Right ventricular perfusion: Do we need additional evidence or just a simple methodology?

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The importance of right ventricular involvement in cardiovascular disease states, including coronary artery disease, is unanimously accepted.[1–3] Nevertheless, the right ventricular evaluation still represents a quite negligible indication for the use of diagnostic imaging techniques. There are no doubts that this is mainly due to the predominant role of the left ventricle in the physiopathology of coronary artery disease and of heart failure syndromes. Another reason resides in the intrinsic difficulties of right ventricular imaging. This is true for the assessment of function, because of the complex geometrical shape of the right ventricle.[4] The limitations of echocardiography and even of cardiac magnetic resonance when dealing with the measurement of right ventricular volumes and ejection fraction, and with the assessment of wall motion, are well known.[4] As regards to this, it is worth mentioning that radionuclide techniques, and in particular first pass angiocardiography and gated blood pool single photon emission computed tomography (SPECT), although heavily underutilized, are considered among the most reliable approaches for an accurate estimate of right ventricular function.[5–7]

Perfusion imaging of the right ventricle is difficult as well, mainly because of the thin wall, which is scarcely visualized within standard myocardial perfusion imaging (MPI). The case is different if the right ventricle is affected by pressure overload, as for instance because of primary pulmonary hypertension. The wall thickening caused by the right ventricular hypertrophy makes possible to more easily visualize the right myocardial perfusion. This was the indication for performing the first MPI studies aimed at the right ventricle, in which the perfusion pattern and its visualization were used to support the diagnosis of hypertrophy and assess its severity.[8] Subsequently, in these patients, the occurrence of ischemia not related to coronary artery disease was demonstrated using Sestamibi SPECT.[9] It is known that right ventricular perfusion abnormalities are not a rare finding in patients with coronary artery disease as well. Necropsy studies demonstrated that right ventricular necrosis rarely occurs isolated, but complicates the left ventricular infarction in a remarkable proportion of cases.[10,11] This is particularly true for inferior infarctions, because the inferior left ventricular wall and the right ventricular wall share the same coronary distribution, being mostly both perfused by the right coronary artery. The involvement of the right ventricle can modify the clinical presentation of acute infarction, requires proper management, and worsens the prognosis.[12,13] Already in the planar Thallium-201 era, it was possible to detect right ventricular perfusion defects in some patients and to correlate them with the presence of proximal right coronary disease,[14–16] Later on, repeated attempts have been made to extend to the normal right ventricle the assessment of perfusion using SPECT, both in the setting of acute myocardial infarction and of stress MPI. Independently of the employed tracer, various studies demonstrated that right ventricular perfusion imaging in the absence of hypertrophy is feasible.[17–20] Moreover, the possibility if performing a semi-quantitative assessment through the comparison with a normalcy database was shown as well.[19] However, in spite of these demonstrations of the importance of right ventricular perfusion abnormalities in coronary artery

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disease and of the feasibility of right ventricular perfusion imaging, this evaluation has not found place in the current approach to MPI processing and reporting.[21]

In this scenario, the study by Farag et al. published in the present issue of the Journal of Nuclear Cardiology® does not represent a true novelty.[22] The Authors have retrospectively identified among patients with inferior myocardial infarction two groups of subjects, one with an apparent abnormality in right ventricular perfusion and the other with a seemingly normal right ventricular perfusion pattern. They have then tested the influence of SPECT processing on the image quality, showing that iterative reconstruction does not offer significant advantages over filtered back projection for the right ventricular wall visualization. The most important new contribution of the study is the application of a dedicated modification of standardized processing software for MPI analysis. This newly implemented procedure performs an automated detection of the right ventricular wall starting from the interventricular septum and introduces various correction factors to take into account the differences between right and left ventricular walls. Finally, by comparing the patient uptake pattern under stress and at rest, the program allows the automatic detection of the inducible right ventricular perfusion defects and their quantification. As expected, given that the patients had been already preselected, the automated procedure detected significant abnormalities in the group with visual perfusion defects, while the results were normal in the group of patients with visually homogeneous perfusion. In conclusion, the paper demonstrates once again that right ventricle perfusion defects are present in patients with inferior wall ischemia and that they can be detected by a user-friendly automated procedure, which is a modification of established software for the assessment of left ventricular abnormalities.

The potential advantage of having such a procedure implemented within a widely used processing platform for MPI analysis cannot be overemphasized, but this promising approach alone will not be enough for reviving the neglected right ventricular evaluation. To obtain that right ventricular perfusion assessment becomes an accepted part of the standard MPI processing and reporting, other steps must be performed. In particular, it would be necessary to demonstrate in a large patient population the true clinical impact of routinely adding right ventricular perfusion assessment to the already established MPI procedure. As far as diagnosis and evaluation of CAD extent and severity are involved, the study could be quite rapidly completed, given the availability of the updated version of the processing in one or more centers with high patient throughput. Preliminarily, it could be even acceptable to perform an extensive retrospective evaluation of already acquired studies. More difficult would be to establish the prognostic implications of the right ventricular perfusion pattern. However, both pieces of information are needed to support the eventual inclusion of right ventricular perfusion assessment and reporting in the current clinical guidelines for MPI. It is exactly the lack of such studies on large patient cohorts, and not just the technical problems, that have so far hindered to extend the evaluation of perfusion to the whole heart. On the other hand, the wide availability of the necessary processing software will stimulate its use. In other words, the offering could create the demand. With the necessary caution about the results of the above proposed larger studies, it could be foreseen that adding right ventricular perfusion data to the left ventricular ones would represent a net gain, also considering that it would not require additional exposure nor significantly more prolonged processing time. It remains to hope that the opportunity offered by the present study and by the developers of the related processing software will not be neglected, and that finally the right ventricle will obtain the position that it deserves in the field of MPI, as already has it within our body.

Disclosure

The author has no conflict of interest.

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