Annals of Nuclear Cardiology Vol. 4 No. 1 120−122

REVIEW ARTICLE−INTERNATIONAL CORNER

Current Status of Nuclear Cardiology in South Korea

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Received: June 20, 2018/Revised manuscript received: July 25, 2018/Accepted: July 29, 2018

Abstract

Nuclear cardiology studies have been part of nuclear medicine practice from 1970s in Korea. It showed a steep growth in 1990s when single-photon emission computed tomography (SPECT) with advanced software was introduced, and it is still growing. SPECT myocardial perfusion imaging takes 12.8% of total gamma imaging studies in 2016. Although ^{201}Tl is still preferred to ^{99m}Tc for myocardial perfusion tracer there is a trend of growing use of ^{99m}Tc perfusion agents. While, the use of cardiac positron emission tomography (PET) is still very limited, which takes less than 1% of total PET studies. The reimbursement for cardiac PET includes only ^{18}F FDG imaging for myocardial viability assessment in patients with acute myocardial infarction before and after revascularization. Cardiac FDG PET studies for sarcoidosis, amyloidosis, myocarditis, and vasculitis are reimbursed in only limited cases. ^{13}N ammonia is the only PET myocardial perfusion tracer that is approved by the Korean Food and Drug Administration. A multi-disciplinary group, the Korean study group of cardiovascular imaging (KCI), is trying to establish new guidelines which include the most up-to-date information on cardiac imaging modalities in various clinical scenarios.

Keywords: Myocardial perfusion imaging, Nuclear cardiology, South Korea
Ann Nucl Cardiol 2018; 4 (1): 120−122

Nuclear medicine technologies were adopted to the medical community in 1960 for hematology and endocrinology patients in Korea. Nuclear cardiology studies became important parts of nuclear medicine practice from 1970s in Korea. Although there are challenges, including reimbursement for newly developed imaging tracers and the development of competing modalities, they are still growing even more important in the clinical fields. In this brief review, the trends of nuclear cardiology studies in Korea will be presented.

Myocardial perfusion SPECT

Nuclear cardiology studies show a steep growth in 1990s when single-photon emission computed tomography (SPECT) with advanced software was introduced. It is presently still growing further, reaching nearly twice as many as its number in early 2000's. SPECT MPI took 12.8% of total gamma imaging studies in 2016. Although ^{201}Tl is still preferred to ^{99m}Tc for myocardial perfusion tracer there is a trend of growing use of ^{99m}Tc perfusion agents, reaching 96,875 studies in 2016 (Fig. 1A) (1). There was a temporary drop of SPECT volume in 2008-2009, when 64-channel coronary computed tomography (CT) widely spread and entered reimbursement. Nevertheless, the recent installation of cadmium-zinc-telluride (CZT) cardiac-dedicated SPECT system in Korea has brought even higher volumetric expansion of SPECT MPI. CZT SPECT-measured myocardial blood flow (MBF) and myocardial flow reserve (MFR) are also available (2). The promising results and the clinical usefulness of CZT SPECT MPI will undoubtedly promote nuclear cardiology in Korea.

Non-perfusion nuclear cardiac studies

Non-perfusion cardiac SPECT imaging studies are also readily available in Korea. Multi-gated acquisition (MUGA) ventriculography is being used for monitoring cancer patients undergoing cardiotoxic chemotherapies. Recent guidelines revived several non-perfusion SPECT agents in Korea. ^{99m}Tc pyrophosphate (PYP) scan was previously used for detecting

doi: 10.17996/anc.18-00076

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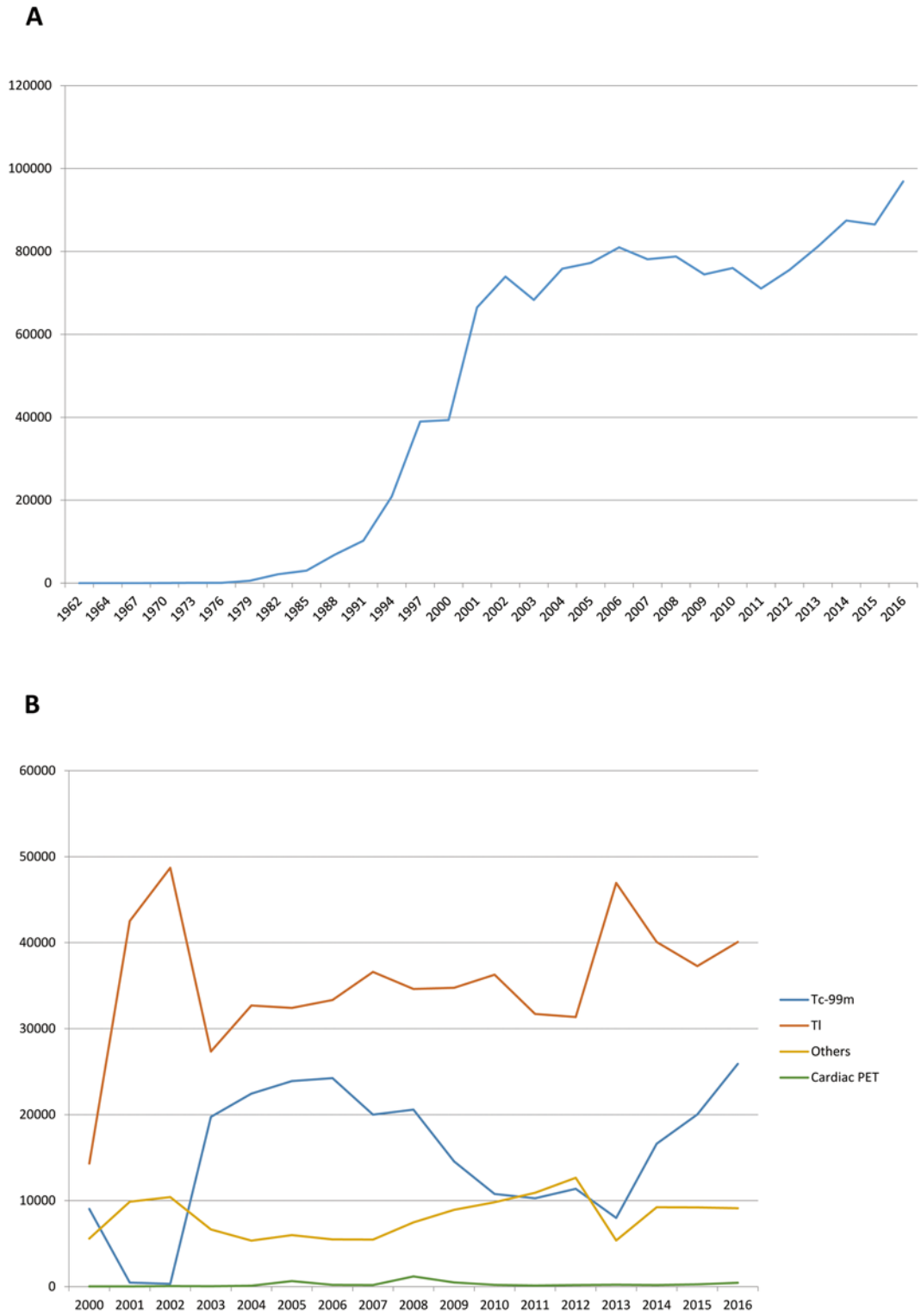

Fig. 1 Trend of nuclear cardiology studies in South Korea. It started in 1970s and showed a steep growth in 1990s and is still slowly growing (**A**). Thallium-201 (Tl) is more popular than ^{99m}Tc myocardial perfusion tracers (^{99m}Tc), while the use of ^{99m}Tc is increasing recently. Other imaging studies (Others) such as gated blood pool studies or infarct-avid imaging shows no growth these days. The use of cardiac positron emission tomography (PET) is very limited (**B**).

infarcted myocardium. It is now a widely available agent for the diagnosis of transthyretin cardiac amyloidosis, along with ^{99m}Tc diphosphono-1,2 propanodicarboxylic acid (DPD). Leukocyte scan is also gaining its clinical relevance for the diagnosis of prosthetic valve endocarditis.

Cardiac PET

While SPECT MPI studies are well accepted and reimbursed in Korea, the use of cardiac positron emission tomography (PET) is still very limited (Fig. 1B), which takes less than 1% of total PET studies. The reimbursement for

cardiac PET by the Korean Health Insurance and Assessment Service includes only FDG imaging for myocardial viability assessment in patients with acute myocardial infarction before and after revascularization. Cardiac FDG PET studies for sarcoidosis, amyloidosis, myocarditis, and vasculitis are reimbursed in only limited cases. ^{13}N-ammonia is the only PET myocardial perfusion tracer that is approved by the Korean Food and Drug Administration. Many useful radiopharmaceuticals including ^{82}Rb for PET perfusion imaging, ^{123}I-MIBG for heart failure, and ^{123}I-BMIPP for fatty acid metabolism imaging are on the list of evaluation by governmental authorities for clinical use.

A multi-disciplinary group, the Korean study group of cardiovascular imaging (KCI), is trying to establish new guidelines which include the most up-to-date information on cardiac imaging modalities in various clinical scenarios. KCI considers the appropriate use criteria (AUC) of the USA (3) and the recent changes in National Institute for Health and Care Excellence (NICE) guideline in the UK (4) as references. KCI describes the unique values of myocardial perfusion PET such as absolute quantification of myocardial blood flow and detection of microvascular disease, which are not available with other modalities including coronary CT. These efforts will shed light on more nuclear cardiac imaging studies and extend their clinical values in Korea.

Conclusion

Gamma camera cardiac imaging studies including conventional SPECT and newer CZT cameras are growing and well reimbursed in Korea. On the contrary cardiac PET technology is not reimbursed well and not used widely despite they are available in many institutions. Nuclear cardiologists in Korea are trying to establish practical guidelines for cardiac PET.

Acknowledgment and sources of funding

This study was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2016R1D1A3B01006631).

Conflicts of interest

This work was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2016R1D1A3B01006631).

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