



ASSIST

MAGAZINE

Innovative Interventional Treatments

Interventional Cardiology



CATHLABS
IN THE PANDEMIC



COMPLEX BIFURCATION
TREATMENTS

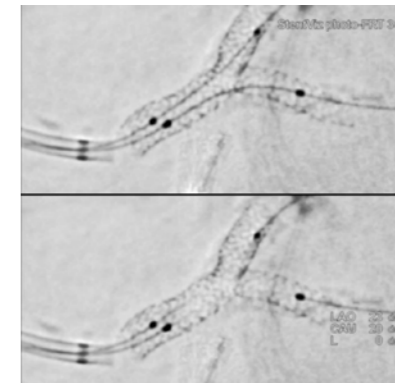
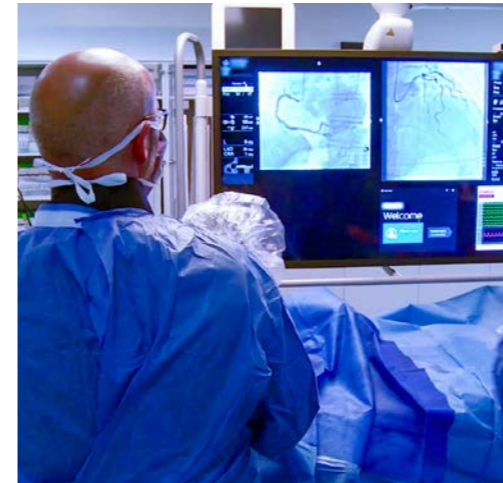
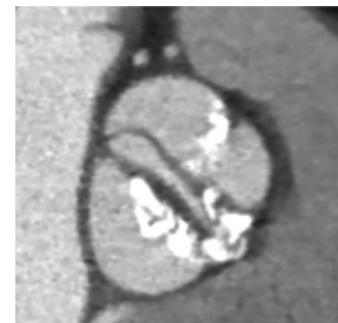


HEART TEAM IN A TOP
EUROPEAN CENTER



Special Edition

ASSIST MAGAZINE



06 _ Heart Team in action

06 _ Heart team in action in a top European center.

22 _ Experts perspectives on echo

- 22 _ Experts perspectives in cardiovascular ultrasound
- 27 _ Focus on TAVI. Extracts from: Current status of transcatheter valve therapy in Europe - Results from an eapci survey. Infographic.
- 28 _ *Case report:* CardioGraphe® ASiR CV 14 cms Coverage TAVI examination.

30 _ Cathlabs maximizing efficiency

- 30 _ The cathlab that covers a third of Scotland with the latest Innova IGS 5 with AutoRight™
- 36 _ Exceeding expectations during a pandemic

46 _ Stent visualisation techniques for PCI

- 46 _ Leveraging technology for complex PCI procedures
- 50 _ *Case report:* StentViz for accurate bifurcation stenting

Local Contact Information:

GE Healthcare Buc
283, rue de la Miniere
78533, Buc Cedex, France

Chief Editor: Charline Chondrou

Editorial Team: Barnabas Nagy, Ioané Cartier, Dustin Boutboul, Eleonora Viviani, Catherine Beignon, Emmanuelle Majus, Cameron Ferguson, Mathilde Dauchez, Renata Reveco

Design: Nathalie Ollivier

Printer: Groupe Lecaux Imprimeries HandiPRINT

Many thanks to our contributors :

- Pr. Bernard Prendergast, St Thomas's Hospital, UK
- Pr. Simon Redwood, St Thomas's Hospital, UK
- Dr. Ronak Rajani, St Thomas's Hospital, UK
- Rebecca Reid, St Thomas's Hospital, UK
- Gemma Beilby, St Thomas's Hospital, UK
- Paula Ghandour, St Thomas's Hospital, UK
- Shelina Sunni, St Thomas's Hospital, UK
- Dr. Heath Adams, St Thomas's Hospital, UK
- Dr. Tiffany Patterson, St Thomas hospital, UK
- Bina Patel, St Thomas hospital, UK
- Dr. Patrick Donnelly, South Eastern Health and Social Care Trust Ulster Hospital, Belfast (Northern Ireland)
- Dr. Augustin Coisne, Lille University Hospital, FR
- Pr. Erwan Donal, Rennes University Hospital, FR
- Pr. Anna Sonia Petronio, University of Pisa, IT
- Prof. Stewart Walsh, UK
- Prof. Muhammad Tubassam, UK
- Dr. Mahmoud Alawy, UK
- Eamonn Coffey, UK
- Dr. Theodosios Bisdas, GR
- Dr. Nicola Facciolo, IT
- Dr. Roberto Piro, IT
- Prof. Steve Leslie, UK
- Dr. Jonathan Watt, UK
- Rebecca MacLeod, UK
- Prof. Béla Merkely, HU
- Dr. István Édes, HU
- Dr. Balázs Németh, HU
- Dr. Krisztina Heltai, HU
- Szilvia Szabó, HU
- Dr. Bruno Farah, FR

Heart team in action in a top European center

St Thomas' Hospital, London

A LONG-STANDING TRADITION OF TEACHING AND INNOVATION

At the heart of London, where the capital's energy can be felt, stands St Thomas's Hospital, facing the Houses of Parliament, with a long tradition of teaching and initiating innovation. The cardiac department at St Thomas' Hospital treats the full spectrum of cardiac conditions including acute coronary syndromes, heart failure, arrhythmias and heart valve disease. It is internationally recognized for its transcatheter heart valve programme and performs more than 300 TAVIs per annum along with additional advanced mitral and tricuspid therapies. Guy's and St Thomas' NHS Foundation Trust were early adopters of innovations in valve interventions. They continue to be at the forefront and remain active with research and in the evaluation of new devices while developing new imaging and technical solutions to otherwise complex clinical problems.

Pioneering in valve interventions



Pr. Bernard Prendergast

"For more difficult challenging valve interventions, imaging is continuously helping to open our eyes, and we can perform these procedures more safely."

Heart Team Foundation



Pr. Simon Redwood

Legacy

There is a long standing tradition of innovation at Guy's and St Thomas'. For example, some of the first congenital heart disease interventions, coronary bypass grafting surgery and valve operations in Europe were performed at Guy's Hospital.

A small group of early adopter centres have been pioneering TAVI in the UK. In early 2008, St Thomas' Hospital was naturally one of the first to adopt the TAVI procedure and evolved the programme rapidly, thanks to the forward thinking of Pr. Simon Redwood and Martyn Thomas who were working at St Thomas' at the time.

The first transcatheter mitral valve replacement procedure in the world was performed here at St Thomas' in 2013 with the FORTIS¹ valve (Edwards). *"We have always taken a very open minded attitude to innovation. Because of our excellence*

in clinical research and high level of procedural and imaging excellence, we are an attractive site for industry to partner with."

The St Thomas' team is also very active in the mitral and tricuspid spaces, having access to innovative mitral valve devices. The team was involved in some of the first implants with the valve from Medtronic, and is

still active in more complex innovative TAVI procedures, electrosurgical techniques, transcaval and BASILICA procedures (Bioprosthetic Aortic Scallop Intentional Laceration to prevent Iatrogenic Coronary Artery). As a result of experience accrued at St Thomas' Hospital, they often accept complex cases from other centres that require specific technical or advanced imaging input. ■



Pr. Bernard Prendergast and Pr. Simon Redwood are well recognized in the broad interventional community, and specifically in structural heart treatments. An extraordinary mechanism lies behind the scenes enabling them to treat patients safely and efficiently. This is underpinned by an exceptional heart team who give their best every day knowing that the work they do influences the day to day lives of their patients.

"The patient always comes first. This is a very important thing to remember, and the team here at St Thomas' recognizes that. We have very forward thinking surgical colleagues, who were part of the programme from day one. The programme grew in in partnership and not in competition. In the early days, TAVI was very different from what we see now. Procedures were

performed under general anaesthesia and 50% were performed using transapical access. Our evolution has been achieved by close collaboration with our surgical colleagues and this has translated into rapid changes to our programme, improvements in patient outcomes and low complication rates." says Pr. Prendergast.

The team recognizes the fact that intensive care is crucial, as is the support of experts in pre-, peri- and post-operative care. While surgeons are no longer required during the TAVI procedure, they are included in all discussions to find the right treatment for the patient.

"The surgeons are very much part of the team. We always discuss very openly what is the treatment for each

individual patient." comments Pr. Prendergast.

The team here definitely played a role in creating the heart team concept, and PCR London Valves was branded in the very early days as the "Heart Team" meeting. ■

TAVI: The patient pathway at St Thomas'

TAVI indication: One-stop shop for the patient



Rebecca Reid and Gemma Beilby, nurses specialized in structural heart disease, intervene as soon as the patient is referred to St Thomas' hospital to undergo examinations.

Rebecca Reid and Gemma Beilby Nurses specialized in structural heart disease

The inpatient pathway

Rebecca Reid focuses more on the inpatient side of the work with patients that have consulted their local district hospital and have been referred to St Thomas' for further investigation. She then organizes any relevant tests for the patient, also involving consultant geriatricians since these patients are subject to clinical frailty.

Patients referred with infected heart valves or infected devices are also brought for procedures. Once a full clinical picture has been obtained for the patients, she presents all of the key information to the wider heart team. This includes the referral source, relevant co-morbidities, blood results, coronary angiographic findings, echocardiogram and CT scan results. Once a treatment plan has been determined this is documented and scheduling can occur.

The outpatient pathway

Gemma Beilby coordinates the consultations of any new patient being

seen in the valve clinic. This includes any relevant blood tests, echocardiograms to clarify disease severity and CT scans for structural planning. The ethos is very much of a one-stop clinic where all information can be obtained to ensure a treatment decision and plan can be made with minimal disruption for patients. This becomes relevant when providing services for patients who may live hundreds of Kilometres away from London or be travelling from abroad.

"I provide them with the literature regarding the TAVI procedure and talk them through the pathway so they know what to expect." says Gemma.

"We've been pursuing a major project internally focused on looking at our service and how we can make it better for the patients."

Information on the TAVI procedure itself and the waiting times are provided to the patient, contact numbers and any questions that they have at that point are answered by Gemma.

After the clinic appointment and CT scan, any other outpatient appointments or outpatient exams that are required for them are organized. Then, when the images and reports are all available, Gemma prepares their case to be discussed at

the Heart Team meeting. *"I prepare the slides to be presented there and that's how I move most of the patients through the pathway. I work with our coordinator for scheduling the patients each week, determining who's being listed and for any extras like vascular support or TOE that are needed on the day."*

They are supported by Bina Patel who makes appointments with the patients, and constantly adapts the schedule to plan patient admissions. This involves dynamically responding to patients

who need to be scheduled urgently and explaining the next steps to patients who are on the waiting list. This is always conducted with benevolence to ensure that the overall experience within the pathway is smooth, efficient and above all transparent. ■

"It is very rewarding to help get the patient's life back to normal. It gives meaning to what you do."



The numerous thank-you cards sent to the Heart Team.

Getting closer to the intervention



Paula Ghandour Senior nurse structural heart interventions

Looking closer at the patient care pathway. Once the patient is referred to the hospital, and provided with a one-stop appointment to get examined, the CT scan is reported and the Heart Team makes a decision as to whether or not a percutaneous

treatment is appropriate. Paula Ghandour's role is to liaise with the patient and the team as we get closer to the intervention and to make the patient comfortable to ensure a positive experience with the medical

"My job is really to liaise with the patient and make him or her comfortable and ensure that the experience with us is an agreeable one."

team.

Paula conducts a consultation with the patient and their families one day before the procedure. She goes through all of the steps of the procedure and explains what they should expect. The patient is provided with details on the valve to be implanted, the access route, who will be in the room and what type of sedation he or she will receive. The recovery phase is also explained. This



is important to let them know exactly what is going to happen. She is joined by a consultant or a colleague in case of any questions or doubts that may arise. They also come to be introduced to the patient so they know who will perform the procedure and this is reassuring for them to know the team. Paula comments: *"We make the patient feel part of the team"*.

On the day of the procedure, after joining the Heart Team meeting to review the patient profiles in detail, Paula goes to the cathlab. She positively identifies the patient and supports them.

This is of huge importance to the team

that the patient feels special and is going to be well looked after.

In her scrub nurse role, Paula is extremely concentrated in the cathlab, preparing all steps to have the valve implant safely ready for the physicians to implant. This is definitely a critical step of the procedure and that specialization ensures any action is under control and repeated frequently to provide the best outcome.

Paula is certified for preparing the valve, and also as second operator in line with the proper training to understand what is needed when the valve is deployed. At any step of the procedure, she is able to intervene and

contribute helping with anything that might go wrong, and then assist the doctors.

"It empowers you when you have full training and full understanding of what you're doing. And there's nothing more rewarding than having a team that is engaged in what we're doing", comments Paula.

Paula has a good understanding of the patient's symptoms and all the past problems and can then relate these to the team and anticipate any problems that could occur. *"I've got a good idea of the patient comorbidities and symptoms and all the past problems. I can then relay these to the team and*

contribute to foreseeing any problems that may occur. For example, if a patient has right bundle branch block and we've talked about it in a team brief, I just remind the team that this patient may require a pacemaker."

As a senior nurse, Paula is always looking to ensure quality: "We have to make sure the standards don't drop. So that's the most important part. In this way, the patient has confidence and feels reassured that we will take good care of him or her."

TAVIs are performed under conscious sedation. The benefit of having less sedation is explained to the patient, and the patient is considered to be an integral part of the team. Also for elderly patients, recovery is quicker and they are exposed to a lower risk of delirium.

The patient is discharged two days after the procedure, and the team has started the "Express TAVI" procedure so patients with pre-existing pacemakers can go home the day after the procedure. The reason behind this

is that patients are kept two days at the hospital to monitor rhythm changes, and those patients who have pacing guaranteed can go home sooner.

Paula concludes: *"Professor Prendergast and Professor Redwood are both very experienced and one of their finest qualities is that they know how to interact with their patients as well as with the team. It's really the value they give to the whole team. We do what we do so well because we are empowered."* ■

Patient and team safety Dose management



Shelina Sunni
Clinical Specialist
Cardiac

The role of the radiographer's team is vital, since they ensure radiation safety for the patient and the team.

"I enjoy the capabilities and the user-friendly interface of IGS systems."

Shelina makes sure that ALARA principles are respected, providing the best image quality with the lowest possible dose. Staff must be away from the radiation beam, have a proper lead apron that protects them effectively and use the optimal low dose protocol.

The team here is concerned and aware of radiation dose issues and adopt the recommendation of these experts in radiation, linking to the overall well-defined roles, grounded by the deep trust between the Heart Team members. ■

Shelina Sunni is specifically in charge of ensuring radiation safety and training staff on new equipment to perform procedures with image guided systems. She makes sure operators and the full team are aware of radiation risks and of best practices, which also ensure efficient team work.

The place of imaging

Imaging in TAVI



Dr. Ronak Rajani
Consultant cardiologist,
Head of the cardiac imaging
department

Cardiac imaging plays a fundamental role in the planning of structural heart disease interventions. Echocardiography is the mainstay in terms of determining the severity of the valve disease and in confirming whether or not a patient has severe

aortic stenosis or not.

Cardiac CT on the other hand is essential for the procedural planning and sizing of transcatheter heart valve devices.

Its emergence has improved their understanding of anatomy and also improved procedural outcomes. With rapid scan acquisition times, it has enabled more patients to be evaluated for device suitability in a quicker time frame. TOE is now used only rarely peri-procedurally for cases where CT has indicated a specific complication

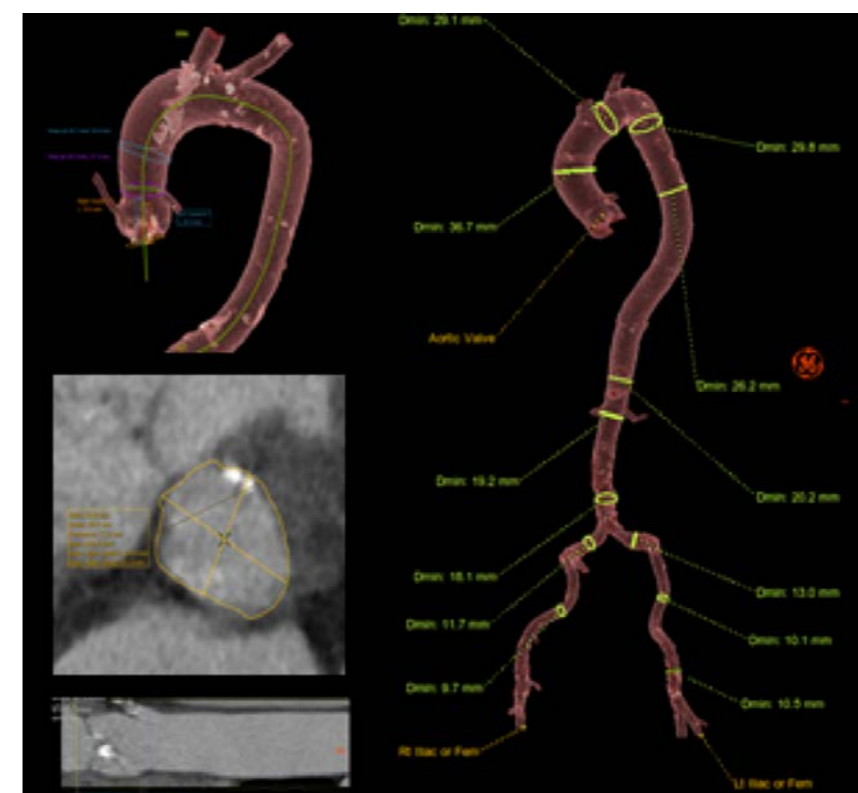
“Imaging has been key in the success of our activity since the beginning, with patient safety as the primary concern.”

risk. Perhaps the most remarkable development of TAVI from an imaging perspective has been in the bringing together of cardiac radiologists and interventional cardiologists to share skills and expertise from different disciplines.

Pr. Prendergast comments: *“In 2019, TAVI without echo guidance has become very routine, and we need to recognize that this is only possible because we learnt so much early on with the help of echocardiography”.*

Echocardiography could quickly identify tamponade, whether the valve was interrupting the function of the mitral valve, a coronary occlusion with region wall motion abnormality, and all could be very accurately seen using this technique.

Dr. Rajani explains: *“The next phase was the evolution from echo to CT. As data emerged, it became clear that gated cardiac CT was the ideal imaging modality for TAVI planning. It provided a wealth of high resolution data on not only the aortic valve itself but also the ventricle, aorta and*



Aortic route segmentation and annulus sizing with Valve ASSIST 2².

peripheral access sites. Nowadays we would rarely consider performing a routine TAVI without a prior CT scan. It helps us to prepare for the intervention, know the valve type and size in advance and to mitigate against complications. As a result of the detailed planning, our interventional cardiologists are able to schedule their cases based upon expected complexity and are able to rapidly deploy valves in routine cases. This results in a more efficient and effective structural heart disease programme.

It has been a very interesting progression in terms of imaging

provision for structural interventions and we were very much a 3D echo based institute but moved very rapidly to incorporate CT into our work stream.

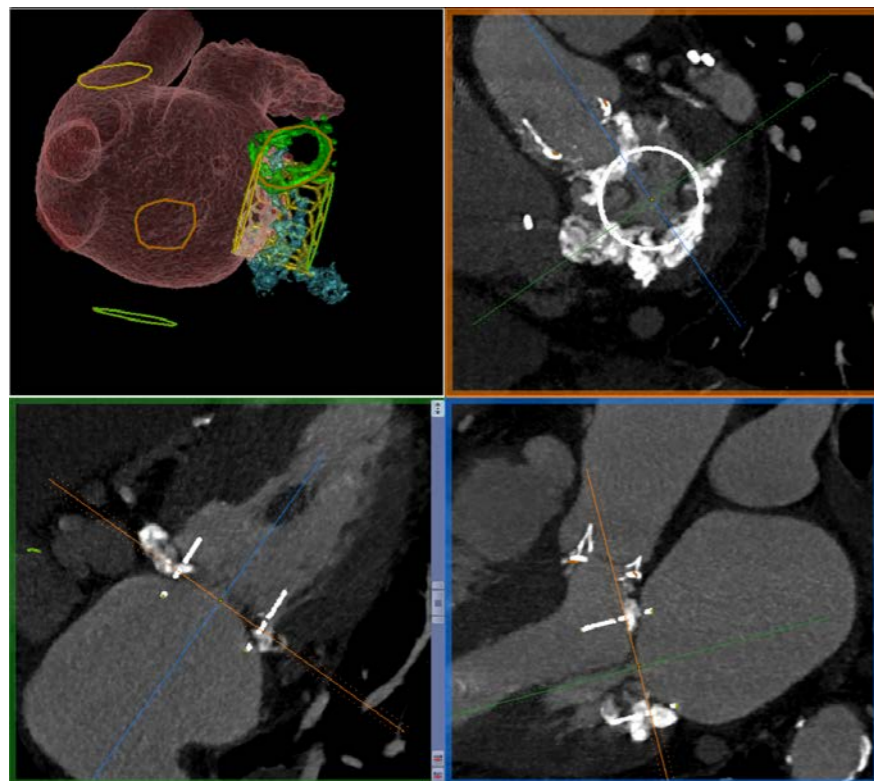
As CT technology improved so did image resolution. This came with the benefit of reduced ionising radiation doses, lower contrast volumes and faster scan acquisition times. The net result was reliable imaging with highly reproducible and accurate results without the need for invasive testing.

Currently about 98% of all of our planning is done with gated cardiac CT scans alone with a contrast volume of

only 60 mls. We currently perform approximately 700 TAVI CT scans per annum which has enabled an upscaling of the number of valves being implanted. This represents a 500% increase in volume over the last 4 years. Currently all of our scans are read by my imaging fellows before each scan is verified by myself. I take personal accountability for every sizing measurement and report issued.

My personal practice as an imaging cardiologist is to provide not only measurements but also guidance to the team. This may take the form of indicating a risk of coronary obstruction, annulus rupture, paravalvular regurgitation or difficult access. Owing to the relationship I have with our interventional cardiologists, I am reassured that any potential concerns prompt appropriate measures at the time of deployment”.

Advanced percutaneous valvular treatments



Segmentation of the 3D CT scanner images of the cardiac anatomy with Valve ASSIST2, including:
- Morphology - Calcification. The predicted position of the prosthesis is provided by FEops³.

The place of imaging modalities in mitral valve procedures

Dr. Rajani classifies the use of imaging for mitral repair and mitral replacement procedures by the transcatheter route into two broad categories: "I think anything that is going to be involving the leaflets alone should always be guided by 3D transoesophageal echocardiography not only for the determination of patient suitability but also for the procedural

planning and deployment of the device. Any device that is going to involve disruption of the annulus or extending into the left ventricle or left atrium, CT is mandatory".

"Echocardiography is a fantastic technique because you can use the imaging during the procedure to obtain a wealth of anatomical and physiological data.

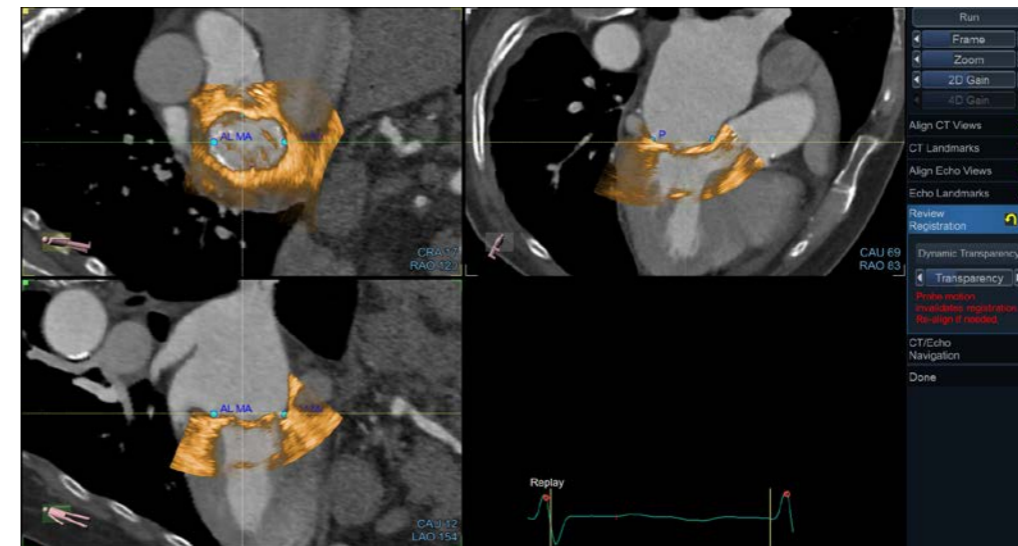
Cardiac CT on the other hand, provides the most accurate representation of the annulus. With a wide field of view,

isotropic imaging properties and sub 0.5 mm resolution, it also provides the team an ideal medium to appreciate the anatomy of the heart in 3D and see its relationship to adjacent thoracic structures." comments Dr. Rajani.

The place of imaging modalities in tricuspid valve procedures

Dr. Rajani thinks that the ideal imaging modality for tricuspid valve procedures has not yet been clearly identified. Working in collaboration with industry they first review the specific device characteristics and then determine the cardiac structures that we consider to be the most important in terms of approach and deployment. This is then followed by bench testing of our protocols to ensure optimal imaging on cardiac phantoms before it is used on patients. Dr. Rajani's role is to obtain the best imaging possible for the task ahead. This often involves protocol refinements as new devices emerge on the market.

If the procedure will disrupt the tricuspid valve annulus, cardiac CT will be required for a slightly different reason to the mitral valve: "Because when you're disrupting the tricuspid annulus you have to worry about the right coronary artery that's passing in the right side of the atrioventricular ventricular groove. If you're just addressing the leaflets themselves such as edge-to-edge repair



Fusion of CT with echo on Vivid E95⁴

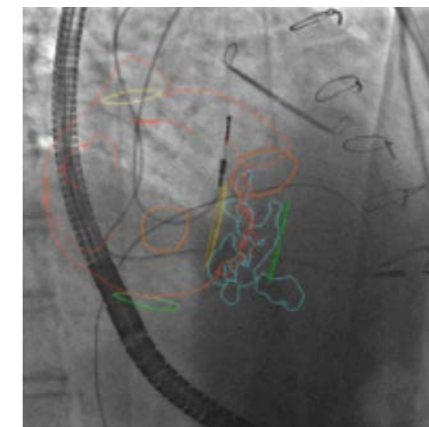
procedures, I don't think you lose anything by performing a CT scan. Ultimately it is complementary information. The mainstay will continue to be 3D transesophageal echocardiography."

Fusion imaging experience with Valve ASSIST 2²

The team at St Thomas' is constantly pushing the limits and treating inoperable patients, treating unusual situations or unconventional anatomies, and this is where image fusion techniques come into their own.

Pr. Prendergast comments: "Beyond conventional CT scanning, fusion Echo with CT and fusion of CT with fluoroscopy is giving us extraordinary information, allowing us to guide much more complex interventions safely, whether complex TAVI or complex Mitral procedures using the transseptal approach and conventional TAVI devices."

For example, Mitral valve-in-valve, in ring or MAC (Mitral Annular Calcification). These procedures are significantly improved by fusion and



Vivid CT fusion - X-ray fusion in Valve in MAC (using Valve ASSIST 2²): 3D fusion helps guide each step with confidence, from the transseptal puncture to the device deployment.

advanced imaging techniques, providing correlation to understand the spatial relationship of the valve pathophysiology, and guide deployment of the valve.

Dr. Rajani explains: "We have tried to incorporate Vivid CT fusion and X-ray fusion to provide some more anatomical landmarks for potentially complicated patients for our interventional cardiologists. And the feedback, for certain types of procedures where you cannot clearly

see the anatomical landmarks on the fluoroscopy, has been that CT fusion overlay provided great benefit, helping to find the optimal position and angles for deployment.

Where we've found it to be particularly useful is in MAC (Mitral Annular Calcification) procedures where the pathway for the implantation of a valve is quite unique. All of our patients undergo a 3D TOE echocardiogram to confirm the mitral valve disease severity. The planning thereafter would be done by a multiphase gated cardiac CT scan and a geometric evaluation by myself to perform some crude measurements as to what I think is the optimal valve that will fit in the mitral valve annulus calcification. This would then be followed by advanced bioengineering with image modeling and computational fluid dynamics to predict procedural outcomes. After the detailed planning, we use CT fusion techniques to perform the deployment."

The fusion imaging enables, Pr. Redwood and Pr. Prendergast to know where exactly to implant the new valve. A lot of planning is done in advance to make sure they obtain a

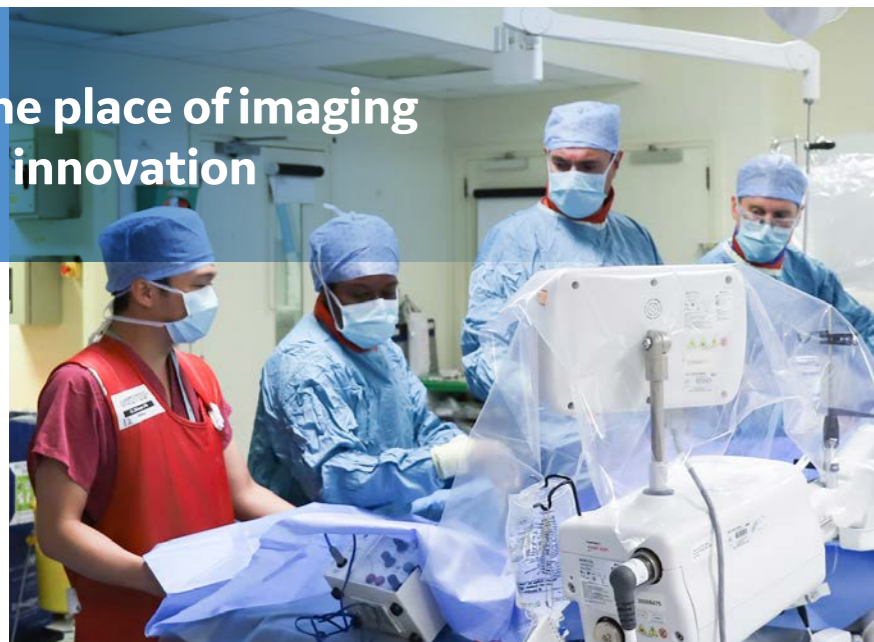
good procedural outcome. This gives us the reassurance that the risk of outflow obstruction is small and that paravalvular regurgitation will be minimal provided that the valve is deployed within the marked target zones. Providing that information to

the interventional cardiologist without disrupting their workflow, and then just following the dots implanting the device and using their skill is a fantastic ability.

"We know that even in the best centres

in the world the mortality rate at one year is about 50% for these types of procedures. It is therefore of critical importance to make sure we provide the best outcomes for the patient." explains Dr. Rajani. ■

The place of imaging in innovation



electrocardiography. On the other hand cardiac CT can provide fantastic information regarding the anatomical arrangement of the relevant surrounding structures of the tricuspid valve, including the right atrium, the SVC, the IVC as well as the right ventricular morphology and the right coronary artery anatomy. Introducing imaging at a very early stage with regard to the new devices is key.

At St Thomas' Hospital we have a very open culture where interventional cardiologists are very open to new ideas and to try new technologies, whether that is imaging, devices, or a new procedure or a particular approach to perform a structural intervention.

I think cardiac imaging was historically the silent partner in the heart team. I think they are now becoming an equal partner in the team, and getting an increased level of exposure through the numerous structural conferences." ■

Dr. Rajani explains: *"We have very experienced interventional cardiologists at St Thomas's Hospital who have not been reliant on CT fluoro-fusion imaging at all in the past. I think you only need to have one case that doesn't go quite as you anticipated to question whether or not this could have been avoided with the aid of advanced imaging.*

So our policy and my philosophy at St Thomas' is that whenever a new procedure is being introduced to St Thomas' Hospital, the first thing that will happen is that I get an invite from Pr. Prendergast and Pr. Redwood to

attend the meeting with industry, so we can start thinking from an imaging perspective as to what challenges may arise for the interventional cardiologists.

Even if there is no technical limitation, there is often something that we can provide from the imaging perspective that may not have been thought about by industry.

As we are speaking about new devices to treat the tricuspid valve, we know this is not very well imaged by trans-oesophageal

Growing the next generation

A key component of St Thomas' activity is education. While each of the team members coach and teach the next generation, young doctors bring a lot of support and also learn from their experienced peers. This is of importance to both share the knowledge, train future experts and grow the international network, whilst also making sure the best doctors in the UK are trained continuously to one day take over locally to serve the population.

Fellows from all around the world are

applying to join St Thomas' Heart Team. Pr. Redwood and Pr. Prendergast are here to provide the best possible supervision, and support the fellows and the team in their practical and scientific activities.

"Equally, in return, fellows provide significant support to the programme. They work hard to support us during the procedure, behind the scenes working with the patients and the nurses, and this is a very beneficial partnership." comments Pr. Prendergast.

While the team welcomes international fellows, it needs to develop their own homegrown specialists in the UK as well.

"We also encourage our own fellows to work in international expert centres in other countries to grow their experience" says Pr. Prendergast.

Cardiac imaging is also part of the trainee programme to help them understand transthoracic echo, trans-oesophageal echo and cardiac CT techniques.

Perspective of an international senior fellow



Dr. Heath Adams
Consultant cardiologist,
senior fellow

Heath Adams is a fully qualified interventional cardiologist who studied in Australia at the University of Tasmania, and at St Thomas' for a 12-months clinical fellowship.

Dr Adams is fully part of the team here, and is spending two days a week in the cathlab, involved in structural heart procedures and one day in the lab performing PCI procedures. He is also involved in the clinic's activities to see patients for workup for TAVI as well as post intervention, and also other cardiology disorders.

When in the cathlab, he is an integral team member. *"The support is quite amazing both from the nursing and the physician's perspective and definitely makes our lives a lot easier"* says Dr. Adams.

TAVI procedures have now become very streamlined and can be safely performed in less than 30 minutes with a good outcome.

"What I find different here is the broad scope of challenging cases, such as patients with peripheral vascular disease or very high-risk patients with challenging anatomy. The Heart Team here is very well equipped to give the

best possible outcomes to the patient, and I have certainly learned a lot from them.”

Pr. Prendergast and Pr. Redwood share their experience and provide comprehensive mentoring. The environment here is very safe since we work under very close supervision. “I have a great relationship with them. They’re extremely supportive.” says Dr. Adams.

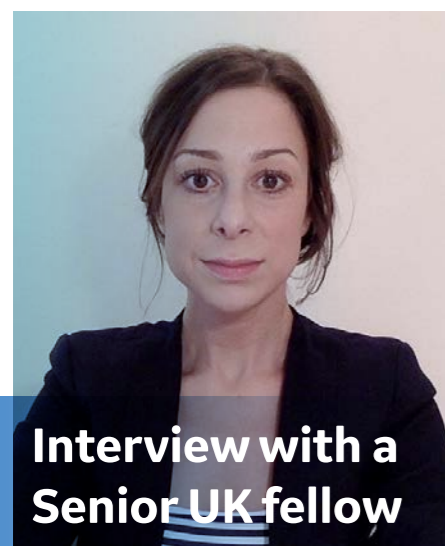
He is also involved in the imaging component that mainly relies on

echocardiography and CT and thinks this is key to having appropriate safety measurements.

“Dr. Rajani and his team are doing a fantastic job and are getting us quality images and quality measurements for performing the TAVI procedure”. When Dr Adam first arrived, he was enrolled by Dr. Rajani into his 5-day London Cardiac CT Academy and taught the basics about how to perform the measurements with regard to TAVI. “The procedural planning is a major step to prevent complications and get

a great outcome for the patient”.

Certainly, lessons learned overseas are very valuable. Dr. Adams believes that heading home he’d be very keen to apply the transferred knowledge, and why not one day, teach the next generation, mirroring the work of the mentors he has today in the UK. ■



Interview with a Senior UK fellow

Tiffany Patterson
Senior UK Interventional Fellow

Please introduce yourself and explain your background

My name is Tiffany Patterson and I’m an NIHR academic clinical lecturer and

Interventional fellow in Cardiology. My current research interests include structural valve degeneration, coronary and LV physiology and out-of-hospital cardiac arrest. I trained at St Bart’s and The Royal London School of Medicine, and graduated with an MBBS (Hons) in 2005 and BMedSci (Hons) in 2004. I trained in Cardiology at St Thomas’, Hammersmith, Royal Brompton and King’s College Hospital and completed a PhD in Cardiovascular Sciences in 2017.

Why did you choose the interventional cardiology specialty?

Interventional cardiology is a fast-paced specialty and you can make a difference to patients’ lives. Our day-to-day practice is very evidence based with advances in Interventional Cardiology rapidly translating from bench to bedside.

Why at St Thomas’?

The team at St Thomas’ is forward thinking, friendly and supportive. They

carry out ground-breaking first-in-man procedures and cutting-edge research. Many centres in the UK refer to the Valve Team at St Thomas’ for their expert opinion and interventional skills.

Why have you chosen to be trained on structural heart percutaneous treatments?

Transcatheter heart valve intervention is a rapidly expanding field and there is a huge unmet need. More recent randomized control trial data suggest TAVI is at least as good as surgical AVR in certain cohorts of patients and there will be a great demand for Interventional Cardiologists who can perform structural interventions in the next few years.

How are you involved as a fellow with patient management? Please describe your typical day

No one day is the same, in addition to being on call for our primary angioplasty service, I perform ward rounds, multidisciplinary team meetings, co-supervise PhDs, perform

structural and coronary interventions and am PI for a multicentre randomized control trial.

Can you speak about the key lessons acquired here with the St Thomas’ Heart Team?

Patient care is at the forefront at St Thomas’, we treat patients and relatives with respect and deliver the highest quality care possible

Can you elaborate on the technical aspects you are learning?

The training in Structural Interventions at St Thomas’ Hospital is second to none. We have the opportunity here to learn novel interventions and techniques that only happen in a few centres in the world. We are trained in mitral, tricuspid and aortic valve interventions and have the opportunity to be involved in live case

transmissions to international conferences.

Can you speak about your interactions within the Heart Team?

The Heart Team functions very well, and is a cohesive and collaborative environment, with measured patient-centred decision making.

How do you see the place of imaging in your interventional work?

Imaging is fundamental to structural heart interventions. We are fortunate enough to have fantastic imaging expertise at St Thomas’ which guides decision making and also now helps guide procedures in real-time.

What will be next step for you right after your fellowship?

As a clinical lecturer, I’m in post for another two years, but I aim to continue an academic/research component to complement structural and coronary interventions.

Where do you see yourself in 10 years from now?

I aim to build on my current coronary and structural learning and expand my research programme.

Where do you think the structural heart programmes will be in 10 years?

Structural heart programmes will rapidly expand over the next 5 to 10 years due to huge unmet needs. Valve design will continue to improve and the procedures will become more straightforward. ■

Training the Heart Team community – the cradle of transcatheter valvular education

The first live case TAVI meeting – London Valves live - was set up by a small group of interventional cardiologists in 2009: Pr. Simon Redwood and Dr. Martyn Thomas were joined by others from London, including colleagues from King’s College Hospital, and Philip Bonhoeffer who implanted the first pulmonary

valve a few years previously.

800 people attended the first meeting, everybody was in the same auditorium in a hotel just in front of St Thomas’ Hospital.

Pr. Prendergast explains: “London Valves Live ran independently for 3

years and then joined with the PCR family of educational programmes to become PCR London Valves. The meeting now attracts over 3,000 participants from all over the world and partners closely with PCR valve meetings in China and Japan”. ■

The statements by GE’s customers described here are based on their own opinions and on results that were achieved in the customer’s unique setting. Since there is no “typical” hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

1. The FORTIS valve is not for sale in any country. Refer to legal team for remaining risks.

2. Valve ASSIST 2 solution includes TAVI Analysis, HeartVision 2 and requires AW workstation with Volume Viewer, Volume Viewer Innova. These applications are sold separately. Refers to features of Innova IGS 5, Innova IGS 6, Discovery IGS 7 and Discovery IGS 7 OR

3. FEops HEARTguide™ is available on the European and Canadian market with indication for use in TAVI and LAAo. Outside Europe and Canada, FEops HEARTguide™ is only available for non-clinical use.

4. Optional

Experts perspectives

Experiences of Doctor Augustin Coisne and Professor Erwan Donal

Mitral valve replacement and repair is now beginning to take-off with a vast array of new techniques and imaging tools.

Two experts in cardiovascular ultrasound provide their perspectives on the Heart Team, the role of this imaging modality and specific innovations.



Dr. Augustin Coisne

MD, PhD, Lille University Hospital, France

Co-lead of the imaging part section of the Heart Valve Centre

EACVI HIT (European Association of Cardiovascular Imaging - Heart Imagers of Tomorrow) Ambassador for France

Vice-President of the Young Group of the French Cardiovascular Imaging Society



Pr. Erwan Donal

MD, PhD, Rennes University, France

Head of the echocardiography Laboratory and of a hospitalization unit of 26 beds of general cardiology in the department of cardiology

Executive board member of EACVI (European Association of Cardiovascular Imaging)

President of French group of cardiovascular imaging, SFC French Society of Cardiology

Who are the members of your heart team?

Dr. A. Coisne: Our Heart Team is made up of many people! To summarize (non-exhaustive list): cardiac surgeons (Dr. Modine, Pr. Vincentelli and Pr. Juthier), interventional cardiologists (Pr. Van Belle, Dr. Sudre), cardiologists specialized in cardiac imaging (Pr. Montaigne and myself), cardiovascular radiologists (Dr. Pontana, Dr. Longère), heart failure specialists (Dr. De Groot and Dr. Fertin) and anesthesiologists.

Pr. E. Donal: Our heart team is made up of heart surgeons, anaesthesiologists, interventionists, heart-failure and cardio-vascular imagers. We all meet on a weekly basis.

What is your experience in structural heart interventions?

Dr. A. Coisne: I routinely perform transcatheter mitral valve repair (MitraClip®, Abbott), valve-in-valve, valve-in-ring and LAA closure. I also had the chance to realize the first TMVR with the investigational device from Abbott, one of the first TMVR

System with Transfemoral Transseptal Approach from Medtronic, the first transcatheter mitral valve repair with the Amend system of Valcare Medical in Europe and the first in-human valve Transseptal Mitral Valve Replacement System.

Pr. E. Donal: We have a large valvular program, and are implanting MitraClip® (Abbott) every two weeks (2 to 3 patients each time), we started triclips, we did 7 percutaneous prosthetic mitral valves (HighLife - HighLife Medical, the investigational device from Abbott) in the hybrid room.

We have TAVI quite every days, para-valvular leaks percutaneous closures, septal myectomy, LAA occlusion, PFO closure, ASD closure...

How important is communication within the heart team?

Dr. A. Coisne: Communication within the Heart Team is the backbone of all structural heart interventions. We strive to have clear and accurate communication using a common language and vocabulary, sharing our knowledge in a relationship of trust and having an optimal position in the operating room. The final goal is to minimize risks, better manage complications and increase success rates in our patients.

Pr. E. Donal: Communication within the heart team can be considered no less than KEY, fundamental. No communication leads to misunderstandings that in turn leads to incorrect indications and inappropriate treatment. So this is something we highly care about in our daily practice. We try to promote the additive value, the skills of each component of the team. It is not just a team for helping the interventionist... It is a team that is working together for the success of team as a whole in dealing with the sometimes-complicated patients we face today.

In that goal of improving the communication, the quality of the images, the quality of the way we display them is again, fundamental.

How do you see the place of echocardiography in this domain?

Dr. A. Coisne: In structural heart interventions, above all in mitral valve disease, echocardiography and multimodality imaging are mandatory

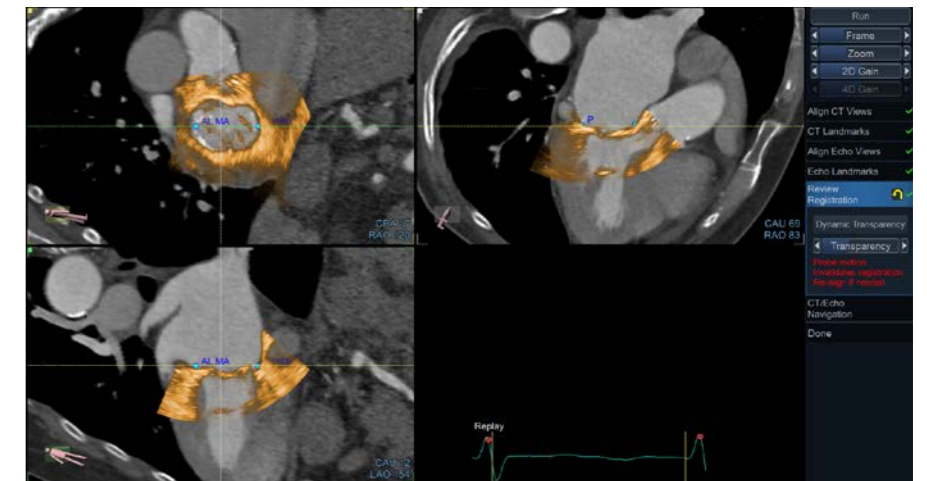
to perform an accurate screening, guide the procedure step-by-step and perform an appropriate follow-up. Finally the aim is to choose the best therapeutic solution for the patient and to increase the short and long-term success of the intervention.

Pr. E. Donal: The role of echocardiography is fundamental; we have a crucial role for the screening, the planning, and guiding of the intervention, the post-operative assessment of the results and the follow-up. It requires skills, collaboration with the other components of the team but also expertise in echocardiography with the

Pr. E. Donal: I find it convenient, robust, with good image quality in TTE and TEE with nice software's and 3D capabilities for the echoLab but also the cathlab. Always nice to use flexi-slice to navigate into the volume and across the valve, the appendage or whatever!

What do you think of CT scanner and echo fusion imaging?

Pr. A. Coisne: Nowadays, both CT scanner and echo are mandatory for several types of structural heart interventions including TMVR. Fusion imaging between these two modalities is a promising tool in three ways:



CT echo fusion with Vivid E95

highest possible quality, to ensure the best possible outcomes for our patients. Of course echo is important but multi-modality imaging and clinical expertises are a must!

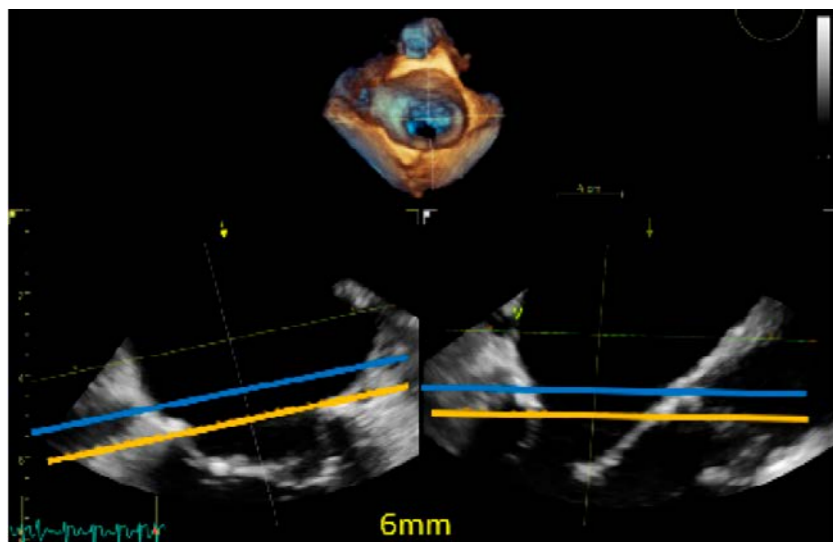
What is your experience with Vivid E95?

Dr. A. Coisne: I have been performing all structural interventions with Vivid E95 R2 for 3 years and now for 1 year with the new R3.

1. crossing of the mitral annulus plane with the prosthetic system while avoiding the sub-valvular apparatus.
 2. final check of the position of the prosthesis before and during definitive deployment.
 3. LVOT impact after deployment of recapturable and retrievable prosthesis.
- I see the applications of this technology mainly for TMVR and LAA closure.

Pr. E. Donal: This is exciting because we have used to implant the investigational TMVR device from Abbott. It provides a significant added value for assessing the neo-LVOT. Depending on the evolution, we might use it in a near future for Triclip, or para-valvular leak closure procedures. All the procedures we are guiding can be considered challenging.

Could you tell us how you use some of the Vivid E95 features, such as 4D markers, FlexiViews and the new FlexiSlice?



Defining the optimal landing zone for the device 6mm from the mitral ring (Live FlexiSlice with distance control)

Dr. A. Coisne: I use all Vivid E95 features (4D markers, FlexiViews and FlexiSlice) during all steps of structural heart interventions. When we are planning the intervention, in the OR to improve the communication, to save time and be more precise in the evaluation of anatomical characteristics both during the delivery and the evaluation of the result of the intervention.

Pr. E. Donal: 4D markers are interesting, FlexiSlice is really convenient for planning but also live, during a triclip intervention for instance.

What is your view on the future of Echo in structural heart interventions?

Dr. A. Coisne: In my opinion, the place of cardiologists specialized in cardiac imaging is of paramount importance within the Heart Team dedicated to interventions in the same way as other doctors. He/she has extensive knowledge of valvular heart diseases

and its related literature, and have been coordinating their teaching for many years. Given their key role in patient screening, intervention and follow-up, they have a central place in these interventions. Moreover, the improvement of imaging techniques and the development of percutaneous interventions require close collaboration and the ability to

use different imaging modalities at different steps of the procedure (echo, fluoroscopy, CT-scan...). For this, Echo-CT Fusion and Valve-Assist appear to be useful tools in structural heart interventions.

Pr. E. Donal: I hope we will continue to build on this expertise of all team members. I believe 3D ICE capability could bring some value of course but we need to remain careful how to use it. Having the imager in the operating theatre together with the knowledge of the patient, the pre-operative images and who will follow the patient afterwards, is certainly important for the understanding of the incomplete results and for increasing the success rate of the procedures we are performing more and more frequently month after month.

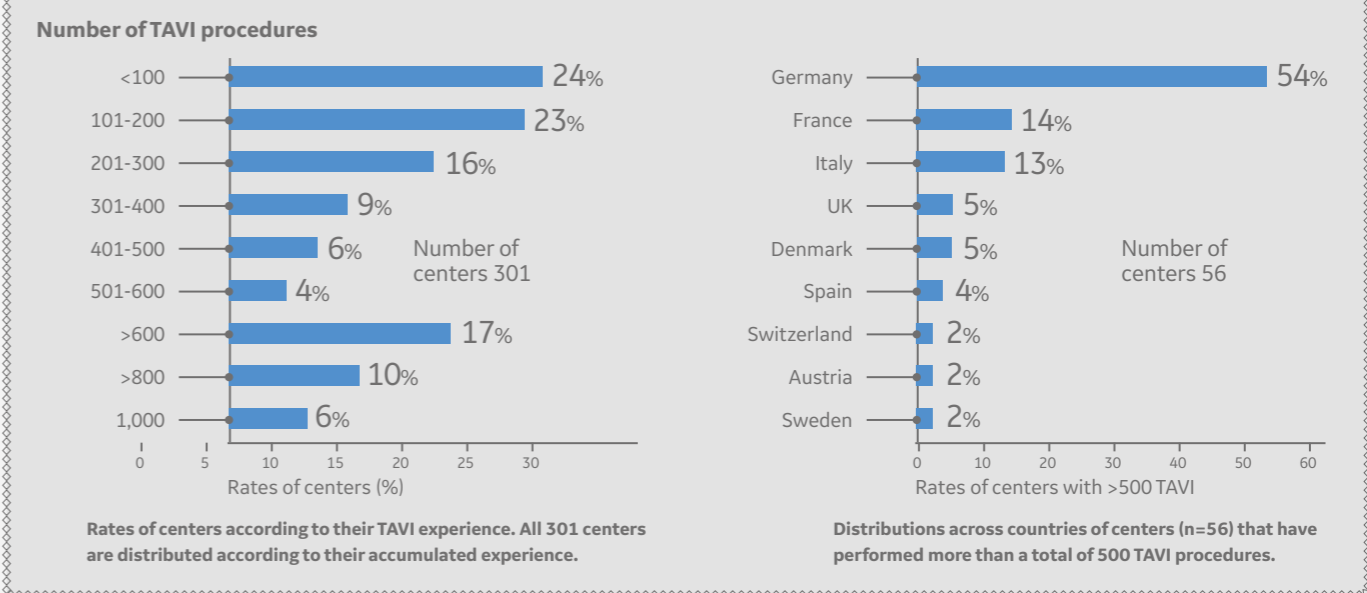
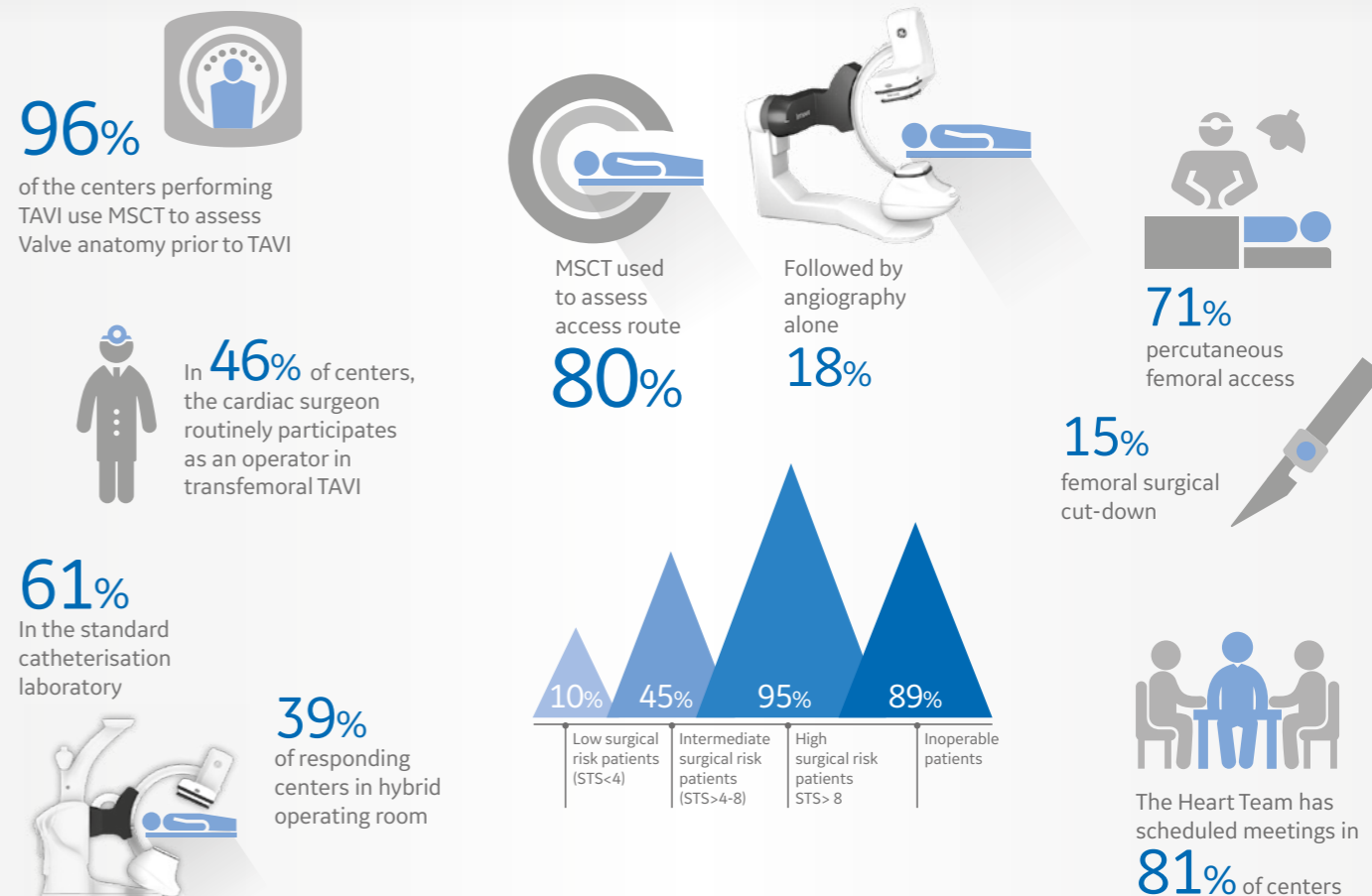
So the new field of intervention that we are moving into now requires good echocardiographies, fusion images and good interaction between people who respect each other. The team spirit is key and echo, imaging is so important that it would be of mutual benefit that EACVI (European Association for Cardiovascular Imaging) would be more present at interventional meetings such as the PCR London Valves course.

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

1. Caution: These products are intended for use by or under the direction of a physician. Prior to use, reference the Instructions for Use provided inside the product carton (when available) or at eifu.bottvascular.com or at medical.abbott/manuals for more detailed information on Indications, Contraindications, Warnings, Precautions and Adverse Events. Illustrations are artist's representations only and should not be considered as engineering drawings or photographs. Unless otherwise specified, all product names appearing in this Internet site are trademarks owned by or licensed to Abbott, its subsidiaries or affiliates. No use of any Abbott trademark, trade name, or trade dress in this site may be made without the prior written authorization of Abbott, except to identify the product or services of the company.

FOCUS ON TAVI

Extracts from: Current status of transcatheter valve therapy in Europe - Results from an EAPCI survey



Sources: Extracts from current status of transcatheter valve therapy in Europe: results from an EAPCI survey. EuroIntervention 2016;12:890-895

CardioGraphe® ASiR CV 14 cm Coverage TAVI examination

Courtesy of Dr. Patrick Donnelly, South Eastern Health and Social Care Trust Ulster Hospital, Belfast (Northern Ireland)



Dr. Patrick Donnelly
Cardiologist

“A complete assessment of the aortic valve & whole aorta to understand the suitability for TAVI device deployment is possible on patients with challenging heart rates.”

Clinical Case

A 72-year old male. TAVI CTA examination performed to assess the severe Aortic stenosis for TAVI work up versus AVR.

Imaging

Gated heart and ungated thoracic and abdominal Aorta combined in one study using a single injection of contrast media followed by saline. The patient was imaged with a ECG arrhythmia with a range of 61 – 125 BPM.

Figure 1

Imaging of the Aortic valve demonstrates a Bicuspid Aortic Valve and the presence of heavy calcification affecting both the anterior and posterior cusps.

Figure 2

Annulus diameter measurements.

Figure 3

Recording of ECG.

Figures 4 & 5

Imaging of the whole Aorta demonstrates the presences of atherosclerosis in the Thoracic and Abdominal Aorta. In the Abdominal Aorta there is significant mural thrombus and evidence of a mild to

moderate stenosis with greater severity inferiorly. The mural thrombus extends into the ilio-femoral system and a stent is visualised in the left iliac artery close to the Aortic bifurcation neither artery appears to be suitable as an access routes for device deployment.

TAVI Assessment

Patient History

- A 72-year old male
- Heart rate 61 – 125 BPM

Injection

- 90 mL at 6 mls/s iodinated contrast
- 50 mL Saline at 6 mls/s
- Smart Prep – bolus tracking

Acquisition

- Single Beat
- 14 cms Coverage
- Whole Aorta 5 x 14 cm

Auto Reconstruction

- Systolic gated acquisition at 45% of R – R
- Ungated whole Aorta
- TAVI software assessment of Aortic valve and whole Aorta

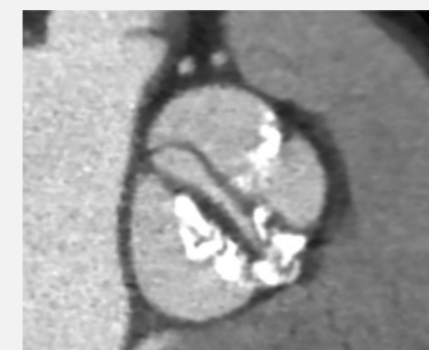


Fig. 1 Bicuspid Aortic Valve

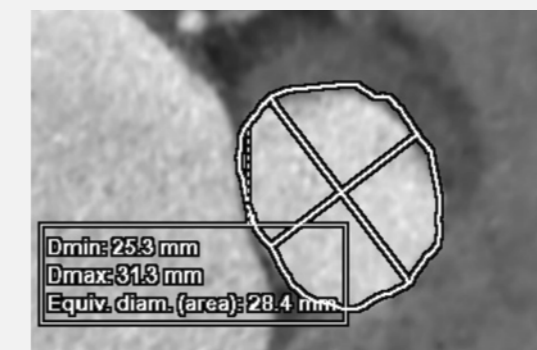


Fig. 2 Aortic Annulus measurements



Fig. 3 ECG Heart rate arrhythmia

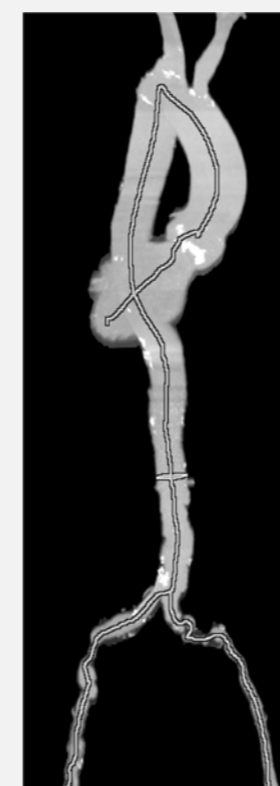


Fig. 4 MIP with automated centre line tracking

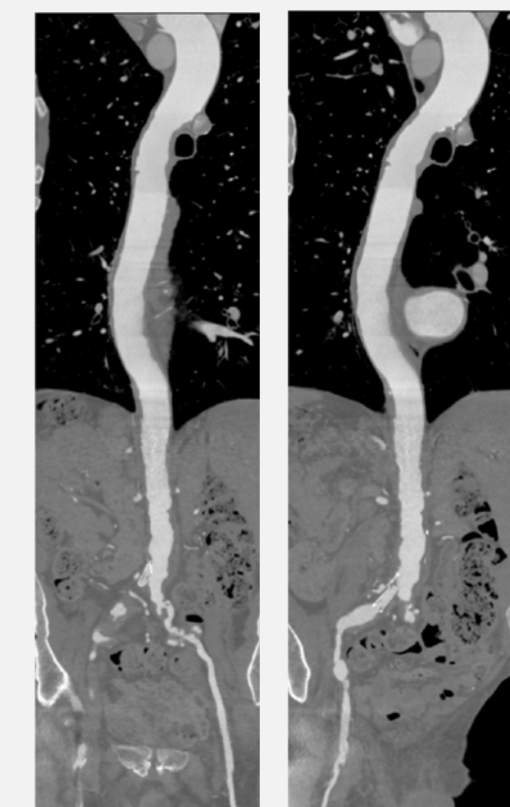


Fig. 5a & 5b Curved reformat of whole Aorta & right and left Ilio femoral Arteries

Clinical Benefit

A single examination can be performed assessing the Aortic Valve and the whole Aorta to assess the access route for TAVI procedures. For this patient imaging demonstrated that neither ilio-femoral route was suitable for access. Full assessment of the Aortic valve and measurements of the annulus, ostial heights, sinus of Valsalva and LVOT were possible regardless of the significant cardiac arrhythmia.

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

The cathlab that covers a third of Scotland with the latest Innova IGS 5 with AutoRight™¹

The cardiology department of the Raigmore Hospital provides general cardiology care for all patients of the Highlands. In the only cathlab in the area, they predominantly perform angiograms, coronary interventions, stenting, and pacemaker implantations.



Prof. Steve Leslie
Interventional
cardiologist at
Raigmore Hospital



Dr. Jonathan Watt
Interventional
cardiologist at
Raigmore Hospital

Rebecca MacLeod
Superintendent
radiographer at
Raigmore Hospital

What challenges do you face in your hospital?

SL: NHS Highland covers a huge area, the size of Belgium, the size of Wales. Raigmore Hospital is situated at the south east corner of the region so patients have long travel times, with poor roads. So patients accessing the cathlab in an emergency situation can actually be challenging.

One of the ways to address these challenges is to make sure that our communication pre-hospital is optimal so we work extremely closely with the Scottish ambulance service and our coronary care nurses. We have a fairly robust pre-hospital ECG service where the ambulance service are encouraged to send all ECGs for symptomatic patients whether they've got ST elevation or not, so that we don't miss anybody and that we know about people who are potentially high risk, and allow them to be triaged to the cathlab as quickly as possible. The Scottish Ambulance Service have been

fantastic and we receive over 3000 ECGs per year through our coronary care unit sent by email.

JW: We have got quite a remote geography here. So we have a very large catchment area, patients come from anywhere up to 100 miles away, and our nearest cathlab is really quite far away, two to three hours. Therefore, we need to be able to treat people here on site without having to rely on other sites. Reliability from the cathlab equipment is really very important.

What do you think about AutoRight™1 and the image quality?

SL: The Innova IGS 5 (configuration 520) with AutoRight™1 gives us fantastic quality images. But more importantly it gives me confidence that the radiation exposure is as low and as optimised as it can be.

RM: Since our purchase of the new system with AutoRight™1, we have found that there has been a significant



dose reduction, specifically in long cases which previously would have had a very high dose. The image quality, especially with the large screen, has been fantastic.

Here in the Highlands, we have a very large proportion of the population that is prone to heart disease. When we need to do a long case, it is very difficult to get a good balance between image quality and dose. The new AutoRight™1 system has made that a lot easier. It takes a lot of the guesswork out of the radiographers and lets them be assured that if they select the correct protocol, the radiation dose will be optimised for that patient. The radiographers are finding it very easy to use, it's been a very simple transition to move from the older generation lab to this one, and see those improvements really fast.

JW: AI plays a major role in the image chain at the present time. I think relying on humans to implement real-time changes in the cathlab is always going to be limited by training and time. Consequently, the more involvement from the device and the equipment, the better. I think automatization is going to be the future of dose optimization.

RM: The image quality has been fantastic in complex scenarios. The day this lab went live, we had two primary PCIs and the radiographers and the cardiologists had never been in the lab. It was a phenomenal achievement that the team felt confident enough to operate on those two patients without hiccup, with very good image quality and very good dose reduction.

What do you think of third-party

equipment integration in the cathlab?

SL: One of the great advantages of our new GEHC cathlab is the integration with third-party equipment. We can use OCT and IVUS very easily at the same case, to the best effect for the patient allowing them to have a safe angioplasty.

JW: The latest Innova IGS 5 cathlab integrates very well with the other modalities we have in the cathlab. These are very essential pieces of equipment allowing us to look at the coronary artery anatomy, including intravascular ultrasound and optical coherence tomography. We have a relatively high usage of these technologies in this cathlab, around 30 to 40%, which is significantly greater than many other UK centres performing PCI. We like to have easy access to the images on the same GEHC display. We have found that the workflow has been very much improved with the Innova IGS 5 system in order to provide immediate visualisation of the IVUS and OCT and coregistration with angiography.

How do you use the improved StentViz² algorithm?

StentViz² is phenomenal. We are impressed at how quick it is to acquire and how quick it is to deliver the images. The image quality is absolutely phenomenal and I think that has been one of the biggest improvements for me.

JW: In the past, StentViz² was used only occasionally, now for most PCIs we use it routinely to ensure that we have good expansion of the stent but more importantly, to optimise the placement of the balloon to ensure the



stent is fully post-dilated. The image quality has improved, and more importantly the speed of processing the image has massively improved. The StentViz² picture is virtually instantaneous following the acquisition. Furthermore, the acquisition is automatically stopped after the required number of frames has been obtained.

How do you feel supported by GEHC as a partner of choice?

SL: GEHC were prompt with the build of the cathlab. It was fantastic to work with a company like GEHC, who did what they said they would do and completed the task on time.

JW: I think in this hospital it is really important to have a very close relationship with the company that provides the cathlab equipment. We have a long history with GEHC and they understand that we rely on them a lot because of our remoteness and our single cathlab. We require responsiveness from the company to provide repairs and servicing as soon as possible, because we are not able to access a second cardiac cathlab. So for us reliability and a service contract that works is something that is very important.

RM: We have always had a good working relationship with GEHC in the past, our previous lab was a GEHC lab

and everybody felt very comfortable with it. The GEHC choice was a perfect option because it allowed us to upgrade our existing system with very minimal build changes and training requirements. GEHC were brilliant at helping us source a GEHC mobile unit, which gave us a six-week bridge to allow our service to continue while the new lab was being installed.

We couldn't have been successful if the communication lines hadn't been that good, being in such a remote spot and having a lot of installation issues, simply because of location. Once you buy a piece of equipment like this, that support needs to be lifelong. ■

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

1 AutoRight refers to intelligent image chain features of GEHC's Interventional x-ray systems, from image acquisition to image processing and display, available on Innova IGS 5, Innova IGS 6, Discovery IGS 7, Discovery IGS 7 OR, Allia IGS 7 and Allia IGS 7 OR

2 StentViz is part of the PCI ASSIST solution



CAPITALIZE ON ONLINE RESOURCES to facilitate training and increase your professional skills

The **GE CARES community** allows you to connect with other Healthcare professionals, share your experiences, publish content and learn new techniques by having direct access to clinical webinars, protocols and clinical cases to continually improve your skills. You can also contact GE Application Specialists whenever you need to ask a question or require support.



LEARN

Learn new techniques and increase your skills in your daily practice. Access online trainings, educational contents, clinical webinars built by experts for experts.



CONNECT

Connect with other healthcare professionals and grow your network. Interact with key opinion leaders and view their publications.



SHARE

Share your experience, publish content and stay up to date with the latest clinical trends shared by your peers.



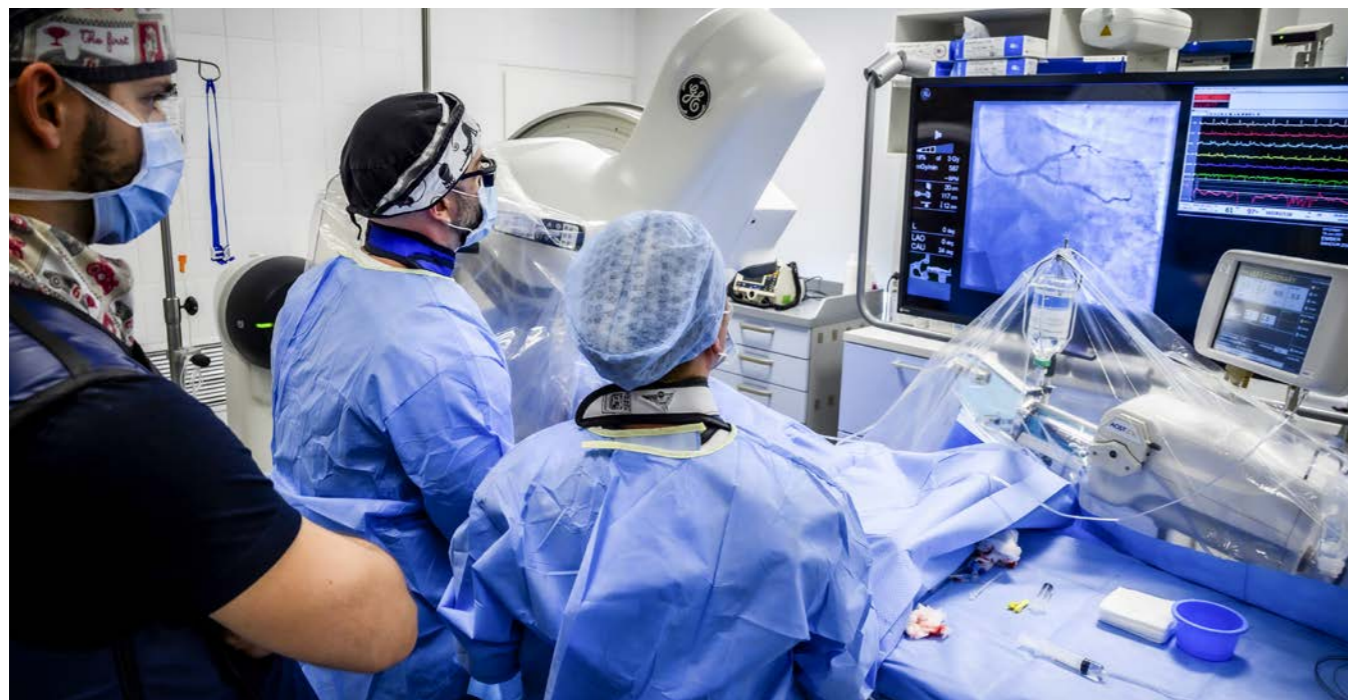
Exceeding expectations during a pandemic

The Heart and Vascular Center of Semmelweis University is a high volume center, performing about 3000 interventions, 300 TAVIs, Mitral clips, PFO and ASD closures per year.

Cases of Acute Coronary Syndrome in the vicinity of Budapest (3,000,000 people) are treated here on a 24-hour-basis on Wednesdays and Sundays and from 8AM to 6PM for the rest of the days.

It is one of two places in Hungary equipped to do mechanical circulation (ECMO) and be a Cardiac Shock Care Center (for Acute Cardiogenic Shock). The first ECMO was performed in 2012 and since 2017 the volume of cases has been increasing at a fast pace.

DETEGSEJAI



How about the scientific work and education? Do you have any other ongoing expansion projects?

Prof. Merkely: We made about 100 peer-reviewed publications and continued our “live” education program right after the first wave. We are just finishing up the expansion of our animal experimental lab (interventions, both on small and large animals) having tripled its capacity. We are also expanding our Cardiovascular OR section, and planning to have another Hybrid OR as well. We renewed our cathlabs with 1 replacement and 1

upgrade, so now we only see our images on “Widescreen”.

What are you most proud of?

Prof. Merkely: The fact that in spite of COVID-19, we were able to improve in several areas both scientifically and clinically and we were able to keep the live educational sessions going. We stepped up to the COVID-19 challenge and created the VV ECMO program by brainstorming about how to utilize our teams of cardiologists. So we did everything we usually do and much more.

From the user’s point of view, how do you see the new Innova IGS 5 (configuration 520) cathlab from GEHC which you also regularly work on?

Prof. Merkely: I like the fact that it has such a large screen, it helps me see the vessels in larger size and with better visibility. After the installation of the new Innova IGS 5 we decided to do the Large Display Monitor upgrade of the other Innova IGS 5 (configuration 530) as well.

We enjoy it, because it is also reliable, with low service maintenance. ■



Prof. Béla Merkely
Rector of Semmelweis University/Head of the Heart and Vascular Center

Let’s start with the latest news: Semmelweis University became the 55th best higher education institution in the world (went up 32 places since last year) in the 2022 world rankings of the “US News Best Global Universities” in the “Cardiology and Cardiovascular System” category. Can you tell us a few words?

Prof. Merkely: We are very glad about this improvement, and let me also interpret this result: Based on the numerical measurable parameters (e.g. citations) we are in 4th place, and only due to subjective criteria (such as reputation) we rank as 55th in total. So, with our actual performance we are in the top 20. We also extensively expanded our capabilities. In the year of COVID-19 we increased our Cardiosurgical activities, and Structural heart procedures by 40%

compared to 2019. The only drop we saw, of about 15%, was in infarcts (which is far better than what we’ve seen abroad, where patients stayed home and were not treated due to the pandemic).

We became a “Hybrid Institution”, treating both COVID and non-COVID patients. Based on the Performance Volume limit which is imposed by the country regulations, we were able to reach exactly 100% even though the expectations were set way before the pandemic hit.

We participated in COVID-19 testing, administration of vaccines, we even had patients on VV ECMO (we converted our VA ECMO program to suit their needs for lung support). Not to mention heart transplants, which we did about 40, although this number was smaller than usual due to fewer donors.

Dr. István Édes
Head of the Hemodynamic department at Semmelweis University



Can you tell me a few words about your team?

Dr. Édes: Our team consists of mostly young doctors, but some of us have more than 10 years of experience, some with more than 20 years. I’ve been here for 14 years. Assistants are usually young, because our work stretches our limits and for this you need to be in good physical and psychological shape.

Do you have a role in university education?

Dr. Édes: All the time. Every day of the week medical students are coming to our labs from the different courses, speaking 3 languages (English, German and Hungarian).

How did COVID change your routine?

Dr. Édes: We were not a primary

COVID center, but people with COVID who needed urgent Cardiac Intervention were sent to us, since we were the only specialized cathlab who could handle such patients from all around the country due to our ECMO program (VA and VV).

How many interventional cardiologists are in Hungary and what happened to them during the COVID pandemic?

Dr. Édes: In total there are about 100 interventional cardiologists. This amounts to roughly 5 for each of the 20 labs, we have a few more.

The COVID pandemic is considered as “times of war”. Some of us got the “order” to serve in a different city. In this profession, under these circumstances, you need to realize you are a doctor, whose primary task is to save lives, whatever the conditions.

What are your daily PCI challenges?

Dr. Édes: The sheer number of patients. Our usual number was 40 patients per day, since COVID there has been a slight drop to about 30 per day for the 2 systems of the lab. This number represents only the elective, planned cases here, the acute cases come on top of it.

Which patients are the biggest challenge for this lab?

Dr. Édes: CHIPs (Complex Higher-risk and Indicated Patients), we get many of those from smaller labs and county hospitals. These are patients with poli-comorbidities, that cardiac surgeons don't want to treat, so our task is to save them.

What differences do you see between the old equipment and the new one?

Dr. Édes: The old machine has been here since 2006 and was replaced 14 years later. If we can name one medical device that has saved the most Hungarian lives in the country, it is this Innova 2100. This statement actually comes from Prof. Merkely, and it's undeniable. The new machine is incomparable with its gorgeous 58” screen. So much so, that we upgraded

the other Innova IGS 5 in the neighboring room with the same Large Display Monitor shortly after. The screen visibility and image size is crucial, because when we treat a COVID patient we have extra shielding (2 layers) in front of our eyes, so we need to see well enough through those layers. It's almost like you are working partially blind and deaf.

Do you take advantage of any other imaging systems, like Cardiac CT imaging?

Dr. Édes: Absolutely, we screen a lot of patients using CT before doing coronary angiographies. If the decision is to proceed to an intervention, we leverage the CT images for device sizing and planning. We have colleagues who do this full time, and we also learned to interpret the cardiac CT images ourselves in the cathlab.

What additional devices do you use to assist you in the procedure?

Dr. Édes: We have an emergency Ultrasound system, we use it to confirm the diagnosis. Intravascular imaging devices, and rotablaters are also available to us but are unfortunately not reimbursed by the National Health Fund.

What about the stent enhancement solutions?

Dr. Édes: We use them very often and like them very much, especially in the new machine with the combined contrast injection (StentVesselViz¹). It displays such an accurate image that strut patterns are well visible and people who are truly familiar with these images (like me) can recognize the deployed stent type. A highly useful tool.

What about reliability?

Dr. Édes: These machines are heavily used 24/7 and regular service maintenance is a must. We do have a few breakdowns from time to time, but they have never happened at the same time on both machines. However, if that would ever happen, we still have a way out, because we have a total of 4 cathlabs (including our hybrid room and the periphery lab), so the ACS service will never cease.

What do you do about dose reduction? Is it a priority?

Dr. Édes: Absolutely. We use all tools that are available on top of what the machine is equipped with: radiation protection caps and spectacles, and even a “Ben-Hur”- style mobile shield. We installed electric leaded doors and the only people in the room are the ones who must be present for the procedure. We have taken a lot of exams on radiation safety and, personally, when teaching my young fellows, I put emphasis on how the operator can protect the nurses from radiation by correctly positioning the shields and the c-arm. It is also important that we are regularly monitored regarding our exposure. Regarding our patients, we've, thankfully, never had any dose-related accident until now.

Of course the fact that our system is now upgraded also helps, since the new algorithms can radically decrease the dose.

What about obese patients?

Dr. Édes: Just recently we had a patient like that. Not much to do in these cases, except for trying to see as much as possible to make the

intervention a success, even if in that case we need to use higher dose. The engineers optimize these machines to go as low as possible in terms of dose, and I also agree with this principle but when it is clinically needed we have to accept the higher levels of radiation.

Fluoro vs Record modes? Do you use Fluorostore?

Dr. Édes: Sometimes, and I should do this more often. However, I use the Fluoro mode at 7.5 frames, and during biopsies I use 3.75 frames, it is enough to guide the biopsy catheter to the right ventricle. I never use 30 fps for record, in my opinion if someone can't see with 15 fps, they should look for another profession.

I am not in favor of increasing framerates and dose at all. You may need to use higher dose, but if you

must, you should use collimation, zoom, and change angulation.

What would you like to achieve in 5 years?

Dr. Édes: To have enough money to work and have cost-efficient tools in our hands.

When I studied in Germany, everyone was surprised when I was asking about the prices of the devices. There was no budget limit, no availability limitation there. The doctors' role there was to heal the patient regardless of the choice of the devices they used. In Hungary we need to be very careful with the device selection due to the reimbursement system. You can blow your costs up easily, by selecting a more expensive balloon, if it is not absolutely necessary. The whole clinic was built upon the Cathlabs and ACS

treatments. Simply put, our department finances the clinic, the Hemodynamics department is the workhorse, the moneymaker.

So I tell my colleagues to focus on using the most reliable tools (which may not be the most sophisticated ones, or the most expensive).

Having said this, in our lab we do have access to the latest tools (from rotablaters, to OCT and IVUS), and the widest consumable portfolio possible. We deliberately want to keep up competition among vendors with a free market approach.

The clinician has a wide range of choices and the final decision is up to them, even if for example they want to use Intravascular Lithotripsy (which is not reimbursed by the National Health Fund either). ■



Dr. Balázs Németh
Resident
Interventional
Cardiologist



How long have you been doing interventions and how long was your learning curve?

Dr. Németh: I have been working here for 3 years, and I would say 100 PCIs would be a good learning curve for a young interventionist. I reached this in about 6 months working here. Now I can do medium-level cases (but not the most complex ones) and I am planning to reach full scale (rotablation, ECMO

etc.) in the next 2 years. My mentor is István Édes, and his mentor was Prof. Béla Merkely, so I am the 3rd generation of interventional cardiologists here at The Heart and Vascular Centre.

How much did colleagues and nurses help you in your journey?

Dr. Németh: Tremendously. Our experienced nurses are also a source of

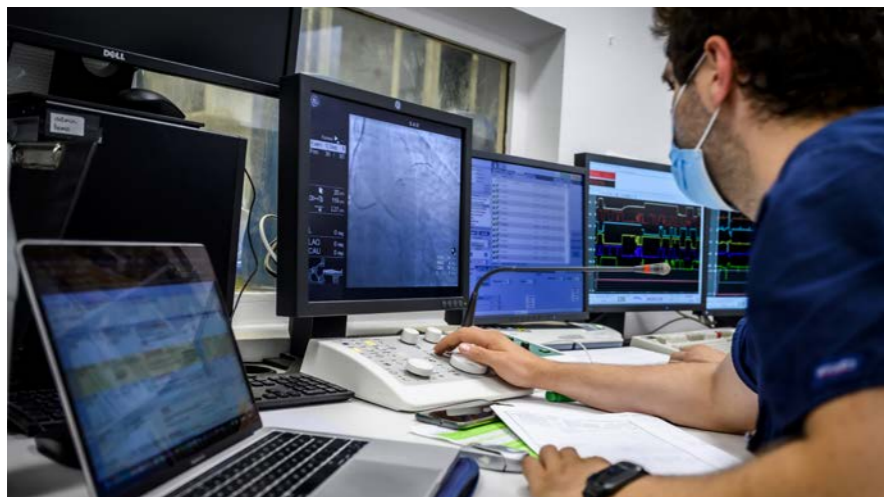
great feedback and I deliberately asked them to help me grow in all cases.

How do you see the “rise of machines” in the field of Intervention? Will robots take over your job?

Dr. Németh: Robots can be even better at doing the mechanical aspects, since their hands don't shake. But their intuition is not there yet, the clinical decision-making process is ultimately human during interventions. Challenging, borderline cases will not be solved by robots any time soon. These cases may account for about 5%, but it is still not negligible.

Any observations about the dose?

Dr. Németh: We noted with István that the dose levels were a lot lower than with the old Innova 2100 after we started using the new system. ■



Dr. Krisztina Heltai
Interventional
Cardiologist

There are not many female interventional cardiologists that I know of in the region. How does it feel working in a field full of men?

Dr. Heltai: The problem is dominant men. In any profession it's hard for a woman when surrounded by men. We know that she needs to know more and work more for less income, the same applies for cathlabs, especially when the lab leaders and institute heads are also dominant men. As for me, I am not special because I am a woman, but because I started relatively late, at age 44, and this is not typical. Today you either start early, like Dr Németh or not at all.

Did you have any challenges as a woman in this particular lab?

Dr. Heltai: I am such an outlier (due to both my gender and my seniority) that I don't have any difficulties anymore. Here, my difficulties are in the past because when I arrived I already had 8 years of experience in Interventional Cardiology.

What are some clinical challenges you are facing?

Dr. Heltai: For example, special congenital cases, for which a better and bigger monitor that we now have surely helps. Generally, our patient population is getting sicker as time passes. 15 years ago we had different kinds of people on the table than today. Basically, modern healthcare and cardiology is able to keep many people alive and we now get those sicker patients on the table who we

couldn't treat 15 years ago. These cases are definitely more challenging.

What about patient compliance?

Dr. Heltai: Hungarian patients are compliant, as long as you care for them and give them your attention

Do you use radial or femoral approach?

Dr. Heltai: In my early days I actually learned femoral approach in 2009. But the world and the guidelines have changed, and today we use radial for at least 98% of the cases.

Did the Innovalift campaign and machine installation go well?

Dr. Heltai: It went according to plan, we got the machine on time, and we were able to manage the transition, because we already had experience from 2015 when the previous replacement happened. Regarding application training we also got strong support as usual from Jan Brutovsky (application specialist), we have direct contact with him, and we trust his expertise. ■

Szilvia Szabó
Head Nurse
of the cathlab



As a head nurse, are you the soul of this workplace? How long have you been in this position at The Heart and Vascular Centre?

Mrs. Szabó: I came here 14 years ago, from Pécs University where I worked in the cathlab for 5 years.

What do you consider your key traits or, in general, the key traits for a good nurse in the cathlab?

Mrs. Szabó: Precision, attention, knowledge (including knowledge for the devices) and the ability to read the doctors' minds and support them with the right tools at the right moment. Obviously this takes a while (a few years for sure) to make all this automatic, but when that happens you will be able to predict the next steps in the procedure and see the potential outcome. That's how the team and yourself are always prepared.

Would I be correct in saying, that the scope of a nurse's work may even be broader than that of the interventional cardiologist?

Yes, it's true. Essentially the nurse is responsible for the patient from the moment they are booked for the exam, to the moment they leave the room. In the meantime, the nurse needs to coordinate the radiology technicians, the assistants, the orderlies, and to prepare the patient for the physician who will then be called only when the patient is fully prepared for catheter access.

A key focus area is to communicate with the patients, letting them know what awaits them has a calming effect. Some are nervous because they underwent other procedures before, some are nervous because they haven't. The nurse's task is to pay close attention to them.

For someone without a medical doctor's degree, being a nurse in the cathlab can serve as a unique career opportunity. There's tremendous professional growth opportunity, fast clinical developments, and serving next to a doctor saving lives you see your direct influence on people. It sure takes commitment, because it is hard work, but it's immensely satisfying.

What is your opinion about the Innova IGS 5 system?

Mrs. Szabó: I like it very much, it's speedy, and quick to position (especially the Innova IGS 5 with the cardiac table), the controls are easy and simple to use. We customized the programmable positions and we use them almost every time. If a doctor wants to deviate to steeper angles, obviously he can, but in most cases we just use the memorized setups.

How do you see the relationship between Interventional Cardiologists and Cardiac Surgeons?

Mrs. Szabó: Nowadays Interventional Cardiologists dare to go to places with catheters (like Left main) where only Cardiac Surgeons were going before with open procedures. The clinical range is definitely widening for us, both with the help of new tools and the validated endovascular practices.

However, we don't take on every case. We regularly hold cardiac/heart team meetings with the surgeons and decide about all questionable cases through a regulated process, and hand over the ones only suitable for surgery.

Being an experienced nurse, are you involved in the clinical decision making?

Mrs. Szabó: Interestingly, the answer is "yes", we are being asked for our

opinion in many situations. This is mainly because of our seniority and our expertise. These acts naturally balance out the long and hard hours on the job. We have a vocation, a calling and our passion is keeping us on track. ■



The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

1 StentVesselViz is part of the PCI ASSIST solution

Leveraging technology for complex PCI procedures

Pasteur clinic, Toulouse, France.

Clinique Pasteur in Toulouse (France), has this new building called La Passerelle - The Bridge. Designed by and for caregivers, all necessary services have been built & organized under one roof. Equipped with an arsenal of high tech imaging modalities dedicated to complex cardiovascular treatments, it aims at optimizing the care of cardiology patients.



Dr. Bruno Farah is an interventional cardiologist at the Pasteur clinic in Toulouse, France. His interests include coronaries, valves and PFO closures. He is also very interested in clinical research and has participated in various studies for devices and pharmaceuticals in the field of interventional cardiology.

What type of procedures do you do?

Most of my procedures are PCI, especially complex PCI and some structural heart procedures like PFO closure or LAA closure.

Regarding PCI procedures, what kind of challenges do you face with your imaging system?

What we need is to have a very good image quality because it's important to make the right decision about how we will treat the patient but also to evaluate the final result, especially the long-term result. So the image quality is really crucial. Also what we try to do is to have the best image quality at the lowest dose in order to reduce radiation exposure for the patient, the staff and myself.

How do imaging systems help you with such procedures?

In our Cathlab we have an Innova IGS 5 (configuration 520) and it helps us a lot in order to carefully evaluate the anatomy of the patient and the severity of the lesion and to make the correct decision: surgery versus PCI. Once we have decided to treat the patient with PCI, during the procedure,

it helps us to be sure that we are at the correct place, that we have a good deployment of the stent and finally that we have a good final angiographic image, necessary for a good long-term result.

Do you often use stent enhancement software such as StentViz¹?

We use StentViz¹ quite routinely now. When using this software, we can be sure that the stent is correctly deployed without any shortening or deformation. Besides, since we are not using intra-coronary imaging for all the procedures, we use StentViz¹ as a secondary confirmation of the angiographic result before the final

angiography.

What does the new StentViz¹ software bring to your practice when working on bifurcations?

We started our experience with this new StentViz¹ software on bifurcations a few months ago. Clearly this gives you an advantage when you have to treat a bifurcation with two stents. First, it can help you to precisely position the second stent at the level of the carina when you do a TAP or a T stenting. Then, when you have the two stents deployed, StentViz¹ allows you to simultaneously evaluate the apposition and the deployment of the two stents and to clearly see what is happening at the level of the carina. ■



The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

¹ StentViz is part of the PCI ASSIST solution



EDUCATION HIGHLIGHTS AVAILABLE ON GECARES.COM



Live Experts WEBINARS

- > Pushing the boundaries of minimally invasive procedures in hybrid rooms
- > How to increase your Social Media Presence?

Clinical Education WEBINARS

- > Embo ASSIST: One stop shop for embolisations
- > "Untangling" arteriovenous malformations
- > Needle procedures: accurately and with minimum dose



StentViz¹ for accurate bifurcation stenting

Courtesy of Dr. Farah, Pasteur clinic, Toulouse, France

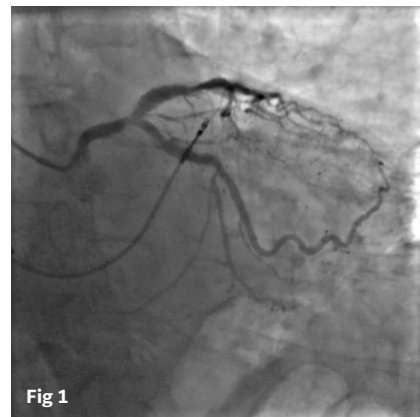


Fig 1

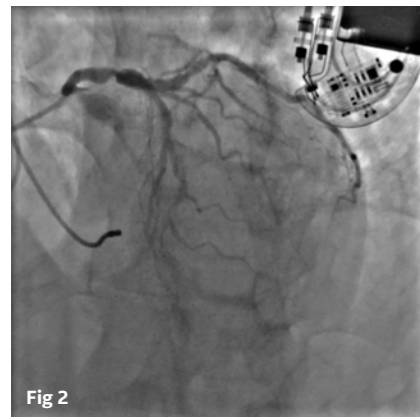


Fig 2

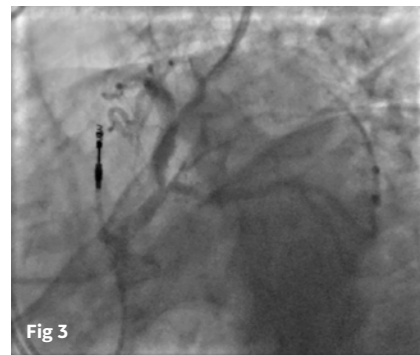


Fig 3

Patient History

The patient is a 76-year-old male with normal weight.
Risk factor: blood pressure and dyslipidemia.
Previous history: pacemaker in 2006 and a prostatic cancer that has no evolution.

This patient was referred due to silent ischemia with a positive stress test especially in the anterior and lateral wall with an ejection fraction slowly decreasing during exertion. Blood tests, ECG and LV function are normal.

The Decision Process

On the baseline angiography (Fig. 1) we can see that there is a calcified lesion at the level of the distal left main involving the LAD and the left circumflex. This tight lesion is more visible on the cranial view (Fig. 2). Finally in the spider view (Fig. 3), we see a true 1,1,1 bifurcation lesion involving the proximal LAD and the left circumflex. The right coronary artery is dominant without any significant disease, the patient has no other comorbidity and the risk evaluation is quite low (EuroSCORE of 1.25 %). The angiographic SYNTAX score is 13 and so, based on SYNTAX score II that provides a treatment recommendation between PCI and CABG, treating this patient with an angioplasty is a clear decision.

The Procedure

Key objectives of the case: Treatment of the distal left main bifurcation with two drug-eluting stents using the TAP technique and the StentViz¹ software.

1. Deployment of the first stent.

We can see here (Fig. 4) result of the StentViz¹ for the positioning of the first stent. We have a very nice deployment of the stent at the level of the left main. Probably on the proximal LAD there is a small under-deployment but it's very calcified. We could go back with a non-compliant 4.0mm balloon afterwards. Clearly, we have a good result on the LAD.

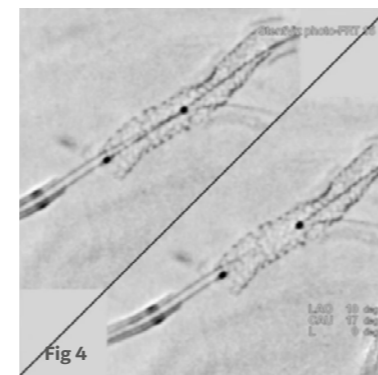


Fig 4

2. Positioning of the second stent

We use StentViz¹ to clearly see the stent at the level of the carina and correctly position it. We have a 3.50/16 stent at the level of the ostium of the circumflex. We have a 4.0mm balloon at the level of the LAD

and the challenge is to make sure that the proximal part of the left circumflex stent is just at the level of the carina without too much protrusion inside the left main but also without leaving a gap at the level of the ostium of the circumflex.

In this StentViz¹ acquisition (Fig. 5) we see the gap and we have to pull the stent back a little bit.

After that, the acquisition depicted in Fig. 6 shows a minimal protrusion.

3. Deployment of the second stent

After the deployment of the second stent we use StentViz¹ to evaluate the result at the level of the bifurcation. Looking at Fig. 7, first, we see good apposition of the two stents at the level of the left main - LAD and the level of the ostium of the circumflex. Second, we see that the stent position at the level of the carina of the left circumflex is satisfying. Finally, the stent at the ostium of the left main has no crush. So with this technology we can have the information about the left main, the LAD stent, the left circumflex stent and the position at the level of the carina.

4. Angiographic control

Looking at Fig. 8a, 8b, the result is good, you can see the neocarina. There is no disease or gap between the two stents. No distal dissection on the LAD or the circumflex.

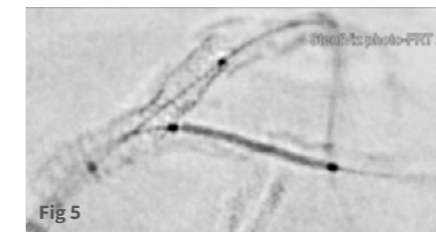


Fig 5

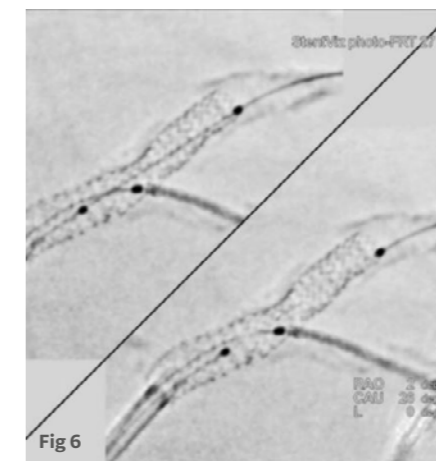


Fig 6

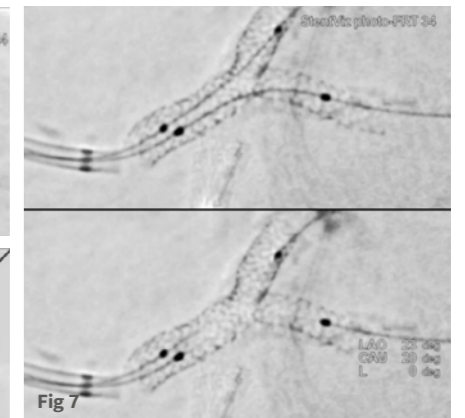


Fig 7

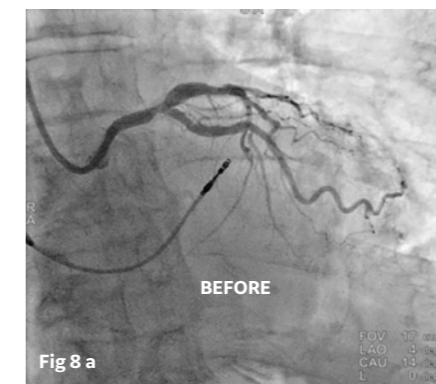


Fig 8 a

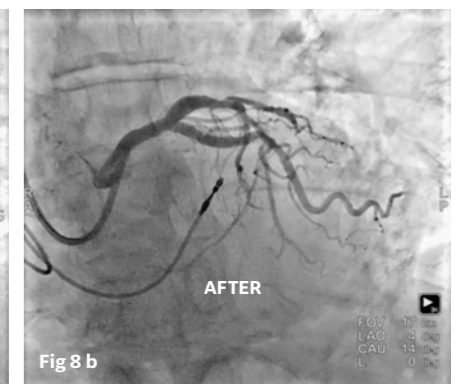


Fig 8 b

Flash this code to access the full live case from Dr Farah



The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

¹ StentViz is part of the PCI ASSIST solution



GE Healthcare

GE Healthcare provides medical technologies and services to help solve the challenges facing healthcare providers around the world.

From medical imaging, software, patient monitoring and diagnostics, to biopharmaceutical manufacturing technologies, GE Healthcare solutions are designed to help healthcare professionals deliver better, more efficient and more effective outcomes for more patients.

GE Healthcare is betting big on digital; not just connecting hospital departments and physicians more effectively, but utilizing the masses of data from its equipment and the collaboration between hardware and software – “digital industrial” – to help clinicians make better care decisions. Sensors, software and smart data analytics are converging to enhance GE Healthcare’s offerings not just in diagnostics, but also pathology, gene sequencing and even hospital asset tracking.

GE interventional imaging systems help you plan, guide and assess your wide range of interventional procedures precisely and efficiently. The new generation of ASSIST advanced applications allow you to extend your clinical capabilities and help simplify and streamline your procedural workflow.

gehealthcare.uk

© 2019 General Electric Company - All rights reserved

GE Healthcare reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation. Contact your GE Healthcare representative for the most current information. GE and the GE Monogram are trademarks of General Electric Company. GE Healthcare, a division of General Electric Company. GE Medical Systems, Inc., doing business as GE Healthcare.

The statements by GE’s customers reported here are based on results that were achieved in the customer’s unique setting. Since there is no “typical” hospital and many variables exist, i.e., hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

Products may not be commercially available in all markets. Please contact your sales representative for more information

JB72994GB