EDITORIAL

Assessment of Cardiac Sympathetic Activity by Nuclear Medicine: Many Clinical Benefits but Weak Recommendation

Jéssica Leite[1] and Simone Brandão[2]

Faculdade de ciências médicas de Campina Grande – FCM/UNIFACISA,[1] Paraíba, PB - Brazil
Hospital das Clínicas da Universidade Federal de Pernambuco,[2] Recife, PE – Brazil

Editorial related to the article: Autonomic Innervation Evaluation in Cardiac Disease

The autonomous nervous system (ANS) regulates important cardiac functions, including heart rate, ventricular contractility, QT interval and systemic vascular resistance. ANS dysfunction, known as dysautonomia, can lead to many clinical manifestations, some of them severe and debilitating.[1] Dysautonomia is often underdiagnosed and detected at late stages, due to its wide phenotypic variability and the poor familiarity of the physicians with the disease, leading to higher cardiovascular mortality and morbidity.[2]

The diagnostic and prognostic potential of nuclear cardiology in the assessment of the ANS has increased. In addition, there is growing evidence that the use of scintigraphy in the evaluation of cardiac innervation can help in cardiovascular risk stratification, therapy selection, and evaluation of potential benefits of new therapeutic approaches.[3,4] However, there is increasing need for physicians with experience with this method, and hence, scientific studies that synthesize and discuss its applications, advantages, and disadvantages would contribute to the effective implementation in clinical practice.[5]

In this issue, Brito et al.[4] present an interesting review on the use of scintigraphic imaging in the assessment of autonomic innervation in cardiac diseases. The article provides an overview of the use of nuclear medicine and different radiotracers in various clinical settings. Despite the unquestionable potentiality of the technique for a non-invasive, objective, imaging diagnosis of cardiac dysautonomia, each section of the review presents clear limitations for its routine recommendation. The authors point out problems involved in the standardization, low availability, and high cost of the method as the main challenges to be overcome.

Among the scintigraphic techniques addressed in the review, we believe that the cardiac 123I-metaiodobenzylguanidine (^{123}I-mIBG) scintigraphy is the most feasible for practical application. Its implementation in clinical practice would help in solving the issue of underdiagnosing of dysautonomia, and in promoting better medical care for these patients. However, for this purpose, all those limitations should be overcome.

The study is a review of the literature and presents, in a didactic way, the main clinical applications of scintigraphy in the study of cardiac autonomic denervation. The use of this technique started in the early 80s, i.e., 41 years of experience have been accumulated (Figure 1). Undoubtedly, cardiac scintigraphy with ^{123}I-mIBG and its parameters – the late heart-to-mediastinum ratio (HMR) of ^{123}I-mIBG uptake and its clearance rate – is the most supported by currently available data.[6] Results of these indexes indicate, respectively, the integrity of presynaptic terminals and the adrenergic tone.[7]

Figure 2 summarizes the clinical settings that would most benefit from cardiac ^{123}I-mIBG scintigraphy. In heart failure a reduced HMR is an independent marker of mortality and a predictive marker of arrhythmic events.[8] Besides, observational studies have shown its applicability in cardiac resynchronization therapy[9] and cardiac defibrillator implantation,[10]

Keywords

Scintigraphy/methods; Single photon emission computed tomography/methods; Nuclear Medicine; 123I-mIBG.

Mailing Address: Simone Brandão
Universidade Federal de Pernambuco - Medicina Clínica
Av. Beira Rio, 360, apt 201. Postal Code: 50670-901, Ilha do Retiro, Recife, PE – Brazil.
E-mail: sbrandaonuclearufpe@gmail.com

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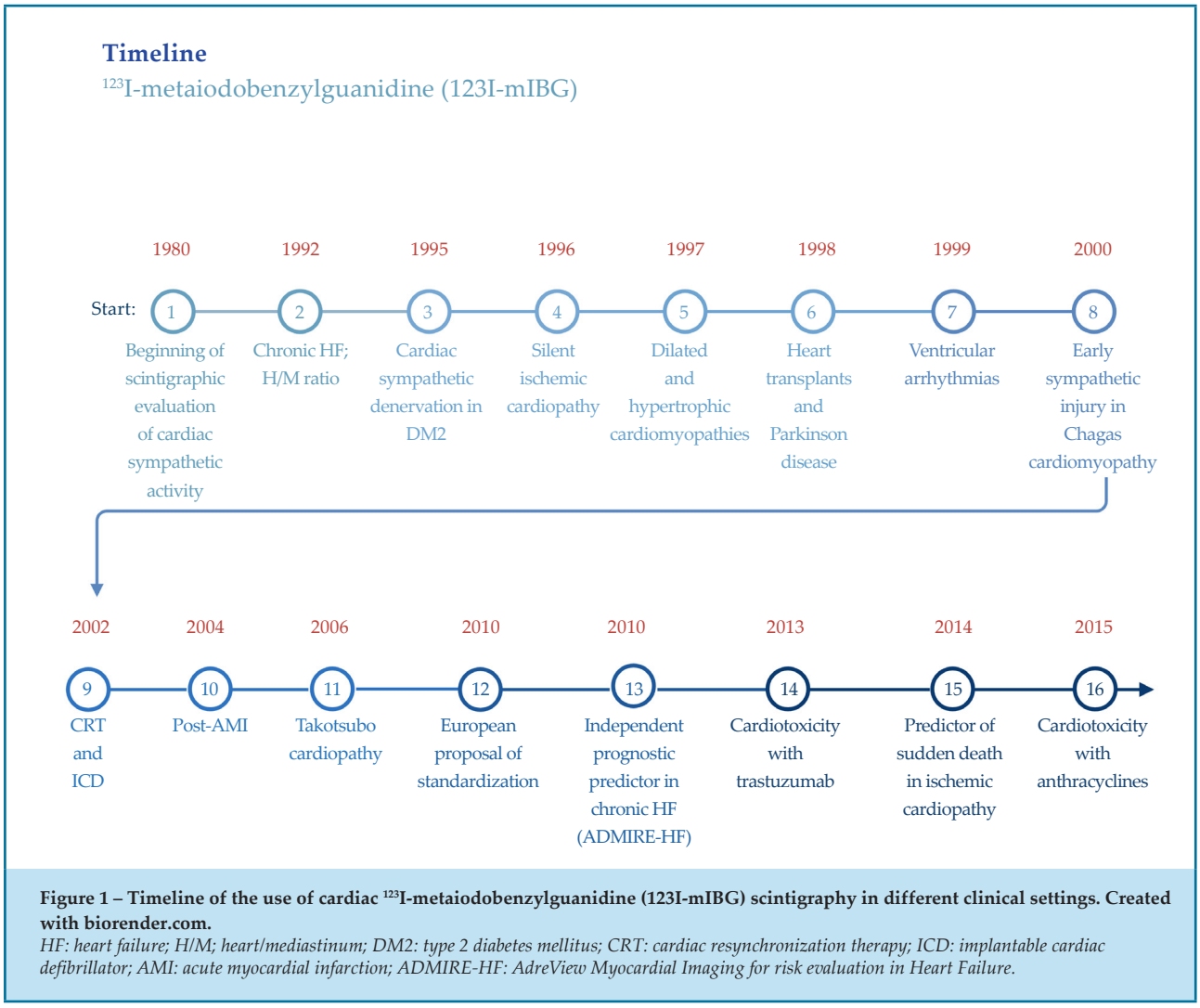

Figure 1 – Timeline of the use of cardiac ^{123}I-metaiodobenzylguanidine (123I-mIBG) scintigraphy in different clinical settings. Created with biorender.com.
HF: heart failure; H/M; heart/mediastinum; DM2: type 2 diabetes mellitus; CRT: cardiac resynchronization therapy; ICD: implantable cardiac defibrillator; AMI: acute myocardial infarction; ADMIRE-HF: AdreView Myocardial Imaging for risk evaluation in Heart Failure.

focusing on refining the indication criteria for these expensive therapies and making them more cost-effective.

Other applications include cardiovascular risk stratification in Chagas cardiomyopathy, hypertrophic cardiomyopathy, Takotsubo cardiomyopathy, early detection of cardiotoxicity, cardiac amyloidosis, and dysautonomia secondary to neurodegenerative diseases and diabetes mellitus, as well as therapeutical monitoring in several cardiac conditions.[4,5,11,12] In many of these situations, mapping of myocardial denervated areas can help in the identification of arrhythmogenic foci and prediction of arrhythmic events,[8] and consequently in better establishing patient risk and appropriate therapy. In addition, monitoring of recovery from myocardial injury by cardiac ^{123}I-mIBG scintigraphy helps in the evaluation of therapy effectiveness.[4]

However, despite the well-established pathophysiological foundation and numerous studies supporting the benefits of scintigraphy in the evaluation of cardiac sympathetic activity, the scientific community still recommends the development of large prospective randomized clinical trials before including the method in clinical guidelines.[11]

The main limitations of the method, discussed in the article, are the scarcity of cost-effectiveness data, the high cost of the technique, poor familiarity of physicians with the method, and the lack of multicenter studies evaluating the role of cardiac ^{123}I-mIBG scintigraphy in each of the clinical conditions above mentioned. In addition, the technique as well as the interpretation results (or cutoff points) in different clinical settings still need standardization.[6] The overcoming of these limitations will advance the use of nuclear imaging in dysautonomia and its full implementation in clinical practice.

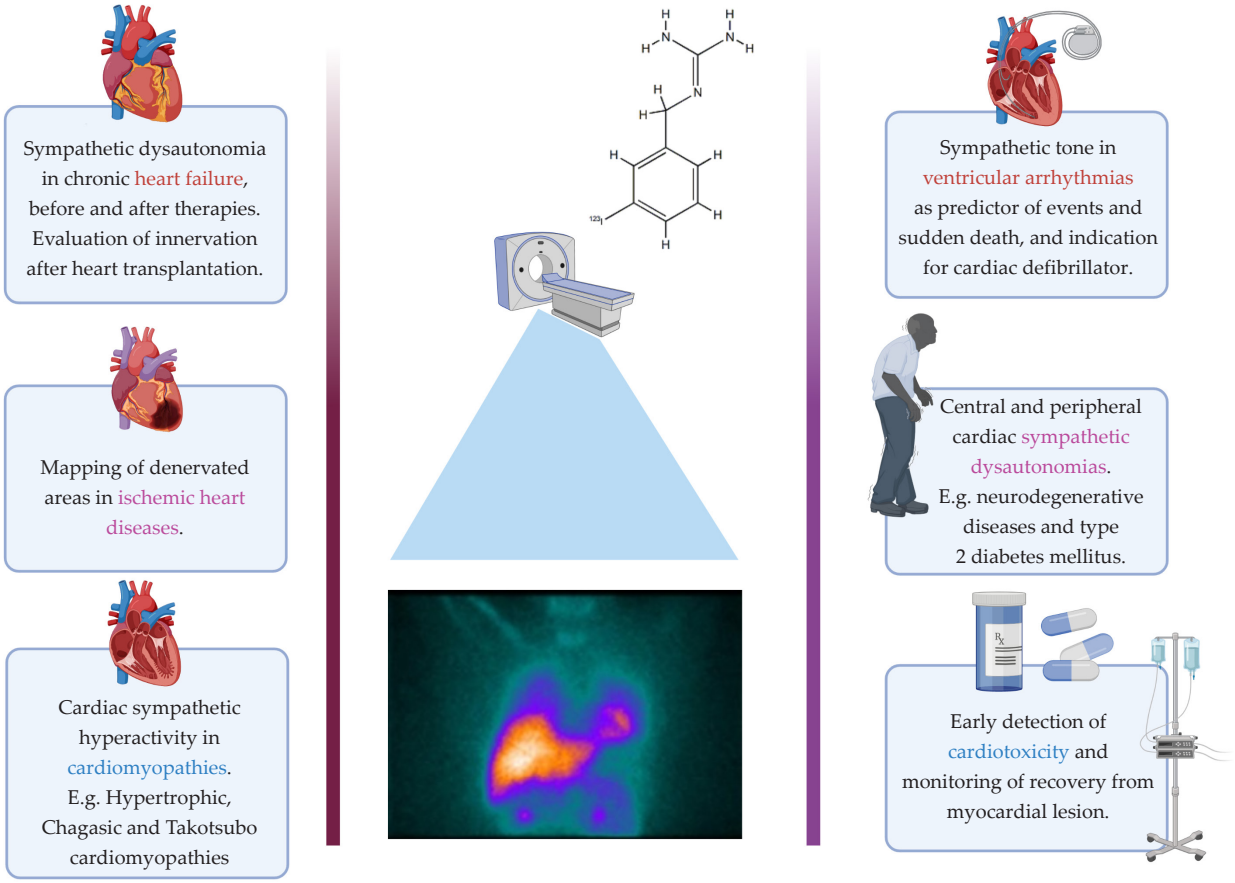

Figure 2 – Main clinical applications of cardiac ^{123}I-metaiodobenzylguanidine (123I-mIBG) scintigraphy. Created with biorender.com.

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