EACTS
European Association For Cardio-Thoracic Surgery

Daily News

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In this issue

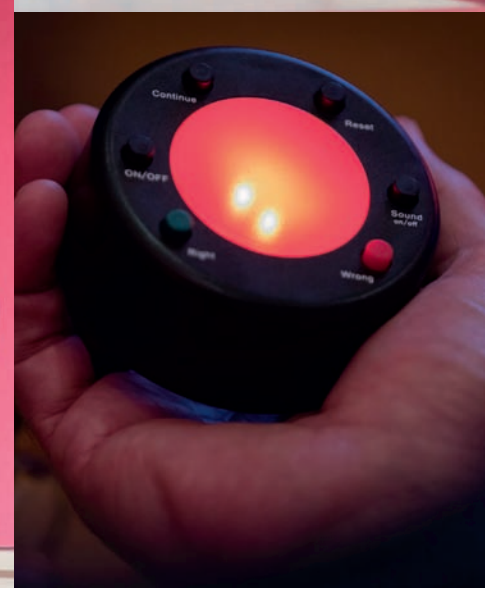
Live from Vienna

Jeopardy competition final held today

Don't miss the final round of the Jeopardy competition, taking place today at 14:15-15:45 in Hall F1. Successful delegates from Sunday's semi-finals will compete for a ticket to the next STS Annual Meeting in Lauderdale, Florida in January 2017. The winning team will represent Europe and will compete against the American winners for the 'World Champion' title.

Come to cheer on the teams, and test your own knowledge!

Finalists:
Madras Medical Mission, India
Castle Hill Hospital, UK



Vascular | Professional Challenge | Challenges in the management of aortic arch diseases

How I treat the aortic arch

In a session that explores one of the most technically challenging areas of vascular repair, Leonard Girardi (New York Presbyterian Hospital, and Weill Cornell Medicine, NY, USA) and Tilo Kölbel (University Medical Center Hamburg, Germany) share their expertise in treating the diseased arch from the open surgical and the endovascular perspective.

Open classic repair

Zanotti et al. recently reviewed surgical options for the treatment of aortic arch pathologies, highlighting that although significant improvements in surgical outcomes have come about, the challenges of operative mortality, neurological impairment and stroke remain[1].

Nevertheless, advances in the understanding of ischaemia on myocardial, cerebral and lower body tissues, and of protective techniques, are largely responsible for increasing safety in open repair that has come about in recent decades, and as such open repair remains the gold standard in the arch. In conversation with *EACTS Daily News*, Dr Girardi described his approaches to arch treatment, in a field that encompasses contrasting schools of thought.

"There are a lot of different ways to protect the brain during arch surgery," he began. "Institutional biases, based on experience, really guide a lot of what people do. To date there really haven't been any randomised trials or large meta-analyses showing an advantage for a particular brain protection strategy."

Open arch repair is performed with varying degrees of systemic cooling, circulatory arrest and cerebral perfusion, either antegrade or retrograde. These topics have been examined in a number of recent observational studies, meta-analyses and reviews[1-4]. Hypothermia reduces brain metabolic demand with the idea of obtaining complete or partial EEG silence, so as to minimise anoxia and acidosis under circulatory arrest as well as reducing reperfusion injury. Adjuvant brain perfusion methods were developed in order to allow for the possibility of moderate and even mild hypothermia amid concerns over both the efficiency of producing complete EEG silence as well as the possible negative effects of profound hypothermia, especially over longer periods of circulatory arrest .[3,5]

Yet despite the advent of adjunctive cerebral perfusion techniques a plurality of temperatures remain in use. Indeed, Dr Girardi discussed the possible pitfalls of higher temperatures in complex operations and in chronic kidney disease patients in a recent editorial[6]: "You see everything from profound hypothermia to moderate hypothermia, from 18°C, to 24°C, 28°C," noted Dr Girardi. "These alternative methods of brain protection generate important discussions. However, to date these discussions haven't standardised a way of doing arch surgery."

"To date these discussions haven't standardised a way of doing arch surgery."

Leonard Girardi

Perfusion strategies also differ, with antegrade perfusion by far the most popular strategy at present, he explained, as well as seeing the greatest variation in hypothermic temperatures. Indeed this is underscored by a recent review of temperature management in aortic arch operations by Kayatta and Chen, who describe selective antegrade cerebral perfusion as yielding most consistent evidence of efficacy relative to profound hypothermia alone.[7] Yet in 2015, Okita et al. found comparable clinical outcomes for antegrade versus retrograde cerebral perfusion in total arch replacement[8] – importantly, data comparisons are extremely challenging in the face of heterogeneous patient groups, selection biases due to institution, techniques employed, the extent and nature of pathology, and the degree of emergency of the procedure[4].

"Antegrade cerebral perfusion is used by the greatest number of investigators performing arch surgery; however, profound hypothermia without adjunctive brain perfusion also works quite well, particularly for uncomplicated arch repairs."

Dr Girardi's preferred strategy is retrograde cerebral perfusion. In 2014 he and colleagues published a large retrospective study demonstrating its safety and efficacy as an adjunct to profound hypothermia in hemiarch and total arch replacement patients[2].

"We must rigorously examine the outcomes of industry-sponsored trials."

Leonard Girardi

"The truth is that it works well, in [the right] hands," he noted. Advantages of retrograde perfusion include avoiding manipulation of the great vessels, maintenance of brain hypothermia, and flushing debris out of the cerebral circulation – advantages that antegrade does not provide. Could this be providing a benefit when it comes to stroke risk? "Most of these patients who have arch aneurysms (not so much dissections) have a lot of atheromanous debris," observed Dr Girardi.

He went on: "If you are perfusing the brain throughout the entire period of your arch reconstruction and if the amount of perfusion to the brain is adequate, why then do you have stroke and temporary neurologic deficit? It must be that either that brain perfusion is inadequate, perhaps attributable to our lack of understanding of cerebral autoregulation and blood flow, or due to great vessel manipulation embolic events are being generated.

"With retrograde we don't see a lot of embolic strokes nor a great degree of temporary neurologic deficit, probably because those of us still using retrograde are still using profound hypothermia. The low temperatures are very reassuring."

Cannulation is another talking point in arch repair, with different strategies favoured in different hands. "Most people using antegrade perfusion will have some form of axillary or innominate artery cannulation. There does not seem to be a difference in terms of which one you choose, but there may be instances where the axillary artery is too small or too fragile; then the innominate is an alternative site, and those that have published on this have good results. A much smaller number of surgeons and centres perform innominate artery cannulation."

Describing his approach, Dr Girardi continued: "In retrograde perfusion, we just cannulate the aorta and try to keep it simple. There isn't a need for complexity. You don't need a special setup and you avoid great vessel manipulation."

While open arch repair remains the gold standard, investigations into hybrid and fully endovascular techniques go on in an effort to address populations at high risk for surgery. Commenting on the extent to which the endovascular field could develop in this area, Dr Girardi said: "A lot of investigation is going into endovascular approaches, both in the cardiovascular and vascular surgery communities. Industry is also involved and is investing heavily in new technology. We must rigorously examine the outcomes of industry-sponsored trials to get the most accurate information from this important area of research."

"To date, there have not been consistent results with endovascular arch repair. I think there will always be a few centres of excellence out there with very talented surgeons and interventionalists who are capable of performing these procedures with low mortality and low rates of neurologic injury. But these procedures are quite complicated and those performing them must be committed to making sure the technology is applied in a very thoughtful way. If you dabble in complex endovascular repair you are going to have problems."

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Vascular | Professional Challenge | Challenges in the management of aortic arch diseases

Endovascular repair

Continuing the session on the challenges in aortic arch repair, a number of speakers discuss strategies alternative to the classic open approach such as hybrid debranching, frozen elephant trunk and endovascular techniques.

Open surgery remains the mainstay of aortic arch repair. But the benefits of surgery are not felt by those with significant risk factors that include advanced age, severe comorbidities and previous cardiac surgery. Such patients are prescribed medical therapy but do not tend to do well. Mid-term outcomes of surgical arch repair were recently published by Urbanski et al., in a European multi centre retrospective analysis spanning from 2004 and 2013, the authors concluding that the surgical risk in elective aortic arch surgery has remained high during the last decade despite the advancements in surgical techniques[1].

"Open surgery of ascending and arch pathologies requires major surgery including cardiopulmonary bypass, cardiac arrest, and a significant incision through the sternum," said Tilo Kölbel (German Aortic Center Hamburg, University Heart Center, University Hospital Hamburg Eppendorf, Germany), who will speak about the progress of endovascular arch repair during the session.

"The side effects of this trauma are significant, even though some centres of excellence may offer acceptable results in young patients. Patients who have undergone this type of surgery, which requires usually months of rehabilitation and getting back to normal life (if ever), do not want to repeat this experience, especially as re-operations have an even higher risk. Endovascular techniques may have a shorter lifespan, but the life the patients get after intervention is usually of better quality, with fast return to normal activities."

Within the subgroup of aortic arch disease patients for whom the risk of surgery outweighs its benefit, there is a potential of endovascular repair – if carried out by experienced teams, and provided that the patient's anatomy is suitable. Recently, Roselli et al. assessed just what proportion of inoperable patients would be eligible for endovascular repair, by conducting a retrospective analysis of patient data within the acute type A dissection population. The authors concluded that, out of the 8% of acute type A dissection patients who were deemed inoperable, two-thirds of such cases would be potentially coverable with endovascular devices.[2]

"Endovascular techniques may have a shorter lifespan, but the life the patients get after intervention is usually of better quality."

Tilo Kölbel

Commenting on this work, Dr Kölbel said: "With today's techniques of using tubular stent-grafts mainly for ascending repair, which Roselli et al.[2] address, I agree that a significant percentage is treatable with endovascular. But I would estimate this to be 50%. I expect to see new devices combining stent-grafts with valves which may overcome this limitation in the foreseeable future."

Where does the state of data lie with regard to endograft types and configurations? Tsilimparis et al. (2016) deemed both fenestrated and branched endografts as important in specific patient anatomies in a retrospective comparative study. They specified that fenestrated thoracic endografts could typically be used to extend the landing zone of TEVAR to treat the descending aorta involving the distal arch, as well as to treat complex mid or proximal diseases of the inner arch. However, aortic morphology must allow for fenestrations to appose to target vessels; if not, the authors favoured a branched endograft – which, they said, is also suitable where aneurysm covers the greater part of the aortic wall.[3]

Data on branched endografts is limited. Tazaki et al. (2017) found acceptable periprocedural outcomes, as well as establishing safety and efficacy, in the long-term in a study of the Inoue branched endograft for arch aneurysms. However, the authors highlighted the need to address periprocedural complications.[4]

Lee (2016) reviewed the current status of branched aortic arch endografts, writing that they likely represent the most promising treatment in the future of aortic arch disease, adding that branched endograft product matrices would include a number of diameters and branch configurations[5]. The use of branched endografts in tandem with tubular grafts in the endovascular repair of the aortic arch and ascending aorta was also described by Kölbel et al. in 2016, in two patients with acute type A aortic dissection[6].

Giving an impression of the state of development of branched endografts, Dr Kölbel said: "Three companies offer a custom-modified arch graft in Europe at the moment. The inner branch technology appears the furthest developed. Both Cook Medical [USA] and Bolton Medical [USA], who produce these grafts, offer limited retrospective data so far. We have now a series of around 100 arch endografts with fenestrations and branches and will soon report on the outcome, which shows around 5% mortality and 5-8% stroke risk."

While the fully-endovascular field continues to grow, the hybrid approach is perhaps better established. A study by Martin et al. (2016) of the short- and long-term outcomes of the hybrid arch repair found short-term outcomes comparable to open repair. The authors highlight issues, such as type Ia endoleaks following chimney grafting, that need to be addressed to make the endovascular approach more durable.[7]

Commenting on the current prevalence and distribution of endovascular aortic arch repair expertise in general within Europe, Dr Kölbel noted: "It is still restricted to a limited number of centres – probably 10 to 20 in Europe. It will require some more years to get operators educated and spread to other places."

He continued, addressing the learning curve demands of arch repair: "Ascending and arch interventions require significant experience and skills with catheters and wires and experience in less dangerous areas. For the moment this should be restricted to dedicated large centres with significant experience. Learning endovascular techniques, if performed properly, requires probably the same depth of training as open surgery. This is sometimes underestimated as just opening a graft doesn't require a lot of skill. But there are hundreds of little tricks around it that allow for a safe procedure and good outcomes."

One such 'trick' appears in a technical note by Kölbel et al., where a CO2 flushing technique is employed to prevent air embolus formation during stent graft placement. 36 TEVAR patients received thoracic stent-grafts preoperatively flushed with carbon dioxide in order to remove room air.[8] Air embolism, explained Dr Kölbel, could be an underappreciated mechanism of stroke: "Stroke is the most significant risk in these procedures. Open surgery also faces stroke risks that are comparable. But the percentage of 5-15% which usually is reported only refers to clinically obvious stroke. There is underreported brain damage, which may be responsible for patients' cognitive decline and future strokes."

He noted that reported rates of silent brain infarctions are as high as 80% in TAVI and plain TEVAR[10,11]. "We should expect this number to be even higher for arch interventions. Air is an under-recognised problem. Although we know that significant amounts of air are released into central circulation during these procedures and that this can block cerebral vessels, the scientific community and device manufacturers have chosen not to address this issue. It is like a big elephant in the hybrid-room."

In his concluding remarks, Dr Kölbel commented on the notion of there always being a place for surgery: "I agree with Dr. Girardi, that there will be a place and need for the foreseeable future. The takeover of endo-techniques will not be as quick as for valve procedures, but it will come."

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Cardiac | Focus | 2017 Perioperative blood management guidelines

Intraoperative anticoagulation

Christa Boer, Professor of Anaesthesiology at VU University Medical Center, Amsterdam, the Netherlands and co-chair with Domenico Pagano of the EACTS/EACTA Guidelines on Patient Blood Management for Adult Cardiac Surgery[1] gives her insights into the collaboration which has produced the first joint guidelines between the two societies.

Implementing a multidisciplinary team approach to patient blood management in cardiac surgery can minimise blood loss, help reduce transfusion requirements and costs, as well as improve patient outcomes, say new guidelines.

Professor Boer, who was involved in drawing up the guidelines with EACTS, said the whole issue of patient blood management was now a hot topic with cardiac surgeons and was "coming out of the shadows."

She added: "I looked back at the programmes for cardiac scientific meetings from a few years ago and there weren't any on patient blood management, but now there are. It's a subject that is gaining much more attention and rightly so. Patient blood management is a 'hot topic' now because it can save blood; blood is really an issue now as blood donation declines, and also blood transfusion is being used as a quality endpoint, so if you perform surgery without needing transfusion you are really a hero.

"Patient blood management has attracted a lot of interest in the anaesthesiology world for around five to 10 years, but has only really become a general interest in the cardiac field for the last few years – but now there is much more awareness and surgeons are much more interested."

Professor Boer underlined that patient blood management in cardiac surgery can minimise bleeding, reduce blood transfusion needs, and help maintain perioperative haemostasis. Both high blood product transfusion requirements and reoperation for bleeding have been associated with adverse clinical outcomes.

"Patient blood management is managed by cardiothoracic surgeons, the anaesthesiologist and the clinical perfusionist," explained Professor Boer.

"In a joint effort, EACTS and EACTA have produced joint guidelines for patient blood management in adult cardiac surgery."

Professor Boer says the guideline initiative came from the surgical side as there seemed to be so much variation in blood management between different centres in Europe."There had been a need for guidelines on blood management in cardiac surgery for a long time, as none currently exist, but EACTS recognised the need to involve cardiac anaesthesiologists too.

"Both realised that patient blood management cannot just be done by one health profession, it needs input from surgeons, anaesthesiologists and perfusionists. I guess it was very important to realise this," said Professor Boer.

Experts from both organisations conducted a review of all the available evidence and agreement was reached through conference calls and face-to-face meetings.

"Each surgeon worked as part of a pair with an anaesthesiologist for every topic so we could cover it from each side. It was very important to have input from both sets of professionals," said Professor Boer."We had meetings and voting rounds through emails so we could reach consensus and we also made rules. At the end there were only a few topics we needed to have discussion on.

"One of the challenges you have to deal with is that you have evidence, and then you have opinion, so there would be a debate between experience and what was published in the literature, and these were the most challenging discussions. The knowledge levels of the whole group increased as a result of the discussions though."

Similarly, Professor Boer said the guideline authors found some practices were mainly based on the individual experience. "Some of these are widely used in clinical practice but they don't have a strong evidence base. For instance, in cardiac surgery we have the opportunity to use a very expensive drug to stop bleeding called fibrinogen concentrate, and there is huge variation in its use. Some centres use it all the time and others don't use it all. The problem is the number and quality of studies available on its effectiveness is very low, most of the studies don't have a powerful design.

"This recommendation had to be handled very sensitively, as obviously we don't want to put the drug out of business, as we need it and there is a place for its use. We are not saying it doesn't work, just that more evidence is needed of its effectiveness."

Professor Boer went on to note that more large trials were needed to show the drugs work and regular updates should be published, saying: "The most important recommendations in the guidelines relate to how you can optimise your patients before surgery to reduce blood loss, transfusions and deaths. For instance, in my own centre we did a lot of investigations on patient blood management and we observed a 75% decrease in use of blood products, just by using a couple of interventions.

"For example, if you operate on patients with anaemia with a shortage of haemoglobin, the risk of blood transfusion increases, so we give advice on how to improve the condition. We also have to deal with all the drugs patients take nowadays such as antiplatelet drugs and anticoagulants. These drugs all increase the risk of blood loss, so we try to give very practical schemes and tools for a physician so they can optimise their patients in a better way.

> *"The most important recommendations in the guidelines relate to how you can optimise your patients before surgery to reduce blood loss, transfusions and deaths."*
>
> Christa Boer

"During the surgical procedure, we provide algorithms for dealing with a patient who is losing blood, and although there is no perfect algorithm, at least introducing a protocol in your institution where you describe what you do when a patient starts to lose blood, can be very beneficial in reducing blood transfusions.

"What is of course very different from other surgical specialties is that we have the heart/lung bypass machine, and we also provide recommendations on the use of the heart/lung machine. There is a lot of variation on how use of the machine is approached. That is also the reason that there is now an expert opinion upcoming on cardiopulmonary bypass."

Professor Boer noted that they have now made recommendations on the volume of fluids used in cardiopulmonary bypass, and also the use of anticoagulant drugs during this period. "These days, surgeons and anaesthesiologists have clinical protocols on cardiopulmonary bypass, but how the bypass machine is operated by perfusionists is an aspect of cardiac surgery which needs more emphasis."

She added that the guidelines also stressed the importance of the multidisciplinary team in patient blood management. One Class 1 (C) recommendation is that the multidisciplinary team (cardiologists, surgeons, anaesthesiologists and perfusionists) discuss optimal surgical strategy based on clinical status, comorbidity and bleeding risks and team expertise. The collaborative approach recommended reflects "the need not only for the surgeon to apply meticulous haemostasis and patience with respect to clot formation," but with recognition that these measures are only effective when paralleled by interventions that minimise haemodilution, normothermia, appropriate anticoagulation and haemostatic monitoring during the procedure.

Other key recommendations include: limitation of haemodilution, routine use of anti fibrolytics, transfusion of PRBC based on the clinical conditions of the patient rather than haemoglobin levels, and PRBCs of all ages.

The guidelines say the following should be *considered*: aspirin should be continued in CABG, cell salvager, MUF and RAP should be implemented, heparin level management should be considered over ACT-guided heparin management, and protamine-to-heparin dosing ratio should be less than 1:1.

The following approaches are not recommended: routine use of topical sealants, AT supp to reduce bleeding following CPB, prophylactic FFP fibrinogen, DDAVP, or rFVIIa administration.

Professor Boer will dive into intraoperative anticoagulation, and the Guidelines, in more detail during this afternoon's session '2017 Perioperative blood management guidelines'.

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Cardiac | Focus | Ethical and surgical issues in organ transplantation

Should patients' wishes come before the dead donor rule?

During a session examining ethical issues in organ transplantation that includes adult heart allocation, immunosuppression, and dual transplantation, Robert Sade (Institute of Human Values in Health Care, Medical University of South Carolina, USA) will discuss the dead donor rule, arguing for a new approach to organ donation that brings donors' wishes to the fore.

The implementation of the dead donor rule – the guiding principle that organ removal must not cause death – is tangled up with the definition of the point of death, which has itself evolved considerably alongside the development of medical technologies such as mechanical ventilation. The legal definition of death has been called into question recently, not least because, in the context of the dead donor rule, it constrains the timing of organ procurement. In a recent paper, Dr Sade argued that a major problem with the dead donor rule as it stands lies in the increasing difference between the number of organ donors and those requiring them – and that, paradoxically, the rule may be responsible for a great number of deaths.[1]

Separating out legal and biological definitions of death is important in considering this subject. Biological death constitutes the cessation of all biological functions. In recent work, Nair-Collins and Miller (2017) deconstruct the concept of 'brain death' upon which basis the dead donor rule is honoured, arguing that, despite being artificially sustained, the brain dead individual is not biologically dead: "In patients meeting 'brain death' criteria, the ventilator provides a necessary condition – air flow – that the organism would not otherwise provide due to brain injury, and therefore the ventilator is life-sustaining technology."[2]

Thus, they argue, brain death and biological death cannot be conflated. In this way the ethical foundation of organ procurement from such individuals is flawed – it being, for all intents and purposes, a 'workaround' of the dead donor rule. The authors query the continuing adherence to the dead donor rule as a necessary ethical condition of organ donation.[2]

> *"If the dead donor rule were abandoned, the waiting list for heart patients would be wiped out in one year."*
>
> Robert Sade

Organ donation is, by general consensus, ethically justifiable.[3] Recent case studies serve to illustrate the legal pitfalls that limit organ donation where it is otherwise ethically defensible. In 'As good

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Cardiac | Focus | Ethical and surgical issues in organ transplantation

Should patients' wishes come before the dead donor rule?

Continued from page 5

as dead', journalist Gary Greenberg described the case of a 14-year-old boy with fatal brain stem tumour, who, despite wishing to donate his vital organs, would be unable to because his higher cortical functioning would remain intact until his brain stem and hence vital functions failed. Yet, by the point of pronouncement of death, warm ischaemia would prevent them from being of any value to donor recipients. Despite this individual making the informed autonomous decision to donate his organs where his death was inevitable, he was unable to do so.[4]

Dr Sade has written on the topic of the dead donor rule, viewing definitions such as donation after brain death (DBD) and after circulatory death (DCD) as legal fictions that result in many organs (that would otherwise be transplantable) deteriorating during the process of circulatory arrest and pronouncement of death 2 to 5 minutes after.[5,6]

"I believe the dead donor rule is not only ethically suspect, but that for practical reasons it should be entirely abandoned," he told *EACTS Daily News*. "This rule is not a law, but an ethical precept that has overshadowed the foundational ethical criteria for organ donation by patients who will die very shortly or imminently: a completely voluntary, no coercion or undue pressure, desire to donate, and well-informed consent to be an organ donor.

"From a practical perspective, the dead donor rule has resulted in about 10,000 unnecessary deaths every year. In my talk, I will show that if the dead donor rule were abandoned, the waiting list for heart patients would be wiped out in one year and for kidneys, livers, and lungs in 2-3 years."

The manner in which the dead donor rule should be abandoned, explained Dr Sade, is that consenting donors facing imminent death be operated on while still alive to remove vital organs. While this proposal seems as though it may introduce ambiguity to the rules of organ donation, Dr Sade stressed that no less ambiguity is associated with the existing mechanisms by which decisions are made to withdraw life support in any patient who is near death. "Death occurs after withdrawal of life support in 60-90% of patients in medical intensive care units in the US.

"In donation by the imminently dead (DID), the decision to withdraw life support must be taken before organ donation is considered or offered to patients or families; that is, there must be complete separation between the decision to withdraw life support and a decision to donate organs. Current protocols for the widely accepted DCD also require that this separation be maintained, so this is nothing new. Withdrawal of life support always requires judgment calls, and those are associated with some ambiguity, but DID is not different from DCD in that regard."

When it comes to bringing such changes into force, Dr Sade commented that abandonment of the dead donor rule is not likely to happen any time soon and that it will face a great deal of resistance. Despite negative headline-grabbing media stories on the topic of illegal organ harvesting, public attitudes toward organ donation in general appear very positive. Indeed, in a 2015 US public survey, Nair-Collins et al. found public attitudes to be in favour of organ donation, even in scenarios directly violating the dead donor rule: 85% of a 1,000-strong sample agreed that they were willing to donate organs after death, 76% of whom agreed that they would donate in the scenario of irreversible coma with organ removal causing death.[3]

"The rate of organ donation in the US has continuously increased over the last 30 years, with very few, if any, blips in that linear increase," noted Dr Sade. "I also believe that the biggest problem in adopting DID or something like it is not going to be public opinion; rather, it's going to be resistance by the community of transplant physicians and surgeons. Transplant surgeons will still be concerned about the possibility of prosecution for killing a patient. Several pathways could be taken to make organ donation acceptable before the patient is pronounced dead.

> *"Withdrawal of life support always requires judgment calls...donation by the imminently dead is not different from donation on circulatory death in that regard."*
>
> Robert Sade

"Consider this also: the concept of brain death was first proposed in 1968 in the US and was codified into law in 1981, although many states did not adopt this law until the mid-1980s. During the (roughly) 15 years when there was no law permitting the determination of death by neurological criteria, many patients who were near death, but were legally still alive in an intensive care unit on a ventilator and many other modalities of life support, were taken to the operating room and their organs removed for transplantation. Although these procedures were technically illegal, in those 15 or more years, there was not a single instance of protest by any individual, organisation, or prosecutor. The general public simply didn't care, and believed that taking organs under those circumstances was perfectly acceptable."

Public values evolve as new ethical challenges emerge in medicine. For example, noted Dr Sade, at the dawn of the donation era, 'good samaritan' donors were viewed with intense suspicion, and were not accepted by most donor centres for fear they might be mentally ill. "Ultimately, most programs [now] accept such donors, recognising that many of them are simply altruistic offerings requiring only a thorough psychosocial evaluation before being accepted. In recent years, several hundred good samaritan donors provide a kidney to the general pool of organs every year."

Ethical challenges of greater relevance today include stem-cell research, prenatal genetic testing, public health policy, data protection, and physician-assisted dying – and have demonstrated that public opinion shifts as these concepts become familiar. Drawing analogies across issues can also be helpful: "Physician-assisted death is a good analogy to DID," said Dr Sade. "Arguments against physician-assisted death generally are based on slippery slope concerns that are in opposition to arguments that favour honouring patients' self-determination, that is, the right of individuals to control the fate of their own bodies and lives.

"The ethical foundation of DID is similar: when a patient is about to die, honouring his right to self-determination or autonomy, even if expressed through a surrogate decision maker, should be the controlling factor in how his wish is handled. In the US, physician-assisted death was illegal in every state 20 years ago. Today, increasing acceptance of the overriding importance of personal self-determination has changed that: physician-assisted death is now legal in 6 states, and legalisation is being considered in a least a dozen more. My hope is that DID will gradually be accepted similarly in both Europe and the US."

Around the world, he added, attitudes to organ donation vary. The opt-out system, also known as presumed consent, holds in several EU countries. Such opt-out systems, as opposed to opt-in systems, assume that everyone wants to be an organ donor unless they specifically state that they do not want to donate.

"Although 'presumed consent' has been recommended by some in the US, no jurisdiction has accepted this as policy or law," he said. "This is probably related to cultural differences between Europe and the US. In the US, there is much greater emphasis on individualism and individual choice, suggesting that making such a presumption is unjustified."

Dr Sade speaks during the session 'Ethical and surgical issues in organ transplantation' taking place this morning from 8:15 in Hall K2.

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Vascular | Focus | How to approach the aortic valve in a dilated root

Cusp configuration and cusp plasty is the clue in tricuspid aortic valve repair

Hans-Joachim Schäfers Dept. of Thoracic and Cardiovascular Surgery, Saarland University Medical Center, Homburg/Saar, Germany

In the past 15 years, aortic valve repair has become an alternative to valve replacement for the treatment of regurgitation. In tricuspid aortic valves, the most frequent cause of aortic regurgitation is cusp prolapse, at least in a central European environment. In order to establish normal postoperative valve function, restoration of normal valve form is essential. This also requires a normal amount of cusp tissue, i.e. an absence of relevant retraction.

Previous repair approaches have relied primarily on visual judgment of valve configuration and the results of the repair interventions. In the absence of objective data on valve form the results were not always predictable. In order to generate better information we have analysed both failures of aortic valve repair and also functionally normal valves. The height difference between cusp margin and basal plane in diastole – termed effective height – was found to relate to root size in normal valves with a mean of 9 to 10 mm in adults, thus was an quantitative indicator for cusp configuration.

In a retrospective analysis, this effective height was also associated with a high probability of a good functional result and durability. In order to define normal values for tissue, we have also measured the maximum tissue height between insertion and free margin in the centre of the cusp, termed geometric height. More than 90% of the individuals studied had a geometric height of 18 mm or more.

Initially, geometric height is measured and the concept of repair pursued if it is 18 mm or more. Using a graded calliper, effective height is then measured, yielding objective and quantitative information on cusp configuration. An effective height of less than 8 to 9 mm (depending on values of geometric height) indicates prolapse. Prolapse can be corrected in most instances by central plication sutures on the free margin, if necessary also extending into the body of the cusp. The calliper, in conjunction with visual assessment, can then be used to evaluate the result of the surgical intervention.

Using these principles, repair of the tricuspid aortic valve has become a rational and widely reproducible procedure. The elimination of retracted cusps helps to identify the valves suitable for repair. Using a determination of effective height, the cusp repair can be tapered to need, and is less dependent of surgical judgment.

Cardiac | Rapid Response | Extra corporeal life support – Always a good solution

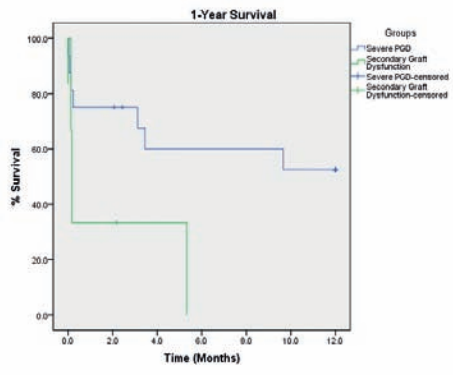
Outcome of ECMO support for treatment of primary graft dysfunction after heart transplantation

Fardad Esmailian, Sadia Dimbil, Ryan Levine, Jignesh Patel, Michele Hamilton, Lawrence Czer, Francisco Arabia, Jon Kobashigawa Cedars-Sinai Heart Institute, Los Angeles, CA, USA

The treatment of primary graft dysfunction (PGD), in the setting of heart transplantation, remains a significant challenge as it is still the leading cause of early mortality. In 2014, the International Society of Heart and Lung Transplantation (ISHLT) defined guidelines for diagnosing PGD. Severe PGD-LV was defined as the requirement of biventricular mechanical circulatory support or extracorporeal membrane oxygenation (ECMO) within 24 hours of heart transplantation.

ECMO offers support for cardiogenic shock, improvement in haemodynamic function, and increased patient survival with end-stage heart disease. In heart transplantation, ECMO can be an effective approach in treating patients with severe PGD in the immediate post-transplant course. Our goal was to assess the efficacy of ECMO use in treatment of patients with severe PGD at our large single centre.

Between 2010 and 2015, we assessed 581 patients undergoing heart transplantation. Of those, 22 patients required ECMO support within 24 hours of heart transplantation. The indications for ECMO included PGD (n = 16), and secondary graft dysfunction (n = 6), primarily due to intraoperative bleeding and thrombotic events. We assessed one-week, one-month, six-month, and one-year survival along with one-year freedom from cardiac allograft vasculopathy (CAV) as defined by stenosis ≥ 30% by angiography. Additionally, one-year freedom from non-fatal major adverse events (NF-MACE) defined as: myocardial infarction, new congestive



heart failure, percutaneous coronary intervention/ stent, implantable cardioverter defibrillator/ pacemaker implant, stroke, one-year freedom from any-treated rejection, acute cellular rejection, antibody-mediated rejection, and biopsy negative rejection was also analysed. Kaplan-Meier survival and Chi-square analysis were performed using SPSS (IBM) software.

In the secondary graft dysfunction group, 4/6 patients died within one week post-heart transplantation, and one additional patient died at six-months post heart transplantation. Of the 16 patients with severe PGD, survival was as follows: one-week survival (81.3%), one-month survival (75.0%), six-month survival (60%), and one-year survival (52.5%).

There was no significant difference in one-year freedom from cardiac allograft vasculopathy, non-fatal major adverse cardiac events, and all types of rejection between the two groups.

It appears that ECMO is a viable option in the treatment of patients with severe PGD as it portends acceptable outcome. However, due to the haemodynamic instability of the secondary graft dysfunction patients, the use of ECMO is associated with poor outcomes. Larger numbers are warranted to validate these findings as these numbers are small. Additionally, better understanding of the pathophysiological mechanisms of PGD will help to improve treatment options for these patients.

Congenital | Focus | Nightmare cases

Nightmare cases session: Univentricular heart

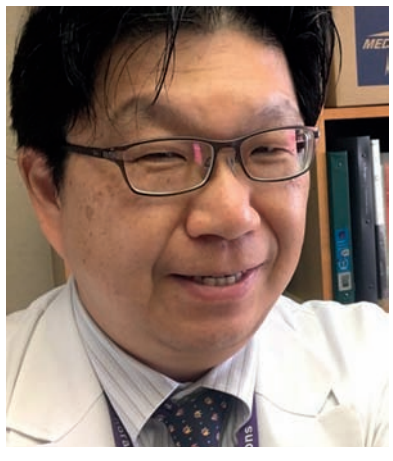
Takahiko Sakamoto Department of Pediatric Cardiovascular Surgery, Children's Medical Center, Matsudo City General Hospital, Chiba, Japan

Introduction

We will present of nightmare case focusing on univentricular heart. First Fontan completion was not accomplished and the following nightmare course was experienced.

Case

The patient was diagnosed as Dextrocardia, Asplenia, {A(s),D,L} SRV, DORV, PS, CAVV, CA, bilateral SVC, left PAPVC, RAA. She underwent RMBT and the following bilateral BDG at the age of three months and seven months, respectively. Cardiac catheterisation data revealed PAP of 13 mmHg, IVCP of 6 mmHg, Rp of 2.7 unit • m^2, PA index of 141 mm^2/m^2, RVEDV of 224 % of Normal and RVEF of 61%. SpO2 was 85-90 %. She underwent extracardiac TCPC without fenestration at the age of two years, and successfully weaned from CPB with AoP of 69/42(52) mmHg,



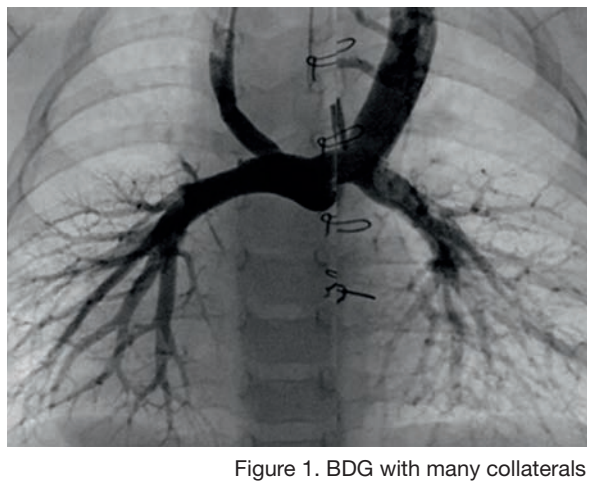


Figure 1. BDG with many collaterals

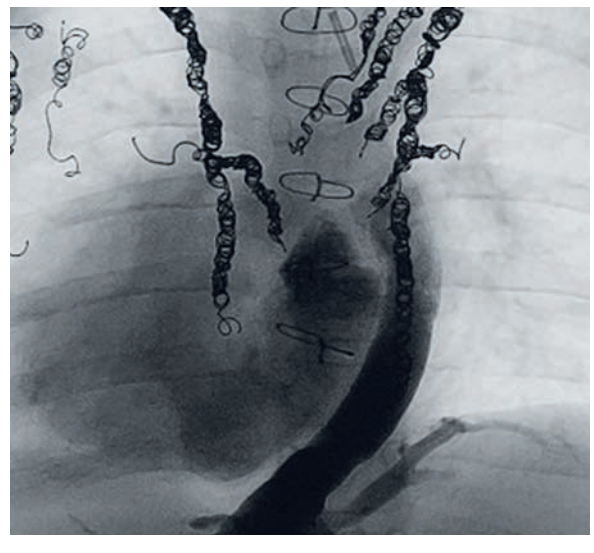


Figure 2, right. Fenestrated TCPC with oxygen

CVP of 12 mmHg and LAP of 6 mmHg. Tracheal tube was removed at two hours after surgery, and she was moved to general ward on POD 2. Last CVP was 15-16 mmHg.

However, there was much increase in bilateral pleural effusion, and she underwent creation of additional fenestration (4 mm) on POD 9 but it was naturally closed and finally she was taken down to BDG on POD 13 due to unstable haemodynamics. Moreover, sudden intestinal perforation occurred and resection of the perforated portion was performed on POD 24. She was discharged from hospital two months later (failed Fontan). Our team discussed the future plan, and she underwent aggressive coil embolization for collaterals and surgical cleaning of left subclavian artery. The following cardiac catheterisation data showed PAP of 12-13 mmHg and IVCP of 6 mmHg, and finally she successfully underwent redo-fenestrated TCPC (5 mm). Final postoperative CVP was 14 mmHg and SpO2 was 90% around under O2 1l/min.

Discussion

In this case, SpO2 after fenestrated TCPC was almost the same as that at BDG, and IVCP (CVP) elevated from 6 to 14 mmHg. Cardiac output is also the same. The time course was nightmare for us as well as the patient. The question is which is better for the patient, BDG with many collaterals or fenestrated TCPC with oxygen inhalation?

Cardiac | Rapid Response | Aortic valve replacement in a nutshell

Haemodynamics during rest and exercise: A comparison of two stented aortic valve bioprostheses and a healthy control group in small aortic annuli

Sina Stock, Inga Lohmann, Ulrich Stierle, Doreen Richardt, Hans-Hinrich Sievers Department of Cardiac and Thoracic Vascular Surgery, University of Luebeck, Germany.

In recent years, surgical aortic valve bioprostheses (SAVBs) have experienced increasing acceptance even in younger patients[1,2], since SAVBs offer certain advantages compared to mechanical heart valve substitutes. But the price to be paid for the absent need of lifetime anticoagulation and the lack of valve noise is a significantly higher rate of re-operations. Thus, it is essential that SAVBs provide excellent long-term data and haemodynamics. But while SAVBs reduce valvular obstruction significantly, some kind of residual stenosis is left as an intrinsic shortcoming of the devices or the procedure itself. According to the Hagen-Poiseuille law (exponential relation of forward flow to to radius of an orifice area), especially in small aortic annuli this may lead to prosthesis-patient mismatch (PPM) causing a functional prosthetic aortic valve stenosis (pAS), which is known to significantly impair postoperative outcome.[3-7] Most studies assess echocardiographic characteristics of SAVBs only at rest, representing some kind of 'low-flow' state and only one splinter of every-day haemodynamics. Since

blood pressure and heart rate increase during exercise, i.e. every-day activities, it is essential to additionally evaluate SAVBs under these conditions, potentially revealing changes in the incidence of PPM and pAS.

The purpose of this study was to determine rest and exercise haemodynamics of two differently designed SAVBs, the Perimount Magna Ease (Edwards Lifesciences, USA) bearing its leaflets inside the stent frame and the Trifecta (St. Jude Medical Inc., USA) bearing its leaflets outside the stent frame, labelled size ≤23 mm, and to compare the results to a healthy control group.

Therefore, mean transvalvular gradient (δp), effective orifice area (EOA) and effective orifice area index (EOAI) during rest and exercise were determined using transthoracic echocardiography in 35 Trifecta patients (mean age 71.4 years, follow-up one year, labelled valve size 21.7 mm), 16 Perimount Magna Ease patients (mean age 66.2 years, follow-up 2.6 years, labelled valve size 21.6 mm) and 25 healthy persons. The parameters derived were summarised in a simplified VARC-2 (sVARC-2) classification based on excerpts of the VARC-2 consensus document[8] to determine prosthetic valve dysfunction. The final categorization of each patient to sVARC-2 I (insignificant dysfunction), II (moderate dysfunction) or III (severe dysfunction) was defined by the worst determined parameter representing the maximum impairment of SAVB function in each patient (Table 1).

Comparing Trifecta and Perimount Magna Ease, a significant superiority of Trifecta was seen at rest in δp (7.96 versus 12.19 mmHg) and EOA (1.57 versus 1.48 cm^2), during exercise in all parameters (δp 11.06 versus 19.2 mmHg, EOA 1.77 versus 1.26 cm^2, EOAI 0.96 versus 0.67 cm^2/m). Trifecta showed a physiological increase of EOAI during exercise. Therefore, the gap in haemodynamic performance between Trifecta and Perimount Magna Ease became wider during exercise, since haemodynamics in the Trifecta cohort improved but even worsened in the Perimount Magna Ease cohort, leading to a shift to better sVARC-2 categories in the Trifecta group and to worse ones in the Perimount Magna Ease group (Figure 1).

This study indicates a haemodynamic superiority of Trifecta with a significantly lower incidence of PPM and pAS compared to Perimount Magna Ease, resulting in better sVARC-2 categories. Compared to a healthy control group, only Trifecta showed a nearly physiological behaviour with an increase in EOA during exercise.

Table 1. Simplified VARC-2 (sVARC-2) classification for prosthetic valve dysfunction (7)

	Prosthetic aortic valve stenosis		Prosthesis-patient mismatch
	δp [mmHg]	EOA [cm^2]	EOAI [cm^2/m^2]
sVARC-2 I (insignificant)	< 20	> 1.1a > 0.9b	> 0.85c > 0.7d
sVARC-2 II (moderate)	20–40	1.1– 0.8a 0.7–0.6b	0.85–0.65c 0.7–0.6d
sVARC-2 III (severe)	> 40	< 0.8a <0.6b	< 0.65c < 0.6d

The worst parameter defines the category.

a: BSA ≥ 1.6 m^2; b: BSA < 1.6 m^2; c: BMI < 30 kg/m^2; d: BMI ≥ 30 kg/m^2

δp: mean transvalvular gradient; EOA: Effective orifice area; EOAI: Effective orifice area index; VARC: Valve Academic Research Consortium

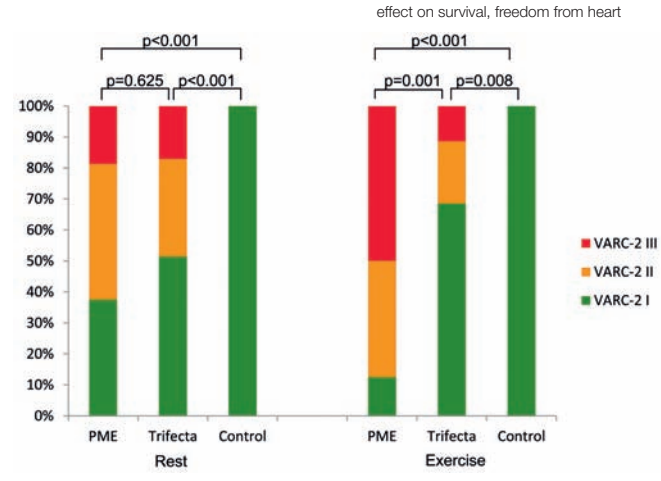


Figure 1. Percentage distribution of simplified VARC-2 categories at rest and maximum exercise in the healthy control, Trifecta and Perimount Magna Ease (PME) groups. The worst determined parameter defines the category.

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Cardiac | Abstract | Surgical management of effective endocarditis…

Aortic valve reconstruction using autologus pericardium (Ozaki procedure) for endocarditis via J-ministernotomy

E Rosseikin, E Kobzev, P Batrakov, V Bazylev
Adult Cardiac, Federal Center of cardiovascular surgery, Penza, Russia

Use of a prosthesis remains the gold standard in the treatment of infective endocarditis of the aortic valve. Currently, however, the search for new surgical methods to eliminate the need for anticoagulants that reduce the risk of infection of the prosthesis and improves postoperative survival. One of such methods is the "Ozaki procedure" for aortic valve disease of any aetiology, regardless of the age of the patient and the size of the fibrous annulus.

We present a case of successful surgical treatment of a 28-year-old man with active infective endocarditis of the aortic valve. On clinical examination, he had dyspnoea (NYHA III) and a subfebrile temperature. Echocardiography revealed left ventricular dilatation, aortic regurgitation III-IV (Figure 1), vegetation 12 mm (Figure 2) and perforation of the right coronary leaflet. Aortic valve replacement was performed on the patient using autologous pericardium

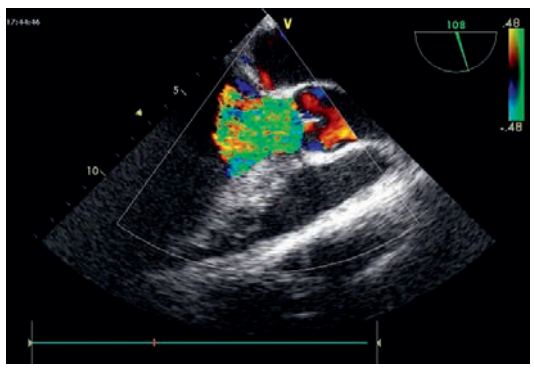

Figure 1. Before operation – aortic insufficiency 3-4

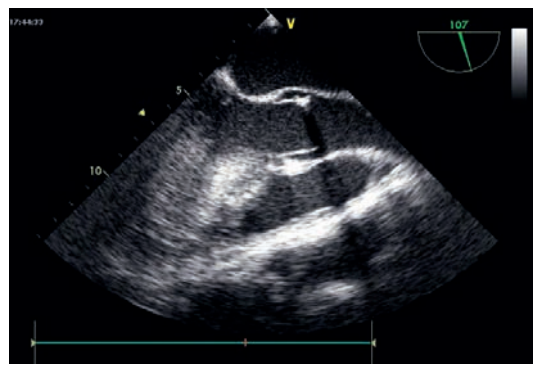

Figure 2. Vegetation on noncoronary leaflet

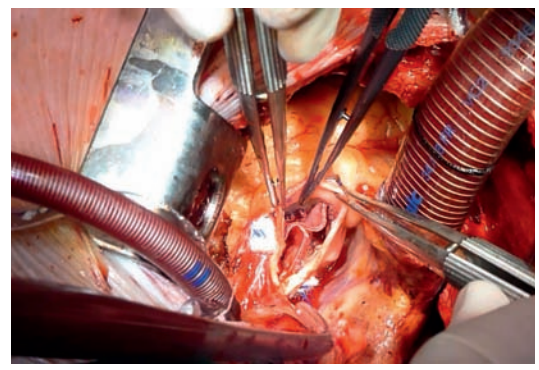

Figure 3. New autopericardial valve (Ozaki procedure)

(Ozaki procedure). The first stage produced thoracoscopic mobilisation of autopericardium from the left side. A J-ministernotomy was performed next, with beginning CPB-aorta-right atrium, and drainage of the left ventricle through the right superior pulmonary vein. After cardioplegic cardiac arrest and transverse aortotomy, the leaflets of the aortic valve were excised. In accordance with the templates, cuts were made in the three autopericardial leaflets and implanted in the aortic position (Figure 3). After disconnecting the extracorporeal circulation, transoesophageal echocardiography showed no aortic regurgitation, an effective orifice area of 3.4 cm^2, length of leaflet coaptation to the valves of 18 mm, and average systolic gradient of 6.5 mm Hg (Figure 4).

The postoperative period was uneventful. The patient was discharged on the seventh day. At the control examination after 16 months, the patient had no heart failure, echocardiography-marked reduction in the size of the left ventricle, an area of effective openings of 3.5 cm^2, an average systolic gradient of 5.2 mm Hg and no aortic regurgitation.

Thus, the Ozaki operation is a promising approach in the surgical treatment of infective endocarditis of the aortic valve, since the valves used autologous material, the pericardium, which is more resistant to reinfection; the valve has excellent haemodynamic characteristics; and it does not require administration of anticoagulants. The use of J-ministernotomy with this procedure has several advantages: it minimises blood loss, shortens the time of mechanical ventilation, reduces pain, reduces the risk of sternal infection and instability of the sternum, and provides a good cosmetic effect.

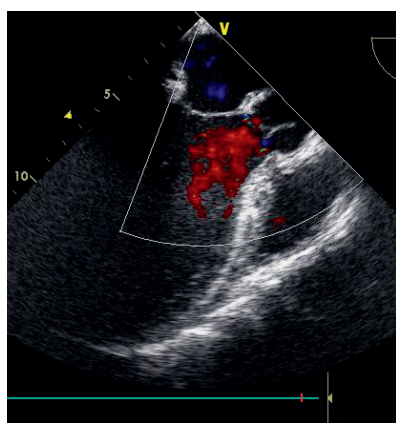

Figure 4. After operation – aortic insufficiency 0

INSIDE VIENNA

Where to go? What to do?

SIGHTS

SCHÖNBRUNN PALACE

With over 1,400 rooms, the former imperial palace is as grand in size as it is in style. Tickets can be purchased for a dedicated tour of the building, or perhaps just stroll its gardens and Roman ruins, taking in the view as you go.

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Orchestral members of this eminent and beautiful opera house are regularly plucked by the Vienna Philharmonic – widely known as one of the most accomplished orchestras in the world.

FOOD AND DRINK

WIENER SCHNITZEL & BEER

The classic Viennese combo can be found in many great restaurants across the city, but there are a few special mentions! **Salm Bräu** has its own brewery, crafting delicious beers with their years of expertise. **Figlmüller** prides itself as being home of the schnitzel for more than 100 years, keeping to a small menu done to perfection. On the other side of the coin, modern **Skopik & Lohn** offers the dish in a bright, 21st century atmosphere.

VINEYARDS OF VIENNA

Wine-making within a large capital metropolis may seem unlikely, but Vienna not only proves it's possible, it leads by example. A trip to an authentic Viennese **Heurige** (a shorthand for "this year's wine") is a real treat. Expect communal tables, beautiful backdrops, and of course a fine glass of (predominantly) white wine. Head to www.wien.info for locations.

NASCHMARKT

The central market of Vienna is over a kilometre long, offering a great way to work up an appetite before tucking into the delicacies that adorn the stalls (open Monday to Saturday).

CATCHING A GLIMPSE OF FROZEN ELEPHANT TRUNK SPECIALTIES

Lunch Symposium

Monday, October 9th, 12:45 h – 14:00 h, Level -2, Room -2.47 / -2.48

Chair: Prof. Aung Oo, MD, London, United Kingdom

Scientific Topics

Mini-Sternotomy during FET-procedure
Petar Risteski, MD, Frankfurt, Germany

Hemi-Arch Surgery in Acute Type A dissection approves the formation of chronic dissections
Prof. Andreas F. Zierer, MD, Linz, Austria

Panel discussion

Prof. Aung Oo, MD, London, United Kingdom
Petar Risteski, MD, Frankfurt, Germany
Prof. Andreas F. Zierer, MD, Linz, Austria
Prof. Heinz Jakob, MD, Essen, Germany
John Kokotsakis, MD, Athens, Greece

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Cardiac | Focus | The surgeon's role in cardiac implantable electric devices

Cardiac implantable electric devices: Is surgeon–electrophysiologist cooperation key to success?

This afternoon will feature a session focussing on 'the surgeon's role' in cardiac implantable electric devices. Co-moderated by Brigitte Osswald, Professor of Cardiothoracic Surgery at Heinrich-Heine-Universität, Dusseldorf, Germany, the session hopes to explore the cooperation between cardiothoracic surgeons and electrophysiologists, and how this can affect patient outcomes.

In an interview with *EACTS Daily News*, Professor Osswald gave an introduction to the session, touching upon the key topics that should be discussed, and emphasising the need for continuous education.

How is the role of a surgeon changing in the cardiac implantable devices field?

Electronic cardiac devices have been implanted since the 1960s and 1970s (pacemakers) and in the early 1990s (ICDs) by cardiac surgeons since epimyocardial leads required open chest access. Since then, transvenous lead placement allowed small incisions, and electrophysiologists have predominantly performed implantations and device exchanges.

So pacemakers and ICDs nowadays usually only return to cardiac surgery if complications are imminent or present. Therefore, a team approach is neededto offer optimal therapy for the individual patient.

Although historically pacemaker surgery was in surgical hands, only a few cardiosurgical experts in Europe performed pacemaker and ICD-related surgery. Pacemaker and ICD implantation in most European countries is done by cardiologists/electrophysiologists. The yearly number of implantations across Europe is according to ESC data about 500,000 pacemakers and 85,000 ICDs.[1]

The life expectancy of patients with pacemakers and ICDs is increasing as the general population lives longer. So we have seen an increase of patients with complex systems, including functional and non-functional leads, as well as a rising number of device-related infections. Since transvenous leads are embedded in massive fibrous tissue over time, lead extraction bears the risk of vascular tears or myocardial perforation.

Therefore, the position paper of Wilkoff et al (2009)[2] recommends any lead extraction being performed in an OR or cath lab with a cardiosurgical team on site, and the equipment needed for emergent opening of the chest and open heart procedures (extracorporeal circulation, etc).

Across Europe, only few specialised cardiac surgeons now perform those procedures as well; they are fully-trained cardiac surgeons and perform electronic device-related procedures such as implantations, aggregate exchanges and revisions.

"The fast-growing functionality and variety of tools and techniques in this field necessitates continuous education"

Brigitte Osswald

In most European countries, though, cardiologists primarily perform any type of device-related procedure with cardiac surgeons on call for revisions. As cardiac surgery and cardiology have become closer in many aspects, fundamental skills and knowledge about electronic device therapy combined with the ability to overcome potential complications areessential. Cardiac surgeons need to be part of a team approach to find the safest and optimal solution for the individual patient.

Is there a need for continuous education in this area because the tools and techniques are changing all the time? If so what form should it take? Can you give some examples or talk about some of the ideas that will be discussed in the session?

Indeed, there is a need for continuous education since available tools and surgical techniques are always developing and changing. In Germany, we do have a common curriculum for certification for pacemaker and ICD implantation together of the German Society for Cardiothoracic Surgery and the German Society of Cardiology. Nevertheless, lots of expert meetings and some slots in larger congresses, or even better academic courses from the surgical societies, are necessary for surgeons to keep up to date and get 'state of the art' knowledge. This will be also part of our discussion since the EACTS represents a sophisticated society for high-level education.

Tell us more about the certificate for electronic device therapy you have developed in Germany.

In Germany, together with the Society of Cardiology, we started a common certificate for electronic device therapy in 2013. This is a seven-day course which gives instruction in theory and practical skills including lead placement simulator, simulated pacemaker and ICD programming of the different device manufacturers.

The practical part requires at least 185 surgical and 330 follow-up procedures. This is far more than required for specialisation in either cardiac surgery and cardiology. The fast-growing functionality and variety of tools and techniques in this field necessitates continuous education. Nevertheless, device therapy offers a huge field of activities either in the cardiosurgical and cardiological environment.

Are there similar training certificate courses now available in other European countries?

So far, I am not aware of similar attempts from other countries in Europe, but we will find out which concept is best and try to apply in all European countries.

Now that more implantable devices are being used, should there be more emphasis on training of cardiac surgeons to meet demand? Will the session be giving this due focus?

"Cardiac surgeons need to be part of a team approach to find the safest and optimal solution for the individual patient."

Brigitte Osswald

There is clearly a rising demand for complex device-related procedures, but most cardiac surgeons are not aware of it. The session will also focus onthis important aspect.

What are your predictions for the future? What needs to change?

Cardiac surgery is highly influenced by the developments and progress of medical and interventional properties. However, electronic device technology, formerly based in the cardiosurgical community, seems to 'come back' at least for complex procedures.

Since the knowledge about limitations and options of this technology requires technical skills and an extended theoretical knowledge, the surgeons may need to focus even more on this interesting and very large spectrum of therapeutic opportunities.

Are there any issues that you would particularly like to highlight?

Each issue is very important and reflects the very interesting and sometimes demanding aspects of cardiac surgery. Some controversial practices may start interesting discussions and potentially influence daily practice. Since many of Europe's well-known specialists are present at this session, questions are welcome and co-operations can be established.

'The surgeon's role in cardiac implantable electric devices', 16:00–17:30, Monday, Hall K2.

EACTS

Statistical Primers in the EJCTS and ICVTS

GL Hickey[1] and SJ. Head[2] 1. Department of Biostatistics, University of Liverpool, UK; 2. Department of Cardio-Thoracic Surgery, Erasmus University Medical Center, Rotterdam, the Netherlands

Biostatistics is an important part of research in cardiothoracic surgery. Multivariable regression modelling, meta-analyses, analysing randomised control trial data, longitudinal data analysis, propensity score matching, development and validation of clinical risk prediction modelling, and the evaluation of diagnostic tests are just some of the statistical methods frequently utilised in clinical cardiothoracic research. About 1 in 4 manuscripts submitted to the EJCTS undergoes a statistical review by one of the Journal's statistical consultants in addition to the usual peer-review process.

Growing on a popular series of statistical research sessions held at previous EACTS Annual Meetings, this year there are eight sessions dedicated to research in medicine, statistics in medicine, meta-analyses, and randomised trials. These sessions will cover statistical topics at the interface of contemporary cardiothoracic research, providing researchers with insights into a variety of statistical methods, ranging from simple techniques to relatively more advanced methodologies.

To expand the reach of these platform presentations to the wider community, a series of short Statistical Primer articles will be published regularly across the *European Journal of Cardio-Thoracic Surgery* and Interactive CardioVascular and Thoracic Surgery beginning from this year. These primer articles will be written by the line-up of expert speakers – a mix of clinicians and statisticians – from this year's EACTS research sessions, tailored specifically to a clinical audience. The articles will illustrate key concepts, provide short practical examples, summarise pitfalls and current recommendations, and describe best-practice for reporting.

The journal articles will be available later this year. In the meantime, please come along to the research sessions at this year's annual meeting.

Date	Time	Session	Location
Mon 9 Oct	08:15-09:45	Research in medicine: increasing the impact of your study	Room 0.11/0.12
Mon 9 Oct	10:15-11:45	Statistics in medicine: 'learning the basics' for clinicians	Room 0.11/0.12
Mon 9 Oct	14:15-15:45	Statistics in medicine: more advanced statistics for the clinician	Room 0.11/0.12
Tue 10 Oct	10:15-10:30	Statistics in medicine: meta-analysis from start to finish	Room 0.11/0.12
Tue 10 Oct	14:15-15:45	Statistics in medicine: from 'simple' multivariable models to complex	Room 0.11/0.12

The remaining sessions at EACTS in Vienna.

EACTS Annual Meeting Programme, Monday 9/Tuesday 10 October, 2017

Cardiac | Rapid Response | Is no-suture the future for aortic valves?

Ten-year follow-up of 334 Perceval sutureless valves: very low mortality and no explants for valve degeneration

B Meuris Department of Cardiovascular Sciences, KULeuven, Leuven, Belgium

Due to the rapid deployment system, the Perceval sutureless valve enables significant shortening of surgical procedure times in cases of single or combined aortic valve replacement (AVR). First-in-man implants were performed in 2007 in our centre, together with Paris (Professor Laborde) and Hannover (Professor Haverich), which means we have up to 10 years of follow-up in this first patient cohort. The Perceval valve is now in routine clinical use in our centre and is used by both experienced surgeons and trainees. The speed of the implantation process facilitates minimal access surgery in single AVR and it is responsible for a significant shortening of the cross-clamp time in more complex or combined cases.

We reviewed our entire single-centre experience from 2007-2016 with Perceval (n = 334) and studied early and late mortality, stroke and hospital readmission rates within 30 days and all available echocardiographic data. We now have 326 patients in follow-up, with a length of follow-up ranging from 1 to 10 years (mean 3.5 years). Even in this aged population (mean age 79-years, mean EuroSCORE II 5.8), the 30-day mortality was only 2.4%. Single AVR cases (mean ES II 3.6) had only 0.6% 30-day mortality and 1.9% stroke rate. The early mortality in multiple valve cases (mean ES II 8.7) was only 1.7%. Readmission rates at 30 days varied between 4% (single AVR) and 8% (combined cases). All-cause mortality at two years was, again taking into account the advanced age at implantation, only 14% in single AVR, 18% in AVR+CABG and 11% in multiple valve cases.

Echocardiography at discharge showed a peak gradient of 28 +/- 9 mmHg and a mean gradient of 15 +/- 2 mmHg. Paravalvular leak is rare and never caused any clinical problems. At the latest echocardiographic follow-up, we saw peak gradients of 24 +/- 5 mmHg and mean gradients of 14 +/- 3 mmHg.

The only explants that have been performed so far are three cases of late endocarditis. All these patients did well after their reoperation. We observed one case of structural valve degeneration (SVD) at 6.5 years postoperatively in a patient with renal failure and vascular disease, showing a peak gradient exceeding 65 mmHg. She refused reoperation or transcatheter treatment given her advanced age. No explants for SVD have been performed yet in this series, nor did we have to treat any Perceval valve with a TAVI valve-in-valve.

Even in a population with clearly elevated risk, the Perceval sutureless valve provides an early survival benefit up to 83% than what is predicted by EuroSCORE II, in combination with low stroke rates and low hospital readmission rates. The overall mean STS-score of this whole patient cohort was also 5.8, thus a similar risk profile of patients that were enrolled in recent prospective clinical trials comparing TAVI to surgery. Given our observed early (30-day) death rate of only 2.4% and a death rate of only 15% at 2 years (lower than what is reported in these trials), it might be that AVR using sutureless valves will have to be considered as a separate entity within the 'surgical' arm of future trials.

EACTS

EACTS launch the new digital Portfolio Management System

EACTS is constantly developing initiatives to implement our stated aim of "Raising Standards Through Education and Training". Existing approaches include the Skills programme delivered through our Academy Programme and *MMCTS*.

During the last two years we have worked to develop a tool which will further advance this noble ambition.

We are therefore proud to announce the launch of the Portfolio Management System, designed especially for residents, trainers and heads of training to monitor progress and evaluation throughout a resident's training programme.

Training the next generation to become both highly skilled surgeons and the next driving force behind future advancements in cardio-thoracic surgery is a significant undertaking, presenting major challenges for both residents and trainers.

The medical profession has seen critical changes over recent times, and maintaining the highest standards of training can be difficult given shorter working hours and busy schedules. Excellent communication and coordination with trainers and heads of training is key to ensuring strong support systems and steady progression for trainees. This Portfolio Management System will help members with these challenges.

A resident from Erasmus University Medical Center, Rotterdam, the Netherlands, gave their perspectives on the Portfolio Management System, noting it is "a very conscious way to track my development, a great possibility to get feedback from my trainers and finally a tool to achieve comparability on a European level."

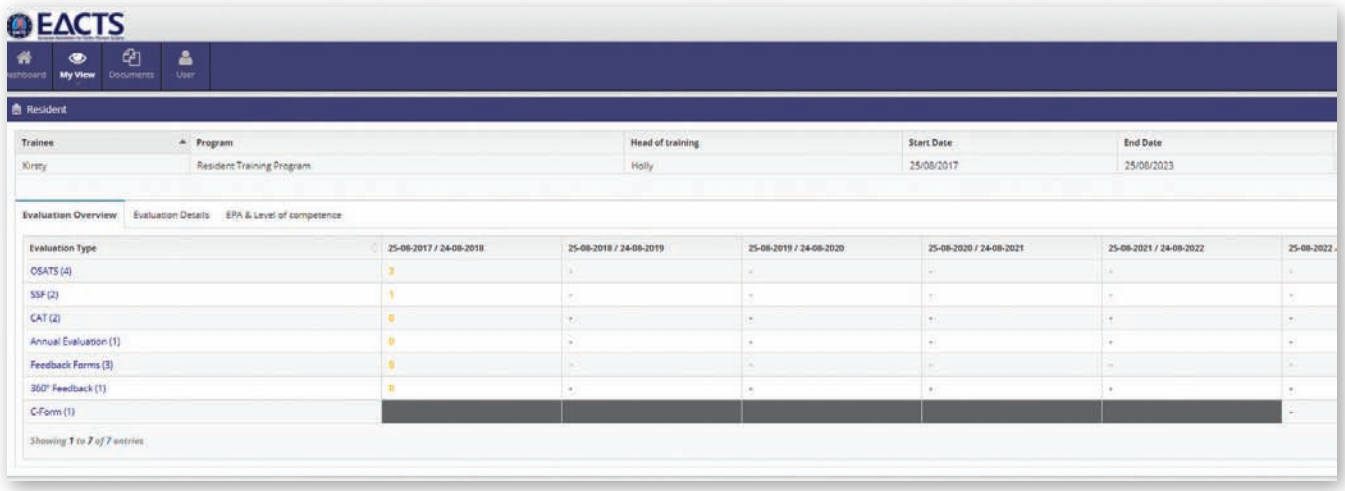
The Portfolio Management System is a user-friendly platform enabling residents to submit procedures and evaluation forms to their supervisors for online review and verification. Both resident and trainer have user accounts, with the ability to upload relevant documents, presentations and submit a range of evaluation forms (OSATS, SSF, CAT, 360°), export information, as well as track their progress on an annual basis throughout the entire residency program. Heads of training can efficiently monitor all their residents' progression through the 'Resident Overview' section in their account.

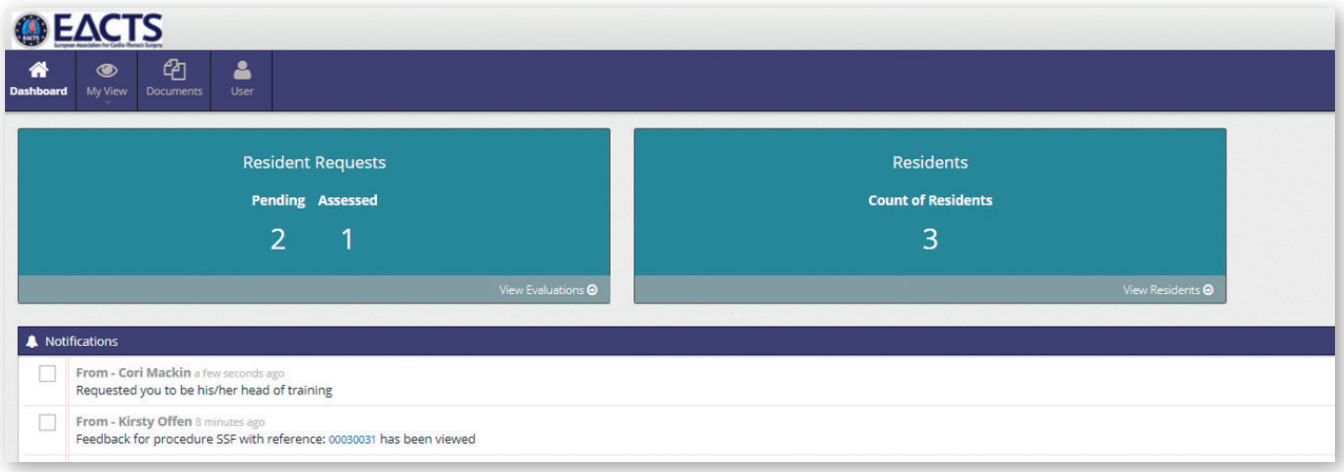
Since the launch one month ago, nine hospitals in seven countries have registered and are actively using the Portfolio Management System. A further twenty centres are in the process of registering. The international nature of this platform is a significant development towards the harmonisation of resident training, facilitating a uniform platform to assess training for all countries. The system also introduces Entrustable Professional Activities as a framework for the assessment of residents, ensuring performance is measured by quality, not quantity, in a resident's training portfolio.

The Portfolio Management System is offered free for EACTS members; heads of training are required to be EACTS members and residents are encouraged to apply for membership. Go to www.eacts.org/the-association/membership/ to discover more benefits of being an EACTS member.

Feedback from current users is extremely positive, with the benefits exceeding all expectations. Registration is easy, and all information is confidential. The next stage in the development is to create the Portfolio Management System App.

To register your centre to the portfolio, go to www.eacts.org/educational-events/portfolio-management-system/ or visit the EACTS booth (#68), where you can also see a demonstration of the Portfolio Management System.





Cardiac | Abstract | Growing needs: ablation, lead extraction and left atrial appendage closure

Differences in laser lead extraction of infected vs non-infected leads

Simon Pecha and Samer Hakmi
Department of Cardiovascular Surgery, University Heart Center Hamburg, Germany

Simon Pecha

Samer Hakmi

In recent years, the number of pacemaker and ICD/CRT implantations has been increasing. Furthermore, the number of device-related infections has been rising. In those patients, complete device and lead extraction is recommended by the guidelines; complete lead extraction has been shown to reduce mortality and morbidity. In this study, we investigated the effect of systemic infection or lead endocarditis on the difficulty and success rate of laser lead extraction (LLE) procedures.

Between January 2012 and March 2017, 184 patients underwent laser lead extraction (LLE) at our institution. All laser lead extractions were performed using a Glide Light 80 Hz Excimer Laser. Indications for lead extraction were reviewed and patients were divided into groups. In group A (n = 52 patients, 112 leads) patients with systemic infection and/or lead vegetations were included, while in group B (n = 132, 239 leads) all patients with local pocket infection or non-infective indications for extraction were included. A retrospective data analysis was conducted and success/complication rates between groups were compared. Mean time from initial lead implantation (103.4 vs 89.6 months; p = 0.1320) and ratio of ICD and pacemaker leads did not differ significantly between the two groups.

Complete procedural success was significantly higher in group A compared with group B (100% vs 94.5%; p = 0.03; Figure 1). Furthermore, the laser treatment and fluoroscopy time was significantly shorter in group A. Minor and major complications were rare in both groups without statistically significant differences (Group A: one minor complication (1.9%), no major complication, group B: one minor complication (0.7%), three major complications (2.3%). No procedure related mortality was observed in any of the groups, however two patients of group A with preoperative septic shock died during hospital stay from multi-organ failure.

In conclusion, the presence of systemic infection or lead endocarditis in LLE procedures allows for higher complete procedural success. When compared with LLE of non-infected leads, the infected leads require shorter laser and fluoroscopy times. No statistically significant differences were observed in minor as well as major complication rates. However, especially in patients with systemic infection and preoperative septic conditions, an intensive postoperative treatment regimen with ICU care and differentiated antibiotic and haemodynamic management is necessary.

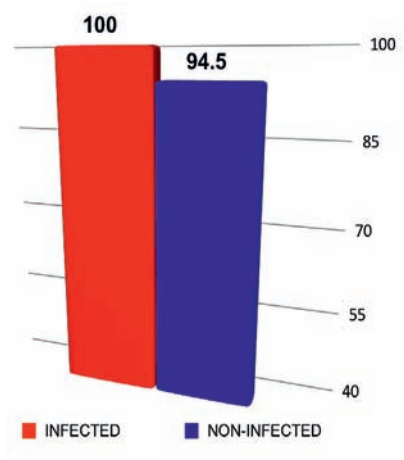
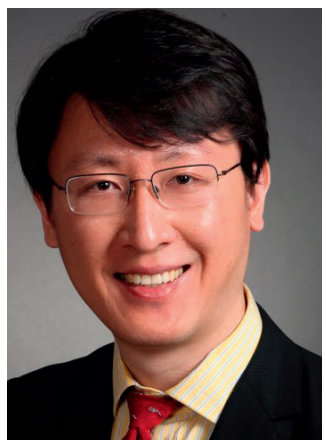


Figure 1. Complete procedural success was significantly higher in group A (infected) compared with group B (non-infected)

Thoracic | Abstract | Oesophageal Surgery

Random forest technology help predict tumor regression grade after neoadjuvant chemotherapy for locally advanced oesophageal squamous cell carcinoma

Xiaozheng Kang[1], Liang Dai[1], Wanpu Yan[1], Yongbo Yang[1], Yu Sun[2], Zhongwu Li[2], Haitao Zhou1, Hao Fu[1], Heli Yang[1], Mengying Fan[1], Zhen Liang[1], Hongchao Xiong[1], and Ke-Neng Chen[1] 1. Key Laboratory of Carcinogenesis and Translational Research (Ministry of Education), Department of Thoracic Surgery I, Peking University Cancer Hospital & Institute, Beijing, China; 2. Key Laboratory of Carcinogenesis and Translational Research (Ministry of Education), Department of Pathology, Peking University Cancer Hospital & Institute, Beijing, China.



Oesophageal cancer is the ninth most common cancer, and the sixth most common cause of cancer death globally. Oesophageal squamous cell carcinoma is the most common histological subtype of oesophageal cancer, particularly in high-incidence areas of eastern Asia. In patients with locally-advanced (T3–T4 [tumour invading the adventitia or adjacent structures] or cN1–N3 [lymph node metastasis according to clinical evaluation]) oesophageal squamous cell carcinoma, neoadjuvant chemotherapy or chemoradiotherapy followed by surgery is a standard treatment. Patients with locally advanced oesophageal squamous cell carcinoma responding to neoadjuvant therapy have better survival than non-responders. However, the optimal definition of responder or tumour regression grade (TRG) remains controversial. Thus, the objectives of this study were to (1) evaluate the continuous distribution of TRG in resection specimens after neoadjuvant chemotherapy for locally advanced oesophageal squamous cell carcinoma, (2) determine the effects of TRG on survival after oesophagectomy, and (3) identify preoperative predictors of TRG.

212 patients underwent induction chemotherapy followed by oesophagectomy for locally advanced oesophageal squamous cell carcinoma. TRG, assessed as the percentage of residual primary oesophageal squamous cell carcinoma cells in resection specimens, was classified histologically by pathologists. Random Forest technology was used for data analysis. The Random Forest method was employed to determine the correlation as well as interactions among clinical variables, which was a popular tree-based ensemble machine learning tool and had been used in previous study on oesophageal cancer staging. A nomogram was developed allowing prediction of TRG through use of preoperative clinical factors for patients with clinically locally advanced oesophageal squamous cell carcinoma who are candidates for treatment with a radical oesophagectomy.

Twenty-four specimens (11%) had no residual primary cancer (ypT0), 39 (18%) had 1% to 10% residual cancer, 48 (23%) had 11% to 50%, 101 (48%) had more than 50%. Survival was worse with increasing residual primary oesophageal squamous cell carcinoma, plateauing at 50%. Poorer TRG was associated with worse three-year overall survival. Better pathologic grade (G), larger number of pack year smoking, fewer cycles of induction chemotherapy, lower level of creatinine, younger age, greater tumour length and clinical T stage were associated with poorer TRG.

These data suggest that better TRG in response to preoperative chemotherapy is associated with a linear increase in survival after oesophagectomy for locally advanced oesophageal squamous cell carcinoma. A nomogram has been developed that can be used to predict TRG. Further assessment on the role of adjuvant therapy to improve survival is warranted. Random Forest technology help identify important clinical variables predicting TRG after neoadjuvant chemotherapy for locally advanced oesophageal squamous cell carcinoma.

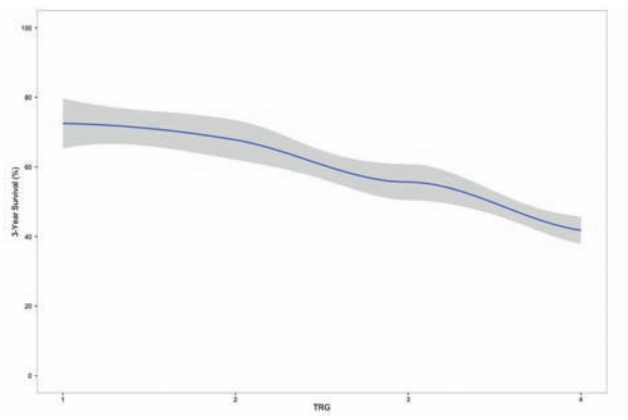


Figure 1. Predicted 3-year survival according to TRG of residual primary oesophageal squamous cell carcinoma.

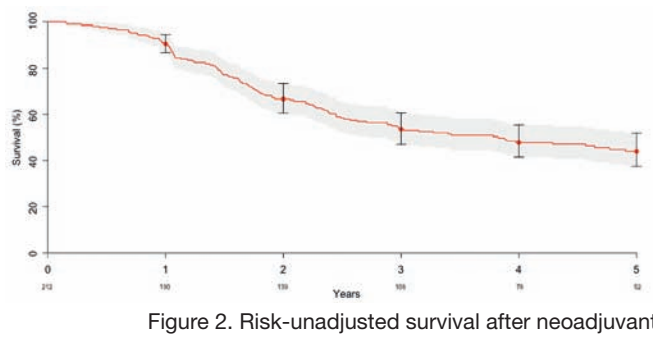


Figure 2. Risk-unadjusted survival after neoadjuvant chemotherapy and oesophagectomy for oesophageal squamous cell carcinoma.

Figure 3. Variable importance of patient, cancer, and treatment characteristics for TRG after neoadjuvant chemotherapy. Green bars represent a positive contribution to reducing prediction error, and orange bars to the left of zero represent variables degrading prediction of TRG.

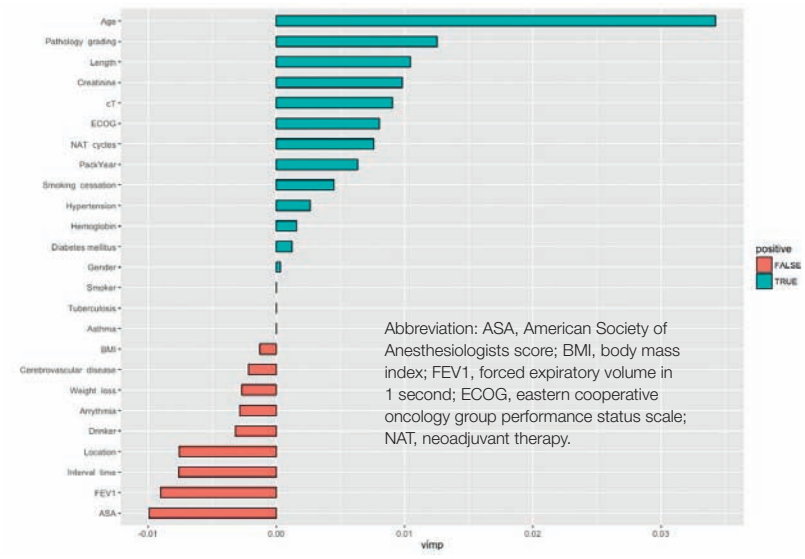
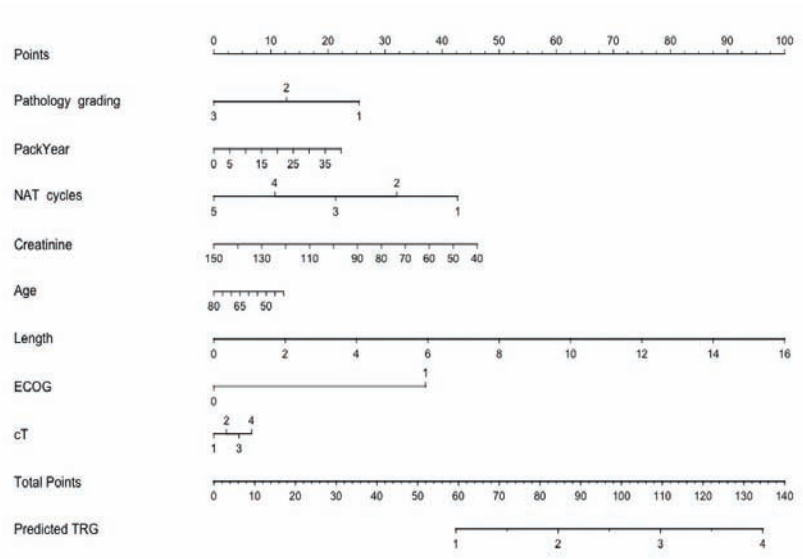


Figure 4. Nomogram predicting TRG after neoadjuvant chemotherapy for locally advanced oesophageal squamous cell carcinoma. Abbreviation: ECOG, eastern cooperative oncology group performance status scale; NAT, neoadjuvant therapy; TRG, tumor regression grade.



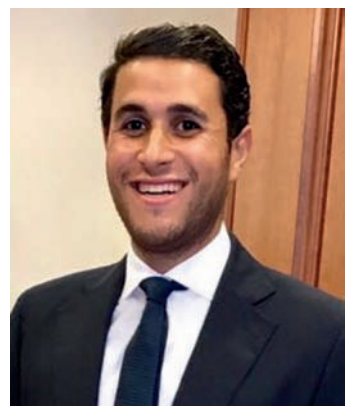
Congenital | Abstract | Coarctation

Aortic coarctation repair through left thoracotomy: results in the modern era

Emile S Farag[1], Jolanda Kluin[1,2], Frederiek de Heer[1], Yunus Ahmed[2],Vladimir Sojak[1,2], David R Koolbergen[1,2], Nico A Blom[3], Bas AJM de Mol[1], A Derk Jan ten Harkel[3], Mark G Hazekamp[1,2] 1. Department of Cardiothoracic Surgery, Academic Medical Center, Amsterdam, the Netherlands; 2. Department of Cardiothoracic Surgery, Leiden University Medical Center, Leiden, the Netherlands; 3. Department of Cardiology, Leiden University Medical Center, Leiden, the Netherlands

Coarctation of the aorta (CoA) is a complex congenital cardiovascular malformation characterised by a narrowing of the thoracic aorta most typically located near the ductus arteriosus. Surgical treatment of CoA is often possible through left thoracotomy and without the use of cardiopulmonary bypass, but life-long follow up is recommended in literature due to risks of hypertension and recoarctation. Large recent studies reporting outcome after CoA repair through left thoracotomy are scarce, but may aid in the identification of patient-specific characteristics that are associated with post-operative complications and mortality. Therefore, the aim of this study was to evaluate the results of primary CoA repair through left thoracotomy and without the use of cardiopulmonary bypass in children (< 18 years).

The analysis included 295 patients, consisting of 118 neonates, 81infants and 96 older children, who underwent surgical CoA repair between January 1995 and December 2016. Patients who underwent catheter-based interventions, such as balloon angioplasty or stent placement, as initial treatment or underwent primary surgical repair of CoA through median sternotomy were excluded. The majority of patients underwent repair with end-to-end anastomosis (146 patients, 49%) or extended end-to-end anastomosis (125 patients, 42%).



Peri-operative mortality was 2.0% (n = 6) and overall mortality was 2.7% (n = 8). Reinterventions due to recoarctation were performed in 9.8% (n = 29) of the cohort, consisting of catheter-based interventions in 24 patients and surgical repair in five patients. Recoarctation occurred more often in patients treated in the neonatal period than in other groups (p < 0.001).

In conclusion, CoA repair through left thoracotomy is a safe procedure and is associated with low rates of mortality. However, recoarctation requiring re-intervention is still a significant cause of morbidity and mandates long-term follow-up and future research. At present we are performing 4D flow MRI studies in patients after CoA repair to study abnormal blood flow and wall shear stresses as this may contribute to the aetiology of postoperative aortopathy resulting in recoarctation or aortic aneurysm formation.

Cardiac | Focus | Left atrial appendage occlusion when and how

Left atrial appendage resection is not only effective but also safe and minimally invasive

Takafumi Inoue
Cardio-Thoracic Surgery, The University of Tokyo, Bunkyo-ku, Japan

Left atrial appendage (LAA) closure as the prophylaxis of cardiogenic stroke has been attracting attention as the number of patients with atrial fibrillation increases, and various methods of LAA closure have been developed. While suture or ligation against LAA exist as conventional ways of closure, percutaneous intravenous LAA occlusion devices have recently appeared. In addition, we recently suggested thoracoscopic left atrial appendectomy. Our new approach for LAA occlusion (and prevention from stroke) features the following: Only LAA resection is performed, with no other manipulation; the procedure is performed in total endoscopic fashion; it takes approximately 30 minutes, and postoperative hospital stays are four days.

Through our experience of this operation, we can evaluate the effect of LAA resection on cardiac function. LAA resection is usually performed combined with other cardiac operation, so it is difficult to evaluate the isolated effect of resection. Meanwhile, no other procedure than LAA resection was conducted in thoracoscopic left atrial appendectomy. Excluding other manipulation influence such as cardiopulmonary bypass, cardiac arrest or valve surgery, evaluation of isolated LAA resection can be achieved.

We examined consecutive 87 patients who had undergone thoracoscopic left atrial appendectomy. In our results, the mean volume of bleeding in the operation was 3±6 ml. The mean length of the postoperative hospital stay was 3.8±1.8 days. All of the patients were discharged while maintaining their preoperative activities of daily living without major complications. With regards to cardiac function, the left atrial diameter, ejection fraction and brain natriuretic peptide (BNP) levels were not significantly different after surgery than before (43±5 mm to 43±5 mm, p = 0.8; 43±5 mm to 43±5 mm, p = 0.8; 116±107 pg/ml to 95±108 pg/ml, p = 0.09, respectively; Figure 1).

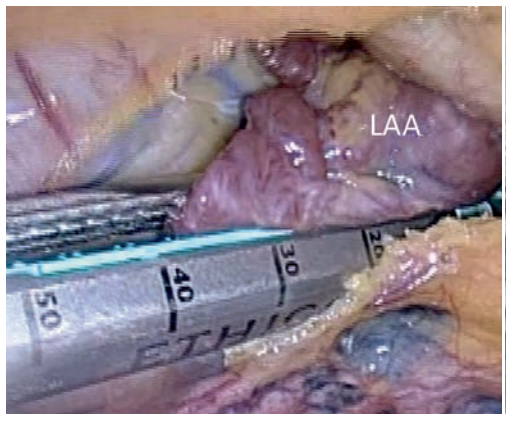


Figure 2. The left atrial appendage was completely resected with an endoscopic linear cutter.

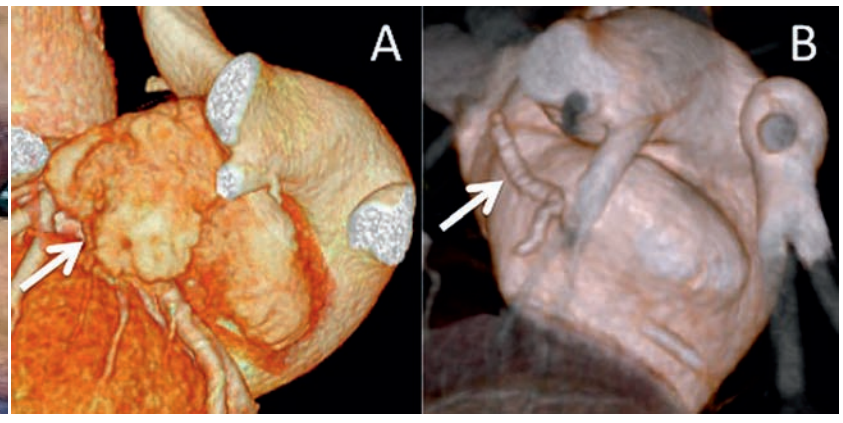
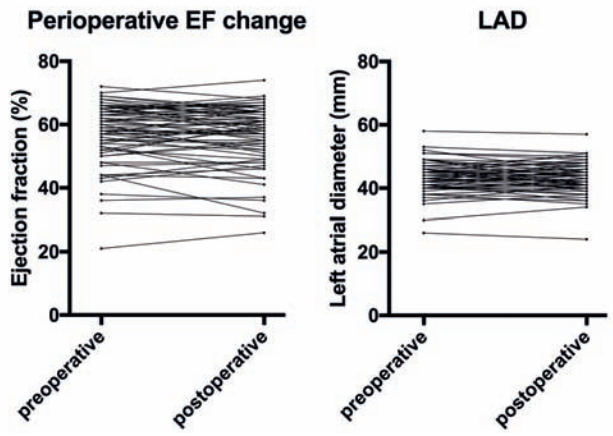


Figure 3. A: Preoperative 3D CT showed an enlarged LAA. B: Postoperative CT showed a smooth LAA resection line. CT, computed tomography; LAA, left atrial appendage.

Figure 1. The preoperative and postoperative data were analysed using Wilcoxon's signed rank sum test. The EF shifted from 57%±10% to 56%±10% (p = 0.11). The LAD shifted from 43±5 mm to 43±5 mm (p = 0.8). EF, ejection fraction; LAD, left atrial diameter.



These results showed that LAA resection did not have negative effect on the cardiac function and can be performed safely. In any operation, the cutting method always carries a risk of bleeding. To reduce the risk of bleeding, ligation or sutures are often chosen for LAA occlusion, and resection is not preferred. With the development of the auto-stapling linear cutter, the bleeding risk has been drastically reduced, and a linear cutter is usually used for cutting tissues during surgery. Its application for LAA resection was therefore natural (Figure 2), and little bleeding was detected in result. The LAA is reported to function as the left atrial reservoir, so we were concerned that the cardiac function might be negatively influenced by LAA resection. However, we found that LAA resection had no effect on the ventricular contraction.

Compared with other ways of LAA occlusion, resection has the merits that no re-canalisation could happen after resection because the resected LAA can never develop again. In addition, no residual ischaemic tissue remains in the body (Figure 3).

In conclusion, LAA resection does not negatively affect the heart function, and the bleeding risk does not increase. LAA resection should therefore be aggressively considered in applicable cases.

EACTS

Aortic Valve Repair Summit 2018

A new EACTS event in Paris: June 18-19, 2018

Emmanuel Lansac on behalf of the AVRS scientific committee.

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

EACTS' implication in aortic valve repair is in compliance with recent European 2017 guidelines for Heart Valve Disease, which recommend "a Heart team discussion in selected patients with pliable, non-calcified tricuspid or bicuspid aortic valve insufficiency in whom aortic valve repair may be a feasible alternative to valve replacement" (class IC indication).[1] New guidelines also overcome the initial valve-sparing debate on remodelling versus reimplantation by recommending (since 2014) "aortic valve repair using the re-implantation or remodelling with aortic annuloplasty technique, in young patients with aortic root dilation and tricuspid aortic valves" (class I indication).[1]

AVRS is the world's largest scientific meeting, gathering together the different schools of thoughts in aortic valve repair. It will cover all aspects of the disease including medical therapy, imaging, patient selection and surgical techniques focused on patient outcomes. The aim is to integrate state-of-the-art into daily practice, as well as to challenge current knowledge via high level scientific debates on the main burning topics of aortic valve repair. Abstract submission is strongly encouraged in order to stimulate the scientific debate and enlarge the community of AVRS.

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

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

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

For more information, please contact EACTS House.
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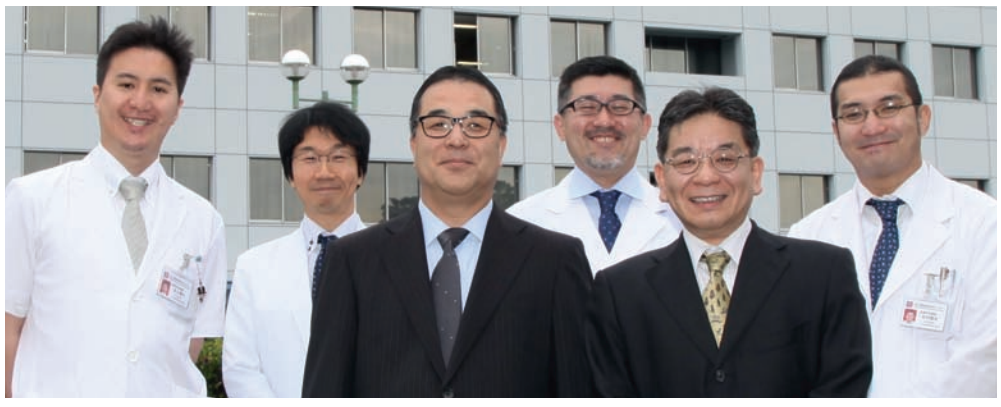
Vascular | Focus | How far away are we from setting guidelines for arch surgery?

Total arch replacement versus debranching thoracic endovascular aortic repair for aortic arch aneurysm: comparison of long-term outcomes in octogenarians



From left to right: Yosuke Inoue, Yoshimasa Seike, Hitoshi Matsuda, Kyokun Uehara, Hiroaki Sasaki and Atsushi Omura

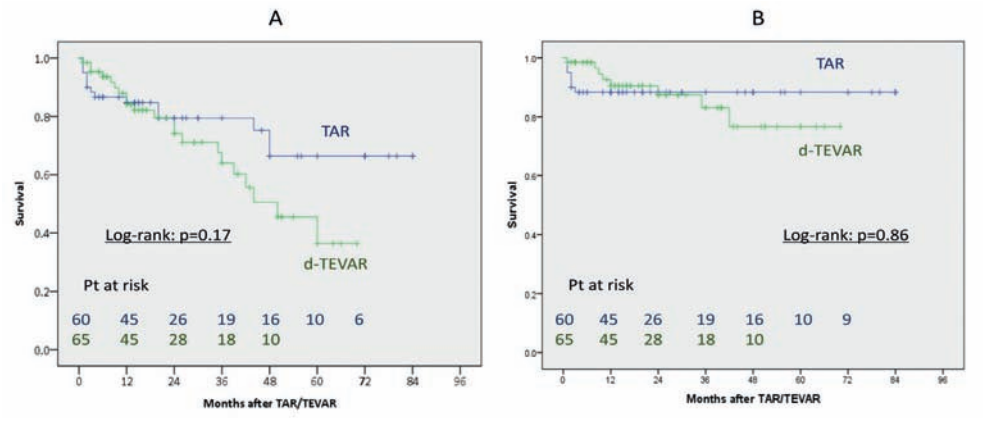


Figure 1. Survival curve: (A) Probability of freedom from all causes of mortality, (B) Probability of freedom from aortic death.

Yoshimasa Seike[1], Hitoshi Matsuda[1], Tetsuya Fukuda[2], Jiro Matsuo[1], Yosuke Inoue[1], Atsushi Omura1, Kyokun Uehara[1], Hiroaki Sasaki[1], Junjiro Kobayashi[1] 1. Department of Cardiovascular Surgery, National Cerebral and Cardiovascular Center, Osaka, Japan; 2. Department of Radiology, National Cerebral and Cardiovascular Center, Osaka, Japan

When aortic arch repair has benefits in octogenarians, total arch replacement (TAR) or debranching thoracic endovascular aortic repair (d-TEVAR) should be selected in accordance with the risk for surgery and anatomical features of the aorta.

Advanced age is generally a powerful independent predictor for early postoperative complications after conventional TAR[1]. In contrast, there are increasing evidences that d-TEVAR can provide acceptable early results in patients deemed to have a high risk for open surgery[2]. Since 2008, we have applied d-TEVAR for treating aortic arch aneurysms, mainly for selected elderly patients[3]. For elderly patients whose anatomical features of the aneurysm are inappropriate for performing the usual d-TEVAR, we indicated a special technique – the chimney stentgraft technique for proximal zone 0 landing. However, some patients still have no choice but to undergo TAR to treat their arch aneurysm. The aim of this study was to reveal the differences of long-term outcomes between TAR and d-TEVAR and to identify risk factors for adverse events after aortic arch repair in octogenarians.

We reviewed medical records of 125 patients aged >80 years who underwent surgical intervention for aortic aneurysm between 2008 and 2016. Of these, 60 underwent conventional TAR (43 men; age, 82 ± 2.2 years) and 65 underwent d-TEVAR (49 men; age, 84 ± 3.4 years).

We primarily chose d-TEVAR to treat aortic arch aneurysms in "high-risk" patients. The contraindications for d-TEVAR were as follows: a) dilatation of the ascending aorta (n = 22); b) severe atherosclerotic changes of the aorta (n = 9); c) unstable preoperative haemodynamics due to rupture (n = 5); d) indication of concomitant procedures (n = 5); and e) connective tissue disorder (Loeys–Dietz syndrome; n = 1).

Freedom from all causes of mortality at two and four years was similar (80% and 66% in TAR, 80% and 51% in d-TEVAR, p = 0.17). Freedom from aortic death at two and four years was similar (88% and 88% in TAR, 87% and 76% in d-TEVAR, p = 0.86) (Figure 1).

Using Cox regression analysis, COPD [hazard ratio (HR), 6.0; p = 0.008], malignancy (HR, 8.8; p = 0.004), perioperative stroke (HR, 12.6; p = 0.012), and postoperative pneumonia (HR, 5.8; p = 0.026) were identified as independent positive predictors of overall postoperative mortality for TAR, whereas neurological dysfunction (HR, 3.0; p = 0.016) and perioperative stroke (HR, 12.1; p = 0.023) were identified for d-TEVAR (Table 1).

In conclusion, TAR in octogenarians with COPD and/or malignancy showed higher mortality rates; d-TEVAR is more appropriate in these situations. The prevention of perioperative stroke, which is related with poor prognosis in both the groups, is critical.

Table 1. Predictors of all-cause mortality (multivariate analysis by group). HR; hazard ratio, TAR; total arch replacement, d-TEVAR; debranching thoracic endovascular aortic repair, COPD; chronic obstructive pulmonary disease

Group	Covariate	HR	95% CI	P value
TAR	COPD	6.01	1.60-22.6	0.008
	Malignancy	8.75	2.00-38.2	0.004
	Perioperative stroke	12.6	1.76-90.4	0.012
	Postoperative pneumonia	5.84	1.24-57.5	0.026
d-TEVAR	Neurologic dysfunction	2.97	1.23-7.18	0.016
	Perioperative stroke	12.1	1.40-104	0.023

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Cardiac | Abstract | Controversies in left ventricular assist device therapy

From the HeartMate 3™ Left Ventricular Assist Device Post-Market Multinational ELEVATE™ Registry: 30-Day Outcomes is consistent with CE Mark Study

Jens Garbade[1], Finn Gustafsson[2], Steven Shaw[3], Jacob Lavee[4], Diyar Saeed[5], Yuriy Pya[6], Thomas Krabatsch[7], Jan Schmitto[8], Michiel Morshuis[9], Joyce Chuang[10], Daniel Zimpfer[11] 1 Department of Cardiac Surgery, Heart Center Leipzig, University of Leipzig, Leipzig, Germany; 2 Department of Cardiology, The Heart Centre, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark; 3 Transplant Centre, University Hospital of South Manchester NHS Trust, Manchester, United Kingdom; 4 Heart Transplantation Unit, Leviev Heart Center, Sheba Medical Center and Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; 5 Cardiovascular Surgery, University Hospital of Duesseldorf, Duesseldorf, Germany; 6 National Research Cardiac Surgery Center, Astana, Kazakhstan; 7 German Heart Center, Berlin, Germany; 8 Department of Cardiothoracic, Transplantation and Vascular Surgery, Medizinische Hochschule Hannover, Hannover, Germany; 9 Department of Cardiothoracic Surgery, Herz- und Diabeteszentrum NRW, Bad Oeynhausen, Germany; 10 Abbott (Formerly St. Jude Medical), Pleasanton, CA; 11 Department of Surgery, Division of Cardiac Surgery, Medical University of Vienna, Vienna, Austria

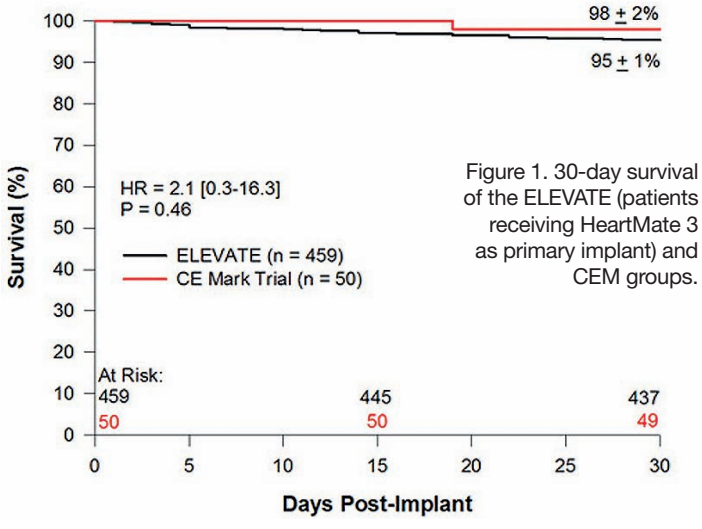

Figure 1. 30-day survival of the ELEVATE (patients receiving HeartMate 3 as primary implant) and CEM groups.

Mechanical circulatory support with a durable continuous-flow left ventricular assist device (LVAD) has become an option for the growing population of patients with end-stage heart failure. However, complications attributable to LVAD therapy are still the challenge and limit the overall effectiveness of therapy. Reducing the incidence of these interrelated events is of great clinical interest.

The HeartMate 3 LVAD (Abbott, Chicago, IL, US), a newly designed LVAD, received the CE mark-approval in 2015. The distinctive design includes a fully magnetically levitated rotor, wide blood flow gaps, and an artificial pulse, which are intended to optimise hemocompatibility[1]. Since the HeartMate 3 became commercially available, its clinical use has expanded worldwide. For this reason the ELEVATE registry – a prospective observational multinational registry (26 centers, both experienced and non-experienced) was implemented to collect clinical data for assessing the post-market real-world experience in a 24-month timeframe. Data collection in the ELEVATE registry was similar to that of the CE Mark trial (CEM). After adjustment for baseline differences, a comparison of outcomes at 30 days post-implant was performed between the clinical trial results and the post-market clinical experience.

Compared to the CEM trial (N=50), the ELEVATE group (N=459, primary VAD implant only) was more severely ill with lower baseline hematocrit (p = 0.008) and more patients classified as INTERMACS profile 1–2 (32% vs 10%; p<0.001). After adjustment for differences in baseline characteristics, the 30-day survival was comparable between ELEVATE and CEM groups (95% vs 98%; p = 0.46; Figure 1)[2]. 10% of the patients were implanted via a less invasive (LIS) approach and 6% were off-pump implants, in contrast to the CEM trial where 100% were implanted via sternotomy on CPB[2]. In both the CEM and ELEVATE groups, bleeding and infection were the most common adverse events. In the ELEVATE group, the stroke rate at 30 days post-implant was 3%, despite 7% of patients having previous stroke history and 11% having pre-operative MCS, which may be risk factors for developing embolism or stroke[2].

An important result from this post-approval registry is that there were no pump thrombosis events at 30 days post-implant. Despite the principle limitation that this is a multinational non-randomised, voluntary, post-market registry, our preliminary data confirm the short-term results from the CEM trial. However, the longer 24-month follow-up of the ELEVATE registry is mandatory to determine the impact of the HeartMate 3 pump design on long-term outcomes, GI-bleeding, infection, and neurological and thromboembolic events.

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Vascular | Focus | PROs and CONs arena on aortic controversies

Hybrid aortic repair using the frozen elephant trunk in acute DeBakey type I aortic dissection

Nora Goebel, Schahriar Salehi-Gilani, Ragi Nagib, Adrian Ursulescu, Ulrich FW Franke Department of Cardiac and Vascular Surgery, Robert-Bosch-Hospital, Stuttgart, Germany

The extent of emergent surgery for acute DeBakey type I aortic dissection is discussed controversially. Common practice is a proximal repair up to the arch leaving the distal dissected aorta untreated. But in the long-term the downstream aorta has been proven to be the major cause of aorta-linked mortality or high-risk re-intervention due to dilation, aneurysm-formation and rupture. The frozen elephant trunk (FET) technique in addition to ascending and arch repair offers simultaneous hybrid treatment of the descending aorta. Moreover, the FET promotes aortic remodelling in the descending aorta by inducing false lumen thrombosis and hereby reduces the rate of secondary re-interventions and the mortality rate linked to the downstream aorta. Concerns exist about the complexity of the procedure and prolonged cardiopulmonary bypass and circulatory arrest times, which implicates an elevated risk of perioperative mortality and neurologic complications, especially spinal cord injury.

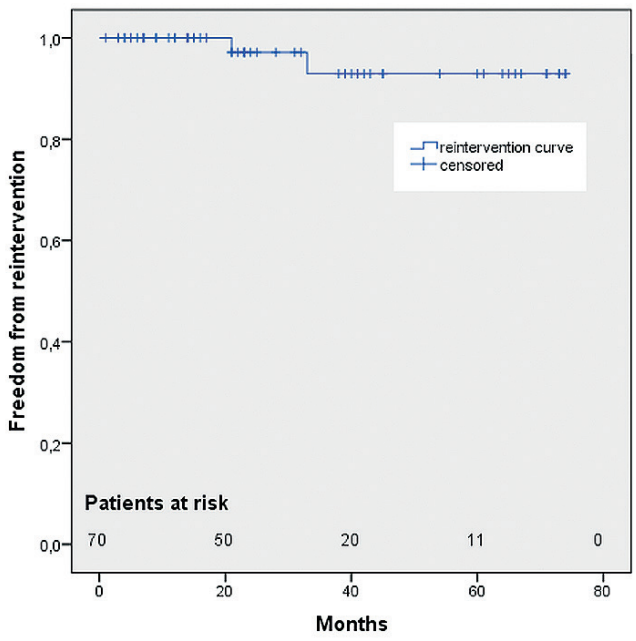


Figure. Freedom from distal reintervention after FET procedure for acute DeBakey type I aortic dissection.

We therefore analysed our data with the FET (Jotec E-vita open plus®) in acute aortic dissection which is among the largest single centre experiences in Europe so far. Between October 2009 and December 2016 a total of 72 patients underwent emergent hybrid aortic repair using the FET for acute DeBakey type I aortic dissection at our centre. Our implant criteria include a minimum aortic diameter of 20 mm, according to the size of hybrid prostheses available (as oversizing is not recommended), and absence of multiple re-entries or extremely kinking in the descending aorta due to increased risk of false lumen placement and stentgraft-induced aortic injury. The neuroprotective strategy is a consequent use of selective antegrade cerebral perfusion combined with mild systemic hypothermia. Clinical presentation of patients at admission was cardiogenic shock in 20.8%, a neurologic deficit in 26.8% and malperfusion in 26.4%, reflected by a mean logistic EuroSCORE of 40%. Overall 30-day-mortality was 15.3% and univariate analysis identified as risk factors preoperative cardiopulmonary resuscitation ($p = 0.02$), preoperative cardiogenic shock ($p = 0.008$), postoperative low cardiac output syndrome ($p = 0.0001$), and length of ICU stay ($p = 0.005$). Interestingly, preoperative malperfusion did not have an impact on postoperative survival ($p = 0.46$). New postoperative stroke was only seen in 2.8%, and spinal cord injury in 4.2%. In follow-up (mean 33.3 ± 23.0 months) cumulative survival was 75.0% with freedom from distal reintervention in 96.7% and false lumen thrombosis in the descending aorta in 92.6%.

We conclude that hybrid aortic repair using the FET in acute DeBakey type I aortic dissection does not elevate the perioperative risk of mortality and provides excellent aortic remodelling with low distal reintervention rate in mid-term follow-up.

Nora Goebel

EACTS

EACTS Academy Course in 'Fundamentals in Cardiac Surgery'

Stuart Livesey Southampton, UK Course Director

I took over from Professor John Pepper as Director of the 'Fundamentals in Cardiac Surgery' courses in October 2017. I am extremely grateful to John for the hard work and vision he showed in developing the courses.

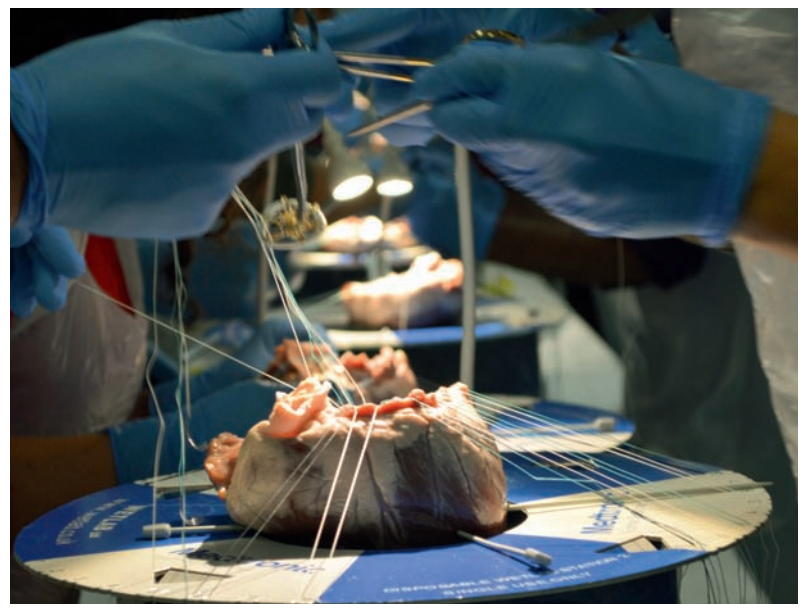
The courses are designed to cover all the basic aspects of cardiac surgery that a trainee would expect to be familiar with. They are held over three separate weeks, with Fundamentals I being held in February, II in June and III in October.

This year, 'Fundamentals I' covered coronary artery disease, aortic valve surgery as well as cardiopulmonary bypass, post-operative management and essential cardiac imaging. 'Fundamentals II' covered diseases of the aorta, congenital heart disease and the surgical treatment of the failing heart and lungs. 'Fundamentals III' is being held at the end of October and will cover mitral and tricuspid surgery, atrial fibrillation, endocarditis, carcinoid heart disease, pulmonary embolism and HOCM.

The courses are held at the EACTS Offices in Windsor, UK. Windsor is easily accessible from the London airports and itself is a town of great historical interest. The offices have a dedicated teaching room where the course is held; each course has a day dedicated to wet-lab work which has proved to be extremely popular.

The Faculty is comprised of enthusiastic teachers from across Europe and North America who have shown a real ability and commitment to the training of the next generation of surgeons.

The course as a whole is designed to be aligned with the syllabus of the European Board of Cardiothoracic Surgery (available at https://www.ebcts.org/syllabus/).



The dates for the 2018 courses are as follows:

- Fundamentals I: 5-9 February 2018
- Fundamentals II: 4-8 June 2018
- Fundamentals III: 1-5 October 2018

It is possible to do each course as a freestanding module over more than one year, though ideally it is preferable to do all three courses in the same year as the format may change slightly from year to year.

There are places for approximately 40 delegates on each course. They have proved extremely popular and do fill up quickly. I hope you have an enjoyable and productive time here in Vienna – I am happy to answer any questions you may have about the work of the EACTS Academy in person if you catch me here at the meeting.

More information about the courses can be found on the EACTS website at http://www.eacts.org/educational-events/academy/

Vascular | Abstract | "La terra di mezzo" The middle earth of aortic surgery

Ten-year results of thoracoabdominal aortic aneurysm treatment with hybrid thoracic endovascular aortic repair

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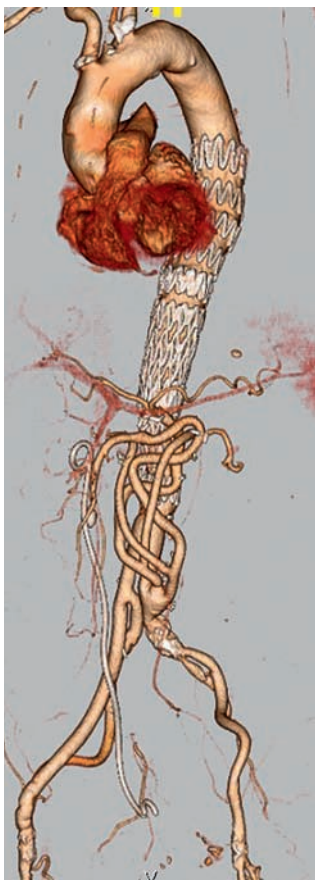
The treatment of thoracoabdominal aortic aneurysms (TAAA) in great vessels is still challenging, as the early results of the operation are not very promising compared with other aortic operations, and the incidence of spinal cord ischaemia is relatively high. In Japan, which is becoming a super-aging society, the method of performing minimally invasive operations remains a major issue. At our facility, we have been performing renovisceral debranching thoracic endovascular aortic repair (TEVAR) to resolve these issues.

Sixty patients underwent surgery consisting of a hybrid repair for the treatment of aortic pathologies in the thoracoabdominal region between 2007 and 2016. The mean age was 72.7 years. Most were older patients, with 21 (35%) in their 70s and 20 (33%) in their 80s. Patients ≥ 70 years of age accounted for 68% of the total. Seventeen patients (28%) had chronic obstructive pulmonary disease. Forty-two patients (70%) showed chronic kidney disease of G3 or higher. Thirty-five (58%) had a history of aortic surgery. True aneurysm was found in 44 (73%) and chronic dissection in 16 (27%). The standard operative procedure of renovisceral debranching involves replacing the abdominal aorta with a bifurcated graft. The quadrifurcated graft is anastomosed to the left leg of the bifurcated graft, and the visceral arteries are then reconstructed using the quadrifurcated graft. Renovisceral debranching and stent-grafting were performed as a two-stage procedure.

In-hospital death occurred in three cases (5.0%), including two cases of aneurysm rupture while waiting for TEVAR and 1 myocardial infarction after hybrid TEVAR. Two patients (3.3%) suffered from spinal cord ischemia after the stenting procedure. One patient (1.7%) newly required haemodialysis. The overall survival is 75.9% at two years, 65.2% at five years and 43.5% at eight years. The long-term all-cause survival rate tended to be low because there were many elderly patients. The rate of freedom from aortic events was 92.9% at two years, 80.5% at five years and 72.5% at eight years. Four patients (7.4%) required additional treatment during the follow-up period. There were no aneurysm-related deaths in the long-term among patients who completed hybrid TEVAR.

Renovisceral debranching surgery for TAAA is not minimally invasive in terms of surgical invasion beyond bifurcated graft replacement for abdominal aortic aneurysms. However, recovery after renovisceral debranching surgery is fast because it does not require thoracotomy or extracorporeal circulation. In addition, staged TEVAR gives a low occurrence rate of paraplegia. Renovisceral debranching TEVAR for TAAAs is a better option for elderly patients, re-do cases and high-risk patients who are hesitant to undergo conventional open surgery. However, further long-term follow-up is necessary to extend the indication to younger patients.



EBCTS

Update on the new format of the European Board of Cardiothoracic Surgery (EBCTS) Level 1 Examination.

Eduard Quintana, Stephen Clark and Tim Graham on behalf of the EBCTS members, question panel writers and examiners.

The development of a fit for purpose examination to assess professional competences has become a priority of EACTS. The construction of the new European Board of Cardiothoracic Surgery (EBCTS) Level 1 examination has been a remarkably exciting and complex undertaking.

The authorship of a new syllabus (www.ebcts.org/syllabus) has been the first milestone upon which the new examination has been built. Extensive collective discussion of the minimum standards expected for a successful candidate are reflected in this detailed document. Both knowledge and clinical judgement have been well defined within it and every individual question in the examination has been written and mapped to it. We aim to deliver an examination which identifies those individuals with a level of competence ready to commence their practice as an independent specialist.

A panel of over 20 recognised academic surgeons were selected to receive extensive training in the technicalities of examination question preparation. A highly experienced educationalist led this important initial stage and has continued to supervise the construction of individual questions. We have jointly spent several days learning the necessary methodology that lies behind a professional high-stakes professional examination development. Since different practices take place across Europe, which may influence performance during the examination, the wide representation of question-authors from more than 12 countries has solved this recognised issue. All of these enthusiastic surgeons have greatly valued the education and training that enabled them to excel at question writing.

The commitment of this group of surgeons and their belief in the need of a modern cardiothoracic examination across Europe has been enviable. Each single question has been created afresh without reference to existing banks of questions from other professional societies. As a result, questions arise from contemporary practice and are based on the latest medical knowledge and guidelines. Each surgeon involved is familiar with academic practice, has a background of scientific and educational output, high engagement in clinical practice and mentors the next generation on a daily basis. These are extremely valuable assets to our panel writers that represent the core values of this foundational group. The panel writers and the Board understand the difficulty and responsibility of setting the standards of such an examination.

The ability to discriminate the minimally competent candidate in a health professional examination represents a major safety net in which erring may cause harm to patients. Aiming at only allowing competent candidates to pass the process requires important analytical judgements within each single question. We have avoided low level (simple recall) questions and have focussed on delivering high order questions. Beyond pure knowledge and comprehension, we have aimed at developing questions that evaluate integration/interpretation (analysis and application) and problem solving (evaluation and synthesis). Importantly, questions are usually framed within a clinical case scenario. Current state-of-the-art practice, EACTS/ESC/AHA guidelines, major literature contributions and referenced specialty book references support each single best choice answer for a given question.

Creation and submission of questions was done in both a collective and individual manner. Each question then underwent multiple review processes by different panel members. Open interaction and discussion between panel members to perfect each question represented an at times tedious but stimulating and rewarding task. Each question had to be clearly referenced to the syllabus and a clear justification for the correct answer provided along with current literature referencing. After an additional review process a total of 210 questions were finalised and stored in our system. Each question has a deadline for review and revision as practice changes based on new evidence.

The exam has not been designed to allow a certain percentage of candidates to pass but a more complex and elaborative process dictates success. Once the question bank had been constructed, a group of very experienced senior surgeons (different from the question writers) were invited to sit the exam themselves in a closed environment. During this standard setting session, each surgeon judged what percentage of minimally competent candidates would get each question right. Any conflicting questions at that point were amended or eliminated. Then, for each question we obtained the 'Angoff score' based on the mean value arising from all evaluations. As a result, a final percentage of correct answers will be needed to pass the exam.

The creation of the syllabus, training the panel writers and third-party standard setting have developed the examination to another level. Beyond the very high quality of the examination that will be delivered, the entire process is very defensible at appeal.

As an end result the EBCTS Level 1 examination is a multiple-choice single best answer examination designed on the basis of five key principles: validity, reliability, feasibility, educational impact and acceptability. It consists of two papers of two hours, for a total of 180 questions.

Future plans will ensure that the EACTS Academy and Domains deliver the entire syllabus through courses and society activities. This may also provide a catalytic effect of feedback in learning.

Different stakeholders will judge the acceptability of our examination. Our goal is to lead the assessment of professional competences in the eyes of our colleagues, trainees, institutions, regulators, and, last but even more important, our patients and society. If we do not achieve this ultimate goal, somebody – possibly, less qualified – will do it for us with unexpected consequences.

Summative assessment with feedback from candidates and external quality assurance evaluation after examinations will contribute to further improvement of this necessary tool. We understand that no exam in our careers has ever been perfect, nor will be. However, we are committed to continue to work to create the best cardiothoracic surgery examination in the world.

Thoracic | Focus | Metastasectomy

A multicentre phase II clinical trial of isolated lung perfusion with melphalan in 107 patients with resectable lung metastases.

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The lung is one of the organs most prone to the development of distant metastases. Between 15% and 50% of patients with colorectal carcinoma (CRC) and sarcoma respectively will develop pulmonary metastases[1, 2]. Although pulmonary metastasectomy is an accepted and commonly used treatment, survival remains poor. A high number of patients develop recurrent metastases in the operated lung possibly due to undetected and not-resected micrometastases. Due to systemic side effects the dose is limited and does not reach sufficient concentrations in the lung to cure the micrometastases or gain long-term control. Isolated lung perfusion (ILuP) is a technique which has the ability to reach high concentrations of the chemotherapeutic agents in lung tissue with a minimal exposure to the systemic circulation. The aim of this treatment is reducing local recurrence.

We performed a prospective, international, multi-centre study in four cardiothoracic centres in the Netherlands and Belgium. ILup is performed by cannulating the pulmonary artery and veins after heparinisation. By central clamping and snaring of the main bronchus the lung is isolated from the systemic circulation. In this trial ILuP was performed with 45 mg of Melphalan at 37°C during 30 minutes followed by a five-minute washout. After ILuP surgical pulmonary metastasectomy was performed. After the first 50 patients this phase II trial was extended[3]. We included107 patients with resectable pulmonary metastasis of colorectal carcinoma, soft-tissue sarcoma or osteosarcoma. 29 patients were treated with bilateral ILuP. Our data show that ILuP is a safe and feasible procedure. No additional morbidity or lung toxicity was recorded in comparison to historical data of pulmonary metastasectomy only. To evaluate local control, median time to local pulmonary progression (TTLPP) and three- and five-year pulmonary progression free survival

(PPFS) were measured. Results seem to favour an increased local control for sarcoma patients when we compare results to retrospective literature data while results for CRC are at least comparable to literature. Three-year PPFS in this study were 42% and 60% for CRC and sarcoma patients respectively. TTLPP were 22 months for CRC patients and not statistically reached for sarcoma patients. The delay in local progression in sarcoma patients caused the increase of total time to progression (TTP) of 7-8 months after pulmonary metastasectomy to 12 months in this study[4,5].

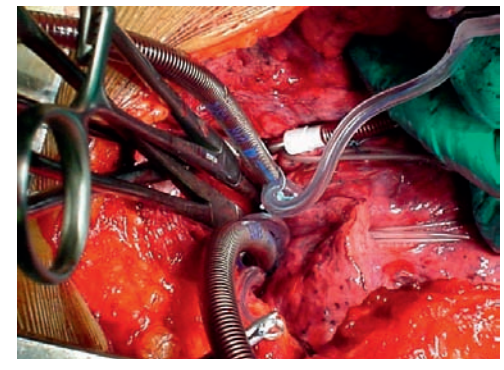

Figure 1. Close-up of the setup of the isolated lung perfusion. Two venous canullae (left) and a arterial cannula (top) are introduced and central clamps are placed to isolate the lung from the systemic circulation.

However as metastatic disease in generalised we find long-term results comparable to literature results of surgical metastasectomy. This study provides an incentive to further investigate this and other locoregional techniques. A randomized control trial would be needed to understand the extend of local control by ILuP. Furthermore, repeated treatments by selective pulmonary artery perfusion or standard combinations of ILuP with adjuvant systemic chemotherapy might improve long-term results.

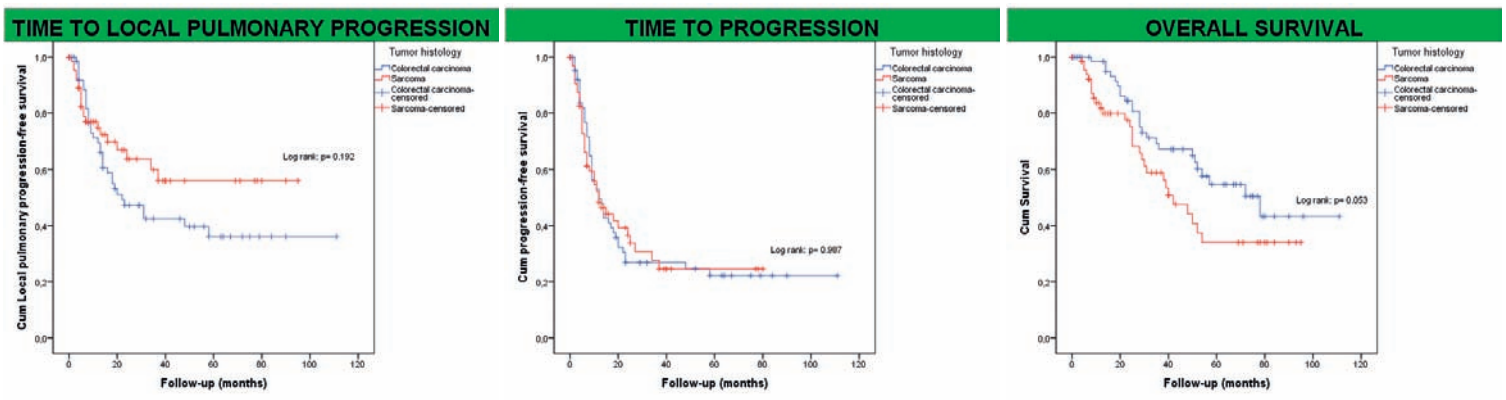

Figure 2. Kaplan-meier curves of local recurrence (left), general recurrence (central) and overall survival (right) of patients treated for pulmonary metastases of colorectal carcinoma (blue line) and sarcoma (red line).

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Thoracic | Abstract | Oesophageal Surgery

Hilar lymphadenectomy can be omitted in selected patients with oesophageal squamous cell cancer

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Xiaobin Zhang (left) and Zhigang Li (right)

Radical lymphadenectomy is the mainstay in the surgical treatment of oesophageal squamous cell carcinoma (ESCC). However, aggressive and skeletonised lymph nodes dissection could lead to increased postoperative complications, especially vocal cord paralysis and pulmonary events. In the Japanese Esophageal Society (JES) or NCCN staging system, an overly broad definition of regional lymph nodes was used for ESCC. It included both the oesophageal and lung cancer-related nodes stations. In fact, the metastasis of ESCC occurs mostly at both ends of the oesophagus (bilateral recurrent laryngeal nerve and cardiac-celiac regions) along the submucosal path, or beside the tumour from direct penetration. Therefore, we hypothesise that the hilum is only the fated danger zone of lung cancer, but not the natural lymphatic drainage area of ESCC.

In this study, we tried to examine the pattern of lymph node spread at the hilar region and clarify the possibility of sparing of lymphadenectomy for selected patients with thoracic ESCC in the hilar area. Between January 2015 to March 2017, a series of 414 consecutive patients with thoracic ESCC underwent McKeown oesophagectomy with two-field lymphadenectomy in the Shanghai Chest Hospital. The hilar lymph nodes were defined as in the region along the carinal trachea and main bronchus, which include subcarinal nodes (No. 7), left main bronchus nodes (No. 10L), right main bronchus nodes (No. 10R) and left tracheobronchial nodes (No. 4L) according to AJCC 7th edition staging system (Figure 1).

The inspiring results showed that no lymph node metastasis was observed at hilar region in patients with pathologic T1 stage or with the tumour located at the upper oesophagus. The mean number of total and thoracic lymph nodes dissections were 19.9 ± 8.6 and 13.4 ± 5.8. Among them, the mean number of hilar nodes were 6.4 ± 2.9 (No. 7 of 2.5 ± 2.0, No. 10R of 1.9 ± 1.1, No. 10L of 1.7 ± 1.0 and No. 4L of 0.2 ± 0.3). Overall, lymph nodes metastasis was confirmed in 186 patients (44.9%). Hilar nodes metastasis was noted in 29 patients (7% – 3.9% in No. 7, 1.4% in No. 10R, 2.7% in No. 10L and 0% in No. 4L), and multiple hilar station metastasis was observed in three patients. A total of 97 patients received lymphadenectomy in the No. 4L station and none was pathologically confirmed with lymph nodes metastasis.

Univariate analysis showed that pathologic T stage ($P = 0.026$), tumour length ($P < 0.001$) and lymph node metastasis in non-hilar stations of chest ($P < 0.001$) were related to the hilar nodes metastasis. And the multivariate analysis revealed that the non-hilar station metastasis in the chest (odds ratios = 7.337, 95% confidence interval = 2.580 - 20.870, $P < 0.001$) and longer tumour length (odds ratios = 2.179, 95% confidence interval = 1.145 - 4.147, $P = 0.018$) were the predictive factors for positive hilar lymph nodes.

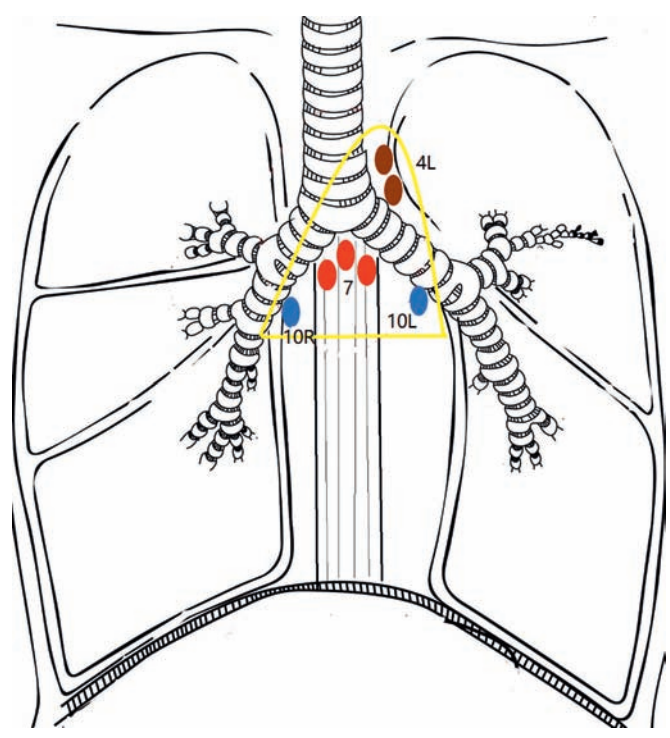

Figure 1. Hilar lymph nodes. 4L: left tracheobronchial nodes; 7: subcarinal nodes; 10L: left main bronchus nodes; 10R: right main bronchus nodes

In conclusion, the hilar lymph nodes metastasis in ESCC was rare. For patients with pathologic T1 stage, upper thoracic tumour location, and shorter tumour length (≤ 3 cm), the lymphadenectomy in the hilum, especially at No. 4L station, could be omitted.

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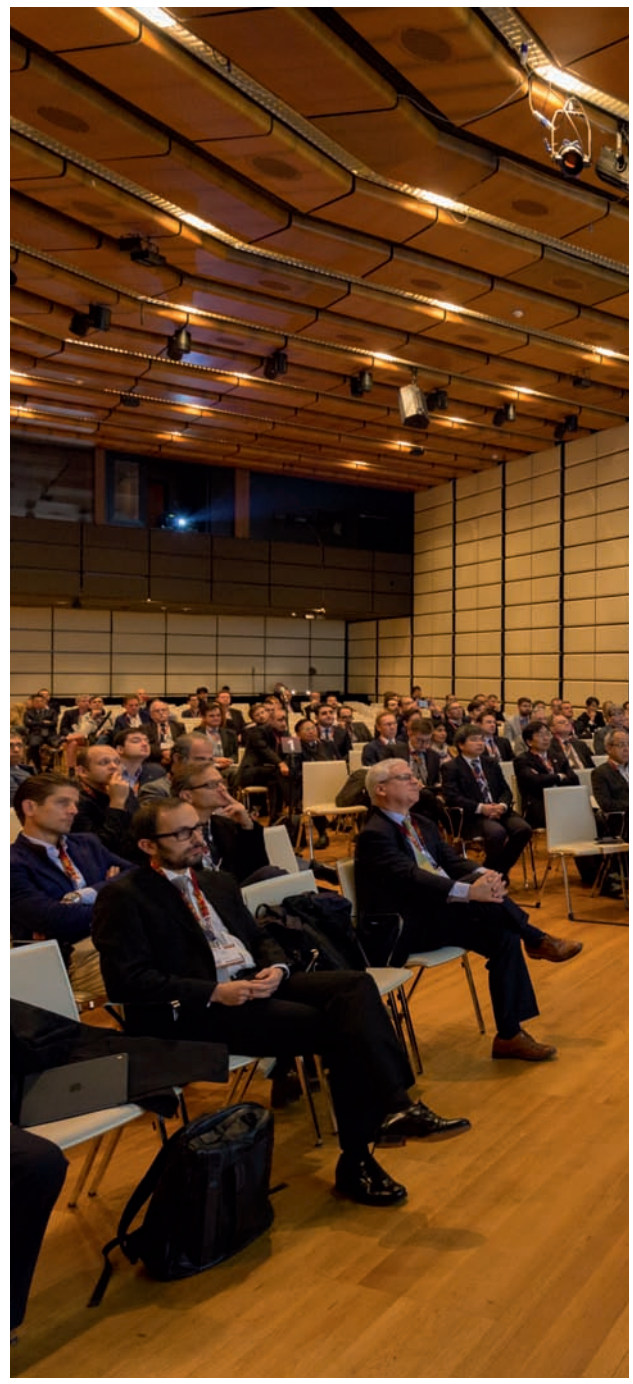

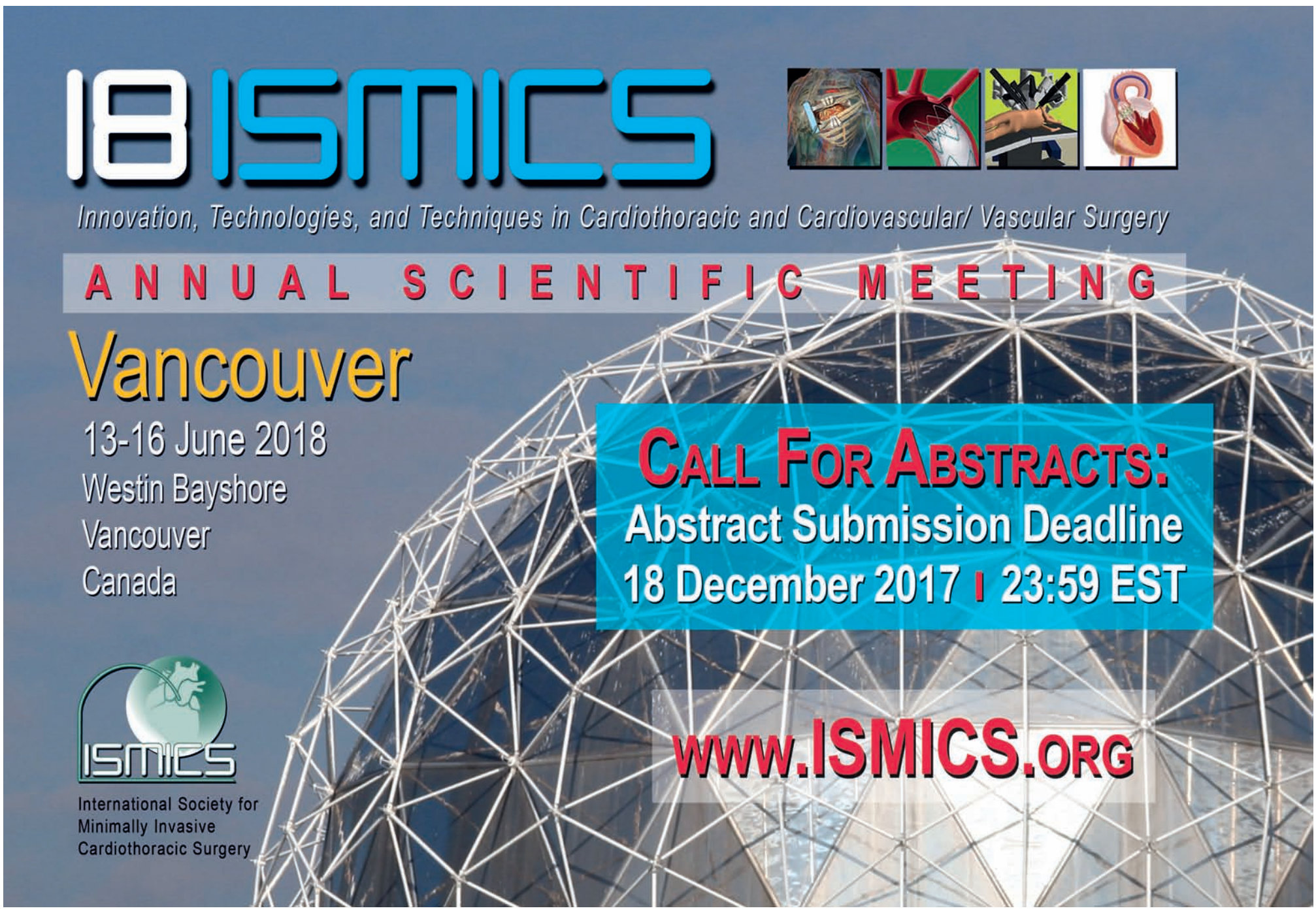

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EACTS

European Association For Cardio-Thoracic Surgery

Raising Standards Through Education and Training

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

Cardiac | Focus | Beyond artificial chords

Foundations of mitral valve surgery: Is repair better than replacement in degenerative MR?

This afternoon's session 'Beyond Artificial Chords' will feature a historical overview of both valve replacement and valve repair surgery, with Prem Shekar, Chief of Division of Cardiac Surgery at Brigham and Women's Hospital and Assistant Professor of Surgery at Harvard Medical School, Boston, USA offering his insights for the audience.

During his presentation, Dr Shekar will pose the question of whether mitral valve repair is better than replacement for degenerative mitral regurgitation, starting with a look back at the early beginnings of treatment. "The history of mitral valve surgery stretches all the way back to 1923 when the first mitral valve repair operation was carried out at the Peter Bent Brigham Hospital, performed by Dr Elliot Cutler," said Dr Shekar.

"At that time, there was no heart/lung machine so surgeons did what we call closed mitral valve surgery, and it was primarily directed towards mitral valve stenosis from rheumatic fever, and that's what surgeons did for several years until the heart/lung machine became available."

Mitral valve surgery was revolutionised by the development of the first mitral valve prosthesis in the early 1960s, and the work of Dr Albert Starr and Lowell Edwards at the University of Oregon.

"In the 1960s and 1970s, there were suddenly more choices and refinements for treating mitral valve disease. We had the caged ball valve for instance, then we had the tilting disc valve and in the late 1970s the bi-leaflet mechanical valve," said Dr Shekar.

In the 1980s though, heart surgeons began revisiting heart valve repairs. "There were surgeons who began experimenting with simple repair techniques who then moved onto more complex techniques," said Dr Shekar.

"Over the decades, with longitudinal follow-up, surgeons have been able to prove that mitral valve repair is first of all, durable, and number two that it is actually better for a patient's heart. The heart functions better when the heart valve is repaired rather than replaced. Repair is better for all-round survival – people live longer with repaired valves rather than replaced valves. It also takes away some of the big issues, such as mechanical valves needing blood thinners and animal valves needing to be replaced every 15 years. So it took a lot of things out of the equation, and that's how it became more popular."

> *"What we have seen in the development of mitral valve surgery is a continued process of discovery, innovation and progress, almost as if it had been plotted on a graph."*
>
> Prem Shekar

Dr Shekar said that in 1983 Dr Alain F Carpentier, from the University of Paris, published a seminal paper called '*The French Correction*' in the *Journal of Thoracic and Cardiovascular Surgery*,[1] which later inspired many surgeons to perform mitral valve repairs. "The increasing success of the surgery resulted in cardiologists referring patients earlier for mitral valve repair and repairs overtook replacements as the most-performed surgery for mitral valves," says Dr Shekar.

He also flagged up the work of Dr Lawrence Cohn[2] and colleagues from Brigham and Women's Hospital, Boston, MA, USA, and Dr Delos Cosgrove III, from Cleveland Clinic, Ohio, who pioneered mitral valve techniques including minimally invasive mitral valve surgery.

Dr Shekar also highlighted the important work of Professor David H Adams from the Department of Cardio Thoracic Surgery at the Mount Sinai Hospital New York, who set up the hospital's Mitral Valve Reference Center.

Other pioneers in mitral valve surgery Dr Shekar gave special mention to were: Dr Craig Miller, Thelma and Henry Doelger Professor in Cardiovascular Surgery at Stanford Hospital, USA; and Dr Tirone David, Professor of Surgery at Toronto General Hospital, Canada.

Dr Shekar said the success of mitral valve repairs was based on collaboration between cardiology, cardiac surgery and cardiac anaesthesia work.

"What we have seen in the development of mitral valve surgery is a continued process of discovery, innovation and progress, almost as if it had been plotted on a graph. Doctors working in the field of mitral valve surgery have continued to explore new ideas, innovate and investigate newer ideas and move forward with it, " said Dr Shekar.

"I'd like to end on a high note by saying mitral valve repair is better than replacement and that we should aim to repair all mitral valves if we can and replace them only where repair is not possible.

"On the other hand, it doesn't mean that mitral valve replacement is a bad thing – so long as you have attempted to do a repair first. Sometimes mitral valves don't render themselves to repair, and sometimes repairs are not successful – which is okay. In the end, it is the outcome for the patient that is paramount."

'Foundations of mitral valve surgery: Is repair better than replacement in degenerative MR?'; 16:00–17:30, Tuesday 10 October.

References

1. Carpentier A. Cardiac Valve Surgery: "The French Correction". J Thorac Cardiovascular Surg 1983; 86:323-37.
2. Cohn L, Rizzo, R, Adams, D, Couper, GS, Sullivan, TE, Collins, JJ Jr et al. The effect of pathophysiology on the surgical treatment of ischemic mitral regurgitation: operative and late risks of repair versus replacement. Eur J Cardiothorac Surg. 1995; 9: 568–574.

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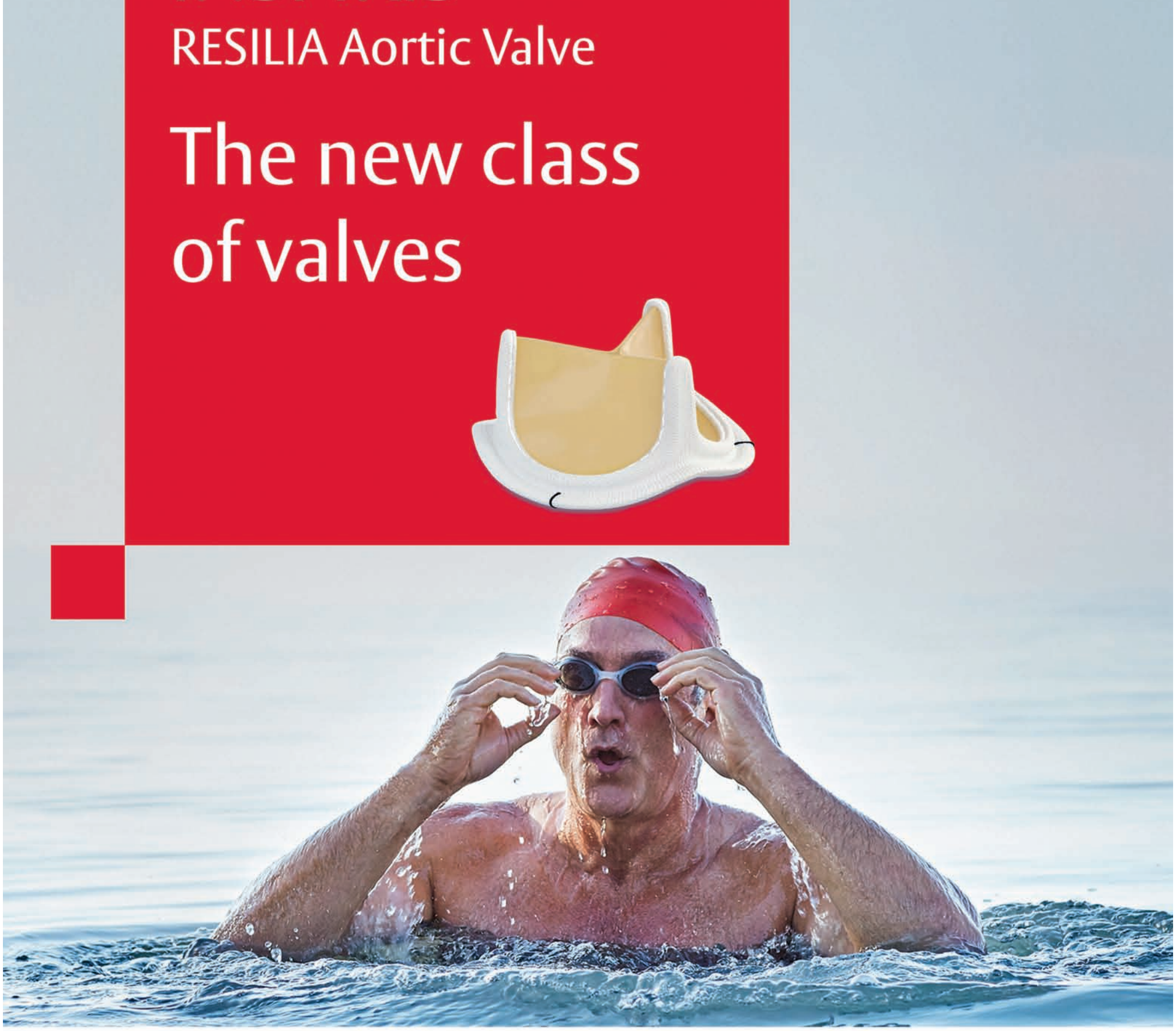

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Edwards

Adult Cardiac | Focus | When saphenous veins are a necessary choice use them wisely and for the appropriate target

How to harvest a vein graft: The Swedish Experience

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For many reasons, the saphenous vein (SV) will continue to be a very important conduit in CABG surgery. Therefore, every effort should be made to improve both the short and long term patency of saphenous vein grafts (SVGs). Indeed, while much progress has been made to advance both percutaneous coronary intervention (PCI) and the development of new stents, there has been no progress regarding the improvement in the outcome of SVGs.

One of the most important reasons for the high incidence of SVG failure is due to the trauma inflicted to the vein wall during harvesting. This is mainly due to the fact that the vein is still prepared using the conventional (C) technique, which was described when CABG was first introduced. With this technique, the vein is stripped of its outer layer of tissue, distended to overcome spasm and stored in saline (Figure 1).

Since the early 1990s we have used a novel technique, the 'no-touch' (NT) technique, whereby the vein is neither stripped nor manually distended, but is instead harvested together with its fat pedicle (Figure 2). This prevents the occurrence of spasm, thereby obviating the need for high pressure distension and consequently providing a better preservation of endothelial nitric oxide synthase (eNOS)[1,2]. Preservation of the outer vessel layers also plays an important role in reducing medial ischemia by maintaining blood flow through the vasa vasorum[3]. The surrounding tissue is also an important source of various vasodilator factors and adipokines including NO, leptin and adiponectin[4]. In addition, the surrounding tissue acts as an external biological stent, protecting the SV wall against the deleterious effects of manual distension and aortic hemodynamics[5]. A study using intravascular ultrasound assessment showed slower progression of atherosclerosisin SVs harvested by the NT technique compared with those prepared by the C technique[6]. This was confirmed by post-mortem biopsies which revealed a clear macroscopic difference in the atherosclerosis process between the two techniques. The fat pedicle also protects the SV from kinking; a function that facilitates the application of sequential grafts[7].

Together, we believe these findings contribute to the long-term success of SVs treated with the no-touch technique as demonstrated recently in a longitudinal randomised trial. Furthermore, in this trial, patients underwent clinical and angiographic assessment at mean time intervals of 1.5, 8.5 and 16 years postoperatively. The main finding in all these studies was that the patency rate of the NT grafts, but not the C vein grafts was comparable to that of the left internal thoracic artery (LITA)[8-10]. (Figure 3)

We have been using NT SVGs to bypass the left anterior descending (LAD) artery in elderly patients with multiple comorbidities. Recently we reported the results of a retrospective observational study whereby we evaluated the patency rate of the NT SVG to the LAD artery at a mean time of six years.[11]

Figure 1. Conventional vein harvesting technique.

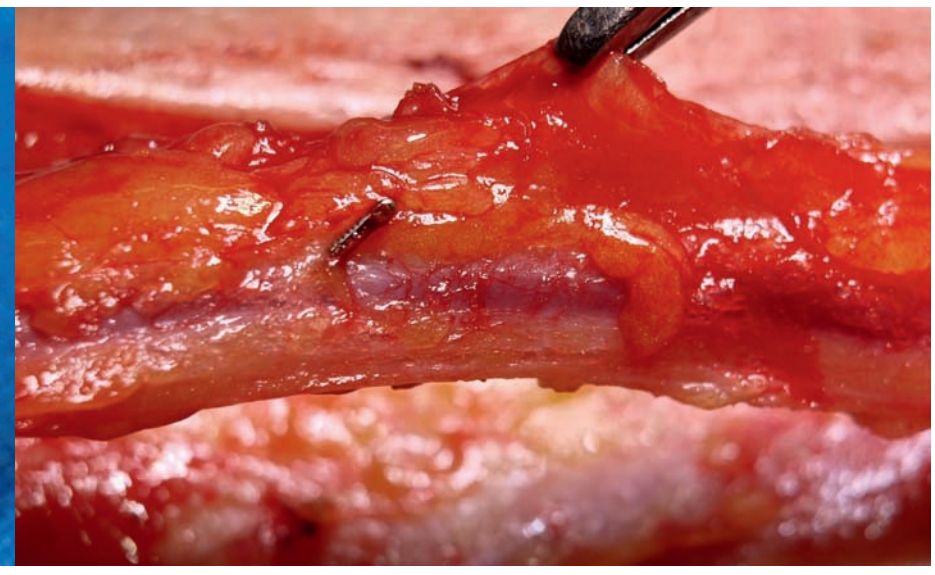

Figure 2. No-touch vein harvesting technique.

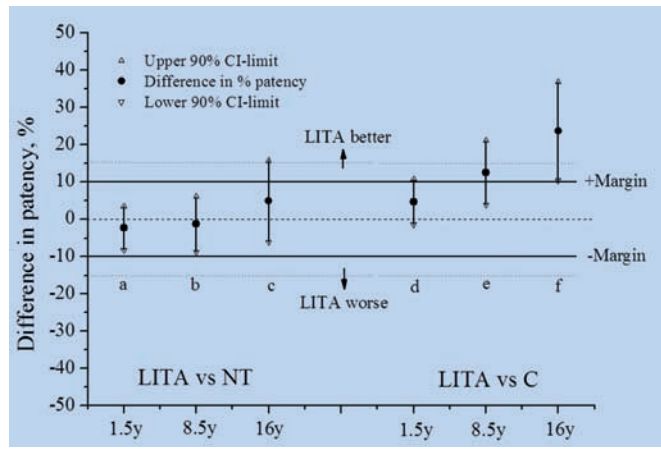

Figure 3. Differences in patency LITA-NT, LITA-C at 1.5, 8.5 and 16 years. The six confidence intervals a-f and the margins of 10 and 15 percentage units are the basis for comparing LITA with SV with respect to potential equivalence and non-inferiority[10]

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Vascular | Focus |
How to cope with the aberrant right subclavian artery (ARSA) in aortic surgery

Left subclavian artery revascularization for thoracic aortic stentgrafting: Single-centre experience in 101 patients

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Through the years thoracic endovascular aortic repair (TEVAR) has rapidly gained interest, as it offers a less invasive option to open aortic repair and is increasingly being used in a wide variety of thoracic aortic pathology such as aneurysms, dissections and traumatic transections. Nowadays, TEVAR is progressively used to treat descending thoracic aortic pathology extending into the distal aortic arch. However, for optimal sealing and fixation, a proximal landing zone of at least 2 cm is generally recommended, creating the necessity to cover the left subclavian artery (LSA) in approximately 40%[1,2] of all endovascularly treated cases. Simply covering the LSA is, however, not without consequence and may potentially increase the risk of stroke, spinal cord ischemia (SCI) and left arm malperfusion. Several fully endovascular options are available today to preserve the LSA flow, such as scalloped or fenestrated stentgrafts. Unfortunately, these are often custom-made and therefore not readily available for every patient. Making the surgical revascularization through subclavian-carotid bypass (SCB) or transposition (SCT) is still a relevant alternative. While the goal of this procedure is stroke prevention, the procedure itself can also cause a stroke during the temporarily clamping of the left common carotid artery (LCCA). Hence, the debate on surgical revascularization is ongoing.

In our centre, with an experience of around 650 TEVAR procedures beginning in 1997, a total of 101 surgical LSA revascularizations were performed, all prior to, concomitant to, or following TEVAR, through supraclavicular incision and with the use of perioperative left-sided transcranial Doppler and EEG monitoring. When a signal drop of >50% was observed (especially when associated with EEG changes), this was corrected by induced hypertension until the signal had returned to above 50% of normal. In total, 63 subclavian-carotid bypasses and 38 transpositions were performed. Most patients were operated in an elective setting (77%) and the LSA was most often revascularized to prevent stroke (57%).

Sadly, two patients suffered ischemic stroke (2%): one resulted in a right-sided hemiplegia, possibly caused by the several attempts made to correctly place the stentgraft; the other resulted in cerebellar infarction due to an intentionally covered LVA, unfortunately terminating as a posterior inferior cerebellar artery (PICA), not known pre-operative. Both recovered greatly after rehabilitation. However, in the groups of patients in which the surgical revascularization of the LSA was performed prior or secondary to TEVAR no strokes were observed, increasing the likelihood that the strokes may have been caused during the placement of the stentgraft. No in-hospital mortality or permanent paraplegia was observed in our cohort.

With this study, we showed that surgical revascularization of the LSA proves to be a safe treatment option to preserve antegrade LSA flow in the context of TEVAR. Patients may be selected based upon the anticipated risk of (posterior) stroke, SCI and left arm malperfusion.

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Thoracic | Abstract | Lung cancer – controversies

Feasibility of lobectomy and mediastinal node dissection by video-assisted thoracoscopic surgery following neoadjuvant chemoradiation therapy for stage IIIA N2 non-small cell lung cancer: Propensity score-matched analysis

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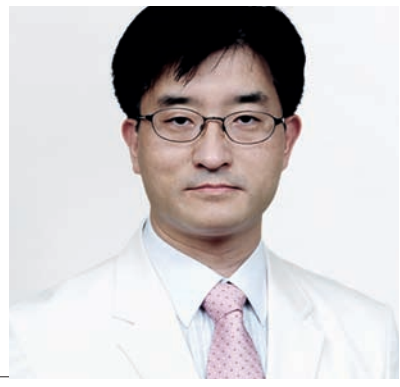

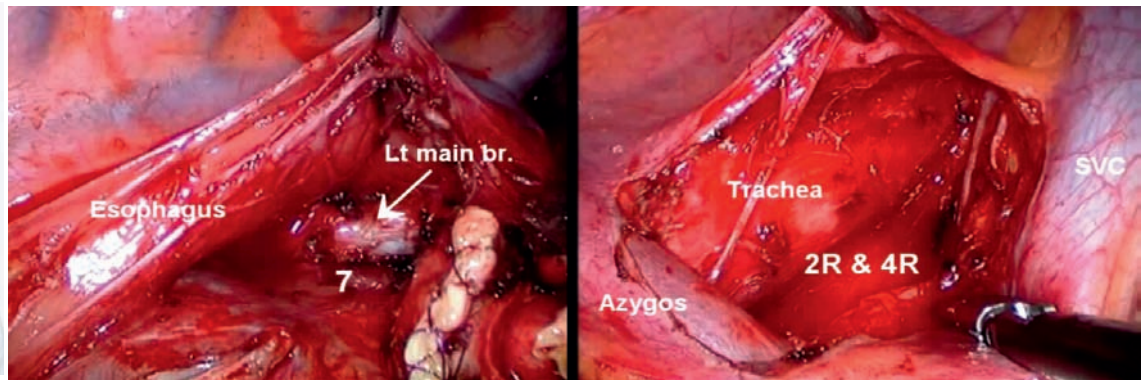

Figure 2. Mediastinal lymph node dissection by VATS

The application of VATS for patients with stage IIIA N2 NSCLC who have undergone neoadjuvant therapy remains controversial. There is concern regarding the technical difficulty of mediastinal node dissection (MND), which could compromise oncologic outcomes. However, as experience with VATS has increased, surgeons have successfully performed VATS lung resection and MND with comparable outcomes. We evaluated the feasibility of lobectomy and MND by VATS following neoadjuvant therapy for stage IIIA N2 NSCLC.

We retrospectively reviewed selected patients with pathologically or radiologically stage IIIA N2 lung cancer who received neoadjuvant treatment followed by surgery using VATS (group V) or thoracotomy (group T). The patients who were eligible for VATS (preoperative tumour size of less than 7 cm, non-bulky N2, less than four positive N2 station and simple lobectomy or bilobectomy) were included in both group. The patients were matched using a propensity score based on age, sex, diabetes, pulmonary function (forced expiratory volume in 1 second %, diffusing capacity for carbon monoxide), histologic type, method for diagnosis of N stage, with a 1:3 ratio (group V: group T). Survival analyses were performed by Cox proportional hazards model and the Kaplan-Meier method.

From November 2009 to December 2013, 199 patients with stage IIIA N2 NSCLC were enrolled including 15 patients in group V and 184 patients in group T. Forty-four patients were matched (group V, 12 vs group T, 32 patients). After propensity matching, the mean age was 65 years old, and adenocarcinoma was present in 27 patients [group V, 7 (58.3%) vs group T, 20 patients (62.5%)]. Patients who diagnosed N2 disease by mediastinoscopy were 5 (41.7%) and 11 patients (34.4%) after matching. In matched comparison, postoperative hospital day and perioperative complications were not significantly different between both group. There were no differences in the number of lymph nodes dissected (19.6 ± 8.1 vs 17.1 ± 9.4, p = 0.42). The median follow-up duration was 31.6 months. No significant differences were found in 5-year survival rates (group V, 66.7±13.6% vs group T, 62.7±12%, p = 0.82) and recurrence-free survival rates (50±14.4% vs 43.7±10%, p = 0.97) in two groups (Figure). Completeness of adjuvant chemotherapy was a significant prognostic factor of overall survival (p = 0.01) and recurrence-free survival (p = 0.05).

Figure 1. Kaplan-Meier analysis of overall survival after surgery (A) and recurrence-free survival (B)

In conclusion, the VATS approach following neoadjuvant treatment was feasible in selected patients for the treatment of stage IIIA N2 NSCLC, without compromising oncologic efficacy. Large and randomly assigned prospective analyses of long-term outcomes for locally advanced lung cancer following induction treatment need to be performed to validate the oncologic efficacy of VATS.

Cardiac | Advanced Techniques | Tricuspid valve: surgery for who, when and how

The risk of surgery for severe tricuspid regurgitation

Bettina Pfannmüller Heart Center Leipzig, University of Leipzig, Germany

Figure 1. Echocardiography: severe TR secondary to previous mitral valve replacement.

Patients with severe tricuspid valve regurgitation (TR) have a low life expectancy. This fact was impressively presented by Nath et al. (JACC, 2004) by the retrospective analysis of echocardiographic data of more than 5,000 patients to determine the association between severe TR and mortality. The authors concluded that mortality increases with increasing severity of TR. Additionally it was shown that patients with severe TR were older with lower left ventricular ejection fraction, a more dilated right heart, and a higher rate of right heart dysfunction in regard to patients with less TR.[1]

Clinical symptoms, caused by severe TR, develop usually very late in the pathologic process. The surgical risk of tricuspid valve surgery is reported with an elevated operative mortality of up to around 25%. For these reasons, severe TR is often equated with a low life expectancy and elevated operative mortality, while clinical symptoms for severe TR appear very late.

Patients with severe TR do not uncommonly present to the surgeon late in their pathological process with severe clinical symptoms as anasarca, ascites, renal failure and/or cardiac cirrhosis due to venous congestion.

Only 25% of patients suffering from severe TR do so due to a primary genesis with structural modifications of the tricuspid valve. This is seen, for example, in patients with Ebstein`s disease, with rheumatic diseases, in patients with Lupus erythematodes, in patients with fibrosis and restriction of the TV due to previous radiation, and in patients with tricuspid valve endocarditis. Severe TR without structural modifications develops secondary in more than 75% of severe TR patients due to left sided valve disease, pulmonary hypertonus, pulmonary embolism or dilative cardiomyopathy.

Both patient types suffer from severe TR – the patient with TV endocarditis and the patient with severe TR after previous mitral valve surgery (Figure 1). Which parameters are responsible for the operative risk in patients with severe TR? Which factors can be determined to estimate the operative risk? Which preoperative investigations are the most effective? Which criteria lead to an indication for surgery? Is it a good idea to perform surgery for an asymptomatic patient with isolated severe TR? These questions will be pursued in this presentation.

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The Heart Club

The Heart Club

Six children operated on by the Guy's surgeon Russell Brock during a one month exchange visit to Baltimore in 1949, during which he introduced surgery for both pulmonary and mitral stenosis to his colleagues at Johns Hopkins.

Tom Treasure London, UK

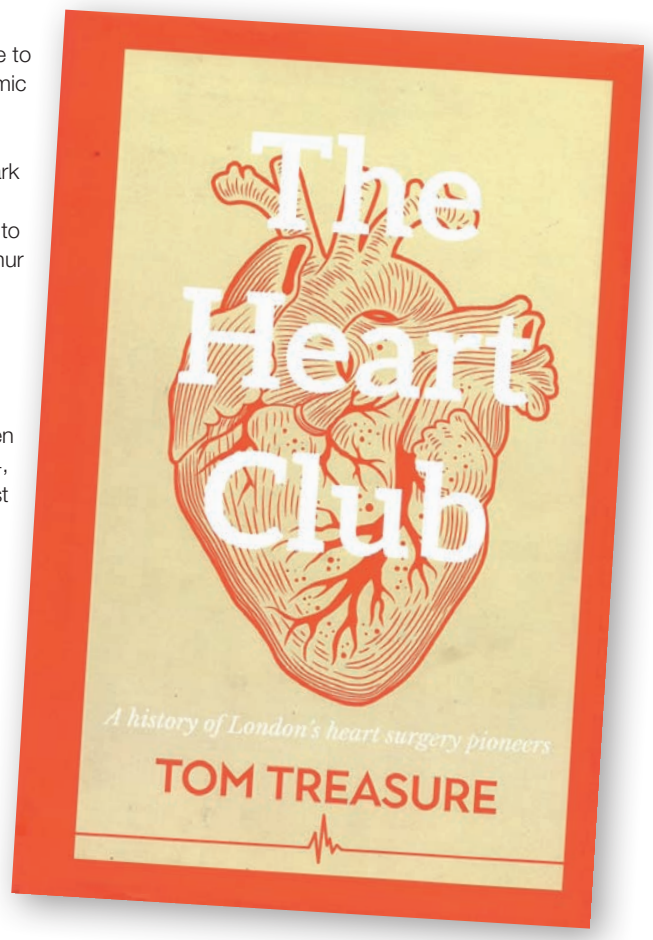
The Heart Club by Tom Treasure is centred around a unique and hitherto unknown written account of the work of Russell Brock in 1945 to 1956. The book starts in a bomb-damaged Guy's Hospital, situated in a devastated area of London's dockland, as it embarks upon its recovery plans. Brock had provided surgical care amidst the bombs and rockets while Roland Boland, dean of the medical school was at the front with American colleagues in the allied forces medical services. When peace returned, Dean Boland arranged – through his wartime contacts – for exchanges of senior medical staff between Guy's and Johns Hopkins. The first American visitor was Alfred Blalock in September, 1947.

Guy's cardiologists had the care of many children with Fallot's Tetralogy, familiarly known as 'blue babies'. During his stay, Blalock demonstrated 10 of his subclavian to pulmonary-artery shunt operations – devised with Helen Taussig and Vivien Thomas – to Brock and the Guy's team. The results were remarkable. The Guy's team adopted the shunt operation and by 1953 published their results in 200 operations. Maurice Campbell, the senior physician at Guy's and the influential editor of the British Heart Journal, was quickly convinced that cyanotic congenital heart disease was amenable to surgical treatment. But Blalock's systemic to pulmonary shunt operations were palliative and extracardiac. Brock had grander ambitions: he wanted to embark on intracardiac surgery.

There was another American crucial to this history. During the 1930s, with Arthur Tudor Edwards at London's Brompton Hospital, Brock had played a major part in developing thoracic surgery as a specialty, and was poised to begin operating on the heart itself. He was a mentor to Dwight Harken who had been at the Brompton in 1939. Then in 1944, Harken returned to head-up a specialist chest service in a US military hospital in rural England, set up in anticipation of the many injured soldiers that would arrive after the D-Day landings. During the 10 months following June 6, 1944, he operated to remove bullets and shrapnel from 134 injured men with 100% success.

Brock supported this work and went to watch Harken operate. Again Brock was present when Harken stood in front of the Association of Surgeons of Great Britain and Ireland and awed them with his results, incising, suturing, and passing instruments within the heart. The heart was shown to be amenable to surgical intervention, contradicting the "don't touch the heart" dogma.

Brock returned Blalock's 1947 visit, heading to Johns Hopkins in 1949. While he was there he did seven operations for valvar and subvalvar pulmonary stenosis using what Blalock referred to as "the Brock method". Brock also performed the first two mitral valvotomy operations to be carried out at Hopkins. He reported this experience at the Club meeting in February 1950, adding them to his run of successful operations for both pulmonary and mitral stenosis at Guy's. He published his results in the British Heart Journal and the British Medical Journal that year.



The Heart Club provides a transcript of the minutes of this and all the other meetings. View a copy of the book at the Wisepress stand in the Exhibition Hall.

Cardiac | Rapid Response | Is no-suture the future for aortic valves?

Outcomes of sutureless and rapid deployment aortic valve replacement surgery: data from a collaborative retrospective international registry

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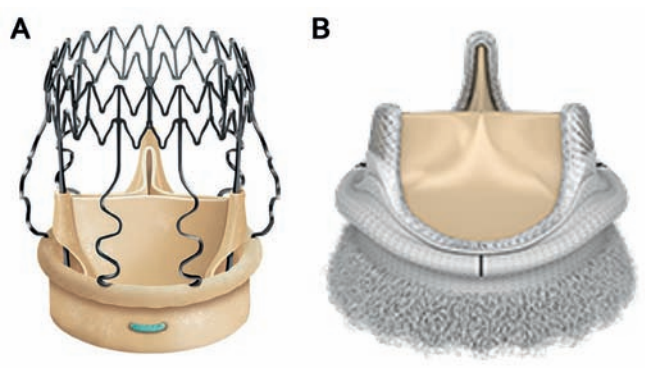

Figure 1. A: Perceval™ sutureless aortic valve (LivaNova, Italy). B: Edwards Intuity Elite™ rapid deployment valve (Edwards Lifesciences, USA).

Figure 2. SU-AVR-IR participating centres.

The available literature on sutureless and rapid deployment aortic valve replacement (SU-AVR) carries relevant limitations related to the observational nature of the majority of studies, heterogeneous definitions of clinical variables, insufficient reporting of postoperative outcomes, lack of robust follow-up data. To overcome these limitations and provide convincing evidence for sutureless aortic valve surgery, an international registry for SU-AVR operations was established by the International Valvular Surgery Study Group (IVSSG). The IVSSG comprises a consortium of 17 research centres that evaluates the current management and outcomes of valvular surgery, with present efforts focused on sutureless and rapid deployment aortic valve interventions.

The Sutureless Aortic Valve Replacement International Registry (SU-AVR-IR) is the first independent – retrospective and prospective – registry enrolling patients undergoing SU-AVR (using any available sutureless and rapid deployment valve prosthesis) at large referral centres in Europe, North America and Australia. Being the largest worldwide registry for sutureless valves, SU-AVR-IR represents a unique opportunity to adequately assess patients' characteristics, hemodynamic profiles and safety and efficacy short and long-term outcomes of SU-AVR, by minimising the inherent biases seen in small surgical registries or single-centre series. The 31st EACTS annual meeting represents the first opportunity to share the main findings about the retrospective phase of SU-AVR-IR. In this phase, data for 3,343 patients undergoing SU-AVR procedures over a ten-year period from 2007-2017, were contributed by 18 centres. Over 190 parameters involving demographics, history, imaging studies, surgical data, post-operative course, clinical and haemodynamic outcomes were collected for each patient. The data were then compiled into a homogenised central database and a descriptive analysis was performed to provide an overview of the database. Early results were stratified by patient risk profile according to the most recent guidelines for the management of valvular heart disease[1]. Overall hospital mortality was 2%, being 1% in low risk patients (logistic Euroscore < 10%) and 2.8% in patients at increased surgical risk (logistic Euroscore ≥ 10%). Moreover, in very low risk patients (logistic Euroscore < 5%) early mortality was just 0.5%. Our findings demonstrate that sutureless aortic valve replacement is a safe and efficacious alternative to conventional aortic valve replacement being associated with excellent clinical outcomes. We believe that further effectively powered statistical analyses from the retrospective and prospective SU-AVR-IR will allow for the development of high-quality evidence based clinical guidelines for SU-AVR.

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Cardiac | Abstract | Conduction disturbances after aortic valve interventions

Conduction disorders after aortic valve replacement with rapid deployment bioprostheses: a real issue?

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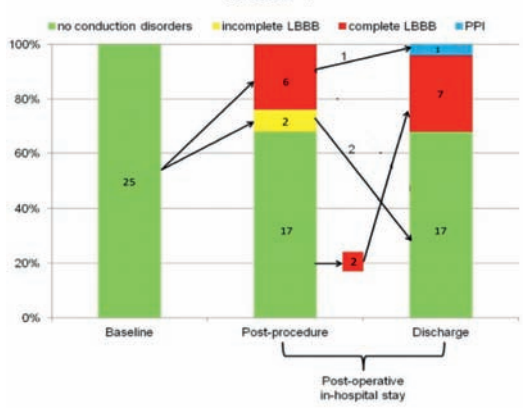

Figure 1

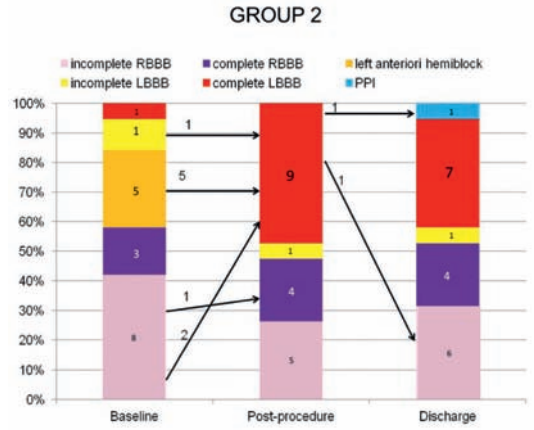

Figure 2

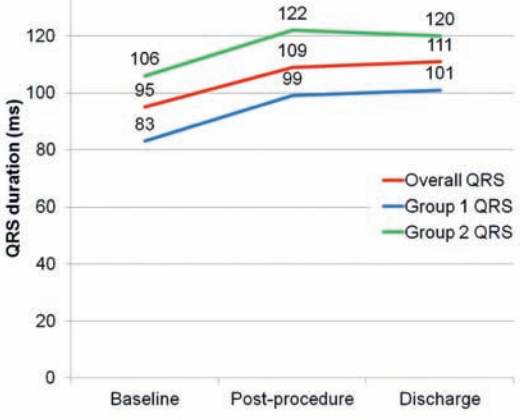

Figure 3

The onset of new conduction disorders is a well-known complication after surgical aortic valve replacement, with both biological and mechanical valves, and it has been associated with worse prognosis. A recently introduced rapid-deployment aortic bioprosthesis (Intuity, Edwards Lifesciences, USA) features pericardial leaflets similar to the Magna Ease valve, and has a balloon-expandable stent placed below the valve for anchoring into the annulus and into the left ventricular outflow tract (LVOT) – based on the Sapien TAVI mechanism. Since the Intuity stent anchors at the annular level, but also goes deep into the LVOT, it is a matter of debate whether this valve might provide a high rate of postoperative conduction disorder.

Therefore, the aim of this retrospective single-centre study was to evaluate the occurrence of conduction disorders following Intuity rapid-deployment bioprosthesis implantation. The primary endpoint was the occurrence of new onset conduction disorders (LBBB, right bundle branch block, RBBB, atrio-ventricular block requiring pace-maker implantation (PPI)) as well as worsening/evolution of pre-existing rhythm abnormalities. Secondary endpoints were the assessment of QRS duration changes, the average QRS duration change and the identification of transient conduction disorders.

The study population included 44 consecutive patients who underwent Intuity implantation at our institution. Patients were divided into two groups according to preoperative conduction characteristics: absence of preoperative conduction disorders (Group 1) (n = 25, 56.8%) and presence of preoperative conduction disorders (Group 2) (n = 19, 43.2%). Globally, the primary endpoint occurred in 14 patients (31.8%) and permanent pacemakers were implanted in two patients (4.5%). In particular, in Group 1 new-onset persistent abnormalities were found in seven cases (28%). These were all LBBB. One patient required PPI (4%) because of complete atrio-ventricular block (A-V block). Worsening of pre-existing conduction disorders was found in seven patients in Group 2 (36.8%); in particular, LBBB in 6 cases and complete RBBB in 1 case. One patient required PPI (5.3%) because of complete A-V block.

New-onset conduction disorders in Group 1 are shown in Figure 1, while worsening of pre-existing conduction disorders of Group 2 is shown in Figure 2. Overall, transient conduction disorders were present in three patients (6.8%), two in Group 1 and one in Group 2; these were all LBBB that spontaneously disappeared before discharge. Comparing the two groups, there were no statistically significant differences in new-onset/worsening of conduction disorders, both permanent and transient, and in PPI. The mean changes in QRS duration throughout the study period are shown in Figure 3. Overall, we observed a significant increase of QRS duration (mean duration 95±20 ms preoperatively versus 111±28 ms at discharge; $p < 0.001$) with an average increase of 16±23 ms. Multivariable logistic regression analysis identified aortic cross clamp time as the only independent predictor of primary end-point (OR: 1.020; 95%CI: 1.002-1.081; $p = 0.048$).

In conclusion, new onset conduction disorders or worsening of pre-existing rhythm abnormalities occur in one-third of patients after aortic valve replacement with Edwards Intuity Valve System. Although the incidence of postoperative PPI is low, strict follow-up is mandatory in order to identify the potential need for PPI in a timely manner especially in patients with persistent LBBB. Aortic cross clamp-time seems to be directly related to the primary end-point of this study.

Cardiac | Abstract | Minimally invasive aortic valve replacements

Full sternotomy, partial sternotomy and right anterior mini-thoracotomy for aortic valve replacement: is there any difference? A propensity matched analysis

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In the last decades, the number of patients affected by aortic valve disease (AVD) requiring invasive treatment are increasing. Despite new percutaneous transcatheter aortic valve implantation (TAVI) technique, surgical aortic valve replacement (AVR) performed through median sternotomy remains the gold standard. Minimally invasive approaches for AVR, such as partial upper hemisternotomy (PUH) and right minithoracotomy (RAT) have been described and encouraging results reported. On the other hand, there is a lack of data about clinical benefits in comparing different minimally invasive techniques. This study compares perioperative results and mortality rates of different techniques to perform AVR and describes possible predictors favouring one approach over the others.

Between January 2010 and March 2017, 1907 patients underwent isolated aortic valve replacement though a ministernotomy (N = 820), a minithoracotomy (N = 488) or a sternotomy (N = 599). After propensity score matching, we obtained three groups composed by 377 patients, homogeneous for baseline characteristics. In the three surgical approaches the same surgical technologies were used to perform aortic valve replacement, such as the technique for extracorporeal circulation, total central cannulation and cardioplegia (with the exception for the double lumen intubation used for RAT).

Regarding intraoperative variables, we observed significant differences between groups. Skin to skin time was significantly higher in the RAT group (193±54 minutes vs 168±34 minutes in PUH, p = 0.001 and vs 169±52 minutes in MS, p = 0.001, respectively; Figure 1). On the contrary, cardiopulmonary bypass and cross-clamp times were lower in the RAT group (57±20 minutes vs 69±21 minutes in PUH, p = 0.009 and vs 67±28 minutes in MS, p = 0.01; 45±16 minutes vs 58±19 minutes in PUH, p = 0.01 and vs 54±22 minutes in MS, p = 0.03, respectively). In-hospital mortality

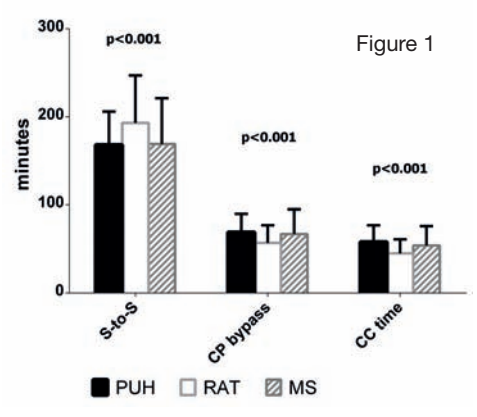

Figure 1

did not differ between groups (p = 0.9). Overall, only renal failure (OR 5.4; 95%CI 2.3-11.4; p < 0.0001), extra-cardiac arteriopathy (OR 2.9; 95%CI 1.1-6.7; p = 0.017) and left ventricular ejection fraction (OR 0.96; 95%CI 0.93-0.99; p = 0.009) emerged as independent predictor of in-hospital mortality. We did not observe any significant difference in secondary outcomes. The only exception was the occurrence of wound infection, which was significantly higher in the MS group (p = 0.01).

To the best of our knowledge, this is the biggest study database, using a propensity score analysis, comparing different standardised and reproducible surgical approaches for AVR. Contrary to previous reports, our data show that RAT required a higher skin to skin time but a lower cardiopulmonary bypass and cross-clamp times than MS suggesting that a careful planning of surgery significantly reduces the length of the most critical phases of surgery. Our policy is to follow a standard protocol for the management of patients independently by the surgical technique used. Thus, our results are fully comparable. Furthermore, this is probably the reason why we did not find (as others did) differences in ventilations, ICU and hospital stay between groups.

This study shows that minimally invasive AVR is a reproducible, safe and effective procedure with similar outcomes without longer operative times compared to conventional sternotomy. Therefore, considering the proven non-inferiority of RAT versus MS in terms of i) in-hospital mortality, ii) post-operative complications and iii) better psychological acceptance of the surgery, RAT might represent the best option for patients needing AVR.

Cardiac | Techno College | New techniques: the developers corner

Live-in-a-box: LAA management & minimally invasive LVAD-implantation to prevent thromboembolic adverse events

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Whether atrial fibrillation (AF) poses an additional risk for thromboembolic events in left ventricular assist device (LVAD) patients is still controversial[1-3]. Nonetheless certain subgroups of patients (e.g. enlarged left auricle appendage (LAA), difficult INR management) most likely will benefit from LAA occlusion during VAD implantation. With minimally invasive access surgery becoming standard of care in most conditions[4, 5], including re-do operations, and LAA occlusion devices being available, that allow fast and easy LAA occlusion from different angles and distances, routine LAA occlusion in VAD patients with risk factors for thromboembolic (TE) events is a worthwhile consideration. We present a Live-in-a-box case, in which less invasive access LVAD implantation (HVAD; Heartware, Medtronic) was performed in a patient who had previously undergone aortic valve replacement for low gradient, low flow aortic valve stenosis. The patient suffered from intermittent AF, which led to recurrent hospitalisations for heart failure. The decision was made to combine HVAD implantation with occlusion of the LAA using the AtriClip PRO2 (AtriCure Inc.) device. (Figure 1)

Operative technique: Upper hemisternotomy is performed as a J-incision after partially removing sternal wires. The aorta is freed and purse string sutures are placed for arterial access. Subsequently a left anterior thoracotomy is performed to access the LV apex. The pericardium is not opened. The HVAD sewing ring is placed on the apex under transoesophageal echo (TEE) guidance and fixed with interrupted, pledgeted sutures. Heparinization is initiated thereafter. A femoral vein and the aorta are cannulated and cardiopulmonary bypass (CPB) is commenced. With the heart unloaded, transsternal dissection around the pulmonary artery is performed to enable free access to the LAA up to its base. Care is taken to not free the right ventricle (RV) from the pericardium to preserve RV dimensions. The AtriClip PRO2 is used to occlude the LAA through the upper hemisternotomy. Subsequently the LV is opened and the HVAD is placed into the LV apex. The system is de-aired and the outflow graft tunnelled through the left pleural cavity to the aorta. The graft is anastomosed to the ascending aorta after side clamping. VAD flow is increased and the patient is weaned from CPB. Drains are placed through the right chest into the mediastinum. The patient had an uneventful postoperative course.

Conclusion

Less invasive LVAD implantation can be combined even in re-do conditions with occlusion of the LAA using the AtriClip PRO2 device. Routine LAA occlusion should be considered in LVAD patients presenting with AF. Further studies have to clarify which patients benefit the most from this approach.


Jan Schmitto


Andreas Martens

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Figure 1. (left) Minimally invasive incisions; (centre) the AtriClip PRO 2 device (AtriCure Inc.); (right) the Heartware HVAD system (Heartware, Medtronic).

Cardiac | Abstract | Controversies in left ventricular assist device therapy

Bridge to transplant in patients with cardiogenic shock. ECLS or BVAD?

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ECLS (extra-coporeal life support) is considered the first choice of treatment for patients with cardiogenic shock because of its ready availability, limited invasiveness and quick implantation. On the other hand, BiVentricular Assist Devices (BVADs) may allow long-term support and potentially better clinical recovery. The aim of the study was to evaluate the outcome of patients supported by ECLS and BVAD as bridge to Heart Transplantation (HTx).

Since 1998, 133 patients with cardiogenic shock received mechanical circulatory support (MCS). As patients with acute myocardial infarction, prolonged cardiac arrest, primary pulmonary insufficiency, excessive acidosis (PH < 7) and contraindications to HTx were excluded from the study, only 44 patients treated with ECLS and 28 with BVAD have been considered. Before the MCS implant, demographic, clinical and haemodynamic data did not differ between groups, but there was worse metabolic acidosis in ECLS patients (lactate 3.2 vs 2.1 mMol/L, p = 0.03).

In hospital mortality was 21% in the ECLS group vs 29% in the BVAD group (p = 0.43). The average support was 8 vs 33 days (p < 0.01), three patients in each group were weaned from MCS (7% vs 11%, p = 0.43) and 68% vs 61% (p = 0.52) underwent HTx in the ECLS and BVAD groups respectively. Early mortality (< 30 days) after HTx was 23% in the ECLS group vs 18% in BVAD group (p = 0.47). After transplantation, patients treated with ECLS were more frequently affected by acute renal failure (50% vs 6%, p < 0.01) and respiratory insufficiency (23% vs 0%, p = 0.03). Long-term survival didn't show a significant difference (70% vs 76%, 64% vs 69% and 64% vs 50%, p = 0.93) at 1-year, 5-years and 10-years in the ECLS and BVAD groups, respectively.

Table 2. Results after Mechanical Circulatory Support

Complications	ECLS (n=44)	BVAD (n=28)	p value
Device related infection, n (%)	11 (25)	9 (32.1)	0.51
AKI, n (%)	22 (50)	10 (35.7)	0.23
CRRT, n (%)	13 (29.5)	9 (32.1)	0.82
Liver dysfunction, n (%)	10 (22.7)	7 (25)	0.83
Atrial Fibrillation, n (%)	9 (20.5)	5 (17.9)	0.79
Ischemic stroke, n (%)	3 (6.8)	1 (3.6)	0.49
Pump thrombosis, n (%)	0	3 (10.7)	0.05*
Leg Complications, n (%)	25 (56.8)	1 (3.5)	<0.01*
Femoral site infection, n (%)	11 (25)	0	<0.01*
Mediastinitis, n (%)	0	2 (7.1)	0.15
Sternal Re-exploration, n (%)	4 (9.1)	19 (67.9)	<0.01*
Pulmonary edema, n (%)	4 (9.1)	0	0.13
Time of device assistance (days, median, range)	8 (0-32)	32.5 (0-385)	<0.01*
Early mortality, n (%)	8 (18.2)	3 (10.7)	0.31
In-hospital mortality, n (%)	9 (20.5)	8 (28.6)	0.43
Hospital stay (days, median, range)	16 (6-97)	45 (0-146)	0.10
Patients transplanted, n (%)	30 (68.2)	17 (60.7)	0.52
Weaning, n (%)	3 (6.8)	3 (10.7)	0.43

Table 1. Preoperative data

Demographics	ECLS (n=44)	BVAD (n=28)	p value
Age (years, median, range)	55.8 (24.6-72.7)	54.5 (14.8-68.3)	0.84
Female sex, n (%)	7 (15.9)	1 (3.6)	0.10
Etiology			
Ischemic cardiopathy, n (%)	19 (43.2)	11 (39.3)	0.74
Dilated cardiomyopathy, n (%)	11 (25)	12 (42.9)	0.11
Myocarditis, n (%)	4 (9.1)	4 (14.3)	0.38
Other, n (%)	10 (22.7)	1 (3.6)	0.03
Diabetes, n (%)	9 (20.5)	6 (21.4)	0.92
Hypertension, n (%)	20 (45.5)	7 (25)	0.08
COPD, n (%)	0	2 (7.1)	0.15
Renal failure, n (%)	14 (31.8)	10 (35.7)	0.73
Liver dysfunction, n (%)	8 (18.2)	7 (25)	0.49
Peripheral vascular disease, n (%)	4 (9.1)	2 (7.1)	0.57
Atrial fibrillation, n (%)	12 (27.3)	5 (17.9)	0.36
IABP, n (%)	25 (56.8)	14 (50)	0.57
Mechanical ventilation > 36 hours, n (%)	14 (31.8)	5 (17.9)	0.19
Echocardiographic data			
LVEF (%, median, range)	21.5 (10-75)	19.5 (10-40)	0.35
RV failure, n (%)	14 (31.8)	22 (78.6)	<0.01*
Mitral Regurgitation ≥ moderate, n (%)	15 (34.1)	11 (39.3)	0.66
Pulmonary Artery Pressure (mmHg, mean±SD)	39.3 ± 12.1	42.5 ± 11.5	0.35
Hemodynamic data			
Systolic Blood Pressure (mmHg, median, range)	85.5 (58-150)	88 (55-120)	0.92
Diastolic Blood Pressure (mmHg, mean±SD)	57±15.8	53.7±10.2	0.31
Central Venous Pressure (mmHg, mean±SD)	13.5±6.4	15.7±6.2	0.18
Cardiac Index (l/min/m^2, median, range)	2±0.6	1.9±0.4	0.49

At long-term, there was a tendency of higher incidence of rejections, infections and tumours in the ECLS group.

ECLS and BVAD are both effective as bridge to transplant in patients with cardiogenic shock, showing an acceptable early mortality rate after implantation and long-term survival after transplantation. BVAD permits longer support and transplantation in more stable conditions, reducing perioperative complications.

Figure 1

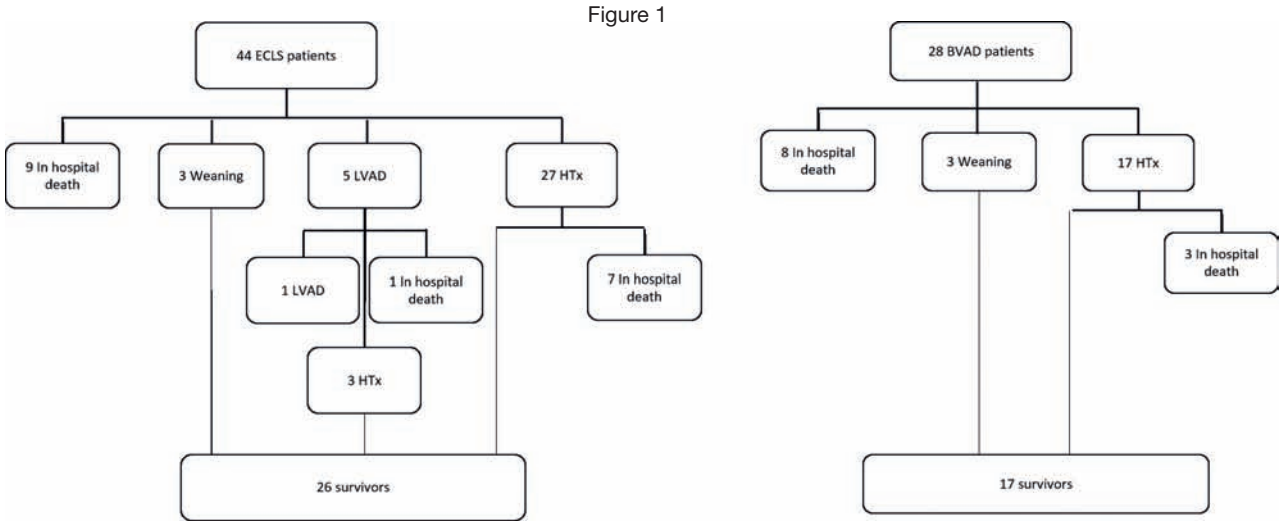
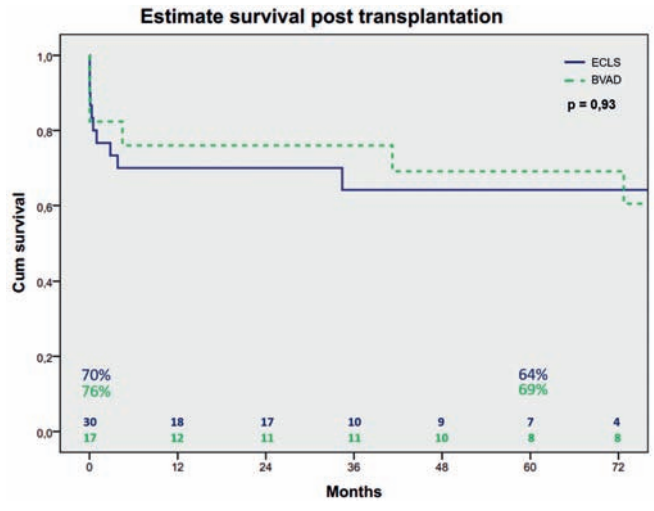


Figure 2



Cardiac | Rapid Response | Rhythm issues

Clipping of the left atrial appendage in persistent atrial fibrillation; effects on stroke volume, E- and A-velocities and left-atrial pressure. A clinical observational study

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Introduction

In order to prevent thrombus formation in persistent atrial fibrillation, clipping of the left atrial appendage (LAA) is part of the surgical therapy. The contribution of the LAA blood flow to the total-left-atrium blood flow in this situation is not known. The purpose of this clinical observational study is to investigate the effect of the clipping of the LAA on changes in stroke volume, E- and A-velocities, and Left Atrial Pressure (LAP) in persistent atrial fibrillation patients.

Methods

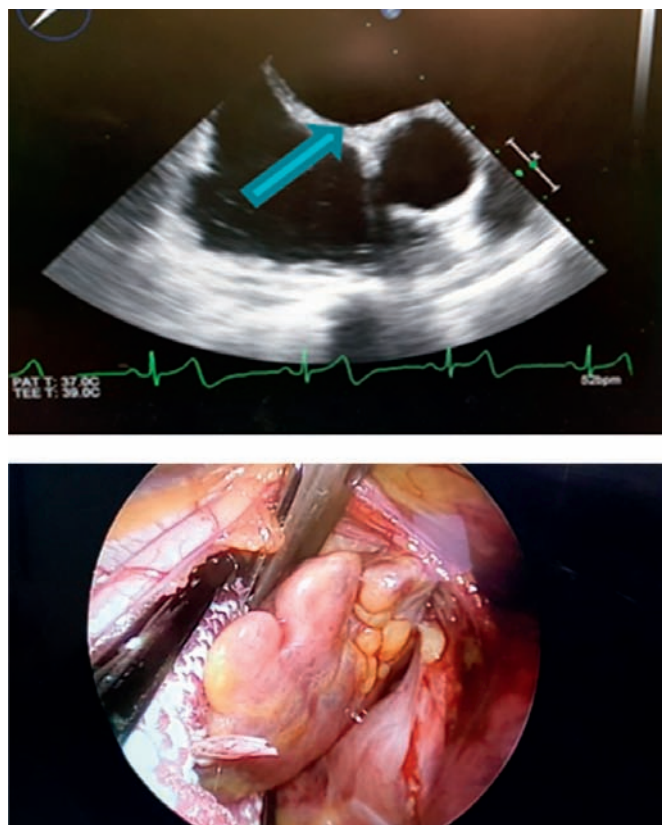
After medical ethical approval operative data were collected in 16 elective hybrid atrial fibrillation ablation surgery patients. During surgery under general anesthesia and single lung ventilation (left lung deflation), stroke volume (SV) (MostCareUp, Vygon), E- and A-velocities (TEE) and left atrial pressure (trans intra-atrial septum puncture) were recorded during sinus rhythm before and after clipping of the LAA.

Results

Fourteen male and two female patients with an age range of 51-69 years were included. Stroke Volume (SV) was 58.4 ml (SD 20.0 ml) before clipping and 55.1 ml (SD 19.8 ml) after clipping (p = 0.356). E-velocity was 56 cm/s (SD 10) before clipping and 55 cm/s (SD 9) after clipping (p = 0.805). A-velocity was 27 cm/s (SD 7) before clipping and 24 cm/s (SD 5) after clipping (p = 0.210). Left Atrial Pressure was 14.8 mmHG (SD 6.2 mmHg) before clipping and 15.3 mmHg (SD 6.9 mmHg) after clipping (p = 0.415).

Conclusions

There are no significant changes in SV, E- and A-velocities and LAP after clipping the LAA in sinus rhythm of persistent AF patients.



(Top right) Left atrium on perioperative transesophageal echocardiography; (Bottom right) Thoracoscopic view of atrial clipping.

Thoracic | Abstract | Oncology - Lung cancer: Outcome

Variation in hospital stay after lung cancer surgery in the Netherlands; do we need an Enhanced Recovery After Thoracic Surgery (ERATS) protocol?

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The concept of Enhanced Recovery After Surgery (ERAS) has been around for almost two decades and has led to improvement in perioperative care for several categories of patients.[1,2] ERAS protocols can potentially reduce Length of Stay (LOS), complications, readmissions and cost. Enhanced Recovery After Thoracic Surgery (ERATS) protocols have been developed and evaluated as well.[3,4] Even though a short LOS should be considered to be a consequence of a good perioperative care programme and not a goal in itself, one of the main outcome measures evaluating these ERATS protocols is post-operative LOS.

Rather than evaluating a single institution experience, we set out to detect variation in LOS after lung resections for lung cancer nation-wide, using Netherlands National Cancer Registry (NNCR) data (study period 2010-2015). Since LOS after lung cancer surgery is not solely influenced by peri-operative care and discharge criteria, but also by patient characteristics, tumour characteristics, surgical technique, hospital volume, postoperative complications, insurance coverage and availability of healthcare services, we wanted to take these factors into account.5,6

Our objective was to determine whether variation in LOS after resections for lung cancer is present between hospitals in the Netherlands, after controlling for these known parameters. Residual variation in LOS would suggest important differences in perioperative care protocols and discharge criteria.

In this retrospective database analysis, we observed an unexplained difference in postoperative LOS after lung resection for NSCLC between hospitals. After case-mix correction, residual between-hospital variation

in mean LOS is observed, ranging from 1.5 days shorter to almost 2.5 days longer.

In contrast to previous publications, hospital volume and patient gender did not seem to influence LOS. 5 Insurance and geographical influences were not analysed, considering the small size of the country, the distribution of hospitals providing lung cancer surgery and universal healthcare insurance coverage. Age, extent of resection and surgical approach were confirmed as important factors determining LOS.

Using LOS as a measure for quality of perioperative care has limitations. Since LOS is dependent on many factors, care should be taken not to equate short LOS with good perioperative care, even after correction for known case mix variables. 5,6 Post-operative mortality, related to LOS, was also evaluated as quality check. In our analysis, shorter LOS was not associated with a higher 30-day or 90-day mortality.

Even though the extent of case-mix correction was limited due to sparse data on comorbidity in the NNCR and even though the lack of readmission data and complication data limited our ability to fully appreciate the relationship between LOS and quality of post-operative recovery, our analysis of the Netherlands National Cancer Registry data shows a clinically significant difference in case-mix adjusted LOS after anatomical lung resection for NSCLC, without signs of increased mortality related to early discharge.

These findings justify further research into the differences in postoperative treatment protocols and discharge criteria leading to these results, aiding the determination of an optimal enhanced recovery after thoracic surgery protocol.

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Thoracic | Abstract | Oncology-preoperative assessment

Is there a role for pleural fluid cytology in the diagnosis of malignant pleural effusions?

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Malignant pleural effusions (MPEs) are an important cause of cancer-related mortality and morbidity and carry a poor prognosis. MPEs are usually diagnosed by respiratory physicians either using medical thoracoscopy or tapping of the pleural effusion. BTS guidelines confirm a low diagnostic yield from pleural cytology (60%). Moreover both procedures can be associated with an increased risk of infection of the pleural space.

Video assisted Thoracoscopic Surgery (VATS) allows to drain the effusion, acquire samples of fluid and pleural biopsies for diagnostic purposes and treat patient by proceeding with pleurodesis or placing an indwelling-pleural catheter. Intra-operatively patients have multiple pleural biopsies acquired under direct vision and 20 ml or more of pleural effusion is sent for cytology.

The purpose of our study was to compare the sensitivity of pleural fluid cytology and pleural biopsies obtained during VATS for MPEs. We also evaluated the in-hospital, 30- and 90-days mortality.

We retrospectively reviewed 466 patients who underwent VATS drainage of pleural effusion and pleural biopsies and either talc pleurodesis or insertion of an indwelling pleural catheter in our institution between January 2014 and December 2016. Out of 466 patients, 274 were identified to have MPE. Mesothelioma was the most frequent histological diagnosis (83 patients-30%); lung adenocarcinoma was the most frequent diagnosis on cytology (56 patients-21%).

Among 274 patients, 268 (99%) had positive histology and 110 (42%) had negative cytology despite confirmed malignancy on concomitant histology (X2 = 43.6, p < 0.001). Diagnostic yield of cytology and histology was assessed in two groups of patients, those with mesothelioma and those with non-mesothelioma malignancy. Histological analysis had 99% sensitivity and 98.7% specificity in diagnosing mesothelioma as compared to cytology (36.7% sensitivity, 25.8% specificity).

Fifty (63%) mesothelioma patients had negative cytology compared to 45 (26%) non-mesotheliomatous patients (X2 = 32.5, p < 0.001). Cytological analysis for non-mesothelioma related MPEs had better sensitivity and specificity (74.1% and 63.3%, respectively) compared to MPEs caused by mesothelioma. 30- and 90- days mortality was 7.7% and 22.1%, respectively. There was no significant difference in 90-days mortality between patients with positive and negative cytology (p = 0.073; Figure 1). 90-days mortality was significantly higher in the histologically diagnosed non-mesothelioma group compared to mesothelioma group (p < 0.005; Figure 2)

Figure 1.

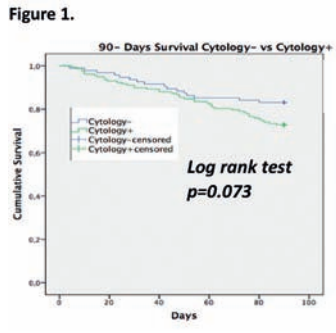
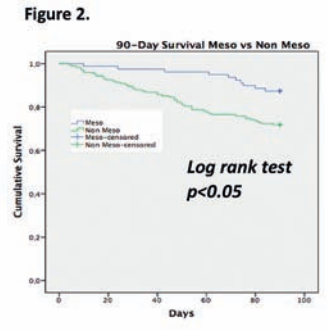


Figure 2.



Our results indicate a weak correlation between cytological and histological findings in patients operated for MPE. Pleural fluid cytology can be considered unreliable in diagnosing malignancy in patients with non-mesothelioma related MPE (74.1% sensitivity and 63.3% specificity).

We assume that there may be no role for cytological analysis in patients with suspected mesothelioma due to its weak association with the disease (63% of patients had negative cytology with 36.7% sensitivity and 25.8% specificity).

Therefore histological diagnosis is paramount to either confirm or exclude malignancy. Surgical approach for diagnosing MPEs remains the most effective approach and provides the opportunity to treat the pleural space with either pleurodesis or indwelling pleural catheter insertion.

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

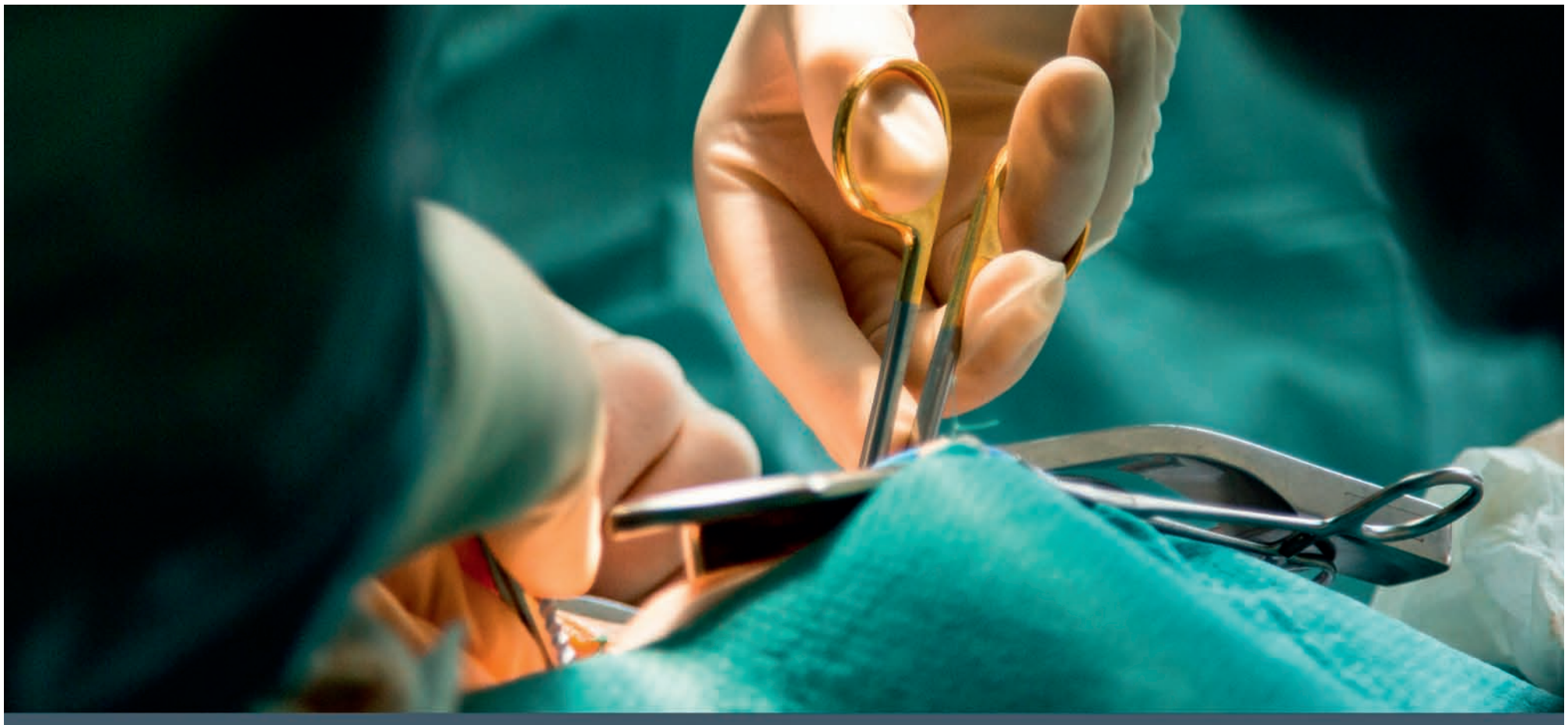
EACTS 2017 **Floor Plan**

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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Contact us at **AFConnect@AtriCure.com** to reserve your spot or learn more about upcoming training opportunities.

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