ASSIST MAGAZINE

Innovative Interventional Treatments

Focus on leading Cardio Centers in France & UK

Efficient TAVI with image fusion

AF ablations experiences with advanced imaging

Magazine #3

Heart Care

Dedicated to Interventional Cardiology

A comprehensive set of solutions for the cardiac care pathway. From diagnostic to PCI to structural heart interventions, GE's portfolio provides a comprehensive set of solutions to the Heart Teams, enabling them to make the appropriate decisions for the optimal patient care pathway, in an accurate and timely manner, at very low dose.

JB53106FR

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General Manager Global,
Image Guided Systems

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Interventional Cardiology
& Electrophysiology

Dear reader,

Leading or belonging to a Heart Team, you are working to save lives, increase life expectancy, and improve your patients' comfort in their daily life.

When treating coronary artery disease, structural heart disease or arrhythmia disorders, you perform highly technical and complex procedures requiring additional clinical information on a daily basis.

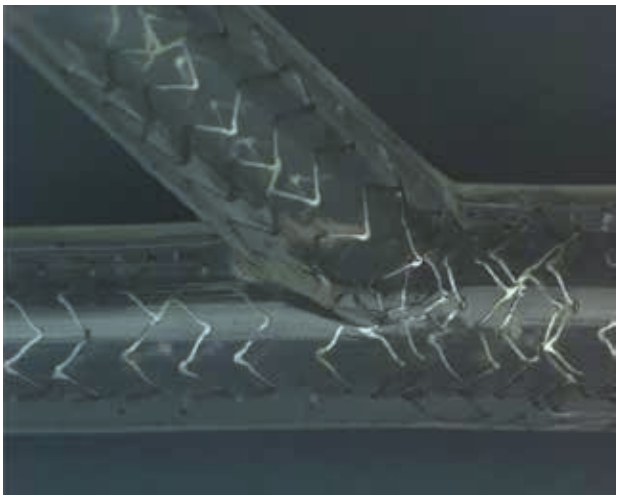
From simple diagnostic examinations to more complex procedures, our goal is to ASSIST you with equipment and clinical tools, and to provide guidance and navigation to ultimately help you improve your patients' outcomes.

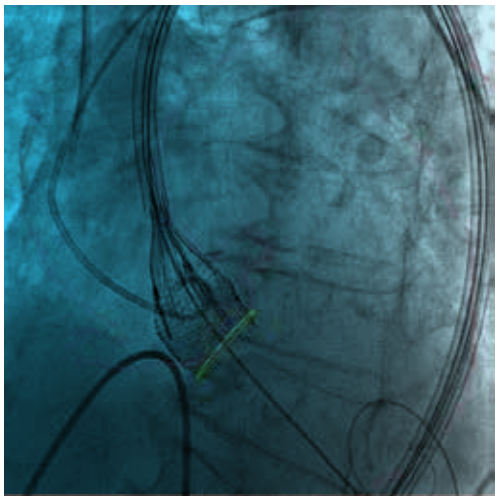
Throughout this edition, dedicated to cardiac procedures, we give a voice to Heart Team members (physicians, nurses, radiographers) who share their point of view and experience on treating patients assisted by our latest image guided technologies for coronary, structural heart and electrophysiology interventions.

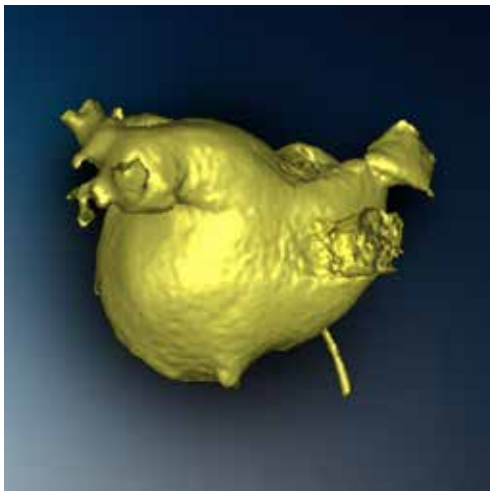
We would like to thank our Heart Team partners for challenging us to always develop better solutions for interventional cardiology and electrophysiology procedures. We hope you find this reading enjoyable!

Chantal Le Chat and Erika Saillant

ASSIST MAGAZINE







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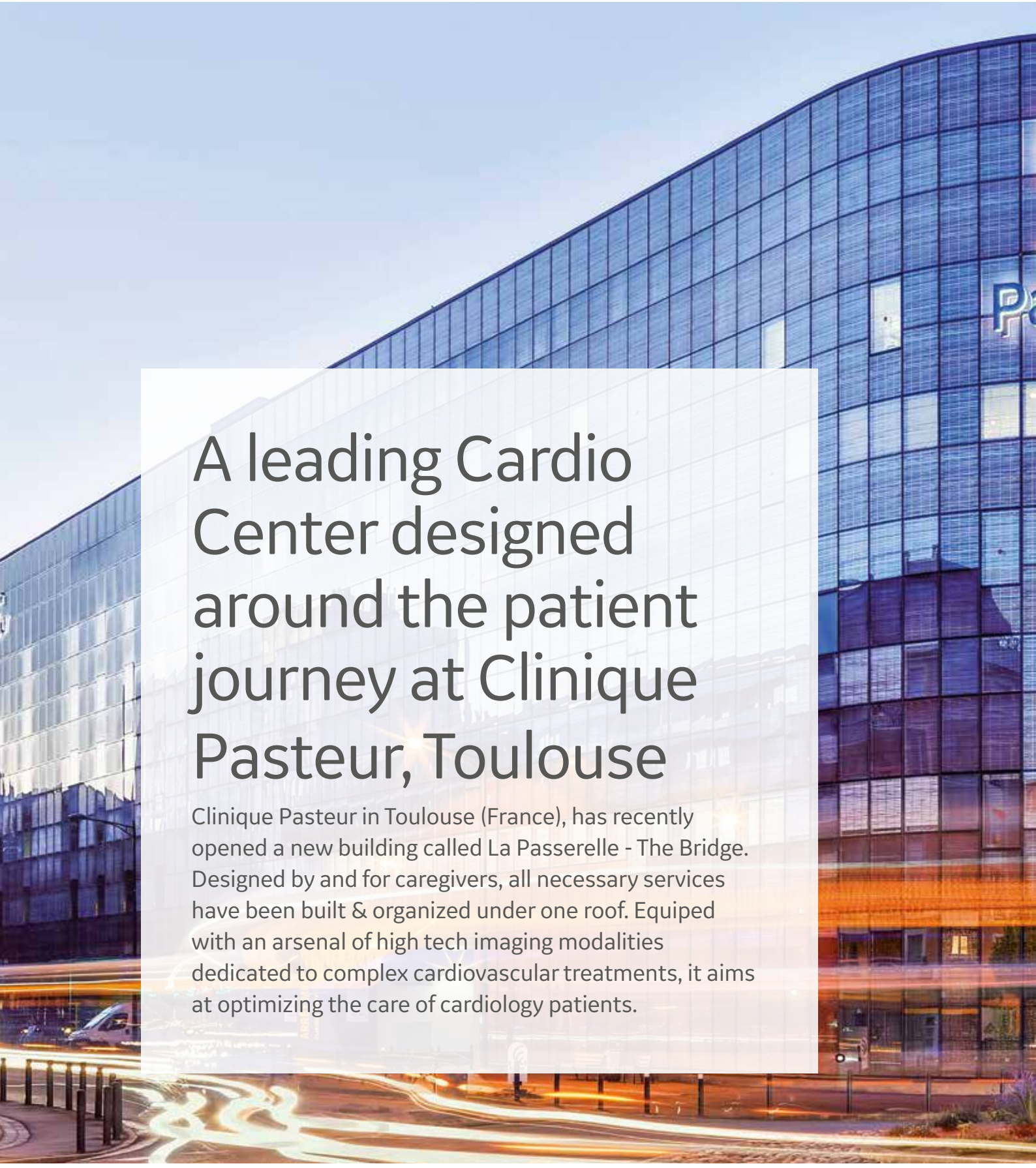
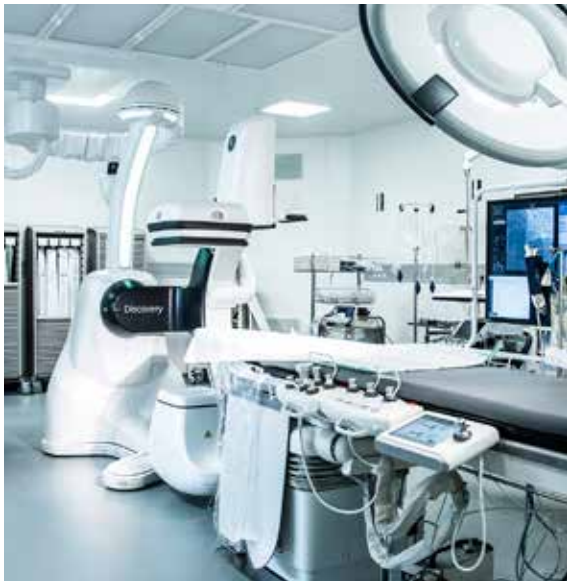


A leading Cardio Center designed around the patient journey at Clinique Pasteur, Toulouse

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

A leading Cardio Center designed around the patient journey at Clinique Pasteur, Toulouse | **ASSIST** 7



11,000 m² dedicated to cardiology, designed by and for caregivers

From the beginning, the project was driven by the desire of physicians to maintain and enhance medical excellence in cardiology and cardiac surgery for the benefit of patients, and the will of an independent, private establishment to continue its growth, remaining a local, ethical and innovative economic actor. After construction of the Atrium building dedicated to oncology and outpatient clinics, Clinique Pasteur carried out a major development project: a building overlooking the Avenue de Lombez, connecting existing buildings dedicated to hospitalizations and consultations. This building, set in a dense urban landscape, spans another avenue to provide access to the public transport network, thus earning the name of La Passerelle - The bridge.

Like the major European cardiology centers, the project will provide an adapted, responsible, professional and sustainable solution for local public health in a region experiencing growth and an aging population. The architecture firm Kardham Cardete Huet Architecture managed major constraints around the building's construction including:

- Maintaining continuity of activity in the existing buildings throughout the construction process.
- Limiting inconvenience to the neighborhood and maintaining vital traffic flow
- Building the operating rooms at higher levels to optimize the air treatment.

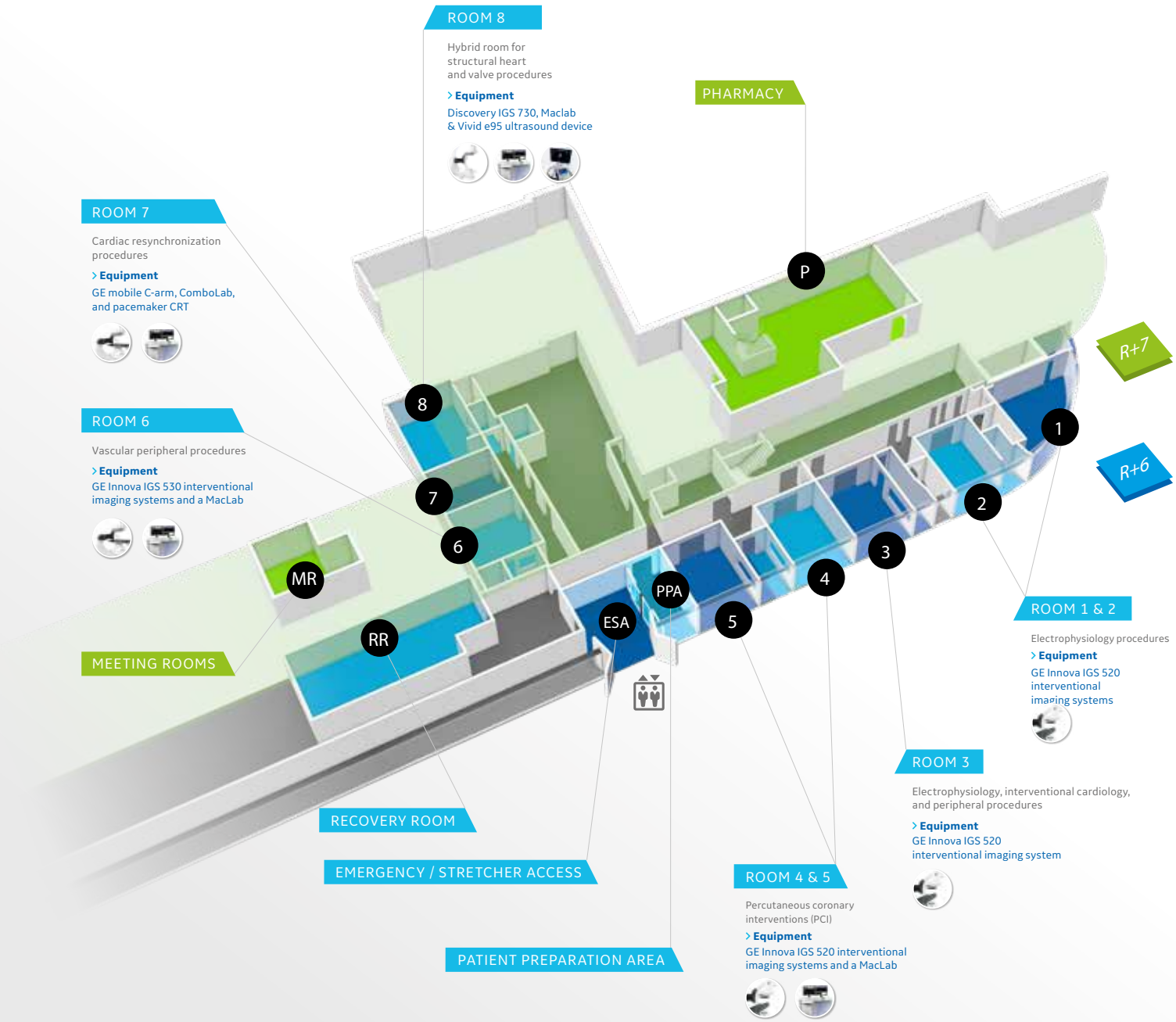
Optimizing patient care

Conceived by doctors and other healthcare personnel, the building aims to optimize the care of cardiology patients – many in fragile health and in need of emergency care – by bringing together all necessary services under one roof. All patient services are concentrated within seven floors, from emergency reception for chest pain, to intensive care, to hospitalization for short or medium stays, to a dedicated pharmacy.

Vertical circulation directly serves the surgical and interventional cardiology operating theaters and the medical imaging department. Patients are thus treated quickly, with optimized travel times and proximity to all dedicated caregivers and technical platforms.

Upon completion of the Passerelle project, five cardiologists from Clinique Pasteur shared their perspectives on the new facility and how it improved the patient care.

Pharmacy - inside the cathlab department cathlabs environment R+7
Cathlabs in total autonomy R+6
Short Stay Interventional Cardiology Unit & Patient rooms R+5
Patient rooms R+4
Chest pain Unit 24/24 and ICU R+3
Medical Imaging Hospitalisation R+2
Medical imaging Consultations R+1
Medical imaging desk 0
MRI R-1



Five cardiologists share their perspectives

Dr. Jean FAJADET,
Interventional Cardiologist, co-leader with Dr. Bruno Farah of PCI program, Clinique Pasteur.
EuroPCR Co-director, and past President of the European Association for Percutaneous Cardiovascular Intervention (EAPCI) executive committee.

"It is important to understand the role of interventional cardiology at Clinique Pasteur. In fact, interventional cardiology can be described as the heart of the cardiology department. All the diagnosis are done there, along with the treatments that include coronary interventions, structural heart, peripheral, endovascular procedures and electrophysiology."

"We are celebrating the 40th anniversary of coronary angioplasty, which at the time we called PTCA. We have seen an evolution in indications of patients treated in this way. Nowadays we are treating patients with more complex lesions; with calcified, diffused disease; with multi-vessel disease; and with poor left ventricular function. We are treating more complex patients

"After only three days, the number of procedures performed was back to normal, thanks in part to the GE team, who accompanied all of the physicians, technicians and nurses, and to the ergonomy of the equipment."

"From the very beginning on, I was impressed by the work taking place in the new rooms, by the GE equipment, and by the quality of the images."

than in the past. And when we consider the efficiency and the safety of our procedures for the patients, the quality of imaging is certainly the most important point in the cardiology department. At the same time, as we move out of the coronary field and into endovascular, structural and valvular, vascular and electrophysiology procedures, we have followed the same trend with increasingly complex procedures."

"We are really happy to open this new department, which is unique in the country. We now have eight rooms working every day. We initiated this project many years ago with the intent to place the patients at the center of the system and to facilitate patient access to care. We aimed at facilitating the flow of patients from admission to discharge. We regarded imaging quality as the major criterion for achieving success with complex procedures, and this is why we selected GE to accompany us on this project."

"The concept was to have total autonomy with respect to the rest of the hospital. One floor up to the cathlabs, we have our pharmacy for the management of devices, stents, catheters and balloons, we are working in total autonomy."

"There was a question about our capability to adapt to a new system, when we had been working with systems from another vendor for the last 30 years.There was a question about the speed to adapt and to be comfortable. And yet we did the switch just over a long weekend, and right after this switch we came back to a normal procedure load."

"This was very effective, thanks to GE, who accompanied all the physicians, the technicians, and the nurses. It was fantastic to see all these people working with the same objective. I think we were helped by the ergonomic design of the system, which is very intuitive and really easy to handle in daily practice. I was impressed by that."

•••

"I have been personally impressed since the beginning by the image quality we achieve with these new rooms. That is very important, particularly for complex procedures. We have the ability to achieve different views than in the past, thanks to the deep movements of the C arm to the right or to the left. In particular for the LAD diagonal bifurcations, we see now extremely clearly the ostium of the diagonal and septal branches. The optimal visualization of the stents with PCI ASSIST is working very well. The quality of the imaging is helping us with the duration of procedures, which are shorter, faster, with good results, and certainly safer for the patients."

"We tried to place the patient at the center of the system. This meant analysing the patient pathway from admission to discharge in an effort to determine the best possible flow. The quality of the imaging equipment was another key criterion at the top of our minds, as it was critical to helping the teams successfully perform complex procedures. That's the reason why we selected General Electric as a partner for this project."

Dr. Didier TCHETCHE,
Interventional Cardiologist, co-leader with Dr. Nicolas Dumonteil of Structural Heart Disease Program, Clinique Pasteur.

"The structural heart program includes treatments for heart and valvular diseases, such as TAVI to treat aortic stenosis. Mitral regurgitation is treated here and is going to become a huge part of the valvular heart diseases we are addressing. We do MitraClip®, Cardioband[1] and even transcatheter mitral valve replacement."

"We also treat some kind of tricuspid disease. Apart from the valvular side, we also have pathologies such as septum defect, patent foramen ovale, and paravalvular leaks. So we are trying to treat all these kind of structural heart diseases. The goal is to be able to treat them in traditional ways but also to be part of all the innovations. When a new device is available, we try to be one of the first teams to use it. "

"The new hybrid OR suite definitely has been a huge improvement for collaboration between cardiological team and surgical team. We are able now to treat valvular disease percutaneously, but also from surgical access, and the same is true for mitral or tricuspid diseases. With this new hybrid OR suite, image fusion is a clear improvement in the comprehension of valvular disease and the way we can treat it."

"We are very proud and happy to have this type of equipment. It has been making everything easier for both the cardiology and surgical teams. We are very satisfied because at the same time we get very low doses of radiation to ourselves and the patients, while obtaining very good quality of imaging, both in fluoro and cine runs. We did not lose anything by reducing radiation dose."

"The ability to combine echo images, and more importantly CT scanner imaging during procedures by fusion imaging, brings added value to the setup in the hybrid OR suite. "The patients gain two key benefits from this new imaging set-up. First is the planning of the procedure based on the CT scan. We are now able to really plan what we are going to do. This enables shorter and more reproducible procedures, and at the end better outcomes for the patients. Second is the radiation dose reduction."

"With the improved management of structural heart disease, we've learned to communicate effectively within specialties. We have to merge the skills of the echocardiographer, the anesthesiologist, the cardiologist and the surgeon. It is a new environment for us, a new philosophy. We really have to trust what the echocardiographers are telling us. They are guiding the procedures, particularly for mitral or tricuspid disease. We are more reliant on the echocardiographers' advice than on our hands, and this is enabled by the new environment."

1 Cardioband Mitral System, Edwards Lifesciences

Dr. Serge BOVEDA,
Electrophysiologist, co-leader
with Dr. Jean-Paul Albenque of the Cardiac Arrythmias Management Department, Clinique Pasteur.

"We are a team that performs 1,500 ablations every year, along with implantation of devices such as ICDs, resynchronizations and pacemakers. About 900 devices are implanted every year at Clinique Pasteur."

"Nowadays, the treatment of cardiac arrhythmias is more and more accurate and complex. We are treating every kind of arrhythmia, ventricular and atrial. We focus a lot on the treatment of atrial fibrillation, mainly by endovascular approaches but also surgical approaches, and hybrid approaches using both endovascular and surgical techniques. At the same time, we are treating more and more ventricular arrhythmias."

"We went from the past to the future with a new platform that is very well equipped, with high quality imaging. The fluoro imaging is now of excellent quality, with low radiation dose, which is very important to the patient as well as the doctors and nurses. At the same time, we can integrate a lot of information with a large screen where we have access to all data needed during the intervention."

"Surprisingly, the adaptation has been quite easy. The new system is easy to use, so the team has been trained quite quickly. It has been easy for us to transition to this new generation of imaging systems. I think the new department is very valuable for the patients, because we can now provide high-quality treatment and high-quality procedures, thanks to the fusion of lot of different imaging in the same system. For example, we can make a fusion between the pre-op CT scan and fluoro images, rotational angiography and 3D mapping systems, and we have all this information in a single screen." This is very important for guiding the operation and targeting the right spot at which to treat the patient."

Dr. Antoine SAUGUET,
Interventional Cardiologist, co-leader with Dr Benjamin Honton of the vascular program, Clinique Pasteur.

"In the past I was more involved in coronary–angioplasty. I moved 10 years ago to peripheral angioplasties. We perform more than 1,000 peripheral angioplasties per year and more than 100 EVAR cases."

"When we moved to the new cath labs, the purpose was to use vascular cath labs exclusively, and not only coronary/vascular cath labs with additional imaging tools like roadmap and digital subtraction angiography. We can also use pre operative CT scan and DSA in the room, and it is helping us to treat patients in the best way. Using fusion imaging, we significantly decrease X-ray dose for the patients and the staff."

"When we plan to treat a patient with an abdominal infrarenal aneurysm, we have to plan the treatment strategy with the pre operative CT scan. That helps us when we use image fusion to well locate the renal arteries and the superior mesenteric artery, and to place the prosthesis at the right location for the endograft deployment.. We can reduce the dose thanks to the use of the pre operative CT scan , and it also allows us to decrease the amount of contrast media and decrease the X-ray exposure time versus where we were working in our previous cathlabs."

Dr. Bernard ASSOUN,
Cardiologist and CEO, Clinique Pasteur

"Two of the essential values for this new establishment are clinical excellence and innovation. This project is the culmination of a remarkable partnership with GE, which has been closely aligned with these essential values."

"Looking back on the past year, this project is really successful:

Adapting fast to this new technological environment with on-site support from GE.

Optimizing patient care, efficient management of emergencies, with care givers' teams who secure each step of the patient journey.

High resolution imaging and technological performances ensuring a high level of medical service in all the interventional cardiac and vascular areas."

Perspective on fastest UK door to balloon center and Complex elective PCIs

@ Golden Jubilee National Hospital, Scotland

Glasgow is not only known for its famous "Glasgow Tower" which earned the Guinness World Record for its ability to be rotated 360 degrees in the presence of wind, but also, just 20 minutes away from this tower stands the Golden Jubilee National Hospital (GJNH) in which a dedicated team of physicians, nurses and radiographers are working night and day to ensure they deliver the best clinical care to patients suffering from heart disease. Spotlight on a reference center for the treatment of heart disease in Scotland.

A reference center in the UK

A national resource for Scotland, the Golden Jubilee National Hospital is part of the Golden Jubilee Foundation Family, which also includes the Golden Jubilee Innovation Center, Golden Jubilee Conference Hotel and the Golden Jubilee Research Institute.

The Golden Jubilee is home to regional and national heart and lung services, as well as a major center for orthopaedics.

Recently elected president of the Scottish Cardiac Society (SCS), Dr Hany Eteiba, an Interventional Cardiologist, Director of the Heart and Lung Center, and acting Medical Director for the Golden Jubilee Hospital, is proud to keep providing an excellent standard of care while having very ambitious projects for the expansion of the hospital.

"We are a flagship hospital and one of the largest Heart and Lung Centers in Europe. GJNH is the highest volume of interventional procedures in the UK." Indeed, GJNH was the first Scottish hospital to perform a replacement heart valve transfemorally, thus avoiding the need for open heart surgery. It's the only Scottish hospital to use a Ventricular assist device implant - also known as a mechanical heart. And last but not least, the PCI department can claim the UK's fastest "Door to Balloon" time for patients requiring Primary Percutaneous Coronary Intervention (PPCI)[1].

Highly equipped center to get the most high-end, up-to-date technology for patient care

GJNH is equipped with 4 cathlabs to support patients coming for PPCI. Two of them were recently renewed to benefit from the latest innovations in PCI care, helping the department to treat more than 3000 PPCI per year. And, There are also several projects under development according to Dr. Eteiba, thanks to the Scottish government support.

"Government has allocated several million pounds for us to expand the hospital. Budget will be predominantly used for imaging, orthopedics and ophthalmology. It will enhance the profile of the hospital in these areas."

Expanding the activity to structural heart disease

GJNH is currently the reference heart attack center in Scotland. Part of the growth plan is to expand the current activity to interventional structural heart treatments, *"We have already our MitraClip® programme, have recently started our TAVI service, and we aim to extend our programme to LAAC."*

GJNH is expected to establish an advanced structural heart disease center in the next several months, which will include TAVI, mitral interventions and heart failure interventions. This will be all the more challenging since GJNH is already the Heart and Lung center for Scotland, performing heart transplants.

First, in relation to the large volume of activities at the Heart and Lung center, the number of beds at GJNH needs further expansion, *"Even though we have a limited number of beds, we are very innovative in terms of expanding our capacity by extending working hours, working weekends as well; of course, it cannot be done without*

investment in staff, both physicians, nursing colleagues, radiographers, physiological measurement technicians and also clinicians who are experts in interventional cardiology."

Indeed, healthcare professionals within the hospital have access to the conference hotel directly connected to the hospital, free of charge. It eases the life of staff when on duty, allowing them to reach the lab faster when PPCI patients come in the middle of the night. The second challenge for GJNH is to develop and grow the imaging staff and expertise, "*We need imaging consultants to support the structural heart disease programme, which includes MRI, CT, and advanced echocardiography. That's our priority. In the immediate future we will be recruiting more staff as the volume is expanding.*"

1. https://www.nhsgoldenjubilee.co.uk/news/press-releases-2014/uks-fastest-heart-attack-treatment/)
data source : National Cardiac Benchmarking Collaborative

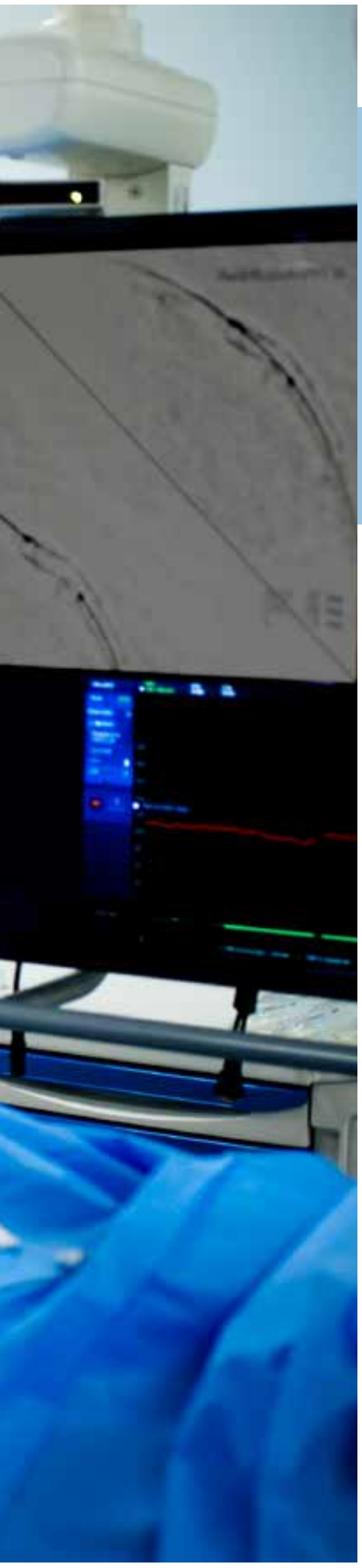
Dr. Eteiba tells us about his role in the Scottish Cardiac Society

Dr. Eteiba,
president of SCS

"This is a multiprofessional society, which includes all the cardiologists, cardiac surgeons and other professionals in cardiovascular Medicine in Scotland. My aim and mission is to put the society into an international role. We would like to partner with larger organizations like the European Society of Cardiology, the American College of Cardiology, and we have already started communicating with these organizations. We also have partnerships with EuroPCR, and we are present at TCT. We would like to become the voice of cardiovascular medicine in Scotland and communicate internationally as a multiprofessional society."

In addition to his role as President of SCS, Dr. Eteiba was recently appointed as the Vice President of the Royal College of Physicians and Surgeons of Glasgow.

Dr. Watkins : "A lot of our patients have heavily calcified coronary disease and often it gets quite hard to see stents when they are implanted. This is one of the use cases where PCI ASSIST helps."



Inside the cathlab of GJNH

a day with Pr. Keith Oldroyd and Dr. Stuart Watkins

Overview of the Interventional Cardiology Department

The main procedure performed in the 4 interventional cathlabs of GJNH is the treatment of coronary artery disease (CAD). CAD is split into 3 different categories; 25% are STEMI patients, 45% non-STEMI, and the rest are elective interventions of patients with stable angina. As GJNH is an international center, there are also patients coming with congenital heart disease or advanced heart failure requiring, in some cases, cardiac transplant.

Management of Primary PCI at GJNH

Recipe to the fastest door to balloon time of the UK

The way GJNH manages patients coming for primary PCI is very efficient, reflecting why GJNH can claim the UK's fastest door to balloon time[1]. Indeed, GJNH serves a population of almost 2 million people for primary PCI. They perform around 750 PPCI cases per year.

Nobody will argue that time is of the essence with primary PCI. *"You want the artery open as quickly as possible,"* says Dr Watkins. The secret of GJNH's claim as first in the UK in terms of door to balloon time (21 minutes according to the National Cardiac Benchmarking Collaborative) relies on several aspects;

"When we started primary PCI in 2008, we had to design a completely new service. For patients who present in the community, Scottish ambulance service brings them directly here and they can transmit the ECG to confirm the diagnosis if necessary," says Pr. Oldroyd.

First, physicians in the cathlab are able to access the patient's ECG very quickly, before arriving at the hospital.

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The ECG is transferred digitally directly from the ambulance to the care unit. Therefore, they can decide remotely who needs to come for the procedure. There is no emergency department at the hospital to delay patients getting to the cathlab, so when patients arrive, they come straight to the cathlab. GJNH reports that time from the front door to the cathlab is 3-4 minutes.

Then, GJNH benefits from an on-call team who are able to stay onsite if they live a distance from the hospital. The Golden Jubilee Conference hotel is adjacent to the hospital allowing cathlab staff to be able to reach in the cathlab within a few minutes of leaving their rooms.

"Recently when we had bad weather, it became crucial and important that the staff was quickly available to deal with emergencies," says Pr. Oldroyd.

Dealing with complex PCI

Even though door to balloon is quick, some cases can take longer, especially for complex PCI. According to Dr. Watkins, complex PCIs happen more and more often as an ageing population is coming to the cathlab.

"The main challenge is that we've got an ageing population. With elderly patients you get more complex coronary disease which is often affecting multiple vessels or calcified coronary disease which is more difficult to fix," says Dr. Watkins.

Moreover, patients who were previously referred to surgery are now eligible for PCI as techniques are improving. As a result, more complex cases can be performed percutaneously instead of going for open heart surgery.

"The PCI that we are doing nowadays is more complex than in previous years. The West of Scotland has a high burden of coronary disease, so in terms of volume, we did just under 3000 PCIs in total last year. We are the second largest center in the UK in terms of PCI volume," comments Pr. Oldroyd.

Innovative tools to treat complex PCI

GJNH's PCI department is fortunate to have high-end imaging tools available in the cathlab to provide optimal treatment options for complex PCI. Indeed, although coronary angiograms are the gold standard to detect coronary lesions, other imaging modalities such as IVUS or OCT are used routinely to help procedural planning. *"These imaging modalities give us a lot of information about the calcifications, the circumferential nature of calcification, and help us decide what we need to do upfront before trying to implant stents, and to make sure stents are well expanded,"* says Dr. Watkins. Coronary pressure wire can be used as well if there remains a debate about the significance of a coronary lesion.

However, habits have changed since the arrival of PCI ASSIST in the lab. According to Pr. Oldroyd, IVUS and OCT

Golden Jubilee Live Case Conference

As the hospital is equipped to allow live case retransmission, GJNH is hosting an annual meeting focused on complex PCI. This year, the cases will be dedicated to high risk PCI (meaning for example, patients requiring circulatory support during the PCI, or patients needing ECMO...).
"At the opposite of other live cases in larger meetings, you can attend the whole case from beginning to end (4 entire cases should be done this year)" says Pr. Oldroyd.
It represents a major event for the cardiology department of GJNH.
"Live case courses put the operator under intense pressure. Last year, we did not have any visiting operators, all cases were done by our own interventional cardiologists, who felt very comfortable working in their own environment, and we succeeded to show every case from beginning to end" precises Pr. Oldroyd.

are more often used for procedure planning instead of insuring the adequate deployment of a stent; *"As PCI ASSIST works very well for stent deployment control, we mostly use IVUS/OCT for pre-procedure planning. For controversial cases, we start the case with IVUS/OCT to assess the degree of calcification, the vessel size, and to resolve some diagnostic ambiguities, then, the catheters are already open; it's quite natural to use it for post procedural assessment. For the remaining cases, PCI ASSIST is very useful."*

Dr. Watkins finds PCI ASSIST very helpful in many ways. It helps him see how well a stent is expanded to assist with good procedural outcomes as under expanded stents carry risks of restenosis and stent thrombosis. *"It is helpful when you are deploying stents, to make sure the stents are properly expanded, without any fractures, and when you are post dilating stents, making sure that your non-compliant balloons are accurately within the stent margins and not outwith in order to avoid edge dissections."*

It's even more useful for his complex calcified cases where visualization of the stent within calcified arteries is sometimes challenging. *"A lot of our patients have heavily calcified coronary disease and often it gets quite hard to see stents when they are implanted. Even implanting platinum chromium stents in heavily calcified vessels can be very hard to see and obviously when we post dilate the stent we want to make sure that our non-compliant balloons are within the stent margins and certainly StentViz is excellent for that. We also use StentVesselViz as well, which is helpful to check that our non-compliant balloons are accurately placed. It's also really good for checking how well expanded the stents are, and making sure you don't have any stent fractures or other problems. We use it a lot here,"* says Dr. Watkins.

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Future of PCI

Both Pr. Oldroyd & Dr. Watkins expect substantial improvements for PCI, whether it be from the device side or the imaging side. According to Pr. Oldroyd, the future of PCI relies on the development of multimodality imaging in the cathlab. He currently has access to IVUS catheters that can do near infrared spectroscopy, and sees great value in catheters ready for multimodality imaging as it helps him to understand the type of coronary disease patients have.

More than the imaging, the dose needed to perform PCI cases is also of great interest to Dr. Watkins, *"I think that GE initative to lower radiation dose during PCI and raise awareness of the dose delivered to the patient during the intervention is important for us as PCI operators. There is a lot of concern regarding interventional cardiologists and lifetime radiation dose exposure."*

Even though the site has recently been equipped with HD IVUS and OCT co-registration, Dr. Watkins also sees great development from the treatment side, especially for complex and very calcified cases; *"In terms of treating calcified coronary disease I think intravascular lithotripsy (IVL) is going to be a big addition to the ornament of dealing with calcified disease. We've already got scoring balloons, cutting balloons, open balloons, and rotational atherectomy, but I think the next device intravascular lithotripsy in the future may be the first line treatment of severe calcified coronary disease."*

When it comes to stents, both physicians agree that a lot of improvements have been made since the introduction of BMS. Despite the results provided by the recent ABSORB III Trial, they are convinced that BVS is not dead.

"As far as PCI is concerned, there has

been a major disappointment in the past few years with bio resorbable scaffolds. They have proven to be no better than conventional metallic stents and possibly harmful in the long term. I personally don't believe that it's the end of the story. I think we will see a new wave of re-engineered bio resorbable vascular scaffold, improved versus the first-generation stents, and we will move towards using devices that in the long term don't leave a permanent metal cage in the artery," says Pr. Oldroyd.

Opening a structural activity

Finally, GJNH has recently opened a TAVI programme. It has been a long road since 2012, when TAVI activity started in Scotland. The main reasons were cost restrictions and government decision to allow no more than one TAVI center for the country,

Demand has increased dramatically since 2012, and the single center in Edinburgh that was providing TAVI for Scotland had to do more than 200 cases a year, which is a lot for one site to deliver.

However, according to Pr. Oldroyd, being amongst the last to start TAVI can also be an advantage.

"First TAVI done in 2002, the first one in the UK was 2007 so we are entering in the TAVI arena at a very late stage. The advantage of that is the technology has become quite mature, and the clinical results are excellent, the length of stay is much shorter, most cases are done transfemorally under local anesthesia."

The closest medical center performing TAVI is in Edinburgh, with a volume exceeding 200 implants per year. GJNH aims to perform 150 cases in the first year, and expand the activity in the following years".

Linking MRI and invasive coronary physiological parameters

Pr. Oldroyd is proud to lead research activities in the cardiology department. Most of his work relates to finding a link between invasive coronary physiological parameters and cardiac MRI imaging.

"During STEMI, we measure (if possible) myocardial blood flow, then we use the MRI (after stenting) to determine the final size of the myocardial fracture. If we can tie these two things together, we can use the blood flow measurement in the cathlab to target new treatments."

And part of the results they published may have changed practice.

"If you have a patient after primary PCI who has very low IMR (index of microcirculatory resistance), we know, from our MRI study, that this patient is going to have a large infarction and a high probability of developing heart failure. Those are the patients on which new therapies can be targeted to try and reduce infarct size. It's a means of trying to select the very high-risk population who potentially will benefit from new treatments."

1. https://www.nhsgoldenjubilee.co.uk/news/press-releases-2014/uks-fastest-heart-attack-treatment/)
data source : National Cardiac Benchmarking Collaborative
JB57196FR

Left Main Bifurcation Stenting using the Culotte Technique

Courtesy of Dr. Stuart Watkins, Golden Jubilee, Glasgow (Scotland)

Case Background

82 yo male

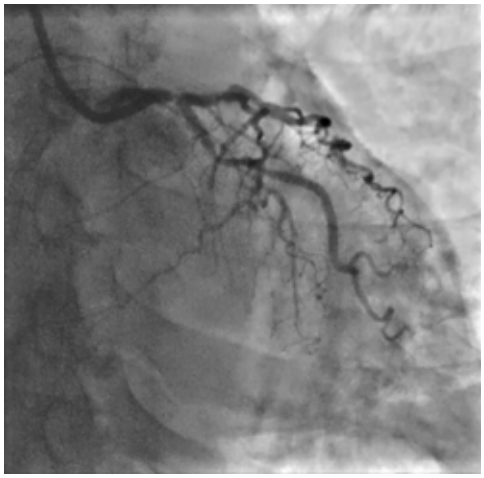
- Known IHD with previous PCI to RCA for angina in 2006
  - 3-mm Driver bare-metal stent
- Polymyalgia rheumatica on prenisolone
- Anaemia with macrocytosis (Hb 121g/dl)
- Iron deficiency anaemia in 2016
- Ischaemic small bowel resection in 2014 (volvulus)
- Duodenal ulcer requiring surgery in 1970
- Raynauds syndrome

Presentation

- Chest Pain requiring GTN infusion to settle
- Lateral NSTEMI diagnosed? with ST depression on ECG
- Troponin I hs 1006 ng/l
- Recent crescendo angina
- Good LV function on echocardiography with no WMA

Coronary Angiogram

The angiogram from one week ago shows a LM (1,1,1) stenosis.



In-Patient Cardiothoracic Surgery Review

- Turned down for CABG in view of comorbidities
  - 82 years old
  - LAD myocardial bridge
  - Anaemia
  - On steroids
  - Previous ischaemic bowel

IVUS is performed on LCx and LAD to help plan the procedure.

Culotte technique overview

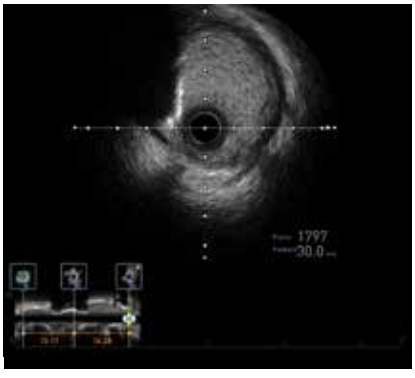


Fig.1 LCx

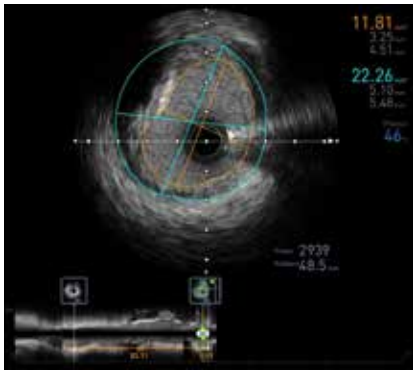
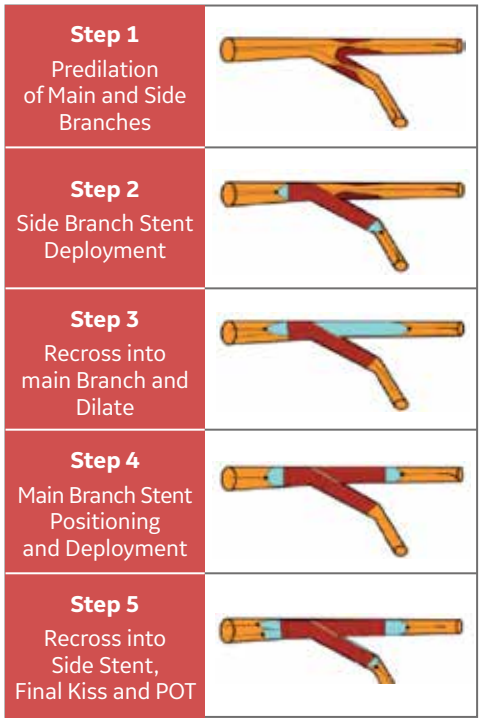
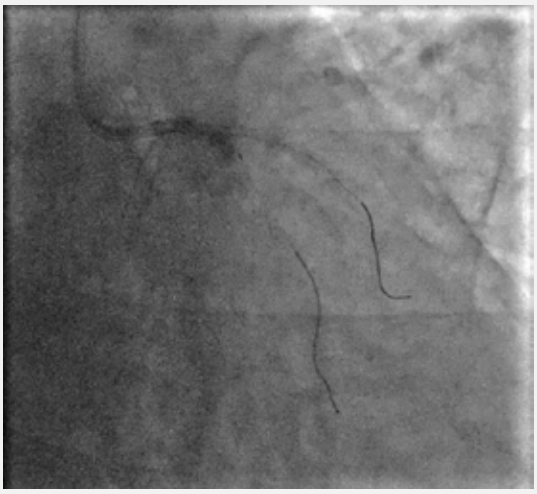


Fig.2 LAD



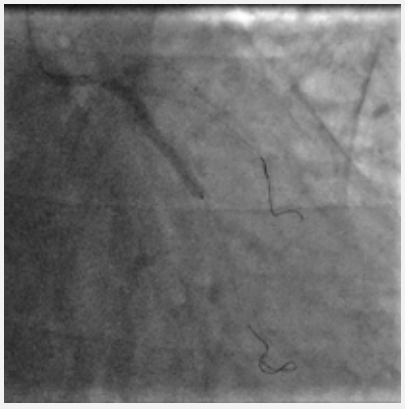
Step 1
Predilation of Main and Side Branches

With 2.5x12-mm NC Emerge balloons
Aggressive predilation of the ostium of LAD and LCx with 3 mm Scoreflex balloon.

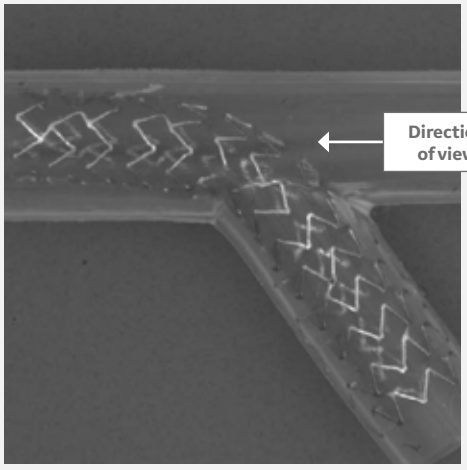


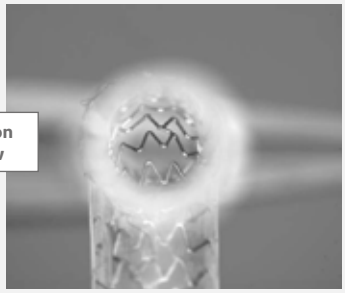
Step 2
Side Branch Stent Deployment

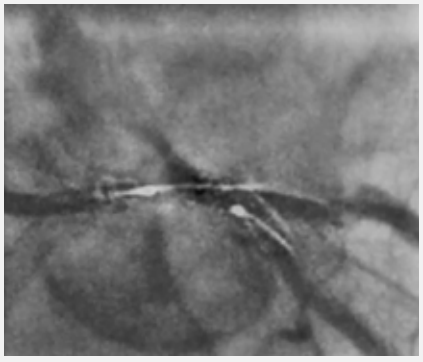
A Synergy 3x38 mm (Boston) stent is deployed from LCx to LM.



PCI ASSIST is then used to assess the position of the POT balloon vs. the carina the LM/LAD bifurcation. POT is performed using a 4-mm NC Emerge balloon.

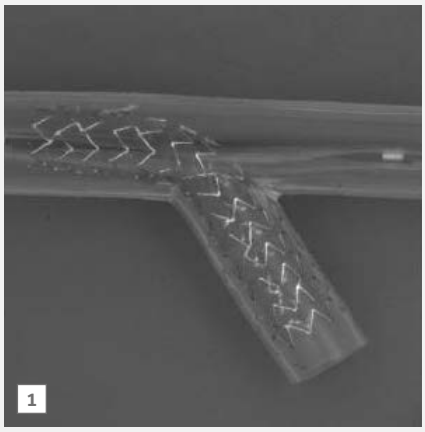


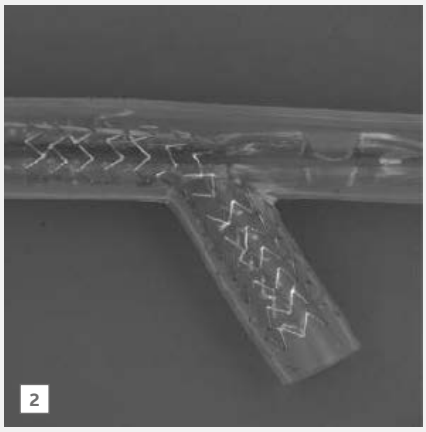


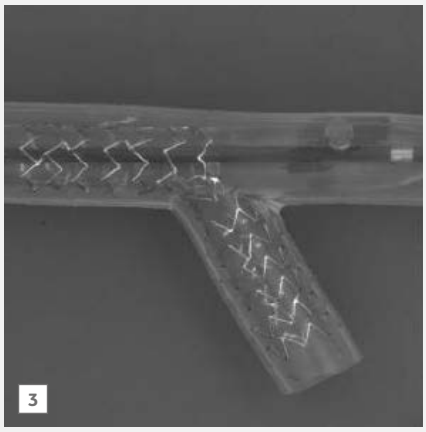


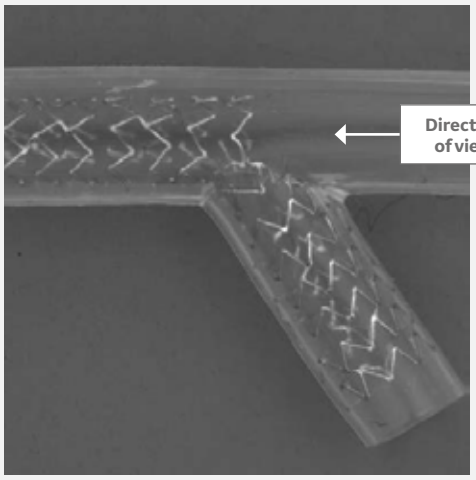
Step 3

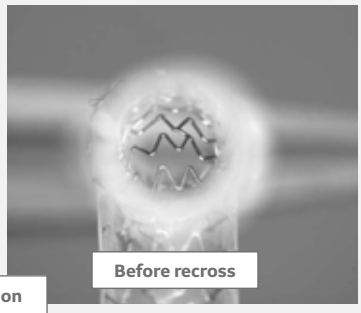
Recross into Main Branch and Dilate

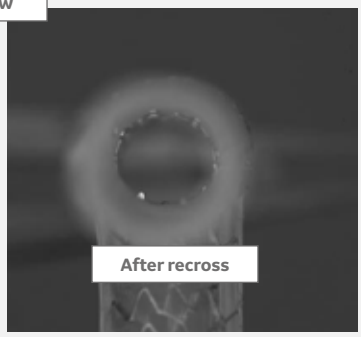




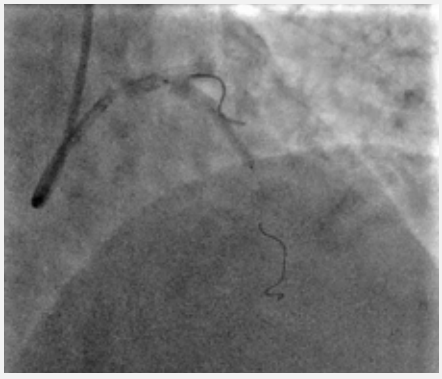




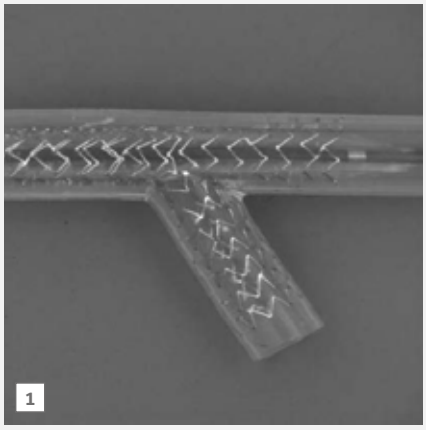




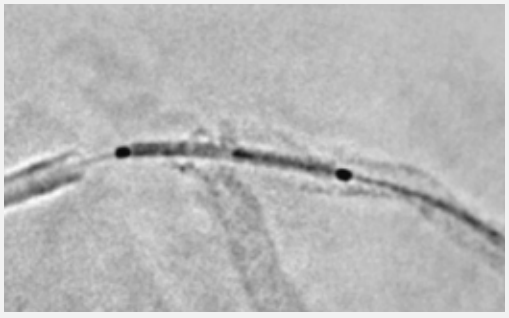
Results after recross:
The pre-dilation was difficult. Anchor balloon technique was required in order to allow a balloon to cross and open struts. Despite aggressive predilation with a 3mm NC balloon, the stent wouldn't cross into LAD. After rewiring the LAD, a Synergy 2.5x24 mm was deployed in the mid LAD.

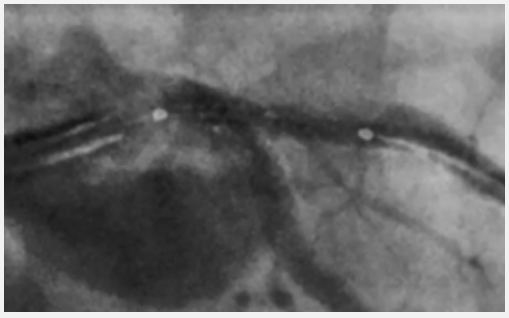


Step 4
Main Branch Stent Positioning and Deployment



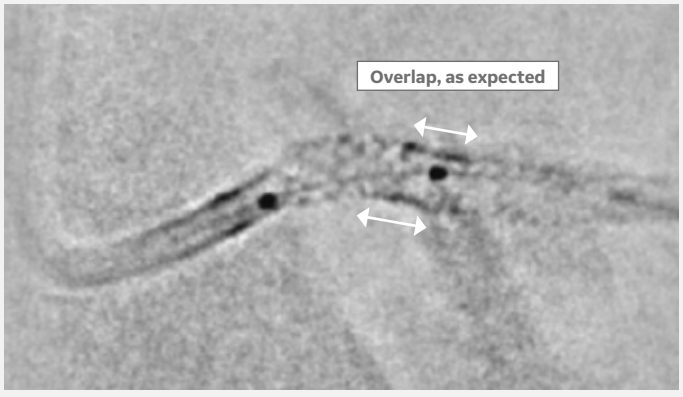
PCI ASSIST is used to visualise the overlap vs. the mid LAD stent



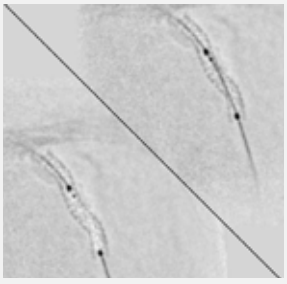


PCI ASSIST is used to accurately position the LM stent, ensuring coverage of the ostium.

Once the stent is in position (SYNERGY 3.5x16 mm), we remove the side branch wire before deployment. PCI ASSIST is used to assess the result and, in particular, to ensure that the ostial left main stem is covered.

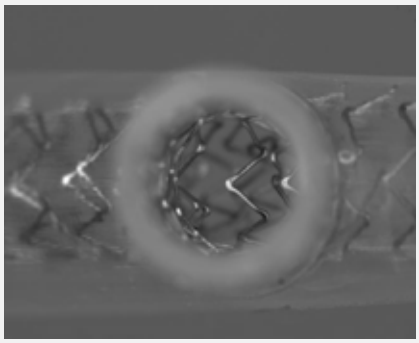


We then post dilate the LAD stent with a 3-mm NC Emerge balloon, using PCI ASSIST to verify the balloon stops at the stent borders



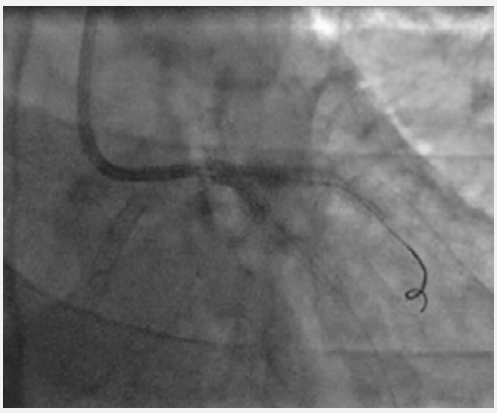
Step 5
Recross into Side Stent, Final Kiss and POT

Side branch before and after final kissing balloons

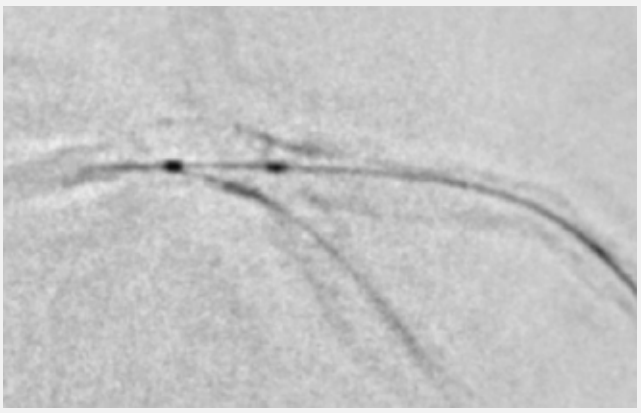


Main artery

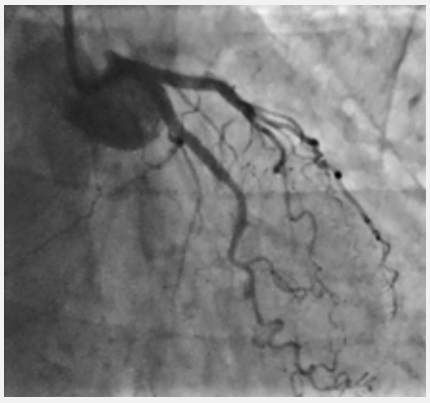
Final kissing balloon inflation is performed with two 3.5x12-mm NC Emerge balloons at 12 atm.

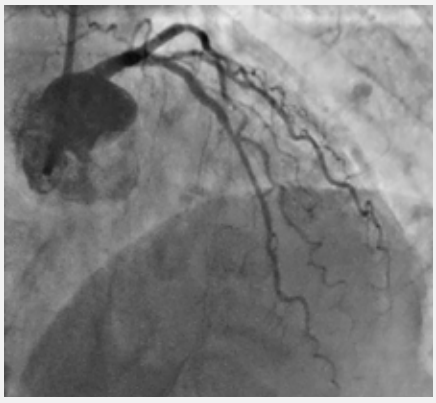


PCI ASSIST is used to position the POT balloon (4.5-mm NC Emerge).



PCI ASSIST can be used to position the POT balloon accurately in the carina and assess the stent expansion.



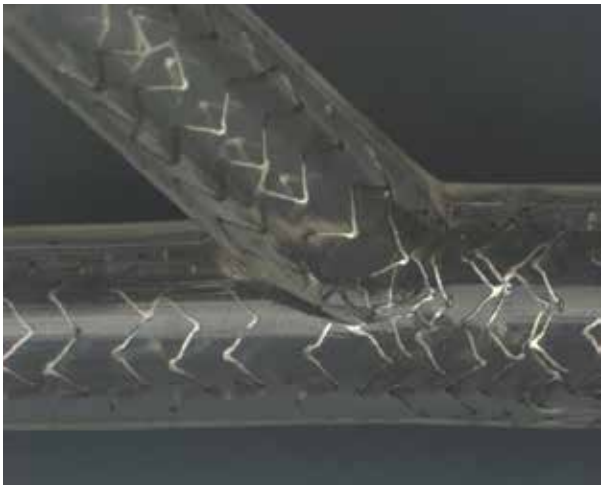


Final angios:
FFR using the Comet pressure wire gives a score of 0.87 for the diagonal and 0.88 for the LAD. Therefore PCI was not required to the diagonal artery.

Conclusion

The culotte technique, although complex, ensured a complete coverage of this left main bifurcation lesion with excellent results. PCI ASSIST was particularly helpful to accurately position stents before their deployment, to make sure they were deployed properly and well expanded, and to guide the post dilation balloons within the stent margins.

The Culotte Technique



Step 1
Predilation of Main and Side Branches

Step 2
Side Branch Stent Deployment

Step 3
Recross into Main Branch and Dilate

Step 4
Main Branch Stent Positioning and Deployment

Step 5
Recross into Side Stent, Final Kiss and POT

Advantages:

- Good radial strength
- Complete coverage
- Best immediate angiographic result
- It may guarantee a more homogeneous distribution of struts and drug
- Can be used for a wide variety of bifurcation angles

Disadvantages:

- Complex, time-consuming
- Rewiring of both branches through the stent struts can be challenging
- More overlapping metal in main branch

Hemodynamics are critical: the role of the Physiologist

Douglas Gordon,
Cardiac Physiologist, Golden Jubilee National Hospital, Glasgow (Scotland)

Please briefly introduce your facility

"We have four cathlabs, three of them are routinely used for coronary interventions and the last one is used for electrophysiology studies. I've worked on a Mac-Lab for 15 years, at two different centers."

Please describe your role in PCI procedures

"My role in PCI procedures is to make the patients as relaxed as possible, and to hook them up to the hemodynamic monitoring system. We routinely monitor 12 ECGs in the center. We have non-invasive blood pressure, oxygen saturation, as well as invasive pressure monitoring.
During the procedure, I'm in charge of logging all aspects of the procedure and of documenting administered medication, staff members present, and devices used. It's also my responsibility to keep an eye on the patient hemodynamic status at any point during the procedure, and to inform staff members of the changes."

What is the most important aspect of a hemodynamic?

"The most important aspect to me, is accuracy and reliability. What I see, what I communicate to the other members of the team regarding the patient's status throughout the procedure, must be accurate. Decisions are made based on measurements so I need to have confidence in the information that is provided."

How easy is it to use?

"I'm not the most competent when it comes to using PCs at home, but in the cathlab, I've never really struggled, I've never been lost with terminology. It's very user-friendly. From the start, when retrieving the patient information on our hospital information system, to the end, when issuing a report containing all measurements, including FFR. During the procedure, I use a combination of keyboard shortcuts and mouse commands. Our macros[1] are all set up. New staff members that have used the Mac-Lab elsewhere may add their own. I also like to run FFR measurements directly from the Mac-Lab."

1 Macros are pre-recorded set of actions within the Mac-Lab that are following the clinical procedure steps, enabling a faster follow-up and documentation of the case.

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.

Combolab system - Intended use:

ComboLab system:
The ComboLab system is a combination of both the Mac-Lab and CardioLab systems. The ComboLab system allows the user to run either the Mac-Lab system or the CardioLab system, although only one system may be used at a time. The ComboLab system runs on the same software, on the same hardware, and in the same environments as the Mac-Lab and CardioLab systems.

Class: Ib

Manufacturer: GE Healthcare (GE Medical Systems Information Technologies, Inc.) 8200 West Tower Avenue, Milwaukee, WI 53223 USA

Notified body: LNE/G-MED, CE 0459

Always refer to the operating instructions before use, and carefully read all instructions to ensure the proper use of your medical device.

JB57200FRa

Point of view of the Radiographer on image quality and radiation safety

Karen Main,
Lead Radiographer for Cardiology, Golden Jubilee National Hospital, Glasgow (Scotland)

Please describe your role in percutaneous coronary interventions

"As radiographers in the cathlab, we are a member of the team and our main role is to ensure - during PCI procedures - the radiation safety of everyone in the cathlab, including the staff, and of course the patient. We operate the imaging equipment and we advise the operators on dose reduction techniques."

What is your main challenge with image quality and dose?

"The main challenge we face is to ensure the best image quality at the lowest dose, thus respecting the ALARA principle 'As Low As Reasonably Achievable'."

What strategy have you put in place to overcome this challenge?

"In our cathlab, all cardiologists are very dose-sensitive. Over the last couple of years, we have reduced the frame rate of fluoroscopy from the standard 15 fps to 7.5 fps.
We encourage or discourage the cardiologist from recording images in a cine acquisition mode, which represents a higher dose; we can do so thanks to the high quality of the fluoroscopy provided by our Innova IGS 5 equipped with PCI ASSIST."

How have you reduced dose in your practice today?

"We also ensure that the table is at the optimal height, and use InnovaSense as well, which is an automatic contouring that brings the detector as close as possible to the patient's skin to reduce direct and scatter radiation."

And how do you do so for obese patients?

"For larger patients - at the beginning of the procedure - we select a specific protocol that has been preset in the system. However, during the procedure, we can change to our lower dose protocol at the table side, depending on the angulations we are using. Some angulations require us to have a higher dose protocol, but others don't, so we can easily switch protocols at the table side to optimize patient dose."

What do you like the most about the Innova IGS?

"I like the Innova IGS system simply because it's very intuitive, easy to practice, and easy to train radiographers on. It has a lot of dose-saving applications which are extremely easy to use. All that we need, then, is effective communication between the operator and the radiographer."

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. JB57199FRa

INTERACT View X

Enhance communication of the Heart Team

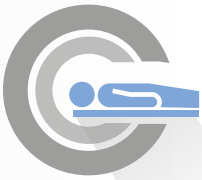
The growth of minimally invasive surgery for ever more complex clinical cases requires the use of imaging modalities in the interventional suite: MRI, CT, or ultrasound. INTERACT combines the capabilities of multiple imaging technologies, connecting them to unlock their full potential and uniting the forces of advanced imaging to fight on behalf of outstanding clinical outcomes.

JB57982FR

FOCUS ON TAVI

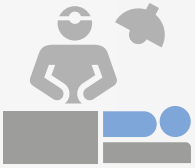
Extracts from: Current status of transcatheter valve therapy in Europe - Results from an EAPCI survey

96%
of the centers performing TAVI use MSCT to assess Valve anatomy prior to TAVI



MSCT used to assess access route
80%

Followed by angiography alone
18%



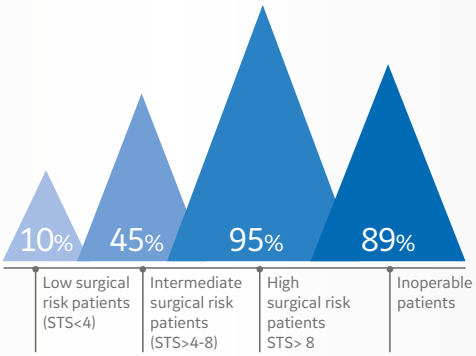
71%
percutaneous femoral access

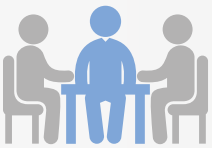
In **46%** of centers, the cardiac surgeon routinely participates as an operator in transfemoral TAVI

15%
femoral surgical cut-down

61%
In the standard catheterisation laboratory

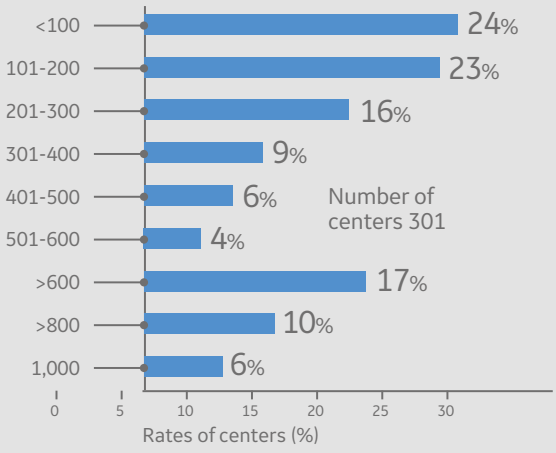
39%
of responding centers in hybrid operating room



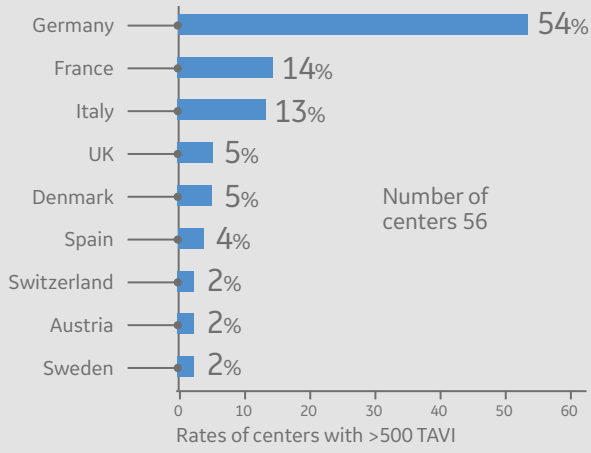


The Heart Team has scheduled meetings in **81%** of centers

Number of TAVI procedures



Rates of centers according to their TAVI experience. All 301 centers are distributed according to their accumulated experience.



Distributions across countries of centers (n=56) that have performed more than a total of 500 TAVI procedures.

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

GE Medical Systems SCS operating as GE Healthcare - 283 Rue de la Miniere, BP 34, 78533 BUC Cedex - FRANCE

JB57456FRa

Efficient TAVI with image fusion

Anna Sonia Petronio,
Head of Cardiac Catheterization Laboratory,
University of Pisa (Italy)

Please introduce yourself and your facility

"My name is Sonia Petronio and I am the Head of the Cathlab department at the University of Pisa in Italy. At this facility, we have been performing interventional cardiology procedures for many years. We have performed TAVI procedures since 2007 and Mitral procedures since 2008."

"The majority of our activity is focused on coronary procedures (60% are ACS patients), and to a lesser extent on peripheral disease and structural heart procedures for adults. We perform approximately 100 TAVI procedures annually and a growing number of MVR procedures, with approximately 30 MVR (MitraClip® as well as cardioband[1]) per year. We are also involved in pre CE marked clinical trials for mitral & tricuspid devices."

What are the main challenges that you have faced with structural heart procedures?

"The prevalence of challenges associated with structural heart procedures has decreased over the past few years, with less Major Adverse Cardiac Events (MACE). To limit such risks, we have focused on reducing paravalvular leaks, positioning valves precisely, and avoiding complications."

"Ten years ago, a TAVI procedure could take couple of hours to carry out. Since the introduction of new technologies, and once we overcame the learning curve, the time needed for such procedures was reduced. The accuracy of patient screening and valve choice was also improved with the increased accuracy of the measurements."

What are your requirements for pre-op CT to enable effective procedure planning?

"We used CT for TAVI since the beginning and did not solely rely on ultrasound. We also recognized the need to have well trained radiologists. We ask radiologists to utilize good gating for the valve and to obtain clear images of the access route. We are the ones who decide on the device implantation. We today use the different devices available on the European market."

Please explain your patient triage and workflow for TAVI procedures

"In the past, the patient would undergo a CT exam during their stay at this hospital. The case would be subsequently discussed within the cardiology team."

"When the patient does not have a history of coronary disease or angina, we do not keep them at the hospital. We do a CT exam to look at the valve and the coronary. If there isn't any doubt on the coronary, the cardiology team screens the patient."

"If there is doubt on coronary arteries or about the patient history, we do a coronary angiogram and then we subsequently perform a TAVI procedure."

"We then obtain the assessment from the radiologist and re-measure everything, which is facilitated by the fact that our cathlab is connected to the radiology department.

We know exactly which valve to use, since we choose it beforehand. On the day of the procedure, we have a screening sheet. We use the CT images prior to the procedure and decide on the best angulation to release the TAVI using Valve ASSIST 2. We register the aorta model from the CT on the fluoroscopy by aligning the pig tail catheter on the non-coronary cusp of the model. This fusion allows us to use less contrast during the intervention."

Please tell us more about the key steps involved in the procedure.

"We rely on the fusion of the CT image on the fluoroscopy image to do the femoral puncture. Since we have the model of the artery displayed on the fluoroscopy, we don't need to inject contrast to check the artery, as we did previously for the valve deployment."

"Valve ASSIST 2 and its calcification[2] enhancement feature is useful: Sometimes calcium is not well seen and its enhancement allows to understand its involvement in the relation between the prothesis and the annulus."

As a leader of the database and registry committee at EAPCI, you recently published the European TAVI survey[3]. Can you please highlight the main findings?

"The survey delivered important information about TAVI procedures and confirmed that what centers are currently doing is inconsistent with the guidelines (more than 300 centers answered the questionnary in 24 countries throughout Europe). Centers are moving to intermediate and low risk patients; however, they do follow screening recommendations. It also highlighted the need to address the reimbursement problem that was identified both for TAVI and for mitral procedures."

Please tell us about the survey on Mitral European centers that also has been published.

"TAVI procedures, which were for high risk patients at the beginning, have generated more adverse events, but when the technique was acquired, the procedure has not only demonstrated to be safe but also effective in different cohorts of patients. For patients undergoing mitral procedures, centers are not behaving as they do for TAVI procedures, the technique has not increased that much because the pathologies and technologies are more complex than the aortic one."

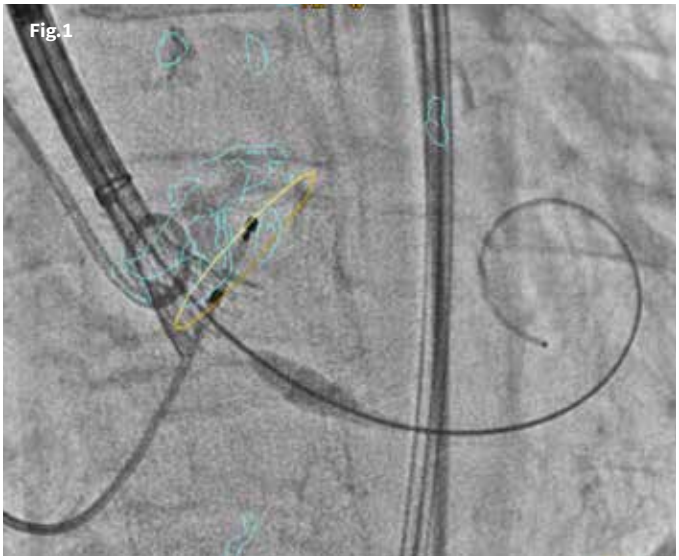


Fig.1 Beginning of valve's releasing: Valve ASSIST 2 view using calcification enhancement feature, fused with annulus plane and calcifications coming from the pre operative CT scan.

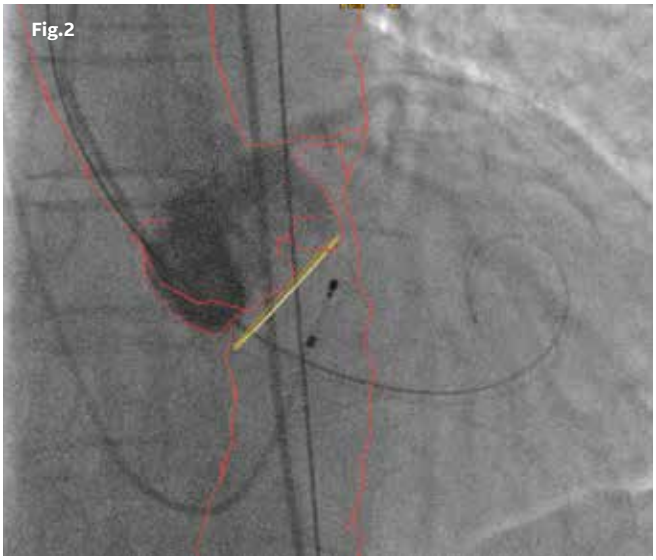


Fig.2 Fusion of pre-op CT with Valve ASSIST 2, gantry position perpendicular to the annulus plane

1 Cardioband Mitral System, Edwards Lifesciences
2 Calcification enhancement is part of Valve ASSIST 2
3 Current status of transcatheter valve therapy in Europe: results from an EAPCI survey, Petronio et Al, EuroIntervention 2016

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*GE Cares is a **community** where you **connect** with healthcare professionals, **share** your experience, publish contents and **learn** new techniques by having a direct access at the clinical webinars, protocols, clinical cases helping you improve your skills. You can also contact GE application specialists whenever you need to ask a question or get supported.*

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FOCUS ON YOUR PATIENTS
Our systems are low dose by design

GE IS A LEADING PLAYER IN DOSE REDUCTION

Automated radiation dose reduction
Without any manual intervention

- 46% DAP reduction for CA[1]
- 56% DAP reduction for PCI[1]
- 54% DAP reduction for CA + PCI[1]

CTO-PCI USING DOSEMAP

- -31% CAK reduction[2]
- -33% DAP reduction[2]

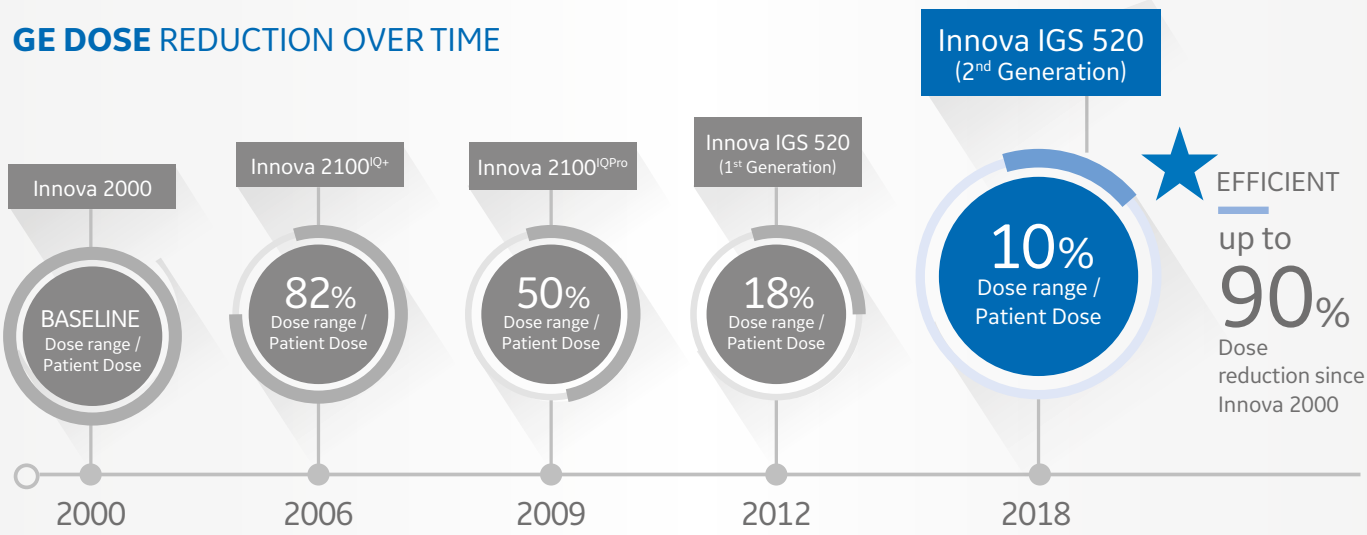
TAVI WITH VALVE ASSIST 2

- -30% dose[3]
- -38% contrast media volume[4]

LAAC WITH VALVE ASSIST 2

- -28% procedure time[5]
- -25% fluoro time[5]
- -78% contrast media[5]

GE DOSE REDUCTION OVER TIME



Introduction of a new detector and new processing

- New generation of automatic dose exposure
- Dynamic 7,5 fps
- Improved tube performance
- Image noise reduction

Image quality improvement, with the same dose

- PCI ASSIST

1. Didier, R., et al., The utilisation of the cardiovascular automated radiation reduction X-ray system (CARS) in the cardiac catheterisation laboratory aids in the reduction of the patient radiation dose. EuroIntervention, 2016. 12(8): p. e948-e956
2. Euro17A-POS0652 Intra-procedural characterisation of estimated peak skin dose during PCI of CTO using a new patient dose mapping technology: the Dosemap studyMANGIAMELI A.(1), LEFEVRE T.(1), HOVASSE T.(1)(1) ICPS, Massy France
3. Overtchouk P, Sudre A, Delhaye C et al. Advanced image processing with fusion and calcification enhancement in transcatheter aortic valve implantation: impact on radiation exposure. Interact Cardiovasc Thorac Surg 2018.
4. Shafiq A, O'Hair DP, Allaqaband SQ, Ullah R, Nfor T, Bajwa T. TCT-353 Effect of a New Enhanced Fluoroscopy Technology (Valve ASSIST2) on Contrast and Radiation Use in Patients Undergoing Transcatheter Aortic Valve Replacement. Journal of the American College of Cardiology 2017;70:B145-B146.
5. Novel Integrated 3D Multi-Detector Computed Tomography and Fluoroscopy Fusion for Left Atrial Appendage Occlusion Procedures. Catheter Cardiovasc Interv 2017; Mar 17, DOI:10.1002/ccd.26998

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JB57454FRa

Pulmonary Vein Isolation with 3D Rotational Angiography

Experience of Dr. De Potter, OLV Aalst (Belgium)

The Arrhythmia Unit of OLV Aalst is a recognized EP center of excellence with more than 1100 electrophysiology procedures a year, of which 40% are pulmonary vein isolation (PVI) procedures for atrial fibrillation.

Becoming more autonomous with accurate, low dose pre-operative imaging

Dr. De Potter,
OLV Aalst Hospital (Belgium)

Could you please let us know about your workflow in performing AF ablation?

"There are few landmarks when using two dimensional (2D) fluoroscopy in the left atrium, and precise energy must be delivered to complex three-dimensional (3D) structures during pulmonary vein isolation (PVI). This is why 3D imaging can add significant value to procedures for the treatment of atrial fibrillation (AF)."

"Ten years ago, the workflow at OLV Aalst for AF ablation required patient admission the day before the procedure, in order to perform a computed tomography (CT) acquisition which is subsequently used to create a 3D image for guiding the PVI procedure."

In 2010, three new labs were each equipped with Innova 2100 systems. The systems provided the capability to do 3D rotational angiography (3DRA) and Dr. De Potter was eager to integrate this new functionality into the workflow. Since then, reconstructed 3DRA has been used as a substitute for pre-operative CT imaging to capitalize on several benefits that will be further explored below:

"3DRA volumes correlate well with CT derived volumes, the most common pre-operative 3D imaging modality. Considering the average effective dose of 3DRA in the LA is 1/5 that of CTA, there is strong incentive to use it as a substitute," says Dr. De Potter. Importantly, 3DRA can be done on the same day of the procedure, eliminating the need to coordinate with external imaging teams, and saving the patient an additional trip to the hospital before his/her procedure."

"At OLV, the option of 3DRA as an alternative to CT was timely as PVIs tripled in the past decade. For example, the logistical freedom of decoupling CT imaging from the workflow was critical, as the CT department could not support the increased demand from the EP practice."

"Finally, when 3DRA is integrated with electro-anatomical mapping (EAM, eg. CARTO 3 System[1]), there is the potential to have near zero effective operator dose (~1µSv outside the lead apron, well below the daily natural background radiation) and very low effective patient dose (~1mSv, mainly from the 3DRA acquisition)."

"The resulting workflow is fast and highly reproducible," comments Dr. De Potter.

What are your thoughts on the partnership with GE to develop your 3DRA workflow?

"Overall, the learning curve was not very difficult. Thanks to the help from GE, we got up and running very quickly. The result is a very low dose 3DRA, with a protocol which is reproducible for every patient and has very good image quality."

From your perspective, what are the key benefits of using 3DRA instead of CT?

"In comparison to pre-op imaging, 3DRA allows near real-time imaging. The volume is acquired just before or during the ablation. This avoids volume mismatch and changes in cardiac frequency or patient position, which has an influence on the chest geometry. Not only does 3DRA offer advantages in terms of accuracy, it also has logistic and cost-effective benefits."

What is your preferred ablation technique and why?

"Currently, I practice different ablation techniques (Laser, Cryo, and RF). Most of the PVIs in OLV are done through radiofrequency. RF ablation facilitated by 3DRA and CARTO EAM[2] is the most efficient approach, with better outcomes and reproducibility of the procedure. Duration of the procedure is predictable within a range of 5 min. On the other hand, cryo-balloon procedures are very variable, depending on the difficulty of the case, and can last up to one hour longer."

Please describe a challenging case where Valve ASSIST 2 has helped you?

"When using single-shot devices such as cryo-balloon catheters, Valve ASSIST 2 is uniquely intuitive. You have an immediate anatomic overview; it's easier to foresee problems and anticipate. This makes it easier to keep your focus on what you are doing.

Valve ASSIST 2 is also very helpful during left atrial appendage closures, as it provides an immediate overview of the anatomy, and helps guide the procedure."

What are your key findings regarding dose?

"We did a lot of dose measurements and we consistently measured patient effective doses around 1 mSv (mainly from the 3DRA acquisition, which is a substitute for CT) and operator doses, measured outside the lead apron, around 1 µSv."

Apart from visualization tools, what new/recently developed technologies are you using to improve the reproducibility and quality of clinical outcomes?

"Contact force and tools for lesion assessment brought a lot of improvement."

Workflow used in Aalst: Three-dimensional Rotational Angiography and Electroanatomical Mapping Integration

Further integration of imaging modalities has led to the linking of existing fluoroscopy systems to EAM systems. This allows an EAM system to display 2D X-ray backgrounds corresponding to a particular orientation and fuse them with the 3D display. The intuitive application of such a feature is catheter positioning (e.g. coronary sinus placement) with minimal use of fluoroscopy. More importantly though, this integration means the fluoroscopy and EAM system now share a single coordinate system – any point in 'true' 3D space is defined precisely and identically in both systems. As a result of this, a linked fluoro-EAM system is able to display a 3DRA-derived volume in its correct position without having to collect even a single anatomy point from the catheter, eliminating any experience barrier and eliminating the potential for 'missed' regions of anatomy.

Extract from Arrhythm Electrophysiol Rev. 2014 Nov; 3(3): 173–176. Published online 2014 Nov 29. doi: 10.15420/aer.2014.3.3.173

1 Bioscience Webster
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., hospitals size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

2 EAM, electroanatomical mapping

Using Rotational Angiography to guide Atrial Fibrillation Ablation

Courtesy of Dr. De Potter, OLV Aalst (Belgium)

Clinical Challenge

Percutaneous catheter ablation for atrial fibrillation is a standard treatment after failure of at least one antiarrhythmic drug. Navigating through the complex and variable anatomy can be very challenging. Therefore, real-time anatomic information of the left atrium and pulmonary veins is of utmost importance to help guide the operator to perform a durable pulmonary vein isolation.

Solution

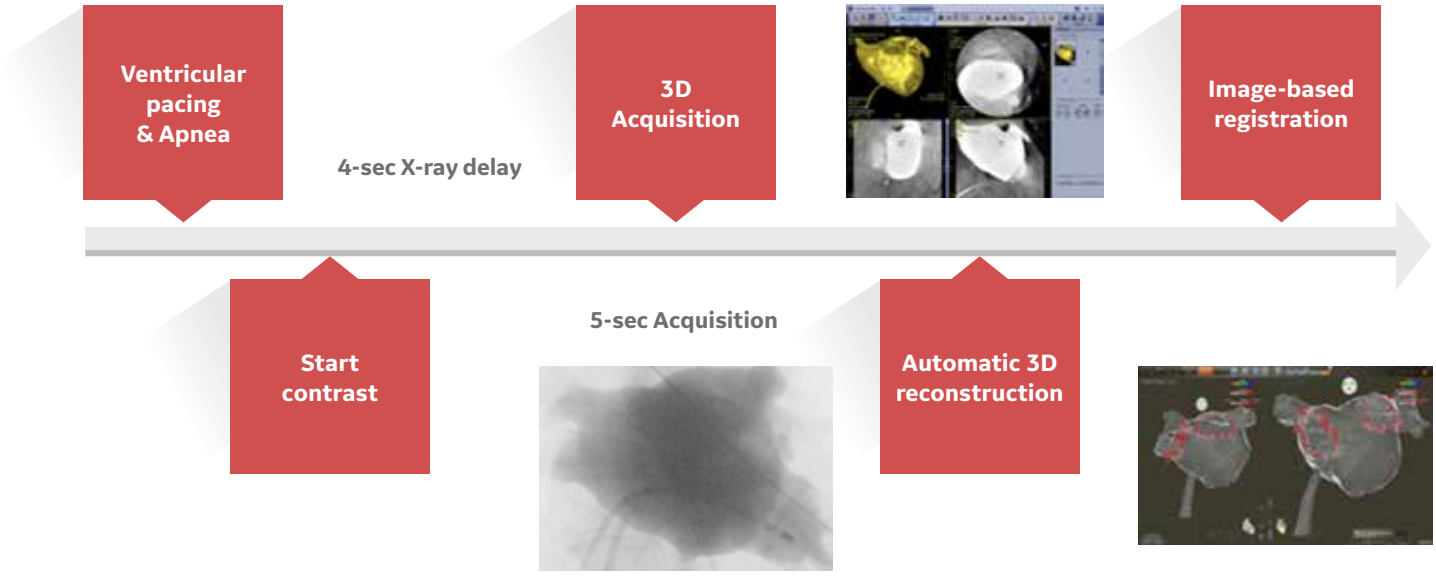
The radiofrequency ablation is performed with an Innova 2100 monoplane system, in combination with Carto® (Biosense Webster, CA, US).

Clinical Case

Paroxysmal, drug refractory atrial fibrillation in a 44-year old female patient.

Procedural Workflow

The entire procedure is performed under general anesthesia to facilitate the transoesophageal echography (TEE) and to increase patient comfort. TEE and fluoroscopic guidance are used to help guide the transseptal punctures and the positioning of the catheters.
Once the pigtail is positioned in the left atrium (LA), the LA anatomy is centered in the ROI, prior to performing the 3D acquisition.



Following completion of the rotational angiography (RA), an automatic 3D reconstruction of the left atrium and pulmonary veins is performed with Valve ASSIST 2. Additional fine tuning of the 3D model is possible. In this case, the pigtail catheter was added to facilitate the registration of the 3D volume in the mapping system.

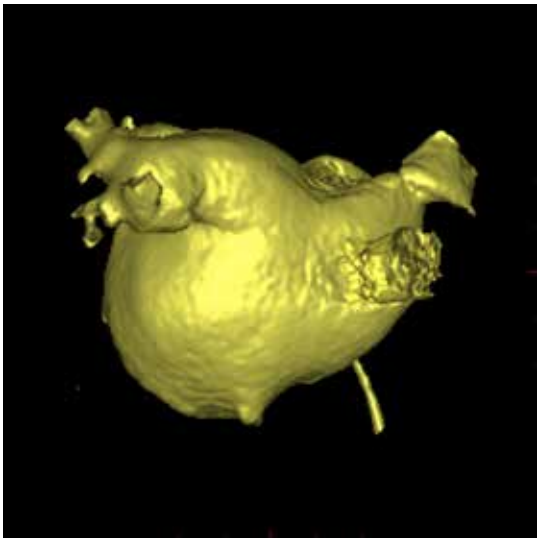


Fig. 1 Postero-anterior view of the left atrium. Automatically reconstructed with Valve ASSIST 2.

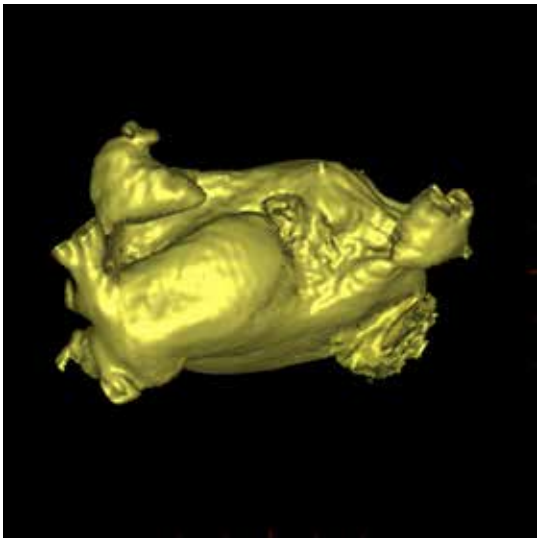


Fig. 2 Supero-inferior view: big common ostium of the left pulmonary veins. Automatically reconstructed with Valve ASSIST 2.

As a result of the advanced integration between the Innova and the mapping system , we can display the 3DRA volume in its correct position, without the need to create an electroanatomical map. The 2D images of the RA are used for registration, since both systems are linked.

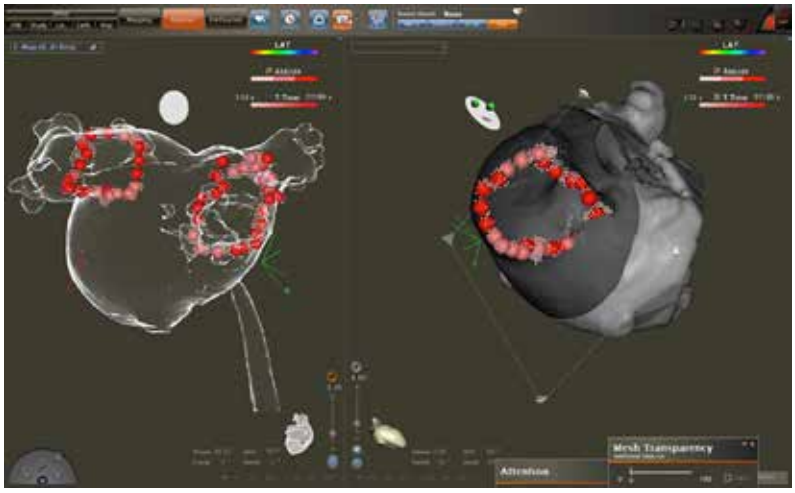


Fig. 3 3DRA volume guiding the Radiofrequency ablation in the mapping system*.

Conclusion

Complete isolation of the pulmonary veins was achieved with almost zero fluoroscopy for the operator, and a very low radiation dose for the patient, within only 57 min.

DAP	3,1 Gy.cm2
Air Kerma	34,1 mGy
Procedure Time	57 min
Operator Dose	< 1 µSv

* CARTO 3 System Biosience Webster

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.

JB57590FR

Treatment of AF with cryoablation using ASSIST

Courtesy of Dr. Serge Boveda, Clinique Pasteur, Toulouse (France)

Cryoablation Treatment

Pulmonary vein isolation by catheter ablation is recommended for the treatment of severe drug-refractory atrial fibrillation.
The difference with radiofrequency is the type of energy used to destroy the tissue: cryoenergy. With radiofrequency, the destruction is done step by step on the tissue, in different areas, which implies the need for an imaging system and cartographic navigation.
Cryoablation allows the use of a balloon that delivers the sub zero temperatures to the entire tissue, and guidance can be done under fluoroscopy.

Planning of the Procedure

At Clinique Pasteur, preoperative CT is performed on all patients who need to be treated with atrial fibrillation ablation.
Prior to the intervention, the physician extracts a 3D reconstructed model of the left atrium from CT images using Valve ASSIST 2.
This is useful for analyzing the anatomy, especially if there are anatomical variations: " In 30% of cases the patient has a single venous trunk or supernumerary pulmonary veins on the right or on the left," comments Dr. Boveda.

Guidance of the Ablation

During a cryoablation of atrial fibrillation, the main clinical challenge is the guidance to catheterize the pulmonary vein and to visualize the anatomical shape of the region of interest during the procedure.
Anatomic volumes extracted during the planning phase from the CT scan: left atrium, pulmonary veins and bronchus are then fused on live fluoroscopy using Valve ASSIST 2.
The additional anatomical landmarks that are provided are helping the physician to reach the ostium of the pulmonary veins with more precision: Navigation of ablation catheters in the heart is then made easier.

"Before we had these tools, we were working with a traditional fluoroscopic image, and we had the pre-operative CT scan. We therefore had the general anatomy, but not the fusion of the two images in our EP lab. It required more mental effort on our part to do this fusion in our minds, while manipulating the catheters at the same time. Our experience helps a lot, of course. In terms of understanding of the anatomy and ease of procedure, this new tool really brings some precious help," comments Dr. Boveda.

Education of the Next Generation

Image fusion is also a good educational tool. The learning curve of new generation rhythmologists is faster because these tools are bringing useful information. *"There is much better integration of anatomical knowledge into the learning process. Imaging is much better than before, with better quality, and it is more reliable."*

"Image fusion is also interesting for left atrial appendage closure. In these cases, we need the image fusion for the trans-septal puncture and then during the guidance, to reach the optimal incidence for the positioning and deployment of the device."

"Image fusion helps to anticipate the intervention for better guidance, to reach the target areas more easily, treat this area more efficiently and certainly, optimize the patient outcomes. "

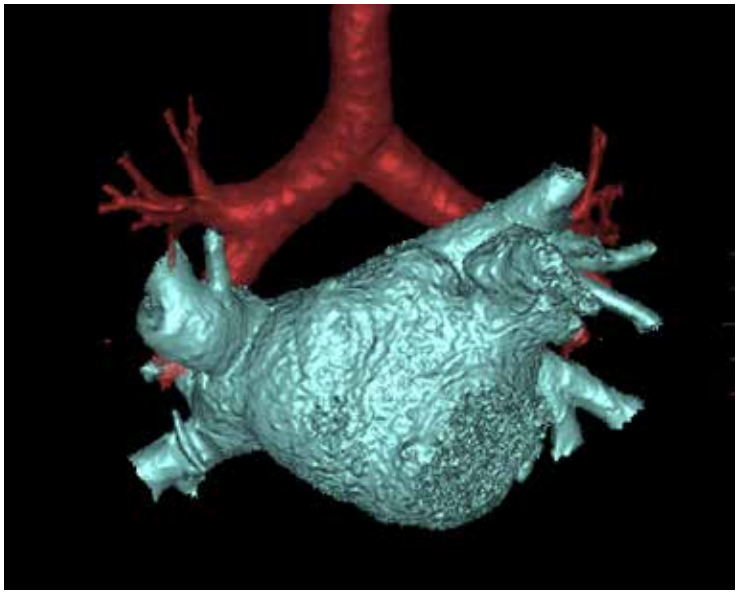


Fig. 1 The patient's pulmonary veins are relatively typical, with a large upper right pulmonary vein

Clinical Example

Example with a 54-year-old male patient with a BMI of 32, who was admitted for a recurrence of his paroxysmal atrial fibrillation, poorly tolerated and refractory to antiarrhythmic treatment.
He was treated, 10 years earlier, by radiofrequency ablation in the pulmonary veins, with satisfactory results until these past months.
In the past few months, the patient had several episodes of arrhythmia. This can be attributed to a reconnection of one of the pulmonary veins.

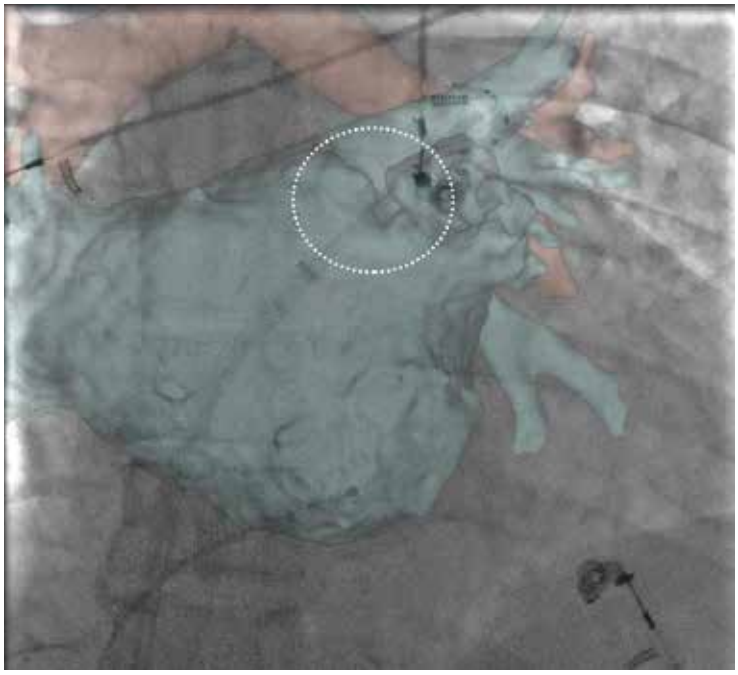


Fig. 2 Pre-operative CT scan fused with live fluoroscopy using Valve ASSIST 2. Optimal angulation to apply cryoablation is found without emitting x-rays: the CT scan model follows the motion of the IGS system

Procedural outcomes

Successful pulmonary vein isolation using 10 cc of contrast media and DAP 6 Gy.m² for 11 minutes of fluoroscopy in a 1-hour procedure.

*CARTO®3 System, Biosense Webster®.

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JB57592FR

EP IN EUROPE – SOME KEY FACTS AND FIGURES

PREFERRED PRE-OP IMAGING FOR ABLATION[1]

48%
CT

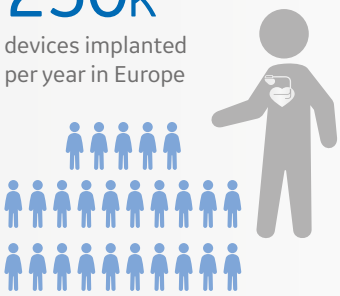
52%
mixed between Ultrasounds, MRI and Rotational Angio

MOST FREQUENTLY USED ENERGY SOURCE FOR ABLATION[2]

78%
RadioFrequency

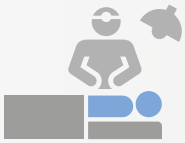
20%
Cryoablation

250K
devices implanted per year in Europe



67%
ablate persistent and paroxysmal AF[3]

31%
of sites do long-standing persistent AF



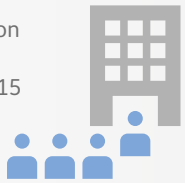
50,000
ablations per year[5]

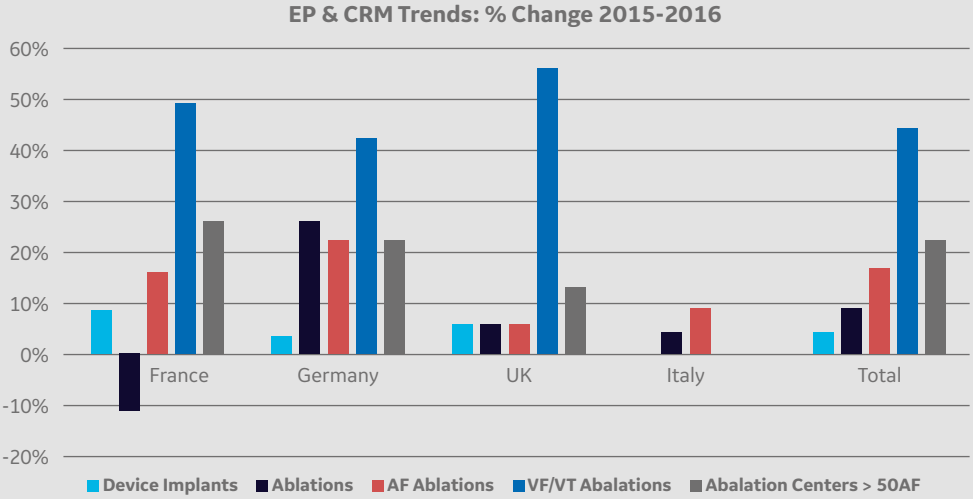
50%
of sites perform >400 implants per year[4]

AF patients to increase from 10M (2014) up to 17M (2030)[6]

17% AF ablation growth

44%
VF/VT ablation growth[3] Between 2015 and 2016





1. 2. 3. Europace (2014) 16, 1078-1082; Survey of 58 hospitals with 327 EP consultants and trainees
4. EHRA Whitebook
5. Europace (2014) 16, 1236-1239
6. Europace (2015) 17, 1149-1152
7. Epidemiology of atrial fibrillation: European perspective. Clinical Epidemiology. 2014;6:213-220.

JB57984FR

CardioLab systems enhance workflow with multiple access points for data entry

* INTEGRATE DATA FROM MULTIPLE WORKSPACES INTO ONE SOURCE WITH NETWORKED MOBILE WORKSTATIONS
(Carescape Integration automates the documentation of vital events (HR, NIBP, RR, etc.) from the Pre/Post Clinical Client Workstation into the procedure log)

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