical approach that influence erectile function.

To be able to offer a more complete care that covers all aspects of a patients health affected by their cardiovascular disease, there is a need to broaden the knowledge about their problems.

To assess the extent to which our patients are affected by erectile dysfunction we selected a study population that was asked to fill out questionnaires regarding quality of life and sexual function.

Our results show that quality of life and sexual health are significantly impaired in the majority of these patients. Patients feel uncomfortable reporting sexual dysfunction or talking about mental health. Thus, it may be necessary to incorporate such evaluations in our routine follow-up assessment to provide available resources.

There are specific treatment options available for patients who are unable to take certain medication (i.e. PDE5 inhibitors) or have other complex problems regarding their cardiovascular system. Better knowledge about different approaches to treat sexual dysfunction would help patients in achieving a better quality of life after surgery, a goal that is neccessary but achievable.

Cardiac | Focus Session | Rapid deployment valves: New evidence & clinical cases discussion

Four fundamental steps to fast-track: my isolated RD aortic valve replacements

Marco Di Eusanio[1], Walter Vessella[2], Roberto Carozza[3], Filippo Capestro[1], Alessandro D'alfonso[1], Carlo Zingaro[1], Sacha ML Matteucci[1], Stefania Balestra[4], Christopher Munch[2] and Paolo Berretta[1]. 1. Cardiac Surgery Unit, Ospedali Riuniti, Ancona, Italy; 2. Cardiac Anaesthesia and Intensive Care Unit, Ospedali Riuniti, Ancona, Italy; 3. Perfusion Unit, Ospedali Riuniti, Ancona, Italy; 4. Preventive Cardiology and Rehabilitation Unit, Ospedali Riuniti, Ancona, Italy

Aortic valve replacement (AVR) through a median sternotomy approach has been largely demonstrated to be a safe and long-term effective treatment for aortic valve diseases. However, aortic valve surgery has undergone continuous development over the last years, involving less invasive techniques and the use of new technologies to reduce the traumatic impact of the intervention and extend the operability toward increasingly high-risk patients.

We believe the concept of minimally invasive AVR (MIAVR) should be broader than simply reducing the length of the surgical incision. In fact, by increasing the technological content of the surgical procedures, the patient's global trauma may be further decreased by adding the use of more sophisticated valve prostheses capable of reducing operative times and providing excellent haemodynamics, advanced cardio-pulmonary bypass circuits effective in minimising inflammatory response, and anaesthetic protocols with rapid table extubation promoting early physiotherapy and recovery.

To reach this target, we have

established a multidisciplinary minimally invasive program involving all health professionals embroiled in the perioperative management of the patient: surgeons, anaesthesiologists, perfusionists, nurses, and physical therapists. Our ultra-fast track multistep approach includes: 1) reduced chest incision (through an upper J ministernotomy) aiming to reduce the traumatic impact of surgical procedure, to decrease blood loss, postoperative pain, wound complications and to improve cosmesis[1], 2) rapid deployment aortic valve replacement (RD-AVR) using Edwards Intuity Elite™ valve (Edwards Lifesciences, Irvine, Calif., USA), to reduce operative times, to facilitate minimally invasive approach and to improve haemodynamic outcomes[2,3] minimal invasive extracorporeal circulation (MiECC) system (ROCSafe™ Hybrid Perfusion System, Terumo, Ann Arbor, Michigan, USA) to improve circulatory support, end-organ protection, and to promote fast track anaesthetic management[3] and 4) ultra-fast track anaesthesia to assure better comfort and outcomes for patient, to promote early recovery and to decrease the rate of postoperative complications[4].

We advocate that the synergistic effects of minimally invasive RD-AVR and MiECC, coupled with a fast track anaesthetic management, focused on reducing the overall surgical stress, may finally provide superior clinical outcomes and increased patient comfort compared to conventional AVR.

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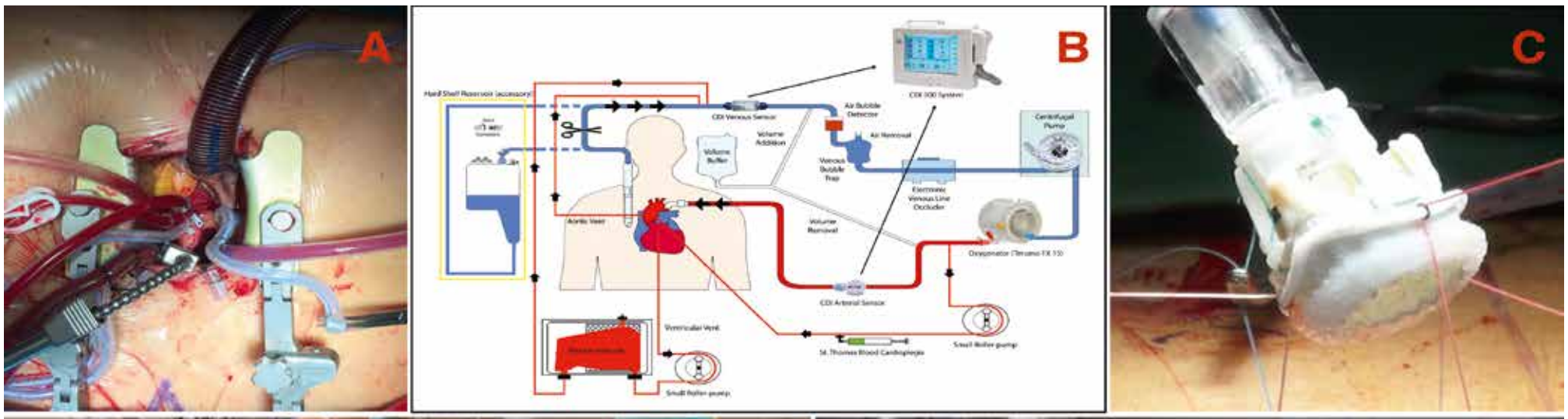


A) MIAVR through upper J ministernotomy.
B) EDWARDS INTUITY Elite™ rapid deployment valve.
C) MiECC system (Terumo ROCSafe™ Hybrid Perfusion System).
D-E) Ultra-fast track anaesthetic management

Satellite Symposia @ the 31st EACTS Annual Meeting

Company	Room	Time	Title
Monday 9 October			
Abbott	K2	12:45–14:00	40 years of partnership in Cardiac Surgery: from St Jude Medical valves to NEW ABBOTT structural heart portfolio
AtriCure	0.31/0.32	12:45–14:00	Surgical ablation: Why, when and how in the face of an epidemic
Auto Tissue	-2.31	12:45–14:00	5 years experience with the decellularized Matrix Patch
Boston Scientific International	0.15	12:45–14:00	ACURATE neo TA: Unique low-profile, self-expanding transapical TAVI system
Edwards Lifesciences	E1	12:45–14:00	The New Inspiris Resilia Aortic Valve: Current Evidence and its Early Clinical Application
Getinge	0.49/0.50	12:45–14:00	Circulatory Support in Heart Failure Patients – Review of Current Clinical Evidence and Guidelines in Cardiac Surgery
JOTEC	-2.47/-2.48	12:45–14:00	Catching a glimpse of Frozen Elephant Trunk specialties
LivaNova	K1	12:45–14:00	That's Why Innovation Matters
Medtronic	G1	12:45–14:00	Learning The Technique: Concomitant Mitral Therapy
Medtronic	G2	12:45–14:00	The Next Revolution: New Interventions for Advanced Chronic Heart Failure
Nordic Pharma	-2.32/-2.33	12:45–14:00	Patient Blood Management in Cardiac Surgery: past, present, future
Vascular Graft Solutions	0.11/0.12	12:45–14:00	CABG: Back to the Future
Vascutek	F2	12:45–14:00	Aortic arch surgery – what should we be doing? Treatment options and practicalities
Tuesday 10 October			
Abbott	K2	12:45–14:00	Improving your outcomes with the HeartMate 3™ LVAD
Edwards Lifesciences	E1	12:45–14:00	Contemporary TAVI and SAVR indications and future perspectives
Medtronic	F2	12:45–14:00	Aortic Complex Cases: Current Options & Outcomes

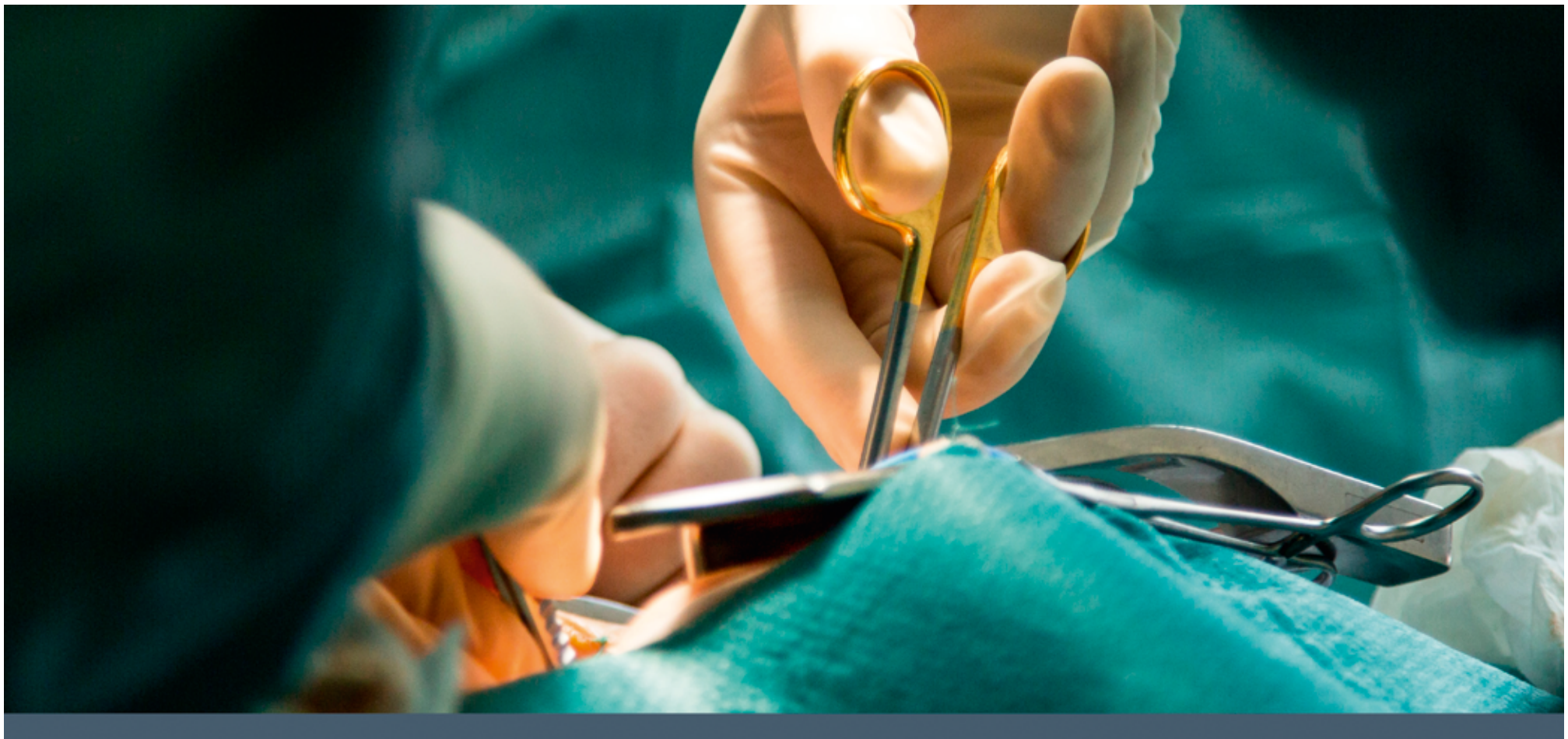
EACTS 2017
Floor Plan

Exhibition opening times:
Sunday 8 October: 15:00–19:00
Monday 9 October: 09:00–17:00
Tuesday 10 October: 09:00–17:00

59	3-D Matrix Ltd
35 & 36	A&E Medical Corporation
21	AATS-American Association for Thoracic Surgery
69	Abbott
94A	Acute Innovations
63	Admedus GmbH
112	Advancis Medical
10	Andocor NV
75	AngioDynamics
93B	Ansabere Surgical, S.L.
96	Asanus Medizintechnik GmbH
42	AtriCure Europe BV
83	B Braun
43	Berlin Heart GmbH
45	BioCer Entwicklungs-GmbH
99	Biointegral Surgical, Inc
94C	Biomatic International Inc.
40	Biometrix BV
73	BioStable Science & Engineering, Inc
23 & 25	Boston Scientific International
64	Cardia Innovation AB
85 & 86	CardiaMed BV
97	Cardio Medical GmbH
5	Changzhou Waston Medical Applicance Co., Ltd.
39	ClearFlow Inc
29	CORONEO Inc
T3	Cryolife Europa
54	Cryolife Europa
19	CTSNet
105	Cura Surgical Inc
89A-89C	CytoSorbents Europe GmbH
95	De Soutter Medical Limited
24 & 26	Delacroix-Chevalier
93A	Dendrite Clinical Systems Ltd
76	Dextera Surgical Inc

79 & 80	Dr. Franz Koehler Chemie GmbH
68	EACTS-The European Association For Cardio-Thoracic Surgery
93C	EBM Corporation
T6	Edwards Lifesciences
52	Edwards Lifesciences
70	Eurosets SRL
11	Evaheart, Inc
109	Exstent Limited
32 & 34	Fehling Instruments GmbH & Co KG
94B	Genesee BioMedical Inc
T2 & 82	Getinge
74	Heart Hugger / General Cardiac Technology
93D	Heart Valve Museum
13	Heart Valve Society
77	HMT Medizintechnik GmbH
22	ISMICS – International Society for Minimally Invasive Cardiothoracic Surgery
37	Japan Lifeline Co., Ltd.
111	Jarvik Heart Inc
102	Jeil Medical Corporation
94D	JOMDD Inc
27 & 28	JOTEC GmbH
67	Kephalios
31 & 33	KLS Martin Group - Gebrueder Martin GmbH & Co KG
50	Labcor Laboratorios Ltda
53	LivaNova
T1	LivaNova
57 & 58	LSI Solutions
T5	LSI Solutions
107	MDD Medical Device Development
38	Medela AG
71	Medistim ASA
81	Medtronic International Trading SÁRL
92C & 92D	Meril Life Sciences Pvt. Ltd

98, 101, 103	NeoChord
6	NORDIC PHARMA
108	OmniGuide Surgical
62	OpInstruments GmbH
106	Oxford University Press
113	PEROUSE-A Vygon company
44 & 46	Peters Surgical
7	Posthorax Limited
72	Qualiteam s.r.l.
104	RUMEX INTERNATIONAL Co.
1, 2, 3 & 4	Scanlan International Inc
78	Siemens Healthcare GmbH
55 & 56	Somahlution
88	Spectrum Medical
30	stroke2prevent
20	STS-The Society Of Thoracic Surgeons
48	Sunoptic Technologies
65	SynCardia Systems Inc
12	TEH-Tube
41	Terumo & Vascutek
T4	Terumo & Vascutek
89D	Tianjin Plastics Research Institute Co Ltd (TPRI)
110	Transonic Europe
8 & 9	Vascular Graft Solutions
92A	WEIRICH Medizintechnik GmbH
47 & 49	Wexler Surgical, Inc. & TeDan Surgical Innovations
87	Wisepress Online Bookshop
92B	WL Gore & Associates GmbH
90	Xenios AG
66	Xenosys Co Ltd
51	ZAMMI
100	Zeon Medical Inc
60 & 61	Zimmer Biomet



Join the discussion during our lunch symposium
on Monday October 9th, 12:45-14:00

Room 0.31/0.32

SURGICAL ABLATION: WHY, WHEN AND HOW IN THE FACE OF AN EPIDEMIC

It is not a lack of evidence: the rationale to treat AF	Manuel Castellà, MD
Concomitant AF ablation strategies: a matter of decision making?	Timo Weimar, MD
Lessons learned: how to implement technology to improve patients' outcome.	Nicolas Doll, MD
The AF heart team approach to optimize the treatment of AF patients	Mark La Meir, MD

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