



# EuroEcho Imaging 2016

EDITION

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## Congress-News

Saturday 10 December

### An update on the European Heart Journal on CardioVascular Imaging

by Prof. G. Maurer, Editor-in-Chief of the European Heart Journal, and Medical University of Vienna, Austria

The past few years have seen a number of changes to the EACVI's journal, now known as the European Heart Journal on CardioVascular Imaging (EHJ-CVI), that have led to a growth in its stature and profile within the field.

For example, the number of submissions to the EHJ-CVI has risen dramatically over recent years. In 2010, when it was still the European Journal of Echocardiography, there were 673 submissions, while this year the journal is expected to receive over almost three times that number with an anticipated 1,700 submissions.

Looking at the origin of submissions reveals that the journal has become truly international, which has been one of our core objectives. Although, when looking regionally, the majority of submissions still come from within Europe, the country that submits the most papers is the USA, followed by Italy and then Japan.

Due to the huge increase in the number of submissions, the journal, which has a fixed number of pages, currently accepts only around 15% of the original papers that are received. In the future, it may have to become even more stringent about the papers that it will accept.

#### Having an impact

In 2012, the European Journal of Echocardiography was expanded to also incorporate imaging modalities



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such as cardiac magnetic resonance, nuclear imaging, computed tomography and intravascular imaging, including intravascular ultrasound and optical coherence tomography. This was a significant change and initially there was a large degree of apprehension about changing a journal felt to do reasonably well at the time. While some considered the move to be a risky endeavour, the EACVI board felt that there was a strong need for a European journal that covered the entire field of cardiovascular imaging.

Looking just at the journal's impact factor, it can be seen that the decision was a success. In 2010, when the journal was still the European Journal of Echocardiography, the impact factor was from 2.1. However, it had risen to 4.3 by 2015, placing the EHJ-CVI slightly ahead of the Journal of the American Society of Echocardiography. The long-term aim is for the EHJ-CVI to reach the same level as JACC Imaging and Circulation Cardiovascular Imaging.

The decision to expand the journal to include other imaging modalities was

also one of the catalysts for the European Association of Echocardiography to evolve into the EACVI, and the success the journal has enjoyed since its expansion has demonstrated the excellent and mutually beneficial cooperation between the various branches of cardiovascular imaging.

#### Explosion in downloads

However, a journal's impact factor is only one metric that indicates its standing. For example, the number of full text downloads per month from the EHJ-CVI website has increased substantially over the past few years, growing from an average of around 20,000 per month in 2010 to almost 100,000 per month in 2016, indicating a five-fold growth in downloads in as many years.

Another important aspect of the EHJ-CVI is that it is the home of the EACVI's recommendation papers. Some of these are developed by the EACVI alone and others in cooperation with other societies, such as the American Society of Echocardiography. In the last year, consensus and recommendations papers produced by the EACVI have featured among the most-cited papers published by the EHJ-CVI, including the Recommendations for the imaging assessment of prosthetic heart valves, chaired by EACVI Past-President Patrizio Lancellotti, Liège, Belgium, and the EACVI/EHRA Expert Consensus Document on the role of multi-modality imaging for the evaluation of patients with atrial fibrillation, chaired by Erwan Donal, Rennes, France.

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Everything that you need  
to know about positron  
emission tomography  
by Prof O. Gaemperli

Positron emission tomography (PET) is one of the variety of imaging modalities at the disposal of cardiologists nowadays. However, it still lags behind the other modalities in terms of its prevalence and global availability, as it is one of the most complex techniques. This article discusses how PET works, how it is used clinically, the pros and cons, and its place in research.

Don't miss  
Saturday 10 December

- 08.30-10.00  
Case based session:  
"See that case at least once",  
Agora
- 11.00-12.30  
EuroEcho-Imaging 2016  
Highlights,  
Room Mahler

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# Everything that you need to know about positron emission tomography

**Prof. O. Gaemperli, Chair of the EACVI Section for Nuclear Cardiology & Cardiac CT, and Prof. of Cardiac Imaging and Intervention at University Heart Center, Zurich, Switzerland**

Positron emission tomography (PET) is one of the variety of imaging modalities at the disposal of cardiologists nowadays. It has earned its place alongside echocardiography, cardiac magnetic resonance imaging (CMR), single-photon emission computed tomography (SPECT) and cardiac computed tomography (CCT) as one of the major imaging modalities.

However, PET still lags behind the other modalities in terms of its prevalence and global availability, as it is one of the most complex techniques. Nevertheless, its high accuracy and versatility means that PET has been employed in a large number of research projects, and the last 10 years have seen a steady increase in its clinical use across Europe and the USA.

## How does PET work?

PET uses mildly radioactive compounds (tracer) injected into the patient's blood stream. The way in which the tracer is distributed around the body depends on the biological characteristics of the compound. Inside the body, the molecule emits radiation that is picked up by the detector ring of the PET scanner, and generates the imaging signal.

The peculiarity of PET is that the radionuclides used for PET imaging decay by emitting positrons (the anti-matter of electrons). These positrons collide with extranuclear electrons of other atoms in a reaction called an annihilation reaction, where both the positron and electron are converted into gamma rays, with an energy of 511 keV. The gamma rays leave the site of the annihilation reaction at an angle of 180°. This feature is exploited for imaging whereby a line of response is drawn between two coincident hits in the PET detector ring, allowing to allocate the source of decay along this line of response. Novel scanners with ultra-efficient detectors may even narrow the source of decay by calculating the time offset (in nanoseconds) between coincident hits on the detector ring.

Compared to other radionuclide techniques such as SPECT, the PET technique has important advantages. It has higher spatial resolution, which for modern PET scanners lies



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in the range of 4–5 mm, compared to a resolution of 8–10 mm with conventional SPECT scanners. PET also has more robust and accurate attenuation correction, usually with a transmission scan, than that available for SPECT, hence PET images are more reliable and attenuation defects are more predictable particularly in obese patients. Finally, myocardial perfusion can be quantified in mL/min/g with PET (absolute blood flow quantification) by tracking the bolus of tracer running through the heart and acquiring dynamic image frames with list mode protocols.

## How is PET used clinically?

There are two main indications for the use of PET in patients with heart disease: Myocardial perfusion imaging (ischemia) and myocardial viability imaging (hibernating myocardium/scar).

To examine myocardial perfusion, PET is often used to detect coronary artery disease (CAD) in patients with symptoms suggestive of angina. It is carried out in a very similar way to stress imaging techniques, such as CMR and SPECT: The patient is injected with a radionuclide during some form pharmacological stress testing, which is usually performed using a vasodilator agent such as adenosine or dipyridamole. This is followed by a second image taken during a period of rest, and the two images are compared. While direct head-to-head comparisons between different techniques are scarce, some systematic reviews indicate that PET is among the most accurate.

The advantage of PET over SPECT for ischaemia imaging is that PET has the ability to quantify myocardial blood flow in mL/min/g of myocardial tissue (as mentioned above), where-

as SPECT can only detect relative differences in myocardial perfusion compared to remote territories. This gives us an idea of the maximal blood flow running in the coronary vasculature under stress conditions, and thereby not only assesses whether the patient has any significant stenoses, but may also interrogate the microvessels (which represent the main source of the resistive forces to coronary blood flow within the heart). We can therefore use PET to assess, for example, the degree of microcirculatory dysfunction that occurs in a number of coronary or non-coronary diseases of the heart (e.g. dilative or hypertrophic cardiomyopathy, Fabry disease, diabetes mellitus or after coronary interventions). This value has also turned out to be an important prognostic indicator, alongside other clinical parameters such as age, left ventricular ejection fraction (LVEF) and myocardial ischaemia.

The second clinical indication for PET is to assess myocardial viability in ischaemic cardiomyopathy patients suffering primarily from heart failure symptoms. This is usually carried out using 18-F fluorodeoxyglucose (FDG), which is a radiopharmaceutical analogue of glucose that is taken up by metabolically viable cells in the presence of chronic hypoxaemia. This allows us to detect areas in the myocardium that, despite being dysfunctional (i.e. low or absent contractility), remained viable and have preserved metabolism but subsist in a state of functional hibernation. This “hibernating myocardium” can be restored to myocardium with normal contractility via reopening the occluded vessels by either percutaneous coronary revascularisation or coronary artery bypass graft surgery. Using FDG PET to assess myocardial viability can very accurately identify areas within the heart with hibernating myocardium and predict their functional recovery, alongside improvements in global LVEF and exercise capacity. Moreover, a number of prospective studies have shown improved clinical outcomes when patients with large areas of hibernating myocardium underwent appropriate revascularization rather than medical treatment.

## Are there any drawbacks of PET?

Like any other imaging technique, PET is not without shortcomings. The main limitation of PET is its limited availability, which is partly due to needing a cyclotron to generate the very short-lived radioactive sub-

stances prior to injection. A cyclotron is similar to a small particle accelerator, which is costly and requires significant operational and maintenance resources. This is why cardiac PET imaging is not (or not fully) reimbursed in most European countries. Consequently, not all hospitals have a cyclotron available for the production of the radionuclides and delivery of tracers from remote cyclotrons is often not possible due to the very rapid decay of positron-emitting radionuclides (with the exception of FDG). Current research is aimed at developing new PET perfusion tracers that can be labelled with 18-F, which has more favourable decay characteristics and therefore could be shipped on demand to remote sites without cyclotron facilities.

Finally, PET, like any other radionuclide imaging technique, exposes the patients to ionizing radiation. However, the radiation doses tend to be lower than those for SPECT. FDG PET can be performed with a cumulative radiation exposure of not more than 8 mSv, and perfusion imaging generally has lower doses.

## Can PET be used for research?

PET has a lot of potential for research, as it can pick up very small traces of radioactive substances in any part of the body. As a consequence, you need only nanomolar concentrations of the molecular tracer to be picked up by the region of interest. Researchers can therefore bioengineer molecules directed to a specific target within the body, which can then be labelled with a positron emitting radioactive nuclide and then injected into the patient.

This so called “molecular imaging” opens a number of interesting avenues for research and very personalised treatment strategies: For instance, PET could be exploited to image specifically a molecule that goes awry in a very early stage of the development of a disease. This may help researchers to elucidate the basic pathophysiological mechanisms, as well as detect individuals who may be at high risk of developing the disease or may be silent carriers of an early stage. Furthermore, coupling therapeutic agents to the radiotracer may allow specific treatment of the biological alterations, while the imaging component may monitor disease regression and allow appropriate dosing. While this may be a very experimental indication for PET, there is a great degree of potential for its use.



## What is your best memory of your congress participation?

Cardiovascular diseases (CVD) take a huge toll on our society and represent the leading cause of death in industrialized countries. Many of these deaths could be averted with



Prof. P. Lancellotti, Liege, BE

appropriate detection (by imaging) of the disease at a preclinical stage or early after the onset of symptoms. So, when I was chairman of the meeting, I felt very honoured to be

deeply involved in widening the scope of the EuroEcho meeting into EuroEcho & other imaging modalities. The change in the meeting objective into a patient oriented congress was at the very heart of the association and served to tackle CVD. The following quote represented best the spirit of such a move and collaborations between all CV imaging leaders.

**"Coming together is a beginning"**

**"Keeping together is progress"**

**"Working together is success"**

Prof. P. Lancellotti, Liege, BE

Chairperson Programme Committee- EuroEcho 2011, Budapest, Czech republic

## What was your biggest benefit of presenting your abstract to EuroEcho-Imaging?

The biggest benefit of presenting my research: « Exercise echocardiographic determinants of BNP changes during follow-up in asymptomatic patients with aortic stenosis and preserved left ventricular function » at the 2014 Young Investigator Award contest was the opportunity to share my work with well-known senior researchers. This allowed me to obtain



Dr. C. Henri, Ste Anne Des Plaines, (CA), US

this was a great opportunity for networking and developing further collaboration with European colleagues. Accordingly, I am involved in the Young Echocardiographers of Canada, a group formed by the Canadian Society of Echocardiography and it's always a pleasure to share ideas and research opportunities with our colleagues from the EACVI Heart Imaginers of Tomorrow (HIT). Finally, thanks to my Young Investigator Award nomination, I have been invited to present at the 25th Annual Meeting of the Japanese Society of Echocardiography. This was also a great opportunity for networking with Japanese colleagues, but also to visit this beautiful country and taste delicious sushi!

Dr. C. Henri, Ste Anne Des Plaines, CA

Young Investigator Award winner- EuroEcho-Imaging 2013, Istanbul, Turkey.

important comments and advice to improve my work. After this experience, I was able to publish 3 original articles as first author in peer reviewed journals. This accomplishment during my 2-year fellowship in valvular heart disease, advanced echocardiography and research at the University of Liège, Belgium definitively helped me to obtain grants to continue my research at the Montreal Heart Institute, Canada. Also,

Learn more about the EuroEcho-Imaging-Imaging history makers

Visit the web page dedicated to the cardiovascular imaging experts who are the pillars of this successful history. [www.escardio.org/EuroEcho-Imaging-imaging/20years](http://www.escardio.org/EuroEcho-Imaging-imaging/20years)

## Why is EuroEcho-Imaging important to you?

Every year EuroEcho-Imaging gives me the opportunity to be on the edge, to catch the wind of the current research projects, to understand the direction where ideas and opportunities are moving. It is a unique contribution to the science, an open space where participants can easily exploit the results of research, an event where education is always provided. I have attended all EuroEcho-Imaging congresses since the first edition in 1997 in Prague and each edition was an extraordinary exciting experience. The congress is always planned for the value of attendees, which results in enthusiastic active participation. We have grown up year after year adding new initiatives, but always with the same colloquial, interactive, and friendly atmosphere. EuroEcho-Imaging was strategic in building the structure and pivotal for the continuous growth of the European echo community.

During my professional journey I had the privilege and opportunity to be involved in the development of 3-D echocardiography. It was amazing to be part of the team at the Thoraxcenter in Rotterdam, aiming to add the third dimension in cardiac ultra-



Prof. A. Salustri, Abu Dhabi, UAE

sound. As it often happens in research, we faced challenges and difficulties that were tackled by a common collegial approach. When I look back to those days, when I remember all the time spent in the Experimental Lab, when I think of the emotion in getting a 3-D picture after hours of image post-processing, I am more and more convinced that "what's advanced today will be routine tomorrow".

Prof. A. Salustri, Abu Dhabi, UAE

EchoEcho Lecture nominee-EuroEcho-Imaging 2015, Seville, Spain

# EuroEcho Imaging 2017

21<sup>st</sup> Annual Meeting of the European Association of Cardiovascular Imaging (EACVI), a registered branch of the ESC, in cooperation with the Portuguese Working Group of Echocardiography.



## Is there a role for imaging techniques in cardiac resynchronization therapy?

**Dr. I. Stankovic, Department of Cardiology, Clinical Hospital Centre Zemun and Faculty of Medicine, University of Belgrade, Serbia**

"I would say that, right now, there is a hope that there will be a role for cardiac imaging in cardiac resynchronization therapy (CRT) in the near future and, thankfully, there is ongoing research.

In the beginning, we were overly enthusiastic but this was dampened by disappointing results from two major trials. I would say that, now, we are cautiously optimistic and it's great to see that there is ongoing research, some presented at EuroEcho-Imaging 2016.

This is great because people were disappointed about the results of the PROSPECT trial in 2009,<sup>1</sup> which indicated that there were no echocardiographic parameters that could help improve patient selection for CRT. There was subsequently a huge decline in publications on the topic. This was followed in 2013 by the EchoCRT trial,<sup>2</sup> which showed that CRT was not beneficial in heart failure with a narrow QRS complex and may even increase mortality.

Since then, the whole concept has changed and novel parameters have emerged. What we need now is some hard evidence from new randomized trials to support these pa-



*Dr. I. Stankovic, Belgrade, RS*

rameters. However, many people think that it would be an adventure to undertake such trials, and no-one is daring to start.

In terms of imaging techniques, echocardiography is, for me, number one for patient selection and, possibly, optimization in CRT. Magnetic resonance imaging should be used for assessing extent of myocardial scar. While nuclear techniques may be useful, they involve exposure to radiation."

### References

1. Chung ES, Leon AR, Tavazzi L et al. Results of the Predictors of Response to CRT (PROSPECT) trial. *Circulation* 2008; 117: 2608–2616.
2. Ruschitzka F, Abraham WT, Singh JP et al. Cardiac-resynchronization therapy in heart failure with a narrow QRS complex. *N Engl J Med* 2013; 369: 1395–1405.

## What to expect for EuroEcho-Imaging 2017 in Lisbon?

**Prof. N. Cardim, Multimodality Cardiac Imaging Department, Hospital da Luz, Lisbon, Portugal**



*Prof. N. Cardim, Lisbon, PT*

"Reflecting the multi-modality nature of EuroEcho-Imaging and our Association, the major scientific topics next year in Lisbon will be on the use of multi-modality imaging in heart failure and in the cath lab (percutaneous valves and devices, closure of the left atrial appendage, of atrial septal defects and patent Foramen Ovale, among others). These major topics highlight not only the increasing role of echocardiography but also the importance of cardiac magnetic resonance (CMR) imaging, nuclear imaging (NI) and cardiac computed tomography (CCT) in modern cardiology. Several major projects will be presented at EuroEcho-Imaging 2017 in Lisbon including: preliminary results from EuroCRT, a key European Association of Cardiovascular Imaging (EACVI) project to detect which imaging parameters can identify responders to cardiac resynchronization therapy; the European Endocarditis Registry (EURO-ENDO), in which imaging plays a major role; and, the IMPROVED ICD study (scheduled to start in 2017) which aims to determine the potential incremental role of myocardial strain (with 2Dspeckle tracking echocardiography) over conventional methods in the selection of patients for implantable cardioverter defibrillators. All these will be discussed in

EuroEcho-Imaging 2017 and complemented by major scientific advances on CMR, NI and CCT.

### Lisbon is also a great venue!

The weather in December is usually nice and pleasant, Portuguese people are warm and friendly, we have excellent food, nice accommodation and an exciting nightlife. Lisbon has a vibrant cultural life, and the brand-new Museum of Art, Architecture and Technology (MAAT) is close to the venue. And, Portugal is trendy! We won the UEFA European Championship in 2016, and former Prime Minister António Guterres was elected Secretary-General of the United Nations. We also look forward to strong participation from Portuguese speaking countries. Join us for EuroEcho-Imaging 2017 in Lisbon next December!"

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