Nuclear cardiac imaging between implementation and globalization: The key role of integration

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It has now been 5 years since we had the privilege of writing our first annual Editor Page. Since then, many things have changed in the world of science, from diagnostics and prognostic stratification to therapeutic approaches. Nevertheless, above all changes due to successful scientific research activities, during the last 2 years Covid-19 pandemic has dramatically and radically modified the way we interact and establish relationships with colleagues and patients, as well as our own family members. While Covid-19 outbreak has pushed the maximum towards social distancing, at the same time it has highlighted how much the globalization process has now breached, perhaps irreversibly, in the daily life of each of us, for better and for worse.

The pandemic has severely affected all areas of health care. The impact has been terrific especially in preventive medicine, limiting the access to diagnostic investigations, including cardiac imaging modalities, such as single-photon emission computed tomography (SPECT) and positron emission tomography (PET). On the other hand, the increasingly extensive use of World Wide Web for medical information on patient side and the widespread utilization of digital technologies and artificial intelligence algorithms from physician side have contributed to revise the traditional doctor-patient relationship. Therefore, though artificial intelligence techniques aim to improve precision medicine approaches, there is concern on emerging concept of approaching a depersonalized patient, where diagnostic advice and therapeutic choices are centered on representations of the average stereotype of the patient who is hardly ever present in clinical reality.

In this contest, while handling advances on radiopharmaceuticals development, software, hardware and algorithms implementation, also nuclear cardiology has been inevitably overwhelmed by pandemic tsunami, whereas the choice between different methods for the evaluation of coronary artery disease (CAD), such as coronary computed tomography angiography (CCTA) and nuclear cardiac imaging (SPECT and PET), became even more conflicting. As Randall C. Thompson recently pointed out in his message as President of ASNC: ''There is also a theory that variability is bad and wasteful and, therefore, standardization will be good. We are even seeing campaigns promoting specific modalities first, for example #CTFirst in CAD diagnostic workups'' highlighting the concept that a #PatientFirst Society would be more necessary.[1] In this respect, the contribution of truly personalized medicine tools, such as the use of dedicated cadmium-zinc-telluride gamma cameras, to tailored diagnosis goal achievement made the #PatientFirst Society idea even closer to real practice.

Beyond this debate on a multimodality wise and aware use of available cardiac imaging techniques, another task that must be addressed is a reliable estimation of the pre-test likelihood of CAD for subjects without known history of disease. The classic approach proposed by Diamond and Forrester in 1979[2] has been revised over years with different alternative models.[3-5] Yet, the best pre-test approach choice is still a matter of debate.[6,7] The main issue to take into account in such a complex dispute is that with pre-test estimation method improvements over time, also the target population changed. The Diamond and Forrester algorithm was estimated on a mostly male population with a mean age of 50 years and typical angina while current diagnostic

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activity faces with older patients, in prevalence females with atypical symptoms.[8] In fact, in recent decades there has been a decline not only in the pre-test probability of obstructive CAD but also in the frequency of stress-induced ischemia at myocardial perfusion imaging (MPI).[9-12] This could be due to the combined effect of the reduction in the prevalence of CAD and the more extensive and widespread and early use of non-invasive cardiovascular imaging techniques. Past retrospective and post-mortem angiography studies have suggested that many patients with ST-elevation myocardial infarction (STEMI) had only mild to moderate stenosis of the infarct-related artery[13] supporting the hypothesis that the acute event may often be due to rupture of small non-obstructive plaques with secondary thrombosis. The problem becomes even more complicated in the light of the growing incidence, beside type 1 myocardial infarction of atherothrombotic nature, of both type 2 myocardial infarction due to the imbalance between oxygen supply and demand without significant coronary atherosclerosis and myocardial infarction with non-obstructive coronary arteries (MINOCA).[14] Thus, all these considerations underline the importance of building algorithms capable of predicting, for both gender and for young and old, not only the presence of coronary stenosis but also the possible future incidence of cardiovascular events in absence of significant coronary atherosclerosis. In this direction, the artificial intelligence applications on both pre-test likelihood of disease estimations and data obtained from cardiac imaging tests is extremely appealing.[15,16] The Registry of Fast Myocardial Perfusion Imaging with Next Generation SPECT (REFINE SPECT) is providing information of considerable value, both in the diagnostic and prognostic fields.[17,18] The decade that has just begun calls us out to new tasks. There is an urgent need to standardize artificial intelligence methods to provide a coded and universal language for univocal interpretation. It becomes clear that, alongside methodological evolution, a wise knowledge transfer across generations is a crucial assumption.

Further, Covid-19 experience and the continuous challenge to deal with emerging SARS-COV2 variants dramatically taught us the fundamental lesson that globalization brings with it the need to leaving no one behind for the safe of humanity. This lesson should be applied to nuclear cardiology techniques, taking into account that it is essential duty of more advanced Countries to spread worldwide consolidated knowledge and expertise. Overall, a greater effort in spreading imaging systems set-up should go together with shared platforms to read images with experts across the world, thus taking advantage of the recent improvements on telemedicine. In this way, modalities integration and globalization may express a patient-centered winning match for the next generation.

The future of nuclear cardiology is linked to scientific and technological progress, especially in terms of eco-sustainability and increased cost-effectiveness of its applications. We hope, indeed we are certain, that the Journal of Nuclear Cardiology will continue, as it has done all these years, to play a leading role in stimulating new ideas and promoting the dissemination of the most significant results in both basic and clinical research in all countries.

Disclosure

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