

Interventional cardiology: an imaging subspecialty

Carlo Di Mario^{1*}, FESC

President EAPCI, Royal Brompton Hospital, Imperial College, London, United Kingdom

With the contribution of Dudley Pennell, FESC, Past Chairman ESC CMR WG, Royal Brompton Hospital, London, UK; Richard Underwood, FESC, Past Chairman ESC WG on Nuclear Cardiology and CT, Royal Brompton Hospital, London, UK; Petros Nihoyannopoulos, FESC, Past Chairman European Association of Echocardiography (EAE), Hammersmith Hospital, Imperial College NHS Foundation Trust, London, UK; Marie Claude Morice, EAPCI Representative ESC Council of Cardiovascular Imaging, Massy, Paris, France

The ambivalent attitude of cardiology towards the new imaging modalities

The ESC President Professor Komajda made clear in his inauguration speech in Stockholm that one of the priorities of his term as President was the creation of an association of cardiac imaging. The growth of cardiac applications of imaging techniques not traditionally handled by cardiologists such as cardiovascular magnetic resonance (CMR) and multidetector computed tomography (MSCT) requires great attention. Traditionally, cardiologists have been able to integrate all the diagnostic techniques into the cardiovascular department in order to facilitate an integrated delivery of care. To an extent this has happened also for nuclear cardiology, a field where cooperation with other nuclear medicine specialists is commonplace, but the presence of cardiology specialists during the stress examination and for the overall interpretation of results is generally accepted.

The attitude of cardiologists towards CMR and MSCT has been more variable. The first response has often been denial. We can do without. Interventional cardiologists often gave the bad example, belittling the value of MSCT as a technique of coronary vascular imaging and using the greater pitfalls of the first generation 64-slice MSCT systems to justify disinterest. Echocardiographers have often claimed that stress echo, complemented by the use of contrast for better delineation of the endocardium, split screen display for easy qualitative comparison, speckle tracking for quantitation could provide the same information as CMR, at a fraction of the cost and with greater patient comfort. In cardiac imaging, unlike in interventional cardiology or heart failure, large randomised trials with independent core laboratory assessment are far from being

a standard, and evidence-based medicine is often substituted by the expert opinion of recognised authorities, showing convincing case examples and reviewing small scale single centre series with no proof that results can be replicated elsewhere. Unlike for echocardiography, where development has always been driven by pioneering cardiologists, magnetic resonance and CT had become the gold standard for the assessment of most body organs with very few cardiologists embarking on the daunting task of overcoming the limitations of the rapid movement of the heart.

While technical progress has increased acquisition speed and resolution to the point that they became viable alternatives for cardiac imaging, few centres have managed to integrate them into the cardiovascular department and establish healthy relationships with our radiology colleagues. As a consequence, not enough cardiology trainees have been exposed to the impact of these innovative imaging modalities, no specific standards for certification of competence have been agreed and put in place limiting the access to these techniques and the quality of service, often run by general radiologists switching from head to cardiac CT or from knee to cardiac MRI. Interventional cardiologists and many other clinical cardiologists are dependent on optimal access to these imaging modalities and integration of the results into the overall diagnostic and therapeutic path of our patients. I realise how privileged I am in my hospital to have access to all these imaging modalities online on my computer's screen, and to take advantage of regular multidisciplinary meetings to discuss patients with indications for coronary revascularisation and transcatheter valve implantation, when young fellows or older colleagues visiting our department complain of a very different situation back home and express their appreciation for the interaction among all the specialists

* Corresponding author: Royal Brompton Hospital, Sydney Street, London, SW3 6NP, United Kingdom

E-mail: c.dimario@rbht.nhs.uk

involved in the patients' care. There are other exceptions which indicate the direction to go. The interventional cardiovascular unit of Massy, France, led by Dr. Marie-Claude Morice, has a worldwide reputation for the quality and variety of its work, spanning from complex left main and bifurcational lesion treatment to recanalisation of chronic total occlusions and transcatheter valve treatment. Everybody knows the four senior interventionalists of the group, Morice, Lefevre, Louvard, Chevalier. When you see them during EuroPCR they make the treatment of amazingly complex cases look simple and we all remember them reporting results of trials that have changed the face of modern interventional cardiology, starting with the RAVEL trial. Few people know, however, that when the cathlab closes in the late afternoon these big names gather downstairs in the non-invasive imaging department and review and report CMR and MSCT examinations, together with Prof. Jerome Garot, head of the non-invasive department. I guess a great deal of their successful angioplasties is based on first hand knowledge of the coronary and cardiac anatomy allowed by these new imaging modalities.

Focus on patients' needs and training

The correct attitude to succeed in medicine is always to focus on the patient's needs. Our cardiac patients do not care whether the interpretation of their tests is done by a cardiologist or a radiologist as long as the information required to guide diagnosis and treatment is provided and there is dialogue and interaction for difficult or controversial cases. Defensive attitudes from both parts, claiming ownership, are always wrong and only manage to slow down the penetration of new techniques. Training and education are the cornerstones of success and this should be the first priority of the newborn Cardiac Imaging Association. Cardiology congresses are not only the place where you hear the results of new trials and have an opportunity to illustrate and discuss with your peers results of your experience and studies in abstracts and lectures. They have become an indispensable source of continuous medical education where updates are provided on new technical developments and the information from new trials is distilled through guidelines and expert opinions to meet the practical demands of everyday patient care.

The main annual congress of the Cardiac Imaging Association has enormous potential for growth if it addresses the rising demand of education in cardiac imaging from all the cardiology specialists, from interventional cardiologists interested to learn non-invasive coronary and peripheral angiography via MSCT to interventionalists, electrophysiologists, heart failure specialists who want to understand the advantages and relative pitfalls of CMR, nuclear cardiology and echocardiography in patient characterisation and guidance of interventions, ablation and device placement. The vast majority of the cardiologists who call themselves imaging specialists also have a lot to learn in a field which has undoubtedly been the fastest changing area in cardiology together with electrophysiology. Most of them must move away from a single technique approach to become accomplished imaging specialists with integrated knowledge allowing them to offer the best technique to meet the individual clinical question rather than continue to defend their own

“baby” resulting in a plurality of conflicting answers from various imaging modalities at unbearable cost. In a previous editorial with Professor Zamorano, I insisted on how much we can learn from echocardiographers, with the most striking example being mitral valve repair with the MitralClip. While I am writing this manuscript I am landing in a plane in thick fog in Katowice, Poland. It is easy to figure out that the captain, despite his glittering golden stripes, has a much less important role than the air traffic controller who guides step-by-step the landing procedure. I feel pretty much in the same position of that captain, just following indications, when I steer the thick MitralClip catheter in the uncharted territory of grossly distorted left atria and turn, rotate and advance sheath and catheter to dive perpendicularly into the mitral valve in the desired position to optimally grab both leaflets.

Intravascular imaging: the Cinderella of European interventional cardiology can finally Find Her Prince

Intravascular imaging is grossly under-represented in Europe compared with Japan or the United States. It is a very distinctive habit of European panellists going to “live” courses to apologise that they are not familiar with intravascular ultrasound, repeating as an excuse that there is not enough money or time pressure does not allow them to perform these procedures routinely. A Japanese physician will not even dream of implanting a stent in a left main or in a long calcific segment without IVUS, and will consider it unethical to run a trial to establish the clinical usefulness of a technique where the advantage is so self-evident. In Europe we have run several trials comparing angiography and IVUS for guidance of stent expansion, and I feel somewhat responsible for the unsuccessful outcome of the biggest of them, the OPTICUS trial. Maybe our main mistake has been to focus more on the development of “easy” criteria of stent expansion, based on simple lumen measurements, expecting that they could be universally followed. With only 56% of cases in the IVUS group achieving the requested parameters of expansion when the IVUS images were reviewed by the core laboratory, it is easy to understand why the increase in lumen area was small and insufficient to translate into an improvement in clinical outcome. A new attempt in a pilot study run by Colombo et al using again an innovative simplified approach reached the same disappointing outcome, with even more cases (>50%) not reaching the proposed expansion criteria despite 10 years more of experience and the availability of better high pressure balloons. Few laboratories can enjoy the luxury of fully trained technicians able to interpret and measure the key images of a fast-run quickly enough to be helpful to guide further interventional treatment. Imaging specialists with a non-invasive backgrounds used to blend into the fast action of the cathlab because of the daily need to cooperate for structural heart disease treatment, can play a similar role to that of IVUS or OCT readers who convey the feedback of the examination in a sufficiently fast and precise manner to allow a successful implementation of the additional steps indicated by the IVUS examination. For this reason, in my view, a borderline method such as intravascular imaging should also be included into the broad family of cardiac

imaging. The great attention devoted by JACC Cardiovascular Imaging to this field confirms the importance of retaining these new techniques into the cardiac imaging family.

A “Super” Association with many flavours

The big challenge for the new Association will be the cooperation with imaging specialists with a non cardiological background. Dedicated courses will serve the growth of both groups, with radiologists more in need to learn the clinical background of the indication and the exact information the test is requested to provide and cardiologists in need to progress in the technicality of the image acquisition and analysis and in a broad understanding of the extracardiac abnormalities which require input from a non cardiac imaging specialist. In an upcoming President’s page I will discuss the reasons why interventional cardiologists have failed to fill some undeniable gaps present in many countries in the application of transcatheter treatment of peripheral vascular disease. The absence of basic knowledge in the vascular imaging field, this time including also many echocardiographers, has been one of the main problems explaining this slow progress. Cardiologists have featured much worse than other non medical specialists such as vascular surgeons who have learnt before us to apply an integrated approach focused on the disease and the patient rather than on the technique. How to create an association able to meet these challenges? Certainly not forcing existing working groups and the Echocardiography Association to merge. Name changes are not enough. We need to promote a change of mentality making all members genuinely interested to learn and master other and new imaging modalities. We must allow the few pioneers in cardiology who contributed to the growth of the new imaging modalities to

retain control of the relevant sections in the congresses and the journals, promoting a bottom-up integration that will probably require a full generation to be fully accomplished from the time 360 degrees training of the new imaging specialists has started. The statute of this new association must reflect its peculiar status, and be agreed by all its components, avoiding the perception that smaller working groups are swallowed by a bigger association. Interventional cardiologists base their daily work on image interpretation. Their presence within the new association is justified by the fact they are logically bound to become the main “users” of non-invasive coronary and peripheral MSCT, are keen promoters of other imaging modalities to detect ischaemia and establish viability, and bring to the family the added value of intravascular imaging techniques which are undergoing a profound revolution with optical coherence tomography.

In Europe we have a chance to avoid the diaspora of independent Societies focused on technique present in the United States. We must act fast, but we must act tactfully, spreading a red carpet in front of the true experts and researchers in the new imaging modalities irrespective of their background from cardiology or other disciplines. Thanks to the visionary approach of the director of our new Biomedical Research Unit, Professor Pennell, the cathlab mounted a 96 inch split screen, taking advantage of dedicated software for co-registration of different imaging modalities, with the possibilities of displaying side-by-side or picture-in-picture angiography, ultrasound, IVUS, OCT, previously recorded MSCT images, newly recorded CMR images obtained sliding the patient bed from the cathlab into a new 3 Tesla CMR unit, EP maps, NOGA maps. If all these imaging modalities can fit into a screen and enhance the value, they can also fit into a new ESC Association.