EDITORIAL POINT OF VIEW

Current Clinical Practice of Nuclear Cardiology in Japan

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Received: July 21, 2016/Revised manuscript received: July 26, 2016/Accepted: July 26, 2016

Abstract

For the numerous cardiology clinical practices in Japan, nuclear cardiology imaging tests are among the most important diagnostic tools. The Japanese nuclear cardiology community has developed a new application using ^{18}F-fluorodeoxyglucose (FDG) positron emission tomography (PET) to diagnose cardiac sarcoidosis, as well as new diagnostic imaging tests using ^{123}I-beta-methyl-p-iodophenyl-pentadecanoic acid (BMIPP) and ^{123}I-metaiodobenzylguanidine (MIBG). These new approaches have become popular worldwide. The Japanese Circulation Society (JCS) and the Japanese Society of Nuclear Cardiology (JSNC) have published clinical imaging guidelines and recommendations showing indications and standards for the new imaging tests. Current nuclear cardiology clinical practices in Japan may provide new insights for nuclear cardiology worldwide.
Keywords: Approval, Guidelines, Japanese Ministry of Health, Labor, and Welfare, Myocardial perfusion imaging, Positron emission tomography
Ann Nucl Cardiol 2016；2（1）：50-52

Based on the Japanese ISOTOPE Foundation survey, 1,170 facilities performed nuclear medicine tests in 2012. The population of Japan is currently 125 million, with 0.94 nuclear facilities per 100,000 population. Twenty-five percent of those facilities (296 of 1,170) performed PET studies. Among them, 104 performed PET only, and the remaining 192 performed both PET and SPECT (1,2).

Nuclear cardiology practice in Japan

The 2012 Japanese ISOTOPE Foundation survey showed the total number of nuclear cardiology studies performed as 31,475, an 11.0% decrease compared to the number in the previous survey in 2007. The Japanese Circulation Society (JCS) also conducts a clinical practice survey known as the Japanese Registry Of All cardiac and vascular Disease (JROAD) every year. Results of this survey also show a decreasing trend in the use of single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI). In contrast, the overall numbers of PET studies are gradually increasing, possibly indicating that PET is gradually replacing conventional SPECT MPI, similar to the case in North America (3).

Ministry's approval of nuclear cardiology in Japan

Almost all members of the Japanese population are covered by either governmental or company health insurance plans. Health insurance covers 70% of hospital visits, in-patient treatment, and drugs. In this regard, it is quite important to obtain Japanese Ministry of Health, Labor, and Welfare (JMHLW) approval and reimbursement for new diagnostic imaging tests. JMHLW has approved 3 MPI and two I-123 imaging tracers for SPECT (Table 1) (4). JMHLW currently approves ^{13}N-ammonia (NH_3) for MPI, ^{15}O-labeled gas for radionuclide angiography, and ^{18}F-fluorodeoxyglucose (FDG) for myocardial viability and cardiac sarcoidosis testing (Table 1) (2,5). Unlike the earlier approval of SPECT imaging, in the case of PET imaging, JMHLW approval was contingent upon some conditions. Currently standard hybrid PET/computed tomography (CT) scanners use CT for attenuation correction. However, for cardiac PET, only the PET part is reimbursed even when a PET/CT scanner is used, and the simultaneously performed CT study is not reimbursed. ^{13}N-NH_3 PET MPI is

doi：10.17996/ANC.02.01.50

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Table 1 Japanese Ministry of Health, Labor, and Welfare's approval of the use of SPECT and PET in nuclear cardiology

Test	Date of approval	Indication	Condition
SPECT			
^{201}Thallium	April 19, 1979	Diagnosis of heart disease	
^{99m}Tc sestamibi	April 2, 1993	Diagnosis of heart disease	
^{99m}Tc tetrofosmin	April 15, 1994	Cardiac function measurement using first pass method	
^{123}I-BMIPP	January 19, 1993	Diagnosis of heart disease	
^{123}I-MIBG	October 2, 1992	Diagnosis of heart disease	
PET			
^{18}F-fluorodeoxyglucose	March 8, 2002	Diagnosis of viability	In case of difficult to diagnose myocardial viability using myocardial SPECT
	March 5, 2012	Detection of inflammatory myocardial regions in cardiac involvement sarcoidosis	Approval of PET only. CT attenuation correction is not reimbursed.
^{13}N-ammonia	March 5, 2012	Diagnosis of ischemic heart disease	When other tests are unable to make diagnosis Approval of PET CT attenuation correction is not reimbursed

^{123}I-BMIPP: ^{123}I-beta-methyl-p-iodophenyl-pentadecanoic acid; ^{123}I-MIBG: ^{123}I-metaiodobenzylguanidine

Table 2 Indication of ^{123}I-BMIPP and ^{123}I-MIBG based on JCS guidelines

Test	Indication	Class	Evidence level
^{123}I-BMIPP	Diagnosis of unstable angina	1	B
	Diagnosis of coronary vasospastic angina	2a	C
	Diagnosis of stable coronary artery disease	2a	C
^{123}I-MIBG	Assessment of severity and prognosis of heart failure	1	B
	Assessment of treatment effects on heart failure	2a	C

^{123}I-BMIPP: ^{123}I-beta-methyl-p-iodophenyl-pentadecanoic acid; ^{123}I-MIBG: ^{123}I- metaiodobenzylguanidine

reimbursed only when other noninvasive diagnostic imaging tests such as SPECT MPI are unable to provide a diagnosis of coronary artery disease (CAD).

The JMHLW's approval of PET including the use of ^{18}F-FDG to detect cardiac involvement of sarcoidosis is significant considering that it is not approved in other countries. This approval is likely based on the significant evidence in Japan showing the usefulness of ^{18}F-FDG PET in detecting cardiac involvement of sarcoidosis (6). This approval may help other countries to obtain approval for the use of ^{18}F-FDG PET in detecting cardiac sarcoidosis.

Japanese Circulation Society guidelines for nuclear cardiology and Japanese Society of Nuclear Cardiology recommendation

JCS guidelines, initially issued in 1989, provided clinical indications for nuclear cardiology. The current JCS guidelines were updated in 2010 (7). In accordance with JMHLW approval, the JCS guidelines include indications for the clinical use of ^{123}I-BMIPP and ^{123}I-MIBG (Table 2).

In 2014, the Heart Rhythm Society (HRS) issued an expert statement on the diagnosis of cardiac involvement of sarcoidosis, in which it raised the importance of ^{18}F-FDG PET imaging for that purpose (8). However, previous to that, no clinical standard for ^{18}F-FDG PET in sarcoidosis patients existed. In this regard, the Japanese Society of Nuclear Cardiology (JSNC) established a subcommittee and issued the recommendation that ^{18}F-FDG PET imaging be used for detecting cardiac sarcoidosis (6).

Conclusions

Current nuclear cardiology practice in Japan resembles that in North America but specifically differs in that ^{123}I-tracers imaging and ^{18}F-FDG PET have been approved for the diagnosis of cardiac sarcoidosis, differences that may be worthy of consideration for nuclear cardiology practice worldwide.

Acknowledgments

This manuscript has been reviewed by a North American English-language professional editor, Ms. Holly Beanlands. The authors also thank Ms. Holly Beanlands for critical reading of the manuscript.

Sources of funding

Dr. Yoshinaga is supported by the Imura Clinical Research Award (Adult Vascular Disease Research Foundation).

Conflicts of interest

None

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