Integrated imaging; the best modality for each patient

By Professor Thor Edvardsen, Scientific Documents Committee Chair

The main goal of the integrated recommendations is that experts from the different modalities - echocardiography, computed tomography (CT), cardiovascular magnetic resonance (CMR) and nuclear imaging – choose the best modality for each patient. In reality, this comes down to personalized medicine from the start for the patient.

Although echo is the most available (and cheapest) imaging modality in Europe and the rest of the world, some important features are not accessible by echo such as scar tissue, a complete image of the heart – which is particularly important and complicated in congenital heart disease – as well as coronary anatomy and stenosis. Moreover, CMR provides a much better resolution. Therefore it was not surprising to find an overall perspective to change the recommendations.

Integrated imaging: dynamic and interesting

Multimodality recommendations are a fairly new phenomenon with the first being published in 2014: “Expert consensus for multi-modality imaging evaluation of cardiovascular complications of radiotherapy in adults: a report from the European Association of Cardiovascular Imaging and the American Society of Echocardiography”. As integrated imaging is so new, the ideas and recommendations keep improving all the time which makes this a very dynamic and interesting field. The benefits of having integrated imaging in daily clinical practice is obvious, not only with regard to the patient who will receive the best and most suitable care, based on his or her specific situation, but by doing so, unnecessary specific imaging studies can also be avoided.

Recommendations ready at hand

By bringing together all experts from different specialties who will co-author the papers, the best possible context is created in which all sections of imaging are present. Clear recommendations on what is necessary are of utmost importance and to enhance their use, a small but comprehensive booklet has been developed by the EACVI which physicians can keep in their pocket and easily use during their daily practice. The information can also be accessed from the EACVI recommendation mobile app suitable for iOS/Android. In the first three weeks after it became available, it was downloaded more than 300 times which is quite impressive. The scientific committee also tried to incorporate integrated imaging in all educational platforms on the web, as well as in research projects.

What the future brings …

Over the next few years, appropriateness criteria for cardiac imaging within Europe will be launched. Although European countries differ substantially, EACVI tries to set up a common European platform for integrated imaging. An ongoing task force is currently working on heart failure as this is a frequent condition with a high mortality rate throughout Europe. They are assessing which kind of imaging modality or combination is necessary for correctly diagnosing and evaluating heart failure.

Download the 2015 EuroEcho-Imaging Mobile App

Today in this issue ...

CMR in non-ischaemic cardiomyopathies – what is new?  Page 2
Cardiac imaging as the gate-keeper for many cardiac diseases  Page 3
Relationship between JSE & EACVI – how do you see it developing?  Page 4
The relationship between Brazil and EACVI – how is it developing?  Page 4

What’s new in CMR in non-ischaemic cardiomyopathies?

CMR is a highly versatile imaging modality which offers accurate information in various cardiac/vascular conditions. New developments in CMR include a study into a predictive model of cardiovascular outcomes in patients with hypertrophic cardiomyopathy as well as T1 mapping.

Follow us at #euroecho on Twitter
CMR in non-ischaemic cardiomyopathies – what is new?

Cardiac Magnetic Resonance (CMR) is a highly versatile imaging modality that can provide accurate and quantitative anatomical and functional information in a range of cardiac and vascular conditions, including in particular cardiomyopathy. Its high tissue contrast and spatial resolution are further attributes of the modality as well as its safety. Cardiac Magnetic Resonance does not expose patients or medical staff to ionising radiation and CMR contrast agents have a better risk profile than iodine-based X-ray contrast agents.

The main past drawbacks of CMR – being claustrophobia and implanta ble devices – are being addressed with the introduction of wide bore CMR scanners and MR-conditional devices. Over the past two decades, CMR has become a routine diagnostic test in several European countries such as the United Kingdom and Germany. In some parts of Europe, access to CMR remains patchy, often as a result of national or local governance and reimbursement policies.

Guidelines recommend CMR

Several current European and international practice guidelines include recommendations for Cardiac Magnetic Resonance in the management of patients with cardiac, pericardial and vascular disease. In patients with heart failure and cardiomyopathy, guidelines suggest CMR to accurately assess chamber size and function and later gadolinium enhanced (LGE) CMR to distinguish ischemic from non-ischemic cardiomyopathy.

While in ischemic cardiomyopathy, LGE CMR may show myocardial infarction, in non-ischemic dilated cardiomyopathy, it can detect mid wall fibrosis – a finding that is independently associated with adverse clinical outcome and above left ventricular ejection fraction as was demonstrated in a publication in JAMA by Gulati et al. (‘Association of fibrosis with acute and stable coronary symp toms, in particular methods for myocar dial infarction and heart failure’, JAMA, 2013;309:896-9080).

HCM study well underway

The presence of fibrosis on LGE CMR has also been associated with worse outcome in hypertrophic cardiomyopathy (HCM), an observation that has motivated the large multicenter HCM study (Novel Markers of Prognosis in Hypertrophic Cardiomyopathy, ClinicalTrials.gov Identifier: NCT01915615). The study is testing the hypothesis that HCM patients with a higher rate of adverse events can be identified by novel CMR findings and aims to develop a predictive model of cardiovascular outcomes in HCM.

The study is organized by the University of Oxford, UK and the University of Virginia, US. By October 2015, over 1,000 of the targeted 2,750 patients with clinically diagnosed hypertrophic cardiomyopathy studies at baseline who will be followed for up to 5 years after index cardiac magnetic resonance imaging and blood draw for genetics and biomarkers, had been recruited in 40 centers across Europe and the USA. Demographic data, clinical risk factors, as well as novel markers from CMR, genotyping, and serum biomarkers of collagen turnover and myocardial injury will be collected and patients will be enrolled over a 2-year period and followed for 3-5 years (mean of 4 years).

Rationale for the HCMR study

The rationale for the HCMR study can be found in the fact that presently used risk predictors in HCM for the clinical outcomes of sudden cardiac death (SCD) and heart failure (HF) are still insufficient and limit clinical trials and institution of novel therapies in this disease.

This large scale, prospective clinical registry will systematically answer the important question whether, through addition of a combination of advanced CMR phenotyping, genetic and biomarker analysis, risk stratification in HCM could be substantially improved over presently used clinical risk predictors. Emerging novel blood, genetic, and CMR markers offer the paradigm-shifting promise of reliably identifying those at risk. In addition, this will be the largest genotyped population of HCM available to correlate with comprehensive CMR and biomarker evaluation. This will allow unique opportunities to evaluate genotype-phenotype correlations and compare specific genetic subsets in a manner that has not been possible in the past. This study will also establish a predictive model that can be used to assess risk given a patient’s combination of risk factors. This will help to select patients for future clinical trials to prevent SCD and HF. In addition, it will identify surrogate endpoints to monitor treatment response in HCM.

In this way, the evidence base will be established in HCM to enable clinical trial design to reduce morbidity and mortality in HCM in a cost-effective manner.

Predictive model of cardiovascular outcomes in HCM

The specific aim of this study is thus – as briefly mentioned before - to develop a predictive model of cardiovascular outcomes in hypertrophic cardiomyopathy by using exploratory data mining methods to identify demographic, clinical, and novel CMR, genetic and biomarker variables associated with the outcomes and to develop a score from the predictive model that can be used to assess risk given a patient’s combination of risk factors, thus establishing the evidence base to enable clinical trial design to reduce morbidity and mortality in HCM in a cost-effective manner.

The primary endpoint of this prospective study is the composite of cardiac death (SCD and HF death), aborted SCD including appropriate ICD firing, and need for heart transplantation. Secondary endpoints include all-cause mortality, ventricular tachyarrhythmias, hospitalization for heart failure, atrial fibrillation, and stroke. The study will be powered to identify risk markers in a Cox model (imaging, serum, and genetic beyond standard clinical risk factors) with a hazard ratio of 1.5 or greater for the primary endpoint, which will be cardiac death (including SCD and HF death), aborted SCD (appropriate discharge of an implantable cardioverter-defibrillator), and need for heart transplantation. Secondary endpoints include all-cause mortality, ventricular tachyarrhythmias, hospitalization for heart failure, atrial fibrillation, and stroke. This study will enable establishment of a predictive model that will help to identify patients at risk as well as patients for future clinical trials to prevent SCD and HF. In addition, it will identify surrogate endpoints to monitor treatment response in HCM.

T1 mapping promising

Increasingly, T1 mapping by CMR is used to characterize tissue quantitatively. Evidence is beginning to accumulate that T1 mapping has incremental value over LGE CMR in non-ischaemic heart disease and ongoing larger clinical studies, including HCMR, will assess its role and impact on outcomes. For clinicians and patients, this may offer the opportunity to further improve risk stratification of patients with non-ischemic cardiomyopathy. The way forward for Cardiac Magnetic Resonance is to conduct further large outcome studies to more clearly define the role of CMR in ischemic and non-ischemic heart disease and to promote the expansion of CMR across Europe so that patients and clinicians can benefit equally of this well-established imaging modality.

Professor Sven Plein, Chair of EACVI Cardiac Magnetic Resonance (CMR) Section, Leeds, UK

Professor Plein who is Professor of Cardiology as well as a British Heart Foundation Senior Clinical Research Fellow and Honorary Consultant Cardiologist, has also served on the EACVI Scientific documents committee since 2014 for an initial 2 year term and has contributed to several position papers on cardiovascular imaging. Most of the recent scientific documents include recommendations for the use of CMR, reflecting the growing role of CMR in clinical practice in Europe.

His research is focused on developing MRI methods for the assessment of ischaemic heart disease and heart failure, in particular methods for myocardial perfusion and coronary MRI. In clinical applications, these and other methods are being applied to patients with acute and stable coronary symptoms and various aetiologies of heart failure.
After his graduation from La Sapienza University in Rome, Professor Salustri entered the Internal Medicine residency followed by the Cardiology fellowship at the University of Siena in Italy. Since the beginning of his career, he was attracted by cardiac imaging; the possibility of looking to the heart in terms of morphology and function in a non-invasive way was extremely appealing to him: “Cardiac imaging is the gatekeeper for the vast majority of cardiac diseases, and in most of the cases a proper diagnosis is virtually impossible – or at least very challenging – without the support of the different imaging modalities.” Professor Salustri is particularly interested in the clinical application of the cardiac imaging modalities and has accordingly combined his clinical activities in busy non-academic hospitals with the cardiac imaging modalities – and echocardiography in particular – in order to get the most relevant clinical information and to provide the best care for his patients.

At the forefront of 3-dimensional echocardiography

As Professor Salustri was also interested in research, he spent four years at the Thoraxcenter in Rotterdam in the Netherlands, where he obtained his PhD in stress echocardiography. At that time, Professor Salustri was also leading the research program on 3-dimensional echocardiography, providing the basis for the further development of this technique in the daily practice. This program was one of the first in the world combining both experimental laboratory as well as clinical applications of 3-dimensional echocardiography. Thanks to the enthusiasm of his mentor Dutch Professor Jos Roelandt - who sadly passed away last year - he was stimulated to spend his energy in this exciting field, which resulted in numerous publications in international journals and a continuous exchange of experience with other centers. As is well known, this particular technique has since evolved and Professor Salustri is to this day amazed to realize that the current 3-dimensional echocardiography would have not been possible without those pioneering experiences in which he played a crucial part.

Education and research

Specific lines of interest that Professor Salustri feels very strongly about are education, quality control and the application of cardiac imaging modalities in the clinical arena. Teaching and education are of paramount importance, because they provide the technical skills and are the prerequisite for obtaining reliable clinical information. In addition, as the interpretation of cardiac imaging is predominantly subjective in nature, quality control program are mandatory to ensure a high reproducibility and a low inter- and intra-observer variability. Finally, the very best imaging modalities for individual patients (i.e., the ideal test for a given patient) need to be selected in order to answer a specific clinical question. With this regard, Professor Salustri is convinced that the integration of different specialties such as cardiology, radiology and nuclear medicine, is still a challenge which needs to be addressed. At this aim the EACVI is playing an active role, with the concept of the patient (and not the test) at the center of our interest, and the different imaging modalities integrated in the specific diagnostic pathway. Finally, research programs on new techniques are very much needed. In fact, the research of today will be the routine of tomorrow, as the development of new techniques expands the horizons of our knowledge.

Structured programs on cardiac imaging needed for training

Young doctors with a special interest in cardiac imaging are strongly suggested by Professor Salustri to undergo a specific training in a center with high reputation in this field. There are few centers at the moment with a structured program on cardiac imaging. These programs should include a solid background on cardiac anatomy, physiology, and flow dynamics, followed by a dedicated training on the different imaging modalities, including physics properties and the specific applications in the different clinical setting.

What the future brings ...

Apart from taking some steps back into history to learn where we are today and how we got there, Professor Salustri is also very forward looking with high hopes for the future of cardiac imaging. He sincerely hopes that cardiac imaging will become an established subspecialty with standardized teaching programs as this will guarantee and enhance its overall quality and even further improve outcomes for patients. For the same reasons, the integration of cardiac imaging with other subspecialties like interventional and electrophysiology would also be highly desirable.
Relationship between JSE & EACVI – how do you see it developing?

Dr. Satoshi Nakatani, Vice President Japanese Society of Echocardiography (JSE)

“The relationship between the Japanese Society of Echocardiography (JSE) and the European Association of Cardiovascular Imaging (EACVI) is important as we believe JSE is one of main echocardiography societies in the world and therefore enjoys active exchanges with international echocardiographic societies especially with EACVI, ASE, the Korean Society of Echocardiography (KSE) and recently the Asian-Pacific Association of Echocardiography (AEE). We hope we continue to be a friendship society of EACVI. That means we are good partners to promote clinical and research echocardiography together for patients. Now, globalization is a trend and echocardiography is not an exception. Partnership is so important. For example, with this limited source of funding, we will be expected to produce more meaningful research results that are helpful for patients in a more efficient way. For that purpose, exchange of information and collaboration are essential. In the near future, we want to have collaborative research, to set echocardiography guidelines as the world standard and to exchange of academic information more intimately. Through the EACVI-JSE Joint Sessions held at JSE annual Scientific Meeting and EuroEcho annual Scientific Meeting, we are quite successful to have fruitful scientific and cultural exchange. JSE’s members are much inspired and stimulated by participating in international scientific sessions and experiencing the world-level echocardiography. We would like to continue and even strengthen much more the relationship between the Japanese Society of Echocardiography and EACVI. We believe it is mandatory to raise the level of echocardiography in terms of clinical practice and research leading to better patient care.”

Did you know you can DOWNlOAD the EACVI recommendations app?

Experience Mobile Education!

The relationship between Brazil and EACVI – how is it developing?

Dr. Samira Saada Morhy, Medical Manager, Non-invasive Cardiology, Albert Einstein, Brazil

“The relationship between Brazil and European Association of Cardiovascular Imaging (EACVI) really started back in 2008 and I really do believe that the partnership between EACVI and Departamento de Imagem Cardiovascular (DIC) will be a very fruitful and important way of bringing closer the European and Brazilian cardiac imaging world. The main focus of our relationship is exchanging experience and scientific knowledge in the echocardiographic field as well as creating the possibility of developing multi-center studies worldwide. Having and maintaining this relationship between Brazil and EACVI also brings along benefits such as the fact that we are organizing and conducting by the group of Professor Gilbert Habib which involves many different countries.”

VISIT STAND B10

DISCOVER ALSO

SPECIAL OFFER! 2016 Membership for only 50€*